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PYRAMIDE SOFTWARE PRESENTS:

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An urgent telegram, the anguished plea of an old friend and the chance to revisit your childhood home build up the Pexlike atmosphere.

It's an unusual adventure in both plot and execution. Motive, rather than monsters, makes up the game, which includes a novel use of window graphics.

Mortville Manor has a good smattering of characters, all of whom are relations of Julia, the friend who pleaded with you to come to the house, but was murdered before you got there.

The discussion mode lets you talk to the house guests, but the vocabulary is limited and your audience unresponsive if you don't ask the right questions. It's a hard slog but, coupled with the information gleaned from characters and the furnishings in their bedrooms, you'll suss out the masterly plot to usurp the family fortune and heritage. Edgar Allan Poe and the inhabitants of Usherland would be pleased with this plot.

Mortville Manor is a show house for the mystery contained in Pyramide's latest game. It contains all the elements for the solution of the puzzle but is not, literally, the scene of the crime.

The game pulls off a difficult concurring trick. It has all the hall marks of a classic who-dunnit but you must realise that the solution lies in how the characters live and read.

Pyramide's adventure is for stickers who like a good mystery and are willing to play for months to get into the game.

THE WANDERER, ★ ★ ★ ★ Sinclair User Classic

The three dimensional graphics are stunning (Popular Computing 21-27 August '86)

This game is absolutely incredible . . . in a class all by itself. There is really nothing on any other computer that can compare with it for the truly innovative visual effects it creates. Other games on the QL are good. On a scale of one to five, this game rates a ten. (The QL Report, Copyright 1986, Curry Computer, U.S.A.)

NUCLEON

One of the most exciting utilities for the QL. (QL World, Sept. '86)

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NEXT MONTH

Miracle Modem

Miracle System's new QL Modem must be one of the smallest produced for any micro. At less than £50 it is also small in price. We test it in the December issue.

An added dimension

We look at two new CAD packages which have pushed QL design into the third dimension.

Competition

Another great software give away.

Plus

Our regular mixture of news, programming features, reviews, help and listings.

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The Assembler can operate in a conventional two-pass mode or as a one-line assembler.

The Monitor offers a useful dual screen to assist in debugging graphics programs.

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Mini modem is a Miracle

Miracle Systems has produced what must be one of the worlds' smallest modems — and it is for the QL. The dimensions of the modem are 70mm. long x 48mm. wide x 24mm. deep, smaller than a packet of cigarettes.

The modem operates at 1,200/75 baud or 1,200/1,200 half-duplex. Terminal software to emulate both a viewdata terminal and a scrolling 80-column terminal is supplied on Microdrive. Therefore it is possible to access Prestel and Micronet, other viewdata services and amateur bulletin boards. The software for the modem was written by Qcode.

Although the modem is not

BT-approved, Miracle director Stuart Honeyball commented: "The QL modem has not been submitted for approval because of the high costs and long delays involved in doing so. If it were, however, we are

sure that it would pass." The QL modem costs £49 including the software.

For further details contact Miracle Systems, 20 Mow Barton, Yate BS17 5HF. Tel: 0454 317772.



Sophisticated Citizen addition

Citizen has added to its extensive range of printers with the new HQP 45. Costing £795, the 24-pin dot matrix machine boasts features such as print speeds of 200cps in draft mode and 66cps in letter-quality mode, standard RS232 and Centronics interfaces, and automatic paper load.

"The HQP 45 is the first of a new range of 24-pin printers which will establish us in the more sophisticated dot matrix printer market," says Jack Bennett, Citizen Europe vice-president, sales and marketing.

Desk-top publishing takes a Quantum Leap

Desk-top publishing on the QL has arrived with a release from GAP Software called *Front Page*. Costing, £22.50, the menu-driven program allows you to scroll, pan, cut and paste, change print sizes and even design simple graphics, then print-out the results to produce newsletters, leaflets or slim volumes of verse.

Among other features the program has a user-defined 8 x 8 graphics grid, as well as a freehand drawing facility, an alternative character set, up to 80 lines and 133 columns, and a routine for printing A4 pages to an Epson or Epson-compatible printer.

The program works by holding half the page in RAM and the other half on Microdrive. Floppies or a RAMdisc can be used to speed the access time and you can toggle between the devices if you wish.

Front Page is available from GAP Software, 17 St John's Terrace, London E7 8BX.

Schön is first with new keyboard

Schön Keyboards, a company formed by ex-Saga sales manager Christopher Smith, has released the first replacement keyboard for the QL. It has professional full-travel keys, is based on the original QL and therefore is compatible with all existing software and peripherals.

Assembly, it is claimed, takes no more than five minutes and consists of removing the original keyboard, connecting the new one and attaching the

new top housing.

Commenting on the new keyboard, Smith says:

"With home computer keyboard experience behind me I have managed to design the perfect keyboard for this computer. With virtually the same key layout, QL owners can look forward to programming the machine with pleasure.

"People who are considering buying a computer this Christmas should now seriously consider

the QL. The consumer now has the chance of buying a superb 16-bit machine with a professional keyboard at a very low cost".

Other companies working on replacement keyboards for the QL include Smith's ex-employees, Saga, ABC Electronics and Rainbow Digital Repairs.

The price of the Schön QL keyboard is £54.95 inc. VAT. More details from Schön Keyboards, Tel: 04865 3836.

Rubicon gives CAD graphics an added dimension

Rubicon Computer Systems has released a three-dimensional CAD program, *Viewpoint*. Designed as a technical drawing aid, the program is also aimed at teachers and lecturers, and enables a 3D wireframe image to be constructed from two-dimensional images. The 3D shape can then be rotated, zoomed in or out, and changed in perspective.

Viewpoint is the first program of its kind in the U.K., although a similar one,

Concept 3D, is produced by Tesseract Software in the U.S. *Viewpoint* costs £19.95.

Rubicon is also taking pity on frustrated players of the company's graphic adventure game, *Dragonhold*, by allowing them to write for a clue to enable them to find the elusive dragon and elixir. Only one clue will be given, so players are advised first to think carefully.

Rubicon Computer Systems is at 11 Bannerdale Road, Sheffield S7 2DJ.

War games

War in the East has arrived — from the west. The military strategy game based on the Russo-German conflicts of World War II is now being imported from the States by TK Computerware.

There are three scenarios — Barbarossa, Stalingrad and the destruction of army group centre. The complete set costs £39.95 although the programs are available individually.

For further details contact TK Computerware, Stone Street, Stanford, Kent TN25 6DF. Tel: 0303 64039.

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What happens if your QL generates the 'bad medium' error? Ron Massey looks at recovery programs — a healthier alternative to suicide.

Media Managers

However meticulously the rule for making back-ups is observed, there is a time in the life of every computer buff when, just as we plan to stop backing-up what can amount to hours of work — possibly more, if making a back-up is not carried-out as part of normal routine — when a relatively minor electrical disturbance turns your data or program cartridge or disc into second-hand plastic. Anyone who says it cannot happen to them is living in a fool's paradise. All kinds of horror stories are alive and well and lying in wait.

A range of utilities exists to help. Readers wishing to acquire useful background regarding disc and cartridge file structure would benefit from reading the articles on the subject by Colin Opie in the February and March issues of *QL World*.

Media Manager

The first recovery utility dealt with is the new Digital Precision definitive blockbuster *Super Media Manager*, which includes every possible facility for management of all types of recorded media, whether in the QL format or not.

Entirely menu-driven, its first set of options is divided into utilities for

either cartridges or discs. Each of the menu options drop through a hierarchy of its command structure. The option of producing hard copy from the various options is both implemented and strongly recommended throughout the manual.

While the internal workings of SMM utilities vary according to the type of media concerned, externally, utilities of a similar nature — Sector Editors, for example — serve a similar function for discs and cartridges and, where similar utilities in this sense are being described, it will be done from their exterior appearance and, unless otherwise noted, apply equally to both types of media.

The Primary Device Selector option provides facilities for changing the default values temporarily for access to Microdrive, floppy, printer specification and baud rate. Permanent changes to the default values of the system may be made by reconfiguring the SMM Medman-Dat file to the defaults required.

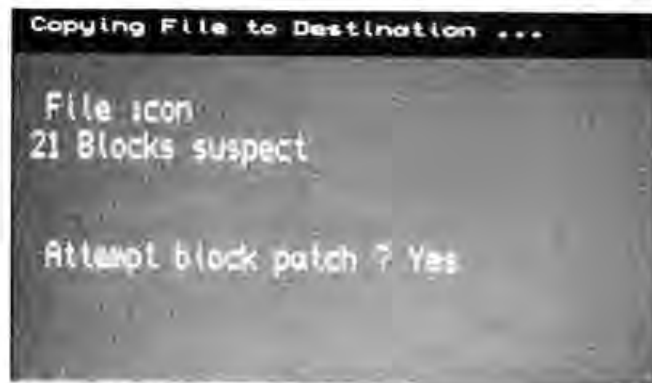
Sector Editing is normally used only where one of the automatic recovery methods cannot produce adequate results. When this option is selected, it is usually used in conjunction with the Drive Utilities option. An option common to Microdrive and disc utilities, current sectors may be saved as separate

files or integrated back into the parent file.

Sectors may also, with the Load and Print Sectors option, be loaded and printed in groups of half-sectors. Special facilities are included for disc sector editing to display the disc type, a calculator for converting denary and hexadecimal values. Of primary importance, the Set Disc Drive and Type of Disc option is used where more than one disc is used in a single editing session to inform the system that a change has occurred.

In common with other options, screen displays may be echoed to a printer; users are encouraged to keep hard copy records of their media information throughout the manual, in any case, so that the job of recovering files at some time is made easier.

Directory sorting may be carried-out by a number of parameters — in alphabetical order filenames may be converted to upper- or lower-case *en masse* or individually, by file size in either ascending or descending order, or by



Super Media Manager.

Utilities options are available for displaying the mapping sector, display of the true drive map, string search by any of three methods—by file name, file sector or global sector search. Microdrive utilities include an option to recover deleted files; because of the more complex way recovery of deleted files from disc occurs, other SMM utilities are used in conjunction with each other for this purpose.

date with the newest file either first or last. Sorted directories may be viewed either on-screen, sent to a printer, or the media may be altered to the sorted values.

A warning regarding sorting Microdrive directories — it is considerably faster to copy a cartridge to RAM disc, sort the directory, and re-write the files to a cartridge than to attempt a cartridge directory sort directly.

That is not a failing of SMM. On average, it takes 10 to 15 seconds to write and verify each sector but if you are not busy for 45 minutes or so . . .

Full selective file-handling facilities are implemented for intelligent wildcard specifications. Directories include their relevant file numbers, which is useful if a printed record is kept to aid in their eventual recovery should they become corrupted. There is selective deleting either

directories can be sorted by filename and the finished catalogue includes filename, size in



bytes, and the media volume in which it appears. Copy printed with XDIR will, wherever possible, produce a two-column listing, optimising the printed catalogue presentation.

A powerful utility exceptional to SMM is the option to read text and binary files from virtually any disc system alien to the QL, using the QL drives. When considering this option, in addition to all the other powerful utilities incorporated into this media utility, Super Media Manager must be a world-beater.

Three major operating systems catered for by the Alien disc file copier include the BBC/Acorn DFS, CP/M and MS-DOS single- or double-sided, 40-and 80-track discs.

The first requirement for this utility is to set the disc drive and Alien disc type so that the system can obtain data concerning the disc regarding its number of tracks, recording density and format layout.

Sectors can contain 128, 256 or 512 bytes but are displayed in SMM standard half-sector screen layout. Other screen information included is the current side, track number and sector value.

A display of an Alien directory includes a number against each file

for total file count — or file extents, in the case of CP/M. Viewing Alien files, or printing them, requires only the relevant file number to be entered. Alien files may be transferred to the QL by entering the appropriate file number.

Of equal value, SMM documentation is well-planned and includes a considerable amount of background information regarding the way discs and cartridges store data. In addition, a chapter is devoted to the file alterations occurring on disc and cartridge when files are deleted, and procedures used to recover them.

Commonsense recommendations are made throughout the manual to help prevent the need arising where the use of Super Media Manager will be required. If programs and data files are important, it is equally important to provide a level of security to ensure their continued availability.

Back-ups are a primary consideration. Of almost equal importance, printed records of a drive will prove a powerful aid where the primary rule was not observed. Recovery is, at best, a

either simpler, more specialised or limited solely to cartridge, disc or RAM disc file are available to perform various operations on files for purposes of recovery or modification.

Cartridge Doctor

One of the first utilities available for the QL, the Talent *Cartridge Doctor*, has become a classic semi-automatic data recovery system for corrupt or damaged cartridges — an invaluable tool in any program library.

It incorporates five separate but related utilities which, between



by wildcard name or utilising the global options of yes/no/all/quit. Copying files include the same facilities.

Text files may be formatted with the parameters required to produce tidy print copy and includes printer control codes, margins, line spacing, page and line numbering, or continuous and sheet stationery options.

Text files may be edited with string search and replacement, case replacement. Machine code files may be altered so that all calls to one drive medium within the file — say, mdv — is replaced by a call to another, say flp or RAM disc.

XDIR is a utility added to SMM which will allow you to make a master directory of the directories of all your media, either as a separate file, on printed copy or both. The



them, will enable the user to recover the majority of files from damaged or corrupted cartridges, produce a directory from



Cartridge Doctor from Talent.

tiresome job; SMM almost makes it an adventure of discovery. It also manages to make recovery, if it is possible, a relatively simple task.

Utilities released by other software houses,

file header information — where access may not be possible by more conventional means — recover newly-deleted files, or patch text files for Quill or Basic programs.

The default facility, Autoclone, is successful in a large number of cases where the much dreaded "bad or changed medium" report is returned after an unsuccessful attempt to load a cartridge.

Users are first given the option of formatting the new destination cartridge. If the offer is declined, a directory of the destination cartridge is performed — a sensible precaution — and the user is then returned to the main Autoclone menu, from which selection of the source and destination is made.

Good health

The next stage examines the "health" of the source cartridge. Sector headers and then files are examined to ascertain data integrity. A screen report is given for sector headers, directory map and file content.

One of the important aspects is that Cartridge Doctor does not depend on the high-level directory — the information obtained with DIR — which may be corrupt; directory information is taken, instead, from local sources.

Q Doctor

Taking a different approach to the problem of repairing Microdrive files, the Adder QDoctor performs its operations by loading a sector at a time, using the file number rather than the filename, and filing all alterations are made manually.

There are three main elements which can be modified — the sector header, the block header and the block. All the system options are available from a single menu and provide facilities to edit a sector, edit an existing file block, edit a deleted file block, write the edited sector to Microdrive, list

Microdrive bad sectors, obtain a directory for the filename and number, set the number of attempted reads before abandoning the attempt and change drive default number.

The QDoctor file display is the conventional hex and ASCII half-sector used with the majority of similar utilities. Other display conventions observed are the drive number, file and block numbers, in both decimal and hex values, and the high or low half flag of the displayed half-sector.

Editing may be performed in either the hex or the ASCII windows. Modified files may then be saved to Microdrive. Applied in a systematic manner, the QDoctor options provide a means of extracting as much usable data from corrupt files as well as a method, where it is possible, for replacing or the patching of files.

Disc Monitor, included with the Ultra Soft Qlone+ package is, as the name implies, intended for editing disc files. Entirely menu-driven, the editor displays both HEX and ASCII representation of a half-sector. Like QDoctor, sectors are loaded one sector at a time for editing and, when completed, can be saved back to disc.

Data Management, Patcher is, superficially, the simplest of the file-handling utilities. While not a repair utility in the sense of the other programs featured, it is nonetheless a powerful and useful utility for editing file contents. One of its specific features is that it will load up to about 80K of file code into RAM, on an unexpanded QL, rather than the more conventional approach of loading one sector at a time. The top part of the screen contains information relevant to

the file.

Sensibly, the documentation quotes the old Chinese proverb — To prevent crotch up, make back-up. By by-passing the Qdos COPY command, it is possible to recover otherwise unreadable files. If such files are loaded successfully, they can be saved intact on to a new media.

From all appearances, Qflash intends eventually to produce a sub-

operating system for the QL. As part of its Ramdisc Toolkit program, it also includes a routine called Ramdoctor, which can be utilised only with the Qflash Ramdisc and Toolkit.

Using the Toolkit command *mdvload*, an entire Microdrive can be dumped into the RAM utility in seven to 14 seconds. By-passing the normal Qdos copy command, *mdvload* is able to transfer both good and corrupt files successfully.

Media file management programs — comparative features

Program	RAM Doctor	Disc Monitor	Patcher	Q Doctor	Cartridge Doctor	Super Media Manager
Auto File Recovery — corrupt	X	X				
Auto File Recovery — deleted	X	X	X1			
Manual File Recovery	X	X	X	X	X	X
Load — file name	X	X	X	X	X	X
Load — file number	X		X		X	X
Intelligent directory handling	X	X				
Intelligent directory sorting	X	X				
Sector editing	X	X	X	X	X	X
File block salvage	X	X	X	X	X	X
Transliteration by character	X	X				
Transliteration by string	X					
Text file format translation	X					
Directory of bad sectors				X		X3
Sector viewing	X	X	X	X	X	X
Sector copying	X	X	X	X	X	X
Header block reporting	X	X2	X	X		
Drive map reporting	X					
String searches	X					
Formatted print utility	X					
Selective file manipulation	X					
Printer echo facility	X					
Media — mdy	X	X	X	X	X	X
Media — disc (QL format)	X			X	X	X
Media — disc (other format)	X					

NOTES:

- Files are loaded, block by block, for recovery or editing.
- First 14 bytes only.
- Rather than a director of bad sectors, by using the *mdvload* option a report is returned indicating the number of bad sectors on a cartridge.

INFORMATION

Super Media Manager £39.95 Digital Precision 222 The Avenue, London E4 9SE 01 527 5493	Ramdoctor £14.95 QFlash Available from: Eldersoft 0708 851099 TK Computerware 0303 64039
Cartridge Doctor £14.95 Talent Computer Systems Curran Building, 101 St James Road, Glasgow G4 0NS 041 552 2128	Disc Monitor £14.95 Ultra Soft c/o Sandy UK PCP Ltd 93 Chiltern Avenue, Bedford MK41 9EH 0234 219814
Q Doctor £19.95 Adder Publishing 0223 277050	Patcher £12.50 Datamanagement 0904 760351

QL Storage from



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.



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.

20MBytes!

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 hierarchical 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.



Cambridge Systems Technology
 24 Green Street, Stevenage, Herts SG1 3DS
 Telephone: Stevenage (0438) 352150

Please supply the following items:

- | | | |
|--------------------------|---|----------|
| <input type="checkbox"/> | QDisc Interface including ram drive (3.5") | £79.95 |
| <input type="checkbox"/> | QDisc Interface including ram drive (5.25") | £79.95 |
| <input type="checkbox"/> | Dual 720K 3.5" Floppy Disc Drives: | £219.95 |
| <input type="checkbox"/> | RAM-plus 512K Memory Expansion: | £139.95 |
| <input type="checkbox"/> | QDisc + Dual Floppy Drive: | £275.00 |
| <input type="checkbox"/> | QDisc + RAM-plus + Dual Floppy Drive: | £405.00 |
| <input type="checkbox"/> | 20Mb Winchester with floppy: | £1150.00 |
| <input type="checkbox"/> | 20Mb Winchester, floppy + RAM-plus: | £1280.00 |
| <input type="checkbox"/> | Q488 IEEE GPIB interface: | £224.25 |
| <input type="checkbox"/> | QEP-III Eprom Programmer: | £115.00 |
| <input type="checkbox"/> | Utility disc including ram drive (3.5"): | £10.00 |
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Prices are inclusive of VAT, postage and packaging in the UK only
 CST reserve the right to alter prices and specifications without prior notice

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I enclose a cheque/PO for £ _____

Please deduct my Access/Mastercard/Eurocard/Diners Club a/c

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Signature _____

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.

O P E N

Slap-happy?

For a machine of this quality, though embodying a language second to none, I am surprised at the standard of some of the programs you publish. Beginners or people new to the beauties of SuperBasic might wonder what is so super about it.

An idle moment tempted me to enter *Pentathlete*, published some months ago. Too long, I thought, to make any of those minor adjustments of style one naturally tends to make.

I had not gone far before I stopped. A more careful reading of the program made me draw breath. I found some dozen examples of five or 10 commands repeated for each event. Where were the passing of parameters? Two long procedures were identical except for one variable. Unbelievable.

Nearly as unbelievable was to find another program

by the same author in the latest issue. It is much shorter and yet a quick perusal showed the same slap-happy disregard of the beauties of the machine. Style and the powers of SuperBasic ought to be promulgated on every page of your magazine.

A. J. Senior,
Dragonby,
S. Humberside.

Editor's reply:

The criterion for acceptance in The Progs is not technical excellence — which you will find in the other features — but that programs work well.

The second program to which you refer, Cosmic Revolution, by A Didcock, may be to good programming what cheese on toast is to haute cuisine but it is a great game all the same.

Of course, if you think you can do better . . .

The scientific view

I am prompted by David Harper's Star Letter in the September issue to comment on the article The Unpredictable Micro in the same issue. It contains little astrology as such and in the main appears to be a program review. Ron Massey attempts to justify serious consideration of astrology by suggesting that "large numbers of respectable groups of serious-minded people, scientists and laymen alike, are examining the validity of astrology."

Of course, one can be respectable, serious-minded and still be mis-informed but it is unlikely that one can also be a qualified scientist and believe in astrology.

One of the sad facts is that unless you have a solid grounding in one of the hard sciences — physics, chemistry or mathematics — you are unlikely to be able to distinguish between the nonsense and the science.

So-called serious astrology is full of mathematics and astronomy, all perfectly correct of course, and perhaps difficult to boot, and that gives the impression that the essence of astrology — i.e., planetary influences at your birth — is also perfectly correct when in fact there is no evidence whatsoever, despite Michael Gauquelin, to support that.

It is difficult not to quote nonsense from any publication on or about astrology. Massey states that "anyone wishing to dispute the validity of the astrological process using its failures as supportive evidence should examine weather reports as reviewed in an historical perspective. In spite of all the extensive technology providing a method of prediction for an entirely physical phenomenon, its frequency of inaccuracy leaves much to be desired."

The first sentence of that paragraph suggests that the

New boot

I have just received a copy of FCOPY from Microdrive Exchange and perhaps you could throw some light on a problem I am experiencing? While the program performs perfectly when I load it manually, i.e., I run `mdv1_fcopy_boot`, it will not run automatically when I press either F1 or F2 on my machine.

As I also received a copy of *Golf* on the same cartridge I thought that might be having some effect, so I transferred the FCOPY suite to a clean cartridge. Still the problem persists.

I have run the program through *Cartridge Doctor* and all appears to be well. I have also checked the Boot listing with that published in the magazine but the program will not load automatically.

J L Hadley,
Oxford.

Editor's reply:

You need to re-name Fcopy_boot. Copy it to another cartridge with the command COPY MDV1_FCOPY_BOOT TO MDV2_BOOT.

astrological process cannot be invalidated by failing to give correct weather forecasts. Why are we not talking about astrological successes? There are none, of course.

The second sentence implies that today's hi-tech satellite forecasts — which are 90 percent accurate and the most accurate method yet of predicting the weather — are somehow connected with the failure of astrology to do likewise. The mind boggles.

Regrettably, the article does not attempt to explain how astrology is supposed to work and its scientific basis. I say regrettably, since it would be interesting to learn how many of your readers consider astrology to be a load of hogwash and write to say so.

Which upgrade?

I have been buying your magazine for the last 16 months and find it very enjoyable and informative. My system consists of an unexpanded QL, a Sinclair Vision QL monitor and a Brother M-1009 printer, none of which has ever let me down — not even the 'unreliable' Microdrives.

I now wish to upgrade my QL to 640K and am thinking about buying the 512K Expanderam, including RAM disc, made by Miracle Systems. I would welcome your comments on the product.

David MacDonald,
Glasgow.

Editor's reply:

The 512K Expanderam is a perfectly adequate way of upgrading your QL memory capacity and one of the cheapest. Other options exist but will cost you more.

