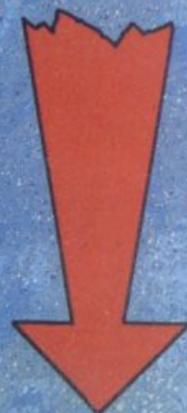
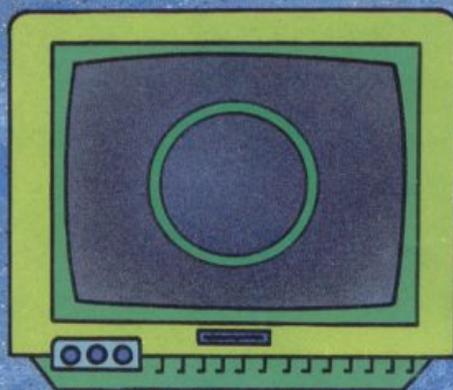
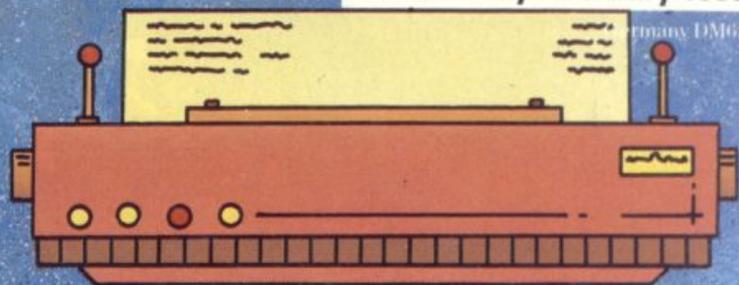


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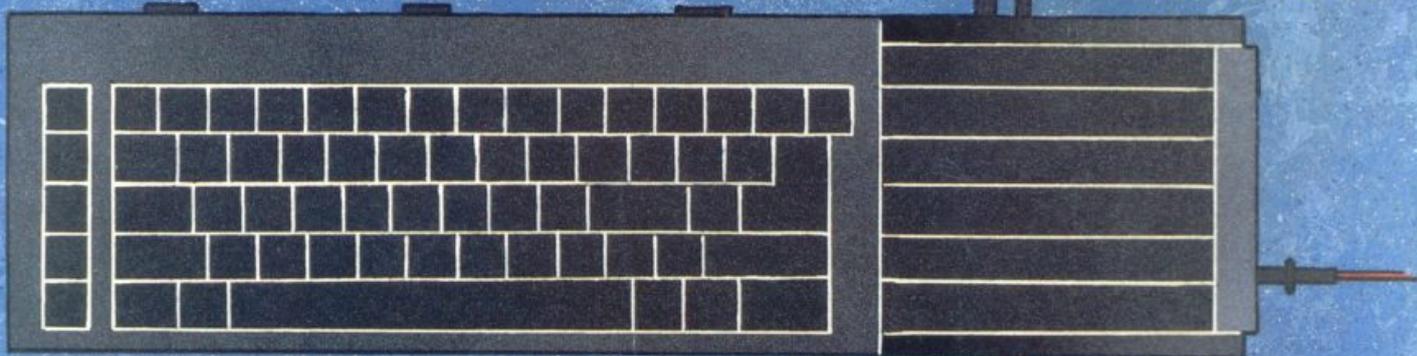
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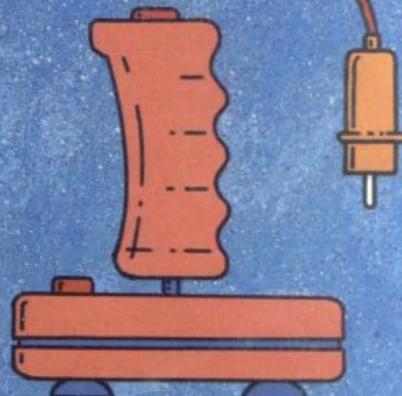
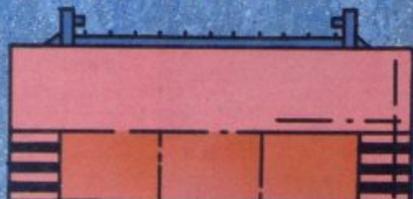
BITS ON THE SIDES QL PERIPHERALS



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SUPERCHARGE SUPERBASIC COMPILER



- ★ This amazing compiler translates QL SuperBasic into 68008 machine code, completely automatically! It supports the entire syntax of SuperBasic (except, obviously, commands like EDIT/LIST/RENUM which are specific to Basic and would be meaningless in machine code). That means all file handling, multidimensional arrays, procedures (with parameters too), local variables, strings, sound, graphics, separate superspeed integer, floating point arithmetic (displaying Nine Digits of Precision versus The Interpreter's Seven!), extensions to Basic, the complete range of SuperBasic control constructs . . . refer to your QL User Guide for the whole list!
- ★ The code generated by Supercharge runs incredibly fast – here are the standard PCW benchmarks (PCW June 1984) for QL Basic compared with the timings for the same programs when Supercharged:

| BENCHMARK NUMBER | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
|-------------------------------------|------|-----|------|------|------|------|------|------|
| SUPERBASIC (SECS) | 2.1 | 6.4 | 10.7 | 10.3 | 13.2 | 26.1 | 61.8 | 25.8 |
| SUPERCHARGE (Floating Point) (SECS) | 0.2 | 0.3 | 1.2 | 0.9 | 1.0 | 2.5 | 4.1 | 8.6 |
| SUPERCHARGE (Integer) (SECS) | 0.06 | 0.1 | 0.3 | 0.3 | 0.3 | 0.7 | 1.0 | N/A |

(Variations will exist between different QL systems)

Hence on standard benchmarks a 60x speed increase is possible . . . SUPERCHARGE, however, is at its least impressive when compiling such short programs, as SuperBasic grows slower as program size increases. Speed improvements of **SEVERAL HUNDRED TIMES** are in no way uncommon when using SUPERCHARGE on programs of average size.

- ★ SUPERCHARGED programs are independent jobs (so you don't need to have SUPERCHARGE loaded to run them).
- ★ SUPERCHARGED programs are relocatable and are inherently multitasking (so you can run any number of them at once).
- ★ SUPERCHARGE optimises as it compiles – and the advanced user may switch the optimisation from time to space on a line by line basis.
- ★ SUPERCHARGED programs load far more quickly (at least 5-10 times) and, hence reliably, than normal SuperBasic – there is no pause between blocks
- ★ SUPERCHARGE can compile programs of ANY size, provided you have enough RAM on board (for the unexpanded QL, the limiting source code size is still a massive 40K!). Compilation listings can be directed to any device – and a complete set of compile/run time error messages (clear and unambiguous, unlike the Interpreter's!) are issued, showing exact error positions.
- ★ Add-on commands, functions and procedures are allowed by SUPERCHARGE, provided they do not read/alter Interpreter data structures . . . Hence utilities supplied with disk systems and QL Toolkits will work with SUPERCHARGE!
- ★ SUPERCHARGE is compatible with all disk and memory-expansion systems. The system we recommend (on grounds of quality, speed and reliability) is the one we used in developing SUPERCHARGE – the CST disk system, available from Computamate (Scotia Road, Burslem, Stoke-on-Trent – Tel: 0782 811711) or from us – write in for details.
- ★ SUPERCHARGED programs are protected against unauthorised modification/listing/tampering – permanently.
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- ★ SUPERCHARGE cures most bugs and lifts many of the restrictions imposed by the Interpreter! Examples of problems completely cured under SUPERCHARGE: "Too many parameters in a procedure" bug; the RESPR bug, GOSUB in a single-line FOR statement, CALL in long programs, procedure parameters/integer/string variables used in SELECT statements, full integer arithmetic, etc, etc.
- ★ SUPERCHARGE adds a number of new commands to SuperBasic, including ones to monitor device statuses, to list/stop/remove tasks, to change task priorities, and so on.
- ★ SUPERCHARGE is supplied either on disk or microcartridge and can be easily transferred/backed up from one to the other.
- ★ SUPERCHARGE is supplied with a superb Instruction Manual (40,000 words) designed to complement the User Guide – it is designed for both beginner and advanced user, with sections on "Getting The Best From SUPERCHARGE" and many examples.
- ★ SUPERCHARGE itself loads and runs phenomenally fast – yes, SUPERCHARGE is itself a SUPERCHARGED program!

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Author: Simon Goodwin. Assistant: Gerry Jackson. Mission Control: Freddy Vachha.

NOTE: Software houses requiring to use SUPERCHARGE will need a site licence, for which the VAT-inclusive cost is £250 (in addition to the price of one compiler). Instructions are supplied to site licence holders on the making of appropriate numbers of copies of SUPERCHARGE for their exclusive use. Site licence holders are exempted from paying Digital Precision royalties on SUPERCHARGED programs.

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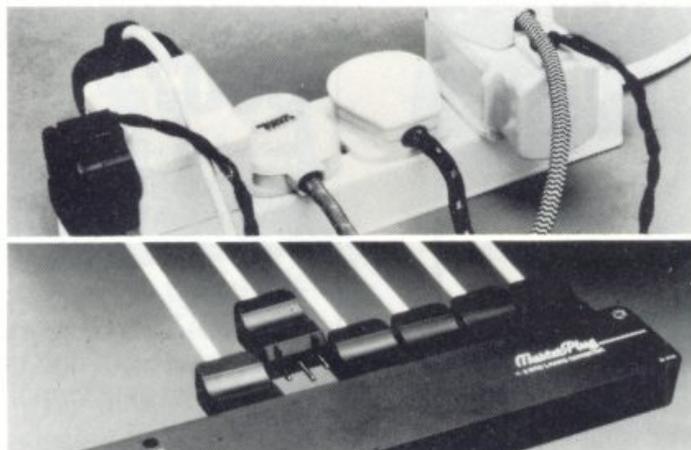
QL SCENE

More On Memory

Following our recent comments concerning internal memory upgrades (November 1985 issue), Silicon Express have confirmed that in tests their external upgrade has proved to be some 25% quicker at performing a recalculation on an Abacus program when compared to internal upgrade.

On the subject of internal memory expansion the company stress that success of any such upgrade is dependent on having the correct component removal equipment. Without the correct tools and test equipment it would be all too easy to cause considerable damage to the QL while attempting component removal. The warranty on Silicon Express's own internal upgrade is for a 90 day period and has been extended to cover the microdrives.

Having expanded the QL's memory many users will be on the look out for a RAM disk driver. In their opinion however, the majority of disk drivers are far from easy to operate. Silicon Express are thus prepared to offer a free disk system to anyone who can produce a RAM disk utility that will run with the Psion packages.



Before and after — the Masterplug 6 into 2 adaptor in action.

Plug It In

Take a QL, monitor, disk drive, printer and modem and one 13 amp power point and you are faced with a problem — five into one won't go. Traditionally the solution has been to buy a four in line distribution block and to supplement this with extra two way adaptors as necessary. This is hardly an ideal solution to the problem though. Not only does the jumble of power leads and plugs look unsightly but quite often it can be unsafe.

Conblock Electrical have come up with a solution in the form of MasterPlug, a six

in-line adaptor that is 30% smaller than the familiar four way adaptor. The adaptor is supplied complete with six special plugs, each having a six amp capacity.

The company can also supply a four way adaptor that may be plugged into any 13 amp outlet.

Both adaptors should be widely available from High Street electrical stores.

QL Comms

It would seem that not too many QL users make use of their computer to access Prestel. The latest figures for Micronet subscriptions

indicate that QL registrations are way down the list in the 'also rans' slot. Figures for QL registrations may not give the full story though. Micronet believe that many more QL owners use their service than the figures indicate. The reason they believe that is, in addition to their QL, many people will have a second machine, most likely the Spectrum, as the equipment necessary to access Micronet via the Spectrum is far cheaper than equivalent QL models.

Keep It Clean

It's a well established fact that the majority of disk read/write errors can be attributed to small particles of dirt that find their way onto the disk drive's recording head. Even a spec of dust no bigger than 30 millionths of an inch can spell disaster for a disk drive. While 3½" drives are far less prone to the effects of dust than 5¼" units, it is still advisable to clean the heads on a regular basis. To meet the cleaning requirements of 3½" disk owners DNCS produce a product that goes under the name of a 'disposable, wet/dry, non-abrasive diskette drive head cleaning system'. The cleaning kit costs £17 and can be used for ten cleaning sessions — that's £1.70 a throw. While this may seem expensive, when the cost of the harm that could be done by a dirty disk head is considered, it is quite reasonable.

For more information contact DNCS on 0706 67567.

ABSTRACTS

The name Medic will be familiar to many readers of *QL User*. Over the past months the company has used the pages of this magazine to advertise offers on QL disk systems that seemed too good to be true — in the final analysis it could turn out that this is exactly what they were. At the time of writing we are sorry to report that the company does not seem to be in a position to supply goods ordered by customers and advise readers not to send Medic any money. Any readers who ordered goods from the company and whose

money was banked by Medic are asked to write to our offices with full details of all transactions with them. Where possible these should include the date on which any goods were ordered, the quantity and price of the items and, in the case of cheques, the date on which these were cashed by Medic. Until we have collected together details of all readers who may be affected by the problems at Medic we are unable to say what the final outcome of the affair is likely to be.

The laws of libel prevent us from saying too much about the Medic case at present. It will take some time to assess just what went wrong with the company.

The Medic saga provides an excuse, if one were needed, to pass on some general

comments on ordering high value goods from mail order companies. We must stress at this stage that *QL User* takes every possible step to ensure the bona fides of those companies advertising in the magazine, readers can however take a few sensible steps of their own. For those who have a major credit card the advice is to use it on any purchase over £100. The reason behind this advice is that recent consumer legislation means that using your credit card for such purchases means that a contract exists not only between you and the vendor of the goods but also between you and the credit card company. If the goods fail to arrive for any reason and the company from which you ordered them from goes bust, you will have a claim in law against the credit

card company.

For those who do not have a credit card, the most sensible option seems to be to make use of the Post Office's COD service. The only drawback with this scheme is that if you wish to pay by cheque, you will have to wait for this to be cleared by the PO, this can take quite a few days.

A third option is to, by arrangement with the company concerned, to pick the goods up in person — this though defeats the idea of mail order.

Once again while we would wish to stress that readers will very rarely suffer as a result of the failure of advertisers in *QL User* to supply goods, we would urge anyone considering the purchase of any high value items of equipment to take steps to safeguard their money.

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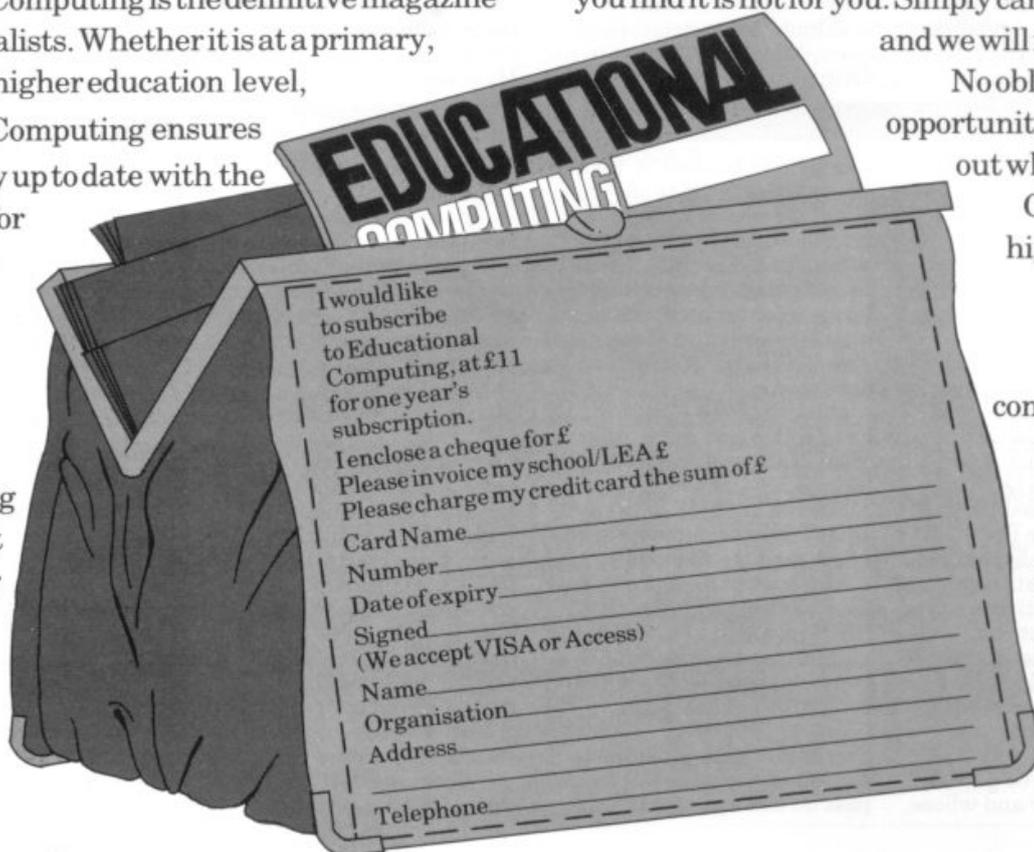
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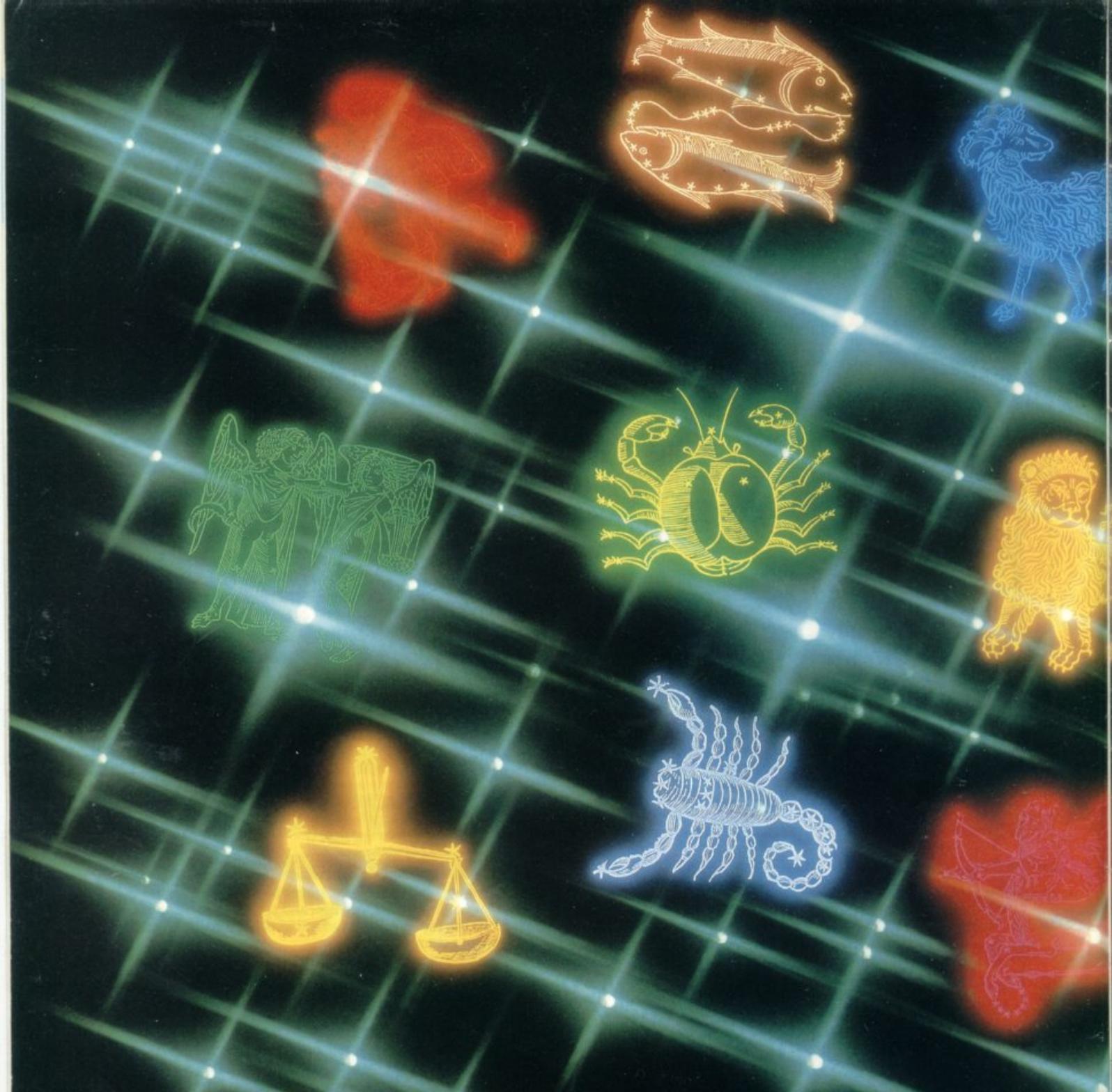
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THE UNPREDICTA

Philip Staniforth charts the heavens with his QL.

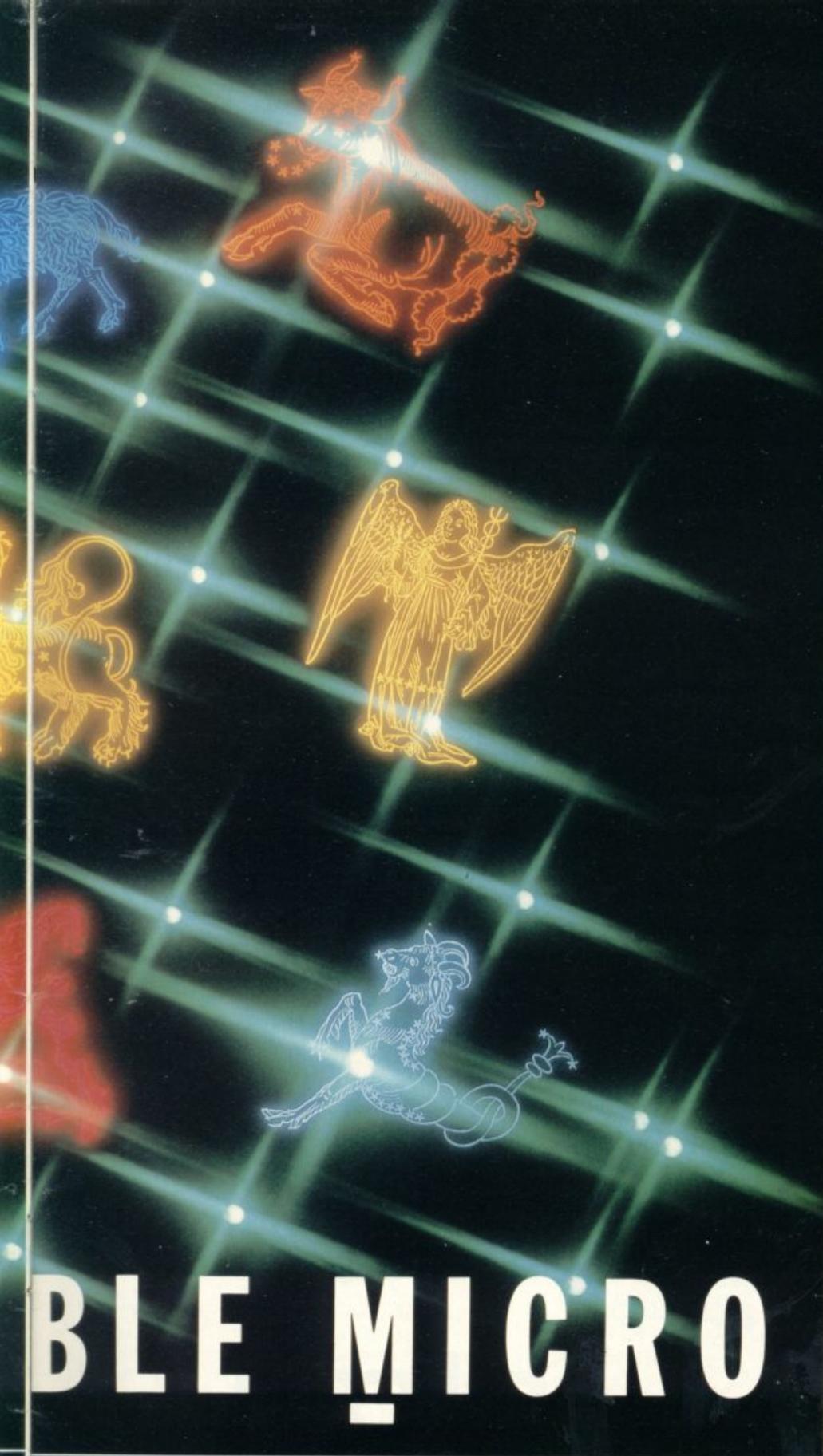
Most people buy a home computer for one specific function: kids go for games, writers for word processors, and businessmen for financial packages. Once these applications are put

aside, looking for something interesting, creative and useful to fill the vacuum can be a problem.

Here Astrology programs come into their own. The complicated mathematical calculations needed to accurately ascertain the correct positions of the planets in the sky at any moment, past, present, or future are

taylor-made for computers. At the same time it can be fascinating to link interpretations of personal characteristics and psychology to the planetary positions at birth.

Since the advent of the cheap home micro with a memory bank of 16K or more there has been a proliferation of Astrology programs for every make



BLE MICRO

of computer. In general these programs calculated the figures and ignored their interpretation, the latter demanding not only a thorough knowledge of Astrology, but also the ability to synthesise the results into a coherent and presentable framework. No easy task, even for a good programmer and Astrologer

working in conjunction.

The few programs that have attempted an interpretation are almost always 'flawed'. Either they have been written on a computer with too little memory so only sketchy and basic read-outs are given, or a big mainframe has been used that presents you with a

hundred page read-out so full of contradictory information that you don't know where to start or what to believe!

We should, at this point touch on the theory behind Astrology itself. It is a vast area that embraces many disciplines from Astronomy, mythology, and philosophy through to modern day psychology. The belief that the movements of the 'stars' in the heavens are connected to and affect the lives of ordinary people on earth, is an idea that has refused to lie down and die. Irrespective of persecution and scepticism those who hold by this belief are to be found throughout history. We should remember that nearly all the major astronomers-scientists from Ptolemy through to Galileo, Copernicus, Kepler, and Newton were well versed in the arts of Astrology, and accepted it as normal. Indeed it was taught in Universities throughout Europe until around the 17th century, and at the same time every noble court employed its court Astrologer to advise the ruler on the events of the times. Documented Astrological records of planetary movements stretch back to 1700 BC to the era of the Babylonians. A continuous thread with many ups and downs can be traced from then until the present day (nearly 4000 yrs). Astrology's heritage, then, is rich and varied.

An exciting link between computers and Astrology exists in the area of research. Huge databanks of birthtimes are being built up to carry out statistical surveys into such diverse areas as occupations, crime patterns, suicides, seasonal births, behaviour traits associated with various signs and planets, illness and diseases, stock market trends. Out of this research some very interesting results are turning up. In the case of occupations, a definite link between planetary positions and profession has been established, much to the amazement of the sceptics, and even of those carrying out the research itself. Also, it is a known fact that the crime rate rises around the time of the full Moon with violent crime coming to the fore. The search for a link between planetary cycles and fluctuations in financial markets is being pursued vigorously by many groups of Astrologers keenly interested in the potential benefits.

'Synastry' the art of comparing your chart with that of someone else and finding the links that are positive and negative is a practice well advanced in the Astrological world. One day we will probably see Computer Dating services using comparisons between a couple's birthcharts. Indeed it is not unknown now for businessmen who are 'believers' in Astrology to have the chart of a prospective partner or customer checked out to see any potential problems in ▶

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THE UNPREDICTABLE MICRO

the relationship. The fact that you can construct detailed pictures of a person's character is the strongpoint of Astrology. Psycho-analysts often use an Astrological analysis to supplement their work with a patient.

Predicting future happenings and events via the 'Transits' of the planets is Astrology's weakest area. Many foolhardy and ridiculous proclamations have let down the art of Astrology giving it a poor reputation. Astrology is however all about Planetary cycles and with the aid of computers we can now easily look back into the past and correlate historical events to Planetary positions in the signs of the zodiac, and thus look out for any recurring patterns in the future that may indicate similar events.

Writing an Astrology program is a very complicated business. To begin with, there are two ways for working



out positions of the planets in the Zodiac. One is called the Tropical Zodiac, the other is called the Sidereal Zodiac. The Tropical system relates the inclination of the Earth's axis to the Ecliptic or orbit as a whole, while the Sidereal Zodiac relates the orbit of the Earth and the Ecliptic to the background of the Stars. Suffice to say different Zodiac sign positions for the planets are reached via the two systems. The Tropical system is mainly used in Western countries, and the Sidereal in Eastern countries. The Sun passes into a new Zodiac sign around the 21st of each month. So, if for example you were born between the 21st of July and the 21st of August, in Western Astrology you come under the Sun sign of 'Leo' whereas in Eastern Astrology you would fall under the sign of Cancer. Both systems are valid they just have different starting points.

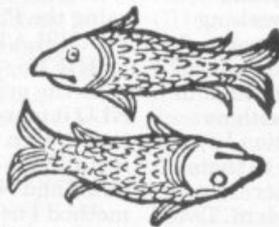
The first step in the search for planetary positions is to calculate the exact time you want to use as a fraction of the 20th century. For example, the Century Fraction for 7.13 am on the 1st January 1986 = 0.8600082 (we'll explain why, later). This fraction is then multiplied by the number of degrees travelled by the planet in the whole of the century and added to the position at the start of the century. This result is then 'fine-tuned' using a long complex algorithm involving the eccentricity, inclination and the gravitational attraction between the planets. To convert these heliocentric positions

to geocentric is a simple matter of subtracting the X,Y,Z co-ordinates of the earth from those of the Planet involved. The entire calculation process can be performed in QL Super-Basic in about 10 secs for nine planets, giving an accuracy to 1 minute (1/60) of arc. Stripped down to the barest minimum an Astrology calculation program can be condensed into about 54 to 60K Basic. This requires about 400 statements, a routine for the input of the date wanted, and the planetary algorithms. In machine code the process could be considerably faster.

