

# Personal Computer

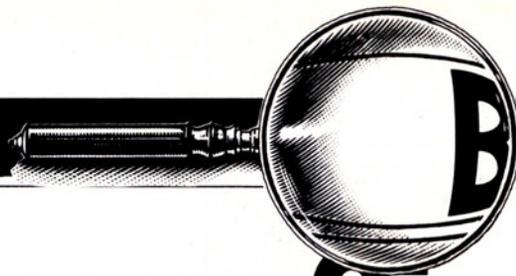
Dragon enters the business market

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**BRITAIN'S BIGGEST MICROCOMPUTER MAGAZINE**



**SINCLAIR QL - CHUMP OR CHAMP?**  
**First full benchtest**



# Sinclair QL

*The launch of the QL represents Sinclair's logical progression into the business computing sector. However, the company's failure to honour its 28-day delivery promise has brought widespread criticism but, ironically, given the QL a lot of 'free' publicity. Is it worth the wait? David Tebbutt got hold of the first working model and reports exclusively for PCW.*



Was I the only person in the world who wondered what all the fuss was about when the QL was launched? People kept on about the Motorola 68000 processor and the 128k of memory, not to mention a souped-up version of Basic. Multi-tasking and windows were thrown at me in a generous attempt to win me round but everything failed. No matter how I tried, I could not get enthusiastic about the QL.

The responses warmed up a little when I read the descriptions of Psion's four programs — Archive, Easel, Quill and Abacus, which compared on paper very favourably with many commercially available packages. But I was still left with doubts; after all, how can anyone do anything serious with a Microdrive?

It wasn't until I had been using the QL for many hours that I twigged what it was all about. Like the lap-helds and the Macintosh, the QL has been designed for serious personal use. The supplied applications are just what the professional user needs to get started. Of course, the built-in SuperBasic will appeal to the enthusiast, too, but I suspect the bulk of QL sales will be to people who would like a business computer but cannot afford the cost normally associated with such a purchase.

The QL costs £399 including VAT but you'll need a printer which will cost from around £250. If you use your existing television, you are ready to go for £650. I would strongly advise buying a monitor if you plan to use the QL for hours at a time. This might cost you another £250, so you still get away with a computing facility for less than £1000.

The main psychological difference between the QL and the other machines mentioned earlier is that the QL is only available by mail order at present. With the lap-helds and the Macintosh you can go into your local dealer and beat him round the head if anything goes wrong. Not so with the QL. There is a thing called the QLUB which, for £35 per annum, entitles you to a newsletter and software enhancements. (Common bugs are fixed for nothing according to Sinclair.) You may also send written queries about the software and these will be answered in writing (in due course, no doubt). All of which means that you're on your own if things go wrong, or if you simply can't get the hang of something.

At the time I carried out the review (mid-April) there was still no sign of any QL shipments, although Sinclair was saying — with a degree of conviction — that the machines would start trickling out at the end of April. If this is the case, then I think they will be going out with a few known holes in the firmware and with some sort of voucher scheme which will entitle buyers to an upgrade when Sinclair finalises the system.

At the moment the firmware is held in three 16k EPROMs which means that

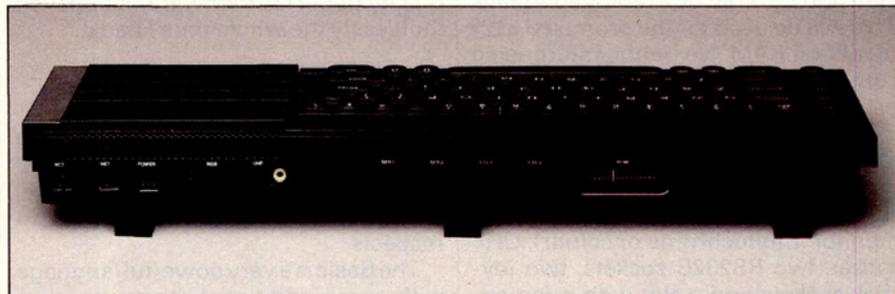
one of them must occupy the ROM slot at the back of the machine. You will not be able to run early QLs without this expansion ROM pack. Once the operating system is tucked away on real ROMs, I am told that it will fit inside the QL (on one 32k and one 16k ROM) and the ROM pack slot will be freed. Quite how the upgrade will take place, I have no idea. I suppose some sort of call-in system will be necessary as I can't see the average QL user taking the machine to bits to replace ROMs. I also find it hard to visualise people who have become dependent on the QL giving it up while the problem is sorted out. I suppose this latter group will stick with the expansion ROM until they find they

in the end I dispensed with them and got used to a new typing position. To compensate for this I found that the printer cable worked first time with my Epson MX 80F/T. The network driver still hadn't been implemented in my version of the operating system, so attempts to talk to my son's Spectrum were doomed to failure.