The Sandy Super Q Board costs £249, but as well as the extra 512K memory you get a disc interface, parallel printer port and the Tebby/Care Supertoolkit. As with

The essence of astrology is prediction. The essence of modern science is quantum mechanics. While there may be some doubts on the true randomness of the Universe, the Uncertainty Principle and the Second Law of Thermodynamics still reign supreme. Without the Uncertainty Principle computers cannot exist in their present form and, if the basics of astrology are correct, your Sinclair Quantum Leap will not work. The best evidence in favour of astrology is that some QLs do not.

Five articles this year on astrology is a bit much, anyway.

Dr John Maltby,
Rubicon Computer
Systems,
Sheffield.

CHANNEL

CST, Silicon Express, MCS and others, the trend is to incorporate several functions on one board.

You must decide whether you want to upgrade in piecemeal fashion — often more expensive and messier — or go the whole hog.

If you want only extra RAM, the Silicon Express Quattro internal upgrade is also worth considering.

No problem

Buying my July edition of *Sinclair QL World*, I read with great excitement of your machine code Spectrum Simulator and not having an assembler I typed-in the hex-loader and discovered with some disappointment I had to wait another month for the end of the program.

A month later, armed with my August edition, I completed the program and it crashed. So I checked all the data and it was satisfactory. Then I noticed the paragraph which reads: Look for lines 202, 203 and 317 — they are 'storage statements'. Look at the hex numbers after the equals sign and type-in that many double zeros, ie, "00".

After trying every combination of zeros I could think of other than typing-in some 2,000 sets of "00", which the hex numbers suggest, it still does not work.

Could you tell me and many others how many and where to put our "00"?

**Anthony Knott,
Shanklin, IoW.**

Editor's reply:

The 00 is intended as a substitute for the storage definition statements so that the rest of the code occupies the correct (relative) address space. For example, at line 202, instead of 00 06, you should enter 00 00.

Fruit for sale

I have just finished designing a Fruit Machine game for the Sinclair QL. I have seen a game advertised with the same name for the QL but after reading the brief description of it, I consider mine may be superior. It has extra features and Winner spinner routines which make it very addictive indeed. When anyone is playing it, I have trouble distracting attention from it.

It is 100 percent machine code and occupies about 20K

of memory. I wonder if you could advise me what to do next? I have never designed a game previously with the intention of selling it. Do you think it would be a good idea to show it to the company already selling the other Fruit Machine? If I cannot sell it would you be able to publish it in your Progs page? Do I even stand a chance of selling it? If so, how much should I expect to receive?

**P R Townshend,
Boscombe,
Dorset.**

Editor's reply:

It is difficult to say whether your program is saleable without first seeing it. You have nothing to lose, however, by sending it to any or all of the QL software houses.

A 20K program sounds too long for The Progs and, to be honest, fruit machine games are considered to be a little passé these days. Send it in all the same and if we cannot use it, we may be able to make some suggestions for improvement.

What — No Midi?

Nobody seems to have written a program and built an interface to be used on the QL for composing music. I am a musician and also a computer-keen person and when I went to the British Music Fair at Olympia I saw on the Electromusic Research stand a new technology for composing music using a computer and Midi Channel from Midi Instruments, amazingly using only BBC, Amstrad, ZX-Spectrum (48/128) and no QL. I could not believe it. Such a powerful machine

and still nobody has done anything about it.

I am sure there are plenty of musicians involved in recording and also they have a QL and would love to use it for composing, as well as playing games or to check the balance in the bank account.

**S. Ruggeri,
Watford,**

Herts.

Editor's reply: You have obviously not yet read the October issue. It is hoped that our Midi series will inspire someone to put together a QL interface. You might even try yourself.

Reward

When I bought from 4 Systems a copy of the Sagesoft Integrated Accounts, adapted for the QL and sold under the Sinclair label, I found it would not transfer to disc. Since the manual gave simple instructions as how to do this, I contacted Sagesoft, which promptly exchanged the Microdrives for version V1.21 of the software. V1.21 loaded with neither disc nor Microdrive.

The program Microdrive cartridges — or discs — autoboot a short program which allows posting, reports, utilities or an installation routine to be run. On running one of them, the Sagesoft logo

appears on the screen, the data Microdrive — or disc drive — spins to set up some data files on the blank formatted data cartridge/disc and spins forever. No further progress is possible.

I use a Silicon Express QL bought with 512K on-board and a Cumana double disc drive. The first version of the software worked on Microdrive, with the second drive hanging-up on disc as described. I insert a one-line 'FSP_USE mdv' in front of the Sagesoft Boot program to run the discs. The same hang-up occurs when I change the installation defaults to accommodate the data disc.

A Sagesoft programmer was bemused by the problem and took the Silicon

Wrong numbers

Having acquired a QL some months ago and using Abacus a good deal, I wondered if there is a numerical keyboard which can be connected to the QL. The keying-in of a large amount of data from the keyboard is tedious and unnecessarily time-consuming and I am surprised that I have not seen a numeric keyboard advertised yet.

**Magnus Danielsen,
Oslo,
Norway.**

Editor's reply:

Numerous new keyboards have been announced for the QL and some will, it is hoped, appear before Christmas. Most of them feature a separate numeric keypad.

Express telephone number, in case it had changed the hardware. Two days later a girl from Sagesoft telephoned to say it could help me only when the software was loaded. She, too, was "not happy" with this response to a loading problem and suggested I wrote to someone else in the company, who has since been sent a letter.

In the meantime, £10 to the first reader who can crack the problem.

**Patrick Dorly,
London SW12.**

When, in April, Sir Clive Sinclair sold his computer business to Amstrad, it was seen by many as the end of Sinclair as a force in the home computer field, but as Ken McMahon discovered, he is preparing not only to take the computing world by storm once again, but has all the answers for the errors of the past.

Sir Clive Sinclair is portrayed variously as the eccentric English inventor, shy genius, airy intellectual and man of vision. He may be any or all of those things to varying degrees. He strikes me as a genuinely friendly and, needless to say, interesting man, refreshingly free of the kind of hype and sham which characterises the conversation of most other computer barons.

Despite those endearing characteristics, Sinclair has a forceful personality. My first, admittedly lengthy, question was interrupted in mid-course and I was informed that if I wanted to hear what he had to say I would have to listen. That I did and what follows is Sir Clive's view of what caused the eventual demise of Sinclair computers, what part the QL played, what he plans for the future and a few things besides.

Sir Clive decided to start by giving a "bit of a rundown" on the events leading to the Sinclair/Amstrad deal.



"The home computer business, in which we are of course pioneers, hit very big trouble two years ago. The problem arose because retailers misjudged the market and ordered heavily. Then they cancelled and we were left with a dearth of orders, in fact negative orders, effectively for several months.

"That caused us and other people in the business at the time very severe difficulties — cashflow problems and so on. The culmination was a very severe major re-organisation on our part and the route we chose eventually was to sell the existing computer range to Amstrad.

"The reason we adopted that approach was that so far as I was con-

cerned they were fairly well-developed, mature products by then. My principal interest is in the future and we wanted to keep within the company the new technology. We are floating the new technologies into new companies. There is Anamartic which does the waferscale business. Shaye Communications which will be doing communications products and a new company, as yet unnamed, which will have the new computer products.

"They will all be partly- or wholly-owned subsidiaries of Sinclair Research — or associates I suppose I should say. The new computer business, I would like to emphasise, has no relationship with Amstrad. We did a one-time deal with Amstrad and that related only to existing technology — nothing at all to do with the future technology.

KNIGHT THOUGHTS

"So we are continuing to develop new computers which naturally will be very radical and they will be our products. What I do not think we will be doing — at least for which we have no immediate plans — is anything in the games field. My principal interest really is in the serious computer field, although, of course, any computer can be used for games and should be, but the machine on which we are working at the moment is aimed at serious users."

I asked Sir Clive if his reasons for selling to Amstrad were purely financial.



"They were financial. I mean we were in a position where we had a tight cash position. We had a choice. We could have sold some of the company to raise money to stay in the existing business but the only deal which could do that would not have given us sufficient money to do both the existing computers and the new technology — the waferscale stuff; and the new technology was what really mattered so far as I was concerned.

"I mean, yes, of course the old stuff mattered in the sense that it had been important but it ceased to be innovative so far as we were concerned, in particular the Spectrum. The QL had also been a disappointment and so it made sense to sell them.

"Above all I think that from my point of view and from the point of view of my customers, it is a tremendously good deal. It may not look a good deal initially, perhaps from the customers' point of view, but I think it will be seen to have been a very good deal because it leaves me to get on with my next generation of computers without the burden of the other products. In particular we don't have to consider any degree of compatibility.

"I think it is very important every so often to take a new stage with computers as we have done traditionally. The QL had nothing in common with the Spectrum. Perhaps it should have done but it had some advantages in doing that. We were able to make more of a technical leap, I think the time is very ripe for something new to be said in the computer business.

If Sinclair's desire has always been to produce a serious computer for serious users it has to be said that his attempts have not met with resounding success. The ZX machines, culminating with the Spectrum, although providing an introduction for many to the joys (?) of Basic programming, will be remembered primarily as the most popular games consoles ever produced. That is why Sugar bought them. I asked Sir Clive if he was disappointed with the frivolous nature his product had acquired.



"Well, I think disappointed is the wrong word, I suppose in a way it has gone a little astray in that what we started doing was selling machines to people to learn programming, knowing that they would play games. I do not mind if they play games on them; if that is what they want to do, that is fine. At the same time it is not the business I want to be in. That is not of interest to me, or at least it is not of great interest.

"Obviously it can be fascinating at times and I have become very interested in what one could do in the games field but I am much more interested in the serious use of computers — in inverted commas, which includes games. I do not have the slightest objection; indeed, I like to see computers being used for games if it is part of them being used in general.

"Most people — and I mean most — discovered a little about computing in the process, so it was pretty good and I think because of that huge number of people exposed to computers by our machines and those of other people in that category, that the market is now ripe for a serious machine, the way it perhaps was not when the QL was launched.

"What has now happened is that we have reached the curious situation where games machines are being sold as if they are computers. I think it will diverge — I am sure it will, in fact — and what you will see in the future is two categories of product, one a games machine which probably will have no keyboard and you will see computers *per se* which, obviously, as I said earlier, will have a games capability."

So to the QL, the no-compromise machine for the serious user. Was it the decision to use a 68008 micro-processor which caused the downfall of the machine? Or was it the unreliability of the Microdrives and the never-ending delays?



"What happened there is an interesting story. It seems to me we made a mistake. Apple made the same mistake, Commodore made the same mistake, and Atari made the same mistake. The mistake is to, well, just that — go to 68000.

"There is nothing wrong with the 68000. I think it is a super chip but if it was a mistake then it was only a temporary mistake. The point is that when the QL was in its development phase it was Z-80-based but the engineers

working on that team were very keen to use the 68000.

"Their argument ran like this. The 68008 is much more expensive than the Z-80 but nothing else goes up in price so the machine will not cost much more, but it will be very much more powerful. That sounds great but it is a fallacy — in several ways.

"First it is a fallacy that it does not cost much more. In practice, as soon as you go to a more powerful chip like that, to exploit it, to have any reason for having it, you need more basic RAM and the chip is less code-efficient so you must have more ROM. Before you know where you are you have a more expensive machine. So the QL was a considerably more expensive machine being 68000-based than it would have been had it been Z-80-based. It was targetted originally at a price of only £250 and as you know it transpired that it was £399.

"I felt then, but I was persuaded by the engineer, and I still feel that really we were not giving the customer what the customer wanted or needed. We provided nothing in that machine

"We have reached the curious situation where games machines are being sold as if they are computers."

which could not have been provided in a Z-80-based machine.

"It was a wonderful chip; one day wonderful programs will come from the 68000 chip and no doubt they will be written for the Amiga or something but it is still the case, I think, that you are not really getting great benefit. That does not prevent it being a good machine; it is a good machine, but it did not need the 68000 to make it a good machine.

"Obviously it meant that there were customers — the hackers, the enthusiasts — to whom the machine was very much better with that chip than it would have been with a Z-80. So it sold well to those people but they are a small part of the market and it inhibited sales to the mass user, which was the large part of the market overall. The overall result was that we had poor sales."

Is he disappointed to see the machine selling for £150 complete with a printer?

"I do not even look at it these days. I do not even think about it because I am always looking to the future and getting on with the next job but it is sad when you think of all the effort which went into it. Really sad. Of course, that has happened not just because of the 68000 choice but because we got off



to a bad start with the Microdrives being unreliable in the early versions."

And the dangled ROMS?

"Well, I think that we could have got away with. That was not so severe, but the trouble with the Microdrives . . . and I think the reviewers were needlessly harsh about it; they were very silly, the press were very irresponsible."

Where does he see his responsibilities to the customer begin and end?



"As I see it he will not buy the product if he does not like it, so I have to meet his needs. It is a responsibility of a kind, I suppose, but I do not think of it in terms of responsibility. What I try to do is to develop a machine so that people will say 'Yes I must have it, it's really good'. I want them to be excited and charged-up about the machine.

Many QL users are exasperated with what they have to do to get their machines to do the simplest things like printing a document; and the support is almost non-existent.

"In terms of where you get the information, the sad concomitant of the sale to Amstrad is that there is no support of any great measure . . . I do not know what Amstrad plans to do with the QL but I judge that it does not plan to continue with it. I do not know why in that case it does not just sell it to someone who will do something with it."

Clearly he is not particularly interested in talking about things past. That I genuinely believe is not an attempt on his part to avoid the question — it bores him to death. Had the QL been particularly successful and Sinclair hailed as a hero of the modern technological age, I have no doubt that his reaction would be exactly the same. So we move to more fruitful ground. The future is a subject at which Sir Clive will talk at length.



"What I am most interested in is portability. I do not mean that I want to make a portable computer and therefore I look at the portables and say how can I make a better one? What I mean is that I want to make a PC and I want to give it those features I consider important. One of the features I consider very important is portability so I am taking it from the personal computer end and making it portable rather than saying let us look at existing portables.

"I think existing portables are niche market products and that what is required is to take a personal computer and, without compromise, to make it portable. That is very difficult because personal computers at the moment

have disc drives and I do not think disc drives are compatible with portability because they are too bulky, too heavy, too mechanical. It is just not on. So you have to find some way round that; you need a neater disc drive or something like that. The Microdrive would be one way but portability, to be valid, has to be portability without compromise.

"The reason I feel so strongly that portability is essential is that some of the things with which a computer can most readily help you — name and address file, diary — are vitiated completely, or badly, if the machine is glued to a desk. I do not think until you have a machine which can move around you will see people in general start to use computers."

Past events have shown, however, that while Sir Clive might have the imagination to produce new and innovative products, things do not always go as planned. Has he learned from the experience of the last five years



and how will that affect the way in which his new products are presented?



"I think the huge lesson of the QL is that you must give customers what they want. It is what I felt instinctively when we were doing it and now I have the experience to back it. There is no point in trying to persuade customers that they need something they do not need.

"It is just like cars, isn't it? There used to be each generation of car with a bigger and bigger engine in it. Then people realised they were not going to sell the bigger engines because people did not want them. There was no advantage to them and they were more expensive.

"So it is with computers. The parallels are not exact, because the day will come when we will think of applications for computers which will justify very great increases in performance. I do not doubt that at all but I have very serious doubts as to whether you will ever gain an advantage by going from 8-bit to 16-bit, for example.

"What we learned from the Microdrive episode was that you must not

"I do not even look at it these days (the QL). I do not even think about it. . ."

rush people. It is a difficult business and if the press get their teeth into it you are a bit stuck. You have to introduce change very carefully. People are very suspicious of change and they are right to be so because most change is frankly for the worse. So it is a natural instinct to be suspicious of change. If you push it too hard at people, even if it is a good thing, they will probably kill it instinctively. You really have to introduce it gradually.

"If you have a radical machine, I think the thing to do — with the benefit of hindsight — is to aim it initially at the people who know what they are doing, who know the product so they will take it up. Other people will see them using it and it will spread out. In a way that is a thing you cannot always do. If you are an IBM and you want to get into the PC business you are bound to be fairly conservative because you must go for volume.

"Take Apple with the Macintosh, which is a very radical product. It was disappointed with the sales but again I think it is because it was too new. If you are going to be radical you have to be gentle about it."

Final thoughts from the man of vision on the future of personal computing in the next decade?



"One thing I am reasonably sure of is that they will be ubiquitous. But, you see, ten years, when you look ahead, seems a hell of a long time. When you look back you think to yourself 'things must be very different now mustn't they?' But they are not. The Apple II, which is by far the best-selling computer Apple makes, has gone through that whole period.

"What I am really saying is I do not know, but I'll bet you one thing. I wouldn't be surprised if the processors in machines ten years from now are the same ones which are around today"

SOUNDING OUT THE MIDI

In the second of our features on the musical interface Robert Penfold describes how to design and build a QL MIDI.

Controlling a number of musical instruments via a Midi interface is a fairly demanding task but one with which the QL is well able to cope. It would seem to be much better-suited to the task than machines such as the Commodore 64 and BBC model B but whereas those computers have a selection of Midi interfaces and software available, the QL seems to lack any commercial support of that type.

That is not to say that the QL is unusable in Midi applications and, apart from the Hinton Instruments RS232C-Midi interface mentioned in Mark Jenkins' article in last month's issue, there is the do-it-yourself approach. I would not encourage anyone who is completely lacking in practical skills and technical knowledge to risk damaging a computer by dabbling with add-on electronics but, on the other hand, making home-constructed interfaces is much easier than most people imagine.

There is nothing particularly out of the ordinary about a Midi interface so far as the technical specification is concerned. It is an asynchronous serial interface, very much like an ordinary RS232C type. The word format is the popular one start bit, eight data bits and one stop bit — with no parity — type but the baud rate is exceptional at 31,250 baud. That is the main problem in trying to use an ordinary RS232C interface for Midi purposes. The nearest standard baud rate is 19,200, which is nothing like close enough to stand any chance of working with Midi equipment.

Another important difference between Midi and the standard RS232C type of serial interface is the form of the

output signal. In the case of RS232C equipment, the output signal switches between about 12V positive and 12V negative but with Midi the output signal is in the form of a nominal 5-milliamp signal which is switched on and off. That method, plus the relatively high baud rate, limits the guaranteed maximum range of the system to only 15 metres, although that should prove to be inadequate only in exceptional circumstances.

The point of using the current loop system is that it works in conjunction with a device called an opto-isolator which is used at each Midi input. It is an ordinary light-emitting diode with its light output directed at a photocell shielded from other sources of light.

Connections

This optical connection results in no direct electrical connection via a Midi interface. One advantage is that it avoids the possibility of damage to the system because of the fairly high voltage differences which can occur between the earth rails of various items of mains-powered equipment.

It is not likely to be a problem, as most electronic musical instruments seem to have their earth rails earthed properly to the mains earth lead, which should eliminate any significant voltage differences. It introduces the possibility of the dreaded earth or hum loop, though, with the attendant 50Hz buzz on the audio output of the system.

There are two general approaches to adding a Midi interface to a computer which could be categorised as the software and hardware systems. With the former, the problem is solved largely by using software to generate the correct serial signals on a digital output and using software to decode received signals on a digital input.

It is usually possible to drive Midi inputs from ordinary logic outputs, or from RS232C type outputs, but to conform properly to the Midi standard an opto-isolator circuit would have to be added ahead of the digital input. The

solution therefore is not provided totally by software but the additional hardware required is minimal.

Although this method has obvious advantages, it is not a very common way of tackling the problem. Encoding and decoding high-speed serial signals is something which requires a machine code or assembly language program and is not a practical proposition for a QL user who is not competent at programming the 68008 directly. Also the encoding and decoding program has to be written in a way which enables it to be integrated easily into sequencer programs or whatever.

The real disadvantage of the software approach is that much of the computer time is likely to be occupied by the encoding and decoding, which could limit severely the prospects for writing good software to run with the system. The QL with its powerful 68008 microprocessor is better-placed in this respect than most of its rivals but that is still not my preferred approach to the problem. It is one which would probably be worthwhile pursuing if you have the necessary programming skills and are familiar with QL hardware.

Hardware

What is in many ways a better solution to Midi interfacing is to use a hardware add-on which does all the encoding and decoding, so that the user has to do little more than send and receive data from the appropriate address. This form of Midi interface is integrated easily with applications software and takes very little processor time. It requires nothing particularly complex so far as the electronics is concerned, since special serial interface devices intended for RS232C and similar interfaces will work equally as well in a Midi application.

Figure one shows the basic stages needed for a hardware Midi interface and the stage at the heart of the unit is the serial interface device. It can either be a general-purpose device called a UART — universal asynchronous re-



ceiver/transmitter — or one of the serial interface chips designed specifically for the 6800 or 68000 series of microprocessors. In either case it connects direct to the databus of the computer

have always found that the best method of interfacing user add-ons to the QL is to place them in the 16K block from 49152 upwards, which is intended for plug-in ROMs. Obviously

modern electronics are such that it requires no more than a handful of what are in the main fairly mundane components. A QL Midi interface circuit appears in figure two.

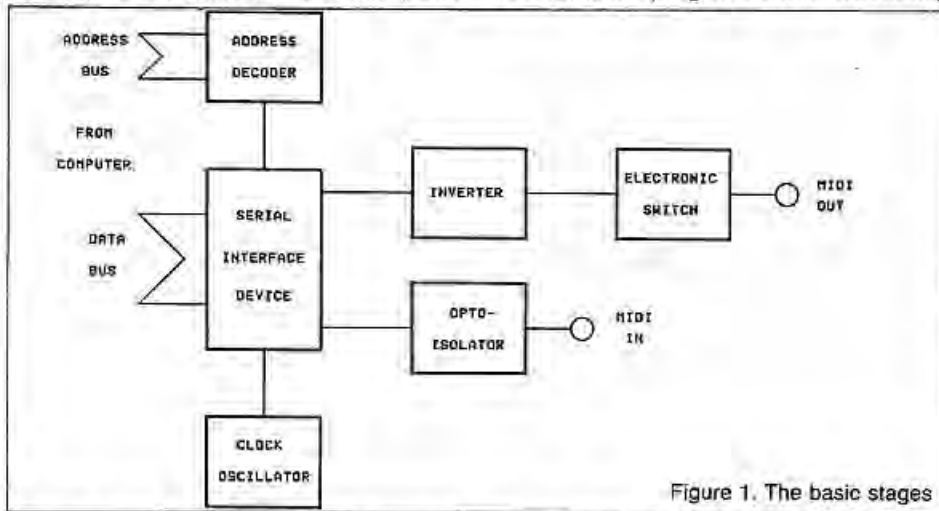


Figure 1. The basic stages

and it does all the hard work of encoding and decoding.

When it is fed with a byte of data for transmission it first latches it into a data register, then transfers it to another register, and from there it is clocked out, one bit at a time, at the appropriate rate. There is more to it than that, with start, stop, and — if required — parity bits being added to the signal but that is all handled by the chip, with the user having only to supply the correct value to the control register to select the required word format.

A clock oscillator controls the baud rate. When data is received the chip synchronises to it automatically, clocks it into the receiving register with any stop, start, or parity bits being stripped-off, and then transfers it to another register. From there it can be read by the microprocessor.

The 68008 has memory-mapped input/output and the interface must therefore be placed at a suitable position in the memory map. It can then be read from and written to in exactly the same way as when dealing with RAM. An address decoder activates the unit when an appropriate address is accessed but at other times holds it in the disabled state with its data outputs at a high impedance state so that they do not interfere with the normal operation of the computer.

There should be no difficulty in finding a gap in the memory map, since the QL uses little of the available 1MB address range. In practice, things are less straightforward because of the use of less than full address decoding for the internal circuits. Placing add-ons in one of the vast unused areas of the memory map tends to result in read and write operations to the circuit accessing ROM or RAM echoes instead. The problem can be overcome but I

only user add-ons which use this section of the memory map or cartridges should be connected to the QL at any time, and not both at once.

The serial output signal of the interface device is inverted — otherwise it will send 0s instead of 1s and vice versa — and then fed to an electronic switch which turns the nominal 5-milliamp output current on and off. On the input side, the serial signal is fed to the interface device only via the opto-isolator.