Accuracy on the QL is no better and no worse than most other computers. The real bonus for QL users is in terms of speed. The same program running on the Spectrum is 4 times as slow, whilst on the Commodore 64 and the Amstrad it can take up to a minute or more. (Astrocalc, one of the few companies around producing Astrology software, have fine-tuned their programs to run faster on the slower computers.)

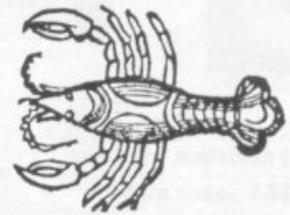
Before computers became widely available the task of calculating positions of planets had to be performed manually using a book called an Ephemeris. This gives one daily position in longitude of the planets over a year, or number of years. You then interpolate between two daily positions by using logarithms to find the correct answer. With practise it takes about 15 to 20 minutes per calculation. A far cry from 10 seconds! Clearly, in terms of accuracy and speed, a computer is hard to beat.

The half-way house for Astrologers at the moment is a hand held calculator capable of interpolating between two planetary positions, but still needing an Ephemeris handy to feed in the daily positions. This takes about two minutes to complete. The capabilities of calculators are improving all the time and the day is probably not very far away when we will see them running Astrology programs independently, using good graphic displays and enough memory to save plenty of data.



The first step in producing a calculation program is an input routine to enter the time and date of birth, and the entry of Latitude and Longitude to 'fix' the terrestrial point we are working from. It's essential to remember that Astrology is 'Earth centered' and to all intents and purposes the Sun and the planets are revolving around the Earth. This of course is not the case but the

Astronomy of the planets is as seen from the Earth. Day, Month, and Year can all be entered as integers separately via the INPUT command. Latitude and Longitude are entered in Degrees and minutes and can be



broken down as shown in Listing 1. It is slightly more complicated to handle as we are dealing with directions, North, South, East and West. Latitude lines divide the Earth's surface from North to South, being 0 degrees at the Equator and spreading to 90 degrees in both directions to the Poles. Longitude lines start at 0 degrees from the Greenwich meridian in England to 180 degrees in both directions meeting at the opposite side of the Earth at the International date line. South Latitude and East longitude must both be converted to minus. At the same time the Latitude must also be expressed in terms of Radians. The degrees and minutes of both are entered separately then converted into a whole decimal fraction. Listing 1 does not take into account all the Print statements necessary to show "Day, Month, Latitude" etc, on the screen for the convenience of the user.

Listing 1.

```
1000 INPUT ;LAT_DEG
1010 INPUT ;LAT_MIN
1020 LET LAT = RAD(LAT_
    DEG+LAT_MIN/60)
1030 PRINT "<N>orth or
    <S>outh ? : " :INPUT
    NS$
1040 IF NS$ INSTR "Ss"
    THEN LAT = -LAT
1050 INPUT LON_DEG
1060 INPUT LON_MIN
1070 LET LON = LON_DEG+
    LON_MIN/60
1080 PRINT "<E>ast or
    <W>est ? : " :INPUT
    ;EW$
1090 IF EW$ INSTR "Ee"
    THEN LON = -LON
```

In the next part we hope to review the first Astrology software to come out on the QL, namely Digital Precision's "Super Astrologer" program. With an interpretation of your Birthchart also included the program would seem to be a brave and ambitious attempt but will it work?

Also in the next issue two expert Astronomer/Astrologers Michael O'Neill, and Bray Braden will discuss a lot more useful routines and procedures that go to make up an Astrology program for the Sinclair QL. The Tropical Zodiac and calculations for dates this century will be used.

OPEN CHANNEL

A slight deviation from our usual Q&A pages as we present some of your comments and advice for other readers. Open Channel, QL User, Priory Court, 30-32 Farringdon Lane, London EC1R 3AU

Parisienne Parlez

I am the owner of a Sinclair QL of the latest design (JS Rom, Psion 2.3) and, on the whole, I am astonished that so powerful a system has troubles to get sold at £199.00 even at £299.00, it would be fine. Indeed, Sinclair Research is better at designing things than selling them.

Concerning the QL, its hardware is sound, SuperBasic is very efficient and versatile, and the Psion software are very interesting. Even the so-maligned microdrives work quick and well, as long as they are understood to be superfast tape-recorders, not two-dimensional access disks.

Yet, nothing is perfect and I think some of the following weak points may hinder the success of this computer:

- 1) The User guide is not well-written, and it may be very confusing for beginners. Some notations, especially those used in the Keywords section, are not explained, and not understandable. By chance, examples are given, which put right what is confused by the explanations, so long as these examples are not themselves confused by misprints or syntax errors.
- 2) I use my QL with a good amber monochrome monitor, for which blue and red are black, green is dark-grey and yellow is white. But Psion software heavily use red to convey messages, so that some of these messages are lost for me. Maybe those colours look fine in showrooms, but they don't go well with business software and monochrome monitors.
- 3) I feel a little overwhelmed to come from my previous ZX81

with 16K to a QL with 128K, and get hindered by some new limitations: why should a DIM statement accept no number greater than 32K, or a string DATA line be shorter than 256 bytes, or the whole variables area be less than 64K?

4) I imported my QL from England to France, where the 1 year guarantee no longer applies (let it be so!), and where the mains provides power in a different way. I have modified my French mains to mimic English and my QL seems to work. Yet its power supply is a sensitive beast: When it is given 220 volts instead of 240 volts, it grumbles and heats, and the screen picture gets unsteady. This is a little troublesome, since voltage changes of that magnitude may happen daily in my district.

Yet, these points (and a few others) are minor ones, and may be easily overcome by experienced users. Things are different for true beginners: for them, even the QL's strong points may be troublesome eg. SuperBasic has so many features that a true beginner may get lost; each Psion software deserves a long study.

As we say in France: best is the enemy of good! But it would be a pity if the QL fails for being so good.

*G W Feler
Paris, France.*

Bad Business

I am currently the proud possessor of a non-working QL, three months out of warranty. Having spend four days trying to get through to Sinclair by 'phone with no success, in desperation I posted the machine to them, with a covering letter explaining the problem. Two weeks later the QL was returned, unrepared, with a letter informing me that the machine was out of warranty and quoting a 'service charge' of £40 (payable in advance) for the repair. This procedure seems to be to be the height of lunacy: why not simply request the remittance by letter? Should I decide to have Sinclair repair the machine

(which I certainly will *not* do if I can get it repaired locally), I will incur repeat postage/ insurance costs totally unnecessarily, not to mention the unnecessary wear and tear on the machine of two additional journeys in the post. One can only conclude that Sinclair do not really want the business.
*S J Wilkinson (Ms)
South Wirral, Cheshire*

Unparalleled Pride

I am writing to you in praise not only of my new QL, on which the PSION packages (v2.3) are excellent, but also of the printer which I obtained at the same time, a CENTRONICS GLP, both available from DIXONS.

The printer is excellent value for money being capable of draft quality at 50 cps and NLQ on a printer costing less than £170, including both Parallel and Serial interfaces as standard with a tractor feed as an optional extra for less than £20.

I use a standard DIXONS QL Serial Printer Lead, which requires no modification. The dip switch settings are as follows (O is ON, X is OFF).

8 7 6 5 4 3 2 1

Switch 1 X X X O O O X

Switch 2 O X O X X O X O

This makes the printer 9600 Baud No Parity with Handshaking. The printer can now be used using ser1h with the printer lead in ser1.

In order to obtain a £ sign using the PSION packages set TRANSLATE 1 to £, <CTRL> <SHIFT> <comma>.

As the printer is capable of NLQ it is useful to be able to switch it in without re-installing a different driver for Draft and NLQ mode. The method I use is to select two characters that you will not use in your documents and use them as the switches. ie using { for NLQ and } for Draft:

TRANSLATE 2 {,ESC;x;1

TRANSLATE 3 },ESC;x;0

Make sure all these are entered as characters as shown in the install_bas program.

The rest of the PSION install parameters are listed

below:

| | |
|-----------------|---------|
| BOLD ON: | ESC;E |
| BOLD OFF: | ESC;F |
| UNDERLINE ON: | ESC;-;1 |
| UNDERLINE OFF: | ESC;-;0 |
| SUBSCRIPT ON: | ESC;S;1 |
| SUBSCRIPT OFF: | ESC;T |
| SUPERSCRIP ON: | ESC;S;0 |
| SUPERSCRIP OFF: | ESC;T |

Please note that the NLQ switches described above are NOT printed and for the purpose of this letter the switch has been removed. You must allow for these new not printed characters.

*G Slatter
Stroud, Glos*

Lock Up Time

With reference to your November issue of *QL User* and the letter from David J. Howard in Open Channel with regard to QL "Lock-Up". I agree whole-heartedly with Mr. Howard's observations that the QL Locks-Up when over-heating is present. In fact during the Summer months this became a very big problem. If you check with Mr. Howard you will probably find that the over-heating occurs in the micro-drive area. This in turn leads to QL Cartridges becoming warm and causing severe stretching of the tapes. Very soon after this the "Bad medium" report comes up. The unwise and gullible then place back-up cartridges in the microdrive to continue any programming work not realising that the over-heating will swiftly do the same to any cartridge.

In fact without the help of Talent Computer Systems of Glasgow and their Cartridge Doctor I nearly lost 4 years accumulated work on a program that began life on a ZX81, which was then re-written for the Spectrum and finally for the QL.

My specialist program demands that the QL be left switched ON permanently so that the SDATE facility can be utilised in calculations. However this can't be done at the moment so the SDATE has to be re-set every time the QL

N N E L

is switched on. This is a small price to pay as against repeatedly losing four years work. My heart is not that strong.

What is Sinclair going to do about this major problem.
*Neville Cresdee
Gosport*

Amateur Owner

I am the owner of a Sinclair Spectrum and a Sinclair QL. I am also a licensed radio ham.

Many of us radio amateurs are also interested in computing - the two hobbies seem to go hand in hand.

Using the ZX Spectrum it is possible to directly connect the tape output socket to the radio transceiver and transmit programs over the air. At the 'other end' the radio receiver's headphone socket is connected directly to the tape input socket on the Spectrum and in most instances the program can be listed and run or saved to cassette.

I would very much like to be able to send programs from one QL to another in a similar way. A problem arises with the QL as there is no tape or other audio output.

Can anyone please provide details of how this can be achieved?

I look forward to hearing from anyone who can help.
*J Cooper (GWOACH)
Mid-Glamorgan*

Quill Printing

I bought my QL several months ago, mainly on the strength of the Psion version 2 packages for business use. While I enjoy Basic programming as a hobby, I have not had the time to really try out SuperBasic yet. I think I'll miss the full screen editor and other productive programming features of my Spectravideo MSX machine. The arrival of a SuperBasic compiler would help to redress the balance though.

I have now used Quill extensively and find it excellent. I miss the ability to skip the cursor straight to the beginning or end of a line; is

there a facility I'm unaware of? I used to find it frustrating to have to repeatedly set my preferred options for Design, Footers, Margins, etc on each new document. I now have all these set in two "empty" documents on my Quill cartridge; one called set11_doc for 11 inch continuous paper and one called seta4_doc for full A4 sheets. I now load one or other of these before starting a new document.

I have a Super5 EP-1201 printer with a Miracle Systems Centronic interface. I believe the Super5 brand printers are identical to Panasonic. It appears to be Epson FX compatible. I seem to get away with the default Open Ser1 parameters for listings. The printer dip switch settings are:

| | | | |
|-----|-----|---|--|
| 1-1 | on | } | standard mode |
| 1-2 | on | } | (can be set to various IBM graphics modes) |
| 1-3 | off | } | no auto linefeed with CR |
| 1-4 | off | } | don't skip perforations |
| 1-5 | on | } | USA character set |
| 1-6 | on | } | (7 European sets available) |
| 1-7 | on | } | |
| 1-8 | off | } | 8 bit |
| 2-1 | off | } | mode switch 3rd position sets to compressed print ("on" sets function of switch to change to proportional spacing) |
| 2-2 | | } | (unused) |

Besides its robustness and good speed (120 cps, 29 cps for NLQ), I find very useful the hardware switch to change from standard to NLQ to compressed or proportional. While these can be switched by software, it is very convenient to simply switch the printer manually from draft to NLQ.

I prefer to do most of my printing at one and a half normal spacing. Consequently I have made the following



changes to the Epson FX-80 printer driver:

```

Lines      44
Preamble   esc,Q,esc,A,18
            (initialise
            printer, set
            spacing to
            18/72 inches)
Postamble  CR
            (this flushes
            out the final
            print line if I
            don't press
            Return after
            the final line in
            my Quill
            document)
    
```

I plan to experiment with some of the translate codes to switch to and from expanded, compressed and italic print.
*Michael Rouse
Auckland, New Zealand*

Curiouser And . . .

Having had a QL for over a year now it came somewhat as a surprise to find a peculiarity.

Every time I type [CLS 100] what appears to be the buffer empties onto the screen for all to see. Once this happens one can edit it, add to it or leave it by pressing [ENTER]. If it is added to, an error "buffer 4" appears and the only way to leave is by pressing [CTRL + C] together.

It doesn't stop there either. CLS and quite a few other numbers including negative ones can be entered and not returned with an error. Most, notably [CLS 99], which suspends the cursor (?) until [ENTER] is pressed a few times.

*Richard Griebler
London SE14*

Transmitted Ease

Having recently graduated from a Spectrum to a QL, I was interested to read the article "Spectrum Connections" in *QL User*, October 1985. I have a

peculiar need to download programs and files from the QL to the Spectrum in order to list to my trusty teletype.

Contrary to the impression created by the article, I successfully make use of the network to communicate between the two machines, which consist of a 'JM' version QL and a version 1 Interface 1. For those with equally perverse needs (or just the plain curious) I offer the enclosed listings.

```

100 REM ---SPECTRUM PROGRAM (RECEIVER)---
110 REM OPEN STREAM TO TELETYPE
120 FORMAT "T";LINE: OPEN #3,"T"
130 REM NAME SPECTRUM STATION #0 ILLEGAL
140 FORMAT "H";: LET N#="S"
150 REM RECEIVE LINE FROM STATION: #1
160 OPEN #1,"H";:
170 INPUT #0:LS
180 CLOSE #0
190 REM DON'T PRINT SAME LINE TWICE
200 IF L#<L# THEN GOTO 150
210 REM OUTPUT TO SCREEN AND TELETYPE
220 PRINT L#;: LPRINT L#;: TO #3
230 LET N#<="L";:
240 GO TO 150
    
```

```

100 REMARK ---QL PROGRAM (TRANSMITTER)---
110 REMARK MAKE QL STATION #1
120 SET 1
130 REMARK INITIALISE LINE COUNTER
140 LINE-COUNT = 0
150 REMARK GET NAME OF FILE TO BE LISTED
160 CLS: INPUT "FILENAME = " : FILE-NAME
170 OPEN-IN #5,FILE-NAME
180 REMARK TRANSMIT LINE-BY-LINE
190 REPEAT EVERY-LINE
200 IF EOF(#5) THEN EXIT EVERY-LINE
210 INPUT #5: LINES
220 PRINT LINES: PENDING-LINES
230 END REPEAT EVERY-LINE
240 CLOSE #5
250 STOP
260 DEFINE PROCEDURE SEND(LINE)
270 REMARK DOUBLE-UP ANY UNRECORDED QUOTES
280 DUMMY = "" : MARK = 1
290 IF STRINGS = "" THEN STRINGS = ""
300 FOR INDEX = 1 TO LEN(LINE)
310 IF STRINGS(INDEX) = "" THEN
320 DUMMY = DUMMY$STRINGS$MARK
330 TO INDEX)
340 MARK = INDEX
350 END FOR INDEX
360 DUMMY = DUMMY$STRINGS$MARK TO
370 REMARK SEND TO STATION #2
380 OPEN #2:RETRY
390 PRINT #2: LINE-COUNT$DUMMY: CHR$(13);
400 CLOSE #2
410 LINE-COUNT = (LINE-COUNT+1) MOD 9
420 END DEFINE
    
```

Note that the file is transmitted line-by-line since the QL uses CHR\$(10) as a terminator whereas the Spectrum uses CHR\$(13). Each line is prefixed with a single digit count in order to allow repeat transmissions to be detected and ignored if required. Note also that in order to transmit programs which contain lines with embedded quotes, any such quotes must be duplicated before transmission.

Using these techniques it is equally possible to transmit data from Spectrum to QL.
*G P Clark
Derby*

Diary of a QL User.

Will a new QL drive you to drink? Samantha Mead thinks it will, but recommends the experience in her QL (dipsomaniac's) diary . . .

Day 1. 10 am Unpacked QL and a wad of paper purporting to be the User Guide. First tremor — does it really involve this much work? Identified microdrive cartridges. Discarded leads for networking system. My QL not even talking to me yet, let alone other computers. Had cup of coffee (*Just coffee — Ed?*). Is this the beginning of computer literacy?

10.30 am First technical encounter — ring binder and numerous pages of instructions — goes very well. Experience surge of confidence, Sir Clive not such a bad bloke after all.

Open manual at page 1, Introduction, and understand everything written. So far, so good. Clear diagrams, ports and connectors easily identifiable, everything fine.

Mains plug on, power supply plugged in, television link achieved, and there's the copyright screen. So far, so very good. Now on to 'Using the QL' . . . and a quick cup of coffee.

11.45 am Keyboard. ENTER, SHIFT, CAPS LOCK, all familiar, all working well. Who said 16-bit machines were sophisticated? Onto DELETE . . . 'Hold down CTRL'. CTRL?!? There isn't one! There must be — if I just hold down the left-hand ALT key and press the arrow . . . ah, yes. I see. CTRL is in fact marked ALT, and ALT is marked ALT, so all I have to do is remember that ALT is CTRL except when it's ALT — quite easy really. NOW I see where the sophistication comes in. Wonder how many other QLs left the factory with two ALT keys?

2.00 pm Now for the good bit. Word-processors are the only thing I use on any computer. Quill, much talked of as an excellent program, is clearly the best starting point for me. Turn to 'Introduction to the

QL Programs', page 8 of the manual's first section, to be told I should make back-up copies of all original programs. Furthermore, I should never use the original program, except when copying it!?

But . . . I haven't got any blank cartridges to make back-up copies on! Does Clive really mean I can't use Quill until I trek off and buy some more microdrive cartridges? Coffee not strong enough this time. One gin and tonic later, turn to Beginner's Guide, page 1 chapter one 'Starting Computing'.

2.30 pm Write my first program in SuperBasic: 'Confusion reigns supreme' — it runs! Progress to using the QL as a glorified calculator.

2.45 pm Hit first major snag. (*That didn't take long — Ed!*) Have learned difference between Direct Command, when statements are put on the screen and answered immediately, and Programming Mode, when lines are numbered and stored until the RUN command is

typed in. Have learned rudiments of EDITING my productions (all three lines of them), but have failed to find out why the results are displayed in the top left-hand corner of the screen, on top of the program lines! Consequent mess on screen makes it difficult to read the results or see how I got them there. Much reading of manual, backwards and forwards, no solutions forthcoming. End of chapter 2 heralds deep depression.

3.15 pm Call in expert. "Oh, yes", says he, "they wrote this manual using a colour monitor, not a common or garden mono TV. Since monitor mode gives a split screen, monitor users don't have this problem. Since you're using the economy TV mode, you do two things. Have a gin and tonic. Then insert extra line before PRINT statement, to CLEAR screen before RUNNING program." Sure enough, listing disappears, result of program displayed (still in top left-hand corner) alone on screen. LIST command puts program listing back on screen in the centre, nice neat solution. Alternatively, use monitor mode instead of TV mode recommended by manual, and put up with not being able to read the whole of each line of your program. Why didn't Clive tell me himself? Restore bruised confidence by dark mutterings in corner. Feel better. Bruise confidence once more by attempting Self-Test on Chapter 2. Excellent feature of manual, this, I just wish I could remember the answers.

Day 2. 10 am Settle in for long session. Chapter 3, Drawing on Screen, discover mono TV has another disadvantage . . . no colour. Wrest colour television from family, set up and start again. All goes well until exercise on chapter three invites me to write my own program for random lines, and I naturally call my program segment 'line'. Program refuses to RUN due to "bad name". Discover that 'line' is a



keyword, and cannot be used as a variable. Why have I not been told this before I am asked to launch out on my own? I'm on page 18, keywords are dealt with in a completely different section and I haven't been referred to it! The air turns blue. Rename offending section FRED and program runs. It doesn't, however, produce the required effect because in order to achieve the answer to the problem set on page 18, I need a piece of information tucked away on page 32. No comment. Expert says I can't expect all the information I need to be in order, I just have to grit my teeth and follow up every point until I find it. Send expert out for more bottles of gin.

(Corrupting the innocent — Ed).

Time unknown (whether due to gin or enthusiasm is not clear). Chapter 4 on Characters and Strings seems straightforward. The only problem seems to be that when I randomly generate combinations of ABC, and instruct the program to stop when it reaches CAB, it doesn't! This highlights one of the fundamental difficulties beginners have with computers: 'Is it me, the machine or the manual, and have I the patience to find out?' Decide I have and am rewarded by Chapter 5 which tells me that I have already begun to work effectively with short programs, and well understand the mechanics of running them. On reflection, feel this is probably true.

I have now reached the point of formatting a microdrive cartridge, duly acquired from the high street, and am referred back to the Introduction for instructions (irritating, to say the least). It gets worse. On reading the Introduction, I am told to be careful with microdrives and refer to the Information section for details on how to format! Resist temptation to hurl fragile cartridge through window and turn to Information, currently at the end of the manual. I seem to have strayed an awfully long way from Chapter 5, which started all this. However, matters don't improve as I am taken aback to discover that formatting is not dealt with until the last page of the last section of the manual! I realise that bad publicity in the past may account for a certain diffidence about microdrives, but this is ridiculous.

There is one telling little phrase, "It is good practice to

format a new cartridge several times." Expert tells me it's not so much good practice, more in the nature of a necessity. Am less than impressed to be told that the underscore symbol and the minus sign are on the same key, so I must be careful not to confuse them when using the underscore for formatting. It seems to me, as a mere novice, to be asking for trouble to add confusion during a critical operation, but perhaps there's some deeply significant technical reason for it...

Proceed to format. All goes according to manual until I format the same cartridge for the third time. Am then told that the capacity is 219/219 instead of 220/221. A fourth attempt reduces the capacity to 218/219, and a fifth confirms that figure. Scurry through manual to be told that several formattings *increase* capacity of cartridge. Decide to call a halt, on the grounds that if it is in fact increasing when the numbers displayed get smaller, then the formatting is working and I've got enough capacity for my feeble efforts, and if the exercise is decreasing the capacity, I'd better stop whilst I'm still in business. Can't as yet find any explanation for this quirk in the manual... it's probably entirely obvious to the *litterati* of the computing world, but to me it's one more illogicality in this most logical of modern pursuits.

Just for fun, I ask for DIRectory of my blank cartridge, only to find I've lost *another* sector of storage capacity in the process. Begin to appreciate warning about losing all programs and data if formatting a full cartridge. I seem to be losing them before I've even stored them. Return to chapter 5.

Type in two-line program and SAVE it to cartridge. It takes countable seconds, which surprises me, and reduces the storage capacity figure by three digits. The display which allows me to keep track of how much space I have left is comforting. Standard BBC disks, for example, are much too prone to filling up without warning and store comparatively little data.

Time — no idea Progress to COPYING from one microdrive cartridge to another, and FORMAT second cartridge in microdrive 2. Expert tells me this is fraught with danger, since if I mis-type, I run the risk of obliterating contents of cartridge in drive 1. I do it

anyway, and discover that my second cartridge starts off with a capacity of 215/216, increases on the first operation to 217/218 and is then reduced again to 217/217, where it stabilises. Curiouser and curiouser. However, must not complain since I'm only entitled to a capacity of 200/200, says expert, and anything over that is a bonus.

Mess about for a while with MERGEing programs and reading the general note which tells me once more how important back-up copies of programs are. This is beginning to make me nervous. It is clear that I must use a minimum of three cartridges in order to be *sure* of SAVEing an important program — one to write and store as I work, and two to keep the program when finished. Although I can then reformat the original cartridge and use it again, we're still talking about tying up £4 worth of cartridges for each program. Can't help feeling the sooner Sinclair launch the disk-version of the QL, the better!

Spend countable minutes trying to tidy up a program in the Problems section which looked fine to me in the first place. Move on to Arrays and Loops, only to have everything explained so carefully that it confuses me. In fact, I know more than I think I do, but lack the confidence to do anything other than slavishly follow the manual, which alternates between painful detail and the quantum leap into sophistication which leaves the beginner stranded. It helps at this point to have some

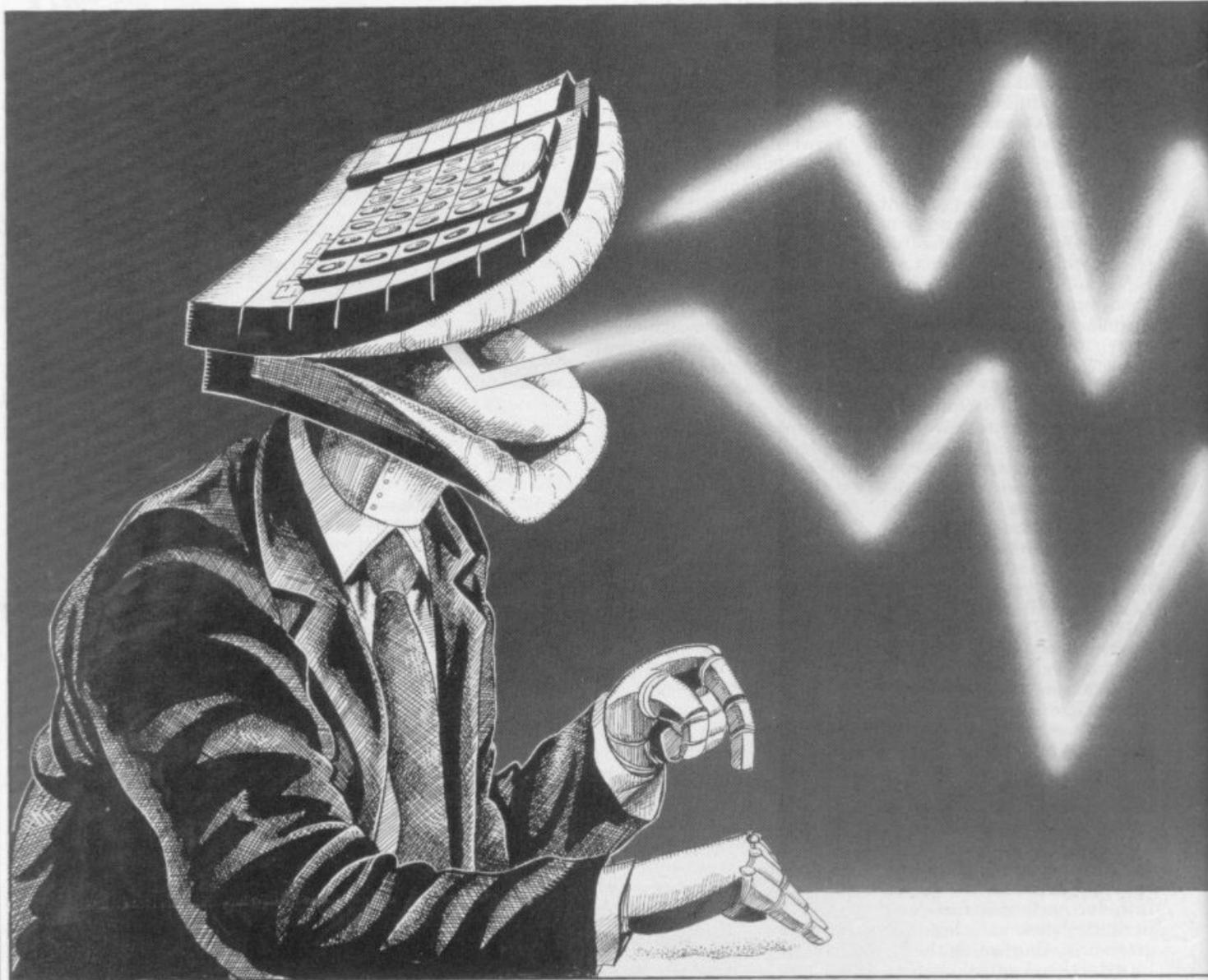
human intervention, which reassures me that I am not so inept as all this print makes me feel. Come to the conclusion that, no matter how competent the manual, most learners will benefit from the occasional consultation, even with another learner.

Day 3. 11 am Heavy night does nothing to encourage enthusiastic approach to today's session. (*Ah, the wonders of alcohol — Ed*). I'm now roughly halfway through the Beginner's Guide to programming, have come to terms with a fair number of keywords and gleaned some interesting things from the Information section as well as making the acquaintance of the infamous microdrive cartridges. So far, I'm quite impressed with the manual and pleased with my progress. I'm nervous of the storage procedures, since they seem to offer too many opportunities for disaster, particularly to those in the first throes of computing, but microdrives are clearly something to which you get used to eventually. That's not to say they're a good idea, but every computer on the market has its drawbacks, and at £200 for the QL, forgiveness comes easily, and cheap!

Now I'm confident the machine is basically friendly, and I have my back-up cartridges, I think the rest of the manual shouldn't provide any great problem (famous last words?) and there's always Quill to provide something a bit lighter — it looks like being three *more* days of enlightenment!



QL L I N G U I



The Bristol based company, Metacomco, has been making quite a name for itself with the Motorola 68000 machines. In the QL systems software market, their five language "development kits", though quite pricey, have been receiving some very good reports. We decided to put them all to the test. Are they really superior products?

The five packages we looked at were Assembler, Lattice C, BCPL, Pascal and LISP. One of the most striking features of all these products is their degree of compatibility and interaction - even the packaging looks the same. For instance, whichever language you choose, they all contain the same screen editor

format, making the transition from one kit to another very easy.

The on-screen editor runs in a user-definable window, and will work on any ASCII coded file, so there's no reason why you shouldn't use it to edit from other sources, such as a SuperBasic program. The wide variety of commands fall into two main categories: immediate commands and command lines (extended commands). The latter allows for such facilities as block manipulation and search and replace, and these can be grouped, repeated and nested for quite intricate command sequences. Whilst the immediate commands cater for the more usual scrolling, inserting and deleting.