Just in case you were wondering about the QL's portability, Sinclair boasts that it weighs around three pounds. What it doesn't boast about is that the separate power supply weighs over two pounds! Also, you still need the television and, at eighteen or so inches wide, the QL cannot be slipped into a briefcase like its ZX predecessor.



The keyboard is the 65-key conventional qwerty layout



Top: sockets for networks, power, 8-pin DIN, UHF, RS232C, joysticks and ROM

need the slot for something else.

While the QL is only available by mail order, I would expect only those already familiar with computers to buy one. Of course this is a pretty hefty market these days so I don't think Sinclair will be short of customers. Once QLs get into the shops and stores, then I think that computer naive people will be taking a serious look too.

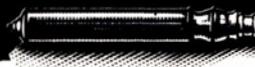
### Hardware

A working QL comprises a keyboard with two integral Microdrives, a power supply, a television or monitor and its associated lead. Early versions will also need a ROM pack plugged in at the back. An RS232C cable and a network cable are also supplied with the machine. If you do a lot of typing, you might find the keyboard lies a bit flat. To overcome this, Sinclair has supplied three funny little plastic feet which are supposed to fit into rubber pads under the keyboard. I found that these fell out regularly and

### Keyboard

The QL has the sort of style the public has come to expect from Sinclair. The potential monotony of an all black rectangular casing is relieved by a textured surface and some ribbing at the right-hand side. The 65-key conventional qwerty keyboard looks very neat, not at all unlike the NCR DMV. Despite the inevitable membrane mechanism underneath, the keyboard feels good and positive in operation. The Microdrives are hidden under the flat area to the right of the keyboard.

The keyboard highlights the fact that we are not really looking at a traditional Sinclair machine. With its ESC key, five function keys, CTRL and ALT, it would seem to represent a quantum leap by this company into the arms of convention. I must say I'm relieved. I felt immediately at home with the QL and found I could get on with the important business of using it for productive work. The '3' key has the hash sign



above it but, don't despair, a pound sign is provided in the top right-hand corner next to a backslash key, apparently vital when programming in C.

A yellow light at the front of the keyboard tells you when the machine is on and a red light in front of each Microdrive tells you when it's in use. A row of slots under the Microdrives provide a degree of ventilation and also conceal a piezo-electric speaker. A covered expansion port on the right allows up to six Microdrives to be added. Incidentally, they are not the same as the ZX Microdrive although the blank tapes are identical.

The Spectrum and the QL actually format their tapes differently so, if you want to exchange information, you'll need to use the network. The Microdrive cartridges have a capacity of at least 100k. In theory they can take up to 255 sectors, each of 512 bytes on a 200 inch tape loop. A reset key next to the Microdrive expansion port is an improvement on the ZX range which requires you to pull out the power supply lead to obtain the same effect. Like the ZX range, there is no on/off switch on the QL. The left-hand side of the keyboard has an enormous expansion port covered by a removable plate. This will be used for the promised 512k of add-on RAM. No doubt enterprising companies will invent all sorts of devices to plug in here.

Turning to the back of the keyboard, reading from left to right, there are two network sockets, a miniature power socket, an 8-pin DIN socket for the monitor (monochrome or colour), UHF socket, two RS232C sockets, two joystick sockets and a slot with a removable cover for the ROM pack. This pack can hold up to 32k. The RS232C and the joystick sockets are like those new-fangled telephone jack sockets. If one RS232C socket doesn't do what you want, you can try the other which has its signalling pins reversed.

Removal of the 10 screws which hold the QL together reveal a very tidy interior. The main PCB is very crowded but neatly laid out. The large Motorola 68008 can be seen on the left, 16 chips make up the 128k RAM, two EPROMs contain the operating system and SuperBasic and an extra 8049 processor controls the keyboard among other things. Four Sinclair-designed ICs control the display, memory, RS232C, network and Microdrives. Over on the right are the Microdrives which look just like the innards of the ZX Microdrives. Behind them is an enormous heat sink which nicely warms the flat panel to the right of the keyboard.

The keyboard is covered by an aluminium plate which when removed reveals the mechanism. The key presses down on a sort of moulded soft

plastic dome. The dome has a spike moulded on its inside which in turn presses down on a sheet of plastic printed with metallised tracks. This presses in turn on another similar sheet thus completing an electrical connection between two tracks — one on each sheet. It sounds nasty but it actually works very well. Once you appreciate how the keyboard works, you can feel it in use but I doubt that most people would notice.

I used the QL with a domestic television; and I must admit that it got a bit tiring after a while. I have seen the machine in operation with a monitor and the picture was a lot better with none of the irritating flicker inevitable with UHF. The computer display wraps off the corners of the television screen, another reason why a monitor may be preferable.

On the other hand, it is possible to select from a variety of character sizes and display resolutions so that you can reduce the problems somewhat. Psion gives users a choice of 80,64 and 40-column displays for its programs. The 64-column display works very well: I found myself using that mode all the time.