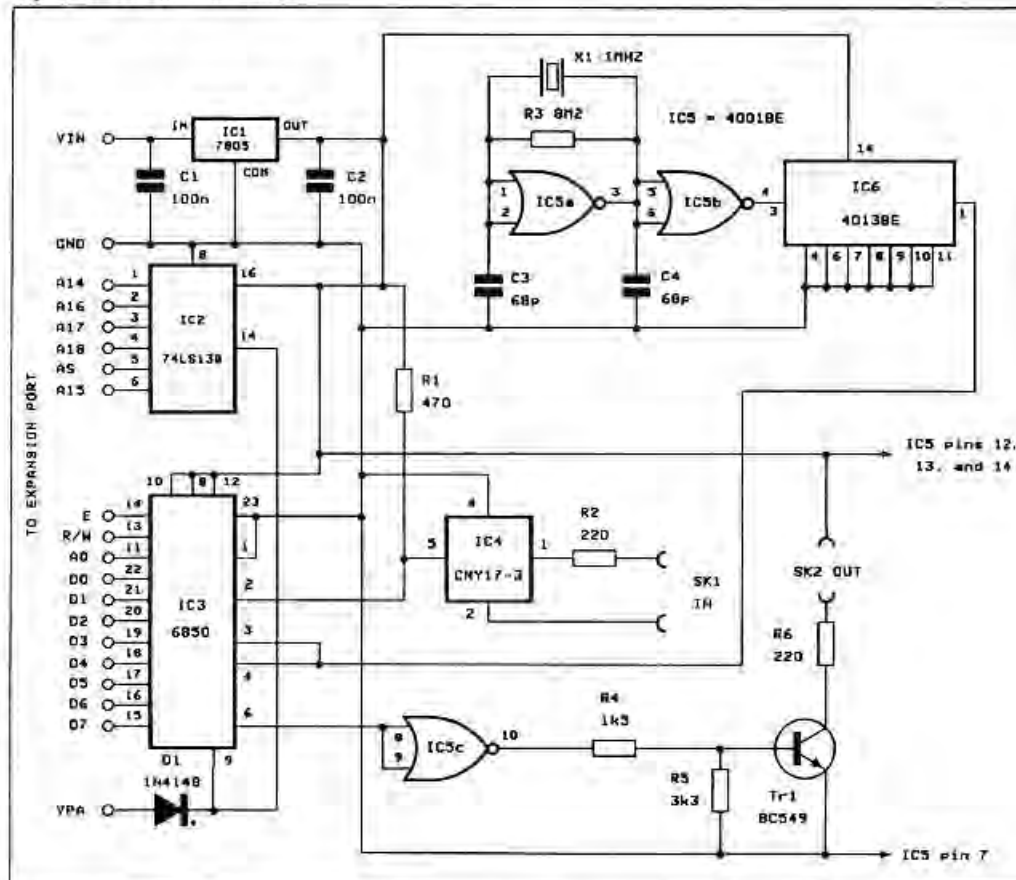
Although a Midi interface is really a fairly complex device, the wonders of

IC3 is the serial interface device — the standard serial chip from the 6800 series of peripheral chips. It is the obvious choice for this application as it is very inexpensive for a component of this type but has sufficient facilities for the present application. A 1MHz clock signal is generated by a simple crystal oscillator based on IC5a and IC5b and that is then divided by two in IC6 to give a 500kHz clock signal for IC3. IC3 is used in the mode where it requires a clock signal at 16 times the required baud rate, and 500kHz — $31.25K \times 16 = 500K$ — is therefore the correct clock frequency in this case.

Address decoding is provided by a single device — IC2 which is a three-to-eight-line decoder. There we are making use of its three enable inputs so that six address lines are decoded. That gives considerably less than total address decoding and although the 6850 occupies only two addresses, echoes occupy the full 16K address range allocated to plug-in ROMs.

When running at full speed, the 68008 microprocessor is too fast for 6800 series peripherals but it can slow to the correct speed if interfacing is handled properly. That involves using the output of the address decoder to pull the Valid Peripheral Address line

Figure 2. THE QL MIDI circuit.



of the expansion port low but the VPA line must be left floating at other times — not pulled high. Therefore it is driven from the output of IC2 via diode D1. The 6850 requires a timing signal on its E (enable) input and the 68008 is equipped with a suitable output available at the expansion port.

At the Midi input, IC4 is the optoisolator and it must be a high-efficiency type. Cheap types are unlikely to work in this application. The serial output signal is inverted by IC5c, which drives common emitter switch Tr1 which, in turn, drives the output socket via current-limiting resistor R6.

The expansion port of the QL has no

two tags are used for signal-carrying purposes but a third can be used to earth the outer connector if the lead is a screened type.

It is advisable to use a screened cable, as high-speed serial signals otherwise can cause strong radio frequency interference to be radiated. Note that the lead connects each pin of one plug to the corresponding pin on the other plug and a lead with crossed-over connections is not suitable — some ready-made 5-way DIN leads seem to be of the crossed-over type.

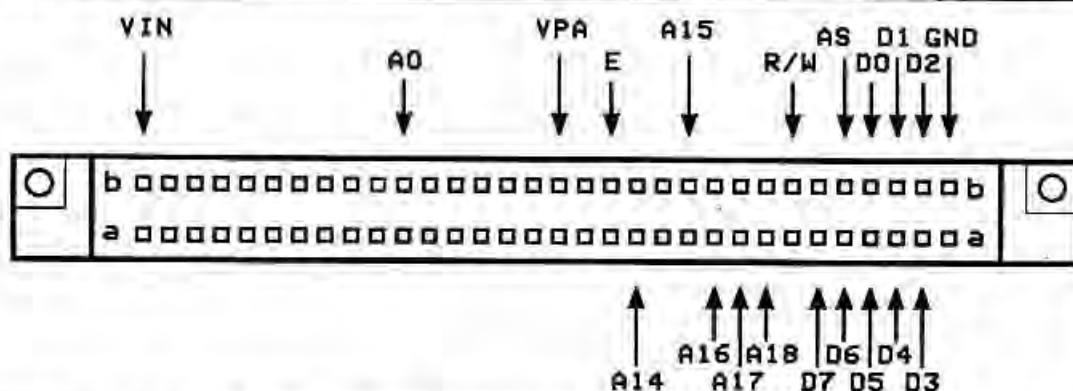
With any add-on which connects to the computer buses the interface should be connected before switching-

than they can be transmitted. A software loop can be used to provide a suitable delay between writing bytes of data, or the software can monitor bit 1 of the status register. That bit goes high when the interface is ready to receive a fresh byte of data.

If you are using a Basic program there is no danger of sending data to the interface at an excessive rate due to the relative slowness of this language and values for transmission are POKEd to address 49153.

Received values are read from address 49153 but care has to be taken to avoid reading each byte more than once. The Midi input is unusable from

Figure 3. Connections for the DIN 41612 socket.



5V output but a 5V stabilised supply is derived from the unregulated 9V supply rail via ICI. The current consumption of the circuit is not great at about 100 milliamps or so but it is advisable to fit ICI on to a small heatsink to ensure that it runs reasonably cool.

Unfortunately the QL is not the easiest of computers to deal with so far as user add-ons are concerned and its expansion port is well recessed into the machine and a little inaccessible. Connections to the port are made by way of a DIN 41612 64-way connector which must be of the narrow spacing — "a + b rows" — type and must be a socket.

The neatest way to construct add-ons is as plug-in boards, with the board being made long enough to fit right into the recess so that there is no difficulty in plugging it in. A less neat but in some ways more practical approach is to fit the connector on to a board which acts as an extension piece to enable the connector to be fitted into place.

The other end of the board can be fitted with another connector, or wired to a piece of ribbon cable which carries the connections to the Midi interface. In either case, figure three gives connection details for the DIN 41612 connector.

The standard Midi connector is a 5-way, 180-degree type and figure four gives connection details for the Midi IN and OUT sockets of this interface. Only

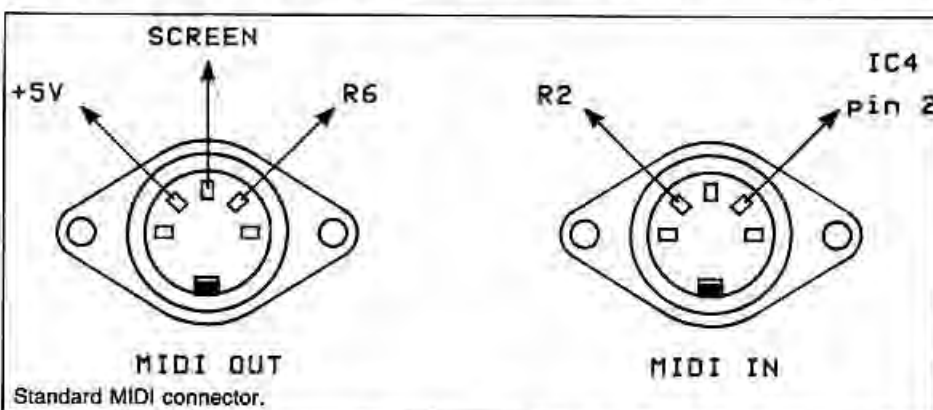
on the computer. Once switched-on, the computer should operate normally — switch-off at once and re-check everything if it does not. Only two addresses are used when dealing with the interface:

Address	R/W	Function
49152	Read	Status register
49152	Write	Control register
49153	Read	Received data
49153	Write	Data for transmission

The control register is needed only when setting-up the interface for use initially. Unusually, the 6850 does not

Basic, incidentally, because data will be received at a far faster rate than Basic could possibly handle. Unlike an ordinary RS232C interface, a Midi type has no provision for handshaking and every element of the system has to be designed to be able to keep pace with a constant flow of data.

Bit 0 of the status register goes to 1 when a fresh byte of data is available and it is re-set automatically to 0 when the received data register is read. The software therefore should be designed to read bit 0 of the status register and



have a re-set input but instead uses a software re-set. That is achieved by writing a value of 3 — POKE 49152,3 — to the control register. The correct word format is then selected using a value of 21 — POKE 49152,21.

Data for transmission is written to address 49153 but care has to be taken to avoid sending values faster

read the received data register if this bit is set to 1.

With the QL and a home-made Midi interface and software you have can have a set-up which makes ready-made Midi sequencers look under-specified and over-priced. If you have a QL and some Midi instruments it is worthwhile bridging the gap.

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- * **TURBO** adds reliable **WHEN ERROR** trapping to ALL versions of the QL, including AH and JM.
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- * No cumbersome protection system - once invoked, **TURBO** remains **resident**.
- * Parameters may be passed to compiled tasks as they are invoked, and **pipes** allow tasks to communicate via PRINT and INPUT.
- * **TURBO** has all the powerful, popular features of **SUPERCHARGE** - comprehensive and flexible reporting, user-controlled space/speed optimisation, multi-tasking, stand-alone code, support of the entire syntax of SuperBASIC, support for 'alien' procedures and functions (with optimisation of TURBO TOOLKIT commands), fast code loading, two extra digits of arithmetic precision compared with the interpreter and pseudo-compiler, etc.
- * **TURBO** has a powerful and original **user-interface**. You can start the compiler with a single command. You can compile several programs while only loading the compiler once, editing the programs between compilations. Compilation is a one-step process; you can trigger a complete default compilation by pressing one key from the main menu, yet a host of useful compiler options are available; you can adjust the defaults yourself.
- * **TURBO** has a detailed, readable A4 manual, containing tutorial and reference sections, hints and tips, plus over **100 example programs**.

TURBO costs £84.95 on disk or two microdrive cartridges.

Upgrade: Supercharge owners may claim a discount of £35 when they upgrade to **TURBO** - send us £49.95, plus page 100 of your Supercharge manual as proof of purchase.

NEW

NEW

TURBO TOOLKIT

A package of 65 new SuperBASIC commands, functions and directives, for anyone seeking to realise the QL's true potential.

- * **TURBO TOOLKIT** is packed with features designed to increase the power, convenience and flexibility of QL SuperBASIC. It has many unique facilities, yet it is totally compatible with other toolkits and occupies just 5K of RAM. It is configurable. It can be used with or without **TURBO**.
- * Example program shows you how to use **TURBO TOOLKIT** commands for: graphic effects, user-defined keys, random-access files, 'pipes' (temporary RAM files), 'transient' (pop-up) windows, continuous background music, fast filing systems, SuperBASIC development tools, and much more.

QL TURBO TOOLKIT COMMANDS:

- * Task invocation and communications: EXECUTE_W, EXECUTE_A, CHARGE, DEFAULT_DEVICE, LINK_LOAD, CONNECT, CHANNEL_ID, SET_CHANNEL
- * On-screen data-editing functions: EDIT%, EDITF, EDITS
- * Super-fast memory-handling commands: MOVE_MEMORY, PEEKS, POKES, SEARCH_MEMORY, ALLOCATION, DEALLOCATE
- * File and data handling: DEVICE_STATUS (improved), DEVICE_SPACE, POSITION, SET_POSITION, INTEGERS, FLOATS, STRINGS, GET%, GETS, GETF, INPUTS, DATASPACE
- * SuperBASIC array commands: BASIC_INDEX%, BASIC_W%, BASIC_B%, BASIC_L, BASIC_POINTER, BASIC_NAMES, BASIC_TYPE%
- * Task control commands: LIST_TASKS, SET_PRIORITY, REMOVE_TASK, SUSPEND_TASK, RELEASE_TASK, SNOOZE
- * **TURBO** compiler directives: IMPLICIT%, IMPLICIT\$, GLOBAL_EXTERNAL, GLOBAL_PROCEDURE, GLOBAL_FUNCTION, REFERENCE, WHEN_ERROR, END_WHEN (for AH and JM QLS), COMPILED, OPTION_CMS\$, DATA_AREA, LINK_LOAD_A, LINK_LOAD_W
- * And many more... TYPE_IN & COMMAND_LINE let a task enter ANY command or sequence of characters into any window, SET_FONT for user-defined graphics, FREE_MEMORY finds the obvious, END_CMD allows command files, CURSOR_OFF & CURSOR_ON select windows, with automatic 'control C's.

TURBO TOOLKIT costs £24.95 and comes with full, readable documentation, over 100 example programs, new character fonts, sound, character-design and configuration utilities.

BETTER BASIC EXPERT SYSTEM £19.95

BETTER BASIC reads any SuperBASIC program, examines & analyses it for structural & other faults or weaknesses, corrects or annotates all errors it detects, & creates a brand new, tidy, clean, optimised source program from it! The result is a program which is much easier to read, understand & maintain. Impossible? We've done it. BETTER BASIC uses AI techniques to achieve its aims. BETTER BASIC is easily (no programming involved) configured to fit your needs exactly. Of course, all the trivial features like auto-indenting & line-splitting are provided too. Supercharge & **TURBO** love programs cleaned by BETTER BASIC!

NEW

THE EDITOR £24.95

For all those of you who are fed up with QUILL's hyper-slow, erratic & unpredictable behaviour, here is the product of your dreams! A full-scale text editor of absolutely amazing speed and flexibility.

Once you use **THE EDITOR**, you won't wish to touch Quill or any other editor ever again!

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☆ Find nth occurrence of string **100X** ☆ Page up **86X** ☆ Delete lines **31X** ☆ Move block **48X** ☆ Create line **26X** speedsups on ED are: 1x, 3.4x, 11x, 10x, 14x, 26x, 53x, 59x, 26x

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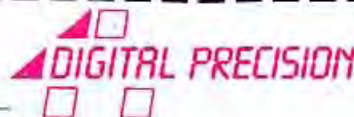
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QFlash RAM disc

QFlash

£21

A RAM disc is useful for saving wear and tear on mechanically-orientated drives; in terms of access speed, they are about as fast as it is possible to be unless you have a Winchester hooked to your QL.

From the users' point of view, a RAM disc works much like a conventional drive in which files can be saved, deleted or copied; conventional RAM discs are formatted in the same manner as cartridges or discs but require stipulation of the number of sectors. Full



drive emulation is supported as a standard feature of most RAM disc programs.

That from QFlash is exceptional in a number of respects. For all practical purposes, it attaches itself loosely to all the available memory for RAM1 when it is installed and releases memory required for program space until the ceiling of the RAM disc meets any files loaded into the utility.

Where QFlash departs sharply from similar utilities is its astonishing speed. If you already own a RAM disc, run the small program to establish its comparative performance. Also, compare the test results obtained with the Sandy I/F RAM disc and the jet-propelled RAM disc released by QFlash:

UTILITY FILE

```
100 WINDOW
512,256,0,0: PAPER 7:
CLS: CSIZE 3,1
110 AT 11,0:PRINT''
FRAME NUMBER''
120 PAUSE 100: BEEP
1000,5
130 SBYTES
ram1_screen,
131072,32768
140 BEEP 1000,2
150t1=DATE: i=0: AT
11,0:PRINT ''0=START''
```

```
190 AT 11,0: INK 2:
PRINT i
200 IF i=1000:EXIT
loop
210 END REPEAT loop
220 BEEP 3000,5:
t2=DATE
230 AT 1,1:PRINT <t2
-t1>/1000; ''SECONDS
on RAM Disc.''
```

A word of warning. If you are using any RAM disc other than QFlash, reduce the "1000" in lines 210 and 240 to "100"; alternatively, you could watch a movie while slower RAM discs get on with it.

Two demonstration routines are included with the QFlash package. A simpler version of the listing is one of them; the other, called Cartoon_bas, requires maximum memory expansion to be able to run the full 14-frame demonstration.

Cartoon_bas runs in two stages. The first

```
160 REPEAT loop
170 LBYTES
ram1_screen,131072
180 i=i+1
```

Ron Massey tests out a RAM disc fast gaining a reputation for speed, two more QL toolkits and a competitor for ICE.

draws a series of concentric, filled circles on the screen and then saves it as a 32K file in RAM disc. The process is repeated until there are 14 files, differing only in the angle of circular eccentricity. They are then loaded sequentially on to the screen. The resultant display is the nearest thing available for full-fledged QL animation, operating at slightly less than 7.5 frames per second.

The facilities available with the complete QFlash system are inter-dependent and may not work with other RAM discs.

Qlone
Ultrasoft
£14.95

A toolkit with a difference, the Ultra Soft Qlone + Toolkit II serves a single main purpose — new keywords are added to SuperBasic to simplify the cloning of files and it supports services for both cartridge and floppy drives.

The 11 keywords included in the system implement the full range of facilities required for the job and enable you, with minimal typing or opportunity for error, to set the defaults for source and destination devices as required, selectively or mass clone files, obtain a detailed directory of files on both drives, set the size of the copy buffer and to perform limited garbage clearing from the common heap acquired

Bench Test

	Memory requirement	14 frame draw/save time	Run (seconds 24 frames)	Time per frame
1. Cartoon_Bas				
Toolkit RAM disc	14-32K files	2:05.25	16.8 sec.	1.2 sec.
QFlash RAM disc	14-32K files	2:00.25	1.845 sec.	0.134 sec.
2. Repeat single-screen bench test — the above program listing. Parameters: Save a 32K screen to test device and re-load it to the screen using the LBYTES command.				
	No. of repeats	Test period	Seconds per screen	
Microdrive	1	20 sec.	20 sec.	
Disc — 3½ in. NEC	1	3 sec.	3 sec.	
Toolkit RAM disc	100	1:44.50	1.04 sec.	
QFlash	1000	3:13.78	0.194 sec.	
Ratios	mdv: QFlash	= 103.1:1		
	mdv: disc	= 6.7:1		
	mdv: Toolkit RAM disc	= 19.2:1		
	Toolkit RAM disc: QFlash	= 5.4:1		

during prolific use.

A useful command included in the *Qclone + repertoire* is *Change*. This keyword provides a means for patching a string in a file. The most common use for the option is to replace all occurrences of "mdv" with "flp" when files are converted for use in disc-based systems. The only restriction on this keyword which must be observed is that the new string must be of the same length as the one being replaced.

Also included with the program is one of the most useful clock routines I yet have encountered. Occupying a miniscule 300 bytes or so, the clock makes its appearance by pressing <SHIFT> & <ALT>, disappearing again when either or both of the keys is released. Also indicated in the clock display is the amount of free memory available. Of more questionable value, after you have seen it for the first time, is your *QL Qdos* version number. *Qclone +* also includes a disc monitor.

Although the review copy of *Qclone +* included a standard type of RAM disc, the minimal documentation, on a *Quill* file included with the program, made hints of upgrading it soon to a superfast version.

Megatoolkit Utilising Software £19.95

From *Utilising Software*, *Megatoolkit* adds 123 extensions, 63 procedures and 60 functions to SuperBasic commands which cover a wide range of facilities not directly available directly to a standard *QL* operating system.

Divided roughly into nine categories, utilities are provided for memory

management of the entire *QL* memory map. Facility is included for obtaining the lengths of a Basic program, tables area, Basic program area, transient program area, common heap area, resident program area, and the largest contiguous block of free memory.

More powerful screen — and graphics — handling has been made possible by keywording the control of the cursor with regard to location and movement. A range of reports via the new keywords is available for obtaining the position of the cursor by character, character size — height or width — or pixel. Other reports are available for obtaining the height or width of characters for a given channel.

Machine code and stream control utilities can switch interrupts off and on, re-set default devices and drives — calls made to *mdv* to occur to *flp* instead and drive 1 to drive 2, for example — place or read file position.

An extensive range of job — multi-tasking — control facilities has been included for the allocation of priority; job details regarding owner, location, tag, and job ID have been implemented.

Improved file-handling includes an extensive range of wildcard utilities, automatic input from a device either to upper- or lower-case, spooling between devices with or without file headers, direct manipulation of bytes and file headers and combining the input of devices with output to another device.

It also includes SuperBasic handling functions and procedures to dump Basic variables, machine code addresses, perform a soft system re-set and a group of commands for complete error control.

The range of miscellaneous commands enables simplified

conversion of hex and decimal vales, software control of the capslock key, control of keyboard auto repeat and delay — setting both values to 0 makes for very fast typing — options, programming the function keys, intelligent movement of bytes in memory and a system operation speed control — and a re-positionable clock.

My only two criticisms apply to its general presentation from marketing points of view as related to the user. The first criticism is that *Megatoolkit* is a single program rather than a collection of linkable routines. More than 13K in length, the single program precludes the possibility for users to incorporate only those routines pertinent to their programs.

Also documentation for programs such as this, where a wide range of often rather esoteric features is available, I feel the author, willing or otherwise, should take care to remember that every potential customer may not be conversant with some of the concepts included.

Where that requirement is applicable, documentation should include some form of tutorial and/or very detailed descriptions of all the concepts included throughout the program, other than instructions for making back-ups.

Roughly half of the keywords included in the repertoire include very good example applications. Some of the others are mentioned, almost as "also includes", with few application notes. Be that as it may, considering the flexibility, *Megatoolkit* represents very good value. If your ROM slot is otherwise occupied and you are not using any other form of EPROM toolkit, you can still enjoy the options of file handling and an

improved operating environment.

4Matter Zitasoft £9.95

With the problem of piracy uppermost in the minds of most software publishers, various sophisticated protection routines have been employed, almost all of which require verification of a master — i.e., an officially-produced purchased copy. While the precaution is prudent and understandable, from a customer's point of view it can be annoying and frustrating.

It means that a program is forever tied to a master cartridge which is prone to corruption. Also, transferring programs to disc will still keep them tied to the cartridge master, perhaps long after the user has graduated to one of the non-*mdv*-based *QL* derivatives.

Compounding the problem, increased sophistication has led to very clever tricks being implemented which, from a coding point of view, are susceptible to corruption or introducing read errors of their own.

When problems of that nature occur, as it seems to do more and more often, the result is a very irate customer. Software houses which ignore customer satisfaction do so at their peril.

Realising the cause for a genuine grievance exists, Zitasoft has leapt into the breach by providing an elegant solution for the majority of users with its new program *4Matter*.

Although technically a sophisticated copying program, it is referred to by its producers as a back-up program and, considering the

ramifications of the term, they are correct.

What 4Matter accomplishes, by using various combinations of routines selected from its main menu, is an exact copy of a master in all respects except one; because of coding introduced by 4Matter, further copying from the sub-master is inhibited, making its role solely that of a key — the main routine for producing a byte-for-byte copy is called *Locksmith*.

Although 4Matter does not provide a solution for complete disc-based transfer, it at least goes a long way towards preventing users having unusable programs and, in this perspective, justifies its release.

Steve Jones, author of 4Matter, has included a rather dramatic exit, if the option to quit is selected. I will not spoil it for you by relating it but be sure not to miss it.

Another routine included with 4Matter is a program called *Bobby-Dazzler* — also available to members of Quanta from its library — and is an interesting, flashy — both allegorically and literally — screen display controller.