Metacomco's two-pass Assembler

is probably the most comprehensive assembler currently on the market, but is also the most expensive. In addition to the expected facilities, including full 68000 mnemonics, the Assembler currently on the market, host of extra features. These include macro assembly, absolute and relocatable code and conditional assembly. It's also possible to link assembly language modules together, or to other metacomco language modules, such as BCPL or Pascal. This is augmented by the XDEF and XREF directives included in the Assembler for referencing external symbols. Linking is particularly useful given the size of the Assembler which overlays to fill up a large portion of available RAM on an

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unexpanded machine. In addition to the mnemonics for conditional assembly, macros, and so on, ten extra directives allow the user to control the format of the listings.

The two major competitors in the assembler market are the products from GST and Computer One. The former is by no means a bad product, though lacking in some of the panache of the Metacomco offering. The manual is very brief by comparison and, though containing a full editor, it is not as easy to use, especially when debugging. It does however have the advantage of using only about one third the memory of the Assembler Development Kit. The Computer One Assembler is cheaper and quite different from its com-

petitors. Using the multi-tasking features of the QL, the editor and assembler are clearly distinguished as separate tasks running concurrently. Lacking in many of the features of the other two products, such as macro assembly and linking, it is nevertheless very easy to use, and is likely to appeal to the less experienced programmer. As always, the decision will depend on the price. If you can afford the best, then buy it.

Until a few years ago, only professional programmers would be found using C, though it must be said that it wasn't unusual for them to fall in love with the language. These days, the popularity of the language is becoming quite widespread, and it is generally viewed as a logical step-

ping stone between a high level language and true assembly language programming.

The Metacomco QL C Development Kit is an implementation known as Lattice C, conforming to the C implementation described by Kernighan and Ritchie (K&R - yet another standard). The package is supplied on a ROM, which plugs into the socket at the rear of the QL, and three microdrive cartridges. The first of these contains the runtime editor and linker, allowing code modules to be connected. The other two cartridges contain two distinct compilation stages. The first stage produces an intermediate file which is then finally compiled into relocatable 68000 machine code by the second phase. The reason for performing the compilation this way is to reduce the size of the compiler parts, leaving more free memory. Though a little awkward to use this two phase process can be automated using QLC which prompts the user for necessary information during the compilation.

The only exceptions made to the K&R standard is the inclusion of GETCHID which return a channel identification, often necessary for the use of QDOS1, QDOS2 and QDOS3 which call the QDOS 68000 TRAP instruction. Though rather clumsy to use, these two additions do give access to the majority of QL-dependant features.

The major alternative to the Metacomco product is RATC from GST. This is definitely a budget-line product, however, and I would recommend it to anyone not familiar with the C language. GST RATC has been designed specifically for use on the QL, and includes a range of QL-dependant instructions, making it easier to use for the beginner. On the other hand, Lattice C is a portable system, designed for more professional use.

BCPL is still a little known language amongst the home computing fraternity. However, the fast, compact code produced by the language have long made it popular, much like C, as a high level alternative to assembly language. The package is supplied on a single microdrive cartridge including the editor and linker for linking separate BCPL modules or Metacomco Assembler segments.

The BCPL program is compiled directly into 68000 machine language. This must then be linked with the runtime library, and any other modules, to produce the final program. This can then be run using EXEC or EXEC_W, enabling BCPL programs to be multi-tasking, if required.

Unlike their Lattice C product, Metacomco's BCPL includes not only the standard functions, but also a comprehensive range of QL-dependant



The fine Metacomco Development Kits — exceedingly nice if you can afford them!

dant instructions, allowing simple use of windowing, graphics, character fonts, time and date, and so on.

The QL Pascal Development Kit is particularly notable for conforming to the ISO standard. To the layman this merely means that the system is consistent with international standards, ensuring the Pascal programs written on the QL are readily transferable to any other computers running a standard system.

The package is supplied partly on ROM, with the runtime editor and compiler on separate microdrive cartridges. As usual, there's a hefty tome accompanying the software, detailing the use of the editor, complete syntax of the language, extensions and a couple of example programs.

This implementation of Pascal has been written using a mixture of BCPL and 68000 assembler and an EXTERNAL directive is included to allow linking between modules from the different languages.

The single pass compiler produces pure 68000 code, rather than the intermediate p-code generated by many products. This means that the final code, which is run using EXEC or EXEC_W and does not require the plug-in ROM to be present, will run

faster than the code produced by many other systems.

Naturally, the ISO standard Pascal doesn't allow the use of QL-dependant features, and an EXTEND directive is included which allows a number of ISO extensions to be usable. One of these extensions is QTRAP which allows information to be passed to and from the 68000 TRAP instruction. Though a little

The two-pass Assembler is probably the most comprehensive on the market.

unwieldy, this effectively gives access to the majority of QL facilities. Another very useful extension is INCLUDE, which allows additional program segments to be included at compile time, permitting the user to create his own library of routines. A set of extension graphics routines is supplied which can be inserted using the INCLUDE statement, giving easy access to windows, plotting, random numbers, time and date, and so on.

This is by no means the only Pascal system available, though the only package which can really compare with it is UCSD Pascal from TDI

Software Ltd, which costs the same. For my money, I'd prefer the metacomco product, which has the more acceptable standard, and is compatible with Metacomco's wide range of other languages. For a cheaper alternative, Computer One Pascal is worth looking at, though it's not really in the same league.

Though previously sparsely used, LISP has become quite popular in

The decision depends upon the price — if you can afford the best, then buy it.

recent years, mainly due to its inclusion in research and development within the field of artificial intelligence.

Supplied on a single microdrive cartridge, Metacomco LISP is, as with most, an interpreted system. Compatible with Acornsoft Lisp on the BBC micro, this version offers quite a few extra functions and large 16-bit numbers.

The structure and format of the LISP language is very simple, and it's not necessary to have more than the bare essential commands from which to work. It is intended that users build their own set of LISP extensions using these core commands, and from these extensions write the programs. Nevertheless, it is usual for LISP packages to include a range of the more common routines. Metacomco have included a fairly comprehensive, tough not excessive, range of core instructions, comprising all the structure manipulation commands normally found. Supplementing these are turtle graphics, a pretty printer to format the often garbled listing (brackets everywhere!), a trace function to aid debugging and a garbage collector. You're only likely to find the latter useful if you intend to write pretty phenomenal programs, given the memory available on the QL.

Metacomco software is admittedly quite expensive. Given the new low cost of the QL, the Pascal and Lattice C products are each half the price of the machine. Having said this, if you can afford them, they are definitely worth the money, emerging as very professional products. The degree of interaction possible by linking modules from different packages is well thought out and undeniably useful, allowing most code to be written at high level, with time critical modules written, say, using the Assembler package. As a final note, would-be software developers will be pleased to hear that the Pascal and Lattice C packages both produce public domain software. This means that any programs produced using this system, along with their runtime libraries may be freely sold, without any obligation to Metacomco.



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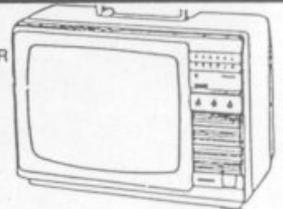
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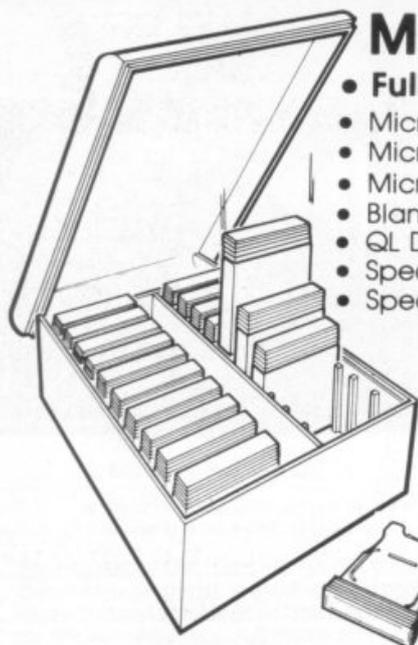
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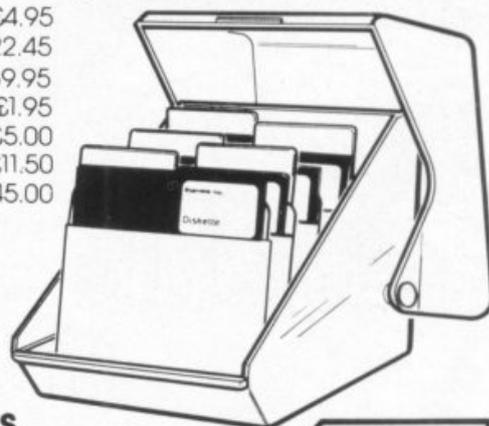


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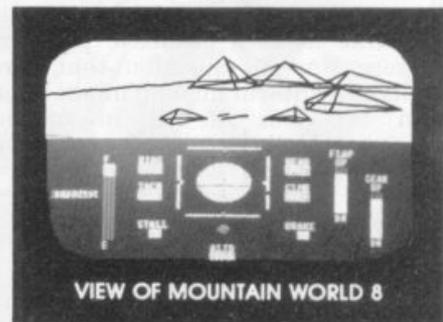
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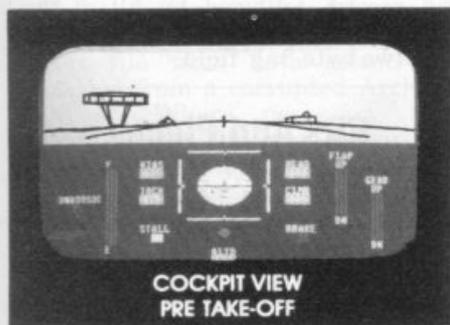
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ARCHIVE ON THE

Archive is a powerful and versatile database but one false move and you're lost! Now Chas Dillon explains how to get out of a tight spot and recover the irrecoverable.

The only redeeming feature of the manual filing systems of the pre-electronic era, aside from the fact that they assured employment for innumerable filing clerks, was that the most complex foul up that might occur was a jammed cabinet drawer. Unlike modern database programs there was no question that some slight technical mishap might result in the loss of all information painstakingly entered onto the system, often at considerable cost.

Reasons For Corruption

It is not possible, or relevant here, to be specific about the causes of all corruptions to databases, but certain generalisations can be made. Corrupted files are likely to originate in one of the following ways:

1. A bug in Archive 2.0 ensures that when backing up files greater than 32K, the backed up copy will be corrupt.
2. Failure to CLOSE a file opened in Archive with the OPEN command, and the removal of a file from the system before QUITting or NEWing will corrupt any database currently being worked upon.
3. Pressing RESET when drives are still whirring. This is fatal irrespective of whether you are used to Archive or any any other program.
4. Where suspect media is being used. For example using old or worn out microdrives or substandard disks. With the latter, for peace of mind, ensure that they have 96track/inch certification.
5. A freeze up on the QL arising from the fluctuations/interruptions in mains power, leaky cables and other hardware faults.

Looking at the first cause, unless you have obtained a patch program over Psion's hotline for your Version 2.00 or have updated to version 2.3, the only way to avoid falling foul of the BACKUP bug is to avoid the com-

mand altogether and revert to using the SuperBasic Copy command from outside Archive.

As regards causes 2 & 3, these arise from carelessness or ignorance on the part of the user. They can be avoided by following the procedures laid-out in the manual:

1. Never reset the QL whilst a drive is whirring.
2. Never remove a disk or cartridge without first closing all files.
3. Never leave Archive other than by issuing a QUIT or NEW command.

The two remaining causes for corruption arise from machine errors so there is little the user may do to forestall them. Fortunately, they are extremely rare. In the course of running an Archive remedial centre we have found causes 1 to 3 are responsible for virtually all the instances of file corruption.

Having looked at prevention we can now develop a program geared to recovering information from corrupt databases. Because of limited information concerning Archive's workings you should bear in mind that the basis of the program is empirical and that most of the 'facts' presented are no more than educated guesses — deduced from examination of Archive files.

You should also note that the program reads from and writes to the particular disk or cartridge upon which our corrupt database lies. This means that we assume that the disk/cartridge directory is intact. If this is not the case and data is to be recovered from a volume that has a corrupt directory, then the preliminary work required to reconstitute the directory will be covered in our "On disk" series and not here.

Inside Archive

An Archive database comprises 5 elements

| Section | Description |
|---------|---------------------------------------|
| 1 | Control record <i>Data Section</i> |
| 2 | File data table |
| 3 | File index table |
| 4 | Free space table |
| 5 | File structure table |

The *control record* is made up of the first 20 characters of the file. It

begins with a two byte RCW (record control word), followed by an eight byte file identifier (usually 'vrmdbf0') followed by four control fields, defining relative starting positions of the subsequent sections of the file.

The data section of the file contains all the records. The order in which they appear differs from the order in which they were defined using the CREATE command in so far as all numeric fields occur at the start of the record, followed by all of the string fields. A record is terminated by a two byte 'tag' field.

Bits And Pieces

Archive pools space within this section of the database so that if a record is deleted, the space occupied by the record is not compressed or otherwise adjusted. Instead, the free space table (section 4 of the file) is adjusted to show that this space is free for reuse. Consequently, when scanning through the file data, the end of one record may in fact not be the start of the next record, but rather a section of free space, which may appear as 'rubbish' — that is, it does not decode sensibly. A new record start point has then to be found.

The *file index table* is present even if the file is not ordered. Each entry on the index contains a pointer to a record in the files. Associated with each pointer is the value of the appropriate key field(s) from the record pointed to. The sequence in which entries are arranged in the index table determines the logical order of records on the database file. This order may be implicit if the user has not specifically ORDERed the file or explicit if he has. The index also has a small control table at the front of it.

The *free space* and *file structure tables* are organised in a fashion similar to the file index. They contain pointers to the free space in the file data area, and the names and type definitions of the database fields, respectively. They are of little significance in the present context.

Even armed with the knowledge of how a database file is organised decoding corrupted data must still be a hit or miss affair. The reason for

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this is that we cannot know for certain the exact extent of the corruption. It may just affect a data record or two but then may just as well affect the control record and all the control tables making it almost impossible to work out where a record starts, where it ends, whether the next piece is a new record, free space or even the end of the file. Indeed, the most complicated parts of the program are designed to uncover exactly this information.

The technique adopted here for recovery is to piece together an export file from data selectively extracted from a corrupted Archive database. Where necessary this 'psuedo' export file may be further edited using a standard text editor (eg, Metacomco's ED), before being IMPORTed back into Archive.

The program relies heavily on the user's knowledge of his own database. The user must first tell the program precisely how the database was CREATED. Using this information, the program then scans and decodes the file data section of the file. As each new record is started, the program displays the contents of the decoded file, and asks for confirmation that the field value is acceptable. Given confirmation, the program will then go on to decode the rest of the record, which is optionally displayed as it is written to the output file.

There are certain tests in the program to check for 'reasonableness' of the data. For example, very long strings may not in fact be long strings at all, but merely appear so because the string controller is corrupt. If these tests are failed, the program displays the decoded value and reports the error to the user, who then has the option to accept the field or invoke one of several corrective actions. This process continues until you opt to 'quit' or the data ends.

Running Commentary

The program conducts a sort of dialog with the user. Prompts are issued and the user responds. Each prompt displays the range of acceptable responses. The first response in this list is always the 'default' — (ie, the assumed response if only the ENTER



key is pressed).

Working through the prompts, the first thing you will be asked for are input and output file names (and devices). The output file will be constructed in the form of an Archive 'export' file, and will typically have a name of the form 'dvc_name_exp'. The input file should be the name of the 'corrupted' Archive database to be recovered (NB. The name should contain no underscores and should be less than 9 characters long). Default extensions '_dbf' and '_exp' will be added where necessary.

The next prompt allows the user to choose between displaying records as they are transferred to the export file. The program then loops and on each pass requests the name of a database field. The database fields must be declared in exactly the same sequence that they were given to Archive (in the original CREATE command for the input database). String fields should have the \$ sign at the end of the name. The loop terminates when only ENTER is typed. As an option, these field names may be read in from a *proc* file, created in Archive, containing only one procedure, with the defining "create" statements for the corrupt database. In this file, each field name must be on a separate line.

During the loop, each successive field name is displayed on the upper screen — this screen remains in place for the duration of the program. When the loop terminates, the program asks the user to check that all fields have been entered, and in the correct order. If the response is 'NO' the program terminates as no useful work can be done. In such a case, the user should re-start the program and enter the fields correctly, or alternatively regenerate the definition file.

Given the instruction to proceed, the program attempts to decode the database control record, and displays on screen the value for the length of the data table. This value is not really meaningful except that the actual data portion of the file is unlikely to be less than the displayed figure.

Road To Recovery

The program now gets stuck into the business of recovering data. At the top of the screen it displays running counts of the number of characters read and the number of records written. It prompts the user as follows:

a) "FIELD (FIELDNAME) OK (Y/N/R):"

This prompt is prefixed by a display of the field contents. It serves the purpose of identifying the value about to be written as the first field of a newly recovered record. 'fieldname'

is the name of the field given earlier on in the program. The "first" field of a file may not be the first name entered — it will be the name of the first numeric field in the record (if any), or the first string field for a record that contains no numeric fields.

Possible responses:

'y' (default) — Accept the field
'r' — Reset the display of recovered records — switch it off if it is on, switch it on if it is off
Other — Get next string from input file

b) "DOUBTFUL COUNT (NN) — WANT TO CHECK FIELD (Y/N):"

This prompt occurs when a string field is encountered with a string length greater than *max_string*. *max_string* is an arbitrary value and is merely an attempt to trap unlikely string lengths, so violation of *max_string* is not necessarily an error. 'nn' is the length of the doubtful field.

Possible responses:

'y' — Check the field
Other (default) — Accept the field sight unseen

c) "REJECT THIS FIELD (FIELDNAME) (N/P/Y/Q):"

The prompt is prefixed by a display of the field contents. This prompt occurs after appropriate responses to (a) or (b).

Possible responses:

'y' — Reject the field and move onto the next
'q' — Quit. Here data on file will have been exhausted and the user will be looking the control table section
'p' — reposition the file pointer (e)
Other (default) — Accept the field

d) "START NEW RECORD (Y/N):"

This prompt occurs if a field has been accepted. If the field on display is the first field of a new record — ie, the user has just skipped over some rubbish fields, then the program should be instructed to restart forming a record. If the 3.5 prompt occurred because a field which exceeded *max_string* was inspected and found good, then there is no requirement to start a new record.

Possible responses:

'y' (default) — Start a new record
Other — Continue building current record

e) "MOVE CURSOR TO RECORD START POINT AND PRESS ESC"

This prompt occurs if the response to (c) was 'p'. It is prefaced by the screen

being cleared and the current undecoded input stream is shown on the top of the screen. The first character position of the current field being decoded has the cursor positioned on it. The user may use the left, right, up and down arrow keys to move the cursor to where the decoding should recommence. When that position is established the ESC key should be pressed. The program will always expect to commence a new record from that point — it will not attempt to continue building the current record.

On Display

To use this powerful feature successfully, the user must be aware of the record field structure — all numeric fields occupy 8 bytes and occur at the beginning of a record; each string field is prefixed by a 1 byte control field. If the new record starts on a string field then the cursor should be placed on the control byte. If the new record starts with a numeric field, then the user should count back nn times 8 characters from the control byte of the first record string field (where nn is the number of numeric fields in the record).

While moving the cursor over 'non-display' characters — shown on screen as square blocks — the program displays the decimal value of the character code at the bottom of the screen. This will assist in the recognition of the string controllers.

It should also be noted that a 'genuine' record has two 'spare' bytes at the end of it.

If the feature is invoked by mistake — 'p' was pressed accidentally — then ensure the cursor position is left unchanged and press ESC; the program will resume as though the current field were the first field of a new record.

f) "THE FILE DATA IS NOW PROBABLY EXHAUSTED — DO YOU WANT TO QUIT (N/Y/D):"

This message occurs when the number of characters read from the input file exceeds the control value contained in the database control record. Of course if the database is corrupted, it is just as probable (in fact it is more probable) that the control value itself is in error.

If the user suspects that the program is now beyond the data section of the file, then he can elect to quit at this point. Conversely, he may choose to continue examining the file for further records. If the message becomes a nuisance, it may be switched off.

The program will in any event detect the true end of input, and terminate automatically

Possible response:

- 'y' — Quit the recovery
- 'd' — Disable the test (stop sending the message)
- Other (default) — Continue with scan and the message display

Winding Up

Once the user 'quits' recovery or the end of the data section of the corrupt database has been reached a message will display the number of records recovered, all files will then be closed and our recovery program will terminate. All that remains to be done is to

load Archive and IMPORT the output file defined at the start of recovery. This 'pseudo' export file will contain all the records recovered and Archive will automatically recreate a database about them.

Should the recovery be accidentally aborted, using CTRL/SPACE, then to re-instate the screen and file statuses, the user should type 'shutdown'. This will close the input and output files and restore the standard screen configuration.

Because the 'export file' generated by our recovery program is entirely text, it may — unlike a normal database file — be easily scanned (eg, SuperBasic 'Copy filename to scr_')

producing a meaningful display, or edited using a suitable text editor (eg, Metacomco's ED).

Finally, you should note the program has to decode the (rather complicated) floating point format used in the Archive database. In doing this, it tends to work to 16 significant places. Very large or very small numbers will not be converted (numbers greater than 2^{56} or less than 2^{-56}). Some of the numeric output of the program is therefore a bit slow and probably with more significant places than Archive itself supports. This should cause no concern, as the IMPORT process will perform any necessary truncation.

```

1 REMark RECOVER - get data from busted Archive db
2 REMark
3 REMark Version 1.3 - Chas Dillon - Sept 85
4 CLEAR
5 rcvr$ = "RECOVER 1.3"
6 REMark
7 :
8 initialise
9 IF NOT quit : do_transfer
10 shutdown
11 :
12 DEFINE PROCEDURE initialise
13 LOCAL i,xs$
14 MODE 0:OPEN #1,con_448x200a32x16,128
15 npap = 4 : nink = 0 : hpap = 0 : hink = 7
16 PAPER npap : INK nink : CLS
17 PRINT rcvr$; " - attempt recovery of corrupted d
/b - C.D. Sept 85"
18 LET wrong = 1
19 REPEAT i_f_loop
20 AT 3,10 : prompt "Enter input device type (m/f)
:"
21 IF yn$=="f" : dvc$="flp" : ELSE : dvc$="mdv"
22 AT 4,10 : prompt "Enter input device no (1 - 6)
:"
23 dvc$ = dvc$ & yn$ & "_"
24 AT 5,15 : prompt "Enter name of input file: "
25 IF NOT ("_" INSTR yn$) : yn$ = yn$ & "_dbf"
26 ipfil$ = dvc$ & yn$ : LET ipdvc$ = dvc$
27 LET wrong = FOP_IN(#5,ipfil$)
28 IF NOT wrong : EXIT i_f_loop
29 AT 6,10 : PRINT "File not found"
30 END REPEAT i_f_loop
31 AT 6,9 : prompt "Enter output device type (m/f)
:"
32 IF yn$=="f" : dvc$="flp" : ELSE : dvc$="mdv"
33 AT 7,9 : prompt "Enter output device no (1 - 6)
:"
34 dvc$ = dvc$ & yn$ & "_"
35 AT 8,14 : prompt "Enter name of output file: "
36 IF NOT ("_" INSTR yn$) : yn$ = yn$ & "_exp"
37 opfil$ = dvc$ & yn$
38 AT 10,0 : prompt "Do you want file output displ
ayed (y/n): "
39 IF NOT yn$=="n" : show_em = 1 : ELSE : show_em
= 0
40 check_em = 1
41 REMark AT 12,2 : prompt "Do you want first fiel
d prompts (y/n): "
42 REMark IF NOT yn$=="n" : check_em = 1 : ELSE :
check_em = 0
43 DELETE opfil$
44 OPEN_NEW #6,opfil$
45 LET q$="" : LET cq$="," : LET c$=","
46 max_string = 51 : REMark Longest 'unchecked' st
ring allowed
47 fmax = 100 : REMark maximum number of d/b field
s
48 sl = 16 : REMark string length - numeric accura
cy
49 mn = 55 : REMark mantissa length in f.p. format
50 hist_lim = 256 : REMark limit of scan-back for
reposition
51 hist$ = ""
52 new_record = 0 : quit = 0 : stack_ct = 0 : in_c
t = 0 : buffer = 0
53 recs = 0 : hist_ptr = 0
54 get_fldnames : IF quit : RETURN
55 REMark ***** d/base control rec *****
****
56 FOR i = 1 TO 10
57 xs$ = get_char$ : END FOR i : REMark throw away
header
58 data_len = 0
59 FOR i = 1 TO 4
60 data_len = data_len * 256 + CODE(get_char$) : E
ND FOR i
61 FOR i = 1 TO 6
62 xs$ = get_char$ : END FOR i : REMark throw away
other cntrl flds
63 PRINT "Probable data length is ";data_len;" cha
racters"
64 load_data
65 END DEFINE
66 DEFINE PROCEDURE do_transfer
67 REPEAT xfr_loop
68 IF quit : EXIT xfr_loop
69 IF in_ct >= data_len
70 PRINT "The file data is now possibly exhausted"
:
71 prompt " - Do you want to quit (n/y/d): "
72 IF yn$=="y" : EXIT xfr_loop : ELSE : IF yn$=="d
" : data_len=9.999999E6
73 END IF
74 LET fct = 1 : REMark field number for error mes
sages
75 LET bad = 0
76 REPEAT field_loop
77 IF fct > fldct : EXIT field_loop
78 IF quit : EXIT field_loop
79 para = 0 : bad = 0 : new_record = 0
80 IF fct = 1 AND check_em : para = 2
81 LET ptr = rel_pos(fct)
82 IF fct > numfld
83 xs$(ptr) = get_str$(para)
84 ELSE
85 xs$(ptr) = get_num$(para) : END IF
86 IF NOT bad
87 fct = fct + 1
88 ELSE
89 IF new_record
90 fct = 2
91 IF ptr <= numfld OR NOT numfld
92 xs$(rel_pos(1)) = xs$(ptr) : ELSE
93 IF LEN(xs$(ptr)) < 3
94 xs$(rel_pos(1)) = "0" : ELSE
95 xs$(rel_pos(1)) = xs$(ptr)(2 TO LEN(xs$(ptr))-1)
96 END IF : END IF
97 ELSE : fct = 1 : END IF
98 END IF
99 END REPEAT field_loop
100 xs$ = get_char$ & get_char$ : REMark Tag at en
d of record
101 IF quit : EXIT xfr_loop
102 bld_string
103 IF show_em : INK 0 : PRINT xout$ : INK 7
104 PRINT #6,xout$ : recs = recs + 1 : AT #4,0,0 :
PRINT #4,recs;
105 END REPEAT xfr_loop
106 END DEFINE
107 DEFINE PROCEDURE shutdown
108 CLOSE #5
109 CLOSE #6
110 PRINT "End of run - ";recs;" records copied"
111 WINDOW 448,200,32,16 : PAPER 4 : INK 0
112 IF NOT quit : CLOSE #4 : CLOSE #7
113 END DEFINE
114 DEFINE FUNCTION get_str$(chk_fst)
115 LOCAL a$,ct
116 IF NOT quit : ct = CODE(get_char$) : ELSE : ct
= 0
117 bad = 0 : new_record = 0
118 IF ct > max_string
119 prompt ("Doubtful count "&ct;" - want to check
field (y/n): ")
120 IF NOT yn$=="n" : bad = 1
121 END IF
122 get_text
123 check_out
124 RETURN q$ & a$ & q$
125 END DEFINE
126 DEFINE FUNCTION get_num$(chk_fst)
127 LOCAL a$,ct,expon,integ$,frac$,minu$
128 decode_float
129 check_out
130 RETURN a$
131 END DEFINE
132 DEFINE PROCEDURE get_text
133 LOCAL j
134 a$ = ""
135 j = 0
136 REPEAT char_loop
137 IF quit : EXIT char_loop
138 IF NOT j < ct : EXIT char_loop
139 j = j + 1
140 a$ = a$ & get_char$
141 END REPEAT char_loop
142 IF fct > numfld
143 LET hist_ptr = LEN(a$) + 1

```

```

144 ELSE
145 LET hist_ptr = 8 : END IF
146 END DEFine
147 DEFine FuNction get_char$
148 AT #7,0,0 : PRINT #7,in_ct;
149 IF buffer
150 xs$ = hist$(buffer)
151 buffer = buffer + 1 : in_ct = in_ct + 1
152 IF buffer > LEN(hist$) : buffer = 0 : hist$ = ""
153 RETURN xs$ : END IF
154 IF EOF(#5) : quit = 1 : RETURN ""
155 in_ct = in_ct + 1
156 xs$ = INKEY$(#5,-1)
157 RETURN xs$
158 END DEFine
159 DEFine PROCEDURE check_out
160 field$ = f_name$(rel_pos(fct))
161 IF chk_fst
162 PRINT q$; a$; q$; "          "; IF LEN(a$) > 40 : PRINT
163 prompt ("Field " & field$ & " ok (y/n/r): ")
164 IF yn$=="n" : bad=1 : ELSE : IF yn$=="r" : sh
ow_em = ABS(show_em-1)
165 END IF
166 REPEAT bad_loop
167 IF NOT bad : EXIT bad_loop
168 IF quit : bad = 0 : new_record = 1 : EXIT bad_
loop
169 IF bad = 1 AND LEN(a$)
170 PRINT q$; a$; q$
171 INPUT ("Reject this field(" & field$ & ") (n/p
/y/q): ");yn$;
172 ELSE : yn$ = "y" : END IF
173 IF yn$=="y"
174 LET bad = 1 : PRINT
175 ELSE
176 IF yn$=="q"
177 LET bad = 0 : LET new_record = 1 : LET quit =
1
178 ELSE
179 IF yn$=="p"
180 re_position
181 ELSE
182 LET bad = 0 : prompt "    Start new record (y/
n): "
183 IF NOT yn$=="n" : LET new_record = 1
184 END IF : END IF : END IF
185 IF NOT bad : EXIT bad_loop
186 IF fct (<= numfld
187 decode_float
188 ELSE
189 REPEAT scan
190 IF NOT quit : ct = CODE(get_char$) : ELSE : ct
= 0
191 IF NOT ct > max_string : EXIT scan
192 END REPEAT scan
193 get_text
194 END IF
195 END REPEAT bad_loop
196 bad = bad + new_record
197 END DEFine
198 DEFine PROCEDURE re_position
199 LOCAL x
200 CLS
201 IF NOT buffer
202 x = in_ct - hist_lim - 1
203 IF x<0 : x = 0
204 BGOT #5\X : y = x
205 REPEAT scan_back
206 x = x + 1 : IF x > in_ct : EXIT scan_back
207 hist$ = hist$ & INKEY$(#5,-1)
208 END REPEAT scan_back
209 END IF
210 FOR col = 1 TO LEN(hist$) : h_off : END FOR co
l
211 PRINT "\\Move cursor to record start point and
press ESC"
212 IF buffer