Overall, I was very pleased with the quality of the QL hardware; it behaved faultlessly the whole time I had it.

## Software

### SuperBasic

As I mentioned earlier, the operating system and the Basic were not finished on the machine I tested. They were, however, complete in most important respects.

The Basic is a very powerful language with some additional structures over and above the earlier ZX Basics. Particularly impressive is the ability to define extensions to the language using the procedure definition facilities. One current limitation in SuperBasic restricts overall program size to 32k. This is to do with the internal error checking. Sinclair tells me that this

restriction will be lifted in due course.

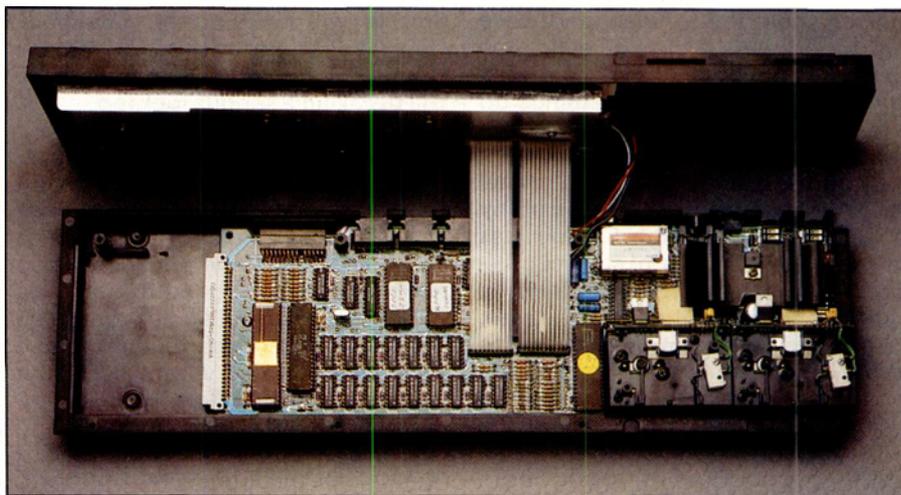
The other major omission in the review machine's Basic was the full screen editor promised at launch. At the time of writing, the only way to edit a line of Basic is to re-enter it.

That's all the bad news; now let's look at what's actually in the Basic and perhaps see why it has been christened SuperBasic.

The Basic follows a similar pattern to all Basics. I had few problems writing little routines. I know I shouldn't admit this but I must confess to having introduced a couple of GOTOs in my programs. SuperBasic doesn't mind; it just makes them a bit unnecessary. Anyway the point of this confession is that you cannot say IF . . . THEN and a line number, you must say IF . . . THEN GOTO. Basic commands must be typed in full — there is no keyword entry system, although I suppose you could create your own using the procedure definition facilities.

An AUTO line numbering system was missing on my copy but I have been assured that it will be included in the released version. This, coupled with a RENUMBER command, will lead to tidier programs. BAUD sets the baud rate of the two RS232C ports — yes, both of them must be set to the same speed which can be one of eight between 75 and 19200 baud. 19200 is reserved for transmission only. BEEP makes sounds through the grotty speaker. Pitch and duration can be varied, as well as things like second pitch and bounce, which 'bounces' the sound between the two pitches. A fuzzy option adds a random number to the pitch on each cycle causing an appropriate distortion. Fine for fun but not of massive practical benefit. I hear that an external sound generator is under development which should help.

The Basic contains an impressive range of graphics facilities as you might expect. Windows, borders and blocks of colour can all be created on the 512 x 256 resolution screen. Up to four



Inside: the main PCB is very crowded but neatly laid out

colours are available in this high resolution mode and the lower resolution (256 × 256) gives eight colours plus flashing.

The MODE command lets you switch between 256 and 512 screen widths. When you define the ink and paper colours, you can also define a stipple pattern but, unless you like shimmering, don't use it on the domestic TV. Character sizes can vary in width in four stages from 6 to 16 bits wide and, in height, either 10 or 20 bits high. This would be useful in headings or in applications for young children or partially sighted people, for example. A PAN command allows you to slide the contents of a window sideways. Once you have lost stuff from the window you can't get it back without regenerating it.

Windows are handled by allocating each one a spare channel then you simply address your Basic commands to the chosen channel. It really is a doddle.

Now for the various control structures available in SuperBasic. Firstly there's DEF FN which is probably already familiar to you. It allows you to define a function which returns some sort of value to the line using it. It also allows you to use local variables through the LOCAL statement. These may have the same name as variables outside the function definition but they will not become confused during execution of the program. DEF FN is terminated with END DEF. Similarly DEFine PROCedure is terminated with END DEF and it, too, allows local variables. When defining the procedure, any parameters needed are placed in brackets: for example, DEF PROC F (LIMIT), but when the procedure is used the brackets are not needed: for example, F 23. You can do some super things with this facility and, of course, it does away with GOSUBs and the complications of parameter passing.