Considering the difficulties 4Matter can prevent it represents superb value.

QATS Cope Software £20

A new modular program system from Cope, the EPROM-based *QL Applications Traffic Supervisor* — QATS — is a professional-grade front-end with which you can control the operation of your QL and one which is not tied to a single screen presentation format.

QATS provides facilities for selecting options from your own menu structure, controls QL tasks,

controls virtually any output device connected to your QL in a comprehensive manner, and supervises the production of printed copy.

The complete package consists of an EPROM and two Microdrive cartridges, with additional modules being developed. The body of the QATS program may be run from either the EPROM or, if the ROM port is required for other purposes, from software.

Any of the modular services of the system are software-connected when and as required. To conserve memory, any services not in use can be disconnected, in effect terminating a job.

On start-up, you are presented with an option to load particular QATS-related files. After pressing <CTRL> & <C>, you select the first default file by pressing <ENTER>; you are then offered sequentially a choice of source drives, the availability of which the system has obtained by examining the configuration of your QL, and drive number. Input throughout the QATS system is confined mostly to single key presses.

The first menu, titled "1 Start", is the calling menu and contains main heading options. Selecting any of those will produce the next menu in the hierarchy and will be numbered as one greater than the preceding menu.

Although the menu structure, as supplied, is configured for general applications, re-configuring a front-end — or any number of front-ends, according to the type of work you are doing — is simple. Depending on the complexity of your command structure, you can build as few or as many successive menus as required.

Screen layout may be

customised temporarily by moving any of the menus and windows to other parts of the screen. When an optimum layout is established, it may be saved and subsequent uses of QATS will default to the new layout.

Operationally, QATS enables you to use the entire range of file-handling functions in a manner unavailable with any other system. Paged directories, displaying filename sizes in alphabetical order, can be produced. From the directory listing, you can apply sophisticated wildcard options for selective copying, deleting, printing or spooling.

The Output Control module permits you to print formatted text pages from unformatted text files — which can include headings, page numbers and other information — print labels or mailing lists. Another specific option provides facilities for nominating printed files as either ASCII characters or hex dumps.

Output can be nominated to print on continuous or sheet stationery, include any of the printer control codes, all as a background job, while you proceed with

other work. Mailing lists may be previewed on-screen before accepting the option to print to the ser or par port.

From the user's point of view, Output Control provides a far more comprehensive range of options than the corresponding Psion printer driver. By selecting any one of the Stationery Codes, which can be user-definable, you can send pre-determined control codes, also re-definable, to your printer for, as an example, setting the baud rate, lines per page, characters per line, margins and paper type.

Designed for ease of use, QATS is an exciting product. The modular approach taken by QATS is well-planned and executed. The Users' Guide is comprehensive and includes practical working examples of almost every application imaginable.

Very good value, by the sheer weight of its polished professional approach, it will have a tremendous impact on the QL and its derivatives.

UTILITY FILE

Information

Megatoolkit £19.95. Utilising Software, 75 Oakhanger Drive, Lawrence Weston, Bristol BS11 0RJ.

QFlash. T. K. Computerware, Unit A, Range Road Industrial Estate, Hythe, Kent CT21 6HG.

QATS £20, Output Control £15, Eprom O/S £10. Cope, 3 Langham Mansions, Earls Court Square, London SW5 9UH.

Qlone Ultra Soft. c/o Sandy 0234 219814

4Matter £9.95 — on cart. Zitasoft, 93 Foxbourne Road, London SW17 8EN.

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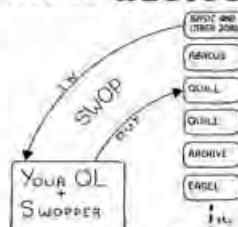
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WDSOFTWARE

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Giga Chrome

Giga Chrome—the ultimate graphics program for the QL

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Giga Chrome is very easy to use; it is totally mouse-driven (it also runs with cursor keys of course). All functions are selectable by icons or pulldown-menus. You can create pictures with the size up to a whole DIN A4-Page (400 x 356 pixel). Some of the functions are: Pencil cursor, paint brush (with lots of brush shapes, paints every pattern you create with the texture editor), spray tin, text, lines, circles, boxes, ellipses, magnifying-lens etc.

Giga Chrome also offers extended blocks handling facilities:

- ★ Blocks may be of any size up to the whole work window.
- ★ You can copy, mirror, recolour them.
- ★ Rotation of blocks is possible (0 to 359 degree turn in 1 degree steps).
- ★ Magnify.
- ★ Logical block operations are possible.

Giga Chrome supplies different fonts, you also create own fonts with the in-built character editor, they can be used with every CSIZES.

Further features are UNDO, reduces view of the whole page, elastic or filled shapes.

There is default file handling (for example, load offers you only those files, which are load-able by Giga Chrome: screens (normal 32k-QL screens), Pages, Blocks and fonts. There also is a control panel to install your mouse speed mouse key-click etc.

Supplied with Giga Chrome are two other programs: A Spectrum-to-QL screen format via RS232 Port. A Mode-4 to Mode-8 converter.

By now there are printer drivers for all Epson-compatible printers and for the Canon F60. Giga Chrome needs at least 128K extra RAM. Giga Chrome is available on Cartridge and on 3 1/2" Disk.

Please make cheque or postal order payable to:

ABC Elektronik; Hügelstraße 10-12; 4800 Bielefeld 1; West Germany

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This book is essential reading if you are interested in programming the QL in machine code. It describes all the features of QDOS, and gives details of all the TRAPS, and Vector calls. It includes details on how to access the keyboard, screen, serial ports etc. from machine code, how to communicate with the 8049 co-processor, and how to write multi-tasking programmes and lots more. £6.95

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All prices correct at the time of going to press. E&OE.

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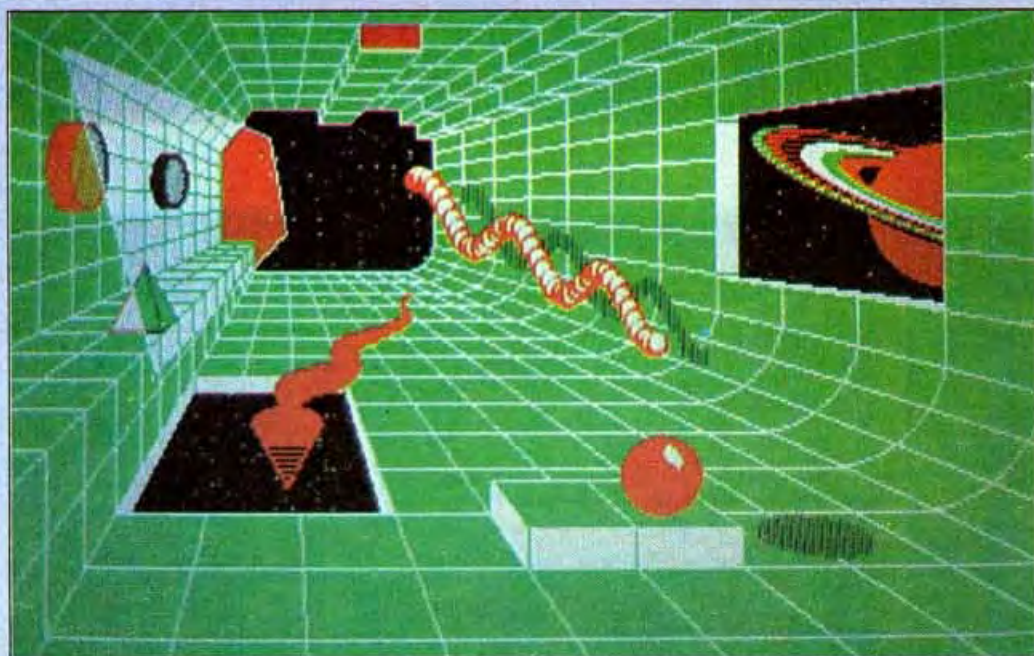
SCREEN STARS

COMPETITION WINNERS

Our offer of free QL software provided the creative inspiration for those who entered our Design a Screen competition.

The 20 prizewinners will each receive a copy of the Pyramide program of their choice. Most people opted for *QL Peintre*, with one or two deciding *Nucleon* would better suit their talents.

We do not have space to show all the winning entries but here are some of them, together with the programs from which they were generated.



Like many of the winning entrants, Josep-Feliu and Jordi Fuster Foncillas produced a stunning screen image by clever use of perspective.

Sharp-eyed readers may notice that the program is 51 lines long but as the first line is a REM statement we decided it was a small transgression.

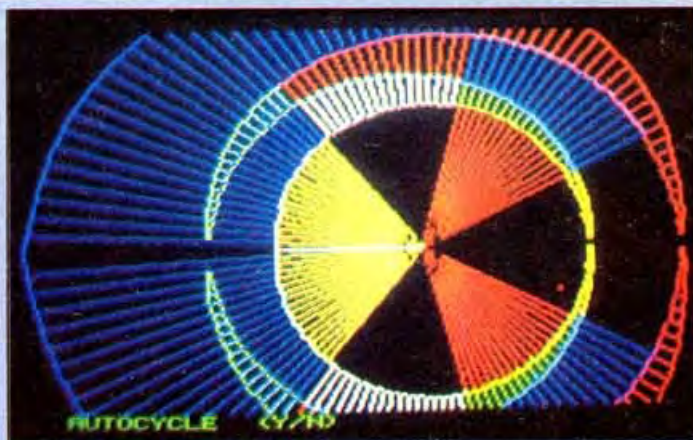
Space Tunnel Δ
 Pattern Generator ∇

Dimitri Vouzounaras chose a Formula One racing car as his subject. Being Italian, he naturally chose to make it a Ferrari. The program, though

straightforward, has produced an excellent and realistic design. His choice of program is *Vroom*.



Δ Ferrari



The only interactive screen design program was submitted by H Hodgson. The program will run either as an automatic pattern

generator, or you can input your own values at the prompt. The author recommends trying some of the following settings:

Ratio	RD1	DC1	RD2	DC2	Mode
4	0	0	82	.01	1 & -1
2	40	0	40	.01	1 & -1
7	40	0	40	.02	1 & -1
.01	60	.03	20	0	1



△ The Worm

Winners

M J Gale, Guildford, Surrey;
 James Carmichael, Stockbridge, Hampshire;
 Anthony Joyner, Emsworth, Hampshire;
 Dimitri Vouzounaras, Ancona, Italy;
 Adam Boyse, Moreton-in-the-Marsh, Glos;
 Alan Ersser, Old Woking, Surrey;
 Nat Alcock, Leamington Spa, Warwick;
 G J Morgan, Tunbridge Wells, Kent;
 Josep-Feliu Fuster Foncillas, Barcelona, Spain;
 Damian Debski, Wivenhoe, Essex;
 D Dimitrov, Ilford, Essex;
 Per Svensson, Frolunda, Sweden;
 J Dempster, Comberton, Cambridge;
 Louai Munajim, Ahmadi, Kuwait;
 H Hodgson, Lowestoft, Suffolk;
 S Salmon, Rayleigh, Essex;
 D Burrows, Rotherham, S. Yorks;
 David Duggan, Worthing, Sussex;
 G Calladine, Wellington, Somerset;
 Edward Whittton, Rochester, Kent.

Pattern Generator

```

100 MODE B:X0=82:Y0=50:CIR=360:CLS
110 X=DATE:RANDOMISE X
120 CLS#0:PRINT#0,"AUTOCYCLE (Y/N)";
130 AS=INKEY$(C-1)
140 IF AS="Y" OR AS="y" THEN GO TO 270
150 IF AS="N" OR AS="n" THEN GO TO 170
160 GO TO 120
170 CLS#0:PRINT#0,"RATIO RD1 DC1 RD2 DC2 M
DDE"
180 PRINT#0,"ENTER O FOR RATIO TO STOP PROGRAM"
190 AT#0,1,0:INPUT#0,RATIO:IF RATIO=0 THEN GO TO 5
60
200 AT#0,1,6:INPUT#0,RD1:AT#0,1,12:INPUT#0,DC1
210 AT#0,1,18:INPUT#0,RD2:AT#0,1,24:INPUT#0,DC2
220 AT#0,1,30:INPUT#0,IM:IF IM>0 THEN IM=1:GO TO 3
30
230 IM=-1:GO TO 330
240 PRINT#0,"RATIO =":RATIO:"RD1 =":RD1:"DC1 =":DC1
250 PAUSE 250:IF XT=232 THEN GO TO 120
260 GO TO 280
270 CLS#0:PRINT#0,"PRESS F1 TO STOP AUTOCYCLE":PAU
SE 50
280 RATIO=RND *10 +.1:IF RATIO > 1 THEN RATIO=INT(
RATIO)
290 RD1=RND(0 TO 70):DC1=RND/10-.5E-2:IF DC1<0 THEN
DC1=0
300 RD2=RND(5 TO 70):DC2=RND/25-.2E-2:IF DC2<0 THEN
DC2=0
310 TV=RD1+RD2:IM=RND(1 TO 2):IF IM=2 THEN IM=-1
320 RD1=INT(RD1*83/TV):RD2=INT(RD2*83/TV)
330 PAPER 0:CLS:OVER=1:STP=3/RATIO
340 X1=X0-RD1-RD2:Y1=Y0
350 CIR=360:CLS#0
360 IF RATIO<.1 THEN RATIO = .1
370 IF RATIO<.1 THEN CIR=360/RATIO
380 FOR ANG=0 TO CIR STEP STP
390 IF ANG > CIR/2 THEN GO TO 420
400 CAL = ANG
410 GO TO 430
420 CAL =CIR-ANG
430 INK INT(CAL/25.715)+1
440 RDP1=CAL*DC1 + 1
450 RDP2=CAL*DC2 + 1
460 A=RAD(ANG):RA=RATIO*A*IM
470 R1=RD1/RDP1:R2=RD2/RDP2
480 X=R2*COS(RA):Y=R2*SIN(RA)
490 X=X0 - R1*COS(A):Y=Y0+R1*SIN(A)
500 X2=X-X:Y2=Y+Y:LINE X,Y TO X2,Y2
510 LINE X2,Y2 TO X1,Y1:X1=X2:Y1=Y2
520 XT=CODE(INKEY$):IF XT = 232 THEN GO TO 540
530 NEXT ANG
540 IF AS="Y" OR AS="y" THEN GO TO 240
550 GO TO 120
560 CLS:CLS#0:PRINT#0,"PROGRAM RUN TERMINATED":STO
P
  
```

The Worm

```

1 MODE O:OVER 0
2 OPEN #3,scr 51x256a0x0:PAPER #3,4:CLS #3
3 OPEN #4,scr 445x195a45x28:PAPER #4,0:CLS #4
4 PAPER #1,7,2,1:CLS #1:SCALE 200,0,0
5 FILL 1:write:sky
6 FILL 1:INK 2:CIRCLE #1,300,130,50
7 FILL 1:INK 4:LINE 0,100 TO 400,100 TO 400,0 TO 0
,0 TO 0,100
8 FILL 0:INK 0
9 ground:mount:c=2:STEPOR #1,1,0
10 FOR n=0 TO 152 STEP .5
11 n1=n/1.5
12 x=n1+n1*COS(n/104*PI)
13 a=n1+n1*SIN(n/52*PI)
14 b=n1-n1*COS(n/(26+x)*PI)
15 FILL 1:INK c:CIRCLE 100+(a-n1),100+(b-n1),n/B
16 FILL 0:INK 0:CIRCLE 100+(a-n1),100+(b-n1),n/B
17 c=(2*(c-4))/(4*(c-2)):NEXT n
18 FILL 1:INK 7:CIRCLE 110,160,15,.8,RAD(C)
19 FILL 0:INK 0:CIRCLE 110,160,15,.8,RAD(C)
20 FILL 1:INK 7:CIRCLE 130,160,15,.8,RAD(C)
21 FILL 0:INK 0:CIRCLE 130,160,15,.8,RAD(C)
22 FILL 1:INK 0:CIRCLE 110,160,5,.8,RAD(C)
23 FILL 1:INK 0:CIRCLE 130,160,5,.8,RAD(C):PAUSE
24 DEFINE Procedure mount
25 c=1
26 FOR loop1 TO -5 STEP -1
  
```

```

27 c=(1*(c-3))/(3*(c-1))
28 FOR n=-30 TO 300 STEP 30
29 a=INT(RND(1 TO (loop+6)*10)):a=a+10+10*SIN(n/10
0*PI)
30 b=INT(RND(50 TO 100))
31 FILL 1:INK 2,0,c:LINE n,100+loop TO n+b/2,100+a
+loop TO n+b,100+loop
32 FILL 0:INK 0:LINE n,100+loop TO n+b/2,100+a+loo
p TO n+b,100+loop
33 NEXT n
34 NEXT loop
35 END DEFINE
  
```

Space Tunnel

```

100 REMARK -- Josep-Feliu Fuster Foncillas & Jord
i Fuster Foncillas -- (1986) --
110 MODE 4: WINDOW 512,256,0,0: PAPER 5: CLS: INK
7: OVER 0: a=100: b=0: c=0: x=1: y=1
120 SCALE a,b,c: FILL 1: INK 0: F=1: segment: FILL
0: INK 7: F=0: RANDOMISE 356
130 FOR c=0 TO 127 STEP 9: SCALE a,b,c: segment: x
-x+.13: y=y+9E-2: a=a-5: b=b+7
140 SCALE 100,0,0: FOR i=0 TO 9: LINE 35+i*2.05,55
TO 5.38+i*18.37,0
150 LINE 55.5,55.5 TO 196.34,0: LINE 56.5,57 TO 23
7.5,0
160 FOR i=0 TO 7: LINE 57,58.5+i*2.07 TO 170,30.68
+i*12.03
170 LINE 55,73 TO 119.6,100.25, 55,75 TO 103.5,100
.25, 53,75 TO 95.5,100.25
180 LINE 53,77 TO 86.3,100.25, 50,77 TO 76,100.25,
48,89 TO 55.75,89 TO 64,100.25
190 LINE 47,75 TO 55.5,85: LINE 43,75 TO 48,85
200 FILL 1: INK 2: LINE 48.25,88.75 TO 48.25,85.25
, 55.5,88.75 TO 55.5,85.25
210 FILL 0: INK 7: FOR i=0 TO 3: LINE 43-i*2.66,77
TO 52.75-i*9,100.25
220 LINE 34,75 TO 16.5,100.25: LINE 32,73 TO 5,100
.25
230 FOR i=0 TO 6: LINE 31,71-i*2 TO 0,91.84-i*8.1
240 LINE 33,59 TO 0,35: LINE 35,59 TO 0,22: LINE 3
5,57 TO 0,6.5
250 FILL 1: INK 7: LINE 27.75,41 TO 18,23.25, 46.2
5,41 TO 52.25,23.25
260 FILL 1: INK 0: LINE 27.75,39 TO 20,23.25, 46.2
5,39 TO 50.75,23.25
270 FILL 0: INK 5: LINE 27.75,41 TO 27.75,39: LINE
46,41 TO 46,39: INK 7
280 FILL 1: LINE 64,27.5 TO 86.75,27.5 TO 95.5,21
TO 95.5,15.5 TO 88.25,16.5 TO 64,23 TO 64,27.5
290 FILL 1: INK 5: LINE 64.5,27.5 TO 68.75,21.25:
LINE 86.75,27.5 TO 95.21,25: INK 7
300 FILL 0: LINE 82,21 TO 75.25,27.5: INK 5: LINE
68.5,21 TO 68.5,15.75, 82,20.75 TO 82,15.75
310 FILL 1: INK 7: LINE 92,75 TO 92,54.5 TO 122,50
.25 TO 122,81.75 TO 92,76
320 FILL 1: INK 0: LINE 95,76 TO 122,80.75 TO 122,
51.25 TO 95,54.5 TO 95,76
330 FILL 0: INK 5: LINE 92,75.75 TO 95,75.75, 92,5
4.75 TO 95,54.75
340 FILL 1: INK 2: CIRCLE 85,28,5.2: FILL 1: INK 7
: ELLIPSE 86.5,30.5,1.6,.5,PI/4
350 FILL 1: INK 5,0,2: ELLIPSE 105,20,8,.3,PI/2:2
360 FILL 0: FOR v=1 TO 48: INK RND(2 TO 7): POINT
RND(36 TO 56),RND(56 TO 73)
370 FOR v=1 TO 50: INK RND(2 TO 7): POINT RND(28 T
O 45),RND(24 TO 39)
380 FOR v=1 TO 40: INK RND(2 TO 7): POINT RND(96 T
O 121),RND(55 TO 75): NEXT v: SCALE 22,0,0
390 WINDOW 93,75,330,48: y=10: FOR r=20 TO 5 STEP
-1: INK r: FILL 1: ELLIPSE 20,y,r,.2,PI/2.5
400 FILL 1: INK 2: ARC 12.75,11.25 TO 27.7,5,PI/3.
8 TO 12.75,11.25,PI*.9
410 FILL 1: INK 2: ARC 12.4,8 TO 26.4,PI/8 TO 12.4
,8,-PI*.75: WINDOW 512,256,0,0: SCALE 100,0,0
420 x=56: r=2: FILL 1: FOR y=2 TO 39 STEP -.6: C
IRCLE x+1.9*SIN(y-9),y,r: x=x-.7: r=r+9E-2
430 FILL 1: FOR v=0 TO 4 STEP .4: INK 2: CIRCLE 39
.5,35-2*v,4.5-v,.5,PI/2
440 FILL 1: INK 88: LINE 36.75,32 TO 39.5,27 TO 42
.32: x=55: FOR y=5 TO 48 STEP -.4
450 FILL 1: INK 2: CIRCLE x,y+3*SIN(y),1.5: FILL
1: INK 7: CIRCLE x,y+3*SIN(y),1
460 FILL 1: INK 5,0,2: CIRCLE x+6,y+3*SIN(y)-2,1:
x=x+.7: NEXT y
470 INK 2: FOR x=11.3 TO 15 STEP .5: FILL 1: ELLIPSE
  
```

```

x,69,6,.4,0:FILL 1:ELLIPSE x*.6+17,67,3.5,.4,0
480 FILL 1: INK 2,5,3: CIRCLE x-.5,69,5.5,.4,0: FI
LL 1: ELLIPSE x*.6+17-.5,67,3,.4,0
490 FOR v=0 TO 1: FILL 1-v: INK 7-v*5: LINE 23,8,4
7 TO 17,47 TO 21.5,56 TO 25.5,49 TO 23,8,47 TO 21.
5,56
500 FOR v=0 TO 1: OVER v-1: FILL 1-v: INK 2+v*5: L
INE 11,86 TO 37,73 TO 39,60 TO 23,42 TO 11,86
510 FOR h=1 TO 1000: NEXT h: BEEP 30000,50,10,530,
7,5,1: PAUSE
520 DEFINE PROCEDURE segment
530 IF c<37 AND F=0: FILL 1: INK 5: LINE 43*x,77
*y TO 43*x,75*y,48.5*x,77*y TO 46.5*x,75*y: FILL 0
: INK 7
540 LINE 35*x,55*y TO 53*x,55*y: ARC TO 57*x,59
*y,PI/2
550 LINE TO 57*x,73*y TO 55*x,73*y TO 55*x,75*y
TO 53*x,75*y TO 53*x,77*y
560 IF c<36: LINE TO 48.25*x,77*y: END IF : IF c
<36: LINE TO 47.5*x,77*y: END IF
570 IF c<45: LINE TO 46.5*x,77*y TO 46.5*x,75*y
580 IF c<46: LINE 46.5*x,75*y TO 43*x,75*y TO 43
*x,77*y
590 LINE TO 35*x,77*y TO 31*x,71*y TO 31*x,59*y
TO 35*x,59*y TO 35*x,55*y
600 END DEFINE segment
  