```

```

213 col = buffer - hist_ptr + 1 : in_ct = in_ct -
hist_ptr : ELSE
214 in_ct = in_ct - hist_lim - 1 : IF in_ct < 0 :
in_ct = 0
215 col = LEN(hist$) - hist_ptr + 1 : in_ct = in_c
t + col : END IF
216 h_on : buffer = 0
217 REPEAT esc_loop
218 x = CODE(INKEY$(-1))
219 SELEct ON x
220 = 192 TO 199 : IF col-1 : h_off : col=col-1:in
_ct=in_ct-1: h_on
221 = 200 TO 207 : IF col >= LEN(hist$)
222 in_ct=in_ct-1
223 hist$ = hist$ & get_char$ : END IF
224 IF col < LEN(hist$)
225 h_off : col=col+1:in_ct=in_ct+1 : h_on : END I
F
226 = 208 TO 215 : IF col-74>0:h_off:col=col-74:in
_ct=in_ct-74:h_on
227 = 216 TO 223 : IF col+74<LEN(hist$)
228 h_off :col=col+74:in_ct=in_ct+74:h_on:END IF
229 = 27 : EXIT esc_loop
230 END SELEct
231 END REPEAT esc_loop
232 buffer = col
233 bad = 1 : new_record = 1 : fct = 1 : REMark fo
rce restart of record
234 field$ = f_name$(rel_pos(fct))
235 AT linmax-2,0
236 PAPER 2 : INK 7 : CLS 2 : CLS 3
237 END DEFine
238 DEFine PROCEDURE h_on
239 LOCAL x
240 PAPER 4 : INK 0
241 x = CODE(hist$(col))
242 AT linmax,10
243 IF NOT (x)>31 AND x<128)
244 PRINT x: "          " : ELSE : PRINT "          " : END I
F
245 AT (col-1) DIV 74,(col-1) MOD 74 : PRINT hist$
(col);
246 END DEFine
247 DEFine PROCEDURE h_off
248 PAPER 2 : INK 7
249 AT (col-1) DIV 74, (col-1) MOD 74 : PRINT hist
$(col);
250 END DEFine
251 DEFine PROCEDURE decode_float
252 LET ct = 8
253 get_text
254 get_bit_str
255 IF bit(i) : LET minus$="--" : ELSE : LET minus$
=""
256 expon = 0
257 FOR j = 2 TO 9
258 expon = expon + (2^(9-j) * bit(j)) : END FOR j
259 expon = expon - 128
260 IF (expon - 1) >= mn
261 do_big_num
262 ELSE
263 IF expon > 0
264 stack_nos 1,expon,mn : ELSE
265 stack_nos 1,expon+1,mn
266 END IF
267 fract$ = added_stack$
268 IF expon < 1
269 integ$ = "" : ELSE
270 set_stack expon,int_tab$
271 IF expon-1 : stack_nos -1,expon-1,1
272 integ$ = added_stack$
273 END IF
274 END IF
275 IF LEN(fract$)
276 IF LEN(integ$)
277 a$ = minus$ & shrunk_str$(integ$ & "." & fract
$)
278 ELSE
279 a$ = minus$ & "0" & shrunk_str$("." & fract$)

```

```

280 END IF
281 ELSE
282 IF LEN(integ$)
283 a$ = minus$ & shrunk_str$(integ$ & " ")
284 ELSE
285 a$ = "0"
286 END IF
287 END IF
288 END DEFine
289 DEFine FuNction shrunk_str$(text$)
290 REPEAT front
291 IF text$(1) = "0"
292 IF text$ = "0" : text$ = "" : EXIT front
293 text$ = text$(2 TO) : ELSE : EXIT front : END
IF
294 END REPEAT front
295 IF LEN(text$)
296 REPEAT back
297 IF text$(LEN(text$)) = "0"
298 text$ = text$(1 TO LEN(text$)-1)
299 ELSE : EXIT back : END IF
300 END REPEAT back
301 END IF
302 RETURN text$
303 END DEFine
304 DEFine FuNction added_stack$
305 LOCAL carry,numb,ans$
306 IF NOT stack_ct : RETURN ""
307 LET carry = 0 : ans$ = FILL$("0",sl)
308 FOR i = sl TO 1 STEP -1
309 numb = carry
310 FOR j = 1 TO stack_ct
311 numb = numb + stack$(j,i) : END FOR j
312 ans$(i) = numb MOD 10
313 carry = numb DIV 10 : END FOR i
314 stack_ct = 0
315 RETURN ans$
316 END DEFine
317 DEFine PROCEDURE set_stack (pointer,array$)
318 stack_ct = stack_ct + 1
319 stack$(stack_ct) = array$(pointer)
320 END DEFine
321 DEFine PROCEDURE stack_nos (adder,begin,finish
)
322 LOCAL i,j,start
323 IF begin < 1
324 j = ABS(begin)+1 : start = 1
325 ELSE
326 j = 0 : start = begin : END IF
327 IF adder>0
328 i = start
329 REPEAT frac_loop
330 IF i > whigh : EXIT frac_loop
331 j = j + 1 : IF j > mn : EXIT frac_loop
332 IF want(i) : set_stack j, frac_tab$
333 i = i + adder
334 END REPEAT frac_loop
335 ELSE
336 FOR i = start TO finish STEP adder
337 j = j + 1
338 IF want(i) : set_stack j, int_tab$
339 END FOR i
340 END IF
341 END DEFine
342 DEFine PROCEDURE do_big_num
343 PRINT "Problems - no big number routine"
344 integ$ = "" : fract$ = "" : bad = 1
345 END DEFine
346 DEFine PROCEDURE get_bit_str
347 LOCAL i,j,k
348 whigh = 0
349 FOR k = 1 TO 9
350 j = (k-1) MOD 8 : i = ((k-1) DIV 8) + 1
351 IF CODE(a$(i)) && 2^(7-j) : bit(k) = 1 : ELSE
: bit(k) = 0
352 END FOR k
353 FOR k = 1 TO mn
354 j = k MOD 8 : i = (k DIV 8) + 2

```

```

355 IF CODE(a#(i)) && 2^(7-j)
356 LET whigh = k : want(k) = 1 : ELSE : want(k) =
0
357 END IF
358 END FOR k
359 END DEFINE
360 DEFINE PROCEDURE get_fidnames
361 LOCAL lin,col,struct
362 DIM f_type(fmax),rel_pos(fmax),f_name$(fmax,13
),x$(fmax,255)
363 CLS
364 fldct=0 : fct = 0 : numfld = 0 : file_ip = 0
365 PRINT rcvr$; " - Database Field names - Enter i
n CORRECT order"
366 LET wrong = 1
367 REPEAT s_f_loop
368 AT 10,10:prompt "Fieldnames from the keyboard
or a file (k/f): "
369 IF yn$=="f"
370 AT 12,4 : prompt "Enter device/file name conta
ining field names: "
371 IF NOT (* * INSTR yn$) : yn$ = ipdvc$ & yn$
372 wrong = FOP_IN(7,yn$) : LET file_ip = 1
373 ELSE
374 LET file_ip = 0 : LET wrong = 0 : END IF
375 IF NOT wrong : EXIT s_f_loop
376 AT 14,10 : PRINT "File not found"
377 END REPEAT s_f_loop
378 AT 3,0 : CLS 2
379 REPEAT name_loop
380 IF file_ip
381 IF EOF(7) : EXIT name_loop
382 INPUT #7,yn$
383 IF yn$(1 TO 5)=="proc" : NEXT name_loop
384 IF yn$(1 TO 7)=="create" : NEXT name_loop
385 IF yn$(1 TO 9)=="endcreate" : EXIT name_loop
386 IF yn$(LEN(yn$))=CHR$(13)
387 yn$ = yn$(1 TO LEN(yn$)-1) : END IF
388 ELSE
389 AT 18,10 : CLS 3 : prompt "Enter the name of t
he field: "
390 END IF
391 AT 19,0 : CLS 3
392 IF NOT LEN(yn$) : EXIT name_loop

```

```

393 IF LEN(yn$) > 13
394 AT 19,10 : PRINT yn$; " - Name too long" : NEXT
name_loop
395 END IF
396 IF fldct = fmax
397 fldct = 0 : PRINT "Too many fields - amend fma
x control"
398 EXIT name_loop : END IF
399 fldct = fldct + 1
400 IF yn$(LEN(yn$)) = "$"
401 f_name$(fldct)=yn$
402 f_type(fldct) = 1
403 ELSE
404 numfld = numfld + 1
405 rel_pos(numfld) = fldct
406 f_name$(fldct)=yn$
407 f_type(fldct) = 0
408 END IF
409 LET lin = (fldct-1) DIV 5 : LET col = (fldct-1
) MOD 5
410 AT lin+2,col+15 : PRINT yn$
411 IF fldct-1 : PRINT #6,c;q;q;yn$;q$; : ELSE : P
RINT #6,q;q;yn$;q$;
412 END REPEAT name_loop
413 PRINT #6
414 IF file_ip : CLOSE #7
415 REPEAT force_ans
416 AT 18,10 : CLS 3 : prompt "Are these correct (
y/n): "
417 IF yn$=="y" OR yn$=="n" : EXIT force_ans
418 END REPEAT force_ans
419 IF NOT fldct : yn$ = "n"
420 IF yn$=="n" : quit = 1 : RETURN
421 AT 0,0 : PRINT rcvr$; " - Translation Diagnosti
cs - contents in order of names"
422 AT 1,0 : PRINT "Characters read:": AT 1,51 : PR
INT "Records copied:"
423 OPEN #4,scr_36x10a444x26 : PAPER #4,npap : INK
#4,nink
424 OPEN #7,scr_36x10a134x26 : PAPER #7,npap : INK
#7,nink
425 osl = 10 * (lin+3)
426 linmax = 19 - (lin+3)
427 WINDOW 448,200-osl,32,16+osl

```

```

428 npap = 2 : nink = 7 : hpap = 0 : hink = 7
429 PAPER npap : INK nink : CLS
430 fct = 0 : struct = 0
431 REPEAT posn_loop
432 fct = fct + 1
433 IF fct > fldct : EXIT posn_loop
434 IF f_type(fct)
435 struct = struct + 1
436 rel_pos(numfld+struct) = fct
437 END IF
438 END REPEAT posn_loop
439 END DEFINE
440 DEFINE PROCEDURE bld_string
441 LET fct = 0
442 LET xout$ = ""
443 REPEAT str_loop
444 LET fct = fct + 1
445 IF fct > fldct : EXIT str_loop
446 IF fct = 1
447 xout$ = x$(fct)
448 ELSE
449 xout$ = xout$ & ", " & x$(fct)
450 END IF
451 END REPEAT str_loop
452 END DEFINE
453 DEFINE PROCEDURE prompt (text$)
454 REPEAT drain : LET yn$=INKEY$ : IF NOT LEN(yn$
) : EXIT drain
455 END REPEAT drain
456 PRINT text$; : PAPER hpap : INK hink : INPUT y
n$
457 PAPER npap : INK nink
458 END DEFINE
459 DEFINE PROCEDURE load_data
460 DIM int_tab$(m,sl),frac_tab$(m,sl),stack$(m
,sl),bit(9),want(m)
461 RESTORE
462 READ int_count
463 FOR i = 1 TO int_count
464 READ int_tab$(i) : END FOR i
465 READ frac_count
466 FOR i = 1 TO frac_count
467 READ frac_tab$(i) : END FOR i
468 END DEFINE

```

| | | | | |
|------------------------------|-----------------------------|-----------------------------|-----------------------------|------------------------------|
| 469 DATA 55 | 503 DATA *0000008589934592* | 537 DATA *0004882812500000* | 517 DATA *0140737488355328* | 551 DATA *0000000298023223* |
| 470 DATA *0000000000000001* | 504 DATA *0000017179869184* | 538 DATA *0002441406250000* | 518 DATA *0281474976710656* | 552 DATA *0000000149011612* |
| 471 DATA *0000000000000002* | 505 DATA *0000034359738368* | 539 DATA *0001220703125000* | 519 DATA *0562949953421312* | 553 DATA *0000000074505806* |
| 472 DATA *0000000000000004* | 506 DATA *0000068719476736* | 540 DATA *0000610351562500* | 520 DATA *1125899906842624* | 554 DATA *0000000037252903* |
| 473 DATA *0000000000000008* | 507 DATA *0000137438953472* | 541 DATA *0000305175781250* | 521 DATA *2251799813685248* | 555 DATA *0000000018626451* |
| 474 DATA *0000000000000016* | 508 DATA *0000274877906944* | 542 DATA *0000152587890625* | 522 DATA *4503599627370496* | 556 DATA *0000000009313226* |
| 475 DATA *0000000000000032* | 509 DATA *0000549755813888* | 543 DATA *0000076293945313* | 523 DATA *9007199254740992* | 557 DATA *0000000004656613* |
| 476 DATA *0000000000000064* | 510 DATA *0001099511627776* | 544 DATA *0000038146972656* | 524 DATA *9999999999999999* | 558 DATA *0000000002328306* |
| 477 DATA *0000000000000128* | 511 DATA *0002199023255552* | 545 DATA *0000019073486328* | 525 REMark | 559 DATA *0000000001164153* |
| 478 DATA *0000000000000256* | 512 DATA *0004398046511104* | 546 DATA *0000009536743164* | 526 DATA 55 | 560 DATA *0000000000582077* |
| 479 DATA *0000000000000512* | 513 DATA *0008796093022208* | 547 DATA *0000004768371582* | 527 DATA *5000000000000000* | 561 DATA *0000000000291038* |
| 480 DATA *0000000000001024* | 514 DATA *0017592186044416* | 548 DATA *0000002384185791* | 528 DATA *2500000000000000* | 562 DATA *00000000000145519* |
| 481 DATA *0000000000002048* | 515 DATA *0035184372088832* | 549 DATA *0000001192092891* | 529 DATA *1250000000000000* | 563 DATA *0000000000072760* |
| 482 DATA *0000000000004096* | 516 DATA *0070368744177664* | 550 DATA *0000000596046446* | 530 DATA *0625000000000000* | 564 DATA *0000000000036380* |
| 483 DATA *0000000000008192* | 517 DATA *0140737488355328* | 551 DATA *0000000298023223* | 531 DATA *0312500000000000* | 565 DATA *000000000018190* |
| 484 DATA *0000000000016384* | 518 DATA *0281474976710656* | 552 DATA *0000000149011612* | 532 DATA *0156250000000000* | 566 DATA *0000000000009095* |
| 485 DATA *0000000000032768* | 519 DATA *0562949953421312* | 553 DATA *000000074505806* | 533 DATA *0078125000000000* | 567 DATA *000000000004547* |
| 486 DATA *0000000000065536* | 520 DATA *1125899906842624* | 554 DATA *000000037252903* | 534 DATA *0039062500000000* | 568 DATA *0000000000002274* |
| 487 DATA *0000000000131072* | 521 DATA *2251799813685248* | 555 DATA *000000018626451* | 535 DATA *0019531250000000* | 569 DATA *000000000001137* |
| 488 DATA *00000000000262144* | 522 DATA *4503599627370496* | 556 DATA *0000000009313226* | 536 DATA *0009765625000000* | 570 DATA *0000000000000568* |
| 489 DATA *00000000000524288* | 523 DATA *9007199254740992* | 557 DATA *0000000004656613* | 537 DATA *0004882812500000* | 571 DATA *0000000000000284* |
| 490 DATA *0000000001048576* | 524 DATA *9999999999999999* | 558 DATA *0000017179869184* | 538 DATA *0002441406250000* | 572 DATA *0000000000000142* |
| 491 DATA *0000000002097152* | 525 REMark | 559 DATA *0000034359738368* | 539 DATA *0001220703125000* | 573 DATA *0000000000000071* |
| 492 DATA *0000000004194304* | 526 DATA 55 | 560 DATA *0000068719476736* | 540 DATA *0006103515625000* | 574 DATA *0000000000000036* |
| 493 DATA *0000000008388608* | 527 DATA *5000000000000000* | 561 DATA *0000137438953472* | 541 DATA *0000305175781250* | 575 DATA *0000000000000018* |
| 494 DATA *000000001677216* | 528 DATA *2500000000000000* | 562 DATA *0000274877906944* | 542 DATA *0000152587890625* | 576 DATA *0000000000000009* |
| 495 DATA *0000000033554432* | 529 DATA *1250000000000000* | 563 DATA *0000076293945313* | 543 DATA *0000076293945313* | 577 DATA *0000000000000004* |
| 496 DATA *0000000067108864* | 530 DATA *0625000000000000* | 564 DATA *0000038146972656* | 544 DATA *0000038146972656* | 578 DATA *0000000000000002* |
| 497 DATA *0000000134217728* | 531 DATA *0312500000000000* | 565 DATA *0000019073486328* | 545 DATA *0000019073486328* | 579 DATA *0000000000000001* |
| 498 DATA *0000000268435456* | 532 DATA *0156250000000000* | 566 DATA *0000009536743164* | 546 DATA *0000009536743164* | 580 DATA *0000000000000000* |
| 499 DATA *0000000536870912* | 533 DATA *0078125000000000* | 567 DATA *0000004768371582* | 547 DATA *0000004768371582* | 581 DATA *0000000000000000* |
| 500 DATA *0000001073741824* | 534 DATA *0039062500000000* | 568 DATA *0000002384185791* | 548 DATA *0000002384185791* | |
| 501 DATA *0000002147483648* | 535 DATA *0019531250000000* | 569 DATA *0000001192092891* | 549 DATA *0000001192092891* | |
| 502 DATA *0000004294967296* | 536 DATA *0009765625000000* | 570 DATA *0000000596046446* | 550 DATA *0000000596046446* | |

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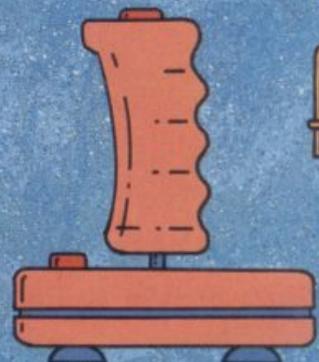
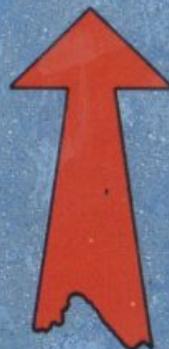
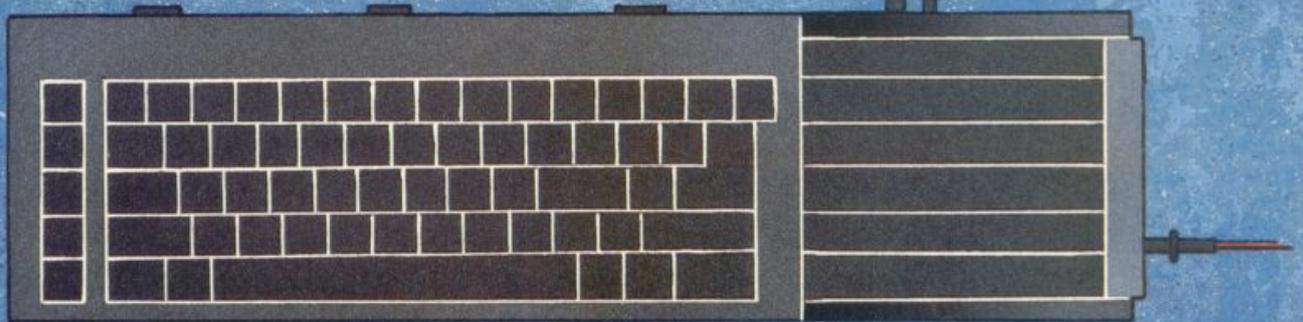
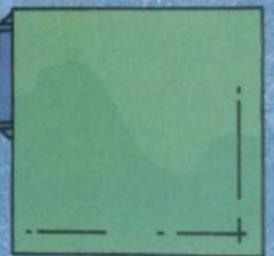
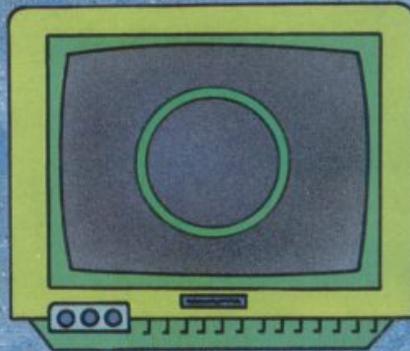
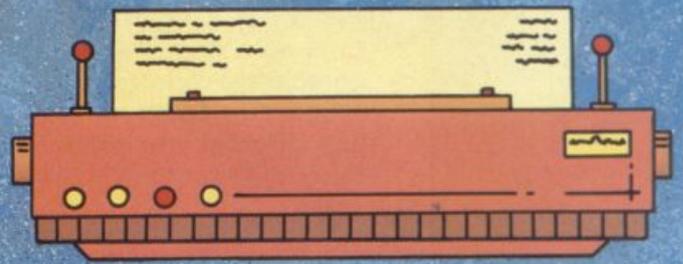
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Centronics Interface
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Serial to parallel
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Plug-in-and-go junction box type
printer interface
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Resolution:
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Bandwidth:
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Signal:
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Product:
Centronics printer interface
Type:
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Description:
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BR3 2EZ
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Product:
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Product:
Philips 7502 Monitor
Type:
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OF DISKS

Colin Opie presents a two part
in depth exposé of disk and
microdrive storage.

It has happened to us all at some time. Everything is going smoothly, we've just reached the last line of a 10,000 word masterpiece, carefully saving and overwriting every ten minutes or so and then . . . Tragedy! 'Bad or changed Medium' raises its ugly head. At this point it is immaterial whether we own a shiny new disk drive until, or are still persevering with the Microdrives, the cold sweat still appears as panic sets in. 'Where is our program?' we ask, 'Surely there must be a way of getting it back? Oh please, please, there must be!' Next comes the realisation of the full horror of it all - we've got to start all over again (groan).

If this scenario is alien to you at the moment, then watch out, you're probably well overdue for some similar calamity to occur. However, there is an answer other than sending your QL to instant oblivion with a single blow - sector editing and rebuilding. And that's where this two part series comes in. It's been designed to lead you into the intricacies of file storage formats on both microdrives and disks.

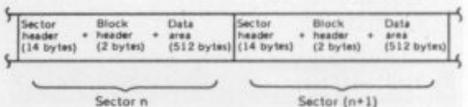
In the first part we look at the theory of how microdrives are formatted, and how files are saved on them. Three machine code extensions to SuperBasic are supplied that will help you to experiment with, patch or save microdrive sectors. Two of them enable reading and writing microdrive sectors directly to and from a single dimension string array. These routines are adapted from a much larger library of utilities and

programs for supporting Microdrive and disk media operations. The full suite is marketed (as a complete package) by Digital Precision, and the two adapted routines are included here (with permission).

The third is a simple display routine that will print a given number in hexadecimal format. This was originally developed for the book *QL Assembly Language Programming*. Some of the technical parts of the text are taken from *QL Interfacing and Hardware*; both books being published by McGraw-Hill (again extracts are included with permission). Finally, we look at a few examples and utility programs related to the recovery of deleted files and files on a corrupted microdrive cartridge.

Microdrive Format

The microdrive cartridge storage format is extremely uniform and compact. Although the optimum can never be achieved, due to tape splicing and so on, a tape 'FORMAT' operation will create a numbered sequence of good sectors up to a maximum of 256 (see Figure 1). Looking at



things a little simplistically, each sector can be thought of as containing three blocks of information:

- 1. A Sector header**
The sector header for each sector is recorded once (at FORMAT time), and once only. It is fourteen bytes long and contains the following data:
 - \$00 Code \$FF (Identifier byte)
 - \$01 Sector number (0-255)
 - \$02 Ten byte medium title (specified at FORMAT time)
 - \$0C 16-bit random numberThis header is used by QDOS in order to determine if the medium in the drive has been changed. As the data exists at the head of every good sector, the check can be very quick.



ILLUSTRATION BY ROY INGRAM

SAND DRIVES

2. A block header

The block header for a sector is written each time a data write operation is performed on that sector. It is two bytes long and contains the 'File number' (0-255) and the 'Block number' (0-255) associated with the data stored in the sector. As an aside, the QDOS routines that enable us to read and write sector data also manipulate the block header data. Data and block headers are inseparable in this respect.

3. A data area

Each sector created on a tape cartridge is capable of storing 512 bytes of data. When reading a sector of data the appropriate QDOS routine will also return the file and block number associated with that sector. Conversely, when writing a sector of data the appropriate QDOS routine needs to know what file and block number are to be associated with that data.

There are three main ways in which the data in a sector is organised, depending on whether the sector in question is the 'mapping' sector, a sector containing directory data, or just a simple data sector. Files are also stored with their own header data that is related to the corresponding directory entry. These structures are vital to our 'inside' handling of the tapes, so we will look at these next.

Any file that is to be stored on a tape must be stored in physical sectors. So, the system splits the file into 512 byte blocks and writes each block, or part block in the case of the last one, into a free sector. Each file saved is given a number that is used as an index into the directory. Initially, saved files are allocated numbers from unity upwards (ie, 1, 2, 3, ...). If three sectors are required to be saved (for example, file number six), at the end of the operation there would be three sectors with block headers of <6,0> <6,1> and <6,2>.

The directory of a cartridge is handled by QDOS in the same way as a user file. The only difference is that, normally, only QDOS has access to this file.

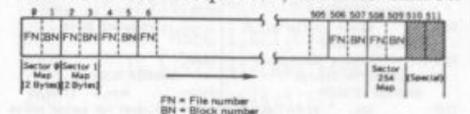
All files are stored with a 64 byte header that contains essential pertinent data about that file:

- \$00** 32-bit integer holding file length (bytes). The file length includes the header.
- \$04** File access key byte.
- \$05** File type byte.
- \$06** File information (8 bytes).
- \$0E** 16-bit integer holding file name length.
- \$10** File name (ASCII). Max 36 bytes.
- \$34-** (Reserved).

The file access byte is normally set to zero. The file type code is zero for data files or SuperBasic programs, or unity for executable programs. In this latter case the first four bytes of the file information field contain the default size of the data space for that program. Note that the existence of this header means that only 440 bytes of the actual file can be stored in the first sector block (block 0). Any subsequent blocks can contain a full 512 bytes.