And that's not all. The old familiar FOR . . . NEXT has a new twist. It allows you to slip some commands after the NEXT but before the END. REPEAT gives you a repeating loop which you escape via an EXIT command embedded somewhere in the structure. Perhaps you need to wait until an input satisfies a test before moving on. Once again this is an attempt by Sinclair to encourage GOTO-less programming.

The final neat structure I'd like to mention is SElect. Used with ON this gives a similar effect to ON . . . GOTO but you can embed all the actions inside the procedure itself. For example, SElect ON a can be followed by ON A=1 and then all the things you want to happen if A=1. The next ON will stimulate a new set of actions for a second value of A. This command ends with END SElect. Very neat.

SuperBasic has an interesting feature which Sinclair calls 'coercion'. This



*Archive (the database) is one of four excellent business cartridge programs supplied free with the QL*

allows you to mix your variables when performing calculations. For example, it will let you add '2' to '2' and still get '4'.

Finally, the Benchmark timings. They put the QL in the top third or so of all machines tested by PCW. Frankly, the comparative speed of machines is insignificant; it's far more important to take the broader view and decide how the facilities offered compare.

#### **QDOS**

The QL operating system, QDOS, is busily working in the background whenever the QL is in use. It makes its presence known, for example, when you need to run jobs in different windows and when you are transferring data to and from the Microdrives.

When the QL is first switched on, the screen is divided into three separate windows. The bottom few lines of the screen is a command entry and message display area where all the direct interactions with QDOS and SuperBasic take place. The top of the screen is then divided vertically with the upper left being used for displaying the developing Basic program and the upper right displaying the user view of the program when you run it. The bottom of the screen is attached to channel 0, the listing area to channel 2 and the program execution area to channel 1. It is a simple matter to direct commands to the appropriate channel.

QDOS handles multi-tasking by dividing processing time between the various jobs being executed, and

#### **Benchmarks**

BM1	2.1
BM2	6.4
BM3	10.7
BM4	10.3
BM5	13.2
BM6	26.1
BM7	61.8
BM8	25.8

**All timings in seconds. For a full listing of the Benchmark programs see 'Direct Access'.**

according to their built-in priorities. As I said earlier I couldn't set up an adequate test system to see how this performed. What I do know is that at the launch it was less than impressive. The fact is that the QL can do several things at once. The performance depends more on the quality of the programs running than on the inherent capability of the operating system.

As you may have guessed from the channel numbers, all I/O is device-independent. You simply choose your channel, attach your device to it by saying something arcane like OPEN £5; CON\_200×200a50×50\_ and you have created a 200×200 bit window starting at location 50×50 and with a keyboard buffer of 32 characters. Easy isn't it?

The really annoying thing about QDOS for me was that I had to put an underline at the end of my Microdrive commands. For example 'DIR MDV1' does not give a directory of Microdrive 1 whereas 'DIR MDV1\_' does.

#### **Applications software**

Without doubt, the Psion programs tip the scales heavily in the QL's favour when comparing the system against others.

Four packages are provided: word processor, database system, spreadsheet program and business graphics. I used all four programs to a limited extent. Then I chose to plunge into the database program in detail.

I'll start with the others and then take a closer look at Archive, the database.

Easel was the largest and most complicated to program, yet it appears to the user as the most trivial and the easiest to use. It's great for bringing numbers to life. At the simplest level you can literally load the program and start keying in numbers and immediately a histogram appears on the screen. If you go off the scale it automatically rescales itself and lets you carry on. If you want to enter another set of figures, simply choose a new name and start keying the new ones.

Let's say the first lot were called 'TURNOVER' and the second lot 'COSTS'. You could easily create a third set by saying 'MARGIN=TURNOVER-COSTS'. These can then be displayed individually as histograms, line graphs or pie charts or they can be superimposed on each other to show the relationships between differing sets of figures. Text can be added to the charts, and moved around, and everything can be printed — provided your printer is capable of graphics.

You can read in files which have been prepared either by Abacus, the spreadsheet or by Archive, the database. Such data will be displayed according to the currently selected format. Data can be transmitted from this program to others in the form of tables of numbers.