```

Ferrari

```

1 WINDOW 512,256,0,0:MODE B:PAPER 1:CLS:SCALE 70
,10,20:RESTORE :POINT 0,102
2 READ c:IF c>=0:SELECT ON c:=0:READ x,y:POINT x,y
:=1:READ x,y:LINE TO x,y:=2:READ x,y,r:ARC TO x,y,
r:=3:READ x,y,r,e,1:CIRCLE x,y,r,e,1:=4:READ i:INK
i:=5:READ F:FILL F:END SELECT :GO TO 2
3 add=148398:FOR j=0 TO 9:FOR i=0 TO 5:READ c:POKE
add,c:add=add+2:NEXT i: add=add+116:NEXT j
4 INK 7:CSIZE 2,1:CURSOR 57,90:OVER 1:PRINT'27'
5 DATA 1,30,61,1,30,65,1,30,72,1,16,68,1,28,63,1,3
1,66,5,0,4,1,0,16,68,1,22,68,1,28,66,1,28,63,1,41,
67,1,34,67,1,30,72,5,1,0,30,72,1,37,72,1,42,70,1,42,65,1
,39,59,1,34,58
6 DATA 1,30,61,1,30,65,1,30,72,1,16,68,1,28,63,1,3
1,66,5,0,4,1,0,16,68,1,22,68,1,28,66,1,28,63,1,41,
67,1,34,67,1,30,72,5,1,0,30,72,1,37,72,1,42,65,1
,39,59,1,34,58
7 DATA 7,1,0,5,0,4,1,0,93,53,2,86,60,3,5,5,1,4,0,0
,106,52,1,107,50,1,100,50,1,95,48,1,95,52,1,97,57,
1,106,52,5,0,1,95,48,1,106,51,4,1,0,93,53,1,97,54,
1,97,57,1,99,56
8 DATA 0,89,54,1,98,52,1,106,51,1,101,50,5,1,4,5,0
,33,53,1,33,58,2,28,55,1,1,28,53,5,1,4,2,0,85,47,1
,97,48,2,97,51,1,1,84,59,1,80,62,1,62,62,2,35,59,1
,3,2,33,56,2,1
9 DATA 33,48,1,39,47,1,63,47,1,65,48,5,1,4,1,1,63,
46,1,72,51,1,96,46,5,1,4,0,3,72,52,7,1,0,5,0,4,1,0,
71,45,2,67,56,3,6,4,3,70,5,51,4,.9,.5,0,71,54,2
,74,50,4,5
10 DATA 1,4,0,0,63,47,1,63,54,1,65,56,1,65,49,1,63
,47,5,1,4,0,0,92,47,1,97,49,1,88,50,1,86,52,1,82,4
9,1,82,47,5,1,0,80,52,1,81,46,1,92,46,1,91,48,1,60
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11 DATA 1,81,48,5,1,4,0,3,22,52,7,1,0,3,24,53,7,1,
0,5,0,4,1,0,21,45,2,17,56,3,6,4,3,20,5,51,4,.9,.
5,0,22,54,2,24,50,2,5,5,1,4,0,0,33,56,1,27,55,1,27
,47,1,33,48
12 DATA 1,33,55,1,36,56,5,1,4,5,0,57,61,1,64,69,2,
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13 DATA 1,73,58,1,66,64,5,0,4,3,0,62,61,2,72,60,.7
5,1,4,8,0,66,67,1,65,63,2,72,62,1,2,71,67,1,2,66,
67,1,5,1,4,3,0,72,65,1,69,65,2,72,63,1,1,72,65,5,0
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14 DATA 65,56,2,33,55,.3,1,63,54,5,1,4,5,0,61,54,1
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16 DATA 170,85,160,40,136,136,46,85,136,40,2,8,138
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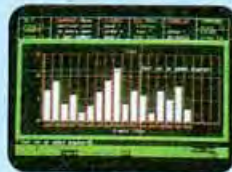
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commands including cell protection and titles command. In Archive the USR function allows you to link in machine code routines, and the \$EDIT command offers improved screen designing. Easel includes the famous 3D bar graphs to give your presentations that professional polish.

THOR PC SYSTEM SOFTWARE

Included with the Thor is an improved version of the ICE computer front end, that allows simple housekeeping to be achieved by the use of mouse or cursor. Built in screen dumps by QDUMP DANSOFT allow you to snapshot the screen at any time to the printer or a file. A much enhanced operating system gives you menu control, single key task switching between Xchange and other tasks (including Superbasic) and extended windowing capabilities.

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SOFTWARE FILE

The recent dearth of QL games has picked up, thanks to Digital Precision and the Germans.

Droidzone

Digital Precision
£9.95

The trend in computer gaming has in recent months moved away from the mindless megablast towards something which is more demanding of mental agility than fast reactions and a skilful hand on the joystick. With *Droidzone*, Digital Precision has gone against the grain and produced a good old-fashioned, no-nonsense blast.

That is not to say that *Droidzone* is in any way boring or unoriginal. There is nothing else on the QL just like it.

The theme sounds familiar enough. You are in control of a spaceship and must defend the Earth against a wave upon seemingly endless wave of alien invaders. The difference is that your ship is not confined to the usual territory, i.e., the bottom or the side of the screen, but can go all the way round. Hence you

can shoot at the invaders from top, bottom, left or right; it is rather like having a spaceship on a curtain rail that runs around the screen. kinds of problems when it comes to orientation. It is all very well when your ship is facing the proper way up at the bottom of the screen. When you push the joystick left the ship goes left, when you push it right it does the predictable thing. When you are upside down at the top of the screen, however, everything happens in reverse. Left- and right-hand controls are similarly a mirror image of each other.

The result is that nine times out of ten you go left instead of right, up instead of down, crashing into the advancing aliens instead of fleeing to relative safety. You are not helped by the fact that the enemy delights in performing the kind of aerobic manoeuvres which make your eyes rotate in different directions at the same time.

The secret is to think in terms of clockwise and anti-clockwise, rather than left and right. There are also certain locations

around the screen edge which offer better defensive and attacking opportunities — sometimes.

Undoubtedly the best tactic is to stand your ground and fire until an impact becomes imminent

and then move to another position of safety. Easier said than done, as they say.

For sheer blasting, unpolluted by any pretension to mental effort, you would be hard pushed to beat *Droidzones*.

The playing area occupies the whole of the screen — and more. Your little man moves round the screen under joystick or cursor control and as he approaches the edge the whole play area smooth-scrolls in the appropriate direction. Scenery includes, naturally enough, the blocks, an abundance of what looks to me like cacti, a similar quantity of little gold coins and a few other useful props.

Look carefully and, if

Blocklands

Digital Precision
£9.95



Blocklands. The fastest scroll in the West?

Blocklands, one of two new games launched by Digital Precision at the PCW Show, claims to feature 'the fastest scrolling in the West'. The speed of the game as a whole is not exactly tortoise-like and, as names go, *Blocklands* describes the nature of the game fairly well.

"*Blocklands*", you are informed "is inhabited by a bunch of nasties so bad that even touching one is enough to cause serious discomfort". While avoiding the seriously discomfiting touch of the nasties, your task is to roam, no, tear through the cuboid terrain in search of the source of the nasties' energy — a jewel; no other energy source looks like it or lasts like it.

you are lucky, you will find a bottle full of water. The water is useful as it prevents you suffering one of the many possible demises in this game, death by dehydration. I never once suffered that fate; something else inevitably got me first.

A key is a useful thing to have, because without one you will be unable to reach the upper levels of the game. Having collected the key you must find a door but if you managed to find the key that should not prove too difficult a problem, should it?

Did I say the playing area occupies the whole of the screen? Well, it does, apart from the window which displays your status. That informs you of your score. Points are



Droidzone. No nonsense blasting. can shoot at the invaders from top, bottom, left or right; it is rather like having a spaceship on a curtain rail that runs around the screen.

This departure from convention may be great fun but it leads to all

gained by collecting the gold coins, the level you are on, the number of shots remaining from a maximum 25, the state of your water supply, number of lives remaining out of the five with which you started, and whether you have anything useful like a key or a map.

The key to success in Blocklands is to adopt the correct tactical approach. If anyone manages to discover what that is, please let me know. For what it is worth the following strategies met with varying degrees of success.

Run through the place like a crazy lunatic shooting everything in sight and grabbing what you can as you go. That is good fun but experience shows that only very low levels of achievement are possible using this plan. There are three major problems. The nasties are not immediately recognisable from the blocks, so you tend to run into them. Control at speed is tricky and you tend to over-shoot targets such as coins, keys and water. Last, you run out of ammunition in next to no time.

A more subtle approach is to hide behind an L-shaped wall and wait for the stupid nasties to hug the other side; they are too stupid to walk round. Then just step from behind the wall and blast them all. Initially that seemed like a good idea but the nasties are replaced in double-quick time, which makes it rather useless.

I decided finally that the only way to win is to keep your eyes open, go cautiously, use your bullets judiciously, head for a key and explore as many levels as you can.

If you become bored with the layout, or manage to complete the game, there is an option to design your own screens. That seems

rather useless as, if you designed the screen you would know where everything was. You could always get a friend to do it, I suppose.

Blocklands is an addictive game which will appeal to anyone who enjoys the challenge of having to react at twice the usual speed. It is also encouraging to see new games being offered at the reasonable price of less than £10.

Full House

Ultrasoft
£14.95

Card games and fruit machine simulations have been around for so long on virtually every machine you can think of that it is difficult to

outcome of a five-card poker hand. Initially the cards are displayed face down on the screen. First you transfer a few credits from the store into the pot by means of the cursor keys. Pressing the down cursor key causes all the cards to flip over and you can see what a poor hand you have.

There are five hold buttons, so you can retain any of the cards if it seems they might yield a promising result. The remaining cards are flipped again and you are either laughing all the way to the bank or heading for skid row.

If you are lucky enough to get a full house, a flush, a pair, or whatever, you have a second option to lose it all. By using the double button your winnings can be multiplied by a factor of



Full House. Or not, as in this case.

summon enthusiasm when another is released. Ultrasoft has managed to enliven the idea by combining the two. This kind of thing is apparently all the rage in Germany, where the pubs are full of card-toting machines urging the punters to part with their Deutschmarks and generally annoying everyone within ear-shattering-chip-generated Musak.

The idea is simple. You start with 100 credits and must gamble on the

up to 64 times — depending on how long your nerve holds. You could, of course, lose the lot but that is the gambling life for you.

There is not a great deal to *Full House* but it is good fun to play, worryingly addictive and will keep you amused in those odd half-hours when you have nothing better to do. The layout of the screen and the graphics are extremely well-implemented and the Musak not in the least irritating.

Various games

RB Software
£6.50

It seemed that it was the month for good German software. We thought Christmas had arrived early when we discovered that RB Software was offering no fewer than five different QL games, each at DM 20 — about £6.50.

It was, in fact, too good to be true. The games were all written in SuperBasic, which in itself is no bad thing, but in every other aspect — speed, graphics, gameplay and overall design — it was poor stuff.

The games we looked at were *World 2000*, *Golf*, and *Satellites*. Instructions were in German only, but surprisingly this was only a problem on one of the games — *World 2000*. It is as old as the ark and is probably better known as *Dictator*. You are the ruler of a thriving economy and must try to maintain the population's goodwill by keeping up living standards.

Satellites and *Golf* are so mediocre they are really scarcely worthy of comment. *Satellites* is a lunar lander-type game in which you manoeuvre a ship from the top to the bottom of the screen.

Golf has potential but is again damned by lack of speed, poor graphics and absence of gameplay. The screen shows an aerial view of the hole, complete with fairway, greens, bunkers and lakes. It is just a question of deciding on the power and direction of each shot until your ball is in the hole.

RB Software lists several other programs in its catalogue but if the quality of these games is a criterion, my advice would be to stay with card games.

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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 override, memory and all the standard type features very useful in a busy office.

QL SWITCH £14.95

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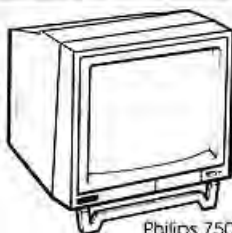
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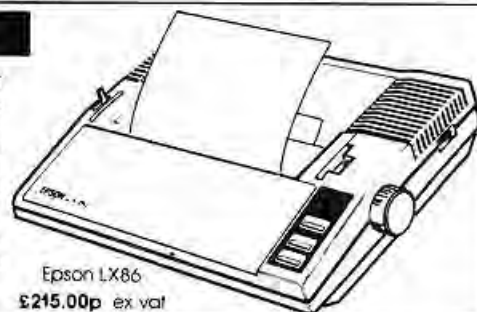
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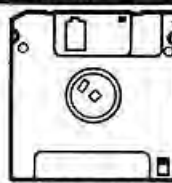
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PUZZLE PAGE

This month's puzzle is very easy and should not cause many problems for anybody. The trick is first of all to make sure that you have the question correct and, second, to discount as many solutions as possible, due to symmetry.

The puzzle, affectionately known as the *Dodo-Problem*, is based on a multi-coloured dodecahedron. For those not in the know, that is a three-dimensional shape with 12 faces, each of which has five edges. If you were to cut along a few of the edges, then flatten the whole shape, you would have something similar to figure one, which shows the 12 faces and their colours.

Be very careful, when trying to solve the problem, to ensure that you get the correct adjacent faces, or you will cause yourself endless difficulties. One foolproof

method is to make a model of the shape. Just draw the shape in figure one — all the edges are the same length and each inside angle is 72 degrees — cut it out, then fold and stick.

Now to the problem. You play the role of a small bug whose whole life consists of hopping round on its dodecahedral world. Each hop takes it from one colour to any one adjacent colour. Not a very exciting life, I am sure you will admit. To make things more interesting, the bug decides to try never to repeat a sequence of three consecutive colours twice. What is the longest sequence of colours possible?

Easy. For instance, start with RED as the first colour, then hop to ORANGE as the second, though you can start anywhere you like — it makes no difference. You could start:
 RED (1), ORANGE (2),
 RED (3), ORANGE (4)

but after that you could not return to RED again, because that would repeat the three-colour sequence "RED.ORANGE.RED", so you might instead move on to, say, PINK, and so on. Note that the answer should be the number of faces visited before a sequence repeats — i.e., number of hops plus one.

As usual, I will be interested in any programs you send. Some people have pointed-out that the shortest programs are not necessarily the best. I agree. Unfortunately, space restrictions mean that only reasonably short programs have much chance of being printed.

With this month's puzzle, I will be particularly impressed if anybody can tell me exactly how many variations of the longest colour sequence exist. Obviously, you can start from any of 12 colours, so there will be at least 12 routes, and it does not matter to which colour you first hop, because there will be five other symmetrical ones.

Marcus Jeffery proves that the dodo is not dead, if you attempt this month's puzzle.

RULES

Entries must be sent by post to:
 PUZZLE PAGE,
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 to arrive no later than November 17, 1986.

The winner will be the first correct entry drawn for the editor's polyhedron. If nobody submits the correct longest sequence, the winner will be the person with the nearest answer.

All entries will be judged by the Editor of *Sinclair QL World*. The editor's decision is final and no correspondence will be entered into regarding the result.

ENTRY FORM

Maximum colour sequence: colours
 Name
 Address

SOLUTIONS

Trying to figure the workings of the program in the September issue certainly had most of you stumped. The classic problem it was solving was the 8-Queens Problem — placing eight queens on a standard chess board, so that no queen attacks any of the others.

The program corrections were:
 150 IF c=a + b
 220 h

400 d(c) = b - a
 460 IF 1 = a THEN c = c + a
 510 for m = 1 TO c - a
 I always ask for short solutions and you cannot get much shorter than the one-liner sent by Vladimir Jovanovski, shown in figure two.

The winner this month is Robert Beattie of Edinburgh, who will receive a year's free subscription.

Figure 2.

```
10 MODE 4:n=8:DIM d(n),u(n):c=1:t=0:REPEAT k:REPEAT l:t=t+1:IF t<n:EXIT l:ELSE c=c-1:IF c=0:STOP:ELSE t=d(c):u(t)=0:END REPEAT l:IF u(t):NEXT l:ELSE i=0:REPEAT m:i=i+1:IF i=c:EXIT k:ELSE IF ABS(d(i)-t)=c-1:NEXT l:ELSE NEXT m:END REPEAT k:i=u(t)=i:d(c)=t:IF c<0:c=c+1:t=0:NEXT l:ELSE FOR i=1 TO n:PRINT "(",i:",",d(i):" )":NEXT i:PRINT:t=d(c):u(t)=0:NEXT k
```

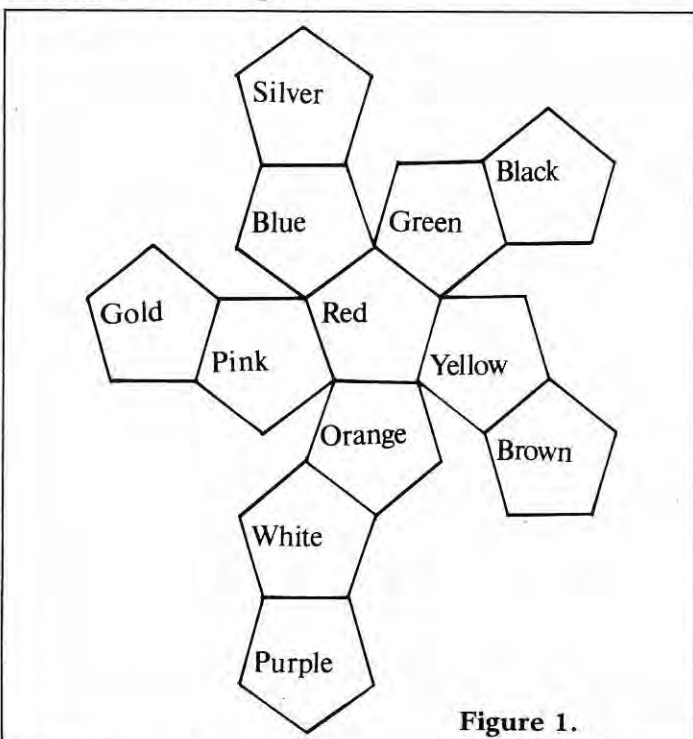


Figure 1.

BETTER BASIC

How do you ensure that user input will be QL compatible?

Mike Lloyd reveals all.

The disadvantages of the SuperBasic INPUT

command were discussed last month. In brief, with INPUT programmers have no control over what users might enter. Characters might be typed when digits were required, or perhaps 30 characters typed when only 10 were expected. Because INPUT gives the user the initiative so imprudently it must be replaced in serious programs by routines which prevent the input of anything for which the programmer has not catered.

The problems of trapping all possible errors are enormous when dealing with numerical input. Although there are only a few valid characters, the rules regarding their validity are complex. The unary minus symbol, for example, can be valid if it is the first character entered and a decimal point can be entered only once, or not at all in integers.

It should be of little surprise that the numerical input function is considerably longer than its string input counterpart, listed last month. What may be surprising, however, is

the wide variety of constraints and assumptions about which the programmer must decide before writing the routine.

The reason for bothering to write a numerical input routine is that it should be crashproof and that must be the over-riding criterion for judging its success. It means only that the user cannot crash the program; errors in programming could cause the program to halt but such problems should be corrected during testing.

Numerical input excludes expressions such as $5-4+9$, algebraic values and variable names but it includes negative numbers and integers, as well as positive real numbers. To allow for negative values, the minus symbol has to be catered for properly.

A common feature of recent programs is "what you see is what you get". It means that the display accords exactly with the information it represents. For this routine, it means that the screen always shows precisely what value would be accepted if ENTER were pressed.

The principles of WYSIWYG need to be considered when deciding on the justification of the screen display. Programmers tend to prefer left-justified printing, so that print co-ordinates are calculated easily, while users appreciate numerical input justified round the decimal point, so that columns of figures are easy to read. The function

called *NUM* and listing one satisfies both demands by referring to the input area by the print co-ordinates of the left-most character but displaying output in the print area justified round the decimal point.

WYSIWYG also demands that illegal characters are suppressed before they appear on-

When input is complete underline and hash are removed.

Two features for the benefit of programmers, are the limitations of the routine, and the parameters it requires. The input area cannot extend over two lines and, although there are no limits to the number of integer places, a

Listing 1. The NUM Function.

