

Practical Computing



**Special Supplement
Your Guide to the
Great British Micro**

Published as a supplement to Practical Computing, October 1983

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Why British?

STOP THE AVERAGE man in the street and ask him how many British micros there are. Numbers like 10 and 20 sound reasonable. In fact we managed to find over 60 companies involved in manufacture, and the number of models is well over a hundred.

Why should anyone care? For a start, schools and local government agencies are recommended to buy British equipment. In certain cases there are financial incentives to encourage it. Some companies and individuals want to buy British for patriotic reasons. Others may be involved in mutual trade. Yet others have special requirements that can only be met by having equipment adapted or customised. And generally it is possible to get a better level of technical support and involvement from a local company, which can be very important. If you have a real problem and persevere, you can often get to talk to the designer, or at least to the guy who wrote the manual. Fat chance of doing that with, say, a Korean product. Finally, the British product may be better, or cheaper or both. Buying British can mean buying best.

But what is a British micro? That is a rather tricky question. Microcomputer manufacture has become a global industry. The components involved are so small they can easily be airfreighted round the world.

Some components, such as ULAs, uncommitted logic arrays, and teletext chips may well originate in the U.K. or the U.S., while many others, such as standard TTL, transistor-transistor logic, and RAM, random access memory, chips originate in Malaysia, Indonesia, Japan and other parts of the Far East.

Printed circuit boards can be made anywhere, though the labour-intensive task of stuffing boards — inserting components — is frequently done where labour is cheaper than in the U.K. Final assembly and casing is more likely to be done close to the final market place, because the finished micro is bulkier to transport and more fragile.

The net result is that a micro may not really be made in any one place. The Oric, for example, uses a ULA made in America and the boards are stuffed in Singapore. But as the final assembly and casing takes place in the U.K., to the specification of a British design by a British company, we count this as a British micro.

For the same reason we count the Acorn BBC Micro as a British product, though it contains many foreign parts. This popular computer is, in fact, manufactured in several different places, including England, Wales and the Far East. The new Acorn Electron, however, is made in Malaysia.

There are some foreign machines which are, by contrast, made in the U.K. For example, both the Commodore 64 and the IBM Personal Computer are American micros, and most samples to date have been made in the United States. However, Commodore has recently opened a factory in Corby, Northants, to make the Commodore 64. IBM has a factory in Greenock, Scotland where IBM PCs are being made — and this production line will eventually supply all of Europe, North Africa and the Near East. A Scottish-made IBM PC must be at least as patriotic a purchase as a foreign-made BBC Micro.

At any rate, the person who does want a British-made micro is forewarned. Our criteria for including firms in this Supplement may

not be yours. The knowledgeable reader will also spot a number of omissions for the listing. These have arisen for various reasons.

First, we have not included some badge-engineered models. For example, British Telecom is now selling British micros under its Merlin brand label, but these are — as far as we can tell — substantially the same as ICL's Personal Computer and the Logica VTS. So even though the boxes look different, we have not listed some machines where the insides are the same. However, note also that some companies may put different boards in the same standard boxes, and these are different micros though they look the same.

Second, some companies such as Microware, Saga Systems and IEL are on the point of launching systems, but at the time of compilation we did not have enough information to include a full listing. These are for reference only.

Third, the distinction between micros and minicomputers is blurring. The differences include the type of central processing unit, the design — whether desk-top or floor-standing — the way it is sold, and the price. We tried to include micros and exclude minis. However, while to a Spectrum user the Britannia and Equinox



machines will look like minis, to a mini-maker they look like micros. At the borderline, inclusion is close to arbitrary, because the distinction itself is arbitrary.

Fourth, we mailed survey forms to all the British micro companies we could think of, and some 10 percent did not bother to return them. Many failed to respond even to repeated telephone calls, and have been excluded. Others may have ceased manufacturing, or moved, or else we have just missed them for reasons unknown. If they are not here they may still be British micro manufacturers — and if they get in touch, we will include them next time.

What is not in doubt is the scope and vigour of the British microcomputer industry. This supplement provides a valuable source-book to one of Britain's burgeoning industries. We hope you find it both useful and interesting.

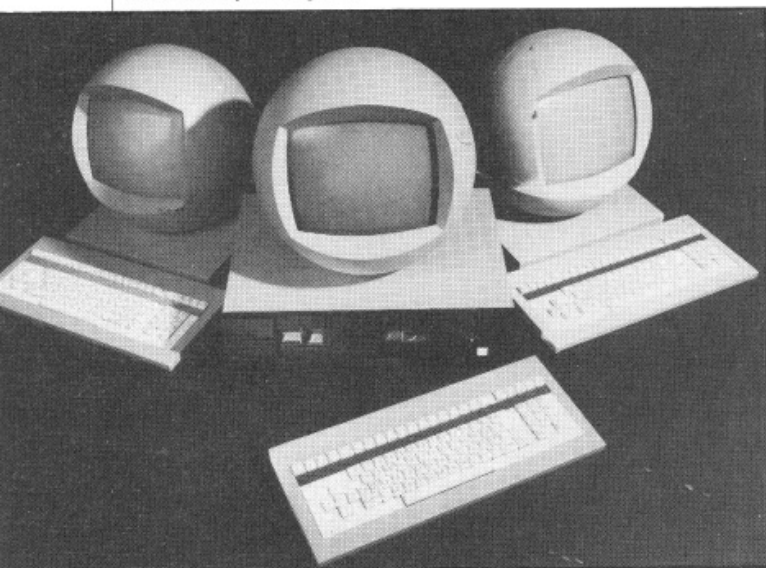
Editor Jack Schofield, Art Editor Steve Miller, Editorial Production Sally Clark, Editorial Secretary Sandra Smith, Contributors: Ian Stobie, Sarah Underwood, Della Bradshaw, Ad Manager Ian Carter on 01-661 3021. Editorial address: Practical Computing, Room L306, Quadrant House, The Quadrant, Sutton, Surrey SM2 5AS. Telephone: 01-661 3609. This supplement is distributed free with the October 1983 issue of *Practical Computing* and may not be sold separately. Copyright Business Press International Ltd 1983. ISSN 0141-5433. Typeset by Centrepoint Typesetters, London EC1, and printed by Eden Fisher (Southend) Ltd, Southend-on-Sea.

Cover shows the main board of the BBC computer, made for Acorn by ICL at Kidsgrove in Staffordshire.

ABS COMPUTERS

Address: North Street, Portslade, Brighton, Sussex.
Telephone: (0273) 421509
Telex: 81488
Company founded: 1971
Number of employees: 150
Origin of name: Registered as Allied Business Systems Ltd. Adopted current trading title in 1980.
Parent company: Trafalgar House plc

ABS Computers was one of the first manufacturers of minicomputers to provide complete business-computing solutions on the Multibus mini-range. In 1974 the company became part of the Trafalgar House group, and continued on a steady path of growth and development, launching the current MX mini-range in 1980. Today it is one of the few remaining British minicomputer manufacturers to maintain its entire research, development, design and manufacturing operation in the U.K., at its purpose-built factory in Brighton.



The Orb micro is made at ABS' own factory in Brighton, and is intended for small business and scientific use. Unusual aspects are that the housing is circular and available in a variety of bright colours.

Also, the micro uses the advanced Intel iAPX186 16-bit chip, and supports multi-user multi-tasking operation. With 256K of RAM and two VDUs and 2Mbyte of disc storage the Orb costs £5,950. Extra terminals cost £750 each.

ACORN COMPUTERS

Address: Fulbourn Road, Cherry Hinton, Cambridge CB1 4JN
Telephone: (0223) 245200
Telex: 817875
Company founded: 1978
Number of employees: 250
Turnover in 1982/83: £45 million

Acorn's first small home micro, the Atom, was launched in 1979. In 1981 Acorn won the contract to produce the BBC microcomputer, and volume production started in 1982 to coincide with the BBC's first series of programmes on computer literacy. By mid 1983 over 140,000 BBC micros had been produced and comprise 80 percent of all micros used in schools. In August 1983 Acorn launched the Electron home micro designed to be compatible with and compliment the BBC micro.

Although Acorn established its reputation with the Atom, it was winning the contract to produce the BBC Microcomputer



that made its fortune. The attractions of the machine are its excellent BBC Basic and colour-graphics facilities, its proper keyboard, and its built-in expandability. While it uses the well-known 6502 microprocessor, it is a very fast computer, and it is claimed that more advanced chips will be added later via the Tube interface.

All these facilities make it suitable for home/games use, for small business use if the software becomes available, and, most of all, for education. It is very popular in schools and a number of BBC Micros can be linked together on an Econet local area network. Now that initial operating system and supply problems have been overcome, its limitations are that it is not designed and finished as a real consumer product, and it is somewhat expensive by comparison with rivals such as the Commodore 64 and Atari 800.

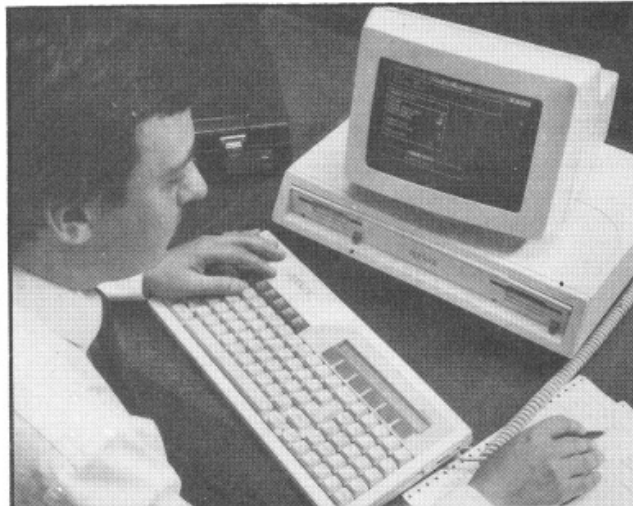
The BBC Micro now has a new rival in the form of the Acorn Electron. This has many of the advantages of the BBC microcomputer, and at around £199 is half the price of a BBC Model B. However, it is manufactured in Malaysia.

ACT (HOLDINGS)

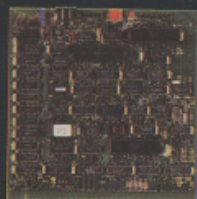
Address: 111 Hagley Road, Edgbaston, Birmingham B16 8LB.
Telephone: 021-454 8585
Telex: 339396
Company founded: 1965
Number of employees: 400
Turnover in 1982: £8 million

ACT was founded in 1965 as computer bureaux and pioneered the concept of packaged software. Today, as Britain's second largest computer company with a current turnover of £50 million, ACT's activities span microcomputer manufacture and distribution, software development and sales, computer maintenance, computer stationery printing, office supplies, research and developing new computer systems and bureau services. ACT currently leads the U.K. 16-bit market with its Sirius 1 personal computer and the Pulsar range of business software. Its new microcomputer development, Apricot — the first fourth generation machine — has already been hailed as a world-beater.

(continued on page 9)

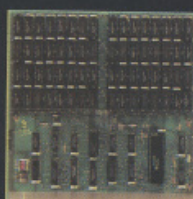


80-BUS SOLUTIONS



GM813—CPU/64K RAM Board

- ★ 4MHz Z80 CPU
- ★ 64K Dynamic RAM
- ★ RS232 Serial Interface
- ★ Two 8-Bit I/O Ports
- ★ 1200 Baud Cassette Interface

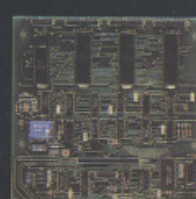


GM833—512K RAM-DISK

- ★ 512K Dynamic Memory
- ★ Simple Software Interface
- ★ Switching Allows Multiple Boards
- ★ High-speed Silicon Disc

GM816 MULTI-I/O Board

- ★ 6 I/O Ports
- ★ 4 Counter/Timer Channels
- ★ Real Time Clock
- ★ Further Expansion Capability



GM812—IVC Board

- ★ 80x25 Display Format
- ★ On-board Z80A Microprocessor
- ★ Programmable Character Generator
- ★ 160x75 Pixel Graphics
- ★ Light Pen Input



GM829—FDC/SASI Board

- ★ SingleDouble Density Operation
- ★ SingleDouble Sided Drive Support
- ★ Up to 4 mixed 5.25" and 8" Drives
- ★ Industry Standard SASI Hard Disk Interface

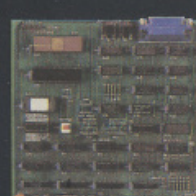
TWO SPARE SLOTS

The Galaxy 3 computer shown has two empty slots, in a 5 board 80 Bus format, for simple addition of Gemini Multiboards to develop your own requirements.



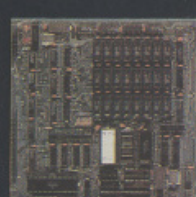
EV814—IEEE488 Controller

- ★ Cost Effective Controller
- ★ Comprehensive Software Supplied



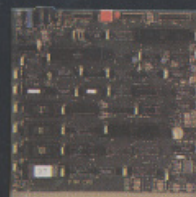
IO828—Colour Graphics Processor Board

- ★ 640x576 Bit Mapped Display
- ★ On-board 16-Bit Microprocessor
- ★ Comprehensive On-board Software



GM811—CPU Board

- ★ Z80A CPU
- ★ RS232 Serial Interface
- ★ 2x8-Bit I/O Ports
- ★ 4 Byte-wide Memory Sockets



GEMINI MULTIBOARDS ARE AVAILABLE LOCALLY FROM:

AMERSHAM, BUCKS

Amersham Computer Centre,
Woodside Road,
Tel: (02403) 22307

BRISTOL

Target Electronics Ltd., 16 Cherry Lane
Tel: (0272) 421196

LEEDS

Bits & PC's, Leeds Computer Centre,
62 The Balcony, Merrion Centre,
Tel: (0532) 45887

LONDON W2

Henry's Radio, 404 Edgware Road
Tel: 01-402 6822

LONDON SW11

OFF Records, Computer House,
58 Battersea Rise, Clapham Junction
Tel: 01-223 7730

MANCHESTER M19

EV Computing, 700 Burnage Lane
Tel: 061-431 4866

NOTTINGHAM

Computerama, (Skytronics Ltd.)
357 Derby Road
Tel: (0602) 781742

The Gemini MultiBoard Microsystem provides a range of 15 fully-compatible microcomputer boards, which can be used to configure solutions for micro processor problems, from as many as 10 boards, to just 1. This flexibility is due to Gemini's adoption of accepted industry standards; especially the 80-Bus, specifically designed for the Z80 microcomputer which forms the heart of the MultiBoard system.

The principle advantage of a Z80 Bus system is the abundance of software available operating under CP/M, by which software becomes machine independent; providing the user with the widest range of software available.

There is also the opportunity to develop systems based on the Galaxy 3 computer (shown above) which uses Gemini MultiBoards, but has 2 spare slots in a 5-board frame for particular configurations. Alternatively, the Galaxy 2 provides a cost-effective development tool with 3 spare slots in a 6-board frame.

With MultiBoard thousands of permutations are possible. Eight of our most popular boards are shown here, but there is a range of 15 available; together with mother boards, frames, cables, power supplies, key boards and compatible software if required. A comprehensive catalogue is available from the Dealers listed, or 'phone us to discuss your requirements.



18 Woodside Road, Amersham, Bucks HP6 5EQ. Tel: (02403) 28321.

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Minstrel

The Minstrel is an exciting new British micro-computer and offers Winchester-based systems at fantastically low prices. The range extends from single-floppy single-user CP/M systems right up to a 68000-based model and includes an 8086-based range.

The Minstrel is compatible with the North Star Horizon and offers a superior alternative at a much better price.

There is a network of Minstrel dealers in the UK and Europe. Contact us for the name of your local dealer. Dealer enquiries invited.