Deeper inside the package there are

The keyboard shows Sinclair's move into conventionality: ESC, CTRL, ALT and five function keys

65-key conventional qwerty keyboard — good and positive feel

On the left-hand side of the keyboard the expansion port is covered by a removable plate

Custom gate array chip

ROM cartridge slot can hold up to 32k

Joystick ports

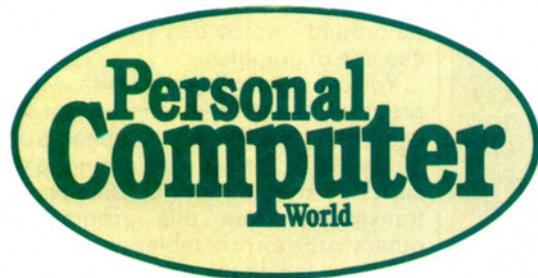
Central processing unit (CPU): 7.5MHz Motorola 68008

The QL (keyboard) lies a bit flat — which is annoying for continuous use — so plastic feet have been supplied to fit into rubber pads under the keyboard

16 chips make up 128k RAM: of which 32k is used by the display

The QL firmware is held in three 16K EPROMs (only two of which are visible: the other occupies the ROM slot at the rear of the machine). They contain the operating system (QDOS) and SuperBasic. However, the final version will have one x 16k and one x 32k leaving the ROM slot free for expansion

An 8049 processor controls the keyboard



# BENCHTEST

The QL is intended for serious personal use. Unfortunately, the QL cannot be slipped into a briefcase like its predecessors. A voucher scheme will enable upgrades to the final system

Potential monotony of an all black rectangular casing is relieved by a textured surface and ribbing

Two RS232 serial ports hidden behind cables

UHF modulator unit and TV connector

Monitor port

Power supply port

Two Local Area Network ports

Row of slots under the Microdrives provide ventilation and conceal a piezo-electric speaker. The speaker is not up to much but Sinclair says 'an external sound generator is being developed'

Expansion port (on right) allows up to six Microdrives to be added

Two Microdrives built-in, 100k per cartridge. Microdrives aren't the fastest things in the world; apparently moves are afoot to hot them up.

facilities to manipulate text, open windows, vary column widths and transfer data.

Quill, the word processor seems to have very grown-up facilities. I particularly like the fact that what you see on the screen is what gets printed out. Superscripts and subscripts are handled by Quill's built-in special character set.

Underline is an inherent feature of the QL and this is also used to good effect.

Another thing that impressed me was the fact that the current character position is shown by a highlight on the margin ruler at the top of the screen. Quill keeps a word count as you go along, something many professional writers will find invaluable.

Now Archive, the database. I spent hours on this one. It is an extremely deep product. A novice user can use it literally like a card file and be none the wiser after months. Others will find that they prefer to use a special screen layout rather than the default. Some people will want to access multiple files while others will want to build some sort of system around Archive. All these things are possible within the one product.

I started by simply listing the fields into which I wanted to enter data and then creating a simple file of names and addresses. That was easy — it took about 10 minutes. Then I got ambitious and started entering data which exceeded the available space for its entry. The data was accepted although it actually ruined the display. Archive will accept variable length data up to 255 characters per field. In this respect it shows similar limitations to other popular databases.

Since the QL has no character graphics, the design of records is achieved with judicious use of the exclamation mark and the hyphen. The end result is usable but looks a little tacky. Bearing in mind the sort of program size and timescale limitations Psion was working to, I think this is a small price to pay for the power and usefulness of the product.

It is possible to locate records in a file quickly by using the search or locate commands. The first ignores case and the second matches exactly. A sort is built into Archive and it works on the straight ASCII sequence. This means that 'Computer' would come before 'all', for example.

Like SuperBasic you can define procedures within Archive, and the potential for developing applications and new commands is mind-blowing. Suddenly the entire product becomes soft and you can redefine it to suit your needs exactly. For example, do you always open the same files, display them in the same form and then access

a particular record. Fine. There's no reason why that shouldn't all be done with two keystrokes — G and ENTER, for example. I chose 'G' for 'Go'. There's a lot of power in this package and it really will repay diligent study.

All the Psion packages have plain English commands, although this does make them a little long-winded at times. They all have extensive help facilities which can be called up at any stage. Psion is about to launch its products onto other machines and I reckon this is an excellent marketing ploy.

People who become used to using Psion programs on the QL will feel much happier if they also use them on their real machines at work. Conversely, people who use Psion on their real machines may want to buy a QL because they've already learned what Psion's products can do.

## Documentation

I was provided with preliminary documentation which was adequate. There was no beginners' guide, although I understand that this will be available in the final version.

A Basic keyword summary is provided which explains every Basic instruction in detail. A concepts section runs through all the concepts regarding the QL which is beyond the scope of the Basic keywords section. And each of the applications packages has a guide to itself which acts both as tutorial reference material. Inevitably, with a preliminary document there were many discrepancies between the manual and the products I was using. Structurally, the documentation is fine and I trust the errors will be put right before the final version is issued.

## Prices

The price of the QL is £399 including VAT. To this you will need to add the cost of a three-pin plug and a monitor plug if you are using this rather than a television.