```
100 DEFine FuNction NUM (chan, ypos, xpos, spec)
110 LOCAL digs, decs, dp, dpos, i$, d$, loop, key
120 digs = INT(spec)+(spec<1): decs = (spec-digs+(spec<1))*10
130 dp = 1+(decs=0): dpos = 2
140 i$ = FILL$(" ",digs)
150 d$ = "." & FILL$("0",decs+(decs = 0))
160 UNDER#chan, 1
170 REPEAT loop
180 AT#chan, ypos,xpos: PRINT#chan, "#";i$;
190 IF decs THEN PRINT#chan, d$
200 key = CODE(INKEY$(-1))
210 SELECT ON key
220 = 9, 10: REMark ENTER/TAB keys
230 UNDER#chan,0: AT#chan, ypos,xpos
240 PRINT#chan, " ";i$;
250 IF decs THEN PRINT#chan, d$: ELSE : PRINT#chan
260 RETURN i$ & d$
270 = 27: REMark ESC key
280 RETURN NUM (chan, ypos, xpos, spec)
290 = 194: REMark delete character
300 IF dp
310 i$ = " " & i$(1 TO digs-1)
320 ELSE
330 dpos = dpos-(dpos>2): d$(dpos) = "0"
340 END IF
350 = 46: REMark decimal point
360 dp = dp - (dp = 1)
370 = 45: REMark minus symbol
380 IF i$(digs) = " " THEN i$(digs) = "-"
390 = 48 TO 57: REMark digits
400 IF dp
410 i$ = i$ & CHR$(key)
420 IF i$(1) = " " THEN i$ = i$(2 TO)
430 i$ = i$(1 TO digs)
440 ELSE
450 IF dpos <= LEN(d$)
460 d$(dpos) = CHR$(key): dpos = dpos+1
470 END IF
480 END IF
490 END SELECT
500 END REPEAT loop
510 END DEFine NUM
```

screen. Integer characters need to be added immediately to the left of the decimal point, moving existing figures to the left, and decimal values added to the right of previously-entered figures.

Finally, the user is told that input is expected not by a flashing cursor, which is difficult to program in Basic, but by an underlined area preceded by a hash.

maximum of nine decimal places is imposed by NUM. The parameters are almost identical to those used in last month's string input routine and are consistent with general SuperBasic syntax. The routine should be concisely but clearly written so that RAM is not wasted and so that amendments can be incorporated easily in the future.

NUM could, of course, be re-written to accord with a different set of assumptions, so long as the essential criteria were satisfied. It should be appreciated that programmers impose their own ideas about how input and output are obtained and displayed and that there is a danger that programs become programmer-friendly rather than user-friendly — the terms are usually mutually exclusive. Pre-planning provides a good discipline for programmers to put the interests of users first, which is as it should be.

The NUM format is similar to last month's string input function, with parameters for the screen channel *chan* the print co-ordinates of the first character in the input area *ypos* and *xpos* and a specification for the length of the input *spec*.

Chan, *ypos* and *xpos* are self-explanatory. *Spec* has two components, the number of digits before the decimal point and the number of decimal places after the decimal point. It could have been represented by a mask, such as "00000.000" which indicates five digits and three decimal places. Masks can be awkward when representing large numbers and therefore NUM uses a simpler system. Five digits and three decimal places are represented by 5.3. The local variables used by NUM are:

digs — the maximum number of integer digits in the display.
decs — the maximum number of decimal places.
dp — decimal point status flag.
dpos — the position in the string of the next decimal figure to be printed.
i\$ — the integer input string.
d\$ — the decimal input string.
loop — a REPEAT control variable.
key — the ASCII value of

a character. The first task of the routine is to decode the specification represented by *spec*. *Digs* is the integer part of *spec* and has a minimum length of one character, to allow space for the minus sign in negative decimals. The number of decimal places is computed and held in *decs* while the decimal point flag, *dp*, is given the value of one if the input includes decimals and two if the input is integer.

Dp can also take the value zero, which indicates that the decimal point has been used. *Dpos* is set to represent the character position immediately after the decimal point. Finally, input strings are made up of blanks for integers and zeros for decimals.

The routine next enters a loop which performs two tasks; it prints the input string repeatedly on the screen and it tests the keyboard for keypresses and acts on them. That approach will be familiar to readers who studied the string input routine last month.

In NUM there are six valid input character classes. The first is formed by the TAB and ENTER keys, both indicating that input is complete. If they are pressed with no previous input the routine will return the value zero. Otherwise the display is tidied and the entered value is assigned to the variable in the calling statement.

The ESC key clears the input area to allow a fresh start by calling the function recursively.

The delete key combination works differently on either side of the decimal point but the effect is to remove the right-most value in each case. The decimal point cannot be deleted. The fourth class comprises the decimal point. If *dp* is two or zero, the keypress is ignored. If *dp* is

KEYWORD OF THE MONTH

CURSOR

EVEN after the issue of numerous corrections to the original QL ROM there are still indications of the haste with which SuperBasic was completed. The peculiar CURSOR command is a case in point.

The thinking behind the CURSOR command is sound, as it allows printing to be positioned using either the pixel or the graphics co-ordinates systems as well as by the more normal print co-ordinate system, as used by AT. The implementation, however is incomplete.

CURSOR works as advertised if only two parameters are specified. The parameters indicate the top left pixel of the print position measured from the top left corner of the window. For example, CURSOR 20, 50 moves the print position 20 pixels across and 50 pixels down from the default window origin.

The User Guide claims that if another pair of parameters is specified, the first two represent graphics co-ordinates and the second pair are pixel co-ordinates relative to the position of the graphics co-ordinates. This, however, is true only for the default window. If four parameters and a channel identifier are

specified, a 'bad parameter' error is generated.

If three parameters plus a channel identifier are specified in the CURSOR statement, all is well. In other words, it is acceptable to specify a channel, two graphics co-ordinates and the horizontal pixel co-ordinate. Perversely, if three parameters are specified, but without a channel identifier, a 'bad parameter' error again occurs.

The advantage of being able to specify offsets in one co-ordinate system from a point specified by another is somewhat obtuse and this facility is perhaps best ignored. It is, however, genuinely useful to be able to place text using either the pixel or the graphics co-ordinate systems, in which case the following syntax is recommended — with optional items in brackets:

For pixel co-ordinates:
 CURSOR (%channel), ypos, xpos

For graphics co-ordinates:
 CURSOR %channel, xpos, ypos,

or:

CURSOR xpos, ypos, 0, 0

positive it is set to zero. The minus sign is valid only if *i\$* is empty.

The sixth and largest class is made up of the digits 0-9. If *dp* is not zero, figures are added immediately to the left of the decimal point, calculator fashion. Previously-entered digits are shifted left-wards by one character if there is space. If *dp* is zero, a digit is added to the left-most position after the decimal point, if space is available.

Defining an error-proof numerical input routine is a teasing intellectual exercise and there is no one correct answer. Other programming tactics might be to adopt calculator-style input.

Other assumptions might be to allow expressions, or to suppress leading zeros, depending on the application. Nevertheless, NUM should be a useful starting-point for designing other variations.

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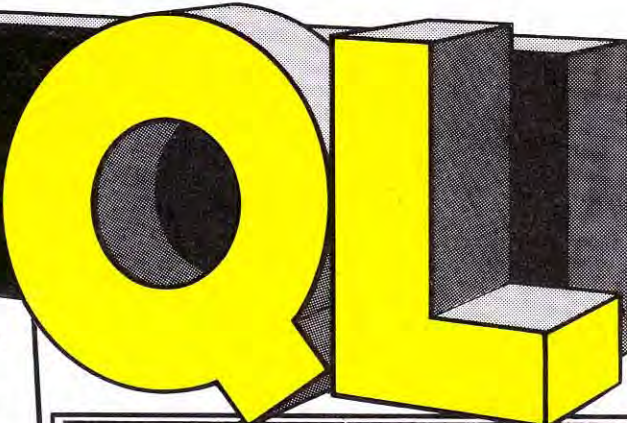
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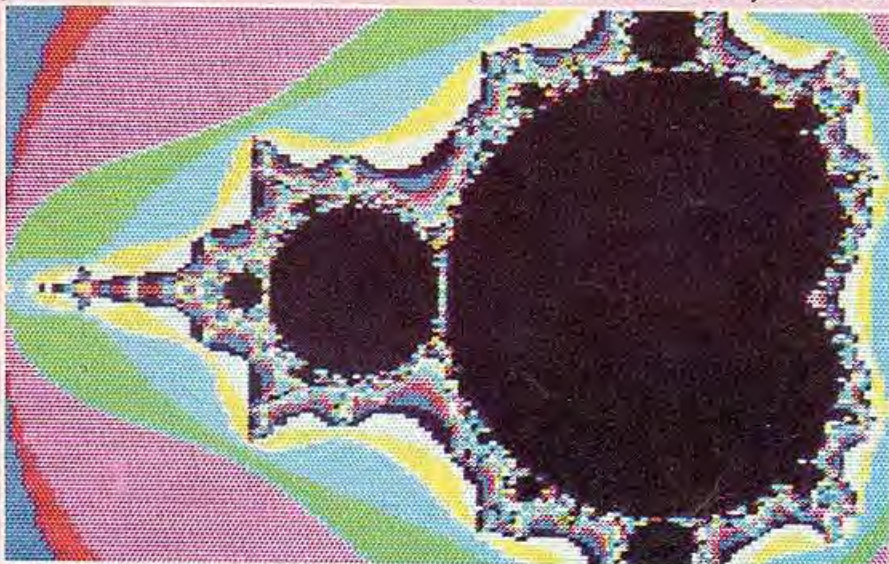
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Mandelbrot Magic

Suppose you are in the middle of a featureless desert. Finding yourself short of other entertainment, and being of mathematical bent, you decide to use the desert to model the complex plane. The axis of real numbers stretches east and west of you and the imaginary numbers run north and south. You choose to allow

Figure 1.



one mile for each unit on the axes — an imaginary number is the product of a normal number and i , the square root of -1 . Any point in the desert has a real and imaginary component and hence represents a complex number.

You consider the repeated process $Z \rightarrow Z^2 + C$ where Z and C are complex numbers. C is constant and Z starts at $0 + 0i$ and then takes the value obtained from the expression using the previous value of Z . After each calculation of Z , you plot it on your desert and decide if it is more than two miles away from you; if so, it is not a member of the *Mandelbrot set* and you try another value of C .

After a great deal of work, you find you are surrounded by values of C which cause Z to remain closer than two miles and that the closest point which does not is less than a quarter of a mile due east. You go to investigate.

When you arrive, you make more calculations on the small area you have found and discover that the boundary of the Mandelbrot set is not so plain as you thought; in fact, the harder you look, the more complexity

you find. The boundary is not smooth but includes inlets and protuberances. When you investigate an inlet, you find recurrences of patterns you think you have seen previously but they are never exactly the same.

Even when you get to the complex number represented by a single grain of sand on your complex plane, you find variations from one side of the grain to another; when you look at an

atom in the sand, there is still more detail to be discovered. You are confronted by an apparently infinite richness of detail.

The same complications apply at all the other points along the perimeter you thought you had discovered and, faced with that you are likely to decide to re-direct your mathematical skills to the calculation of the Great Circle route to the nearest oasis.

Those who are situated more comfortably and equipped with a QL can use computers to do the same for us. Even more interesting, we can get it to display the results in a multi-coloured graphical form. The calculation is straightforward, provided that you understand the multiplication of complex numbers — see panel — and is implemented in the program. The apparently simple program is capable of consuming QL time in enormous quantities, so beware. It has been kept as short as possible, to make it easy to type-in, so contains no frills.

The idea is that you describe the square in the complex plane to be investigated by specifying its lower left-

Their basis is in complex mathematics but it does not take a genius to generate images such as these. James Lucy shows how.

hand corner co-ordinated — i.e., the real and imaginary parts — and the length of the side of the square. You then indicate the accuracy to which you want to work and the number of pixels which make up each side of the square.

The accuracy figure refers to the number of attempts made to persuade the value of the expression $Z^2 + C$ to run to infinity. It can be any number you like but small numbers — e.g., 10 — will give only a very general view and will not work at all in the more detailed areas, and large numbers will consume a great deal of time. To give a starting-point, the various parameters used to generate the images in the photographs are shown in the table.

The program looks at each location in the square, 40,000 of them if you have specified a 200-pixel side, and checks to see if it is a member of the Mandelbrot set. If at any stage the distance of Z from the origin becomes greater than 2, calculated by Pythagoras, a rule of complex numbers predicts that Z will eventually go to infinity, so the calculation is aborted.

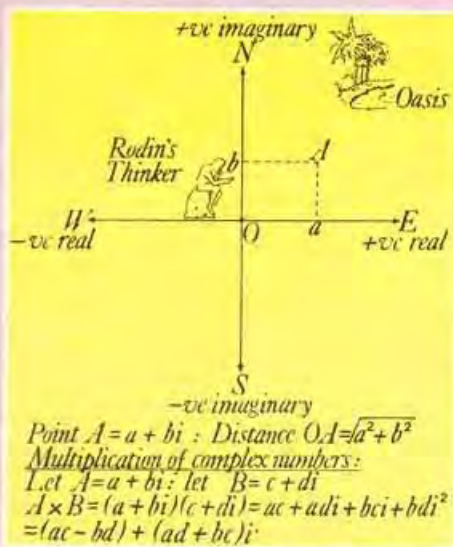
```

100 REMark 'Quick' Mandelbrot
110 REMark James Lucy
    Tel. 0206-868159
115 REMark Type all 'E' signs as hashes
120 INPUT#0,'Enter the real part of the
    number';rp
130 INPUT#0,'Enter the imaginary part
    of the number';ip
140 INPUT#0,'Enter the size of the
    square to be investigated';side
150 INPUT#0,'Enter the accuracy';ac% :
    ac% = ac%-1
160 INPUT#0,'Enter the number of pixels
    ';pix
170 PRINT#0,'Press any key to continue..
    ' : PAUSE : CLS#0
180 gap = side/pix
190 MODE 8 : WINDOW 512,
    200,0,0 : PAPER 0 : CLS
200 FOR m = 1 TO pix
210 FOR n = 1 TO pix
220 rc = n*gap+rp : ic = m*gap+ip
230 rz=0 : iz=0 : count%=0
240 REPEAT Mandel
250 tempz = rz*rz - iz*iz + rc
260 iz = 2*rz*iz+ic : rz = tempz
270 count% = count%+1
280 size = SQR(rz*rz+iz*iz)
290 IF size > 2 OR count% > ac%
    : EXIT Mandel
300 END REPEAT Mandel
310 INK (count% MOD 8) : POINT n,m
320 END FOR n
330 AT#0,0,0 : PRINT#0,m
340 END FOR m
    
```


The number of iterations necessary to reach that point is used to select a colour for the pixel under investigation, which is then drawn. If the number of iterations exceeds the accuracy chosen, the point under consideration is considered a member of the Mandelbrot set and is coloured accordingly.

The program as it stands is intended as a starting-point. Unless you are blessed with extraordinary patience, you will find the several days taken to produce an image such as those in the photographs something of a strain. One possibility would be a re-write in assembler or another language faster than SuperBasic but the method I adopted was to compile a modified version using the Supercharge compiler.

I suggest you use the in-line code option on Supercharge and you might find it worthwhile to analyse the con-



tents of the loop, which will be executed many millions of times, to find a more efficient method. Whatever the improvements, running times of up to 24 hours or even more can be expected — has anyone yet developed an add-on Transputer for the QL?

A much more significant improvement possible is in the method of producing colour from the fruits of the calculations of the computer. The program shown uses the simplest method of which I could think, that of taking the number of iterations modulus 8. While giving a pretty picture, it also means that not all areas coloured black are in the Mandelbrot set.

What is more, all that you have to show for many hours' running is a screen image. You might choose instead to store the number of iterations for each point by some means, such as poking it into resident procedure space or placing it in an array, and then to write a separate program to process the data into a picture.



Figure 2.

This program might do a statistical analysis of the data and ascribe colours to iteration number ranges to produce pleasing colour balance in the final picture, or it might do something wild like generating three-dimensional coloured surfaces.

The three colour photographs show views of the Mandelbrot set generated by the program in the listing. Each picture may be reproduced on your machine if desired, but since there is an infinite number of such images it would be much more interesting for readers to look at other areas.

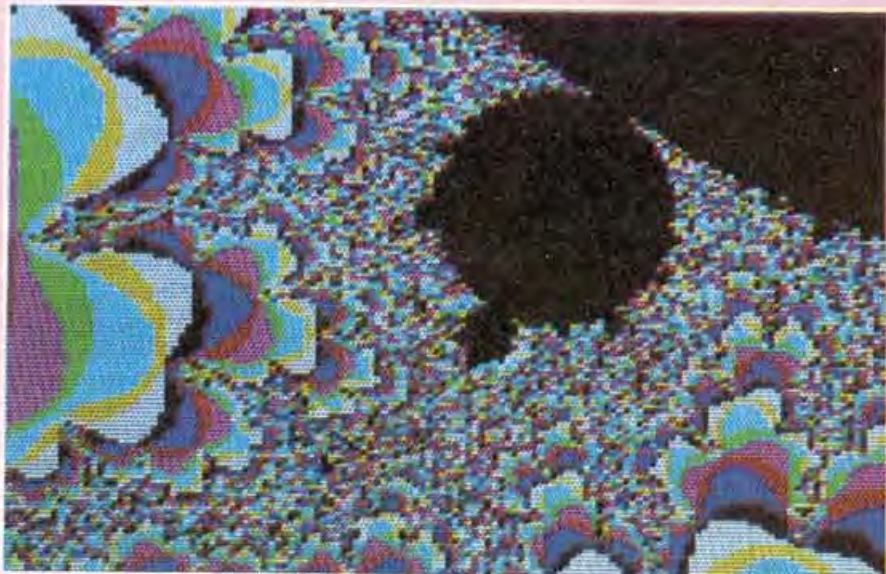
Figure one shows an overall view of the entire Mandelbrot set and provides a starting-point for further exploration. I selected the smallest, left-most, of the three block 'blobs' on the axis of symmetry — the imaginary axis — for further investigation, resulting in figure two. The inlet in the south-south-west of the black area of figure two was enlarged further for figure three, an overall magnification of almost 60 times.

The Mandelbrot set is infinitely com-

plex and the investigation of each small area takes a great deal of computer time. Readers should enter the world of Mandelbrot with their eyes open and with an awareness that it can prove almost all-consuming to the susceptible. While we, for the moment, have kicked the habit we would be interested to hear from readers who discover their own corners of paradise in the Mandelbrot domain.

If you cannot wait for SuperBasic, and if you do not want to write your own machine code Mandelbrot program, you might consider Mandelbrot from Transtech, 324 Yorktown Road, Camberley GU14 4PZ. My copy did not arrive in time for review but it seems that the author has re-written the QL floating point routines to the faster IEEE standard and has produced a quicker point-plotting routine. The result is about two hours for something similar to figure one, using a 192-pixel square and 255 iterations per point. It sounds good but untested, so *caveat emptor*. £7.

Figure 3.



TECHNICAL HELPLINE

QL expert Colin Opie offers advice on RAM expansions and ROM removal.

The disappearing ROM trick

My QL — JS ROM — is fitted with a PCML disc interface plus 256K and I use an Eidersoft ICE ROM. I also make regular use of the Tandata QL modem. I have recently received version 2.2 of the Q-Connect software from Tandata, the version supposedly written to take account of a QL with expanded memory.

If I remove the ROM there is no problem but I am concerned that doing it repeatedly is weakening the interface and I want to find a way to run the modem with the ROM in place.

When Q-Connect runs it checks to see if additional memory is fitted and if so re-sets the QL to pretend that it has only the standard memory. Splitting the Boot program and

running the two sections before and after the re-set loads the program but leaves one with a pulsating clock on one side of all the Prestel pages.

I am concerned that it might also affect other aspects of the software, although I have yet to check that thoroughly. Is there a way to allow the ROM and modem to live in harmony with one another? Can the ROM perhaps be switched out by a software command in the Boot program?

I have contacted Tandata and Eidersoft. Both companies are aware of the problem but neither has so far offered any helpful suggestions.

**C. J. Willsher,
Northwich,
Cheshire.**

If a ROM is designed to be recognised automatically by Qdos when the QL is re-set, there is no software patch you can use to prevent it happening. There is, however, a hardware solution. To perform the operation you will need to be confident about using a low-power soldering iron.

Do not attempt the modification to your ROM cartridge if you are not sure about what is happening. Find a trustworthy friend who knows about electronics to do the work for you. QL World can take no responsibility for anything which may happen to your QL or your cartridge.

Figure one shows the

operation being performed. Open the cartridge case by undoing

the two screws in the base. Lift the board from the top half and turn it over so that you can see the track side. There is a small track which joins pin 6 of the 74LS10 to pin 22 of the 27128 EPROM.

Using track cutters or a sharp modeller's knife, cut this track. Obtain a micro-miniature SPDT switch which will fit into the top half of the cartridge case, at the back, between the screw lug and the rear edge. Make a suitable hole in the top of the case and mount the switch.

Connect the common of this switch to pin 22 of the 27128 EPROM, one pole to pin 6 of the 74LS10 and the other to pin 28 (+5V) of the 27128 EPROM via a 2K2 resistor. Make sure that you use thin flexible wire and that you have created no shorts. Feeding the thin wires between the case top and the board, place the board EPROM uppermost, on to the case

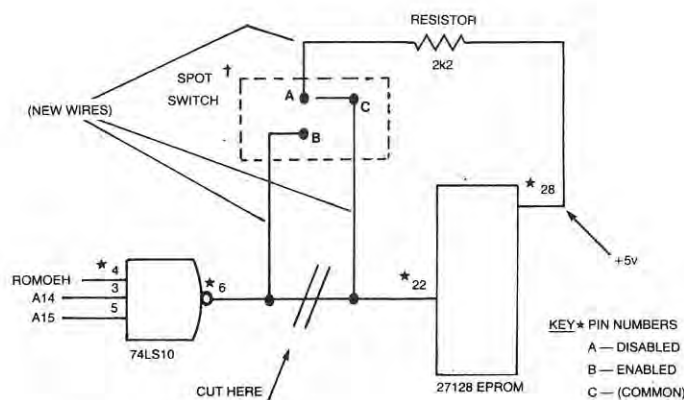
top. Finally, screw back the base.

With the switch in one position the EPROM will be recognised by Qdos when the QL is re-set. In the other position the EPROM becomes disabled and Qdos will assume that one is not present. Which position is which will depend on how you mount the switch. I suggest you use the switch forward — i.e., switch pointing towards the rear of the QL — position to mean enabled.

If you disable a ROM without re-setting the QL, there is a good chance of locking-up your QL or causing the QL to do something weird and wonderful.

Enabling a ROM which was disabled when the QL was re-set will not cause the ROM routines to be recognised automatically. In other words, the switch replaces the need to plug and unplug cartridges.

Figure 1. The EPROM disabling circuit.



Memory management

In your reply to N. Kasrawy — August, page 21 — you said: "There is no standard procedure for reclaiming resident procedure memory". Does that mean that, having called a machine code procedure for an on-screen capslock marker for Quill, I am stuck with it in #0 once I return to Basic? Must I press RESET and lose 700 sectors of occupied RAM

disc? My Miracle 512K expansion works well with everything but Chess and Home Finance packages, which report "Out of memory [!]" and refuse to load. I am told that should not happen and therefore does not — which is not much help. Can you explain?

**B. P. Holt,
Sevenoaks,
Kent.**

QL users seem to be having a great deal of trouble utilising the QL memory efficiently and properly. Certain software houses also seem to be a little naive. Holt's questions highlight a number of important considerations which should be taken into account when designing and using software, particularly when it involves machine code.

There is no reason, provided the capslock utility was designed correctly, why the marker should remain active while in SuperBasic. As no mention is made regarding the author of the utility or how it works, let us examine the overall design process which should be behind every published utility. Being aware of this process will help you decide what is and what is not possible in any instance.

There are three main ways in which machine code programs can exist in the QL environment: As CALLED code — used mostly for games As JOBS, invoked by EXEC, or as SuperBasic language extensions.

It is the overall task to be performed which will decide which implementation is to be used.

SuperBasic language extensions are always, so far as I know written in

the correct manner. You could refer to *QL Assembly Language Programming* by McGraw-Hill to see how it is done. Once they are added to SuperBasic only a re-set will reclaim the space they required.

They are, however, programs which normally do nothing until called explicitly by their corresponding SuperBasic name.

If a machine code

Figure 2. Chess.

```
CLOSE#1
CLOSE#2
MODE 4
OPEN #1, con_
512x256a0x0_32
INK 7
PAPER 3
CLS
CSIZE 2, 1
AT 2, 16
CSIZE 3, 1
PRINT"QL CHESS"
CSIZE 1, 0
AT 7, 28
PRINT"by PSION"
AT 9, 24
PRINT"with Richard
Lang"
CSIZE 1, 0
AT 24, 20
PRINT"Copyright 1984
PSION LTD"
LBYTESf1p1_logo, 151552
addr=184064
a=ALCHP(75000)
IF a<=addr THEN LBYTES
f1p1_chessc, addr:
ELSE STOP
CLOSE #0
CALL addr
```

program is intended for some form of monitoring or continuous display action — such as clocks, timers, or keyboard status indicators — it should be

implemented as a Qdos job.

Within the constraints of memory space, you can have as many jobs active in the QL as you wish. SuperBasic is one job. You could add a real-time clock job, an alarm job and so on — the book mentioned discusses it more fully. Facilities exist in Qdos to alter the priority of jobs, stop/start them and kill them off. When a job is killed off, the memory allocated to that job is relinquished and hence is available for use by something else.

Packages such as the Tebby/Care Toolkit ROM, Digital Precision *SuperCharge* and *Media Manager*, and some memory/disc interface cards, support SuperBasic language extensions — such as SJOB, RJOB and KJOB — which can be used to view and alter the status of any current jobs.

If the capslock utility has been written appropriately — i.e., as a QL job — those SuperBasic extensions can be used to prevent the marker being displayed whenever you wish.

If a game is being written, the use of the CALL statement is the most common. The game will require a certain amount of memory space to run and that is allocated by using the SuperBasic RESPR statement. Those programs usually have a small SuperBasic BOOT program which displays a title, requests the memory space required and then CALLs the code.

That leads to the problems encountered with Psion *Chess* and *Home Finance*. The QL memory management facilities in Qdos are, clearly, designed to enable maximum use of the large amount of memory available. That is especially so when extra memory is plugged-in.

One of the side-effects of this management is that machine code routines, with the notable exception of ROM cartridge code, should be written in position-independent code.

That is easy to do in 68000 code. When RESPR is used to reserve memory you do not know where in the memory map the reserved block will be, so your code must be able to run

Figure 3. Home Finance.

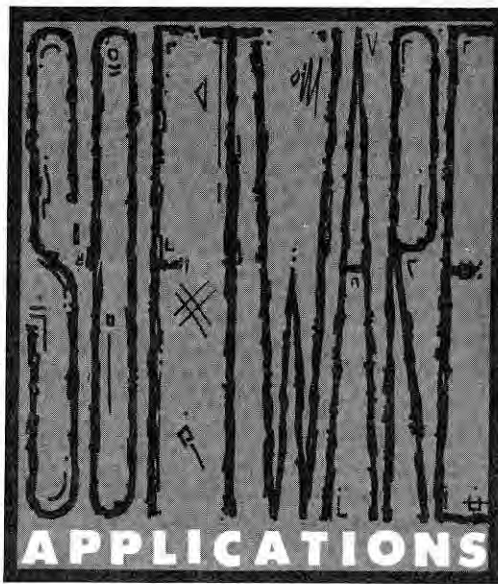
```
CLCHP : a=ALCHP
(256*1024)
IF a>HEX('2D000')
THEN STOP
x=a+256*1024-512
LBYTES FLP1_HF_LDR, x
CALL x+44
```

wherever it is placed. The two programs mentioned are written in fixed — or absolute — code. When extra memory is attached to the QL, the Qdos memory management creates a different map for RAM usage and the programs fail to load and run properly. Peculiarly, the error message which appears most often under those circumstances is 'Out of memory'!

Perhaps the easiest, and normally 100 percent effective solution, is to keep requesting memory with the RESPR command until you receive a base address lower than the required start address for the absolute code. You then load the code and call it as dictated by the original BOOT program.

That is a technique Talent Computer Systems has used e.g., with *GraphiQL*. Tony Hitchins from Essex also supplied the solutions shown in figures two and three for *Chess* and *Home Finance* respectively. Software houses which continue to offer programs written in absolute code are doing the QL user a great disservice. The sooner they cease to do so the better.

Peter Witte has been putting his QL to good use in the home for the mentally handicapped where he does voluntary work. Here are his suggestions for improving your QL set-up.



The Psion suite for the QL is an excellent package, catering for most day-to-day needs in a simple and uncluttered manner. Its versatility and usefulness can be greatly enhanced with the aid of some multi-tasking facility — the capability to load some or all of the programs together, and by a few key presses to switch between them. That capability requires extra memory, of course. RAM-discs for the fast transfer of data between the programs also increase the performance considerably.

I would like to share with you some uses to which the printer drivers can be put. The table lists various settings

manual under the information section.

Now follows a description of each of the printer drivers, together with instructions and suggestions for use.

Dfault

Four types of usage are described in ever further-removed relation to the intended purpose of a printer driver. The first is a plain driver for an Epson LX-80 or compatible printers. Two

function; they could well be utilised for something more useful. If, like myself, you have a parallel printer interface on the expansion board and Psion version 2.00 software, this is something for you.

Since you cannot install a Centronics printer to use with the Psion suite directly you have to print to a file named `_PAR` — note the underscore. That makes the programs look for a device named "par" and print to it as if it were a file, which makes a mess if you are using single-sheet paper for multi-page documents.

Basic

Quill has its function as a SuperBasic editor. Transliteration is only one of a host of possibilities — e.g., change all occurrences of `mdv` into `flp` — for those who upgrade to disc drives. That is faster and surer than by hand for long, complex programs. Other uses are tidying programs, editing or even writing whole SuperBasic programs. Remember you then have a full screen editor with advanced editing facilities.

Programs can be typed-in using the normal keyboard abbreviations, e.g., `defproc So_and_so`. Another short-form method can be seen by studying the Basic driver listing. There you see that certain characters have been translated into common SuperBasic keywords. Note that some of the translations end on a space. Thus, the procedure `Train` could be written like this:

```
{Train
  [puff:print'PUFF '];puff
```

Now follows a short principle program for removing line numbers from a SuperBasic program for editing in Quill:

```
OPEN #3,mdv1_PROG_bas
OPEN_NEW #4,mdv2_PROG_exp
REPEAT loop
IF EOF(#3):CLOSE #3:CLOSE #4:
  STOP
INPUT #3,1$:PRINT #4,1$(( ' INSTR
1$)+1 to)
END REPEAT loop
```

Similarly, the following method may be used for restoring the line numbers after editing.