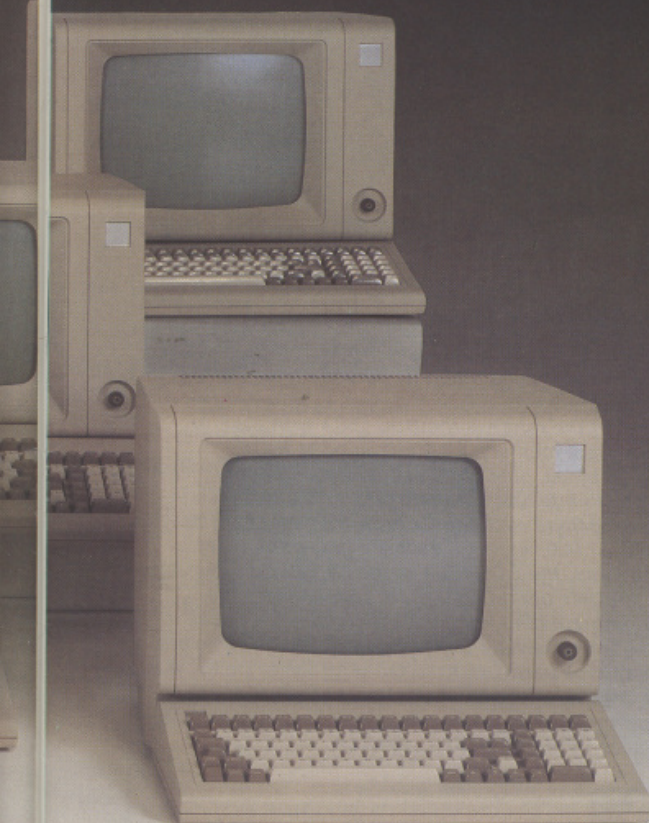
S100 bus

The amazing versatility of the Minstrel is due to the bus used: the S100 bus. This bus system is not only future-proof – the future is created on the S100 bus. Every major micro-computer development appears first on the S100 bus. Now over 150 manufacturers make S100 products and their combined range approaches 1000 boards.

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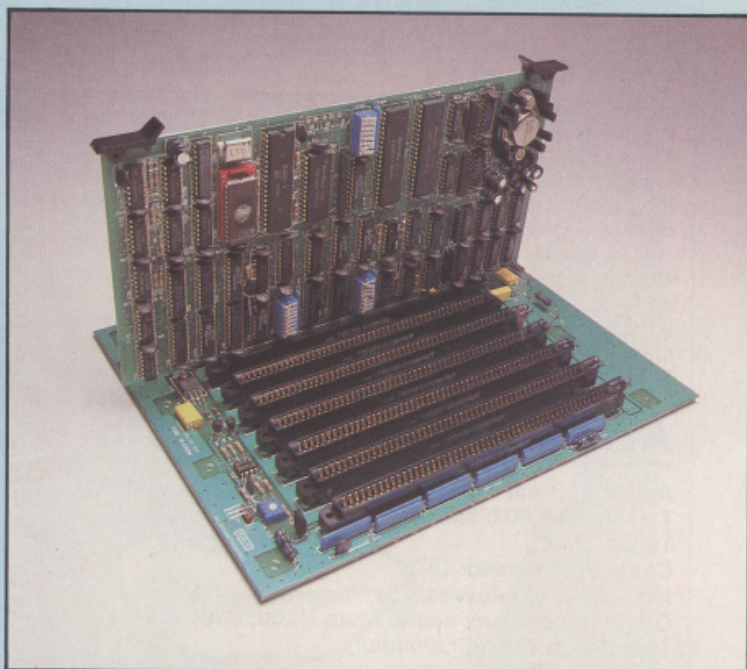
mily



One machine — eight computers

Yes! Inside the Minstrel micro-computer illustrated there are actually 8 Z80A single-board computers. One is dedicated to each user of the system resulting in astonishing performance. A ninth processor controls central disk storage and printers.

TurboDOS provides sophisticated spooling for multiple printers, supports 1000Mb disk drives and 128Mb files, and employs powerful disk buffering techniques.



TurboDOS[®] CP/M COMPATIBLE MULTI-USER OPERATING SYSTEM

TurboDOS is a popular high-performance multi-processor operating system. Each user has their own slave processor board (illustrated above). TurboDOS systems have been shown to out-perform mini-computers in the DEC PDP11/34 class at a fraction of the hardware cost.

TurboDOS is compatible with CP/M, the industry standard operating system, which means you have access to a vast range of off-the-shelf software.

The next development to TurboDOS on the Minstrel allows you to connect systems together via a Local Area Network.

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5 KDS7362 VDU's (illus)
1 Epson printer
1 OKI 84 printer

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TurboDOS is a registered Trade Mark of Software 2000, Inc.

• Circle No. 302

(continued from page 4)

The Apricot is a small, semi-portable micro which ACT is manufacturing in its factory in Glenrothes, Scotland. It uses an Intel 8086 16-bit chip and offers 256K of RAM, plus 315K of disc storage on 3.5in. drives.

For portable use the keyboard includes a two-line 40-character LCD which also functions as a calculator display and clock face. The Apricot is claimed to be 99 percent software compatible with the popular Sirius 1, which ACT distribute through 470 dealers. While ACT currently import the Sirius from the U.S., it is possible this will be made in Scotland.

ALMARC DATA SYSTEMS

Address: Great Freeman Street, Nottingham NG3 1FR
Telephone: (0602) 52657
Telex: 37407
Company founded: 1978
Number of employees: 25
Origin of company name: ALan Hood, MARCus Mazure
Turnover in 1982: £1.2 million

Almarc designs and manufactures microcomputer systems in the Nottingham area. It has concentrated on S-100 bus systems to provide users with a logical upgrade path from entry-level systems to multi-user networks. For the last five years Almarc has also imported Vector Graphic systems from the U.S.



Introduced earlier this year Almarc's Spirit range includes four models. Prices range from £2,355 for a single user eight-bit twin floppy-disc system with 1.6Mbytes of memory, to £25,000 for a Winchester system capable of supporting up to 10 users and built around Intel's 8086 16-bit microprocessor.

Manufactured in Nottingham, the systems feature processor-independence allowing an eight-bit Z-80 or 16-bit 8086 or 68000 chips to be incorporated. The micros S-100 format means that the selected processor board can be slotted into its chassis, while the system can be upgraded or expanded by simply adding or changing boards.

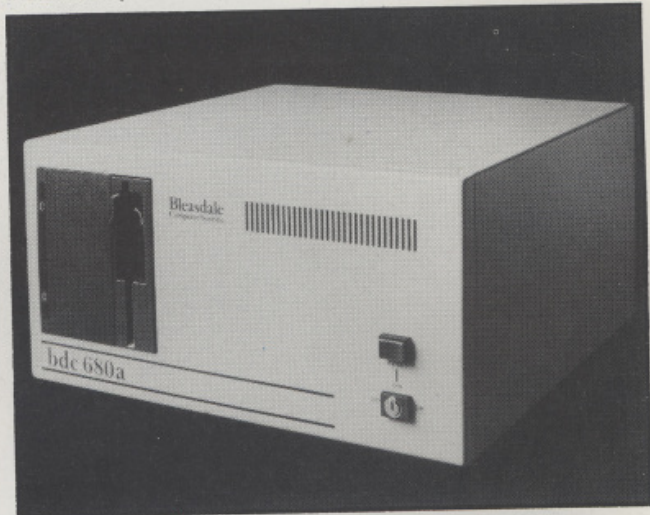
Operating systems available for the Spirit are CP/M-80, DPC/OS and MP/M for the eight-bit systems and CP/M-86, MS-DOS, DPC/OS and Concurrent CP/M-86 for 16-bit models. A wide range of programming languages and applications packages are also offered, while disc options range from twin 800K floppy discs up to 120Mbytes using an expansion chassis and three Winchester disc drives.

The company sells its products through 35 dealers as well as directly to large corporations.

BLEASDALE COMPUTER SYSTEMS

Address: Francis House, Francis Street, London SW1
Telephone: 01-828 6661
Telex: 28905
Company founded: 1975
Number of employees: 25
Turnover in 1982: £0.5 million

The company started as a consultancy specialising in the design of high reliability microprocessor-based industrial control systems. As a basis for its projects, it designed a highly-flexible computer which could be configured to meet each user's specific requirements. The company recognised the importance of Unix, a software system, and was the first European company to develop and install Unix computers. It now specialises entirely in building 68000-based Unix systems and configuring these systems to meet the user's specific requirements.



Built around Motorola's 68000 16/32-bit processor, Bleasdale Computer Systems' BDC-680 family of micros run under the Unix operating system.

At the bottom of the range is the BDC-680A with 256K or 512K of no wait-state memory, 256K of multibus RAM expandable to 2Mbytes, plus 20,33 or 46Mbytes of 5in. Winchester disc storage. Data back-up is to either 1Mbyte floppy disc or to 5Mbyte exchangeable cartridge discs. The BDC-680A costs £7,900, while Bleasdale's fully configured 68000 Unix machine, the BDC-680X carries a £20,000 price tag.

The use of the Unix operating system coupled with the availability of programming languages including C, Pascal, Fortran 77, RM-Cobol, Level II Cobol, Basic +, SMC Basic and APL make the micros particularly suitable for the system development, university and OEM markets as well as the commercial sector. Made by the company in Leicestershire, the systems are sold through five U.K. dealers.

BRITANNIA COMPUTERS

Address: 12 Castle Hill, Dudley, West Midland DY1 4QQ.
Telephone: (0384) 233433
Company founded: 1971
Turnover in 1982: Over £1 million

In its early days Britannia Computers' major concern was the sale of refurbished Singer-Freedom equipment. In 1975 Britannia initiated the development of its own range of microprocessor-based word processors and business computers. The second generation of these machines was launched in 1980.

Britannia calls its micro the Baby, but in fact the S3 Model 5-10 is more like a 16-bit minicomputer. It uses the Motorola 68000 chip in an S-100 bus compatible construction, with a minimum of 256K of RAM. Disc storage comprises a 5.25in. floppy with 1Mbyte of unformatted storage, plus a 10Mbyte hard disc. The operating system is Whitesmith's Idris, which is a multi-user multi-tasking o/s compatible with version 6 of Unix.

(continued on page 10)

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The SAGE program is also widely used for Incomplete Records Accounting (without requiring modification). It can therefore be used by practising accountants for both functions. Its efficiency is built on simplicity - and its simplicity accounts for the price.

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It's fully automatic - which means no shuffling through the program to find the section you need.

It's complete and self-contained - no expensive modules to buy every time you need an extra function.

It's suitable for use on CP/M or MS-DOS machines and has so far been implemented on Osborne, Superbrain, Epson QX-10, Sirius, Victor 9000, IBM PC, BBC/Torch Z80 and ITT with others in the pipeline.

What's more, the SAGE accounting program has been successfully tested in hundreds of installations and is the only system of its type - is as effective in a one-man business as in a multi million pound corporation.

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PC1

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(continued from page 8)

BRITISH MICRO

Address: Unit Q2, Penfold Works, Imperial Way Watford, Hertfordshire WD2 4YY

Telephone: (0923) 48222/43956

Telex: 946024

Company founded: 1980

Number of employees: 65

Origin of company name: Hegotron Microcomputers Ltd

Turnover in 1982: £1.5 million

Parent company: Hegotron Holdings

Hegotron group is a vertically integrated group of companies. Its computers are manufactured by British Micro, Watford. Its software is created by Scifax, in Basingstoke. Electronic assembly and testing is at Compact Business Machines in Brighton and printed circuit boards are manufactured by Hegotron PC in Herefordshire. Research and development in the fields of micro computing and robotics is by Hegotron Robotics, also in Watford.



British Micro offers the Mimi range of micros and Grafpad, a £99.95 tablet digitiser. In the micro family are the Mimi 803 based on the eight-bit Z-80A microprocessor with 800K of floppy-disc storage plus 64K of RAM, and the Mimi 803W with the same processor and RAM capacity but with 10Mbytes of floppy-disc storage. The 803 is priced at £1,495, while the larger system comes in at £2,750.

Made in Watford, the company's product range is sold through a 45-strong dealer network with most of the micros sold into the business market. Special features of the Mimi range include Trojan, an integrated software system which combines both an operating system and high-level programming language.

BROMLEY COMPUTER CONSULTANCY

Address: 417-421 Bromley Road, Bromley, Kent BR1 4PJ

Telephone: 01-697 8933

Telex: 896691

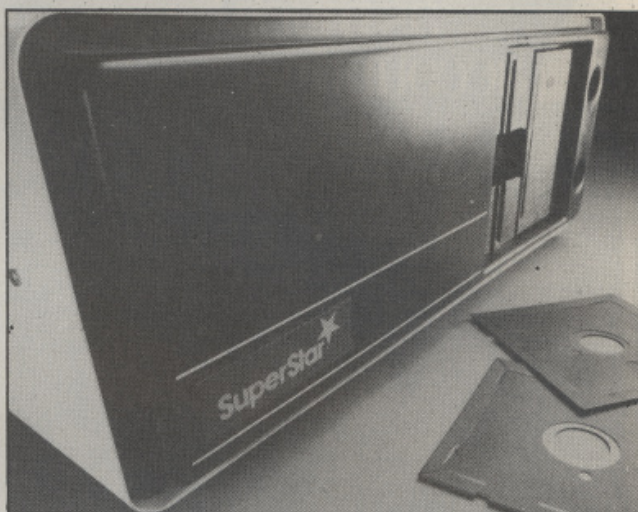
Company founded: 1978

Number of employees: 18

Origin of company name: Founded in Bromley, Kent

Turnover in 1982: £0.5 million

Bromcom is a company of consultants, each fully qualified in a branch of microsystems — both hardware and software — formed to help businesses choose the best available. The company developed the software packages followed by the hardware, which resulted in the Bromcom multi-user Superstar computer system. However, the software can also run any normal CP/M software.



Bromley Computer Consultancy manufacture and market the Superstar system, which can support one to 16 users. The system is based around a central unit containing disc drives and an S-100 card frame. Each user on the system has a dedicated processor card with either an eight-bit Z-80A and 64K of RAM on it, or alternatively a 16-bit 8086 with 128K memory.

Users therefore do not have to compete for processor time and can work independently, but they have the advantage of sharing system resources like discs and printers. Eight-bit cards running eight-bit CP/M and 16-bit cards running CP/M-86 can be mixed in any combination. Superstar prices start at £1,750 for a single-user system with two floppy drives. A fully expanded system with 80Mbyte of hard disc storage and 16 terminals attached would cost about £30,000.

CAMPUTERS

Address: 33a Bridge Street, Cambridge CB2 1UW

Telephone: (0223) 315063

Telex: 817207

Company founded: Started design work March 1983

Number of employees: 40

Origin of company name: To reflect origin in Cambridge and building computers

Turnover in 1982: Only started manufacturing this year

Parent company: Computer Holdings plc

Camputers, the Cambridge-based manufacturer of Lynx microcomputers, was formed in 1981. The first project was the development of the Lynx 48K, designed by Camputers' sister company GW Design Services, and launched at the 1982 PCW Show. This year the company has launched the Lynx 96K and a range of peripheral equipment including disc drives. The 128K professional version of the Lynx is due for launch at this year's PCW Show. Camputers' software subsidiary Camsoft was formed earlier this year and now markets a growing range of games, educational and business programs. Camputers went public in June this year. It is now an established force in the U.K. market, and its products are exported to Europe and the Middle East.

The Lynx, Camputers' first product, is a small cassette-based home micro built around the popular Z-80 CPU. It has high-resolution colour graphics and a real keyboard, though the Return key is bizarrely positioned. The basic model costs £225

(continued on page 13)

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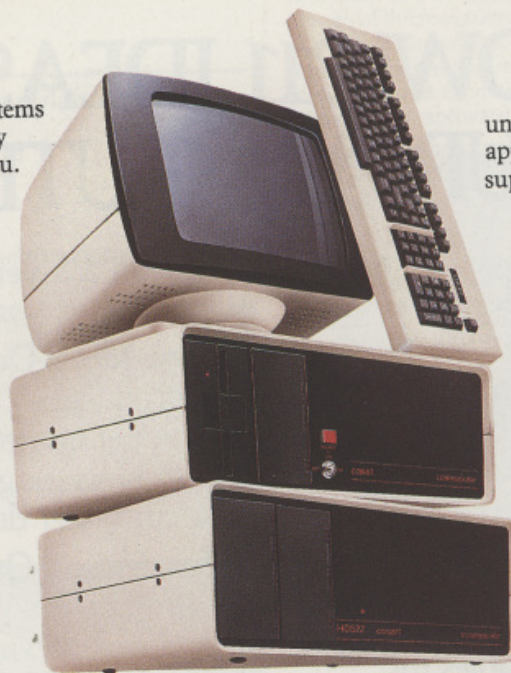
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Comart have also met the stringent CCTA requirements. Which means we are A1. In short, Comart Communicator systems can keep pace with both progress and innovation.