At press time Sinclair claimed that deliveries of the machine would start at the end of April. The fact is that in mid-April I had an almost-working

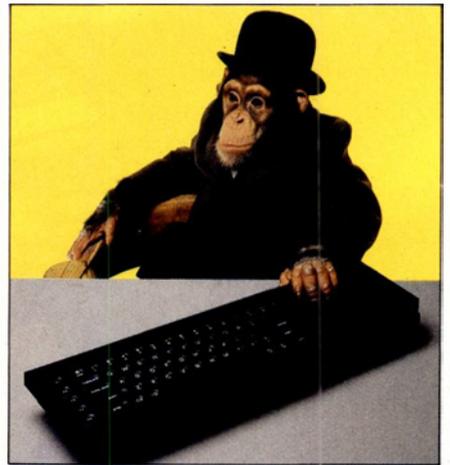
machine and set of software. If the machines do go out soon, then I think it is certain that they will have an extension ROM sticking out of the back with software upgrades promised under some sort of voucher scheme. Not the happiest state of affairs.

## Conclusion

There's no doubt that the QL is a well made piece of hardware. The operating system, the applications and the Basic look very good, on paper. The review machine was still short of a few facilities. This either means that deliveries will start soon and early buyers will need some sort of upgrade, or that the project is going to be delayed further while the software is completed.

If everything were in place, then I would consider this machine very seriously as a truly personal computer but not as something to run a business on. The Psion spreadsheet, database, business graphics and word processing packages coupled with the limited Microdrive capacity define the market very clearly. The Psion programs look very good in terms of the ranges and quality of facilities offered.

The bottom line is that the QL gives you the potential to own a complete serious computing facility, including printer and essential software, for under £1000. Well under that if you're prepared to use a domestic TV rather than a monitor for the display. **END**

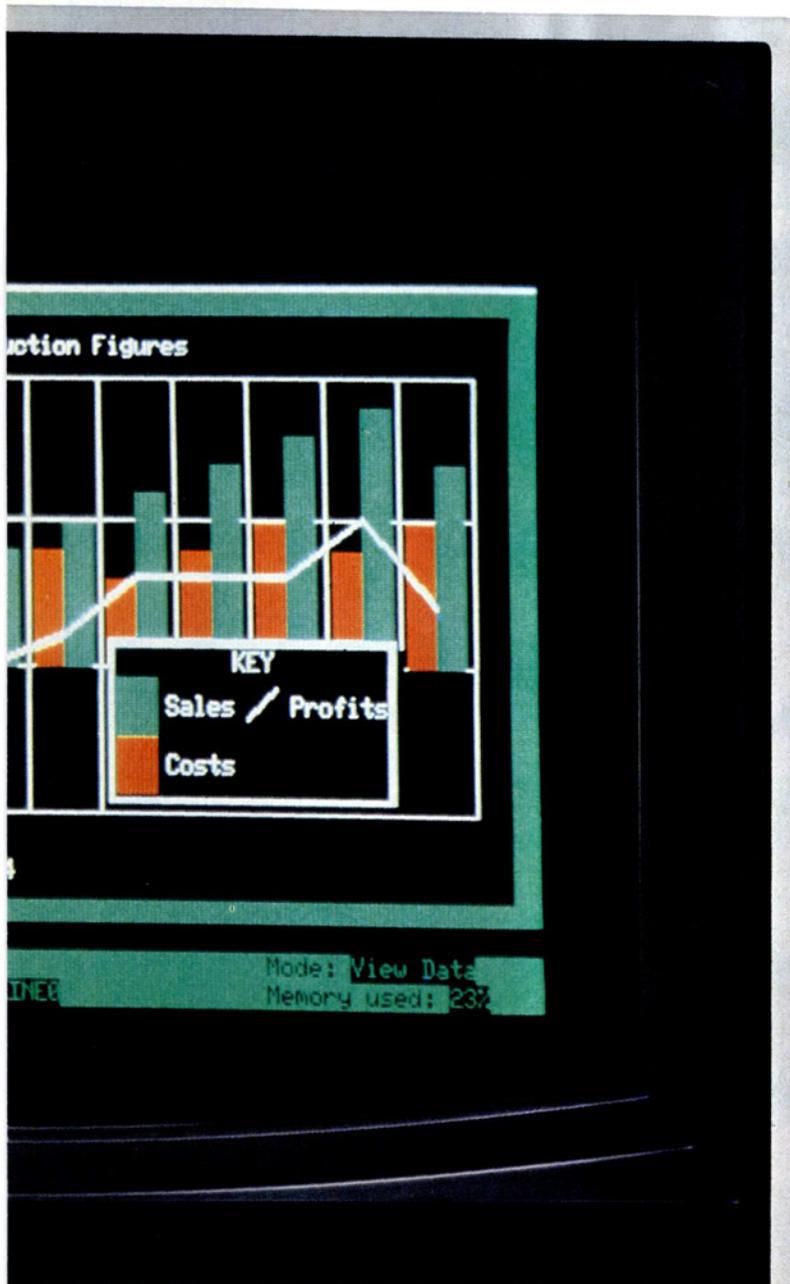


## Technical specifications

CPU	7.5MHz Motorola 68008 plus Intel 8049
RAM	128k (32k used by display). Expansion to 640k coming
ROM	48k QDOS and SuperBasic. 32k ROM pack (see review)
Display	512 × 256 four colour. 256 × 256 eight colour. UHF or RGB
Keyboard	65-key, normal qwerty plus five functions and cursor
Microdrives	Two drives min 100k each. Can expand with further six
I/O	Two RS232. Two joystick. Two network
Languages	SuperBasic
Applications	Quill — Word processor Abacus — Spreadsheet Easel — Business graphics Archive — Database

# New-Sinclair QL

## There's no comparison chart,



The Sinclair QL is a new computer.