```
OPEN #3,mdv2_PROG_lis
OPEN_NEW #4,mdv1_PROG1_bas
FOR 1=1 TO 999
IF EOF (#3):CLOSE #3:CLOSE
#4:STOP
INPUT #3,1$PRINT #4,1!1$
END FOR 1
```

APRG

In the same way as for SuperBasic, Archive procedures and programs may be written from Quill or even from within an Archive program. The possibilities of search and selection criteria you may include in your Archive pro-

	DFAULT	BASIC	ARCHPROG	ARCHFILE	MAILMERGE
DRIVER NAME	LX80	BASIC	APRG	AFILE	MAIL
PORT	SER1	SER1	SER1	SER1	SER1
BAUD RATE	9600	9600	9600	9600	9600
PARITY	NONE	NONE	NONE	NONE	NONE
LINES/PAGE	66	0	255	0	0
CHARS/LINE	80	255	160	80	80
CONT FORMS	NO	YES	YES	YES	YES
EOL CODE	CR,LF	LF	CR,LF	"",CR,LF"	"",CR,LF,print"
PREAMBLE	NONE	NONE	NONE	"",1,\$",CR,LF"	proc,ME,R,CR,LF
POSTAMBLE	FF,ESC,@	NONE	SUB	"",CR,LF,SUB	"",CR,LF,end,proc
BOLD ON	ESC,E	NONE	NONE	NONE	"",B,on,\$,+"
BOLD OFF	ESC,F	NONE	NONE	NONE	"",+B,of,\$,+"
UNDER ON	ESC,-,1	NONE	NONE	NONE	"",+U,on,\$,+"
UNDER OFF	ESC,-,0	NONE	NONE	NONE	"",+U,of,\$,+"
SUB ON	ESC,S,1	NONE	NONE	NONE	
SUB OFF	ESC,T	NONE	NONE	NONE	etc
SUPER ON	ESC,S,0	NONE	NONE	NONE	
SUPER OFF	ESC,T	NONE	NONE	NONE	
TRANS 1	ESC,ESC,R,ETX,#, ESC,R,NUL	(d,e,f,p,r,o,c,	(p,r,o,c,	"",]p,r,i,n,t,"
TRANS 2	↑,ESC,9	,e,n,d,d,e,f	,e,n,d,p,r,o,c	NONE	{",+
TRANS 3	↓,ESC,8	(,r,e,p,	(,w,h,i,l,e,	NONE),+,"
TRANS 4	←,ESC	,e,n,d,r,e,p,	,e,n,d,w,h,i,l,e	NONE	{",;,"
TRANS 5	/FF			NONE	};:,l,e,t ,d,\$,="
TRANS 6	NONE	YOU	YOU	NONE	"",
TRANS 7	NONE	THINK	THINK	NONE	YOU
TRANS 8	NONE	OF	OF	NONE	THINK
TRANS 9	NONE	SOMETHING	SOMETHING	NONE	OF
TRANS 10	NONE			NONE	SOMETHING

for which you may find of some use and, most important, may give you some ideas for further development or different uses.

To make testing and development of the printer driver settings easier, I modified the `INSTALL_bas` program supplied with Quill so that it would install on any medium — disc or RAM-disc; install the printer data under any name, not only `printer_dat`; re-run; multi-task — using a SuperBasic compiler.

Instructions on how to operate `INSTALL_bas` can be found in the QL

special features are included in this driver. The first is of more general application — the translation (see `TRANS 2`) of the `<<` (`CTRL&SHIFT X`) symbol into `ESC`. It enables control codes to be inserted in your Quill documents on par with other word processors. Thus typing `<<4` — on a line of its own, or it will mess up your margins — will cause the italic character set on an Epson printer to be used.

The `↑` and `↓` translation into `ESC 9` and `8` — Epson control codes for paper-out sensor disable/enable respectively — have a more esoteric

gram may be increased manifold utilising this method. Say that in a program you wish to make a selection of fields from a database. You have, of course, catered for your less bizarre needs in the usual manner with statements like:

```
input 'Input search field number ':n
input "Input search string ': string$
search fieldv(n) = string$
```

This may not always be sufficient. How about this, using the GAZET_dbf file supplied with your QL:

```
proc sirch
rem *** If all else fails ***
input 'Input statements ':scrit$
rem *** eg "search continent$ =
'AFRICA' and pop>20"
kill 'mdv1_printer_dat' backup
'mdv1_APRG_dat' as
'mdv1_printer_dat'
spoolon 'ram1_proc_prg'
lprint 'proc special': rem *** or lprint
'(special' See TRANS1
lprint scrit$
lprint 'endproc':rem *** or lprint '}'
See TRANS2
spooloff
merge 'ram_proc'
error special
if errnum(): print "Error in
statement":sirch: endif
endproc
```

This can all be done, then, without leaving the shell program. As an example, AFIL is a different kettle of fish. A foretaste of ways of using the drivers has already been given. To start with the PREAMBLE entry, the first two lines printed in the file will look like this:

```
"1$"
```

due to the given preamble setting. The EOL code — End Of Line — prints the following to the file:

```
"
```

If we take those codes together, add some text and finish with the POSTAMBLE settings, a Quill document which looks like this:

```
Wait till you see "MAILMERGE"
It's really useful
would be printed to file looking like this:
"1$"
"Wait till you see 'MAILMERGE' "
"It's really useful"
```

If you remember reading the full discussion on import and export in the QL Manual Information section, you will see that this is the format of a single variable (1\$) export file. You may add as many lines as you please but they are all elements of the variable 1\$. If you need to add large amounts of edited text into an ARCHIVE file, this is one way of doing it.

Back to GAZET_dbf. Perhaps you wish to have some notes on some of

the countries which could be referred to by keywords or just simple string searches. You could create a new file with a large number of fields but this, more often than not, imposes unnecessary complications and restrictions on this particular type of data. On some countries you may wish to have a large amount of notes, perhaps adding to them every time you return from a visit there; on others you may not wish to have any and thus, I find, a single-line text file suits the purpose best. The gazette file and the text file could have the following structures:

GAZET dbf	GAZTEXT dbf
logical name : g	logical name : t
country\$: NORWAY	line : 0
continent\$: EUROPE	text\$:
capital\$: OSLO	ref : 102
language\$: NORWEGIAN	
currency\$: KRONE	
pop : 4	
gdp : 5288	
area : 324	
ref : 102	

The umbilical cord between the two files is ref, which has to be added to the gazette file. This may be achieved easily, by exporting GAZET_dbf to file and then importing the file into Abacus by column. On row one of the column after area, add the text ref. Then, on the next row enter the formula col = row() - 2 from 2 to 152. That gives each record a specific reference number. Export the file by column again and import it into ARCHIVE.

Type your text using Quill as you would type any other document and edit it to your heart's desire. The following points may be worth considering.

Left margins are translated by Quill into spaces, so unless you do not mind storing a few K of empty spaces, do not use left margins. Do not use a right margin greater than 79 or it will ruin your display.

Once the text is ready, back-up your AFIL_dat file as printer_dat.

Print the document to file. — e.g., TEMP_exp
Import this file into Archive as, say, TEMP_dbf:

```
import "temp" as "TEMP" logical 'x'
Open the gazette file and find the name of the country to which you wish to attach the text so as to discover its ref number:
```

```
open "GAZET" logical "g"
search country$ = 'NORWAY':rem ***
for example
let reference = ref
```

You now have ref number of Norway in the variable reference.

Mail

This final driver is also the furthest removed utilisation of the printer drivers from their intended purpose. It turns the combination Quill/Archive

into a powerful and intelligent mail-merge duo. It may also be used for other purposes than mailmerge. The facilities shown are the bare basics. No doubt more powerful and elegant solutions can be found and other features may easily be added. The principle is simple enough, yet some explanation may still be necessary.

The idea is to use Quill to type and edit a letter to satisfaction, using squiggly brackets { } and field names to insert variables into the document, e.g.:

```
Dear {title$} {sname$},
```

This document must be printed to file using the MAIL_dat driver as printer_dat. The foregoing line will then be translated into:

```
lprint "Dear " + titles$ + "
" + sname$ + ,"
```

because each EOL code is translated into

```
"
```

```
lprint"
```

and each { is translated into

```
" +
```

while each } is translated into

```
+ "
```

It is important to note that the mail-merge document must start with a , or whatever other symbol you choose. See TRANS1 as the driver data is limited to a maximum of 10 items per line. Thus the whole PREAMBLE code is taken up with the Archive initialising procedure, proc MER, and there would be no quotes or anything to justify the EOPL closing quote.

So this symbol must be on the first line above any header and, unless you specifically wish it to be otherwise, alone on the line. As you see, ~ translates as lprint" for no other reason than as an excuse for the inevitable closing quotes.

Advanced facilities

There is no reason why other Archive keywords should not be utilised. That is the meaning of TRANS 4 to 5. The square brackets [and] neutralise the inevitability of the lprint" statements. The [translates as ";;" and the] as :let d\$ = " (dummy\$) leaving a hole in the document for keywords thus:

```
lprint:";;" one statement : another :let d$ = ""
```

```
lprint" etc . . ."
```

A number of spaces constituting your margin or indent will be inserted automatically in the lprint statements and therefore they will have to be taken into consideration. Alternatively, program lines in the document could be written with the indent set to zero.

Obviously it is not possible here to provide further documentation. The best way is to experiment and discover what you require.

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FORTH

Charles Gerrard ties the loose ends in our Forth features and looks at the relative merits of two implementations.

With our brief foray into the Forth language in the last three months we hope we have managed to whet your appetite. In the last article we look at a few remaining features of the language and consider the relative merits of the two major Forth implementations available for the QL.

There are two problems which many newcomers to the language have. The first is understanding the language, which even hardened users will admit is a little unusual at first. To those people, all I can suggest is that they stay with it. Even Reverse Polish Notation makes sense once you are used to it.

The second major problem is trying to make use of the stack data structure, when conventionally having access to as many arrays and variables as you could possibly need. We saw in the last article how an array could easily be added to the language. Additionally most commercial products include strings. Lists are another easy data structure to add, and so on.

A word of warning. Decide carefully, from the beginning, what data structures you will use. It is very tempting to type-in a standard array definition, say, for a single-dimensional, single-precision array. You then start writing the remainder of the program and find that you also need a two-dimensional byte array, a double-precision array, and so on.

You then face the dilemma of deciding whether to fit those different instances into the word you have already defined; or is it worth creating a new word definition, just for this particular instance? You soon either find that your program is too long to be readable, or too garbled to be readable. In these respects, Forth is very much like Pascal, encouraging you to plan and build your data structure before trying to cope with the coding, to finish with a much neater product.

Do not worry too much initially about the over-use of variables. That is a common tendency and you will find that their use decreases automatically as you become more familiar with the language.

Although we have looked at a few examples of Forth code, we have said little, as yet, of how Forth code is entered and compiled. Once within the Forth system, you are in a completely interactive environment. Calculations may be typed and new word definitions may be entered — over several lines. If at any time an error occurs, the system will tell you of it and you can correct it immediately. That approach,



as we have been using so far, though far superior to many systems, is still analogous to single-line command input in SuperBasic.

The Forth implementation on your QL will have an EDIT command of



some form. It will take you to an editor which manipulates blocks of information. Traditionally they are 1KB blocks, each of which is placed on a single screen containing 1,024 characters — 16 lines of 64 characters. Usually with the use of a full-screen editor, standard word definitions may be typed on to those screens, then saved to Microdrive in the form of a Screen File. Once written, screens may be loaded and compiled using the LOAD command, with the screen number on the stack.

That form of layout is very different from the more conventional form of program writing and storage; in other words the program. It is, however, a logical method of storage for a language based on word definitions, rather than complete, segregated programs. It is thought to be good practice when writing SuperBasic programs to split the program into a number of small tasks, with a separate procedure or function for each one, allowing each segment of the program to be tested individually.

Additionally, it permits standard procedures to be used in a variety of programs. When doing this, you probably find yourself merging programs, then deleting vast areas of the original programs which are no longer need-



FORTH

ed. The Forth language is based on this segmented philosophy, so it makes sense to store word definitions in separate areas.

Forth 83

We will now look at two QL Forth packages. The two major Forth implementations available for the QL are from Computer One and Digital Precision. Both are versions of the Forth-83 standard language, with applicable extensions to make use of QL-specific features.

Computer One Forth is supplied on a single Microdrive, with a 100-page A5 manual. With only a brief explanation of Forth, the manual consists mainly of system word lists and details of the more esoteric features of the implementation. The beginner will be perplexed if trying to use the manual, which is really designed only for reference purposes. So there will probably

you amused for minutes.

The Digital Precision SuperForth package is supplied in an A4 box, with a loose-leaf manual — to be inserted into the QL User Guide — and a single Microdrive. Again it will need copying but there is no protection. The manual is well-written, with sufficient details for the beginner to learn the fundamentals of the language, without the need for a separate book. The manual also contains an index, which is noticeably lacking in the Computer One documentation.

The cartridge contains the standard files and screen blocks, plus two examples. The main additional feature in the package is a complete source listing of the classic *Reversi* game, which is also listed in full in the manual. It will provide not only good examples of the Forth language but Digital Precision claims that it plays an excellent game, outperforming all other available programs for the QL.

In both implementations, program writing and editing is done by means of a full-screen editor, operating on standard Forth screen files. The default screen with SuperForth shows only 56 horizontal characters — the remaining characters are made visible by scroll-

files, containing one or more screens. Computer One Forth saves named multi-screen files automatically.

One major advantage with the Computer One editor is the ability to obtain



be the added expense of a Forth manual.

The cartridge, of which you will have to make a copy — it is not protected — contains the BOOT and CLONE files, the Forth image, a number of overlays, and a Forth screen file. The latter file contains source code for a few useful utilities, including an assembler, a de-compiler, and a demonstration arcade game, *Nibblers*, which is likely to keep

ing the screen — which may appeal to TV owners. The full 64 characters can be made visible by altering the display parameters, as explained in the manual.

Though both systems use the standard Block Screen layout, the default storage methods are different. Whereas SuperForth saves each screen as a separate block — eg, BLK123 — with an optional method of creating named

an index of screens in a screen file, by using option 'I'. It will print the first 14 characters of the first line of each screen block, where the screen title is held traditionally. If you are using the Digital Precision package, you will

Figure 1.

Typical Forth Bubble Sort routine sorting double-precision values.

```
: ARRAY CREATE 2 * ALLOT
  DOES> SWAP 2 * + ;
100 ARRAY PRESORT
[Set up some random values in
PRESORT]
: CHECK PRESORT @ ROT
  DUP
  PRESORT @ ROT OVER
  OVER >
  IF ROT PRESORT! SWAP
  PRESORT ! O S !
  ELSE 2DROP 2DROP
  ENDIF;
: BUBBLE BEGIN DUP DUP
  1+ DUP CHECK
  1+ OVER OVER =
  UNTIL DROP DROP;
: SORT BEGIN 1 S !
  OVER OVER BUBBLE S !
  UNTIL 2DROP ;
```

have to remember which screen you need.

For speed, there is very little to choose between the two packages. They were tested on a few Basic arithmetic problems, simple looping, and

so on. SuperForth was marginally faster than the Computer One product for most applications. A typical test program was the standard Bubble Sort routine — figure one. Both versions



were much faster than the SuperBasic equivalent, with the SuperForth version being four per cent faster than the Computer One version. They are both fast implementations of the language and, unless speed is particularly critical, the slight advantage of SuperForth are negligible.

In addition to the required set words of the Forth-83 standard, both implementations of the language include a number of extension words, dealing with double-precision arithmetic, string manipulation — SuperForth version 2.0 onwards and so on. Because of the nature of the language, any missing features are added easily.

Both implementations allow multi-tasking of SuperForth definitions and both versions contain a number of job and task words for dealing with this. They both also allow for the creation of stand-alone, machine code application programs, for use without the Forth operating system. Computer One will freely allow the marketing of such final products, though it insists that an acknowledgment and a copy of the copyright notice in the manual be included.

Extensions

Naturally, QL owners will be particularly interested in being able to access such QL-specific features as graphics, windows, sound, printer commands, and so on. Both packages contain

extensions to Forth-83 to accommodate those features, including channel input/output, time and date, and graphics handling. Computer One Forth has the additional advantage of containing a set of words corresponding to assembler mnemonics. Consequently, with the appropriate machine knowledge, any Qdos traps not already implemented in Forth could be added easily.

If you have been following this series, you are probably a beginner so far as the Forth language is concerned. If that is the case, Digital Precision SuperForth provides all the necessary features and is much easier to use for the uninitiated. In addition, it is cheaper, has a better manual for the beginner, and is marginally faster than its rival.

Versatility

Alternatively, experienced users may prefer Computer One Forth, which has a more versatile Qdos interface, assembler word set and supplied source code. More experienced users may also be interested in the QL Forth Development Package, available from Microprocessor Engineering, the writer

QL micros. Nevertheless, there are many limitations with the language. For instance, converting programs written in SuperBasic to run on other microcomputers is particularly difficult. Though many other micros run versions of Basic, they are rarely as comprehensive as SuperBasic, which is more equivalent to Pascal than the traditional Basic syntax.

Speed King

The major problem which most people find with SuperBasic is its speed. Even with a powerful processor such as the 68008, programs written in interpreted SuperBasic run very slowly. The answer lies in choosing a compiled language, where the code is written at high level but run in machine code. The problem with most compiled languages is that they are not interactive, making them much more difficult to use, and errors much more difficult to correct quickly.

Forth, however, is an interactive compiled language, running at typically 30 times the speed of SuperBasic. Forth word definitions are compiled



of this implementation.

It is remarkably easy to become settled with a particular language. The large majority of QL owners will learn SuperBasic and never look at any of the alternatives available. SuperBasic has a number of advantages. It is easy to learn and write, corresponding very closely to English and standard mathematical notation. It is interactive, making it easy to use and correct mistakes and it is universal among all

separately, showing errors immediately and allowing the programmer to correct them as the program is written.

The main handicap with Forth is learning the language initially. It is written very differently from other languages and Forth programs are notoriously difficult to read and understand. Once you have achieved some competence with Forth, however, you will never consider Basic again.

P + R = G S

If you have a program that is worthy of consideration, send it to 'The Progs', Sinclair QL World, 79-80 Petty France, London SW1H 9ED. We pay for everything published at the usual page rates — £80 per thousand words.

Starport 2001 Karl Jeffery

Does anybody remember *Galaxians*? If you do, you will need no prompting to type-in the November Program of the Month. Karl Jeffery has produced a version which incorporates all the speed and excitement of the original.

Type-in program two, save it, then run it. That will generate the program and graphics code on the cartridge. Then type-in program one and save it on the same cartridge. To play the game LRUN program one.

Program 1.

```

10 REMark
20 REMark STARPORT 2001
30 REMark
40 REMark Written APR 86 By Karl Jeffery
50 REMark
100 WINDOW#1,512,256,0,0
110 MODE 8
120 prog=RESPR(3000):a5=RESPR(3800)
130 LBYTES mdv1_code,prog:LBYTES mdvq_grap,a5+200
140 POKE a5+55,0:POKE W a5+14,0
150 PAPER 0:CLS:CSIZE 3,1:OVER 1
160 FOR I=1 TO 7
170 CURSOR I*8+5,I*8+40:IN-aL80 PRINT "S T A R P
   O R T  2 0 0 1"
190 NEXT I
200 CSIZE 0,0:AT 2013:INK 5:PAPER 1:OVER 0
205 PjRNT "   PRESS ENTER TO START THE GAME   "
210 IF INKEY#<>CHR$(10) THEN GO \O 210
220 CALL prog,a5
230 FOR I=1 TO 100:^EXT I:BEEP
240 GO TO 150

```

Program 2.