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What's more, it's British. At any one of the addresses listed below you can see the remarkable flexibility of a Comart Communicator system for yourself. In under three years, it has become a complete family of compatible, fully expandable microcomputer systems, covering

20 models and including single user, multi-user and multi-processing systems.

To become technical for a moment, there's a choice of 8 or 16 bit processors, up to 1 megabyte of RAM and a wide range of floppy and hard disk storage capacities and add on modules.

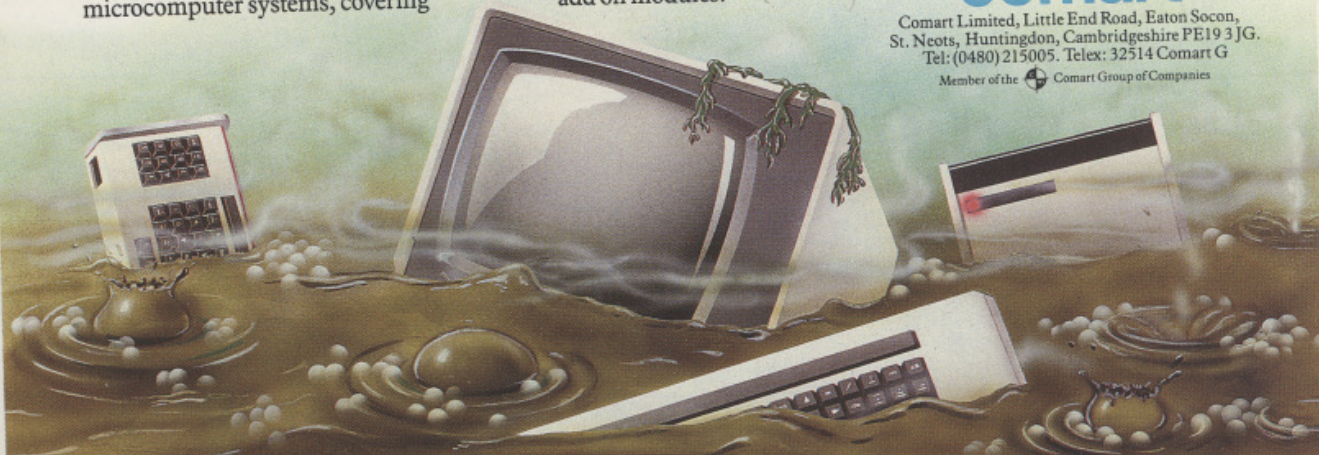
COMART COMMUNICATOR SPECIFICATIONS

CP100 Series Systems		CP1000 Series Systems	
Microprocessors:	8 Bit Z80A (1 to 4)	16 Bit 8086	
Memory:	64K-512K bytes	256K-1M byte	
Storage:	720K or 720K byte diskettes	720K or 720K byte diskettes	
Operating Systems:	CP/M, MP/M11 & CP/NET	5M or 20M byte hard disks	
	multi-processor 1 to 5 users	CP/M86, MP/M86, MS-DOS, 1 to 8 users	
Features common to both CP100 & CP1000 Series Systems			
Keyboard/Display: 101 Key, detachable 14" green screen, switchable			
Expansion: Internal—510K cards, mainframe communications & protocols			
Expansion: External—variable modules inc. cartridge & 8" floppy & hard disks			

CP/M, MP/M11, CP/M86, MP/M86 & CP/NET are trademarks of Digital Research Inc. Z80A is a trademark of Zilog Corp. MS-DOS is a trademark of Microsoft Corp. Comart and the Comart logo are trademarks of Comart Ltd.

comart

Comart Limited, Little End Road, Eaton Socon, St. Neots, Huntingdon, Cambridgeshire PE19 3JG.
Tel: (0480) 215005. Telex: 32514 Comart G
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COMART COMMUNICATOR UK DEALERS

ABERDEEN
MOM Offshore
Tel: 0224 22520
AYLESBURY
J K. Wakeford Associates
Tel: 0296 27473
BEDFORD
Remdex-Bradley
Tel: 0234 68581
BEDS (AMPTHILL)
M. E. Marketing
Tel: 0525 404262
BELFAST
Cardiac Services Co
Tel: 0232 625566

BIRMINGHAM
The Byte Shop
Tel: 021 622 7149
CAMBRIDGE
Cambridge Computer Store
Tel: 0223 65134
CAMBS (ST NEOTS)
Westcom
Tel: 0480 217217
CHANNEL ISLES
Bell Data Systems
Tel: 0481 21671
COLCHESTER
Eurotec Consultants
Tel: 0206 72538

DONCASTER
Spot Computers
Tel: 0302 25159
DUBLIN (EIRE)
Lendac Data Systems
Tel: 0001 710226
EDINBURGH
Holdene Microsystems
Tel: 031-557 4060
GLASGOW
The Byte Shop
Tel: 041-221 8202
GLENROTHES
Computer Services Scotland
Tel: 0592 773710

LEEDS
Holdene
Tel: 0532 459459
LONDON (BRISTON)
Jarogate
Tel: 01-671 6321
LONDON (COVENT GARDEN)
Digital
Tel: 01-379 6968
LONDON (ECA)
Zygal Dynamics
Tel: 01-248 4883
LONDON (NW1)
The Byte Shop
Tel: 01-387 0505

LOUGHBOROUGH
Data One
Tel: 0509 37281
MANCHESTER
The Byte Shop
Tel: 061-236 4737
MANCHESTER
NSC Computers
Tel: 061-832 2269
NORWICH
Eastern Bus. & Accounting
Systems Tel: 0603 27460
NOTTINGHAM
The Byte Shop
Tel: 0602 40576

OXON (BICESTER)
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READING
M. E. Electronics
Tel: 0734 667663
SOUTHAMPTON
The Byte Shop
Tel: 0703 334711
STAINES
Newbury Data Recording
Tel: 0784 61141
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Great Western Computing
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Holdene
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WINDSOR
Romtec
Tel: 075-3551550
WORTHING
Ace Computing Services
Tel: 0903 35411

● Circle No. 305

PRACTICAL COMPUTING British Micro Guide

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and has 16K of ROM and 48K of RAM, of which around 13K is free to the built-in Basic.

The 96K model costs £299 and has a 20K ROM, with some extra commands and firmware to drive a printer. Around 37K of the 96K RAM is available for Basic programming. The 48K version is upgradeable, and it is hoped that a further upgrade will provide access to CP/M. The Lynx is sold mainly through Lasky's and the Spectrum chain of shops.

CASU ELECTRONICS

Address: Arundel Road, Uxbridge Industrial Estate, Uxbridge, Middlesex

Telephone: 01-561 6820

Telex: 296753

Company founded: 1977

Number of employees: 67

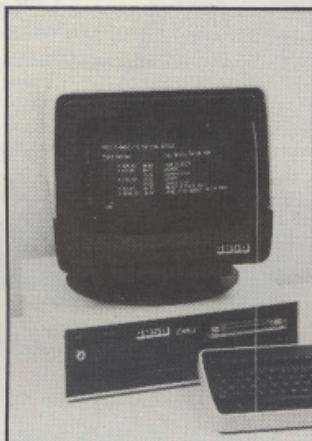
Origin of company name: Carolyn and Suzanne — founder director's two daughters

Turnover in 1982: £5.2 million

Casu markets eight- and 16-bit microcomputers and communications systems to the business sector and government departments. It manufactures all products in a modern production facility based in Uxbridge. It provides a network of hardware and software support centres throughout the U.K.

Casu manufactures a range of eight and 16-bit systems all designed to give a wide degree of choice of different hardware configurations in a neat package. The C-Max is a single-user eight-bit Z-80A, S-100 system with a range of disc options starting from £1,750. The MC-Max is an eight-bit, Z-80A, multi-user system with a range of hard-disc options priced from £5,495, running the Digital Research family of operating systems, CP/M, MP/M and CP/Net.

Casu's 16-bit system is the Super PC, based around the Intel 8088, running either MS-DOS or CP/M-86. Prices start from £1,800 for the entry level floppy-based system, with several hard-disc options available. By micro standards Casu offers high-capacity disc options with its systems, including a 40Mbyte 5.25in. Winchester drive with 17Mbyte tape cartridge back-up.



CIFER

Address: Avro Way, Bowerhill, Melksham, Wiltshire SN12 6TP

Telephone: (0225) 706361

Telex: 449872

Company founded: 1972

Number of employees: 250 +

Origin of company name: Computer InterFace

Turnover in 1982: £5.3 million

Cifer started in 1972, designing and constructing specialised computer interfaces. VDU manufacture commenced in 1974, and since then Cifer has become the major U.K. supplier of micro-based intelligent terminals. From intelligent terminals to stand-alone microcomputers was a logical step, and Cifer now produces a wide range of high performance desktop microcomputers.



The Wiltshire-based company Cifer manufactures a range of micros in its Melksham facilities, including the flagship of its products the Cifer Club. The Club sells at £3,395 and incorporates a Z-80A processor with 64K RAM, and a Z-80A display processor with 64K RAM. The machine has a 5Mbyte Winchester drive and a 800K floppy-disc drive. It supports the CP/M operating system, with MP/M and Unix as extras.

At the bottom of Cifer's range is the series 2880, with prices starting at around £2,295. The multi-processor workstations have three RS-232C/V24 ports and parallel and IEEE-488 interfaces. The five models in the series have various disc capacities from a single floppy to a Winchester drive plus floppy. CP/M is standard on the range and application packages available include word processing, the various accounts packages, and payroll.

Also on offer is Cifer's Series One, a range of four micros with built-in disc storage either floppy or Winchester 21Mbyte. The 16-bit processor systems have a detachable keyboard, three serial interfaces, and one parallel one.

All Cifer's machines are sold through a network of 14 dealers and numerous OEMs, and are used mainly in business, science and engineering applications.

CLENLO COMPUTING SYSTEMS

Address: Crown House, 18 Gypsy Hill, London SE19 1NL

Telephone: 01-670 4202/3

Telex: 8954102

Company founded: 1980

Origin of company name: Family initials

Clenlo S-100 bus systems are assembled in the U.K. to suit the needs of individual customers. It has a range of chassis, of which the most popular is the floor-standing 20-slot model the Pronto. Into the bus Clenlo can fit a range of options. Processors offered are Z-80A, Z-80B, 5MHz 8086 and 8MHz 8086. Each eight-bit processor has 64K of RAM and each 16-bit from 128K to 1Mbyte. A 4Mbyte RAM-disc is also available.

Multi-processor systems are a popular option, with each user having a dedicated CPU board and RAM. Depending on requirements, the operating system can be CP/M-80, CP/M Plus, CP/M-86, DPC-DOS and Turbodos. Floppy and hard discs cover most possibilities from 350K to 360Mbyte, with tape drives for back-up.

(continued on page 15)

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● Circle No. 309

(continued from page 13)

COMART

Address: Little End Road, Eaton Socon, St Neots,

Cambridge PE19 3JG

Telephone: (0480) 215005

Telex: 32514

Company founded: 1977

Number of employees: 120

Origin of company name: Computer Mail Order and Retail

Parent company: Comart Group of Companies

Comart has developed into a major U.K. microcomputer manufacturer with a specialist subsidiary, Xitan Systems in Southampton, providing the operating systems and packaged application software. Six regional Byte shops and Microserve centres provide local support and service from six major cities in the U.K. Comart also supports a nationwide network of dealers and OEMs, comprehensively backed by Comart's technical support, training and customer service departments. Future plans include a major extension of manufacturing facilities and an export thrust into Western Europe and the U.S.

Comart has both eight- and 16-bit models in its Communicator range of microcomputers manufactured in St Neots, Cambridgeshire. Of the six Z-80A eight-bit models the latest is the CP-520MP, a multi-user, multi-processing micro with five Z-80A processors, each with 64K RAM, and a 20Mbyte hard disc. Others in the series are the CP-100, the CP-200, the CP-500, the CP-520, and the CP-520M. The CP-520M and CP-520MP have multiprocessing software for up to three users as standard. All the eight-bit models run under CP/M and MP/II.

The three 8086 models run under CP/M-86, MP/M-86, and MS-DOS and handle up to eight users.

Comart also offers CP/Net, an entry level micro networking system which can be configured in a number of ways.

COMMODORE BUSINESS MACHINES (U.K.)

Address: 675 Ajax Avenue, Trading Estate, Slough, Berkshire SL1 4BG

Telephone: Slough (0753) 74111

Telex: 848403

Company founded: 1958

Number of employees: 3,000

Turnover in 1982/83: \$650 million

Parent company: Commodore International Inc.

Commodore began as an assembler of hand-held calculators and in 1974 bought into MOS Technology, the semiconductor research and manufacturing company. Its improvements on the Motorola 6800 led to the production of the 6502 microprocessor, and hence the Pet was born. The first model was unveiled in 1977 and was a huge success. Later models and new micros such as the Vic-20 and Commodore 64 have made Commodore one of the most successful micro companies in the world. This year Commodore opened a manufacturing plant in the former steel town of Corby, which qualifies them for inclusion in British Micro supplement.



Commodore Business Systems has four types of business systems starting at around £550, plus the Commodore 64 and Vic-20 home computers starting at £139.

Both the larger business systems, the 8000 range and the 4000 range, and the smaller business systems, the 500 and 700 series, are manufactured in West Germany. The two personal computers are produced in Corby in Northamptonshire.

The Commodore 64, which has a base price of £299, has a MOS-6510 main processor, 64K RAM and a Z-80 processor option. It incorporates a dedicated video chip, sprite graphics, a music synthesizer, a Prestel link and 320 by 200 high-resolution graphics. It also has the option of CP/M and an external ROM cartridge slot.

The Vic-20 home computer has 5K RAM, expandable up to 29K, RS-232C interface ability and eight programmable special functions accessed through four special function keys.

CONTROL UNIVERSAL

Address: Unit 2, Andersons Court, Newnham Road, Cambridge CB3 9EZ

Telephone: (0223) 358757

Company founded: 1958

Number of employees: 23

Origin of company name: To indicate company is in the business of supplying computers for general control purposes

Turnover in 1982: £0.5 million

The company started selling the Rockwell Aim in 1965 when it found a need for additional equipment, such as, power supplies and additional memory which it started to manufacture. The need to provide a disc drive for the Aim-65 led to co-operation with Acorn in 1979 in order to use its standard Eurocard floppy disc controller. After acquiring a dealership for all Acorn products, the company complimented Acorn's product range by bringing out its own range of additional Eurocards including the Cubit CPU cards and the Cumem memory card which have been extremely successful. Control Universal is now the leading U.K. supplier of industrial eurocard computers and in July 1983 launched the complete Cube range of industrial microcomputer cards. The links with Acorn continue through the Beebex hardware extension unit for the BBC microcomputer which permits the use of the entire Cube range of modules.

Control Universal's micro is the Eurocube, a £100 single-board computer with a 6502 or 6809 CPU according to choice.

Together with a further range of about 30 standard Eurocard boards and software tools these form a microcomputer development system aimed mainly at industrial process control applications. Also the cards are Acorn compatible and can be used as extensions to the BBC Microcomputer.

(continued on next page)



(continued from previous page)

COUNTRY COMPUTERS

Address: Pipers Road, Park Farm Industrial Estate,
Redditch, Worcester B98 0HU
Telephone: (0527) 29826
Telex: 337497
Company founded: 1981
Number of employees: 25
Origin of company name: Based on Countrywide Service
Company
Turnover in 1982: £0.3 million

Country Computers was established to sell to and service the growing computer industry. With a country-wide maintenance organisation already established its first manufacturing venture was the highly successful Acclaim microcomputer running all Apple and CP/M software. Large sales volumes into the CP/M market and Country's ability to launch a new product within a short space of time, led to the introduction of the C-3000 with price being a major consideration. Some 90 plus orders were received and satisfied within the first two months of its launch in the U.K. — customers include British Telecom, BMA and MoD — the C-3000 has all the ingredients for today's low-cost CP/M market.



The C-3000 is an eight-bit Z-80 system designed to allow the user access to the huge quantity of CP/M 2.2 software with all the benefits of a 10Mbyte hard disc but at a very low price. In fact the 10Mbyte version with a 500K floppy disc thrown in costs only £2,450, though of course it also needs a terminal.