The Mapping Sector

Sector zero is special, and is called



the 'mapping' sector. It maps logical file storage onto physical sectors. Sector zero is split up into 256 two byte entries. The first two bytes contain the file and block number of sector zero (see Figure 2). The next two bytes contain the file and block number of sector 1, and so on. Because there can never be 256 good sectors, the last two bytes of sector zero are used by the system for other purposes. In practice we need not concern ourselves with these last few bytes. We already know that user files are saved with numbers rang-

LISTING 4

```

Microdrive Sector Handlers
McStraw-Hill (UK) 48000 Assembler v2.0
0001 4h Microdrive Sector Handlers

0002 ;
0003 ; a) SuperBASIC extensions to r
read/write Microdrive
0004 ; sectors:
0005 ;
0006 GET_MSEC d1,s1,buffer - read
d sector 's', drive 'd', into buffer
0007 PUT_MSEC d1,s1,buffer - write
sector 's', drive 'd', from buffer
0008 ;
0009 ; In both cases, 's1' and 'd1'
are integers and 'buffer' is a
0010 ; 512 byte array. 'd1' may be 1
or 2. 's1' may range from 0
0011 ; to 255. Last 2 bytes of array
hold the data for the 'block'
0012 ; and 'file' numbers for a sect
or. These are returned on a
0013 ; sector read, and used for the
sector header on writes.
0014 ;
0015 ; b) Also included in this pack
to speed up printing of hexadecimal
0016 ; numbers:
0017 ;
0018 ; ch = MHEX(a,value) - return
an 'n' digit hex string for 'value'
0019 ;
0020 ; Note that this is not needed
for Microdrive operations. It is
0021 ; simply an extension to help i
n displaying results.
0022 ;
0023 ; Copyright (c) 1985 Videa Rebus

0024 4h Constants
0027 ;
0028 ; General
0029 ;
0030 err_or = -4
0031 err_no = -6
0032 err_bo = -15
0033 at_inf = 0
0034 sd_curs = 8E
0035 sd_curs = 8F
0036 at_rclk = 813
0037 sv_vbas = 828
0038 sv_pcnt = 835
0039 bv_rip = 858
0040 ca_ithl = 8FE
0041 bp_init = 8110
0042 ca_glint = 8112
0043 ca_glin = 8118
0044 ad_read = 8124
0045 ad_writ = 8126
0046 ad_sect = 812A
0049 ; Specific to microdrive operat
ions
0050 ;
0051 pc_sclb = 1 ; microd
rive select clock bit
0052 pc_deal = 2 ; ide-sel
ect bit
0053 pc_slec = 3 ; select
bit
0054 pc_serb = 4 ; 10 = se
rial I/O
0055 serdy = 8331 ; RS232
serial mode delay

0000080 =
0056 pc_asak = 80 ; transe
it mask
0000080 =
0057 sv_toad = 8A0 ; transe
it mode byte
0000086 =
0058 sv_tiao = 8A6 ; ttimeou
t for transeit mode switching
00000E7 =
0059 pc_notad = 8E7 ; all bi
ts mask except mode control
00000EE =
0060 sv_adrun = 8EE ; microd
rive running flag

0061 ;
0062 pc_tctrl = -81E ; transe
it control offset from
00018020 =
0063 ad_ctrl = 81829 ; microd
rive control register
0064 4h Initialization

0067 ;
0068 ;
00000000 =
0069 arg 0

0070 ;
0071 ;
00000000 43FA000C
0072 sectra: lea prc_defipcl,a
; link in extensions
00000004 34780110
0073 movw.w bp_init,a2
00000008 4E92
0074 jsr (a2)
0000000A 7000
0075 movl a0,aveq (0,60)
; no errors
0000000C 4E75
0076 rts

0077 ;
0000000E 0003
0078 prc_def: defw 3
; (2 really, but ensure space
)
00000010 0026
0079 il: defw getsec-11
00000012 684745543F40534543
0080 defb 0, 'SET_MSEC'

0081 align
0000001C 009C
0082 21: defw putsec-21
    
```

| | | | | | | | | |
|-------------------------|------|--|------|---|------|---|------|---|
| 000001 0800534F40534543 | 0133 | move.l (a7)+,a1,a8 (rgrain SuperBASIC pointers 00000078 44FC0000 | 0186 | 00000114 4EAA4000 jst 00000118 301F | 0238 | 00000170 7000 setdvs moveq %st_inf,40 jcollect sys vars in A6 00000172 4E41 | 0292 | 00000236 720F moveq %st_inf,41 jokay, check string array 00000238 C23A8801 |
| 000002 0000002E 0000 | 0134 | move %0,sv jgo to interrupts + user mod | 0187 | move.w (a7)+,40 jsettle stack and assume 00000174 6000FF78 | 0239 | trap %1 00000176 2C48 move.l %0,a8 00000178 02E0EE | 0293 | 00000240 6442 move.l 4(a8),a11,a1 00000242 0C010001 |
| 000003 0000002A 0001 | 0135 | bra no_err jall okay | 0188 | bra all_okay 0192 4B MHE19 function | 0240 | 0000017A 2C48 move.l %0,a8 0000017C 02E0EE | 0294 | 00000244 287A8804 move.l 4(a8),a11,a1 00000246 4442 |
| 000004 0000002C 00F2 | 0136 | Transmission error | 0189 | 0000011E 34780118 move.w %0,ca_glint,a2 jget too long integers 00000122 4E92 | 0241 | 0000017E 007C0040 or.w %0,sv jswitch off interrupts 00000180 4100003A | 0295 | 00000248 4442 move.l 4(a8),a11,a1 00000250 0C7A0028C064 |
| 000005 0000002E 0001 | 0137 | 00000042 2A7A01FE 0140 error: move.l bufptr(pc),a5 00000044 44FC003C | 0190 | 00000124 4644 move.l %0,ca_glint,a2 jget two long integers 00000128 4E92 | 0242 | 00000178 46FA move.l %0,sv jwait for R5232 to complete 00000182 267C0001B020 | 0296 | 00000254 4442 move.l 4(a8),a11,a1 00000256 0C7A0028C064 |
| 000006 00000030 0001 | 0138 | 00000046 44FC0054 00000048 44FC0054 | 0191 | 00000126 4644 move.l %0,ca_glint,a2 jget two long integers 00000130 4E92 | 0243 | 0000017A 46FA move.l %0,sv jwait for R5232 to complete 00000184 267C0001B020 | 0297 | 00000260 4442 move.l 4(a8),a11,a1 00000262 0C7A0028C064 |
| 000007 00000032 0002 | 0139 | 0000004E 44FC0054 00000050 44FC0054 | 0192 | 00000128 4644 move.l %0,ca_glint,a2 jget two long integers 00000132 4E92 | 0244 | 0000017C 007C0040 or.w %0,sv jswitch off interrupts 00000186 4100003A | 0298 | 00000266 4442 move.l 4(a8),a11,a1 00000268 0C7A0028C064 |
| 000008 00000034 0001 | 0140 | 00000052 44FC0054 00000054 44FC0054 | 0193 | 0000012A 4644 move.l %0,ca_glint,a2 jget two long integers 00000134 4E92 | 0245 | 0000017E 007C0040 or.w %0,sv jswitch off interrupts 00000190 4100003A | 0299 | 00000270 4442 move.l 4(a8),a11,a1 00000272 0C7A0028C064 |
| 000009 00000036 0001 | 0141 | 00000056 44FC0054 00000058 44FC0054 | 0194 | 0000012C 4644 move.l %0,ca_glint,a2 jget two long integers 00000136 4E92 | 0246 | 00000180 007C0040 or.w %0,sv jswitch off interrupts 00000192 4100003A | 0300 | 00000274 4442 move.l 4(a8),a11,a1 00000276 0C7A0028C064 |
| 000010 00000038 0001 | 0142 | 0000005A 44FC0054 0000005C 44FC0054 | 0195 | 0000012E 4644 move.l %0,ca_glint,a2 jget two long integers 00000138 4E92 | 0247 | 00000182 007C0040 or.w %0,sv jswitch off interrupts 00000194 4100003A | 0301 | 00000278 4442 move.l 4(a8),a11,a1 00000280 0C7A0028C064 |
| 000011 0000003A 0001 | 0143 | 0000005E 44FC0054 00000060 44FC0054 | 0196 | 00000130 4644 move.l %0,ca_glint,a2 jget two long integers 00000132 4E92 | 0248 | 00000184 007C0040 or.w %0,sv jswitch off interrupts 00000196 4100003A | 0302 | 00000282 4442 move.l 4(a8),a11,a1 00000284 0C7A0028C064 |
| 000012 0000003C 0001 | 0144 | 00000062 44FC0054 00000064 44FC0054 | 0197 | 00000132 4644 move.l %0,ca_glint,a2 jget two long integers 00000134 4E92 | 0249 | 00000186 007C0040 or.w %0,sv jswitch off interrupts 00000198 4100003A | 0303 | 00000286 4442 move.l 4(a8),a11,a1 00000288 0C7A0028C064 |
| 000013 0000003E 0001 | 0145 | 00000066 44FC0054 00000068 44FC0054 | 0198 | 00000134 4644 move.l %0,ca_glint,a2 jget two long integers 00000136 4E92 | 0250 | 00000188 007C0040 or.w %0,sv jswitch off interrupts 00000200 4100003A | 0304 | 00000290 4442 move.l 4(a8),a11,a1 00000292 0C7A0028C064 |
| 000014 00000040 0001 | 0146 | 0000006A 44FC0054 0000006C 44FC0054 | 0199 | 00000136 4644 move.l %0,ca_glint,a2 jget two long integers 00000138 4E92 | 0251 | 0000018A 007C0040 or.w %0,sv jswitch off interrupts 00000202 4100003A | 0305 | 00000294 4442 move.l 4(a8),a11,a1 00000296 0C7A0028C064 |
| 000015 00000042 0001 | 0147 | 0000006E 44FC0054 00000070 44FC0054 | 0200 | 00000138 4644 move.l %0,ca_glint,a2 jget two long integers 0000013A 4E92 | 0252 | 0000018C 007C0040 or.w %0,sv jswitch off interrupts 00000204 4100003A | 0306 | 00000298 4442 move.l 4(a8),a11,a1 00000300 0C7A0028C064 |
| 000016 00000044 0001 | 0148 | 00000072 44FC0054 00000074 44FC0054 | 0201 | 0000013A 4644 move.l %0,ca_glint,a2 jget two long integers 0000013C 4E92 | 0253 | 0000018E 007C0040 or.w %0,sv jswitch off interrupts 00000206 4100003A | 0307 | 00000302 4442 move.l 4(a8),a11,a1 00000304 0C7A0028C064 |
| 000017 00000046 0001 | 0149 | 00000076 44FC0054 00000078 44FC0054 | 0202 | 0000013E 4644 move.l %0,ca_glint,a2 jget two long integers 00000140 4E92 | 0254 | 00000190 007C0040 or.w %0,sv jswitch off interrupts 00000208 4100003A | 0308 | 00000306 4442 move.l 4(a8),a11,a1 00000308 0C7A0028C064 |
| 000018 00000048 0001 | 0150 | 0000007A 44FC0054 0000007C 44FC0054 | 0203 | 00000140 4644 move.l %0,ca_glint,a2 jget two long integers 00000142 4E92 | 0255 | 00000192 007C0040 or.w %0,sv jswitch off interrupts 00000210 4100003A | 0309 | 00000310 4442 move.l 4(a8),a11,a1 00000312 0C7A0028C064 |
| 000019 0000004A 0001 | 0151 | 0000007E 44FC0054 00000080 44FC0054 | 0204 | 00000142 4644 move.l %0,ca_glint,a2 jget two long integers 00000144 4E92 | 0256 | 00000194 007C0040 or.w %0,sv jswitch off interrupts 00000212 4100003A | 0310 | 00000314 4442 move.l 4(a8),a11,a1 00000316 0C7A0028C064 |
| 000020 0000004C 0001 | 0152 | 00000082 44FC0054 00000084 44FC0054 | 0205 | 00000144 4644 move.l %0,ca_glint,a2 jget two long integers 00000146 4E92 | 0257 | 00000196 007C0040 or.w %0,sv jswitch off interrupts 00000214 4100003A | 0311 | 00000318 4442 move.l 4(a8),a11,a1 00000320 0C7A0028C064 |
| 000021 0000004E 0001 | 0153 | 00000086 44FC0054 00000088 44FC0054 | 0206 | 00000146 4644 move.l %0,ca_glint,a2 jget two long integers 00000148 4E92 | 0258 | 00000198 007C0040 or.w %0,sv jswitch off interrupts 00000216 4100003A | 0312 | 00000322 4442 move.l 4(a8),a11,a1 00000324 0C7A0028C064 |
| 000022 00000050 0001 | 0154 | 0000008A 44FC0054 0000008C 44FC0054 | 0207 | 00000148 4644 move.l %0,ca_glint,a2 jget two long integers 0000014A 4E92 | 0259 | 0000019A 007C0040 or.w %0,sv jswitch off interrupts 00000218 4100003A | 0313 | 00000326 4442 move.l 4(a8),a11,a1 00000328 0C7A0028C064 |
| 000023 00000052 0001 | 0155 | 0000008E 44FC0054 00000090 44FC0054 | 0208 | 0000014A 4644 move.l %0,ca_glint,a2 jget two long integers 0000014C 4E92 | 0260 | 0000019C 007C0040 or.w %0,sv jswitch off interrupts 00000220 4100003A | 0314 | 00000330 4442 move.l 4(a8),a11,a1 00000332 0C7A0028C064 |
| 000024 00000054 0001 | 0156 | 00000092 44FC0054 00000094 44FC0054 | 0209 | 0000014C 4644 move.l %0,ca_glint,a2 jget two long integers 0000014E 4E92 | 0261 | 0000019E 007C0040 or.w %0,sv jswitch off interrupts 00000222 4100003A | 0315 | 00000334 4442 move.l 4(a8),a11,a1 00000336 0C7A0028C064 |
| 000025 00000056 0001 | 0157 | 00000096 44FC0054 00000098 44FC0054 | 0210 | 0000014E 4644 move.l %0,ca_glint,a2 jget two long integers 00000150 4E92 | 0262 | 000001A0 007C0040 or.w %0,sv jswitch off interrupts 00000224 4100003A | 0316 | 00000338 4442 move.l 4(a8),a11,a1 00000340 0C7A0028C064 |
| 000026 00000058 0001 | 0158 | 0000009A 44FC0054 0000009C 44FC0054 | 0211 | 00000150 4644 move.l %0,ca_glint,a2 jget two long integers 00000152 4E92 | 0263 | 000001A2 007C0040 or.w %0,sv jswitch off interrupts 00000226 4100003A | 0317 | 00000342 4442 move.l 4(a8),a11,a1 00000344 0C7A0028C064 |
| 000027 0000005A 0001 | 0159 | 0000009E 44FC0054 000000A0 44FC0054 | 0212 | 00000152 4644 move.l %0,ca_glint,a2 jget two long integers 00000154 4E92 | 0264 | 000001A4 007C0040 or.w %0,sv jswitch off interrupts 00000228 4100003A | 0318 | 00000346 4442 move.l 4(a8),a11,a1 00000348 0C7A0028C064 |
| 000028 0000005C 0001 | 0160 | 000000A2 44FC0054 000000A4 44FC0054 | 0213 | 00000154 4644 move.l %0,ca_glint,a2 jget two long integers 00000156 4E92 | 0265 | 000001A6 007C0040 or.w %0,sv jswitch off interrupts 00000230 4100003A | 0319 | 00000350 4442 move.l 4(a8),a11,a1 00000352 0C7A0028C064 |
| 000029 0000005E 0001 | 0161 | 000000A6 44FC0054 000000A8 44FC0054 | 0214 | 00000156 4644 move.l %0,ca_glint,a2 jget two long integers 00000158 4E92 | 0266 | 000001A8 007C0040 or.w %0,sv jswitch off interrupts 00000232 4100003A | 0320 | 00000354 4442 move.l 4(a8),a11,a1 00000356 0C7A0028C064 |
| 000030 00000060 0001 | 0162 | 000000AA 44FC0054 000000AC 44FC0054 | 0215 | 00000158 4644 move.l %0,ca_glint,a2 jget two long integers 0000015A 4E92 | 0267 | 000001AA 007C0040 or.w %0,sv jswitch off interrupts 00000234 4100003A | 0321 | 00000358 4442 move.l 4(a8),a11,a1 00000360 0C7A0028C064 |
| 000031 00000062 0001 | 0163 | 000000AE 44FC0054 000000B0 44FC0054 | 0216 | 0000015A 4644 move.l %0,ca_glint,a2 jget two long integers 0000015C 4E92 | 0268 | 000001AC 007C0040 or.w %0,sv jswitch off interrupts 00000236 4100003A | 0322 | 00000362 4442 move.l 4(a8),a11,a1 00000364 0C7A0028C064 |
| 000032 00000064 0001 | 0164 | 000000B2 44FC0054 000000B4 44FC0054 | 0217 | 0000015C 4644 move.l %0,ca_glint,a2 jget two long integers 0000015E 4E92 | 0269 | 000001AE 007C0040 or.w %0,sv jswitch off interrupts 00000238 4100003A | 0323 | 00000366 4442 move.l 4(a8),a11,a1 00000368 0C7A0028C064 |
| 000033 00000066 0001 | 0165 | 000000B6 44FC0054 000000B8 44FC0054 | 0218 | 0000015E 4644 move.l %0,ca_glint,a2 jget two long integers 00000160 4E92 | 0270 | 000001B0 007C0040 or.w %0,sv jswitch off interrupts 00000240 4100003A | 0324 | 00000370 4442 move.l 4(a8),a11,a1 00000372 0C7A0028C064 |
| 000034 00000068 0001 | 0166 | 000000BA 44FC0054 000000BC 44FC0054 | 0219 | 00000160 4644 move.l %0,ca_glint,a2 jget two long integers 00000162 4E92 | 0271 | 000001B2 007C0040 or.w %0,sv jswitch off interrupts 00000242 4100003A | 0325 | 00000374 4442 move.l 4(a8),a11,a1 00000376 0C7A0028C064 |
| 000035 0000006A 0001 | 0167 | 000000BE 44FC0054 000000C0 44FC0054 | 0220 | 00000162 4644 move.l %0,ca_glint,a2 jget two long integers 00000164 4E92 | 0272 | 000001B4 007C0040 or.w %0,sv jswitch off interrupts 00000244 4100003A | 0326 | 00000378 4442 move.l 4(a8),a11,a1 00000380 0C7A0028C064 |
| 000036 0000006C 0001 | 0168 | 000000C2 44FC0054 000000C4 44FC0054 | 0221 | 00000164 4644 move.l %0,ca_glint,a2 jget two long integers 00000166 4E92 | 0273 | 000001B6 007C0040 or.w %0,sv jswitch off interrupts 00000246 4100003A | 0327 | 00000382 4442 move.l 4(a8),a11,a1 00000384 0C7A0028C064 |
| 000037 0000006E 0001 | 0169 | 000000C6 44FC0054 000000C8 44FC0054 | 0222 | 00000166 4644 move.l %0,ca_glint,a2 jget two long integers 00000168 4E92 | 0274 | 000001B8 007C0040 or.w %0,sv jswitch off interrupts 00000248 4100003A | 0328 | 00000386 4442 move.l 4(a8),a11,a1 00000388 0C7A0028C064 |
| 000038 00000070 0001 | 0170 | 000000CA 44FC0054 000000CC 44FC0054 | 0223 | 00000168 4644 move.l %0,ca_glint,a2 jget two long integers 0000016A 4E92 | 0275 | 000001BA 007C0040 or.w %0,sv jswitch off interrupts 00000250 4100003A | 0329 | 00000390 4442 move.l 4(a8),a11,a1 00000392 0C7A0028C064 |
| 000039 00000072 0001 | 0171 | 000000CE 44FC0054 000000D0 44FC0054 | 0224 | 0000016A 4644 move.l %0,ca_glint,a2 jget two long integers 0000016C 4E92 | 0276 | 000001BC 007C0040 or.w %0,sv jswitch off interrupts 00000252 4100003A | 0330 | 00000394 4442 move.l 4(a8),a11,a1 00000396 0C7A0028C064 |
| 000040 00000074 0001 | 0172 | 000000D2 44FC0054 000000D4 44FC0054 | 0225 | 0000016C 4644 move.l %0,ca_glint,a2 jget two long integers 0000016E 4E92 | 0277 | 000001BE 007C0040 or.w %0,sv jswitch off interrupts 00000254 4100003A | 0331 | 00000398 4442 move.l 4(a8),a11,a1 00000400 0C7A0028C064 |
| 000041 00000076 0001 | 0173 | 000000D6 44FC0054 000000D8 44FC0054 | 0226 | 0000016E 4644 move.l %0,ca_glint,a2 jget two long integers 00000170 4E92 | 0278 | 000001C0 007C0040 or.w %0,sv jswitch off interrupts 00000256 4100003A | 0332 | 00000402 4442 move.l 4(a8),a11,a1 00000404 0C7A0028C064 |
| 000042 00000078 0001 | 0174 | 000000DA 44FC0054 000000DC 44FC0054 | 0227 | 00000170 4644 move.l %0,ca_glint,a2 jget two long integers 00000172 4E92 | 0279 | 000001C2 007C0040 or.w %0,sv jswitch off interrupts 00000258 4100003A | 0333 | 00000406 4442 move.l 4(a8),a11,a1 00000408 0C7A0028C064 |
| 000043 0000007A 0001 | 0175 | 000000DE 44FC0054 000000E0 44FC0054 | 0228 | 00000172 4644 move.l %0,ca_glint,a2 jget two long integers 00000174 4E92 | 0280 | 000001C4 007C0040 or.w %0,sv jswitch off interrupts 00000260 4100003A | 0334 | 00000410 4442 move.l 4(a8),a11,a1 00000412 0C7A0028C064 |
| 000044 0000007C 0001 | 0176 | 000000E2 44FC0054 000000E4 44FC0054 | 0229 | 00000174 4644 move.l %0,ca_glint,a2 jget two long integers 00000176 4E92 | 0281 | 000001C6 007C0040 or.w %0,sv jswitch off interrupts 00000262 4100003A | 0335 | 00000414 4442 move.l 4(a8),a11,a1 00000416 0C7A0028C064 |
| 000045 0000007E 0001 | 0177 | 000000E6 44FC0054 000000E8 44FC0054 | 0230 | 00000176 4644 move.l %0,ca_glint,a2 jget two long integers 00000178 4E92 | 0282 | 000001C8 007C0040 or.w %0,sv jswitch off interrupts 00000264 4100003A | 0336 | 00000418 4442 move.l 4(a8),a11,a1 00000420 0 |

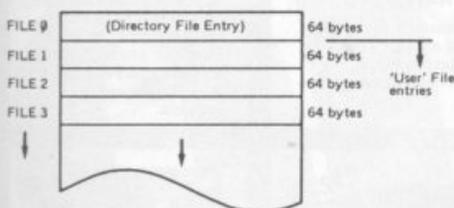
ing from unity upwards. There are some other 'files' that the system knows about and which will be found on viewing the mapping sector.

- \$00 — The directory file.
- \$F8 — The mapping file (ie. sector 0, 1 block long!!)
- \$FC — The block is pending a delete operation, you should never see this at this level.
- \$FD — The block (sector) is unused.
- \$FE — The block (sector) is bad.
- \$FF — The block (sector) does not exist.

Note that this explains the two messages the QL produces on formatting a cartridge and then immediately doing a directory operation on it. When a cartridge is formatted a message of the form '202/206 sectors' appears. This means that 206 sectors could be created and 202 of them were verified as being good ones. If a directory is requested, the medium's title is given followed by (in this case) '200/202 sectors'. This means that out of the 202 good sectors that exist, 200 of them are left for our use (ie. 100kbytes of storage). The reason why we are 2 down before even starting is because the directory file (file 0) always exists and starts off just one block/sector long, and the mapping sector (file \$F8) always exists and is always just one block long.

The Directory File

QDOS creates and maintains a directory file on each cartridge. It has a file header the same as any other file. Every time a new file is saved, an entry is made in the directory file. If the directory file runs out of space in its current block, another sector will be allocated if possible, or a 'directory full' message will appear. Each new entry in the directory file is in fact the 64 byte file header that is also stored at the beginning of each file (Figure 3). The important point is that file numbers (below \$F8) are an index into the directory file.



The position of the directory entry for any file is given as:

file_number * 64. Now you can see why the 'internal' directory file is file zero. The position in the directory file of the entry for the directory file is '0 * 64 = 0'. That is, at the very beginning. We know that at the beginning of every file there is a file header that has the same form as the directory

entry. In the case of the directory file it is simply that the file header and the directory entry are one and the same bit of stored data (if that doesn't 'shiver yer timbers' then nothing will!).

SuperBasic Extensions

There are three extensions to the SuperBasic language, the assembler source and object listing being shown in Figure 4. Their use is explained at the top of the source listing. Assuming you have an Assembler, simply create a copy of the source file, assemble it, and create a code file on

MDV1_ called 'MDRIVE_CODE'. The following short program is then used to extend SuperBasic whenever you need to.

```
10 base=RESPR(900)
20 LBYTES mdv1_mdriVe_
   code,base
30 CALL base
```

If you don't have an Assembler (or you do but you prefer to use a known working copy) then all the necessary files and programs in this article can be obtained by using the QL User 'Microdrive Exchange'.

These extensions, together with the theory presented above, enable

LISTING 5

```
115 DIM sz$(514),bf$(514),de$(514),m
   $(256)
120 bf=0:de=0: fno=0:dptr=0
125 CLS:PRINT 'File recovery program
   '
130 PRINT 'Cartridge must be in MDV1_
   '\
135 INPUT 'Name of file to recover? '
   ;f$
140 GET_MSEC 1,0,sz$: fno=dir_entry
145 IF NOT(fno)
150 PRINT 'Cannot find ';f$: STOP
155 ELSE
160 PRINT 'Was file number ';fno
165 END IF
170 scan_drive(fno)
175 update_dir: update_map
180 PRINT 'All okay - recovered <';f$
   ;>'
185 STOP
190 :
195 DEFine FuNction dir_entry
200 LOCAL blk,m,ptr,found: blk=0
205 de=find_dblk(blk)
210 IF de
215 GET_MSEC 1,de,de$: found=0
220 FOR m=0 TO 7
225 ptr=m*64+16+1
230 IF de$(ptr TO ptr+LEN(f$)-
   1)=f$
235 found=1:EXIT m
240 END IF
245 END FOR m
250 IF found
255 RETURN blk*8+m
260 ELSE
265 blk=blk+1: GO TO 205
270 END IF
275 ELSE
280 RETURN 0
285 END IF
290 END DEFine
295 :
300 DEFine FuNction find_dblk(bn)
305 LOCAL m
310 FOR m=1 TO 511 STEP 2
315 IF sz$(m)=CHR$(0)
320 IF sz$(m+1)=CHR$(bn)
325 RETURN (m-1)/2:END DEFi
   ne
330 END IF
335 END IF
340 END FOR m
345 RETURN 0
350 END DEFine
355 :
360 DEFine PROCedure scan_drive(fnum
   )
365 LOCAL m,sct,c,base
370 FOR m=1 TO 256: m$(m)=CHR$(0)
375 FOR sct=1 TO 254
380 PRINT 'Scanning sector ';sct
385 IF sz$(sct*2+1)=CHR$(253)
390 GET_MSEC 1,sct,bf$
395 IF bf$(514)=CHR$(fnum)
400 c=CODE(bf$(513))
405 m$(sct+1)=CHR$(c+1)
410 IF c=0: base=sct: END IF
   '
415 PRINT ' - found block ';
   c
420 END IF
425 END IF
430 END FOR sct
435 GET_MSEC 1,base,bf$
440 END DEFine
445 :
450 DEFine PROCedure update_dir
455 dptr=1+((fno MOD 8)*64)
460 de$(dptr TO dptr+15)=bf$(1 TO 16
   )
465 PRINT 'Updating directory file'
470 PUT_MSEC 1,de,de$
475 END DEFine
480 :
485 DEFine PROCedure update_map
490 LOCAL lp
495 FOR lp=1 TO 256
500 IF (m$(lp)<>CHR$(0))
505 sz$(lp*2-1)=CHR$(fno)
510 sz$(lp*2)=CHR$(CODE(m$(lp)
   )-1)
515 END IF
520 END FOR lp
525 PRINT 'Updating mapping sector'
530 PUT_MSEC 1,0,sz$
535 END DEFine
```

us to start having some fun (if that is what you call trying to recover one of your precious files!). Perhaps the most straightforward example is that of recovering a deleted file.

Instant Restoration

Fortunately for us, QDOS performs few changes to a cartridge when a file is deleted. The main point to remember is that we can only successfully restore one or more deleted files to the directory if no file saving has been performed since the delete(s) took place. Clearly, if a file has been saved since a delete, there is no reason to suppose that it would not use up a deleted file's directory entry, and/or some sectors used to store the original file.

First of all, let's think of what happens when a file is saved. A file number is allocated to it, which if multiplied by 64 will provide a pointer to the start of the directory entry in the directory file. Sufficient sectors will have been allocated to store the file and each of these sectors will have been given a block header containing the file number and the relevant block number (from zero onwards).

When a file is deleted the following happens. The first 16 bytes of the directory entry are filled with zeros. This has the important attribute that the file name still exists in the direc-

tory, it's just that the DIR command will fail to see it. Second, the mapping sector entries for the erased file are returned to the pool of free ones by being filled with the data word \$FD00 (ie, file \$FD:empty:block0). These are the only two operations performed. So, as already noted, we still have the name in the directory. Just as importantly, we still have all the saved data sectors for the file intact, together with their stored block headers.

The listing given in *Figure 5* is a SuperBasic program that will recover a deleted file on a microdrive cartridge. First the program sets off to find the specified file name in the directory file. If found, its file number is returned and another procedure 'scan_drive' is used to scan through all the data sectors collecting sector and block numbers of all sectors relating to that file number. Only 'empty' (ie, empty as far as the mapping file is concerned) sectors are scanned. The process is quite slow, about 25 minutes for an almost empty microdrive, but is obviously quicker the fuller the cartridge is. In any event it is usually quicker than trying to rewrite your work from scratch. The sector scanner returns block zero of the deleted file and the first 16 bytes of this block are then used to update the directory file to its original status.

Last, but far from least, the mapping sector is updated by replacing all the appropriate references to used sectors. It is unlikely that QDOS will have noticed (due to internal buffering) that we have changed the directory, so to see your previously deleted file appear in its full glory simply reset the QL and then perform a directory. Magic, eh?

Cure For Bad Mediums

This is a bit more tricky. The main problem is trying to sort out what has happened. Is it a totally corrupted mapping sector that is causing the error, or is it a bad file sector somewhere. Note that QDOS normally complains only if it gets a duff sector or, for some reason, the file and block numbers supplied by the mapping sector do not agree with those found in the block header of the corresponding data sector. Let's explore a few avenues.

No matter what else we will try and do, the basis of our recovery attempts is the mapping and use of the individual sectors. If we think that the mapping sector may be OK, the program in *Figure 6* will be fine. This simple program scans the mapping sector for used sectors and lists the entire mapping of a cartridge. If we don't trust the mapping sector (and wish to recreate a suitable 'good' one), the procedure 'scan_drive' can

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LISTING 6

```

140 prt=0:CLS:PRINT 'Microdrive mapp
er:
150 PRINT 'Cartridge must be in MDV1_
'\
160 INPUT 'Copy to printer (y/n)? ';
r$
170 IF r$(<)'y':GO TO 220:ELSE :prt=1
180 INPUT 'Printer channel spec.? '
;r$
190 IF r$(1 TO 3)<)'ser':GO TO 210
200 INPUT 'Baud Rate? ':r: BAUD r
210 OPEN#3,r$
220 scan_drive(prt)
230 PRINT 'Finished.'
240 IF prt=1:PRINTE3,'Finished.':CLO
SEE3
250 STOP
260 :
270 DEFine PROCedure scan_drive(p)
280 LOCAl sct,c: DIM sz$(514),bf$(51
4)
290 GET_MSEC 1,0,sz$
300 FOR sct=1 TO 254
310 PRINT 'Sector ';sct;TO 12; ' -
';
320 IF prt=1
330 PRINTE3,'Sector ';sct;TO 12;
340 END IF
350 c=CODE(sz$(sct*2+1))
360 SElect ON c
370 =0:PRINT 'directory file'
380 IF prt=1:PRINTE3,'directory
file'
390 =253:PRINT 'empty'
400 IF prt=1:PRINTE3,'empty'
410 =254:PRINT 'bad sector'
420 IF prt=1:PRINTE3,'bad sector
'
430 =255:PRINT '<null>'
440 IF prt=1:PRINTE3,'null'
450 =REMAINDER :
460 GET_MSEC 1,sct,bf$
470 PRINT 'file ';CODE(bf$(514));
480 PRINT ' block ';CODE(bf$(513
))
490 IF prt=1
500 PRINTE3,'file ';CODE(bf$(51
4));
510 PRINTE3,' block ';CODE(bf$
(513))
520 END IF
530 END SElect
540 END FOR sct
550 END DEFine

```

be changed so that all sectors are scanned.

Once we have the mapping of the cartridge we can check that the block numbers for any one file are contiguous. If not, the missing ones are almost certainly corrupt sectors. Either way, our recovery attempt is reasonably straightforward. We will now know which sectors hold which files and also the appropriate order of the sectors to read (ie, the order is by block number). We could now write a simple program to open up a channel on another 'good' device, read the appropriate order of sectors from the bad cartridge, and write the sector data to the output channel. We must remember two things here. First, the output channel will not require the 64 byte header from our block zero. Second, we must only write the data to the output channel, that is, the first 512 bytes of our buffer array.