Not just a new Sinclair computer, but a totally new sort of computer – nothing like it exists anywhere.

It's not just a bit better than this, or a bit cheaper than that – it's a computer that's very hard to compare with anything. Just check the features below – and if you don't agree, take up the challenge at the end of the advertisement.

If you do agree, there's only one course of action you can take... get yourself a Sinclair QL at the earliest possible moment.

### The Sinclair QL has 128K RAM. Big deal?

Several micros offer 128K RAM, or more, as standard. The 'What Micro?' table for December 1983 lists over 50 of them – but 40 of the 50 micros listed cost over £2,500!

The Sinclair QL offers you 128K RAM for under £400, and an option to expand to 640K. That's a lot of bytes to the pound!

### The Sinclair QL has a 32-bit processor. Who else?

Under £2,700, nobody. Even the new generation of business computers, such as the IBM PC, are only now beginning to use 16-bit processors.

At prices like this, the Motorola 68000 family – widely regarded as the most powerful microprocessors available – will remain a luxury.

Yet with the Sinclair QL, the 32-bit Motorola 68008 is available for less than £400.

You can also be sure that the QL will not become outdated. 32-bit architecture is future-proof.

32-bit processor architecture, 128K RAM, and QDOS combine to give the QL the performance of a mini-computer for the price of a micro.

### Exclusive: new QDOS operating system

No competition! QDOS sets a new standard in operating systems for the 68000 family of processors, and may well become the industry standard.

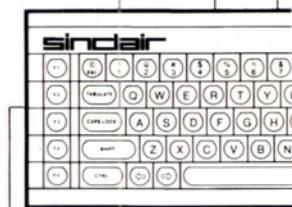
QDOS is a single-user, multi-tasking, time-sliced system using Sinclair's new SuperBASIC as a command language.

One of its most significant features is its very powerful multi-tasking capability – the ability to run several programs individually and simultaneously. It can also display the results simultaneously in different portions of the screen. These are features not normally available on computers costing less than £7,000.

### Eleven input/output ports

QL ROM Cartridge slot

2 x Joystick ports 2 x RS

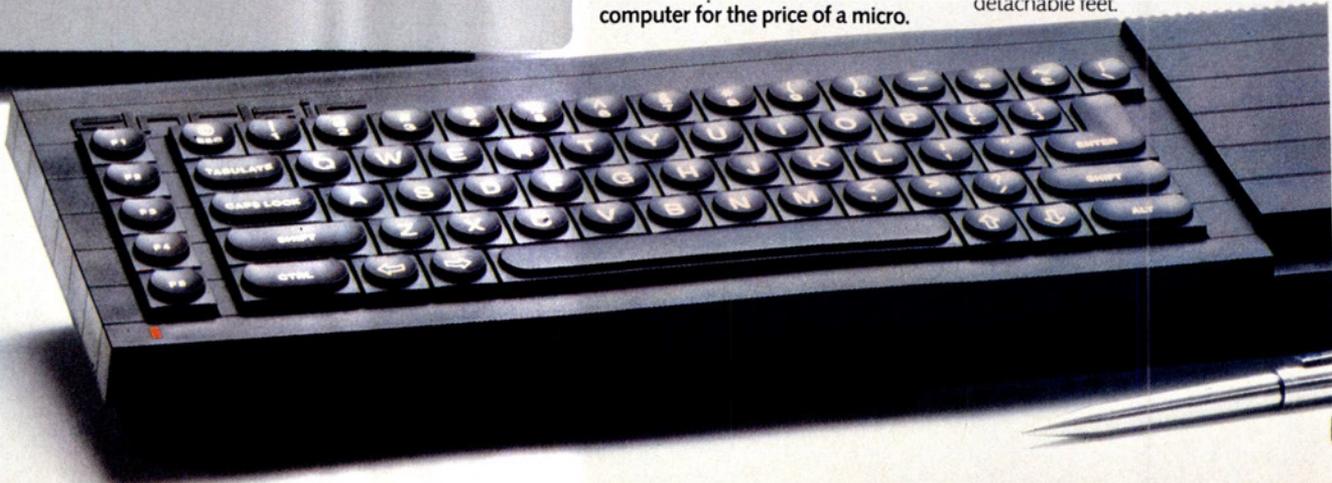


### New professional keyboard

The QL keyboard is designed for fast input of data and programs.