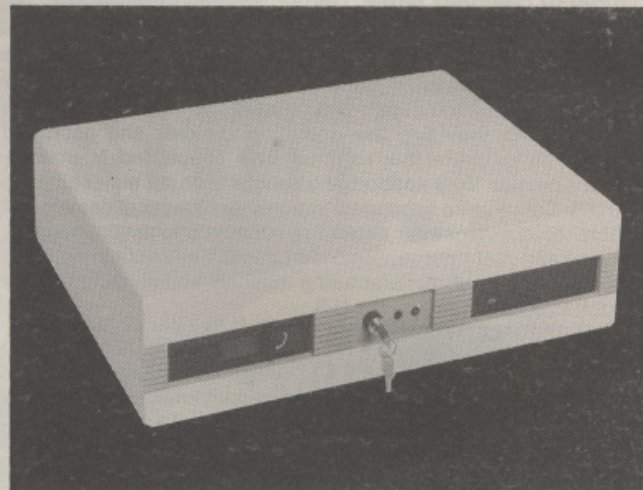
The C-3000 actually uses five Z-80s plus a Western Digital WD-1797 disc controller. There is 64K of RAM and up to 32K of ROM. Hard disc options are offered from 5Mbyte to 21Mbyte, and the CP/M can be upgraded to MP/M-II for multi-user operation.

The C-3000 is made in Redditch, using Rodime hard discs which are manufactured in Scotland. It is sold through some 25 dealers, mainly into vertical markets to meet specific end-user requirements.

DIGICO COMPUTERS

Address: Wedgwood Way, Stevenage, Hertfordshire
SG1 4PY
Telephone: 314381
Telex: 825508
Company founded: 1966
Number of employees: 100
Origin of company name: Digital Company
Turnover in 1982: £5.5 million
Parent company: Spanverne Investments

Having commenced as a mini manufacturer in 1966, Digico launched its first CP/M-based microcomputer, the Prince, early in 1981. Very quickly the Prince was followed by a sophisticated microcomputer network called the Vision which catered for up to eight microcomputers sharing into a common Winchester database with standard CP/M application packages. The whole micro network then will link into Digico's 7800 series mini-micro network catering for up to 30 terminals, each terminal capable of being developed as a micro cluster or even linking to an ICL, IBM or Honeywell mainframe.



Digico's Prince micro can be used as a stand-alone system or an intelligent terminal in a computer network. Priced from £2,950, the system has three Z-80A microprocessors, 64K of RAM as standard and can support both Winchester and floppy-disc drives for data storage.

Running under the CP/M operating system, the Prince offers Basic, Fortran, Cobol and Pascal programming languages plus a range of high-resolution graphics facilities. Users wanting a multi-terminal micro network can be linked using Digico's Vision product which provides 20 or 40Mbytes of shared disc storage supporting up to eight micros. Each micro connected to the central Vision unit may have its own storage, otherwise Digico's 3807 terminal without local storage but with a large 15in. screen can be used as a node on the network. As a stand-alone device the 3807 can be used in conjunction with on-line floppy or Winchester storage standing alongside the terminal.

Digico sells its Leeds-built products through 50 U.K. dealers. Major end-user applications of the micro and terminals include production control, integrated business systems, word processing and use of the systems as mainframe terminals.

DRAGON DATA

Address: Kenfig Industrial Estate, Margam, Port Talbot,
West Glamorgan SA13 2PE
Telephone: (0656) 744700
Telex: 498934
Company founded: 1982
Number of employees: 180
Origin of company name: Name connected with Wales
— Dragon
Turnover in 1982: Not yet completed full year's trading

Dragon Data began life as a subsidiary of Mettoy, the Welsh toy-manufacturing giant, in the Spring of 1982. In August of that year the Dragon 32 was launched and rapidly became a best-seller. In November 1982 a six-partner consortium was formed to purchase the company from Mettoy and help Dragon Data into a new factory in Port Talbot, a move which helped treble the company's production capacity. Between August and Christmas 1982 over 32,000 units were sold in the U.K. By the end of 1983 it is estimated that over 300,000 will have been sold world-wide.

(continued on page 20)

"HELLO. I'M ORION. CAN WE TALK BUSINESS?"

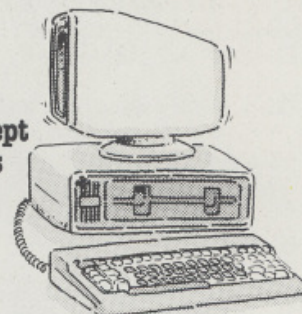


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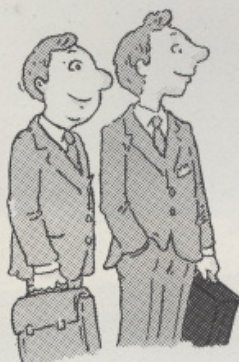
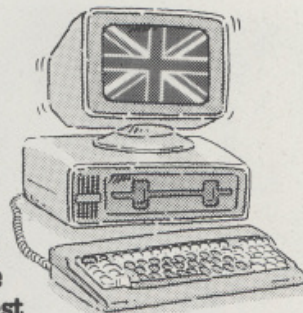
"ORION? You're new then."

"I'm the latest in 16-bit technology. Up to 896kb RAM memory, Multi-tasking, offering Word Processing, Telex, Data Processing, Financial Management..."



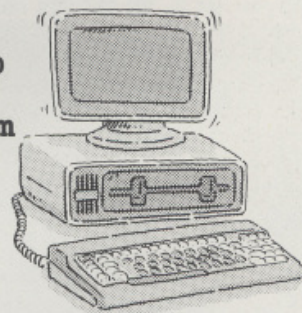
"Look, I don't have time for the sales pitch right now. Where are you from?"

"To start with, I'm British. And I'm from the OEM Group. They're the people who've been selling Adler business systems for over 30 years. And Imperial, too. So they know what they're talking about when they talk business. And my software programs are being produced by one of the biggest and most experienced specialists in the world."



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"Then fill in the coupon and I'll send you my brochure. But don't commit yourself to anything until we've met. And as for talking business, well... we've already started, haven't we!"

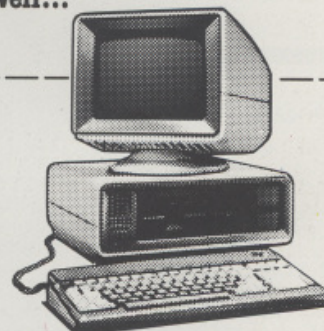


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NOW ALL OTHER MICROS ARE LESS THAN PERFECT

[†] OS/M is the trademark of Scifax Microsoftware.

[‡] CP/M is the registered trademark of Digital Research Inc.

*Monitor extra, from £132.

TROJAN

With the completion of the TROJAN Operating System and language, Scifax have already produced TROJAN Ledgerfax-Sales Ledgerfax-Purchase and Videofax. Because of the 'English Language' programming these packages are exceptionally user friendly, and being based on existing card systems, any accounts clerk can transfer from the present laborious, manual system to a complete computer system with all its management reports.

TROJAN Videofax is written specifically for the Video type rental business, and handles all membership, rentals, leasing and financial reporting of the Video Market.

This package has met with full approval of the Video Traders Association.

The currently planned releases in TROJAN includes TROJAN Networking and Wordprocessing.

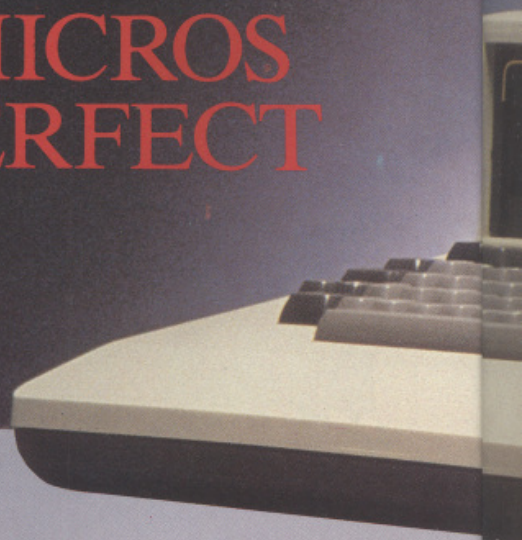
TROJAN Networking will permit up to eight satellite mimi microcomputers to share files via a central disc based system. This system will be demonstrated at Compec '83.

TROJAN Wordfax will be a truly user friendly Wordprocessing package, and will include Merge facilities as standard.



BRITISH MICRO

Penfold Works Imperial Way Watford Herts. WD2 4YY Tel: Watford (0923) 48222/43956





A Hegotron Group Company



SOFTWARE DEVELOPMENT ON THE MIMI 803

With the release of NEW OS/M 'a user friendly implementation' of CP/M* compatible operating system, British Micro are pleased to announce synchronous protocols can now be built-in as 'drivers' in the operating system.

Already tested are ICL and IBM protocols, and the availability of this Software means that mainframe users can have intelligent terminals

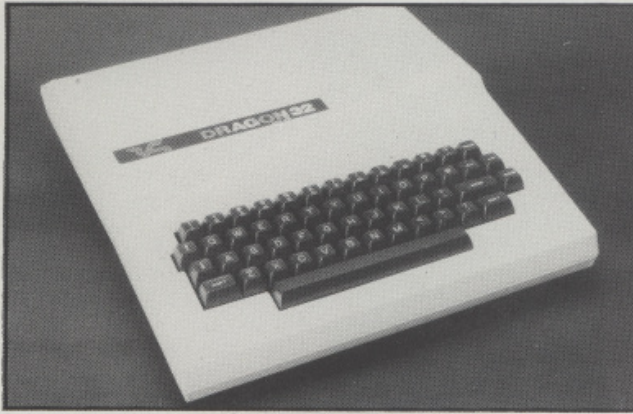
at a cost not much greater than that of the manufacturers Dumb terminals.

The availability of Cobol and Fortran on the British Micro Mimi 803 ensures that users of mainframes have no re-training of programmers to make the best use of this vastly enhanced performance of their terminals.

MIMI 802

● Circle No. 308

(continued from page 16)



The Dragon home computer was the smash hit of the pre-Christmas sales scramble in 1982. Mainly because it offered a typewriter-style keyboard and 32K of RAM for under £200. Like the semi-compatible Tandy Color computer, which its design resembles, it uses the powerful 6809 microprocessor.

Unfortunately it has seen little development since its launch. In spite of strong support from Boqts the chemist — a major sales outlet, its poor screen display, unfriendly line editor, lack of lower case letters, and lack of good software and peripherals are now beginning to tell against it. Dragon's next development is more likely to be a small business machine.

DVW MICROELECTRONICS

Address: 345 Foleshill Road, Coventry.

Telephone: 668181

Telex: 312171

Company founded: 1977

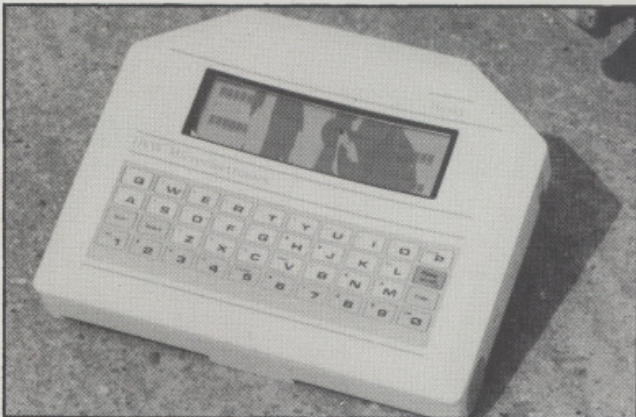
Number of employees: 40

Origin of company name: Dalton Viewing & Whitsey Ltd. became DVW Microelectronics in 1981

Turnover in 1982: £4.8 million — parent company

Parent company: Aidcom International

Founded as a microprocessor product design consultancy in 1977 DVW merged its interests with the newly formed Aidcom Group in order to finance development of the Husky portable microcomputer. Conceived as a truly utilitarian portable micro, Husky was the world's first truly robust microcomputer and quickly found favour with customers from hotel keepers to the military.



Coventry-based DVW Electronics manufactures the metal-cased Husky microcomputer for use in adverse weather and environmental conditions. The hand-held micro is available in three versions, the Husky, from £1,200 to £3,000, the Husky IS — intrinsically safe — and the Husky A/D with analogue input, from £1,525.

The Husky has up to 144K of RAM with a 32K firmware space for an extended Basic interpreter, and a liquid crystal

display with four lines of 32 characters. It supports synchronous and asynchronous communications via a RS-232/V-24 serial port on a standard 25-pin D-type connector.

The Husky is battery operated and gives up to 50 hours of operational use, or twelve months of data retention in the dormant mode. The micro is sold directly to end users in the U.K. and via agents overseas.

EQUINOX COMPUTER SYSTEMS

Address: 16 Anning Street, London EC2A 3HB

Telephone: 01-729 4460

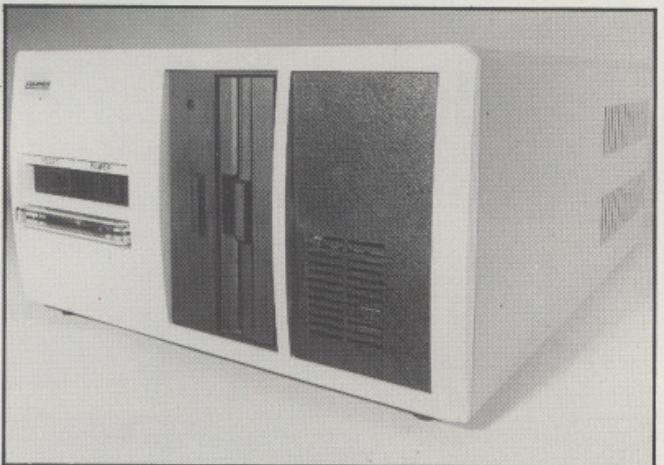
Telex: 27341

Company founded: 1978*

Number of employees: 26

Turnover in 1982: £3 million

The company's growth is based on its concentration on top-end multi-user microsystems.



The Equinox 200 is an S-100 bus floor-standing micro that is designed to compete with minicomputers, but at a relatively lower price. The standard machine features a Z-80A with 64K of RAM and a 12-slot bus, dual 8in. floppy-disc drives and a 32Mbyte cartridge disc drive — 16Mbyte fixed, 16Mbyte removable.

With the flexibility of the bus system various options can be offered with an 8088 CPU or up to 14 multiprocessors. The hard disc can be expanded to 96Mbyte. Operating systems available are CP/M, Turbodos and BOS systems start from around £9,950, and are sold through a network of 20 dealers mainly to government and industry.

FERRANTI COMPUTER SYSTEMS

Address: Simonsway, Wythenshawe, Manchester M22 5LA

Telephone: 061-499 3355

Telex: 668084

Company founded: 1975

Number of employees: 6,300

Origin of company name: Founders Ferranti name

Turnover in 1982/83: £124.7 million

Parent company: Ferranti

The company was formed from three trading activities within the Ferranti company: Bracknell dealing with military systems, Cheadle Heath for simulators and military activities, and Wythenshawe division responsible for all civil applications of computer equipment and systems.



Ferranti Computer Systems offers one micro as part of its computer range, the Professional Personal Computer, PPC. The PPC uses a standard PT7 display and keyboard, and incorporates a 16-bit microprocessor with 128K RAM and 0.5Mbyte twin floppy discs.

The PPC can be either a stand-alone model or access a mainframe computer; switching between the two is done by a simple key sequence. The PPC runs under CP/M with a simplified operator interface for first time users. Ferranti sell the micro direct to end users at £2,800.

FUTURE COMPUTERS

Address: PO Box. 306, Purley, Surrey.

Telephone: 01-683 0111

Telex: 947788

Company founded: 1982

Number of employees: 35

Future Computers backed by the British Technology Group and APA, a private venture-capital company, was formed in 1982. The Future Computers range was conceived as a complete product family able to grow and shape to suit a particular customer's needs in the business world. Encotel Systems are the sole U.K. distributors and a nationwide network of 100 dealers sell the range. Units are being produced at a rate of 3,000 per month and the range is now being actively sold in the U.S., Europe and China as well as the U.K.



At the heart of Future Computers' FX range is the FX-20, a stand-alone 16-bit system built around Intel's 8088 microprocessor with a standard 128K of RAM and twin 5.25in. floppy disc drives, which can read IBM formatted floppy discs. Priced at £1,875 the FX-20 has an in-built local area network facility.

Other members of the FX range are the FX-0 and FX-10 terminals, the FX-21 OEM micro, three network processors capable of supporting eight to 16 terminals with shared Winchester discs, and either floppy disc or cartridge tape back up, and the FX-30 stand-alone micro. The 16-bit FX-30 is priced from £2,800 for a version with integral Winchester discs offering up to 50Mbytes of storage, while a version with cartridge tape back-up costs from £4,150.