Clearly if we had missing blocks in a sector sequence for a file, we had better skip those sectors when transferring our data to another medium. The point about our recovery attempt under these circumstances is that we want to get back as much as we can! If it really was the mapping sector that went west, we ought to still be able to recover all of our original files.

Next Month we'll turn our attention to the slightly trickier medium of floppy disks.

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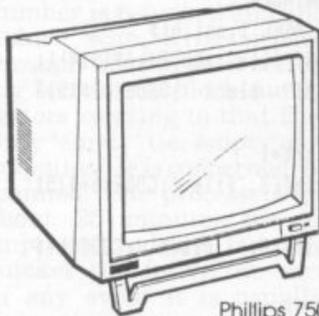
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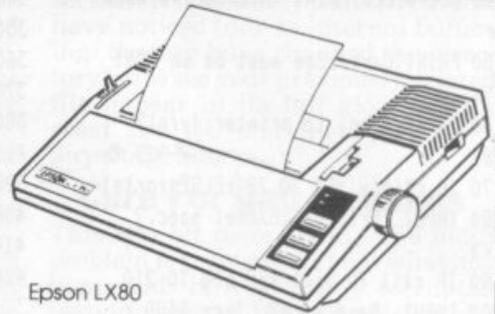
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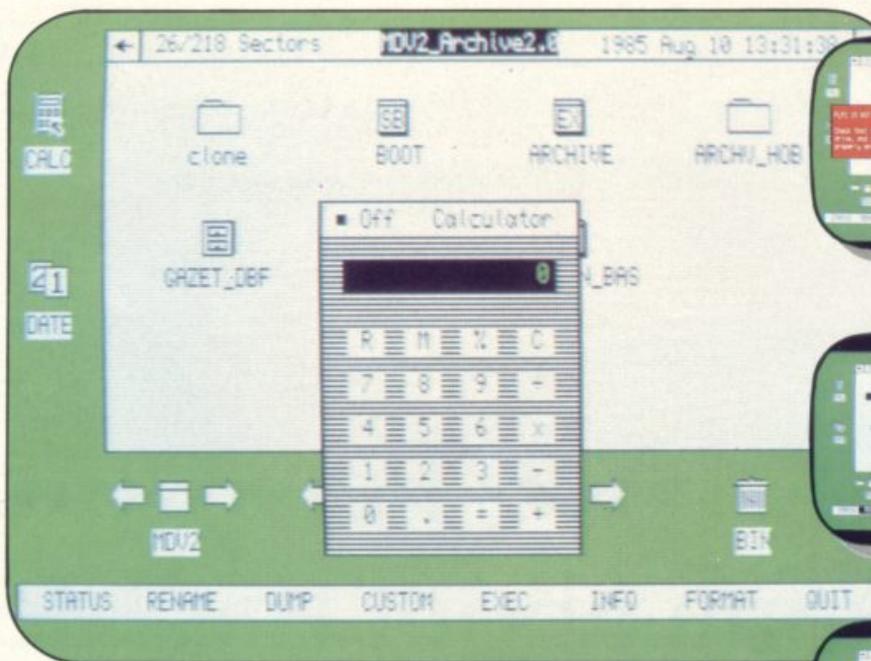
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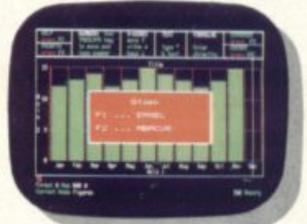
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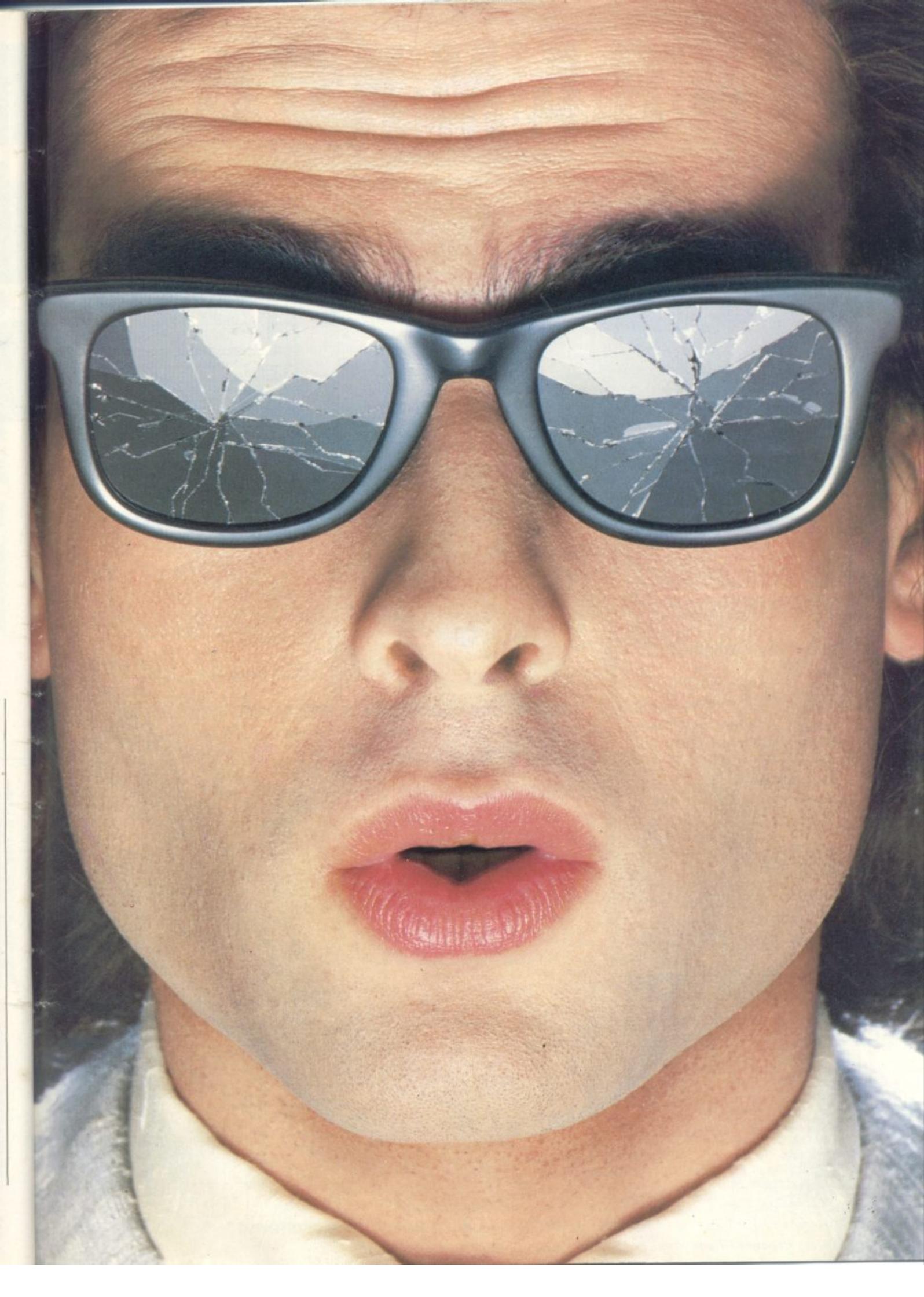
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BOOKMARKS.

Nicky Trevett reviews selected books for the QL and computing in general.

Books about the QL computer, and indeed all Sinclair micros, already abound, but books about the man behind the home computer revolution are few and far between. Rodney Dale attempts to redress the balance with his *The Sinclair Story*, published by Gerald Duckworth & Co at £9.95.

It is a rare compliment to find yourself the subject of a biography in your own lifetime, and certainly Sir Clive should find little to distress him in this friendly, admiring (but not blinkered) look at his life and inventions.

After the first chapter, dealing with family, childhood and early activities like editing *Practical Wireless*, the narrative moves on to the setting up of the first company, Sinclair Radionics, and starts to gather pace. It makes truly fascinating reading, filling in the gaps in a story that most of us thought we already knew.

Here is the history of Sinclair hi-fi, the rise and fall of the pocket calculator, the miniature television, and of course the microcomputers. As episode follows episode, Sir Clive himself tends to fade into the background and attention is focussed on the companies and the progress of the often shaky but always spectacular and innovative projects.

It is entertaining and immensely readable, and whatever you might think about the Black Watch disaster or the unreliability of the calculators, you emerge at the end (as the author intends) with no doubt at all that in his own way, the ever-optimistic Sir Clive is a genius, if sometimes a rather tragic

genius. And the ending is, inevitably, shadowed by the failure of the C5 and the financial troubles besetting Sinclair Research.

The 68000 chip has undoubtedly seized the imagination of assembly language programmers, for here is yet another book especially for them.

68000 Machine Code Programming by David Barrow is published by Collins at £12.95, and aims to impart just about everything the assembly language programmer needs to know about the 68000 family, including the "massive" 68020.

The book is loosely divided into four parts. There's a section dealing with the internal architecture of the processors, a large chapter devoted to assembly language programming in a general way, which includes some useful hints, and two chapters looking at instructions and addressing modes. Several routines are provided in the course of this part of the book which should also prove handy.

The last section, comprising well over half the book, is the reference section, tables of registers, instructions and so on.

It's a serious treatment of a highly technical subject, and certainly not for newcomers to machine code. But it's competent and as comprehensive as a book of this size (230 pages) can be, and particularly useful for anyone wanting to upgrade their programming from the earlier chips to the 68020.

The C programming language has deservedly established itself as a fashion, and next is a book that aims to teach you all about it. *C Primer Plus* by Mitchell Waite, Stephen Prata and Donald Martin, published by Pitman Publishing and costing (take a deep breath) £18.50, looks and sounds dauntingly like a text book. It is also large and very heavy. But don't let this put you off; it claims as early as the front cover to be a "user friendly guide" to C, and it is.

The emphasis throughout is on experimentation and practice. Some, but not very

much, programming experience is assumed. The Plus, say the authors, comes in the question and answer sections at the end of each section, the breadth of the topics covered, the fact that a look at Unix is included, and the cartoons.

For a primer, it covers impressive ground, from What is C? to using advanced structures, taking in data, operators, I/O functions, loops,



arrays and pointers on the way. There are also several appendices, dealing with keywords, C operators, data types, program flow control and more.

The book advises that you'll need access to a computer with a C compiler to make best use of it.

There are several good books on C available, but I particularly liked this one for its enthusiasm and ability to engage the interest of the reader. It is easy to read, and therefore easy to learn from, with a light touch and characters like Ichabod Bodie Marfoote infesting the text to keep you smiling. Expensive, but recommended.

And now, just for a change, a look at three recently introduced computer dictionaries jostling for space on your shelf.

The Penguin Dictionary of Computers, by Anthony Chandor and priced at £3.95, is on its third edition and has been updated, it says, to take into account such developments as the rise of personal computers. Sphere's *Dictionary of Computing* costs £4.95 and was published in 1983; reviewed here is the first

paperback version, which, ominously, does not seem to have been updated since the book first appeared in 1983. The third offering is also the smallest, the tiny pocket *Microelectronics Dictionary* by Malcolm Plant, published by Longman at £1.50.

The Penguin Dictionary, as might be expected from such an illustrious stable, is well researched and written, and pleasant to use. It's suitable for both business and home use - 'joystick' is in there, and 'spreadsheet', although it hasn't heard of integrated software, which won't please Psion.

It's certainly better than Sphere's effort, which, to do it justice, is aimed more at academics and industrial users. It adopts a much more technical approach to its definitions, is not so clearly presented, and doesn't know about such things as joysticks and spreadsheets.

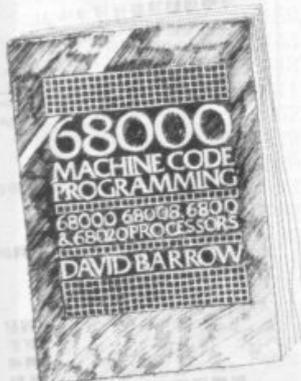
Neither dictionary could be said to be written with QL users in mind - you won't find 'microdrive' in either of them, for example.

The baby of the trio turned out to be a surprise. *Microelectronics Dictionary* covers "the science and technology of microelectronics", including space research, medicine, telecomms, computers and consumer products, but still finds room for items missing



from the two bigger dictionaries - 'dongle', for example, 'sprite graphics', even 'microdrive', at last!

Its definitions of basic computing terms tend to be less deep but also more immediately comprehensible than the opposition, and all in all, it represents good value for money.



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Romford. Software Plus, 72 North Street. Tel: 70 65271.
Southend-on-Sea. Computerama, 88 London Road. Tel: 0702 335443.
Southend-on-Sea. Computer Centre, 336 London Road. Tel: 0702 337161.
Southend-on-Sea. Estuary Personal Computers, 318 Chartistwell North, Victoria Circus Shopping Centre. Tel: 0702 614131.

GLOUCESTER
Cheltenham. Screen Scene, 144 St Georges Road. Tel: 0242 528979.
Gloucester. Boots, 38-46 Eastgate Street. Tel: 0452 423501.

HAMPSHIRE
Basinstoke. Boots, 15 Old Basing Mall. Tel: 0256 51611.
Bournemouth. Boots, 18-20 Commercial Road. Tel: 0202 21713.
Fareham. Electronequip, 36-38 West Street. Tel: 0329 230670.
Fareham. Boots, 21 Westbury Mall. Tel: 0329 232011.
Portsmouth. Micro Choice, 159 Havant Road, Drayton. Tel: 0705 327591.
Portsmouth. RDS Electrical (Portsmouth) Ltd, 157-161 Kingston Road. Tel: 0705 812478.
Portsmouth. Boots, 194, 204 Commercial Road. Tel: 0705 825248.
Southampton. Boots, 23-29 Above Bar Street. Tel: 0703 333983.
Waterlooville. GB Microland, 7 Queens Parade, London Rd. Tel: 0705 259911.

HERTFORDSHIRE
Potters Bar. The Computer Shop, 197 High Street. Tel: 0707 44417.
Stevenage. DJ Computers, 11 Town Square. Tel: 0438 65501.
Watford. SRS Microsystems, 94 The Parade, High Street. Tel: 0923 26602.
Welwyn Garden City. DJ Computers, 40 Frertherne Road. Tel: 96 28444.

HUMBERSIDE
Beverly. Computing World, 10 Swabys Yard, Dyer Lane. Tel: 0482 881831.
Grimsby. R.C. Johnson Ltd, 22 Friargate, River Head Centre. Tel: 0472 42031.
Hull. Boots, 48-58 Prospect Centre. Tel: 0482 22334.
Hull. Computer Centre, 26 Analby Road. Tel: 0482 26297.

ISLE OF MAN
Douglas. T.H. Colebound, 57-61 Victoria Street. Tel: 0624 73482.

KENT
Ashford. DGH, 10 North Street. Tel: 0233 32597.
Beckenham. Supa Computers, 425 Croydon Road. Tel: 01-650 3569.
Bromley. Boots, 148-154 High Street. Tel: 01-460 6688.
Chatham. Boots, 30-34 Wilmott Square, Pentagon Centre. Tel: 0634 405471.
Gravesend. Gravesend Home Computers, 39 The Terrace. Tel: 0474 23871.
Folkestone. Boots, 24-26 Sandgate Road. Tel: 0303 54007.
Maidstone. Boots, 56-62 King Street. Tel: 0622 53912.
Maidstone. Kent Micros, 52 Union Street. Tel: 0622 52784.
Rainham. Microway Computers, 39 High Street. Tel: 0634 376702.
Sevenoaks. Ernest Fielder Computers, Dorset Street. Tel: 0732 456800.
Shortlands. The Village House of Computers, 87 Beckenham Lane. Tel: 01-460 7122.
Sittingbourne. Computer Plus, 65 High Street. Tel: 0795 25677.
Tunbridge Wells. Boots, 7-11 Calverley Road. Tel: 0892 26486.

Tunbridge Wells. Modata Computer Centre, 28-30 St Johns Road. Tel: 0892 41555.

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Blackpool. Boots, 28-38 Bank Hey St & Victoria St. Tel: 0253 22276.
Blackpool. Blackpool Computer Store, 179 Church Street. Tel: 0253 20239.
Bolton. Computer World UK, 208 Chorley Old Road. Tel: 0204 494304.
Burnley. IMO Computer Centre, 39-43 Standish Street. Tel: 0282 54299.
Lancaster. Northern Lights, 89 Scoforth Road. Tel: 0524 62634.
Preston. 4Mat Computing, 67 Friargate. Tel: 0772 561952.
Rochdale. Boots, 50 Market Way. Tel: 0706 53225.

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Leicester. DA Computers, 104 London Road. Tel: 0533 549407.
Market Harborough. Harborough Home Computers, 7 Church Street. Tel: 0858 63056.

LONDON
W1. Computers of Wigmore Street, 104 Wigmore Street. Tel: 01486 0373.
W1. Galaxy, 230 Tottenham Court Road. Tel: 01-636 6500.
W1. Sonic Foto Micro Center, 256 Tottenham Court Road. Tel: 01-580 5826.
W1. Tomorrows World Today, 27 Oxford Street. Tel: 01-439 7799.
W1. Transam Micro Systems, 59-61 Theobalds Road. Tel: 01-405 5240.
W8. Boots, 127a Kensington High Street. Tel: 01-937 6882.
SE7. Vic Odds Micros, 6 London Bridge Walk. Tel: 01-403 1988.
SE15. Castlehurst Ltd, 152 Rye Lane, Peckham. Tel: 01-639 2205.
EC2. Devron Computer Centre, 155 Moorgate. Tel: 01-638 3339.
N14. Logic Sales, 19 The Bourne, The Broadway, So.igate. Tel: 01-882 4942.
N22. Boots, 38-40 High Road, Wood Green. Tel: 01-881 0101.
NW4. Davinci Computer Store, 112 Brent Street, Hendon. Tel: 01-202 2272.
NW4. Boots, Brent Cross Shopping Centre. Tel: 01-202 52567.
NW11. Computers Inc, 86 Golders Green. Tel: 01-209 0041.

GREATER MANCHESTER
Altrincham. Boots, 13-17 George Street. Tel: 061-928 4471.
Hyde. c Tech Computers, 184 Market Street. Tel: 061-366 8223.
Manchester. Boots, 32 Market Street. Tel: 061-832 6533.
Manchester. Mighty Micro, Sherwood Centre, 268 Wilmslow Road, Fallowfield. Tel: 061-224 8117.
Manchester. NSC Computer Shops, 29 Hanging Ditch. Tel: 061-832 2269.
Marple. Marple Computer Centre, 106 Church Lane. Tel: 061-449 9933.
Oldham. Home & Business Computers, 54 Yorkshire Street. Tel: 061-633 1608.
Oldham. Boots, 1 Town Square Shopping Centre. Tel: 061-624 2525.
Stockport. National Micro Centres, 36 St Peters Gate. Tel: 061-429 8080.

MERSEYSIDE
Liverpool. Hargreaves, 31-37 Warbreck Moor, Walton. Tel: 051-525 1782.
St Helens. Microman Computers, Rainford Industrial Estate, Mill Lane, Rainford. Tel: 0744 885242.
Southport. Boots, 31-39 Chapel Street. Tel: 0704 33907.
St Helens. Boots, 8 Church Street, 24 La Grange Arcade. Tel: 0744 25488.

MIDDLESEX
Harrow. Camera Arts, 42 St Anns Road. Tel: 01-427 5469.
Hounslow. Boots, 193-199 High Street. Tel: 01-570 0156.
Southall. Twilstar Computers Ltd, 7 Regina Road. Tel: 01-574 5271.
Teddington. Andrews, Broad Street. Tel: 01-977 4716.
Twickenham. Productive Computers Ltd, 72 Heath Road. Tel: 01-891 4991.
Uxbridge. JKL Computers, 7 Windsor Street. Tel: 0895 51815.

NORFOLK
Norwich. Adams, 125-129 King Street. Tel: 0603 22129.
Thetford. Thetford CB & Micros, 21 Guildhall Street. Tel: 0842 61645.

NOTTINGHAMSHIRE
Mansfield. Boots, 39 Four Seasons Shopping Centre, Tel: 0623 23089.

Nottingham. Boots, 11-19 Victoria Centre. Tel: 0602 470676.
Nottingham. Telstar, 280 Huntingdon Street. Tel: 0602 505585.
Worksop. Computer Graphics, 32 Bridge Street. Tel: 0909 472248.

NORTHAMPTONSHIRE
Kettering. Boots, 35 Gold Street. Tel: 0536 514675.
Northampton. Boots, 9 The Parade. Tel: 0604 22573.

NORTHUMBERLAND
Morpeth. Telerents (Northern) Ltd, 31 New Gate Street. Tel: 0607 513537.

OXFORDSHIRE
Abingdon. Ivor Fields Computers, 21 Stert Street. Tel: 0235 21207.
Banbury. Computer Plus, 2 Church Lane. Tel: 0295 55890.
Oxford. Science Studio, 7 Little Clarendon Street. Tel: 0865 54022.
Oxford. Absolute Sound and Video, 19 Old High Street, Headington. Tel: 0865 65661.

SCOTLAND
Aberdeen. Boots, 133-141 Union Street. Tel: 0224 585349.
Dundee. Boots, 49-53 High Street. Tel: 0382 21756.
Edinburgh. Boots, 101-103 Princes Street. Tel: 031-225 8331.
Edinburgh. Microworld Computer Group, 12 Leven Street. Tel: 031 228 1111.
Edinburgh. Edinburgh Computers, 51-57 Lothian Road. Tel: 031 229 4418.
Edinburgh. Silicon Centre, 7 Antigua Street. Tel: 031 557 4546.
Glasgow. Boots, 200 Sauchiehall Street. Tel: 041 332 1925.
Glasgow. Microworld Computer Group, 11 Bath Street. Tel: 041 332 1116.
Glasgow. Boots, Union Street and Argyle Street. Tel: 041 248 7387.
Glasgow. Tom Dixon Cameras, 15-17 Queen Street. Tel: 041-204 0826.
Glasgow. Commscot Ltd, 30 Gordon Street. Tel: 041 226 4878.
East Kilbride. Boots, 33-37 The Plaza. Tel: 035 52 20629.
Falkirk. Boots, 79-91 High Street. Tel: 0324 20535.
Hamilton. Tom Dixon Cameras, 8 Cadzow Street. Tel: 0698 283193.
Peterhead. North East Computers, 1 Ellis Street. Tel: 0779 79900.

SHROPSHIRE
Shrewsbury. Computerama, 13 Castlegate. Tel: 0743 60528.
Telford. Computer Village, 2/3 Hazeldine House, Central Square. Tel: 0952 506771.
Telford. Telford Electronics, 38 Mall 4. Tel: 0952 504911.

SOMERSET
Taunton. Boots, 64-65 High Street. Tel: 0823 76061.

STAFFORDSHIRE
Newcastle-under-Lyme. Computer Cabin, 24 The Parade, Silverdale. Tel: 0782 636911.
Stoke on Trent. Town Computer Store, 30 Town Road, Hanley. Tel: 0782 287540.
Stoke on Trent. Boots, 3-5 Market Square, Hanley. Tel: 0782 23271.

SUFFOLK
Bury St Edmunds. Boots, 11-13 Cornhill. Tel: 0284 701516.
Bury St Edmunds. The Suffolk Computer Centre, 1-3 Garland Street. Tel: 0284 705503.
Ipswich. Computer Magic, 24 Crown Street. Tel: 0473 50965.

SURREY
South Croydon. Concise Computer Consultants, 1 Carlton Road. Tel: 01-681 6842.
Croydon. The Vision Store, 53-59 High Street. Tel: 01-686 6362.
Croydon. Boots, The Mall, 12-18 Whitgift Centre. Tel: 01-688 6021.
Epsom. The Micro Workshop, 12 Station Approach. Tel: 0372 721533.
Guildford. Guildford Computer Centre, 5 The Quadrant, Bridge Street. Tel: 0483 578848.
Wallington. Surrey Micro Systems, 53 Woodcote Road. Tel: 01-647 5636.
Woking. Harpers, 71-73 Commercial Way. Tel: 0486 225657.

SUSSEX
Brighton. Boots, 129 North Street. Tel: 0273 27088.
Brighton. Gamer, 71 East Street. Tel: 0273 728681.

Bognor Regis. Bits & Bytes, High Street. Tel: 0243 867143.
Eastbourne. Boots, 15 Eastbourne Armdale Centre. Tel: 0323 27742.
Horsham. Boots, 1 Swan Walk. Tel: 0403 53053.
Horsham. Orchard Computer Centre, 34 East Street. Tel: 0403 64884.
Worthing. Boots, 48-52 Montague Street. Tel: 0903 207106.

TYNE & WEAR
Newcastle-upon-Tyne. Boots, Eldon Square. Tel: 0632 329844.
Newcastle-upon-Tyne. RE Computing, Parkway House, Front Street, 4 Lane Ends. Tel: 0970 615522.
Sunderland. Business Micro Communications Ltd, Refuge Assurance Buildings, Saint Thomas Street, West Sunniside. Tel: 0783 654916.

WALES
Aberdare. Inkey Computer Services, 70 Mill Street, The Square, Treycnon. Tel: 0685 881828.
Aberystwyth. Aberdara at Galloways, 23 Pier Street. Tel: 0382 615522.
Cardiff. Boots, 36 Queens Street & 105 Frederick Street. Tel: 0222 31291.
Cardiff. The Computer Shop, 41 The Hayes. Tel: 0222 26666.
Cardiff. Cardiff Microcomputers, 46 Charles Street. Tel: 0222 373072.
Newport. Gwent Computers, 92 Chepstow Road. Tel: 0633 841760.
Newport. Boots, 155-156 Commercial Street. Tel: 0633 51212.
Swansea. Boots, 17 St. Marys Arcade, The Quadrant Shopping Centre. Tel: 0792 43461.
Swansea. The Micro Store, 35-36 Singleton Street. Tel: 0792 46980.

WARWICKSHIRE
Coventry. Boots, 38-42 Corporation Street. Tel: 0203 26561.
Leamington Spa. Boots, 31 Parade. Tel: 0926 24945.
Leamington Spa. Leamington Hobby Centre, 121 Regent Street. Tel: 0926 29211.
Nuneaton. Micro City, 1a Queens Road. Tel: 0203 382049.
Rugby. O.E.M., 9-11 Regent Street. Tel: 0788 70522.

WEST MIDLANDS
Birmingham. Boots, City Centre House, 16-17 New Street. Tel: 021-643 7582.
Dudley. Central Computers, 35 Churchhill Precinct. Tel: 0384 238169.
Stourbridge. Walters Computer Systems, 12 Hudry Road. Tel: 0384 370811.
Walsall. New Horizon, 1 Goodall Street. Tel: 0922 24821.

WILTSHIRE
Trowbridge. West Wiltshire Micros, Whiteheart Yard. Tel: 02214 67259.

YORKSHIRE
Bradford. Boots, 11 Darley Street. Tel: 0274 390891.
Doncaster. Boots, 13-15 French Gate. Tel: 0302 62238.
Barnsley. Boots, 34-40 Cheapside. Tel: 0226 82616.
Huddersfield. Micro World Computers, 1006-1010 Manchester Road, Linthwaite. Tel: 0484 846117.
Huddersfield. Boots, 22 King Street. Tel: 0484 21756.
Leeds. Boots, 19 Albion Arcade, Bond Street Centre. Tel: 0532 33551.
Leeds. Micro Power, Northwood House, North Street. Tel: 0532 458800.
Sheffield. PIP Micro Communications, 9 Taptown Crescent, Broomhill. Tel: 0742 661096.
Sheffield. Boots, 4-6 High Street. Tel: 0742 78333.
Wakefield. Boots, 26-28 Upper Kirkgate. Tel: 0924 376181.
York. York Computer Centre, 7 Stonegate Arcade. Tel: 0904 641862.



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PUZZLE PAGE

Another teasing computer problem from Marcus Jeffery, our resident problem poser and technical author.

This month's prize problem will really get you thinking. Don't rush into anything! The solution might take you less than an hour, or could keep your micros whirring into the middle of next week, possibly next year!

A lecturer first introduced me to this problem, though in a slightly different form. You simply have to generate the series of numbers which have the form:

$$3^i 7^j \text{ where: } i \geq 0 \text{ and } j \geq 0$$

Easy isn't it? The expansion of 3^j will look like:

1, 3, 9, 27, 81, 243, 729, 2187, 6561, 19683, ...

and the expansion of 7^j will be:

1, 7, 49, 343, 2401, 16807, 117649, 823543, ...

Now, if we multiply all combinations of these numbers together, in order, we get:

1x1, 3x1, 1x7, 9x1, 3x7, 27x1, 1x49, 9x7, ...

or:

1, 3, 7, 9, 21, 27, 49, 63, ...

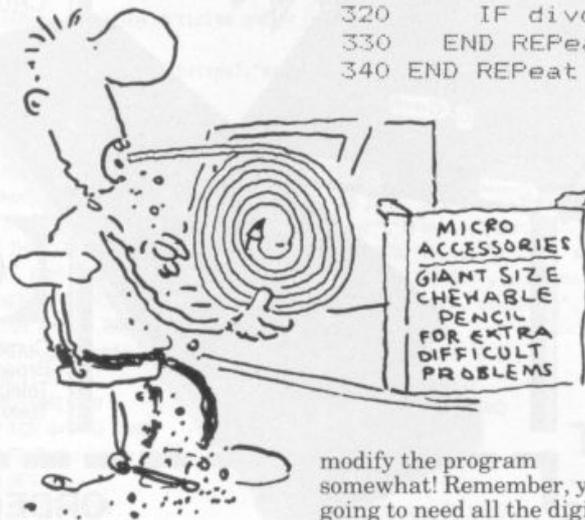
giving the series shown in Figure 1.

FIGURE 1

| Count | 9 Number |
|-------|----------|
| 1 | 1 |
| 2 | 3 |
| 3 | 7 |
| 4 | 9 |
| 5 | 21 |
| 6 | 27 |
| 7 | 49 |
| 8 | 63 |
| 9 | 81 |
| 10 | 147 |
| 11 | 189 |
| 12 | 243 |
| 13 | 343 |
| 14 | 441 |
| 15 | 567 |
| 16 | 729 |
| 17 | 1029 |
| 18 | 1323 |
| 19 | 1701 |
| 20 | 2187 |
| 21 | 2401 |
| 22 | 3087 |
| 23 | 3969 |
| . | . |
| . | . |
| . | . |

To win the prize of a free year's subscription to *QL User*, all you have to do is find the 1500th number in the series. Having found this number, add up all the digits in the number and enter the result on the form below. For instance, from Figure 1, if I'd asked for the 20th number in the series, then the result would be 18 (ie. 2+1+8+7).