```

100 REMark
110 REMark GENERATE PROGRAM AND GRAPHICS DATA
120 REMark
130 REMark PROGRAM 2
140 REMark
150 ad=RESPR(3000)
160 generate "MDV1_GRAP",400
170 generate "MDV1_CODE",850
180 DEFINE PROCEDURE generate(f$,li)
190 RESTORE li
200 p=ad
210 REPEAT loop
220 READ a$,c
230 IF a$="END" THEN EXIT loop
240 t=0
250 FOR i=1 TO 31 STEP 2
260 x=hex(a$(i))*16+hex(a$(i+1)):t=t+x
270 POKE p,x:p=p+1
280 NEXT i
290 IF t<>c THEN PRINT "Error in line ";li:STOP
300 li=li+10
310 END REPEAT loop
320 SBYTES f$,ad,p-ad
330 END DEFINE
340 DEFINE FuNction hex(x$)
350 IF x$<"A" THEN RETURN x$:ELSE RETURN CODE(x$)-55
360 END DEFINE
370 REMark
380 REMark Graphics data
390 REMark
400 DATA "000000000000000000000000000000",0
410 DATA "000000000000000000000000000000",0

```

```

420 DATA "000000000000000000000000000000",0
430 DATA "000000000000000000000000000000",0
440 DATA "000000000000000000000000000000",32
450 DATA "0000A800000000002AA0000000002AA00",512
460 DATA "000000005554000000005554000000005",313
470 DATA "55400000000055540000000055540028A",597
480 DATA "0007DF400A8A800FCFC00A02800F03C0",1334
490 DATA "200008200008080020080020000000002",162
500 DATA "AA800282800BEBE000820002EB800000",1523
510 DATA "0002AA80000000002AA800828200ABEA0",1040
520 DATA "20000822AA8820820820820808080808",752
530 DATA "08080000000000000000000000002800",56
540 DATA "28280028000000002AA800082000AEBAB",955
550 DATA "00820002EB8000820002EB8000000002",992
560 DATA "AA800828200ABEA020000822AA882082",1280
570 DATA "082082082020202020200000800000080",626
580 DATA "000000000000000000000000A0A000A",180
590 DATA "00A0208208208208208002800002800000",580
600 DATA "0002AA80000820002EB800082000AEBAB",1330
610 DATA "0000000AAAA02008002AA8002008002",902
620 DATA "00800800200800200000000000000000",208
630 DATA "000000002000082000080A82A00A82A0",608
640 DATA "002800002800000000002AA8000820002",512
650 DATA "EB800082000AEBAB00000000AAAA0200",1240
660 DATA "8002AA80020080020080020080020080",948
670 DATA "00000000000000000000000008280A041",483
680 DATA "40508822084411048822084411048822",848
690 DATA "08441104882208441104882208441104",631
700 DATA "8822084411048280A041405000000000",894
710 DATA "00000000000000000000000000000000",0
720 DATA "00000000000000000000000000000000",237
730 DATA "0000000033033000000000330330000000",228
740 DATA "03330000000000000000000000000000",270
750 DATA "003F0C0C000000000000000000000000",87
760 DATA "0000000000000000000000000000A820200",232
770 DATA "000080888880000000008088800000A088",1096
780 DATA "8800000000888880000000008888800000",696
790 DATA "88888800000020202000000000000000",504
800 DATA "00000000000000000000FF0000014E444F",481
810 DATA "END",2
820 REMark
830 REMark Program code
840 REMark
850 DATA "2A411B7C00C800001B7C000100381B7C",817
860 DATA "00050036426D000C422D00394238003E",598
870 DATA "1B7C0005003A3B7C000100143E7C0001",602
880 DATA "00164A2D0037661443FA0656347800C0",1099
890 DATA "4E922B4800081B7C00010037206D0000",703
900 DATA "720274017600700C4E4343FA06403478",1179
910 DATA "00D04E926100038C1B7C00640001422D",1035
920 DATA "00321B7C00C2000247ED006449FA05F6",1379
930 DATA "303C000E321CD23C000A36C136FCFE00",1287
940 DATA "51C8FFF2303C001047ED00A436FC0000",1680
950 DATA "51C8FFFA426D0018422D003C1B7C000E",1321
960 DATA "003B1B7C000100351B7C000A00346100",574
970 DATA "047247FA04F070114E413C2D00000801",1069
980 DATA "000367024E7508010004670254060801",520
990 DATA "000167025506610003201B4600017001",540
1000 DATA "610003343A2D0002610003AE142D0033",647
1010 DATA "1B410033080100066716080200066610",417
1020 DATA "701147FA04F84E411B7C000100326018",1167
1030 DATA "4A2D003267185B2D00020C2D000A0002",503
1040 DATA "62121B7C000000321B7C00C200025A06",760
1050 DATA "1B4600033A2D000261000390424749ED",896
1060 DATA "00640C2C00FE000267340C2C00D20002",835
1070 DATA "6578671E532C000242400C2C00D20002",881
1080 DATA "6704102C00033C2C0000610002AA6000",639
1090 DATA "019E303C00C851C8FFFE600001923C2C",1604
1100 DATA "0000DC2D0035194600017002D02D0039",838
1110 DATA "6100028461000366B26D0014640000B6",1022
1120 DATA "2F07701147FA04664E412E1F39460000",957
1130 DATA "70056100034CC2FC000519410002197C",985

```

```

1140 DATA "0001000370006100024E4240102C0002",485
1150 DATA "47FA03DAD6C0E348D6C0532C0003660E",1899
1160 DATA "522C000247EB0003196B000200031C2C",646
1170 DATA "0000DC2B0000E14E1C2C0001DC2B0001",903
1180 DATA "610001F6394600007004D02D00396100",994
1190 DATA "02060C2C00BE0000653A162D00010603",490
1200 DATA "000BB606630A04030016B6066500011C",655
1210 DATA "4280610001E23207E30945FA0428D4C1",1579
1220 DATA "3412D42D003439420000197C00FE0002",907
1230 DATA "600000BC342D0002B42C000163000088",843
1240 DATA "0402000BB42C0001627CE04AB42C0000",986
1250 DATA "63740402000BB42C0000626A2F077011",843
1260 DATA "47FA039A4E412E1F70060C2C00FE0002",1128
1270 DATA "670C70036100026A3001060000063C2C",600
1280 DATA "000019400003197C00FA000261000168",695
1290 DATA "04000006E3485240D16D000C61000264",984
1300 DATA "3A2D0002610001D21B7C000000321B7C",765
1310 DATA "00C20002532D003B660C1B7C0001003C",709
1320 DATA "1B7C005A003D61000214B26D0016641E",860
1330 DATA "45ED00A4362D0018D4C34A1266100646",1286
1340 DATA "0A0634B654430243001F3B43001849EC",912
1350 DATA "000452070C07000E6600FE283E3C0010",660
1360 DATA "45ED00A44A12673E3A126100016C5E12",1121
1370 DATA "0C1200C8652A182D0001B82A0001641C",798
1380 DATA "0604000BB82A00016512701147FA02DE",1041
1390 DATA "4E41532D00366600FCFC4E7542526006",1376
1400 DATA "3A126100016645EA000251CFFFB8142D",1373
1410 DATA "0034D42D00350C02008267060C02000A",639
1420 DATA "6604442D00351B420034532D003A660C",717
1430 DATA "086D000000391B7C0005003A4A2D003C",567
1440 DATA "662847FA02B870114E41080100016600",1033
1450 DATA "FD0247FA0288086D0000003E670447FA",1321
1460 DATA "028C70114E416000FCEA532D003D6600",1287
1470 DATA "FCE2526D0014526D0016522D00386000",1181
1480 DATA "FC88207C0002000303C1AFE20FC0000",1218
1490 DATA "000051C8FFF84E7542800C0600E66308",1528
1500 DATA "61141C3C000B4E750C06000A64066106",648
1510 DATA "1C3C00E54E753F063F00C0FC004841ED",1462
1520 DATA "00C8D0C03006E24E020600FE08C60011",1443
1530 DATA "224602400003E3083C3CFF000E07ECCBC",1525
1540 DATA "000000FF1A060A05000FF243C00000008",661
1550 DATA "9400303C000B26181803420348443818",645
1560 DATA "E18CE5BBCD118719E5BBCD118919E19B",2344
1570 DATA "12C3E19C12C4E19B12C3E19C12C4E19B",2376
1580 DATA "CB118719E19CCB118919D2FC007851C8",2006
1590 DATA "FFC6301F3C1F48753005E24D020500FE",1435
1600 DATA "08C50011224502400003E3081A3C007F",842
1610 DATA "143C003FE02DE02A303C0004CB19C511",1232
1620 DATA "D2FC007F51C8FFF64E753005E24D0205",1929
1630 DATA "0FE08C50011224502400003E3081A3C",969
1640 DATA "0080143C00C0E02DE02A303C00048B19",1211
1650 DATA "8511D2FC007F51C8FFF64E75303C0384",1959
1660 DATA "222D0004C2C1242D0010B5812B410010",1001
1670 DATA "028100FFF0E089D3AD0004C2C04841",1913
1680 DATA "4E75343C0001323C00076152322D000C",711
1690 DATA "B26D000E65043B41000E6150615A343C",1020
1700 DATA "0001323C001C61364241122D00363478",710
1710 DATA "00CE4E92343C0002323C00076120322D",885
1720 DATA "000E61286132343C0002323C001C610E",661
1730 DATA "4241122D0038347800CE4E924E75363C",1161
1740 DATA "0000206D000870104E434E75206D0008",766
1750 DATA "347800CE4E924E7543FA0130347800D0",1543
1760 DATA "4E924E750901000000001020000C801",633
1770 DATA "002800003C01FF1401013201FFC80101",886
1780 DATA "3200003201002800003202FFC801FF28",944
1790 DATA "01003C00FF0A00011902FFC801003201",861
1800 DATA "FF0F00011E01FF0F0100C80201500000",856
1810 DATA "320001280000190100C800000A080000",335
1820 DATA "AAAA01489001302A210001000A080000",700
1830 DATA "AAAA287A58020C49117101000A080000",826
1840 DATA "AAAA7B8B6400BB0B800001000A080000",1044
1850 DATA "AAAA538B6400546FF00001000A080000",1116
1860 DATA "AAAA2BBD6400000100801000A080000",715
1870 DATA "AAAA2BBD640000020800100010000000",834
1880 DATA "00000200050005190532054B0564140C",309
1890 DATA "1425143E145723192332234B3225323E",700
1900 DATA "0201000401C20028001E00D8003B0A0A",567
1910 DATA "0A0A53434F52453A20202020202020",714
1920 DATA "202020202020204C495645533A0A2042",777
1930 DATA "4553543A2020202020202020202020",678
1940 DATA "2020204C4556454C3A00000230300000",628
1950 DATA "0000019000000000FFFFFFFFFF00000190",1310
1960 DATA "0000010B00000837B000018E00008373",655
1970 DATA "END",0

```

Britain John Hartrey

Our call for educational software has not gone unheeded. Britain is a geography quiz. A map of the country is drawn and eight cities pinpointed. You must make an educated guess and name each of the eight cities from a list of 25.

Each time the program is run, different cities are targeted. If you think it sounds easy, try it. The Sinclair QL World team managed a respectable seven out of eight—after several attempts.

```

10 REMark *****
20 REMark *** BRITAIN ***
30 REMark ** copyright **
40 REMark * John Hartrey*
50 REMark *** 1986 ****
60 REMark *****
70 DIM q(25),z(8):score=0
80 MODE 4
90 set_up
100 britain
110 towns_list
120 input_chart
130 choose
140 input
150 compare
160 answers
170 finish
180 STOP
190 :
200 DEFine PROCEDURE set_up
210 WINDOW#2,240,230,20,10:SCALE#2,900,0,0
220 WINDOW#1,512,256,0,0:PAPER#1,0:CLS#1
230 INK#2,4:PAPER#2,7:BORDER#2,4,2
240 CLS#2
250 WINDOW#0,212,154,270,15:BORDER#0,2,7:PAPER#0,0:CLS#0
260 OPEN#3,scr_212x55a270x183:BORDER#3,2,4:INK#3,7:PAPER#3,2:CLS#3
270 WINDOW#1,212,14,270,169:BORDER#1,2,2:PAPER#1,0:INK#1,4:CLS#1
280 CSIZE#0,2,1:INK#0,2:CURSOR#0,6,0:UNDER#0,1:PRINT#0,"CHOICE OF TOWNS":CSIZE#0,0,0:UNDER#0,0:INK#0,7
290 END DEFine
300 :
310 DEFine PROCEDURE britain
320 LINE#2,106,32
330 RESTORE 2000
340 FOR x=1 TO 164
350 READ a,b
360 LINE#2 TO (a*1.75)-230,(b*1.5)-550
370 BEEP 10,RND(255)
380 NEXT x
390 END DEFine britain
400 :
410 DEFine PROCEDURE towns_list
420 RESTORE 2070
430 FOR x=1 TO 13
440 READ a$,b,c
450 AT#0,(x+1),0:PRINT#0,CHR$(x+64);" = ";a$
460 NEXT x
470 FOR x=1 TO 12
480 READ a$,b,c
490 AT#0,(x+1),16:PRINT#0,CHR$(x+77);" = ";a$
500 NEXT x
510 END DEFine towns_list
520 :
530 DEFine PROCEDURE input_chart
540 UNDER#3,1:AT#3,0,10:PRINT#3,"YOUR CHOICE":UNDE R#3,0
550 FOR x=1 TO 4
560 AT#3,x,0:PRINT#3,x;"=":AT#3,x,17:PRINT#3,(x+4):"="
570 NEXT x
580 END DEFine input_chart

```



```

590 :
600 DEFine PROCedure choose
610 RANDOMISE
620 FOR x=1 TO 8
630 p=RND(1 TO 25):IF q(p)>0:GO TO 630
640 q(p)=x
650 RESTORE 2070
660 IF p=1:GO TO 680
670 FOR y=1 TO (p-1):READ a$,b,c:NEXT y
680 READ a$,b,c
690 b=(b*1.75)-230:c=(c*1.5)-550
700 OVER#2,1:INK#2,0:CORSOR#2,(b/3.1)-6,(ABS(c-900
)/4)-10:PRINT#2,x
710 POINT#2,b,c+4:POINT#2,b+3.2,c+4:POINT#2,b,c:PO
INT#2,b+3.2,c
720 NEXT x
730 END DEFine choose
740 :
750 DEFine PROCedure iinput
760 CLS:PRINT#1,"Please enter choice :";
770 a=CODE(INKEY#(1,-1)):BEEP 100,50+a:IF a<49 OR
a>56:GO TO 770
780 PRINT CHR$(a);" = ";
790 b=CODE(INKEY#(1,-1)):BEEP 100,50+b
800 IF (b>64 AND b<90) OR (b>96 AND b<122):GO TO 8
10:ELSE :GO TO 790
810 IF (b>96 AND b<122):b=b-32
820 PRINT#1,CHR$(b);
830 pprint
840 sstore
850 eend
860 IF flag=0:GO TO 140
870 END DEFine iinput
880 :
890 DEFine PROCedure pprint
900 RESTORE 2070
910 FOR x=1 TO (b-64):READ a$,k,l:NEXT x
920 IF a-49<4 THEN AT#3,a-48,2:PRINT#3,FILL$(" ",1
3):AT#3,a-48,2:PRINT#3,a$;ELSE AT#3,a-52,19:PRINT
#3,FILL$(" ",13):AT#3,a-52,19:PRINT#3,a$;
930 END DEFine pprint
940 :
950 DEFine PROCedure eend
960 CLS#1:PRINT#1,"Have you finished ";
970 c=CODE(INKEY#(1,-1))
980 IF c=89 OR c=121:flag=1:END DEFine
990 IF c=78 OR c=110:flag=0:END DEFine :ELSE :GO T
O 970
1000 :
1010 DEFine PROCedure sstore
1020 d=a-48:e=b-64
1030 z(d)=e
1040 END DEFine sstore
1050 :
1060 DEFine PROCedure compare
1070 FOR x=1 TO 8
1080 IF q(z(x))=x THEN score=score+1
1090 NEXT x
1100 END DEFine compare
1110 :
1120 DEFine PROCedure answers
1130 CLS#1:CLS#0:CSIZE#0,2,1:UNDER#0,1:INK#0,2:AT#
0,0,4:PRINT#0,"ANSWERS":CSIZE#0,0,0:UNDER#0,0:INK#
0,7
1140 FOR x=1 TO 8
1150 RESTORE 2070:a=0
1160 REPEAT loop
1170 a=a+1
1180 IF q(a)=x:EXIT loop
1190 END REPEAT loop
1200 FOR y=1 TO a:READ a$,k,l:NEXT y
1210 AT#0,x+1,4:PRINT#0,x;" = ";a$
1220 NEXT x
1230 AT#0,11,9:PRINT#0,"Your score is ";score
1240 AT#0,13,1:PRINT#0,"Do you want another go ? (
y/n)"
1250 a=CODE(INKEY#(-1))
1260 IF a=89 OR a=121:PRINT#0,"          Yes":FOR x=
1 TO 500:NEXT x:RUN
1270 IF a=78 OR a=110:PRINT#0,"          No":FOR x=1
TO 500:NEXT x:END DEFine
1280 GO TO 1250
1290 :
1300 DEFine PROCedure finish
1310 WINDOW#1,512,256,0,0:CLS#1
1320 CLOSE#3:WINDOW#0,448,30,32,216:WINDOW#1,448,2
00,32,16:WINDOW#2,448,200,32,16:PAPER#0,0:PAPER#1,

```

```

1:PAPER#2,2:INK#0,7:INK#1,7:INK#2,7:OVER#2,0
1330 CLS#0:CLS#1:PRINT#1,"BYE ....."
1340 END DEFine finish
1350 :
2000 DATA 204,391,210,384,216,390,216,396,233,400,
237,406,266,402,270,396,279,396,290,420,303,426,32
6,418,347,418,347,414,354,426,376,423,388,430,392,
425,422,429,437,425,460,436,466,436,483,448,486,46
8
2010 DATA 468,465,457,473,466,483,465,492,474,490,
480,495,480,501,492,514,499,530,498,553,498,588,45
0,570,447,560,441,557,433,567,444,576,447,582,438,
604,432,607,435,615,425,636,429,645
2020 DATA 420,650,405,672,387,681,381,704,376,706,
372,740,360,749,354,762,342,769,326,769,324,764,31
8,764,312,770,324,780,332,780,339,786,330,792,334,
799,342,804,360,834,361,846,372,864,366,878
2030 DATA 339,882,303,878,288,875,301,891,294,894,
297,900,326,924,330,940,318,945,315,939,270,942,26
3,947,255,924,244,912,249,903,231,897,234,888,226,
879,230,855,224,842,222,828,210,828,207,824
2040 DATA 216,822,220,810,237,813,231,794,228,780,
223,774,225,762,213,735,225,735,230,747,237,741,24
2,741,245,753,249,747,258,750,262,744,252,738,235,
710,246,684,246,700,264,690,267,698,285,696
2050 DATA 294,699,297,705,307,708,292,678,306,643,
309,651,321,637,324,650,318,636,312,636,309,627,32
2,624,310,618,306,606,312,591,297,602,267,597,258,
606,249,600,258,588,240,567,252,564,255,570,264,57
3
2060 DATA 270,548,264,534,228,516,215,507,222,504,
218,498,228,486,252,498,255,492,253,483,276,486,28
5,473,294,471,306,480,330,486,314,476,306,462,258,
465,252,450,244,450,240,436,222,420,210,402,194,39
8,192,388
2070 DATA "ABERDEEN",357,845,"BIRMINGHAM",369,519,
"BLACKPOOL",315,633,"BOURNEMOUTH",360,428,"BRISTOL
",324,471,"CARDIFF",297,483,"CHESTER",313,582,"COV
ENTRY",388,513,"EDINBURGH",324,759,"EXETER",291,42
9
2080 DATA "GLASGOW",282,750,"IPSWICH",480,510,"LEE
DS",390,630,"LIVERPOOL",312,603,"LONDON",450,480,"
MANCHESTER",354,615,"MIDDLESBROUGH",393,672,"NEWCA
STLE",375,693,"NORWICH",486,537,"NOTTINGHAM",393,5
61
2090 DATA "OXFORD",395,486,"PLYMOUTH",262,408,"SHE
FFIELD",385,603,"SOUTHAMPTON",384,432,"SWANSEA",27
3,489

```

Boot 128 Steve Sutton

Often the smallest routines are the most useful. This little gem causes an expanded QL to think it has only the standard 128K bytes of memory. That means there is now no need to remove your RAM card when you want to use software which will not run on an expanded machine, thus saving a good deal of bother and potentially disastrous pin-wear. JS and MG ROM owners should substitute 460 for 458 in line 100.

```

1 REMark BOOT_128 by Steve Sutton
2 REMark
3 REMark This routine will cause an expanded
4 REMark QL to re-boot as though it only has
5 REMark 128 Kbytes installed.
10 start=RESPR(38)
20 RESTORE
30 FOR i=0 TO 36 STEP 2
40 READ j
50 POKE_W start+i,j
60 END FOR i
70 CALL start
80 DATA 20032,18172,9984,10876,4,0
90 DATA 16889,2,0,8252,0,-31617
100 DATA 16920,20936,-4,8316,0,458
110 DATA 20112

```


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MICRODRIVE EXCHANGE

PROGRAM OF THE MONTH

The games freaks have never had it so good. The quality of games software submitted by readers is improving every month. So it goes almost without saying that our program of the month for November, *Starport 2001*, by Karl Jeffery, is a fast-action arcade game with superb graphics and sound.

Starport 2001 is an authentic-looking version of the classic coin-operated game *Galaxians*. Using your cursor key or joystick-controlled laser base you must defend the earth against squadrons of screaming

aliens. You have five bases with which to destroy as many waves of attacking Galaxians as is humanly possible.

Update

In addition to the Program of the month, Microdrive Exchange features two new programs. Regular readers will need no introduction to the programming talents of Marcus Jeffery. He is a keen strategy games player and programmer and is a regular writer for *Sinclair QL World* and other magazines.

QL Go appeared in the April and May issues of *Sinclair QL World* with an accompanying article explaining the rules of the game and the principles

involved in its programming. Although the game made a tough opponent, because of the complexity of the evaluation procedures, it was very slow.

We have overcome that problem by compiling the program with the Digital Precision *Supercharge* and there is now nothing to touch it. *QL Go* is essential for every serious strategy games player.

Teachers, parents and anyone who likes to test their general knowledge will find *Britain*, by J P Hartrey, both entertaining and educational. Utilising a graphic representation of the country, the user is tested on the location of 25 cities.

The program is written in

SuperBasic and would provide a useful foundation for those wishing to expand its capabilities as a geography quiz program.

A number of people have omitted to include their addresses on the Microdrive Exchange form and it has not been possible to despatch their orders.

If you have ordered programs from Microdrive Exchange and have not received them within 28 days, please write to *Sinclair QL World* stating your name and address, which programs you requested, the total amount enclosed and the method of payment. Alternatively you can telephone System Design on 01-731 7948.

ORDER FORM					
Author	Language	Program Name	Price	Issue	Size
Giles Todd	(B)	DIY Assembler	£5	Mar/Jun	120
<i>Converts Assembler source into m/c object code</i>					
Richard Cross	(AO)	Mini Monitor	£3	Oct	60
<i>Pocket-sized monitor with comprehensive facilities</i>					
A Didcock	(B)	Connect4	£1	Sept	15
<i>Pit your wits against the QL</i>					
Shergold & Tose	(B)	*Golf	£2	May	35
<i>From fairway to green on 50 courses of varying difficulty</i>					
Williams & Holliday	(AO)	Paladin	£5	Apr	70
<i>The basis of our games programming series — a Space Invaders-type game written entirely in machine code</i>					
Richard Cross	(MB)	Sprite Animation	£2	Apr	50
<i>A subtle blend of machine code and SuperBasic which produces a versatile sprite designer and high-speed animator</i>					
Steve Deary	(B)	Pacman	£1	Mar	20
<i>A reasonably fast rendition of the famous arcade favourite</i>					
Andy Carmichael	(B)	Family Tree	£3	Aug	100
<i>Archive program and database for setting-up and displaying large family trees</i>					
James Lucy	(B)	Composer	£3	Oct	50
<i>Composer and play sheet music on the QL</i>					
Mathew Capp	(B)	Miners	£2	Aug	30
<i>A nail-biting management simulation which puts you in charge of the NCB</i>					
P J Smith	(B)	*DIY Adventure	£1	Feb	60
<i>A skeleton framework where you have to slot in the details to create your bespoke adventure</i>					
R Green	(B)	Othello	£1	Aug	25
<i>A 3D version of the well-known board game Othello for one or two players</i>					
S J Ackers	(S)	*Touch Type	£4	Aug	80
<i>Touch-typing course — 14 lessons, on-screen keyboard, 800+ word vocabulary and WPM readout</i>					
Rob Sherratt	(AO)	FCOPY	£4	Mar'86	80
<i>A machine code Microdrive utility for turbocharged file copying</i>					
Alan Prior	(B)	World Map	£2	Mar'86	80
<i>A high-resolution multi-coloured map of the world for geography buffs</i>					
J M Dower	(B)	Mushyman	£2	Jun/Jul'86	15
<i>Mushroom munching arcade action</i>					

Tony Quinn	(S)	*CAD QL	£5	Sept'86	120	<input type="checkbox"/>
<i>Professional features include rubber banding and user-definable symbol library</i>						
Stuart Campbell	(MB)	Attack of the Things	£3	Oct'86	45	<input type="checkbox"/>
<i>Can you repulse the attacking Things?</i>						
Karl Jeffery	(MB)	Starport 2001		Nov'86	40	<input type="checkbox"/>
<i>An authentic version of the arcade game Galaxians</i>						
Marcus Jeffery	(S)	QL Go		Apr/May'86	40	<input type="checkbox"/>
<i>A must for strategy games enthusiasts</i>						
J P Hartrey	(B)	Britain		Nov'86	20	<input type="checkbox"/>
<i>Improve your geography knowledge with this round Britain quiz</i>						
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by Ian Stewart and Adrian Soundy

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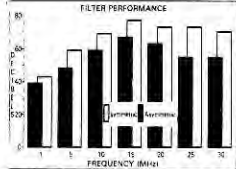
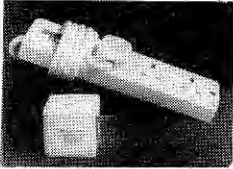
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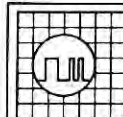
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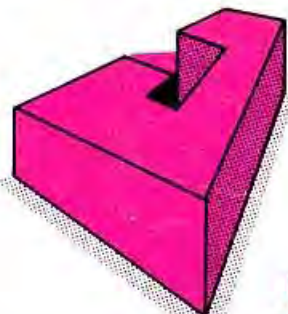
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