The micros all include the CP/M-86 Plus operating system, with Concurrent CP/M and MS-DOS offered as optional extras. A wide range of applications packages are available, although the word-processing package Spellbinder and IMPS financial planning and spread-sheet package are included with the machines.

Future Computers has 100 dealers and sells its British-made systems to both U.K. and overseas business users working in single and multi-user environments.

FUTURE TECHNOLOGY SYSTEMS

Address: Lochview Road, Beith, Ayrshire KA15 1JD

Telephone: 05055 3637

Telex: 779247

Company founded: 1981

Number of employees: 130

Future Technology Systems, FTS, was formed in 1979 by Martin Healey, Professor of Microprocessor Engineering at University College, Cardiff, with Peter McHugh and David Sheer. The company chairman is Sir Monty Finniston. The backers include the Norwich Union and the Scottish Development Agency. The first product was the advanced Series 88 multi-function office computer. Later FTS designed the Orion desktop micro for Office and Electronic

Machines, which it builds at its plant in Beith, Ayrshire.



GEMINI MICROCOMPUTERS

Address: 18 Woodside Road, Amersham,

Buckinghamshire

HP7 0BH

Telephone: (02403) 28321

Telex: 837788

Company founded: 1980

Number of employees: 25

Origin of company name: Relates to the birth sign of the managing director

Turnover in 1982: £1.2 million

Gemini started life building and marketing peripherals for Nascom systems. The range of products became so wide that the move into selling its own systems was inevitable. Multiboard cards have been in production since 1980 together with disc systems. Galaxy Systems were first shipped in the Spring of 1982, by December 1982 the first Winchester-drive based systems were shipped and in January the Multinet network system was displayed at the Which Computer Show.

(continued on next page)

(continued from previous page)

The Galaxy range of micros currently includes three models — 2, 3 and 4. All are based on the industry-standard 80-bus system and use twin Z-80 processors, giving access to the huge range of CP/M 2.2 software. The Model 2 includes three cards in a five-slot bus, and offers 64K of RAM plus two 400K floppy disc drives. With keyboard and monitor it costs £1,495 plus VAT. The Model 3 offers a 5.4Mbyte hard disc plus one 800K floppy and costs £2,500 plus VAT. 10Mbyte and 20Mbyte versions are also available. The Model 4 is a networking version.

The Galaxy systems are made in Amersham and distributed through a network of dealers. The main markets are small businesses, schools, and industrial control systems. Gemini also sell the 80-bus boards separately for this, and so people can configure their own systems.

GLOBE BUSINESS MACHINES

Address: Units 1 and 2, Smith's Forge Industrial Estate, North End Road, Yatton, Avon, BS19 4AU
Telephone: (0934) 835222
Number of employees: 10

The company moved into premises during July of 1982. The next two months were spent equipping the factory and recruiting staff. First production units were shipped during late August, early September. Since then 300 plus have been shipped.



The entry-level system in the Globe range is the 101, which features an Intel 8085 eight-bit microprocessor and 64K of RAM. Storage is provided by two 5.25in. floppy disc drives built into the cabinet with the VDU. The detached keyboard has 100 keys including a numeric keypad and 17 function keys dedicated to word processing requirements.

The base price of £1,960 includes CP/M, WordStar and Mailmerge. The 101 can be upgraded to the Model 102, which features two 8in. drives offering 1.2Mbyte of formatted storage each. The £3,395 price includes additional software, Plannercalc and Financial Director. The Model 103 is a dual-processor version with 128K of RAM and a 5Mbyte hard disc instead of one of the floppies. It costs £4,300, including software.

Globe Systems are made at Yatton in Avon and distributed through about 50 dealers, mainly for word processing and small business use.

GRUNDY BUSINESS SYSTEMS

Address: Somerset Road, Teddington, Middlesex TW11 8TD

Telephone: 01-943 1901

Telex: 929728

Company founded: 1981

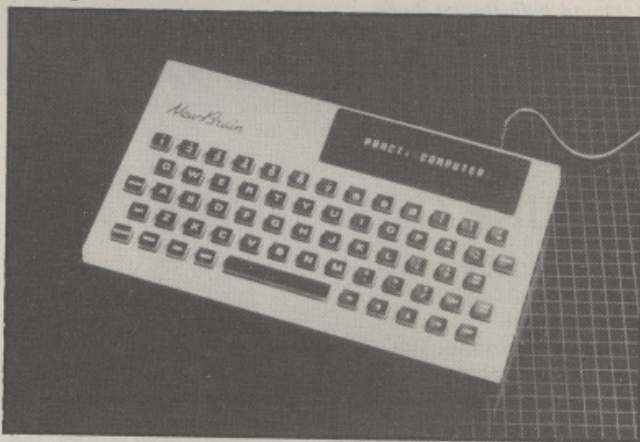
Number of employees: 50

Origin of company name: From parent company founded by Stanley Grundy

Turnover in 1982: £21 million

Parent company: Grundy Group

Grundy Business Systems is part of the international Grundy Group. The Newbrain has been in the market place for 18 months and now sells in 10 major European countries. A full CP/M system is now offered. No modification is required to the basic machine which provides an 80-column display as standard. Grundy is the first microcomputer manufacturer to offer CP/M on a machine costing less than £300.



The Newbrain is a very small semi-portable personal micro which is modular in construction and can be built up into a full system. The basic Model AD costs under £300 and has a Z-80A processor, 32K of RAM and 29K of ROM. The built-in Basic is very close to American ANSI standard. The AD has a single-line display built-in, but needs a battery pack to be truly portable. The keyboard has moving keys but is not quite typewriter style, though you can type on it.

The system can be expanded to near its maximum by adding a disc controller and two drives, an expansion interface with 64K of RAM, and a larger power supply. With CP/M the cost is just under £1,000 plus VAT, excluding 80-column monitor. Discs can be 200K or 800K each. With expansion modules the system will handle 1Mbyte of RAM and 1Mbyte of ROM. CP/M software for the Newbrain includes the Peachtree range such as Peachcalc, Peachtext and the Accounting system. Newbrain's can also be networked.

The Newbrain system is made in Feltham, Middlesex, and is sold through around 200 dealers mainly for home use, with some in education and small business use. Some are sold via OEMs, for example, many are used in chemists' shops under one large scheme.

HAYWOOD ELECTRONIC ASSOCIATES

Address: Electron House, Leeway Close, Hatch End, Pinner, Middlesex HA5 4SE

Telephone: 01-428 0111

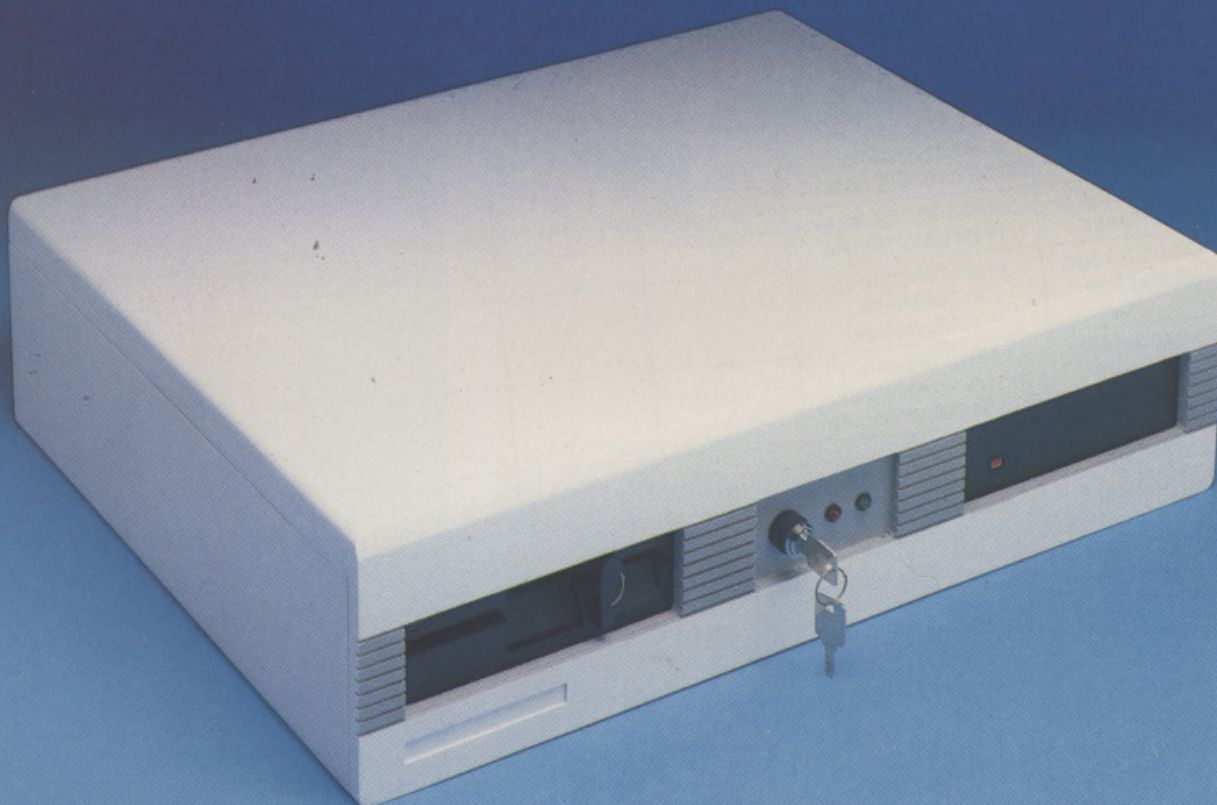
Telex: 896819

Company founded: 1973

(continued on page 26)

**WINCHESTER CP/M SYSTEM
BREAKS THE £2000 BARRIER.**

**THE COUNTRY
C3000
SERIES**



Whether the requirement is for graphics using the new Tektronix® 4010 emulation under CP/M,* or for use as a powerful Word Processor, the C3010 with 10 MBytes of Winchester disk storage must be one of the most cost effective CP/M systems currently available.

Extensive use has been made of the entire range of Z80 peripheral devices, therefore the chip count is low and with only five major components, reliability is guaranteed.

Background diagnostics continuously run while the processor is idle performing RAM checks and logging disk retries.

All status information is stored on files on the Winchester and can be accessed by the user if so desired.

A range of VDU's and printers is available either from Country Computers or it's dealer network, to compliment the C3000 series. And is available NOW!

*CP/M is the Registered Trade Mark of Digital Research.

- 5, 10, 15, MBYTE WINCHESTER
- 500k OR 1 MBYTE FLOPPY
- Z80A 4MHZ PROCESSOR
- 64k RAM (256k RAM OPTIONAL)
- 16k PROM (32k PROM OPTIONAL)
- TWO SERIAL INTERFACE
- CENTRONICS PARALLEL INTERFACE
- BRITISH MADE
- MP/M OPTIONAL
- REMOVEABLE-MEDIA WINCHESTER DRIVES OR INTEGRAL TAPE BACKUP UNITS OPTIONALLY AVAILABLE

*Country
Computers*

Country Computers Limited
Pipers Road, Park Farm Industrial Estate, Redditch, Worcs. B98 0HU.
Tel: 0527 29826. Telex: 337497 Fistex G.C.C.L.



● Circle No. 306

A HIGH PERFORMANCE MULTI-USER

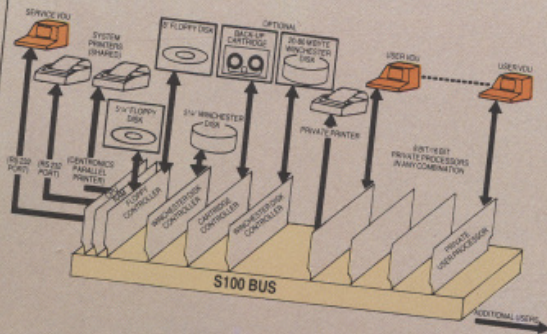
GRASP THE FACTS AND SAVE UP TO 50%

Pay much less for much more computing power per user

	BROMCOM SuperStar	IBM System 34	DEC PDP11/34	ICL System 25	Olivetti System M40	Burroughs B
Class	Super-Micro (Multi-Processor)	Conventional Mini-Computers				
Processing Power	Up to 16 8 bit (Z80A) or 16 bit (iAPX 186)					
Memory Per User	8 bit up to 128Kbyte 16 bit up to 1Mbyte					
Disc Storage & Backup	From 10Mbyte up to 160Mbyte + 40Mbyte tape					
Expandability	Up to 16 users more with networks. Up to 512Mbyte storage					
Lowest Entry Cost	£2450 (including VDU)					
Cost of 2 User 10Mbyte System 2 off VDUs	£5975 (8 bit) £6975 (16 bit)					
Incremental Cost for Each Additional User	£995 (8 bit) £1495 (16 bit) (including VDU)					
Hardware Compatibility	World Standard S100					
Software Compatibility	World Standard CP/M & MS-DOS					

Systems Architecture

Each user has its own processing power each with 16 bit and up to 1Mbyte Memory or 8 bit and up to 128Kbyte.



Available Software

BROMCOM Standard Range	BROMCOM Specialised Packages	Text & Database	Languages
Sales Ledger Purchase Ledger Nominal Ledger Stock Control Order Processing Job Costing Payroll (with SSP)	Property Management Energy Management Membership M'gement Betting Office Chain Insurance Brokers Wholesale/Retail Automatic Invoicing Planned Maintenance Garment Trade	WordStar SpellStar Mailmerge DataStar ReportStar Spellbinder SuperCalc dBasell Rescue Microplan	BASIC COBOL FORTRAN PASCAL C PL/I APL

BROMCOM Bespoke Programming –
Can be carried out by BROMCOM or a growing number of OEMs
and Dealers in all areas.

All CP/M and MS-DOS software will run without any modification
at all.

ADVANCE, GENUINE, USER SYSTEM.

50% Some installations are a little more difficult than others!

Such as the one at Banham Patent Locks, Limited, in London.

BROMCOM® supplied hardware and software that would have taken a respectable-sized minicomputer from, say, DEC or IBM or Olivetti at twice the price for hardware, three times the price for software and four times as long to implement.

The Hardware — BROMCOM SuperStar™ — is handling six terminals (expandable to 16) and three printers with 20Mbyte disk storage and tape backup. The operators work round the clock, so the speed and reliability demanded of the system are high.

Operators can simultaneously enter Invoices, Payments, etc, while other functions such as word processing and database operations (over 15 000 entries!) are in constant use by other terminals.

BROMCOM

Bromley Computer Consultancy Ltd
417-421 Bromley Road, Bromley, Kent, BR1 4PJ.
Telephone: 01-697 8933 Telex: 896691



- * POWERFUL — HIGH PERFORMANCE — FLEXIBLE
- * VERY COST-EFFECTIVE WITH LOW ENTRY PRICE
- * FULLY MODULAR AND EASILY EXPANDABLE
- * WORLD-STANDARD S100 HARDWARE AND OPERATING SYSTEM — CP/M OR MS-DOS
- * FULL MULTI-USER CAPABILITY WITH RECORD/FILE LOCKING AND PRINTER SPOOLING
- * FIELD-PROVED OVER TWO YEARS WITH A LONG LIST OF SATISFIED CLIENTS
- * STYLISH NEW DESIGNS FOR 1984
- * MODEL 10 CATERS FOR UP TO 6 USERS, MODEL 20 UP TO 16 USERS

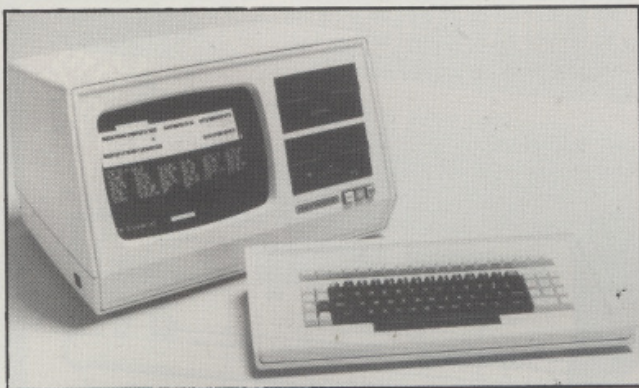
BROMCOM SuperStar

OUTPERFORMING MINICOMPUTERS WITH
MICROCOMPUTER ADVANTAGES.