If you're a budding genius, then you might want to work this out by hand, but the rest of us will undoubtedly write a program to find the answer. Feeling generous, I decided to give you the program to do it (Figure 2). The variable 'number' simply generates all odd numbers, starting at one. Then for each odd number, the 'sevens' REPEAT loop divides it by seven as many times as possible, such that it still



obtains an integer result. Having done this, the 'threes' REPEAT loop divides the result by three as many times as possible. If after all this the final result is one, then the number must be in the series, so it's printed and 'count' is updated.

If you type this in and run it, you'll begin to get the series shown in Figure 1. Were you to go away for a day or two, then you might expect to come back and find the solution waiting for you. Unfortunately, the QL can only handle integers up to 32767, which will only give you the first 33 numbers, so I'm afraid you'll have to

FIGURE 2

```

100 count=1
110 number=1 : REMark 3^0*7^0
120 REPEAT series
130 PRINT count,number
140 count=count+1
150 REPEAT divide
160 number=number+2
170 divd=number
180 REPEAT sevens
190 IF divd/7 = divd DIV 7 THEN
200 divd=divd/7
210 ELSE
220 EXIT sevens
230 END IF
240 END REPEAT sevens
250 REPEAT threes
260 IF divd/3 = divd DIV 3 THEN
270 divd=divd/3
280 ELSE
290 EXIT threes
300 END IF
310 END REPEAT threes
320 IF divd=1 THEN EXIT divide
330 END REPEAT divide
340 END REPEAT series
    
```

RULES:

All entries must be written on the panel provided on this page. Any other form of entry will be disqualified.

Entries must be sent by post to this address:

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QL User,
Priory Court,
30-32 Farringdon Lane,
London EC1R 3AU

to arrive no later than 31st January, 1986.

The winner will be the first correct entry drawn out of the Editor's hat (who said he had a big head?!).

All entries will be judged by the Editor of *QL User*, whose decision is final, and no correspondence will be entered into regarding the result.

modify the program somewhat! Remember, you're going to need all the digits in the number if you want to enter the competition.

Finally, I'd also be interested to see any elegant SuperBasic solutions to this problem, and I'll be including one or two of the most stylish when giving the results.

ENTRY FORM:

Sum of digits = _____

Name: _____

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AI

APPLICATIONS

A new series in which we begin where 'AI on the QL' left off — applications of AI theories. This month, Robert Alcock presents an automatic storyline generator — have you any other ideas?

```

100 REMark *** Quill & Swoon - PLOT
DESIGNER ***
110 REMark *** By Robert Alcock ***
120 REMark
130 REMark Title nouns
140 DATA "Romance", "Love", "Conflict", "Meeting", "Passion"
150 DATA "Destiny", "Intrigue", "Fateful Meeting", "Chance Encounter", "Emotion"
160 RESTORE 140
170 RAND=RND(1 TO 10)
180 FOR A=1 TO RAND
190 READ Titlenoun$
200 NEXT A
210 REMark
220 REMark Nationalities, national adjectives and articles
230 DATA "Australia", "Switzerland", "Austria", "Scotland", "Sweden"
240 DATA "Australian", "Swiss", "Austrian", "Scottish", "Swedish"
250 DATA "an", "a", "an", "a", "a"
260 RESTORE 240
270 RAND=RND(1 TO 5)
280 FOR A=1 TO RAND
290 READ MainNatAdj$
300 NEXT A
310 RESTORE 230
320 FOR A=1 TO RAND
330 READ MainNats$
340 NEXT A
350 RESTORE 250
360 FOR A=1 TO RAND
370 READ MainNatArt$
380 NEXT A
390 RESTORE 240
400 RAND=RND(1 TO 5)
410 FOR A=1 TO RAND
420 READ SecondNatAdj$
430 NEXT A
440 RESTORE 250
450 FOR A=1 TO RAND
460 READ SecondNatArt$
470 NEXT A
480 REMark
490 REMark Hero's names
500 DATA "Harry", "Edward", "Bill", "Theo", "Philip"
510 RESTORE 500
520 RAND=RND(1 TO 5)
530 FOR A=1 TO RAND
540 READ Heroname$
550 NEXT A
560 REMark
570 REMark Villain's names
580 DATA "Boris", "Ivan", "Sebastian", "Jules", "Kemal"
590 RESTORE 580
600 RAND=RND(1 TO 5)
610 FOR A=1 TO RAND
620 READ Vilname$
630 NEXT A
640 REMark
650 REMark Girl's names

```

```

660 DATA "Sylvia", "Joanna", "Victoria", "Alicia", "Fennella"
670 RESTORE 660
680 RAND=RND(1 TO 5)
690 FOR A=1 TO RAND
700 READ Girlname$
710 NEXT A
720 REMark
730 REMark Father's names
740 DATA "Sir", "Lord", "Duke", "Earl", "Marquis"
750 DATA "Beauchamp", "Montague", "Bodley", "Marjoribanks", "Cholmondley"
760 RESTORE 740
770 RAND=RND(1 TO 5)
780 FOR A=1 TO RAND
790 READ Dadttitle$
800 NEXT A
810 RESTORE 750
820 RAND=RND(1 TO 5)
830 FOR A=1 TO RAND
840 READ Dadname$
850 NEXT A
860 Dadname$=Dadttitle$ & " " & Dadname$
870 REMark
880 REMark Locations, articles and prepositions
890 DATA "ski lodge", "chateau", "mansion", "hospital", "beach"
900 DATA "a", "a", "a", "a", "a"
910 DATA "at", "at", "at", "in", "on"
920 RESTORE 890
930 RAND=RND(1 TO 5)
940 IF RAND=5 AND MainNat$="Switzerland" THEN GO TO 930
950 IF RAND=2 AND MainNat$="Australia" THEN GO TO 930
960 FOR A=1 TO RAND
970 READ MainLoc$
980 NEXT A
990 RESTORE 900
1000 FOR A=1 TO RAND
1010 READ MainLocArt$
1020 NEXT A
1030 RESTORE 910
1040 FOR A=1 TO RAND
1050 READ MainLocPrep$
1060 NEXT A
1070 RAND=RND(1 TO 5)
1080 RESTORE 890
1090 IF RAND=5 AND SecondNatAdj$="Swiss" THEN GO TO 1070
1100 IF RAND=2 AND SecondNatAdj$="Australian" THEN GO TO 1070
1110 FOR A=1 TO RAND
1120 READ SecondLoc$
1130 NEXT A
1140 IF SecondNatAdj$=MainNatAdj$ AND SecondLoc$=MainLoc$ THEN GO TO 1070
1150 REMark
1160 REMark Hero's profession, article
1170 DATA "doctor", "struggling artist", "novelist", "racing driver", "skier"

```

```

1180 DATA "a", "a", "a", "a", "a"
1190 RAND=RND(1 TO 5)
1200 RESTORE 1170
1210 FOR A=1 TO RAND
1220 READ Heroprof$
1230 NEXT A
1240 RESTORE 1180
1250 FOR A=1 TO RAND
1260 READ HeroprofArt$
1270 NEXT A
1280 Heroprof$=HeroprofArt$ & " " & Heroprof$
1290 REMark
1300 REMark Girl's profession, article
1310 DATA "secretary", "student", "nurse", "tennis player", "fashion designer"
1320 DATA "a", "a", "a", "a", "a"
1330 RAND=RND(1 TO 5)
1340 RESTORE 1310
1350 FOR A=1 TO RAND
1360 READ Girlprof$
1370 NEXT A
1380 RESTORE 1320
1390 FOR A=1 TO RAND
1400 READ GirlprofArt$
1410 NEXT A
1420 Girlprof$=GirlprofArt$ & " " & Girlprof$
1430 REMark
1440 REMark Villian's profession, article, adjective
1450 DATA "villanous", "scheming", "sinner", "French", "American"
1460 DATA "a", "a", "a", "a", "an"
1470 DATA "tycoon", "millionaire", "diamond smuggler", "executive", "gangster"
1480 RAND=RND(1 TO 5)
1490 RESTORE 1450
1500 FOR A=1 TO RAND
1510 READ VilAdj$
1520 NEXT A
1530 RESTORE 1460
1540 FOR A=1 TO RAND
1550 READ VilAdjArt$
1560 NEXT A
1570 RAND=RND(1 TO 5)
1580 RESTORE 1470
1590 FOR A=1 TO RAND
1600 READ Vilprof$
1610 NEXT A
1620 Vilprof$=VilAdjArt$ & " " & VilAdj$ & " " & Vilprof$
1630 REMark
1640 REMark Verb at end
1650 DATA "triumphs", "conquers all", "breaks all barriers", "unites them", "moves the earth"
1660 RAND=RND(1 TO 5)
1670 RESTORE 1650
1680 FOR A=1 TO RAND
1690 READ EndVerb$
1700 NEXT A
1710 REMark

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1720 REMark Verb, adjective of dislike
1730 DATA "loathe", "dislike", "hate", "despise", "abhor"
1740 DATA "very much", "intensely", "vehemently", "with all their hearts", "totally"
1750 RAND=RND(1 TO 5)
1760 RESTORE 1730
1770 FOR A=1 TO RAND
1780 READ HateVerb$
1790 NEXT A
1800 RAND=RND(1 TO 5)
1810 RESTORE 1740
1820 FOR A=1 TO RAND
1830 READ HateAdj$
1840 NEXT A
1850 REMark
1860 RAND=RND(1 TO 2)
1870 REMark
1880 REMark Now print the synopsis..
1890 REMark
1900 MODE 4
1910 WINDOW 512,256,0,0
1920 PAPER 8 : CLS
1930 BORDER 25
1940 PRINT Titlenoun$ ! MainLocPrep$ ! "the" ! MainNatAdj$ ! MainLoc$
1950 PRINT "by Q. L. Heartland"
1960 PRINT
1970 PRINT "(Quill & Swoon MCMCLXXXV)"
1980 PRINT
1990 PRINT Heroname$ ; ", " ! Heroprof$ ; ", " ! "and" ! Girlname$ ; ", " ! Girlprof$ ; ", "
2000 PRINT "meet" ! MainLocPrep$ ! MainLocArt$ ! MainLoc$ ! "in" ! MainNatAdj$ ; ", "
2010 PRINT "They" ! HateVerb$ ! "each other" ! HateAdj$ ; ", "
2020 PRINT "But when" ! Heroname$ ! "saves" ! Girlname$ ! "from" ! Vilname$ ; ", "
2030 PRINT Vilprof$ ; ", " ! "they find they"
2040 PRINT "love each other after all."
2050 PRINT Dadname$ ; ", father of " ;
2060 IF RAND = 2 THEN PRINT Heroname$ ; : ELSE PRINT Girlname$ ;
2070 PRINT ", refuses to let them marry."
2080 PRINT "but they escape to" ! SecondNatArt$ ! SecondNatAdj$ ! SecondLoc$ ; ", "
2090 PRINT "where their love finally" ! EndVerb$ ; ", "
2100 PRINT
2110 PRINT
2120 PRINT "Press <F1> for the next thrilling installment..."
2130 another=CODE(INKEY$(-1))
2140 IF another=232 THEN GO TO 100
2150 STOP

```

THE

P + R : O = G < S

This is the page we hand over to you. So, if you've a program that is worthy of consideration, send it to 'The Progs', QL User, Priory Court, 30-32 Farrington Lane, London EC1R 3AU. We pay for everything published at the usual rates.

Froggy — Part 2 Tony Day

For those who had the patience to type in Part 1 from our December '85 edition, here's the concluding part. For some reason we called the last part number 2 in the listing, but the resulting files should be OK.

Once you've typed in and run both parts (1 & 2), you should have two programs on microdrive called froggy1 and froggy2. To run the whole program type in the following line: **MODE 8:d=RESPR(15000):LBYTES mdv1_froggy1.d:LBYTES mdv1_froggy2.d+6500:CALL d**

Alternatively, you could enter the lines one by one as a 'boot' program and use that to run the two sections.