It is a full-size QWERTY keyboard, with 65 keys, including a space bar; left- and right-hand shift keys; five function keys; and four separate cursor-control keys – key action is positive and precise.

A membrane beneath the keyboard protects the machine from dust (and coffee!), and for users who find an angled keyboard more comfortable, the computer can be raised slightly at the back by small detachable feet.



# £399

# because there's no comparison!

## Advanced new friendly language – Sinclair SuperBASIC

The new Sinclair SuperBASIC combines the familiarity of BASIC with a number of major developments which allow the QL's full power to be exploited.

Unlike conventional BASIC, its procedure facility allows code to be written in clearly-defined blocks; extendability allows new procedures to be added which will work in exactly the same way as the command procedures built into the ROM; and its constant execution speed means that SuperBASIC does not get slower as programs get larger.

## Included – superb professional software

The suite of four programs is written by Psion specially for the QL and incorporates many major developments. All programs use full colour, and data is transportable from one to another. (For example, figures can be transferred from spreadsheet to graphics for an instant visual presentation.)

### Word-processing

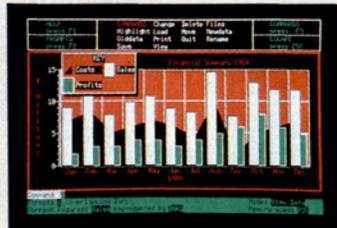


Certain to set a new standard of excellence, QL Quill uses the power of the QL to show on the screen exactly what you key in, and to print out exactly what you see on the screen.

A beginner can be using QL Quill for word-processing within minutes.

QL Quill brings you all the facilities of a very advanced word-processing package.

### Business graphics



QL Easel is a high-resolution colour program so easy to use you probably won't refer to the manual! It handles anything from lines, shaded curves or histograms to overlapping or stacked bars or pie charts. QL Easel does not require you to format your display before entering data; it handles design and scaling automatically or under your control. Text can be added and altered as simply as data.

### Spreadsheet



QL Abacus makes simultaneous calculations and 'what if' model-construction easier than they've ever been. Sample applications are provided, including budget-planning and cash-flow analysis. QL Abacus allows you to refer to rows, columns and cells by names, not just letters and numbers. Function keys can be assigned to change a variable and carry out a complete 'what if' calculation with a single key-stroke.

### Database management



QL Archive is a very powerful filing system which sets new standards, using a language even simpler than BASIC. It combines ease of use for simple applications – such as card indices – with huge power as a multi-file data processor.

An easy-to-use labelling facility means that you don't have to ask for your file by its full name – a few letters are enough.

## New – the Sinclair QLUB

The QLUB is the QL Users Bureau. Membership is open to all QL owners. For an annual subscription of £35, QLUB members receive one free update to each of the four programs supplied with the QL, and six bi-monthly newsletters. Sinclair has also made exclusive arrangements for QLUB members to obtain software assistance on QL Quill, Abacus, Archive or Easel by writing to Psion.

## The Sinclair QL challenge

If you're seriously considering any other computer, post the coupon for a blow-by-blow comparison. We'll take a published comparison chart for the machine you're considering (not one we've created ourselves) and give you the Sinclair QL figures, detail by detail.

## Take action today!

### To order by mail

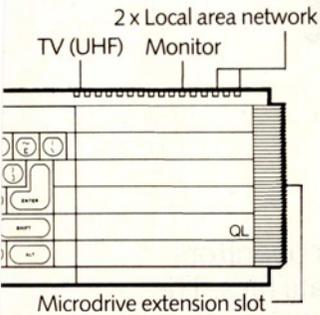
– complete the coupon and send it to the FREEPOST address below. For credit card holders it may be possible to extend your credit limit. Full details will be sent when we acknowledge your order.

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– phone Camberley (0276) 685311; – have your credit card (Access, Barclaycard, Trustcard) number ready. It may be possible to extend your existing credit limit. Please ask our telephone staff for more details. **Please do not use this number for other enquiries.**

### For more information

Phone Camberley (0276) 686100 or use the coupon to get a QL brochure. Due to demand, the goods may not be posted within 28 days. Your order will be acknowledged immediately with an expected posting date. Remember that Sinclair offers a 14-day money-back undertaking.



## Two 100K microdrives built in

The Microdrives for the Sinclair QL are identical in principle to the popular and proven ZX Microdrives, but give increased capacity (at least 100K bytes each) and a faster data-transfer rate. Typical access speed is 3.5 seconds, and loading is at up to 15K bytes per second. The Sinclair QL has two built-in Microdrives. If required, a further six units can be connected.

Four blank cartridges are supplied with the machine.



Send to: Sinclair Research Ltd, Computer Division, FREEPOST, Camberley, Surrey, GU15 3BR

Qty	Item	Code	Item Price £	Total £
	Sinclair QL Computer	6000	399.00	
	QLUB membership (one year)	6100	35.00	
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