● Circle No. 310

(continued from page 22)

Company incorporated in 1973 to provide applications for keyboards marketed in U.K. by associated company, Keytronic. Products included cased keyboards, keyboard PSUs, video terminals and parallel/serial converters. Haywood then marketed SWTP and vector micros and assembled SWTP from kits. An S-100 micro was added to the range which became a range of micros for specialist applications assembled in U.K. Current range is the good composite range of U.K.-manufactured low-cost desktop business micros.



Haywood's latest range is the 9000 Composite which includes four models, depending on the disc storage offered. The 9000 has two 320K floppy disc drives and costs £1,795. The 9001 has a 5Mbyte hard disc and costs £3,300. The 9002 and 9003 have 15Mbyte and 20Mbyte hard discs and cost £3,800 and £4,200 respectively. All prices exclude VAT.

The 9000 series is built on the proven technology of a Z-80A CPU with 64K of RAM, running CP/M version 2.2. The screen and discs are integral. The separate keyboard has a numeric keypad and up to 34 dedicated function keys. A special keyboard is available with keys dedicated to WordStar. Networking is possible for up to 30 users under Turbodos, or using the Hi-Net system. Haywood can also provide full word processor training.

The computers are made in Hatch End, Middlesex, and sold via 14 dealers. The main uses are word processing and small business systems, especially for vertical markets such as solicitors and estate agents.

HH MICROCOMPUTERS

Address: Viking Way, Bar Hill, Cambridge.

Telephone: (0954) 81140

Telex: 817515

Company founded: 1983

Origin of company name: Founding partners surnames — Harrison and Heald

H H brings to the market place a range of microcomputer products which incorporates innovation, quality and service. Progress to date has been exceptionally good as can be seen by the number of professional dealer outlets already established.



HOTEL MICROSYSTEMS

Address: 69 Loudoun Road, London NW8 0DB

Telephone: 01-328 8737

Telex: 266828

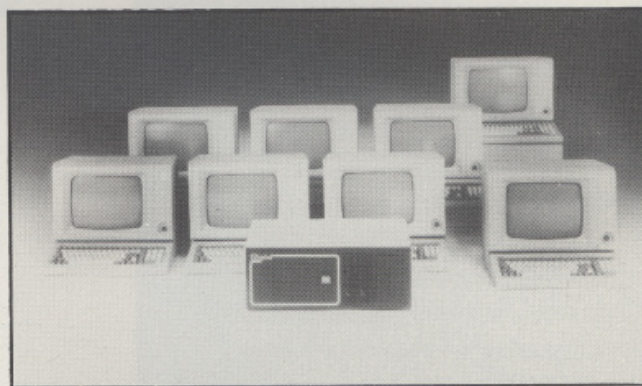
Company founded: 1979

Number of employees: 11

Origin of company name: System developed for hotel administration

Turnover in 1982: £0.8 million

Hotel Microsystems, now known as HMS, originally developed systems for the hotel trade using North Star Horizon machines. The company has expanded rapidly over the last four years diversifying into a wide variety of other markets, selling its latest computer, the Minstrel, into colleges, hospitals, universities and blue-chip companies throughout the U.K. HMS now specialise in low-cost, multi-user systems, with built-in telecommunications and telex facilities if required. Tony Harris, the company's director, stresses that "customers come to us when they need a system with full service and back-up, not when they want an armful of boxes."



Hotel Microsystems, HMS, manufactures its Minstrel range of micros in a warehouse behind Kings Cross Station. The machine is available in several different configurations, from single-user Z-80A-based CP/M systems through Turbodos multi-processor systems to the top of the range 68000-based Cromix and CP/M-68K version.

The Minstrel uses the S-100 bus, to give access to a wide range of interfaces, displays, functions and facilities. The Minstrel Turbo, the basic machine, costs between £1,800 and £7,000; the Minstrel 86, a 8086-based micro with MS-DOS and CP/M-86, ranges from £3,100 to £5,000; and the Minstrel 68K, a 68000-based micro with Unix, costs from £4,000 to £7,000, VDUs and printers are extra. Storage ranges from one or two 400K or 800K 5.25in. floppy discs to 5, 10, 15 or 20Mbyte Winchester discs. The Minstrel is being sold via a network of 20 dealers in the U.K. and Europe.

HYTEC MICROSYSTEMS

Address: Sandy Lane West, Oxford OX4 5JX

Telephone: (0865) 714545

Telex: 837875

Company founded: 1980

Number of employees: 80

Turnover in 1981/82: £2 million

Parent company: H D Holdings

In three years Hytec Microsystems has grown into one of the most successful computer companies in Britain today. In 1980 it introduced one of the first microcomputers with mainframe communications and later became the first to offer all three ICL communications protocols on a single machine. Its reputation for innovation continued with the C Series, the first microcomputer to

perform stand-alone and communications tasks concurrently. Now in 1983 Hytec has consolidated its considerable expertise in the launch of the Prelude, a range of terminals and network microcomputers designed, built, assembled and tested in the U.K. at Hytec's Oxford factory. With its commitment to quality, service and innovation Hytec has become the U.K. company synonymous with British high technology success in the 1980s.

Built around the Z-80B eight-bit processor Hytec Microsystems' Prelude range includes two microcomputers as well as a mainframe terminal.

The smaller micro, Prelude 15, has 192K of RAM, a 5.25in. floppy disc drive with 946K of storage, and can be connected to an external hard disc system offering up to 50Mbytes of storage. At the top of the range the Prelude 20 can accommodate integrated floppy, hard and exchangeable hard disc devices giving a maximum storage potential of 50Mbytes.

The Prelude, which has communications protocols for ICL, Honeywell, Burroughs and IBM mainframes, runs under the CP/M operating system and is offered with Hytec's Hytext word processing and H-base database management software as part of the standard package. The system also has its own local area networking facility called Tecnet, which allows the micros to be linked together sharing processing power and peripherals.

Manufactured at Hytec's Oxford factory, the range is modular and compatible allowing a basic terminal system to be upgraded to a fully-fledged Prelude 20.

IBM UNITED KINGDOM LTD

Address: PO Box 41, North Harbour, Baltic House, Portsmouth; Hampshire PO6 3AU

Telephone: (0705) 321212

Telex: 86741

Company founded: 1951

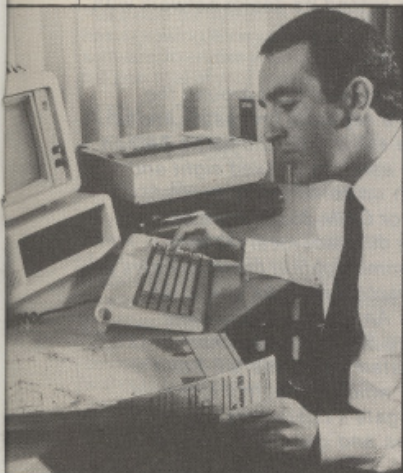
Number of employees: 15,000

Origin of company name: In 1924 the name International Business Machines Corporation was adopted from the Computing-Tabulating-Recording Company

Turnover in 1982: £1.2 billion

Parent company: International Business Machines Corporation

IBM's operations, with very minor exceptions, are in the field of information-handling systems, equipment and services to solve the increasingly complex problems of business, government, science, space exploration, defence, education, medicine and many other areas of human activity. IBM's products include data processing machines and systems, telecommunications systems and products, information distributors, office systems, typewriters, copies, educational and testing materials, and related supplies and services. Most products are both leased and sold through IBM's worldwide marketing organisations.



The IBM Personal Computer — PC for short — is an eight/16-bit micro which uses the Intel 8088 CPU. It has 40K of ROM, which includes the Basic language, plus from 64K to 544K of RAM. Mass storage is provided by one or two 160K or 320K floppy disc drives. Alternatively there is the XT model with a 360K floppy plus a 10Mbyte hard disc. A further 10Mbyte disc can be added to either machine.

The IBM PC — set to be the best selling small business micro — is manufactured in Greenock and available from over a hundred dealers.

ICL (INTERNATIONAL COMPUTERS LTD)

Address: ICL House, Putney, London SW15 1SW

Telephone: 01-788 7272

Telex: 22971

Company founded: 1968

Number of employees: 23,500 worldwide, 16,000 U.K.

Turnover in 1982: £721 million

ICL, Europe's largest indigenous manufacturer of computers, was formed originally from the merger of English Electric and Singer. It manufactures a complete range of computers from micros to mainframes, to satisfy a complete spectrum of needs from the smallest office right up to the largest corporation or government department.

IMMEDIATE BUSINESS SYSTEMS

Address: 3 Clarendon Drive, Wymbush, Milton Keynes MK8 8DA

Telephone: (0908) 568192

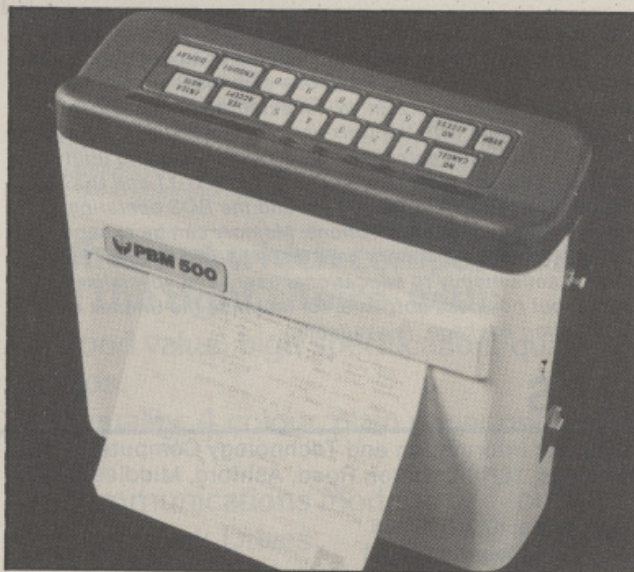
Telex: 825256

Company founded: 1982

Number of employees: 120

Origin of company name: From Immediate Billing. The production of a utility bill by the meter reader using a portable computer with integral dot-matrix printer — the Portable Billing Machine, PBM.

Manufacturer of one of the first portable computer and Host data manager system FS-2000, PBMs, first operational with South of Scotland Electricity Board in 1980, contain Z-80 processor and 64K to 256K magnetic bubble memory, 16-character display and keyboard in waterproof and shockproof case weighing 4.5kg. SSEB transferred all non-industrial billing to IBS system. Several other large U.K. and overseas utilities now following SSEB's example. IBS has now introduced data capture and processing unit, fieldwork fifty, identical in CPU and memory capacity to PPM but without printer and with Microsoft M-Basic programming. Latest product is magnetic bubble cassette, a lightweight, 70g. exchangeable memory unaffected by dust, dirt and vibration and with no moving parts.



IBS specialises in portable systems for billing, data collection, and data processing in harsh environments. The portable

(continued on next page)

(continued from previous page)

billing machine pictured here has a full width built-in printer so that the customer can be billed on the spot after a meter reading is taken.

IBS also produces the Nomad, also called the Fieldwork Fifty, an eight-bit CP/M computer built around a CMOS variant of the Z-80. The 3.3lb. machine is extremely rugged and uses bubble memory in place of the more vulnerable floppy disc as its mass storage device. A Nomad with two line by 40 character LCD display, waterproof keyboard, 32K of RAM and 64K of bubble memory costs £2,236.

INTEGRATED MICRO PRODUCTS — IMP

Address: Unit 17B, Number One Industrial Estate, Medomsley Road, Consett, Co. Durham DH8 6SY

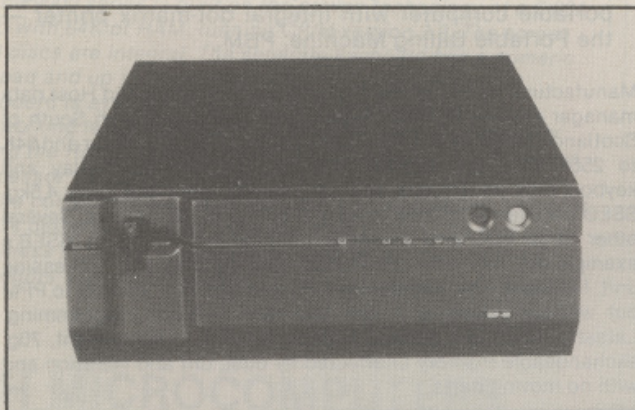
Telephone: (0207) 503481

Telex: 53429

Company founded: 1981

Number of employees: 12

Integrated Micro Products was founded in late 1981 to manufacture the IMP-68, a general purpose multi-user computer based on a MC-68000 CPU card of its own design. A pre-production prototype was launched at Microsystems '82, and full scale production commenced upon moving into its new factory in Autumn 1982. A dealer network is now being established, and based on current production levels alone, 1983 will show multi-million pound turnover.



The IMP-68 is a powerful and compact 68000-based system, with prices starting at £7,950. Inside the compact case is the 68000 processor, 250K of RAM, one slimline 8in. floppy drive, and a 10 or 20Mbyte 5.25in. Winchester drive. The system comes complete with the Unix-like multi-user operating system Idris, C and Pascal compilers, 68000 Assembler and utility software to enable the user to read CP/M, RT-11 and UCSD floppy discs. The UCSD p-system and the BOS operating systems are available as options. Memory can be expanded in 256K increments and more hard discs can be added. The IMP system sells mainly to educational users and specialised OEMs, but business software, for instance the Uniplex office automation package, is available.

ITCS

Address: Information and Technology Computer Services, 16/18 Littleton Road, Ashford, Middlesex TW15 1UQ.

Telephone: (0742) 47186

Company founded: 1981

Number of employees: 37

ITCS was founded to exploit the growing market for portable micros, and after a period of development the Andromeda range

was launched in 1982. After initial British manufacture by Information and Technology Services — a separate company from the marketing company ITCS — it is possible that manufacturing will be subcontracted out.



The standard model in the Andromeda range is the Zita P, which uses a Z-80A microprocessor and either two floppy disc drives or one floppy and a hard disc. The latest model is the Portable Executive, which comes in an executive-style briefcase. Again the CPU is a Z-80A.

The machine has 128K of RAM, and 8K of ROM expandable to 12K. Versions are available with two or three 5.25in. floppy discs giving 1Mbyte of storage each. With hard discs storage can range from 5Mbyte to 24Mbyte. £2,500 worth of software is included with the Executive. Zita prices start at just over £1,500.

JAROGATE

Address: 197-213 Lyham Road, Brixton, London SW2 5PY

Telephone: 01-671 6321/2/3

Telex: 8950094

Company founded: 1979

Number of employees: 20

Turnover in 1982: £1 million

Jarogate originated as a high-technology R-and-D company in the mid-seventies with links to university research. Now having built firm technical and commercial foundations, it has a five-strong R-and-D team dedicated to keeping the MP computers as market leaders. For customer back up it has a free telephone support service, and a U.K. field maintenance company. In addition to the MP series systems Jarogate is a maindealer for Comart and Future products; it also manufactures a wide range of plug compatibles for Cromemco machines. Future plans include an extensive marketing campaign to extend its dealer network with a new product launch in October.

The Jarogate MP-5 is a multi-user system built around the S-100 bus which gives each user a separate processor and at least 64K of dedicated RAM. The 4MHz Z-80, the 6MHz Z-80 or the 16-bit 8086 processor can be used, and mixed eight and 16-bit systems are possible with up to 16 users in total.

Each user has a private CP/M or CP/M-86 environment and an individual S-100 bus, allowing different local I/O and graphics options to be used. Communication between users is handled by CPINOS, Digital Research's network operating system. Prices start from £4,945. An Ethernet local area network is available to link up to 50 MF-5s together.

Jarogate also make a Z-80B system called the MP-1 and a dual-processor system, MP1-C68, which has both a Motorola 68000 and Z-80A processor. Jarogate's customers are in process control, communications and general business.

(continued on page 32)

CHOOSING A HOME MICRO

WARNING

Choosing a home micro can be a daunting task to the newcomer, and with an ever increasing number of micros emerging on the market, even up-grading, say, from a ZX81 can be a risky and expensive exercise if the wrong decision is made. It is important to look at the real facts and specifications, and check exactly what you get for your money before choosing your micro-computer system.

THE PITFALLS

"DON'T LET THE ADD ONS ADD UP"

A number of large companies are offering packages that seem to be good value and low cost. These offers usually have a hidden sting inasmuch as the essential accessories such as connection leads, peripherals and software often carry very high cost premiums. e.g. software for low cost hardware usually costs between £29 and £49 for a ROM cartridge!!