PUT ON MURPET

```

100 REMark **** Part1 QL Froggy ****
110 REMark **** For QL User: A Day ****
120 DIM array(5):address=RESPR(4500)
130 start=address:CLS:CLS:RESTORE :lin=1000
140 READ nwords:PRINT lin
150 IF nwords=0 THEN PRINT"Load complete":SBYTES adv2_froggy1
,start,6500:STOP
160 csu=0:FOR i=0 TO nwords-1:READ array(i):csu=csu+array(i)
:NEXT i
170 READ csu2:IF csu<csu2 THEN PRINT"Checksum error at lin e
":lin:PRINT"Correct checksum":csu=PRINT"Line of data":FOR i
=0 TO nwords-1:PRINT,array(i):":NEXT i:STOP
180 FOR i=0 TO nwords-1:POKE W address,array(i):address=address
+2:NEXT i
190 lin=lin+10:GO TO 140
1000 DATA 6,24576,2860,19002,20295,18265,11822,95820
1010 DATA 6,11843,20304,22866,18759,18516,8257,100545
1020 DATA 6,11859,11844,16729,8241,14648,13568,76889
1030 DATA 6,21061,16708,22875,23387,23387,19450,126868
1040 DATA 6,-12,8316,2,9772,31241,4629,53948
1050 DATA 6,-28100,54,18663,-1,24832,2192,17640
1060 DATA 6,19679,-1,22664,21133,20941,-24,84392
1070 DATA 6,20085,23622,21071,18247,22876,23622,129523
1080 DATA 6,21071,18247,22876,16448,16448,16448,111538
1090 DATA 6,16448,16448,16450,22848,16448,21583,110225
1100 DATA 6,20057,16452,16729,16448,16448,16448,102582
1110 DATA 6,16448,16448,14143,15931,16448,24832,104250
1120 DATA 6,6276,19450,-62,31238,8316,2,65220
1130 DATA 6,11056,31751,29184,4629,-28100,54,48574
1140 DATA 6,18663,-1,24832,2088,19679,-1,65260
1150 DATA 6,22664,21133,20942,-24,-17860,6,46861
1160 DATA 6,26118,-28164,0,1535,-11780,0,-12291
1170 DATA 6,1504,20941,-50,20085,2,14504,56986
1180 DATA 6,2,14504,0,2,26024,18663,59195
1190 DATA 6,-1,24832,6188,19962,-24,11452,62409
1200 DATA 6,2,14504,11644,2,14504,4,40660
1210 DATA 6,15740,0,8,11644,2,26024,53418
1220 DATA 6,10,29184,30212,19962,460,8316,88144
1230 DATA 6,2,4758,30740,4630,-28100,54,12084
1240 DATA 6,18663,-1,24832,1968,19679,-1,65140
1250 DATA 6,21128,18663,-1,24832,1954,19679,86255
1260 DATA 6,-1,22152,21134,20940,-38,-11780,52407
1270 DATA 6,0,1452,20939,-50,31241,8316,61898
1280 DATA 6,2,27689,29224,18663,-1,24832,100409
1290 DATA 6,1914,19679,-1,22664,20941,-16,65181
1300 DATA 6,29184,8316,2,14888,31747,31241,115378
1310 DATA 6,18663,-1,24832,1884,19679,-1,65056
1320 DATA 6,22664,20939,20941,-18,-11780,0,52800
1330 DATA 6,2392,20942,-30,19962,-192,11606,54680
1340 DATA 6,4,29185,18426,446,9916,2305,60282
1350 DATA 6,0,17003,4,5953,6,6012,28978

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1360 DATA 6,2,7,28689,20033,19962,-230,68463
1370 DATA 6,-19908,64,26368,446,-19908,16,-12922
1380 DATA 6,26168,21038,8,22678,3118,10,73020
1390 DATA 6,8,26368,404,3118,20,8,29926
1400 DATA 6,26368,394,3118,30,8,26368,56286
1410 DATA 6,384,3118,40,8,26186,7548,37284
1420 DATA 6,0,8,1174,0,7336,-19908,-11390
1430 DATA 6,2,26168,21294,8,22934,3118,73524
1440 DATA 6,9,8,26368,352,3118,19,29874
1450 DATA 6,8,26368,342,3118,29,8,29873
1460 DATA 6,26368,332,3118,255,8,26124,56205
1470 DATA 6,7548,39,8,1866,0,7336,16617
1480 DATA 6,10838,10350,4,10428,0,0,31620
1490 DATA 6,-9732,0,128,10428,0,0,824
1500 DATA 6,10428,0,0,-9732,0,1792,2488
1510 DATA 6,10428,0,0,-9732,0,128,824
1520 DATA 6,10428,0,0,15036,-21846,15228,18846
1530 DATA 6,-21846,2,-9220,0,128,15036,-15900
1540 DATA 6,-21846,15228,-21846,2,-9220,0,-37682
1550 DATA 6,1792,15036,-21846,15228,-21846,2,-11634
1560 DATA 6,-9220,0,128,15036,-21846,15228,-674
1570 DATA 6,-21846,2,13372,15000,20938,-2,27464
1580 DATA 6,24576,-296,18002,20295,18265,11822,92664
1590 DATA 6,11843,20304,22866,18759,18516,8257,100545
1600 DATA 6,11859,11844,16729,8241,14648,13568,76889
1610 DATA 6,16448,20037,22356,21583,20544,21573,122521
1620 DATA 6,20032,21315,20306,17728,16448,16478,112307
1630 DATA 6,24158,24158,24158,24158,24158,24158,144948
1640 DATA 6,24158,24158,16448,16448,16448,114108
1650 DATA 6,16448,16448,16448,16448,16448,98688
1660 DATA 6,16448,16453,20052,17746,16473,20309,107481
1670 DATA 6,21056,20033,19781,16469,21321,20039,118699
1680 DATA 6,19525,18004,16466,18759,18516,16449,107719
1690 DATA 6,20036,16467,20545,17221,23296,30728,128293
1700 DATA 6,9788,7,-24288,20939,-2,20940,27384
1710 DATA 6,-12,19679,-1,20085,0,0,39751
1720 DATA 6,0,0,0,0,0,0,0
1730 DATA 6,1686,0,2392,24576,-308,1174,29520
1740 DATA 6,0,2392,24576,-318,8302,10,34962
1750 DATA 6,21128,4654,8,18663,-1,24832,69284
1760 DATA 6,1350,19679,-1,22702,10,21038,64778
1770 DATA 6,9,13372,20000,20938,-2,19450,73767
1780 DATA 6,28,30720,6190,9,21252,-9276,48923
1790 DATA 6,6785,3118,10,9,26504,24576,61002
1800 DATA 6,-384,0,2827,3084,3341,3598,12466
1810 DATA 6,3855,19450,954,19962,460,18426,63107
1820 DATA 6,566,-10244,0,144,30217,10773,31456
1830 DATA 6,11286,-17786,28528,24832,-778,9219,55301
1840 DATA 6,10242,19962,428,-8708,0,32,21956
1850 DATA 6,11630,4,8,22926,20940,-10,55498
1860 DATA 6,11589,8,9291,10091,18,36,31033
1870 DATA 6,10091,22,40,10091,26,44,20314
1880 DATA 6,10091,30,48,14187,34,52,24442
1890 DATA 6,-26628,0,18,20938,-38,18938,13228
1900 DATA 6,844,10068,48,14188,4,52,25204
1910 DATA 6,18938,-130,10068,36,10092,4,39008
1920 DATA 6,40,14188,8,44,24582,22670,61532
1930 DATA 6,20939,-124,20085,4363,5903,2585,53751
1940 DATA 6,8207,7168,8316,2,14380,18663,56736
1950 DATA 6,-1,24832,3900,19679,-1,29184,79593
1960 DATA 6,30728,17402,-34,4625,21129,9288,83138
1970 DATA 6,31247,9404,85,85,-10756,0,30065
1980 DATA 6,128,20941,-14,18663,-1,24832,64549
1990 DATA 6,1074,19679,-1,22664,31746,10812,85974
2000 DATA 6,0,-10536,20941,-2,20942,-12,31333
2010 DATA 6,20940,-56,31754,10812,0,-15536,47914
2020 DATA 6,20941,-2,20942,-12,20085,2568,64522
2030 DATA 6,0,-21846,15420,-536,3,-22001,-28960
2040 DATA 6,256,2568,0,-21846,15420,2560,-1042
2050 DATA 6,10,0,256,2568,0,-21846,-19012
2060 DATA 6,-1281,256,-18421,9215,256,8316,-1689
2070 DATA 6,2,30620,18938,28,30720,6164,86472
2080 DATA 6,-11836,31242,12476,0,-11780,0,20102
2090 DATA 6,128,20941,-12,20085,0,14352,55494
2100 DATA 6,4096,0,0,0,0,0,4096
2110 DATA 6,0,0,0,18663,-1,29185,47847
2120 DATA 6,18426,-24,9916,2305,0,17003,47626
2130 DATA 6,4,5953,6,6012,2,7,11984
2140 DATA 6,28689,20033,-19908,64,26332,19679,74889
2150 DATA 6,-1,20085,24832,5034,17402,106,67458

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2160 DATA 6,8316,2,6680,29184,30732,29713,104627
2170 DATA 6,4625,18663,-1,24832,850,19679,68648
2180 DATA 6,-1,21129,22664,20938,-20,-11780,562930
2190 DATA 6,0,1464,20940,-32,28672,20085,71129
2200 DATA 6,0,1000,0,900,0,800,2700
2210 DATA 6,0,700,0,600,0,500,1800
2220 DATA 6,0,400,0,300,0,200,900
2230 DATA 6,0,100,0,0,0,0,100
2240 DATA 6,0,0,0,0,2570,7705,10275
2250 DATA 6,6666,7695,6154,7437,6428,3869,38249
2260 DATA 6,2570,2570,10280,10280,10280,10280,46260
2270 DATA 6,10280,10280,10280,2570,2570,2570,38550
2280 DATA 6,2570,2570,2570,2570,2570,2570,15420
2290 DATA 6,2570,4124,6417,4387,9509,9509,36516
2300 DATA 6,9509,0,256,0,4124,6417,20306
2310 DATA 6,4387,9509,9509,9509,0,9,32923
2320 DATA 6,0,4124,6417,4387,9509,9509,33946
2330 DATA 6,9509,0,8,0,4124,6417,20058
2340 DATA 6,4387,9509,9509,9509,0,7,32921
2350 DATA 6,0,4124,6417,4387,9509,9509,33946
2360 DATA 6,9509,0,6,0,4124,6417,20056
2370 DATA 6,4387,9509,9509,9509,0,5,32919
2380 DATA 6,0,4124,6417,4387,9509,9509,33946
2390 DATA 6,9509,0,4,0,4124,6417,20054
2400 DATA 6,4387,9509,9509,9509,0,3,32917
2410 DATA 6,0,4124,6417,4387,9509,9509,33946
2420 DATA 6,9509,0,2,0,4124,6417,20052
2430 DATA 6,4387,9509,9509,9509,0,1,32915
2440 DATA 6,0,0,0,0,0,0,0
2450 DATA 6,0,0,0,0,0,0,0
2460 DATA 6,0,0,0,0,0,0,0
2470 DATA 6,0,0,0,0,0,0,0
2480 DATA 6,0,0,0,0,0,0,0
2490 DATA 6,0,0,0,0,0,0,0
2500 DATA 6,0,0,0,0,0,0,0
2510 DATA 6,0,0,0,0,0,0,0
2520 DATA 6,0,0,0,0,18938,92,3116,22146
2530 DATA 6,10,5,27914,1068,10,5,29012
2540 DATA 6,21038,4,3116,10,4,27914,52084
2550 DATA 6,1068,10,4,21036,3,3116,25237
2560 DATA 6,10,3,27914,1068,10,3,29008
2570 DATA 6,21036,2,3116,10,2,27914,52080
2580 DATA 6,1068,10,2,21036,1,3116,25233
2590 DATA 6,10,1,27912,1068,10,1,29002
2600 DATA 6,21012,20085,0,0,0,0,41097
2610 DATA 6,0,18663,-1,10874,2,32088,61628
2620 DATA 6,31247,15036,0,21645,20941,-8,88861
2630 DATA 6,30720,18938,42,6164,-18372,1,37493
2640 DATA 6,26394,21764,8316,2,30681,18663,105820
2650 DATA 6,2176,24832,2960,19679,272,20616,70535
2660 DATA 6,20940,-16,19679,-1,20085,768,61455
2670 DATA 6,0,18938,840,6332,26,6524,32660
2680 DATA 6,11,2,10620,2,26940,8,6524,11,44105
2690 DATA 6,10620,2,26940,8,6524,11,44105
2700 DATA 6,12,20085,7437,6428,3850,0,37812
2710 DATA 6,0,0,2570,2570,2578,4881,12599
2720 DATA 6,4618,0,256,0,7699,5903,18476
2730 DATA 6,2602,10537,10537,10537,10537,10537,55287
2740 DATA 6,10537,11018,2570,2570,2570,2570,31835
2750 DATA 6,10537,10537,10537,10537,10539,17402,70089
2760 DATA 6,-68,29723,29184,8316,2,29064,96221
2770 DATA 6,4625,18663,-1,24832,130,19679,67928
2780 DATA 6,-1,21129,22664,20938,-20,28672,93382
2790 DATA 6,20085,17402,-80,29184,29723,8316,104630
2800 DATA 6,2,30601,4625,18663,-1,24832,78812
2810 DATA 6,19679,-1,21129,22664,20938,-18,84391
2820 DATA 6,28672,20085,17402,-90,29705,29184,124958
2830 DATA 6,8316,2,30636,4625,18663,-1,62241
2840 DATA 6,24884,19679,-1,21129,22664,20938,109293
2850 DATA 6,-18,28672,20085,17402,-304,29701,95538
2860 DATA 6,8316,2,29088,4625,18663,-1,60693
2870 DATA 6,24848,19679,-1,21129,22664,20938,109257
2880 DATA 6,-18,28672,20085,17402,8790,-15620,59311
2890 DATA 6,22,-11327,29706,4241,4457,1,27100
2900 DATA 6,2,-11780,0,128,21641,20938,30929
2910 DATA 6,-18,28672,20085,18663,-1,18938,86339
2920 DATA 6,7888,19450,7874,19962,174,7316,62664
2930 DATA 6,6804,31319,21132,6484,-1,20941,86679
2940 DATA 6,-8,6485,-1,18938,7944,19450,52808
2950 DATA 6,7844,19962,144,7316,6804,10812,52882

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2960 DATA 6,0,148,21132,6484,-1,20941,48704
 2970 DATA 6,-8,6485,-1,18938,8058,19450,52922
 2980 DATA 6,7810,19962,110,7316,6804,10812,52814
 2990 DATA 6,0,282,21132,6484,-1,20941,48818
 3000 DATA 6,-8,6485,-1,18938,8286,19450,53150
 3010 DATA 6,7776,19962,76,7316,6804,10812,52746
 3020 DATA 6,0,228,21132,6484,-1,20941,48784
 3030 DATA 6,-8,6485,-1,18938,8480,19450,53344
 3040 DATA 6,7742,19962,42,7316,6804,10812,52678
 3050 DATA 6,0,129,21132,6484,-1,20941,48685
 3060 DATA 6,-8,6485,-1,19679,-1,20085,46239
 3070 DATA 6,0,256,256,256,256,1280
 3080 DATA 6,0,2,4,6,128,130,270
 3090 DATA 6,132,134,256,258,260,262,1302
 3100 DATA 6,384,386,388,390,512,24832,26892
 3110 DATA 6,-234,18663,-1,8316,2,6282,33028
 3120 DATA 6,24832,160,8316,2,8436,24832,66578
 3130 DATA 6,184,8316,2,10378,24832,140,43852
 3140 DATA 6,8316,2,12532,24832,164,8316,54162
 3150 DATA 6,2,14474,24952,30720,19962,-100,90010
 3160 DATA 6,6166,10876,2,6262,24904,30720,78930
 3170 DATA 6,19962,-114,6166,10876,2,8200,45092
 3180 DATA 6,24888,30720,19962,-128,6166,10876,92484
 3190 DATA 6,2,10358,24872,30720,19962,-150,85764
 3200 DATA 6,6166,10876,2,12296,24856,30720,84916
 3210 DATA 6,19962,-168,6166,10876,2,14454,51292
 3220 DATA 6,24840,19679,-1,28672,20085,18938,112213
 3230 DATA 6,6866,18426,-184,-10300,13843,-9789,18862
 3240 DATA 6,31247,14996,-9220,0,128,20620,57771
 3250 DATA 6,20941,-12,20085,10812,0,13,51839
 3260 DATA 6,10300,0,54,12624,-2,21640,44616
 3270 DATA 6,20940,-8,-11780,0,18,20941,30111
 3280 DATA 6,-24,20085,10812,0,13,10300,41186
 3290 DATA 6,0,54,12624,2,21896,20940,55516
 3300 DATA 6,-8,-11780,0,238,20941,-24,9367
 3310 DATA 6,20085,17914,3336,8316,2,2056,51709
 3320 DATA 6,31745,31245,19450,2298,13330,-15108,82960
 3330 DATA 6,128,-9278,30735,12040,30209,8341,72175
 3340 DATA 6,22664,22669,20939,-8,-11780,0,54484
 3350 DATA 6,120,20940,-20,8287,20366,21642,71585
 3360 DATA 6,20941,-46,-11780,0,19,20940,31993
 3370 DATA 6,-58,20085,0,2816,2,26888,47933
 3380 DATA 6,2,26888,2816,18426,9190,17914,75236
 3390 DATA 6,7324,10300,0,861,5778,21130,45393
 3400 DATA 6,21131,20940,-8,18663,-1,18663,79388
 3410 DATA 6,-1,24832,-2754,24832,-1562,24832,70179
 3420 DATA 6,-1520,24832,-1570,19679,-1,19450,60870
 3430 DATA 6,-914,4844,3,19450,-1608,15036,38811
 3440 DATA 6,0,19450,5986,31237,6844,0,63517
 3450 DATA 6,23693,20941,-8,19450,-1024,10940,73992
 3460 DATA 6,0,0,15228,0,4,11132,26364
 3470 DATA 6,0,0,6,19450,-2010,15036,32482
 3480 DATA 6,0,24832,3440,24832,3464,24832,81400
 3490 DATA 6,3752,19450,-988,8844,0,19450,48508
 3500 DATA 6,-1684,3157,1,26136,18663,-1,46272
 3510 DATA 6,31237,19450,5902,6844,1,23693,87127
 3520 DATA 6,20941,-8,19679,-1,18663,-1,59273
 3530 DATA 6,24832,-928,24832,-268,24832,-820,72480
 3540 DATA 6,17914,9004,18426,7138,10300,0,62782
 3550 DATA 6,861,5778,21130,21131,20940,-8,69832
 3560 DATA 6,19679,-1,24832,3266,18663,-1,66438
 3570 DATA 6,24832,-1080,24832,-940,24832,-906,71570
 3580 DATA 6,24832,-1164,19450,-250,8277,24832,75977
 3590 DATA 6,1836,19679,-1,18426,-632,3093,42399
 3600 DATA 6,0,26370,21670,19450,-2768,6997,73806
 3610 DATA 6,10,11117,2,6,3093,2,14230
 3620 DATA 6,26368,1494,3093,4,26368,1486,58813
 3630 DATA 6,3093,1,26368,1456,3093,3,34014
 3640 DATA 6,26368,1448,3093,5,26368,1440,58722
 3650 DATA 6,18426,1420,29185,9916,2305,0,61252
 3660 DATA 6,17003,4,5953,6,6012,2,28980
 3670 DATA 6,7,28689,20033,19450,-364,18426,86241
 3680 DATA 6,-732,2049,3,26380,18663,-1,46362
 3690 DATA 6,24832,-1892,19679,-1,2049,7,44674
 3700 DATA 6,26112,1244,2049,2,26112,1266,56785
 3710 DATA 6,2049,1,26112,1300,2049,4,31515
 3720 DATA 6,26112,1314,28672,19450,-416,8277,83409
 3730 DATA 6,18938,-426,3220,2,6408,26410,54552
 3740 DATA 6,3220,2,8560,26402,3220,2,41406
 3750 DATA 6,1,10504,26394,3220,2,12656,26386,79162
 3760 DATA 6,3220,2,14600,26378,18426,-838,61788
 3770 DATA 6,3091,0,26480,18938,-476,3220,51253
 3780 DATA 6,2,6408,26368,1320,3220,2,37320
 3790 DATA 6,8560,26368,1338,3220,2,10504,49992
 3800 DATA 6,26368,1300,3220,2,12656,26368,69914
 3810 DATA 6,1318,3220,2,14600,26368,1280,46788
 3820 DATA 6,18938,-526,3092,1,26368,1086,48959
 3830 DATA 6,3092,3,26368,1078,3092,5,33638
 3840 DATA 6,26368,1070,3092,2,26368,1056,57956
 3850 DATA 6,3092,4,26368,1048,24832,1594,56938
 3860 DATA 6,19450,-582,8277,24832,1504,24832,78313
 3870 DATA 6,3600,24832,-918,20081,19450,-602,66443

3880 DATA 6,10325,-9732,0,640,19450,-616,20067
 3890 DATA 6,6165,10828,-18372,1,26368,446,25436
 3900 DATA 6,-18372,3,26368,438,-18372,5,-9930
 3910 DATA 6,26368,430,-18372,2,26368,444,35240
 3920 DATA 6,-18372,4,26368,436,-18372,0,-9936
 3930 DATA 6,26368,452,-18372,7,26368,442,35445
 3940 DATA 6,-18372,8,26368,634,-18372,9,-9725
 3950 DATA 6,26368,626,-18372,10,26368,618,35618
 3960 DATA 6,-18372,6,26368,644,18663,-1,27308
 3970 DATA 6,24832,-1736,24832,-1344,19450,-2612,63422
 3980 DATA 6,19962,-1648,18938,-1580,3093,0,38765
 3990 DATA 6,26138,3222,0,1500,27922,6844,65626
 4000 DATA 6,1,21012,18663,-1,24832,-1676,62831
 4010 DATA 6,19679,-1,3117,0,1,26140,48726
 4020 DATA 6,3222,0,5000,27924,21012,7036,64194
 4030 DATA 6,1,1,18663,-1,24832,-1712,41784
 4040 DATA 6,19679,-1,19679,-1,19450,-1654,57152
 4050 DATA 6,3093,6,26170,19450,-2352,21077,67444
 4060 DATA 6,30730,10812,0,-10536,20941,-2,51945
 4070 DATA 6,20940,-12,18663,-1,24832,-2726,67148
 4080 DATA 6,24832,-3652,30739,10812,0,-10536,52195
 4090 DATA 6,20941,-2,20940,-12,19679,-1,61545
 4100 DATA 6,24576,-744,18938,-2408,21292,1,61655
 4110 DATA 6,3116,0,1,26152,6508,2,35779
 4120 DATA 6,1,21780,18663,-1,24832,-4726,62803
 4130 DATA 6,18426,-2524,28689,20033,19679,-1,84302
 4140 DATA 6,19450,-2452,3093,0,26368,458,46917
 4150 DATA 6,24576,-668,19679,-1,19450,-1788,61248
 4160 DATA 6,3093,0,26172,18663,-1,18663,66590
 4170 DATA 6,-1,24832,-1978,19679,-1,24832,67363
 4180 DATA 6,-2684,18663,-1,24832,-2850,18938,56898
 4190 DATA 6,-2278,19450,-1788,11116,12,226534
 4200 DATA 6,15212,16,26,19679,-1,19679,54611
 4210 DATA 6,-1,24576,-970,28672,29184,29696,111157
 4220 DATA 6,30208,30720,31232,31444,11900,0,135804
 4230 DATA 6,0,11388,0,0,10876,0,22264
 4240 DATA 6,0,9340,0,0,9852,0,19192
 4250 DATA 6,0,8828,0,0,8316,0,17144
 4260 DATA 6,0,10364,0,0,24576,-842,34098
 4270 DATA 6,21645,3156,10816,26368,304,3157,65446
 4280 DATA 6,-22527,26368,296,24576,-384,22668,50997
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 4300 DATA 6,-22527,26368,272,24576,-408,23693,51974
 4310 DATA 6,3156,85,26112,250,3157,85,32853
 4320 DATA 6,26112,250,19450,-1142,8316,2,52988
 4330 DATA 6,3344,3093,4,26368,428,8316,61553
 4340 DATA 6,2,3360,3093,12,26368,414,33249
 4350 DATA 6,8316,2,3376,3093,20,26368,41175
 4360 DATA 6,400,8316,2,4000,3093,32,15243
 4370 DATA 6,26368,386,8316,2,3416,3093,41581
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 4400 DATA 6,18663,-1,18938,-2768,21780,18663,75275
 4410 DATA 6,-1,24832,-2814,19679,-1,18426,60121
 4420 DATA 6,-2180,22059,5,18426,-2182,22163,58291
 4430 DATA 6,18663,-1,24832,-2292,24832,-1900,64134
 4440 DATA 6,10300,0,10000,20940,-2,19679,60917
 4450 DATA 6,-1,18938,-2826,3092,0,26300,45503
 4460 DATA 6,6332,56,6508,2,1,19679,32578
 4470 DATA 6,-1,20085,17914,678,31279,13500,83455
 4480 DATA 6,0,21642,20941,-8,23693,3156,69424
 4490 DATA 6,0,26156,3157,0,26150,24576,80039
 4500 DATA 6,-640,17914,644,31279,13500,-21846,40851
 4510 DATA 6,21642,20941,-8,23693,3156,-21846,47578
 4520 DATA 6,26122,3157,-21846,26116,24576,-674,57451
 4530 DATA 6,19450,-2236,18663,-1,18426,-2980,51322
 4540 DATA 6,28689,20033,19679,-1,21269,30724,120393
 4550 DATA 6,10812,0,-15536,20941,-2,20940,37155
 4560 DATA 6,-12,17402,-1424,8273,10312,17402,51953
 4570 DATA 6,-1434,6161,-18372,1,26114,21896,34366
 4580 DATA 6,-18372,3,26114,21896,-18372,5,11274
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 4600 DATA 6,-18372,4,26114,21640,-17924,2,11464
 4610 DATA 6,6408,26426,-17924,2,8560,26436,49908
 4620 DATA 6,-17924,2,10504,26410,-17924,2,1070
 4630 DATA 6,12656,26420,-17924,2,14600,26394,62148
 4640 DATA 6,24832,654,19450,-3056,6844,56,48780
 4650 DATA 6,7021,2,1,24576,-604,24576,55172
 4660 DATA 6,-608,18938,452,31755,14524,515,65576
 4670 DATA 6,20620,20942,-8,24788,18938,434,85714
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 4690 DATA 6,-8,24768,18663,-1,24832,-618,68872
 4700 DATA 6,19450,-2438,21013,19450,-2524,23085,78036
 4710 DATA 6,4,1709,0,50,8,19679,21448
 4720 DATA 6,-1,24832,-388,24576,-688,21640,69971
 4730 DATA 6,24576,-1050,21896,24576,-1056,3117,72059
 4740 DATA 6,10,2,28160,-1250,21037,2,47961
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 4760 DATA 6,24576,-1246,3117,1,2,27904,54354
 4770 DATA 6,-1272,21293,2,1197,0,2048,23268
 4780 DATA 6,4,5820,2,18938,-2620,21036,43180
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4800 DATA 6,2,27904,-1304,21781,22957,4,71344
 4810 DATA 6,5820,2,24576,-1310,3093,50,32231
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 4840 DATA 6,0,0,0,0,0,3117,3117
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 4860 DATA 6,21933,2,24576,-1458,3117,51,48221
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 4900 DATA 6,-8,19679,-1,24576,-1304,18663,61605
 4910 DATA 6,-1,19450,152,30731,15228,-32576,32984
 4920 DATA 6,6,20621,20940,-10,19679,-1,61235
 4930 DATA 6,24576,-1334,18002,20295,18265,11822,91626
 4940 DATA 6,11843,20304,22866,18759,18516,8257,100545
 4950 DATA 6,11859,11844,16729,8241,14648,13568,76889
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 4970 DATA 6,-24561,-32705,764,2800,-24561,-32705,-110968
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 5130 DATA 6,22601,22603,20940,-8,-10244,0,55892
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 5150 DATA 6,30723,4625,5136,-31743,4226,21128,34095
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 5170 DATA 6,21129,20940,-26,-11780,0,120,30383
 5180 DATA 6,20941,-38,28672,20085,31243,17402,118305
 5190 DATA 6,-180,30721,8337,22601,22600,20940,105019
 5200 DATA 6,-8,-11780,0,120,20941,-20,9253
 5210 DATA 6,28672,20085,17402,1110,31745,31233,130267
 5220 DATA 6,8337,22665,22664,20941,-8,-11780,62819
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 5510 DATA 6,-22014,-22016,-21952,-22016,-22016,-132030
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 5610 DATA 6,-21888,-22008,-21931,-21931,-21931,-131620
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 5630 DATA 6,85,85,

5720 DATA 6,-22016,-22008,-22014,-22523,-22016,-22016,-132593
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 5780 DATA 6,85,85,85,85,85,85,510
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 5920 DATA 6,10834,-22016,-22008,-22523,10832,-22016,-66897
 5930 DATA 6,-22016,-22523,10832,-22008,-22014,-22523,-100252
 5940 DATA 6,10832,-22016,-22016,-22523,10832,-22016,-66907
 5950 DATA 6,-22016,-22523,2644,-22016,-22016,-24555,-110482
 5960 DATA 6,2644,-22008,-22016,-24555,597,-22016,-87354
 5970 DATA 6,-22008,-32683,85,-21936,-22011,85,-98468
 5980 DATA 6,85,2645,-24491,85,10832,-22016,-32860
 5990 DATA 6,-22016,-22016,10832,-22008,-22008,-22016,-99232
 6000 DATA 6,10832,-22016,-22016,-22016,10832,-21984,-66368
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 6060 DATA 6,2644,-22016,-22016,2644,-22008,-82768
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 6100 DATA 6,1,3,2,0,3,1,10
 6110 DATA 6,3,1,3,2,4,5,18
 6120 DATA 6,6,5,6,5,7,4,33
 6130 DATA 6,5,6,5,6,5,7,34
 6140 DATA 6,85,-22016,-22016,85,80,-21824,-65606
 6150 DATA 6,-22013,5,2639,10800,-22516,-24335,-55420
 6160 DATA 6,10879,-30004,-24013,-22275,10364,2572,-52477
 6170 DATA 6,-24528,10301,-24528,2572,-24528,2572,-58139
 6180 DATA 6,-24528,2572,-24528,2572,-22016,-22016,-87944
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 6260 DATA 6,-22001,-21764,-21953,-21776,-21761,-21764,-131019
 6270 DATA 6,-21953,-21761,-21761,-32555,599,-21761,-119192
 6280 DATA 6,85,85,85,85,8316,2,8658
 6290 DATA 6,1928,8828,2,28680,30775,12988,83201
 6300 DATA 6,-21761,12476,-21761,21577,21576,20940,33047
 6310 DATA 6,-14,8316,2,1926,8828,2,19060
 6320 DATA 6,2040,9788,0,209,12476,515,25028
 6330 DATA 6,12988,-32576,-11268,0,128,-11780,-42508
 6340 DATA 6,0,128,20939,-22,28672,20085,69802
 6350 DATA 6,8316,2,0,10300,0,8192,26810
 6360 DATA 6,8380,0,0,22600,20940,-10,51910
 6370 DATA 6,28672,20085,8316,2,2056,30831,89962
 6380 DATA 6,30235,8380,85,85,22664,20939,82388
 6390 DATA 6,-10,-11780,0,16,20940,-22,9144
 6400 DATA 6,28672,20085,-21846,-21846,-21846,-38627
 6410 DATA 1,-21846,-21846
 6420 DATA 1,-21846,-21846
 6430 DATA 1,-21846,-21846
 6440 DATA 1,-21846,-21846
 6450 DATA -1

Pentathlete A Didcock

At the risk of repeating ourselves (this is turning out to be a bit of an epic), we'll have one final attempt at putting the record straight.

The November listing of Pentathlete is correct, albeit a little confused. What happened is that we included a set-up screen within the listing that is not needed for running the game.

So, if you've typed in lines 1-32180, all you need to do is delete two segments for the program to run. These are at the beginning and end of the listing, that is; lines 1, 3, 4, 5, 6, 7 and all lines from 31999 to the end.

The final program should begin with 10 hiscore = 0 and end with 30000 DATA 5,1,6,4,3,2. Hopefully this ends the Pentathlete saga — apologies for the muddle and December's 'half-attempt' to correct it (which is best ignored). We hope you can all now enjoy the game.

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 GETN & GETS Allow you to edit variables on screen. MCUR Moves the cursor up down left or right. TAB Moves the cursor to the given column no (left or right). FONT Allows you to reset the font address. Makes user designed graphics possible. RMODE returns the current display mode. DUMP dumps 1 or more lines from the screen to the printer. BVAR returns address of Basic Variables. PLUS HI RES SCREEN DUMP to printer at the touch of a key.

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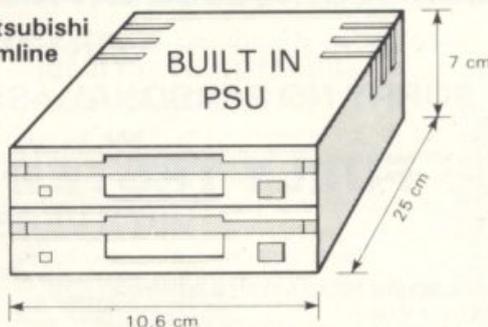


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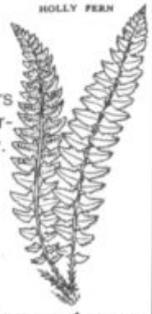
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TOOLKIT TOURNAMENT

Whatever the computer and how-ever extensive the language and operating system, it never seems to have just the commands you really need. Given the flexibility of QL QDOS, it's a fairly simple matter to add your own extensions to Super-Basic, assuming you have the time and ability to program in 68000 machine code. The rest either have to make do with what they've got or invest in one of the excellent TOOL-KIT packages available.

We decided to take a look at a couple of well-established toolkits. We also have details of a new extension package called Giga-Basic.

The first of the packages we examined is Super 'B', written by Adam Denning and marketed by HiSoft. We'll also be looking at the Qjump QL-Toolkit, written by Tony Tebby, and marketed by Sinclair Research, including some information on Tony's new toolkit.

TOOLS ON ROM

Place the cartridge into the micro-drive, press F1 or F2 and go make a pot of tea. Not so with Super 'B', which is supplied in the form of an EPROM, plugging into the ROM socket at the rear of the machine. This is far better than microdrive storage for this type of product, and it's unlikely that it will have to compete with any other ROMS, which tend to be languages, when you're using SuperBasic.

Figure 1 shows the additional commands available from Super 'B'. Though similar in many ways to the Qjump QL-Toolkit, Super 'B' contains far more extensive commands in the areas of screen graphics and general utilities. Having said this, it's difficult to understand the use of the bit-manipulation commands, though Adam Denning claims frequent use of them. The two linked-list functions are fairly redundant, being far too brief to be of any real use in list processing. The High Score Table games routines are quite novel, but I'm sure games programmers could manage to implement

Marcus Jeffery compares two QL Toolkits with some interesting results — striking similarities and very few differences.

their own high score table, which is not time-critical, and would be far happier to see some more generally useful game routines.

A very similar package is the Qjump QL-Toolkit. Figure 2 shows how much these two overlap. The Qjump product tends to concentrate far more on the file-handling and stream control features, rather than the more general and graphics features of Super 'B'. It also suffers from being supplied on microdrive, requiring loading, and reducing the amount of available RAM. Both of these packages are aimed at the more serious programmer, providing access to advanced QDOS features through SuperBasic. The choice between them is mainly up to the user's specific requirements. Probably the most useful additional command on the QL-Toolkit, missing from the HiSoft product, is the on-screen SuperBasic editor.

The story behind QL-Toolkit is that it was originally supplied to Sinclair (well over a year ago) for inclusion in updated QL ROMs. These should have been available by April 1985, but never materialised. Instead, the extensions were marketed as a toolkit, though actually obtaining copies isn't easy. Unless you're lucky enough to find a dealer selling them, the most likely course is to send for the toolkit via mail order, though this appears doubtful.

The good news is that Tony Tebby is nearing completion on Toolkit Version II, which will be marketed in Europe by Qsoft and in England by Care Electronics. This new version will be in a 16K ROM format, and should contain many extra commands. These include vastly increased file handling commands, an extended on-screen editor and PRINT_USING for fixed format out-

put. There are also new commands, such as DO, which will execute a file of direct commands and a numeric/string array sort routine. It is hoped that the ROM version will be available by mid-December, and disk/Microdrive versions will follow early in 1986.

Finally, GigaBASIC is a new package of SuperBasic extensions from ABC Electronic. Very different from the previous two toolkits. GigaBASIC is designed for the more general games and small business applications programmer. There are extensive sprite commands, allowing definition, saving and loading, moving, animation and sprite-to-sprite collision detection. In fact, the only feature which appears to be missing is sprite-to-background detection. In addition, there are a number of Macintosh-style menu utilities. These allow for definition and placement of pull-down menus using either the cursor keys or mouse. In addition, there are also a number of more general commands, tending to overlap with the other toolkits, including fill-any-irregular shape, file handling, function key definition, digital/analogue clocks, an on-screen editor, Epson printer hard copy routine and font definition.

A spin-off from the pull-down menus in this toolkit is a package called EASE (Easily Applicable System Environment), which is a complete desk-top environment, similar to ICE from Eidersoft.

All of these products can be recommended for use with the QL. The choice lies mainly with the user's applications. The new GigaBASIC extensions are ideal for users wanting to write their own games programs or menu-driven business packages, remembering that they'll only be for your own use, or anybody else with a copy of GigaBASIC. The more established toolkits are aimed at the more serious programmer, who has just found out that QDOS doesn't give all the necessary facilities for an advanced development environment.

FIGURE ONE: HISOFT SUPER 'B' EXTENSIONS

JOB CONTROL

ACJOB - Activate a job.
 CJOB# - Create a job.
 DLEN - Return default data space length of file.
 JOB - Return TRUE if job is present.
 JOBS - Give details of present jobs.
 KJOB - Kill a job.
 PJOB - Set job priority.
 RELJOB - Release a job from suspension.
 SJOB - Suspend job for specified time/indefinitely.

MEMORY MANAGEMENT

ALCHP - Allocate space from Common Heap.
 FREE - Return amount of free memory.
 RECHP - Return space to Common Heap.
 RERES - Release all Resident Procedure space.

MACHINE CODE

CHANID - Returns internal QDOS channel ID.
 DUMP - Dump memory in hex. and ASCII.
 QTRAP - Executes 68008 TRAP# instruction.

STREAM CONTROL

CONNECT - Connect input/output channels.
 FTR - Set read/write position on given channel.
 FTR_R - Add relative offset to read/write position.

SCREEN & GRAPHICS

CUR - Enable/disable cursor on given channel.
 FXPOS - Return horizontal pixel position of cursor in window.
 FXSIZE - Return number of horizontal pixels in window.
 FYPOS - Return vertical pixel position of cursor in window.
 PYSIZE - Return number of vertical pixels in window.
 SETWIN - On-screen user definition of size and placement of window.
 SSHOW - Show screen area previously SSAVEd.
 SLOAD - As for SSHOW, but also releases Common Heap area used.
 SSAVE - Save a screen rectangle to the Common Heap area.
 UDG - Set font addresses on given channel.
 XPOS - Return horizontal character position of cursor in window.
 XSIZE - Return number of horizontal characters in window.
 YPOS - Return vertical character position of cursor in window.
 YSIZE - Return number of vertical characters in window.

FILE HANDLING

EXT - Return length of file.
 FREAD - Read from channel to buffer address.
 FWRITE - Write to channel from buffer address.
 HEADR - Read file header to buffer address.
 HEADS - Set header on file.

GAMES ROUTINES

HIGHS - Display High Score Table.
 SCORE - Enter score and name into High Score Table.
 SETHIGH - Initialize High Score Table.

BASIC

LINK - Link item into linked list.
 RESET - Perform a software Reset.
 TRACE - Create SuperBASIC tracing job.
 TROFF - Stop trace by suspending it.
 TRON - Start trace by releasing it.
 UNLINK - Remove item from linked list.

BIT MANIPULATION

AND_L - AND 32-bit integer.
 OR_L - OR 32-bit integer.
 XOR_L - Exclusive-OR 32-bit integer.
 LSL_L - Left shift 32-bit integer.
 LSL_W - Left shift lower 16 bits of 32-bit integer.
 LSL_B - Left shift lower 8 bits of 32-bit integer.
 LSR_L - Right shift 32-bit integer.
 LSR_W - Right shift lower 16 bits of 32-bit integer.
 LSR_B - Right shift lower 8 bits of 32-bit integer.
 ROL_L - Left rotate 32-bit integer.
 ROL_W - Left rotate lower 16 bits of 32-bit integer.
 ROL_B - Left rotate lower 8 bits of 32-bit integer.
 ROR_L - Right rotate 32-bit integer.
 ROR_W - Right rotate lower 16 bits of 32-bit integer.
 ROR_B - Right rotate lower 8 bits of 32-bit integer.

GENERAL

HEX - Convert hex. string to decimal.
 HEX# - Convert decimal to hex. string.
 ICOPY - Intelligent copy of byte area between memory locations.
 ICOPY_L - As for ICOPY, but for longwords.
 ICOPY_W - As for ICOPY, but for words.
 KEY - Allows function key programming.
 REPORT - Print QDOS error message.

FIGURE TWO: QJUMP QL-TOOLKIT EXTENSIONS

JOB CONTROL

AJOB - Activate a job.
 JOBS - Give details of present jobs.
 JOBS# - Return name of job.
 NXJOB - Get next job in tree.
 OJOB - Get job owner.
 PJOB - Get job priority.
 RJOB - Remove a job.
 SPJOB - Set job priority.

MEMORY MANAGEMENT

ALCHP - Allocate space from Common Heap.
 CLCHP - Clear space in Common Heap area.
 FREE_MEM - Return amount of free memory.
 RECHP - Release an area of the Common Heap.

MACHINE CODE & STREAM CONTROL

DATA_USE - Set directory default for data files.
 EX.ENV.ET - Extended EXEC and EXEC_W commands, allowing setting of input/output files and chains of jobs (filters) for stream control.
 EX_DEF - Set default priority and buffer size between jobs.
 PROG_USE - Set directory default for program files.

SCREEN & GRAPHICS

CHAR_INC - Set horizontal and vertical spacing between characters.
 CHAR_USE - Set character fonts.
 CURDIS - Disable cursor.
 CURSEN - Enable cursor.
 WMON - Reset windows (Monitor defaults).
 WTV - Reset windows (TV defaults).

FILE HANDLING

BGET - Get bytes from channel.
 BPUT - Put bytes to channel.
 FDAT - Get program data space from header.
 FLEN - Get file length from header.
 FOPEN - Open file.
 FOP_DIR - Open directory.
 FOP_IN - Open file for input.
 FOP_NEW - Open new file.
 FOP_OVER - Open file, overwriting old one, if it exists.
 FPOS - Returns current file position.
 FPTY - Get file type from header.
 GET - Get data from file using internal numeric/string format.
 PUT - Put data to file using internal numeric/string format.
 RENAME - Rename a file.
 SPL - Spool a file.
 SPL_USE - Set spool default output directory.
 STAT - Print drive statistics.
 TRUNCATE - Truncate a file to current position.
 VIEW - Print a file.
 WDEL - Delete files, with confirmation.
 WDEL_F - Delete files.
 WDIR - Print directory.
 WSTAT - Print file statistics.

GENERAL

BIN - Convert binary-type string to decimal.
 BINS - Convert decimal to binary string.
 CDECS - As IDECS, but inserts commas every three digits.
 ED - On-screen editor.
 FDECS - Convert decimal number to formatted string.
 HEX - Convert hex. string to decimal.
 HEX# - Convert decimal to hex. string.
 IDECS - As FDEC, but assumes value to be in least significant units.
 PARTYP - Returns type of parameter in SuperBASIC procedure/function.
 PARUSE - Returns usage of parameter in SuperBASIC procedure/function.

In addition, QL-Toolkit contains the following programs:

JOB FILTERS (for use with EX)

CCL - Concatenate line-based files.
 CCT - Concatenates files.
 CFY - Copy a file.
 LNO - Adds line numbers to a file.
 MORE - Copies file to screen window, with screen page prompts.
 PAGE - Splits file into pages.
 UC - Convert file to upper-case.

MACHINE-CODE PROGRAMS

ALARM - Alarm clock.
 CLOCK - Digital clock in window 0.
 CLOCKH - Clock with hands (continuously drawn).
 CLOCKM - Clock with hands (updated).
 CLOCKS - Digital clock (fixed position).

SUPERBASIC PROGRAMS

FBACK - Fast backup of all files.
 MBACK - Fast backup of preselected files.
 PATCH - File patching utility.
 SBACK - Fast backup, with confirmation of each file.
 UDC - User-defined character editor.

and Superscript and subscript fonts (for use with CHAR_USE).

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Each month, for a trial period, this column will contain details of readers' programs that we are able to offer on microdrive.

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

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

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

HOW TO ORDER

Listed below are programs which have appeared as listings inside *QL User*. To the right of each program entry is a small box, which you should mark with a bold cross if you want to order that program.

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

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ORDER FORM

| Author | Language | Program Name | Price | Issue | Size | |
|--|----------|------------------|-------|---------|------|--------------------------|
| Giles Todd | (B) | DIY Assembler | £5.00 | Jun/Mar | 120 | <input type="checkbox"/> |
| <i>Converts Assembler source into m/c object code</i> | | | | | | |
| Richard Cross | (AO) | Mini Monitor | £3.00 | Oct | 60 | <input type="checkbox"/> |
| <i>Pocket sized monitor with comprehensive facilities</i> | | | | | | |
| A Didcock | (B) | Connect4 | £1.00 | Sept | 15 | <input type="checkbox"/> |
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| Shergold & Tose | (B) | Golf | £2.00 | May | 35 | <input type="checkbox"/> |
| <i>From fairway to green on 50 different courses of varying difficulty</i> | | | | | | |
| Williams & Holliday | (AO) | Paladin | £5.00 | Apr | 70 | <input type="checkbox"/> |
| <i>The basis of our games programming series - a space invaders type game written entirely machine code</i> | | | | | | |
| Richard Cross | (MB) | Sprite Animation | £2.00 | Apr | 50 | <input type="checkbox"/> |
| <i>A subtle blend of machine code and SuperBasic that produces a versatile sprite designer and high speed animator</i> | | | | | | |
| Steve Deary | (B) | Pacman | £1.00 | Mar | 20 | <input type="checkbox"/> |
| <i>A reasonably fast rendition of the famous arcade favourite</i> | | | | | | |
| Andy Carmicheal | (B) | Family Tree | £3.00 | Aug | 100 | <input type="checkbox"/> |
| <i>Archive program and database for setting up and displaying large family trees</i> | | | | | | |
| James Lucy | (B) | Composer | £3.00 | Oct | 50 | <input type="checkbox"/> |
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| Mathew Capp | (B) | Miners | £2.00 | Aug | 30 | <input type="checkbox"/> |
| <i>A nail biting management simulation that puts you in charge of the NCB</i> | | | | | | |
| PJ Smith | (B) | DIY Adventure | £1.00 | Feb | 60 | <input type="checkbox"/> |
| <i>A skeleton framework where you simply have to slot in the details to create your bespoke adventure</i> | | | | | | |
| R Green | (B) | Qthello | £1.00 | Aug | 25 | <input type="checkbox"/> |
| <i>A 3D version of the well known board game Othello for one or two players</i> | | | | | | |
| S J Ackers | (B) | Touch Type | £4.00 | Aug | 80 | <input type="checkbox"/> |
| <i>Touch typing course - 14 lessons, on-screen keyboard, 800+ word vocabulary and WPM readout</i> | | | | | | |

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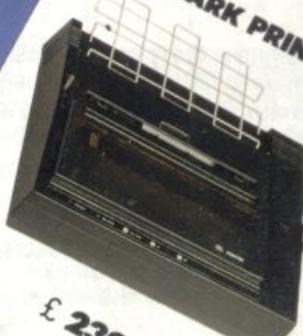
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