CHECK THE QUALITY OF THE PRODUCT.

Raw materials are now an area where corners can be cut, and shoddy workmanship during 'building' can effect the 'up-time' of your unit. Areas to watch out for are unreliable edge connectors, corrosion and poor quality P.C.B.s. Low quality components and bad design will seriously effect the reliability of the end product, and can lead to false economy.

DON'T BUY A GAMES MACHINE

Unless you want just games and nothing else! With a games computer you are limited. Some computers, however, have the advantage of both games facility plus the whole world of computing to explore, as your interest and skills develop. A real computer system will allow you to expand your knowledge of the Hi-Technology world, and help earn its keep with its added uses in the field of education, communication and home business use.

SOFTWARE

Make sure the system you choose has a growing library of support software, to enable you to realize the full potential of your machine.

KEY POINTS TO LOOK FOR

● High Resolution Colour

In general most home computers have a poor graphics resolution (or detail). Check on the vertical and horizontal resolution in graphic mode and multiply the two numbers together. If the result is less than 35,000, then the graphics can hardly be considered high resolution. Without high resolution graphics displays such as those used in games tend to be "Chunky" in appearance.

● High Quality Sound

Some computers claim to provide a sound channel when in reality all that can be found inside the computer is a small buzzer controlled by electronic pulses. At the very least a sound facility should provide more than one channel and a raise channel as well (for gun shot effects in games for example). The best systems also provide envelope control of the sound channels to produce very sophisticated effects; very important for generating music. Also look for the ability to connect to external amplifiers.

● Keyboard

For accurate entry of programs and data into a computer it is important that the keyboard has a good tactile feel in operation. Coupled with acoustic feedback the user is fully aware when the computer has accepted his/her actions. Also of importance in a keyboard is layout. A standard computer keyboard layout will familiarise the user with the vast majority of computers used in the world of business and professional applications; very important if the purpose of purchasing a computer is educational.

● RAM

One of the most important features of a computer is the amount of RAM, or memory, included. In general the more powerful and exciting a computer program is the more RAM it requires. But take care, all computers are advertised quoting the total RAM used in the system. Computers use up a great deal of their own RAM for storing essential data and particularly in supporting the graphics display and the CPU. If it is less than 32K think again, is it enough?

● Computer Language

It is too difficult to program a computer in its own binary language so high level languages are used, the most popular being BASIC. However, there are a number of BASICs, some being very different from the rest. A de facto standard in the computer industry is Microsoft BASIC. Learn this one and you will be able to program in the majority of computer BASICs; such an important point if a home computer is to be used to educate your children to face the technology of the future.

● Expansion

As your interest and knowledge of computing grows, you will need a



Choosing the right system carefully will save you from throwing your money away. Check full specification, plus peripherals and software prices, before you buy. Preferably choose a Real computer system that can expand to meet your needs.

computer system that will grow with you; able to accommodate Printers, Disk-drives, Joysticks, Communications Modem, and Colour Monitor, as well as produce HI-FI sound effects.

● Software

The computer you choose should have a growing selection of utility

software to make the most of its capability.

Remember, computing is here to stay. You can't learn to compute on a toy, or a device which does not behave like a real computer. In short, look out for a computer which offers all the points above, and you will be sure of getting the best value for money.

To find out which company offers you the right choice, with:-

- Good value, high specification, quality micros.
- A quality, 4 colour, plain paper printer/plotter.
- Communications Modem.
- Micro Disk Drives.
- Comprehensive and growing range of software

TURNOVER... ➡

ORIC-1



The Growing System

ORIC 3" MICRO FLOPPY DISK DRIVE

Coming soon the incredible new 3" Oric Micro Drives. Small size. Compact. High precision disks with storage capabilities from 100K Bytes to in excess of 1 Megabyte unformatted. With their own built-in power supply, these easy to use units will add big system capability to your home micro.

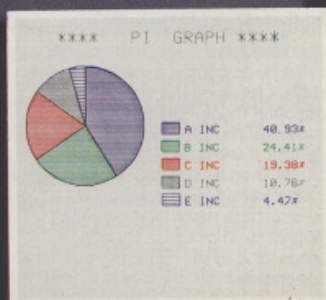


ORIC MCP 40 COLOUR PRINTER/PLOTTER

The Oric Colour Printer is quality engineered to provide 4 colour hard copy on plain paper, with superb graphics and text capability, printing either 40 columns or 80 columns. It prints in red, green, black and blue, onto a 4½" width standard paper roll. With a print speed of 12 characters a second, the MCP 40 comes with its own power supply and all necessary leads to connect straight into your Oric or to any standard Centronics interface.



This superb printer represents excellent value at just **£169.95 including VAT.**



ORIC PRODUCTS INTERNATIONAL LTD. COWORTH PARK, LONDON ROAD, ASCOT, BERKS.

The right choice for real computing ORIC-1

Before making your final choice, check any other home micro in the same price bracket, against the incredible specification of the ORIC-1.

● Quality of build and materials	● Real computer keyboard layout and moving keys
● Superb styling / Full colour display	● High Resolution colour graphics 240 x 200 pixels
● Choice of 16K or 48K RAM	● Real computer language programming – Basic/ Forth
● Latest design technology and circuitry	● Teletext/Viewdata compatible graphics (28 rows x 40 characters)
● Real sound – 8 octaves plus Hi-Fi output	● Cassette Port & R.G.B. output.
● Centronics printer interface	● Fully supported and growing software library
● Colour printer / Disk Drives	● A fully expandable system for home, education & small business use
● Communications Modem	● Full range of peripherals to support your system...

ORIC-1 Setting today's standard in Quality and Price.

ORIC-1 48K £139.95 inc. VAT **ORIC-1 16K £99.95 inc. VAT**

All ORIC computers purchased before 31st December 1983 come with a £40 voucher off the M.R.P. of the MCP 40 Colour Printer.

MCP 40 COLOUR PRINTER £169.95.
OFFER PRICE £129.95

TANSOFT ORIC Software

The fast growing success of ORIC-1 means that an incredible number of software titles are becoming available for your Oric. With many well known titles from independent software houses, plus exclusive ORIC SOFTWARE from TANSOFT, you can now drive your Oric towards its full potential. Below is a small selection from Tansoft's range, all of which offer superb value.

BUSINESS

ORIC BASE, ORIC CALC, AUTHOR.

MACHINE LANGUAGES

FORTH, ORIC MON.

COMPUTER GAMES

ZODIAC, HOUSE OF DEATH, ORIC MUNCH, SUPER BREAKOUT, ULTIMA ZONE, DEFENCE FORCE.

TOURING LANGUAGES

GERMAN, SPANISH, ITALIAN, FRENCH.

GENERAL INTEREST

ORIC CHESS, MULTIGAMES 1, MULTIGAMES 2, ORIC CAD, THE NOWOTNIK PUZZLE.

TANSOFT ORIC SOFTWARE available from your ORIC supplier and all good software dealers. For full list of further information contact:-

NEWS FLASH
LATEST RELEASE
THE HOBBIT



TANSOFT LIMITED – 3 CLUB MEWS, ELY, CAMBS CB7 4NW TEL (0353) 2271/2/3/4

JUPITER CANTAB

Address: Cheshunt Buildings, Bateman Street,
Cambridge CB2 1LZ

Telephone: (0223) 313479

Telex: 81546

Company founded: 1982

Number of employees: 5

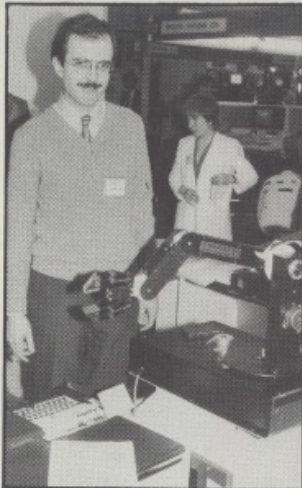
Origin of company name: To pinpoint location of
Cambridge

Turnover in 1982: Not yet traded for a full year

Jupiter Cantab was founded to market Jupiter Ace, the first low-cost microcomputer to run in Forth rather than the usual Basic. After selling several thousand machines by mail order the company moved out into the open market, both at home and overseas. Initially it followed the market, concentrating primarily on games playing applications, but during the last few months it has become clear that the real future for the machine lies in serious control applications and educational functions. It is to this end that present and future developments will primarily be dedicated. Several such projects are already being undertaken.

The Jupiter Ace is a tiny machine which in some respects resembles the Sinclair ZX-81, but there are some major differences. First, the keyboard is moving key, not the membrane type. Second, the Ace uses not Basic but Forth as its native language. Third, it comes with 19K of RAM, though 16K of this is in a separate Sinclair-style pack which plugs into the expansion bus on the back.

At around £90 the Ace offers one way of learning Forth. As Forth is a powerful control language — it was invented to drive an astronomical telescope — the Ace could also be used for industrial control operations such as driving robots, which the picture shows. The Jupiter Ace is in the bottom left-hand corner.



KALAMAZOO

Address: Northfield, Birmingham B31 2RW

Telephone: 021-475 2191

Telex: 336700

Company founded: 1908

Number of employees: 2015

Origin of company name: City of Kalamazoo, Michigan,
U.S.

Turnover in 1982: £35.8 million

Despite its name, Kalamazoo plc is a wholly British company. For many years it has been the market leader in hand-written business systems in the U.K. It has been increasingly involved in computer systems since 1967, first offering batch services to the motor trade. Today Kalamazoo is selling a wide range of micro systems, mainly to small businesses and based on its own range of micro computers which are made at the company's factory in Birmingham and sold by the 250-strong Kalamazoo sales force.

Kalamazoo, the originators of the paper-filing systems for office records, offer three micros for use in small businesses and specific trades such as the motor trade, the construction industry, hotels, clubs, schools and insurance brokers.

The smallest system is the Kalamazoo K-1050 single station, single board computer with integral floppy disc controller and communications. It

incorporates an Intel 8085A microprocessor with 64K

dynamic RAM and 4K EPROM, and has dual 5.25in. floppy disc drives, with a capacity of half a megabyte of storage in total. The K-1050 costs £3,400.

In the middle of the Kalamazoo range is the 1500, again a single station 8085 computer, with 10K EPROM and 48K RAM. The dual 8in. floppy disc drives provide 1Mbyte of memory in total, and the system costs £5,115.

The top of the range model is the K-1600, with 10K EPROM and 48K RAM, and 2Mbytes of memory on dual 8in. floppy discs. The system sells at £6,095. All the systems are manufactured at Kalamazoo's factory in Northfield, Birmingham.



KEMITRON ELECTRONICS

Address: 21-23 Charles Street, Hoole, Chester CH2 3AY

Telephone: (0244) 21817/8

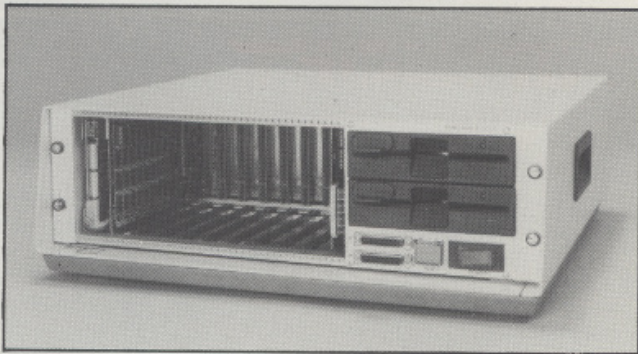
Company founded: 1976

Number of employees: 17

Origin of company name: CHEMical and electRONics —
Kemitron

Turnover in 1982: £0.5 million

Kemitron was founded in 1976. Initial development work concentrated on the design of a range of instruments for monitoring and controlling experiments. Increasingly, this control took the form of a central disc-based computer, designed and produced in-house, together with a range of interfaces which gave the equipment its flexibility for industrial as well as scientific use. Kemitron also offer a widely used and proven development service through which dedicated hardware and software may be designed and produced.



Kemitron manufacture a range of Z-80A-based CP/M computers, for industrial and scientific users. The systems are purpose built for the laboratory and shop-floor environment rather than the office and have industry standard 19 rack mounting and fully regulated and suppressed power supply units. The entry level system costs £900 without discs, a twin 5.25in. floppy system costs £2,200, and there are 8in. and hard disc options. Over 30 different analogue and digital interface modules are available for specialised applications.

LIMROSE ELECTRONICS

Address: Aerial Road, Ilay Industrial Estate,
Wrexham LL12 0TU
Telephone: (097 883) 5555/6

Limrose is best known for its Logic Tutors and other educational ventures, including training and consultancy. Its Microtutor MPT 8080/K-1 is an 8080-based micro with 1K of RAM and a fully labelled, diagrammatic board. It can be run in single step mode or continuously. The Microplus 1 is a business micro with a Z-80 CPU, 64K of RAM and two 1Mbyte 8in. floppy disc drives. It runs CP/M, and including the VDU and detached keyboard costs £2,695. A 20Mbyte hard disc is an optional extra, as is the Flex operating system.

LOGICA VTS

Address: 86 Newman Street, London W1
Telephone: 01-637 5171
Telex: 27200
Company founded: 1979
Number of employees: 250
Turnover in 1982: £10 million
Parent company: Logica Holding Ltd

Logica VTS has grown in four years to a turnover of £10 million. Its main products are the Vitesse PC, the VTS range of word processors and the Polynet local area network. It is part of the international Logica group of companies. It recently received the Queen's Award for Technological Achievement.



Swindon-based Logica VTS markets three models of its 16-bit Vitesse range via about 20 U.K. dealers. The top of the series model is the 256K version which retails at about £3,800, with the 128K version selling at £2,890, and the 64K version at £2,490.

All three models use the Intel 8086 processor, and have a detachable QWERTY keyboard and 15in. screen display. The micro has two 5.25in. disc drives with a capacity of 1Mbyte, and RS-232 and Centronics ports. Software for the micro includes Logica's Wordsworth word processing package and V-Edit, a screen-editing package.

LSI COMPUTERS

Address: Sherwood House, Copse Road, St Johns,
Woking, Surrey
Telephone: (04862) 23411
Company founded: 1976
Number of employees: 100
Turnover in 1982: Approximately £7.5 million
Parent company: CPU Computers Ltd

LSI Computers was formed by its present two managing directors as an independent British micro manufacturer to attack the small

business computers market. It has grown as one of CPU Computers' two companies to the point where it now has regional sales/service offices in most major U.K. areas, has a network of dealers for its smaller desktop models and exports via associated companies in France and Germany. The main manufacturing unit is at Woking, the headquarters of the parent company which recently launched successfully into the stock market.

LSI Computers manufactures all three of its microcomputer offerings at its Woking headquarters. The company's latest product, M-Four, uses both Intel's 8088 16-bit microprocessor and Zilog's Z-80B eight-bit chip, selecting one or the other automatically according to what software is being used. Priced from £2,390 this multi-user desk-top machine runs under CP/M-86, MS-DOS or CP/M and can support both floppy disc drives or Winchester systems providing up to 10Mbytes of storage.

The company also manufactures the M-Two eight-bit multi-user office system which costs from £8,595, and the M-Three, a single user eight-bit desk-top micro priced from £1,995. An M-Five is being developed for launch later this year. Small businesses and professionals form the bulk of LSI's users who have the advantage of being supplied by a dealer network with excess of 100 outlets.



LUCAS LOGIC

Address: Welton Road, Wedgcock Industrial Estate,
Warwick
Telephone: (0926) 497733
Telex: 312333
Company founded: 1977
Number of employees: 80
Parent company: Lucas Industries

Lucas Logic was established in 1977 and has been involved in computerised process control equipment, automatic test equipment and the Lucas Nascom range of microcomputers. The well known Nascom microcomputer has been very popular with the home enthusiast and more recently has gained wide acceptance in schools where the particular features of networking and graphics have put Nascom ahead of its competitors. The new Lucas LX range of business microcomputers offers CP/M with multi-floppy disc and Winchester configurations and is supported by Lucas advanced colour graphics.

(continued on next page)



(continued from previous page)

The Z80-based Nascom was one of the earliest British Microcomputers. Lucas Logic now produce and market the system and in its new incarnation as the Nascom 3 the greatly expanded machine is hardly recognisable. The standard cassette-based system now comes with 48K of RAM and costs £549. The addition of 1.5Mbytes of floppy disc storage and CP/M brings the price to £1,850. RAM can be expanded to 256K and the optional Nas-Net allows up to 32 Nascoms to be networked together. Lucas appear to be aiming the Nascom mainly at the educational and scientific markets.

The Lucas Lx is essentially the same machine as the Nascom repackaged to modern business system standards, with a separate numeric keypad, screen and system box. Prices start at £1,795.

MEMOTECH

Address: Station Lane, Witney, Oxfordshire

Telephone: (0993) 2977

Telex: 83372

Company founded: 1982

Number of employees: 140

Origin of company name: Memory technology

Turnover in 1982: Only started trading mid 1982

Parent company: Orchid Computers

The company began the manufacture of peripherals for the Sinclair ZX-81 in 1982, producing the well known Memopaks 16K, 32K and 64K; RS-232 ports; high-resolution graphics; and software packs. The company took advantage of its experience with the Z-80 CPU to design the extremely advanced MTX series of computers, the launch of which in September will accelerate the company's already outstanding growth rate. Unusually, the systems introduced will arrive with a complete range of peripherals and software in the fields of business, education and games playing.



Memotech offers two micros for the home, business and education markets. The £275 MTX-500 is built around a Z-80A processor with 32K of user RAM expandable to 512K, while the £315 MTX-512 has a standard 64K of RAM. The company also sells a disc-based system which can be used with the 64K version plus an optional communications board. This system, running under CP/M, may contain two 5.25in. floppies, a 5.25in. Winchester or four 256K silicon discs, while the smaller system can support either a 5.25in. or 8in. floppy disc drive.

The systems, manufactured at the company's Oxfordshire site, have joystick, cassette and Centronics ports and are offered with the MTX Basic and Logo languages as standard.

MICROAPL

Address: 1F, Nine Elms Industrial Estate, Kirtling Street, Nine Elms Lane, London SW8 5BP

Telephone: 01-622 0395

Telex: 896885

Company founded: 1979

Number of employees: 15

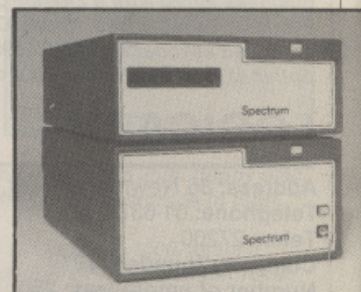
Turnover in 1982: £1 million

MicroAPL specialises in the application of the powerful

programming language APL to microcomputers. In particular, MicroAPL has been at the forefront of the 16-bit technology which provides the power and addressing capacity necessary for the high-level language. Frustrated by the slow progress of microcomputer manufacturers, MicroAPL designed and constructed its own system: the MicroAPL spectrum, first available in 1981, based on the powerful Motorola 68000 processor and using the flexible S-100 bus construction. MicroAPL have since implemented its Mirage/APL software combination on other exceptional Motorola 68000 based hardware: most notably the SAGE II and IV ranges of microcomputers, manufactured in the U.S.

The other Spectrum, from MicroAPL, is manufactured in Vauxhall, South London and sold via six European distributors. Spectrum is a 16-bit micro using the Motorola 68000 CPU, with 32-bit internal registers and 16-bit data lines. A typical configuration would be a system with 1Mbyte of memory, a 36Mbyte hard disc and a 17Mbyte tape cartridge, which would support a mix of simultaneous APL users with up to 900,000 bytes of user workspace that would fit into two boxes.

Options on the system are available for memory size, disc capacity and RS-232 ports up to the limit of 20 S-100 boards; memory is installed at 64K or 256K per board. Disc options range from floppy discs to 36Mbyte 8 in. Winchester discs, with 17Mbyte tape cartridge for back-up and data interchange. The multi-user system costs between £10,000 and £25,000 depending on the configuration.



OFFICE TECHNOLOGY

Address: Diamond House, Bookham Industrial Estate, Church Road, Bookham, Surrey

Telephone: Bookham 58911

Telex: 892414

Company founded: 1967

Number of employees: 250 +

Parent company: Information Technology

In 1983 Data Recall merged with Office Technology. The company has been at the forefront in Britain in the highly-competitive office automation and word processor market places. Its main products, the Diamond Information Processor and the IMP Office Automation System are both recognised as market leaders in their particular sectors of the industry.



Office Technology is not well known in the micro world but sells CP/M compatible machines like the Diamond 7 to the office equipment, information technology and small business markets.

ORIC PRODUCTS INTERNATIONAL

Address: Coworth Park, London Road, Ascot, Berkshire SL5 7SE

Telephone: (Ascot) 27641

Telex: 847 489

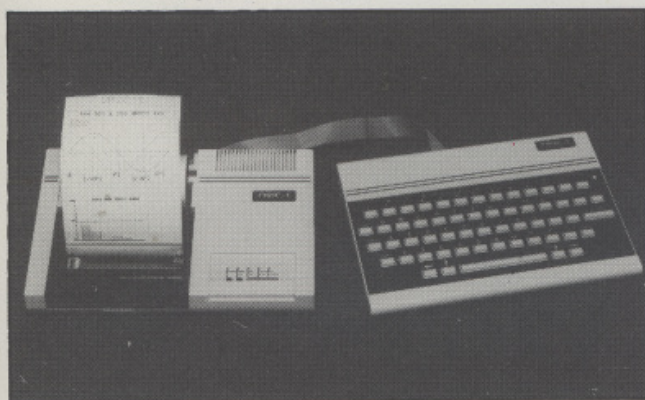
Company founded: 1982

Number of employees: 25

Origin of company name: Derived from Aurac, Blake Seven's wonder machine

Turnover in 1982: Did not exist, 1983 projection £25 million

John Tullis and British Car Auctions approached Tangerine Computer Systems to design a low-cost personal computer. The first production unit was completed on 11 December 1982. The ULA was totally designed by Tangerine, the only company to have done so, and worked first time. A forecast of 50,000 sales during 1983 was achieved by the end of May and the target has been revised to 250,000 units worldwide. Joint venture companies have been formed in Singapore and Japan.



Oric offers both 16K and 48K versions of its micro designed for the hobbyist, educational and first-time user markets. Based on the 6502A microprocessor, the Oric-1 has 57 moving keys and uses a TV set as a colour monitor. The Oric Modem allows the system to access Prestel services, while the Oric printer, priced at £169.95 means that hard-copy can be produced. Extended Microsoft Basic and a Centronics interface are included in the Oric-1 as well as six octaves of controllable sound.

The machine, which costs £99.95 for the 16K version and £139.95 for the 48K version, is sold through 180 U.K. outlets as well as to overseas markets. The printed circuit board contained in each system is manufactured in the Far East, although assembly and test of the Oric-1 is carried out in Feltham.

PLESSEY MICROSYSTEMS

Address: Water Lane, Towcester, Northamptonshire NN12 7JN

Telephone: (0327) 50312

Telex: 31628

Company founded: 1925

Number of employees: 41,000

Turnover in 1982: £1,075 million

Plessey is one of the U.K.'s major manufacturers of electronics equipment, though few people have seen the name on the front of a microcomputer. Most of its computers are sold to OEMs, original equipment manufacturers, who distribute and sell to end users. Plessey supplies System 19 computers to such companies as Logitek, Logica and Root Computers.

PORTICO TECHNOLOGY

Address: Southbank House, Black Prince Road, London SE1

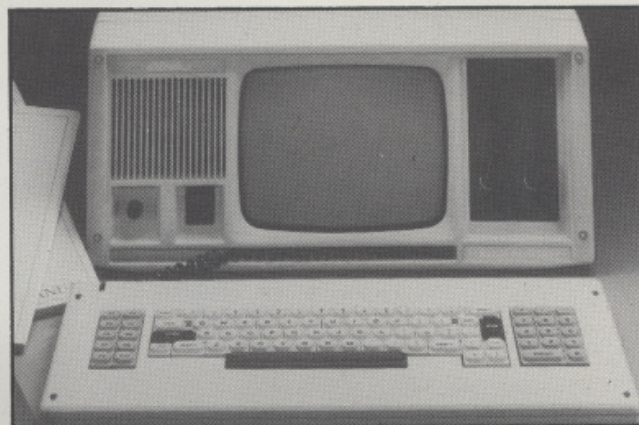
Telephone: 01-735 8171

Telex: 295555

Company founded: 1983

Number of employees: 15

Origin of company name: From portable, logo features a doorway.



Portico make the Miracle, a 28lb. mains powered transportable which comes with a large amount of CP/M software included in its £1,795 price. The Z-80A based machine has built-in twin 5.25in. floppies providing 800K of disc storage and an unusually large screen for a portable, measuring 10in. diagonally. The Miracle's 128K of RAM includes 64K set aside as a RAM disc.

The software includes Micromodeller, the Profitplan spreadsheet, Memoplan wordprocessor, and Microcache memory-management system.

POSITRON COMPUTERS

Address: Unit 16, Deacon Trading Estate, Newton-le-Willows, Lancashire WA12 9XQ

Telephone: (09252) 29741

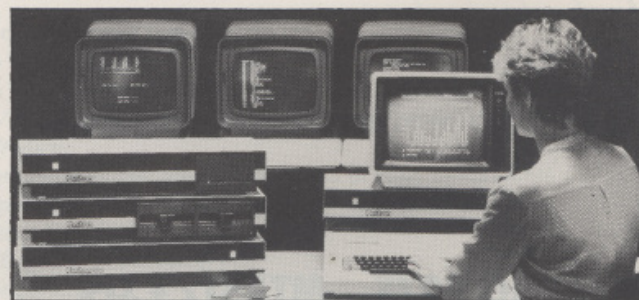
Company founded: 1979

Number of employees: 20

Origin of company name: Isaac Asimov's robots had Postronic brains.

Turnover in 1982: £0.5 million

Positron specialises in the design and manufacture of advanced microcomputer systems that utilise the philosophies and techniques more usually found in minicomputer environments. Since the company was founded the range of products has increased to cover multi-user processors, floppy and Winchester disc drives and a networking option to allow the sharing of expensive resources. For users looking for a low-cost start-up system but with the ability to grow as the user's needs expand, Positron's philosophy of expansion without hardware redundancy should be considered.



(continued on page 39)

MEMOTECH MTX SERIES



MTX500 £275 MTX512 £315

**Available in September—please phone for sales information
Memotech products are designed and made in Oxford and Witney**



The All-Purpose System

The MTX Series

The MTX Series is a new departure in micro-computer technology. Whether your needs as a user are for personal programming, games playing, scientific or process control, educational or business use the MTX Series is already capable or very easily adaptable to almost every application. Glance through the standard features below — you'll see what we mean.

Software

The MTX's 16k ROM contains several languages and routines which enable the novice or the experienced programmer to make full use of the machine. Standard languages are MTX BASIC, LOGO type commands, and NODDY. ROM routines include an ASSEMBLER/DISASSEMBLER with screen display of the Z80 CPU registers, memory and program, which can be manipulated from the keyboard. Machine code programs can be stepped through one instruction at a time, and easily called from within BASIC programs. A further feature is the Virtual Screen facility which enables the programmer to define sections of the screen to work independently whilst maintaining all full screen facilities. Pascal is available as an add-on ROM pack.

Hardware

The MTX500 has 32k of user RAM as standard (64k on the 512), expandable to 512k plus 16k of dedicated video RAM. Sixteen colours, 40 column text, 256 x 192 high resolution graphics with all sixteen colours available, and easily moveable user defined graphics (Sprites) combine to make effective screen displays quick and simple to achieve. Standard outputs are centronics



printer port, two joystick ports, an uncommitted I/O port, 2400 Baud Cassette port, separate TV and Video Monitor ports, 3 voice sound with hifi output plus a dedicated games cartridge port. Other standard features include the Z80A processor running at 4MHz, real time clock, full moving key keyboard with 79 keys including eight function keys and separate numeric pad.

The Disc Based System

The MTX series has been produced with performance and expandability uppermost in the design team's thoughts. When expanded to Disc level the computer supports the following facilities, which will be available in October:

- 80 column video board
- 5¼" floppy discs
- 5¼" hard discs
- CP/M 2.2, enabling the widely available range of CP/M based software
- Memotech Silicon discs — multiples of 256K of fast RAM expandable to 8m bytes
- Colour Wordstar
- A/D and D/A converters
- Networking

MTX

Memotech Limited,
Station Lane Industrial Estate, Witney, Oxon. OX8 6BX.
Telephone Witney (0993) 2977. Telex 83372 Memtec G

● Circle No. 313

CONTINENTAL SOFTWARE



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CONTINENTAL INVADERS

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CHES, BACKGAMMON, OTHELLO, DRAUGHTS.

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MATHS 1 PHYSICS 1

The first two programs in a series of specially written software designed to teach at the pace and level best suited to the user.

CONTINENTAL SOFTWARE UNIT 24 STATION LANE WITNEY

Software for the
MTX
SERIES

(continued from page 35)

The Positron is a modular microcomputer designed around the Motorola MC6809 microprocessor. To the central processor unit, capable of supporting three users, can be added floppy and hard disc controller units and a network controller. For multi-user, multi-tasking operation it uses the powerful, modular Microware OS-9 operating system, which is based on the functional specifications of Unix, including hierarchical directories and a shell.

It offers a Pascal-like structured Basic called Basic-09, with fast execution speed. Flex can be used for single-user operation. The 900 CPU features 64K to 256K of RAM, 36K to 128K of ROM and four RS-232C ports. The 9000 workstation includes the 900 processor, integral keyboard and colour graphics output for a monitor.

POWERTRAN CYBERNETICS

Address: Portway Industrial Estate, Andover, Hampshire SP10 3CT

Telephone: (0264) 64455

Telex: 477407

Company founded: 1972

Number of employees: 12

The Powertran Cortex is a most unusual 16-bit micro built around the Texas Instruments TMS-9995 chip. It has 64K of RAM, with about 34K free to Basic, and features high-resolution colour graphics as standard, with 16K of video RAM. The design was published as a construction project in Electronics Today International magazine, and the Cortex is available for £295 as a self-assembly kit or for £395 ready built. A machine with two 5.25in. floppy disc drives costs around £900.

Another computer called the Cortex is an office/small-business machine imported by CWIP from the U.S. It is no relation.

QUANTUM COMPUTER SYSTEMS

Address: 55 Wade Lane, Merrion Centre, Leeds, West Yorkshire

Telephone: (0532) 458877

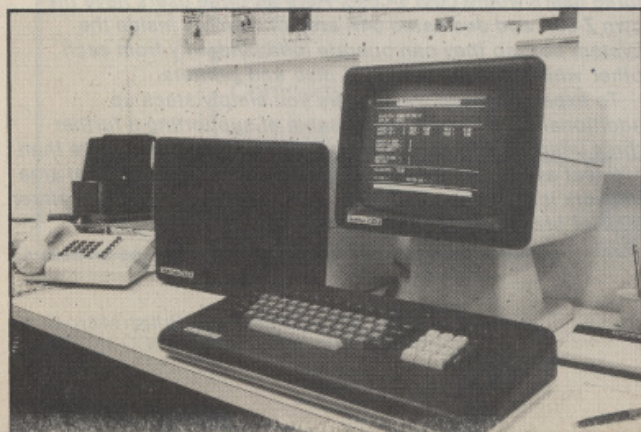
Company founded: 1981

Number of employees: 9

Origin of company name: Quantum levels are used in A-D conversion; subject of our past

Turnover in 1982: £0.5 million

The company was formed by Brian Wingfield of Bits & PC's and John Marshall of Gemini with the intention of designing a highly-flexible microcomputer. This aim was successfully achieved and the Quantum 2000 range offers over 20 different disc drive combinations and a multitude of additional cards for colour, input/output, RAM options, etc. The Quantum has now found its way into many unusual control situations and the introduction of its new network has paved the way for some interesting developments.



The Quantum 2000 is an eight bit CP/M system built around twin Z-80 processors. It has good ergonomic characteristics with a large 12in. green screen, and a wide range of expansion options. The entry-level system costs £1,510 and comes with a single 400K Micropolis 5.25in. floppy drive and 64K of RAM. Up to three floppy drives and two Rodime 10Mbyte hard discs are available as options, as is up to 1Mbyte of extra RAM configured as a RAM disc. The system uses the Quantum 80 bus.

A networking option allows the Quantum 2000 to be linked into a Local Area Network with up to 32 stations. Other stations can be 2000s or the £860 Quantum Cyclops intelligent terminal, which is identical to the Quantum 2000 screen and keyboard unit.

RAIR

Address: 6-9 Upper St Martins Lane, London WC2

Telephone: 01-836 6921

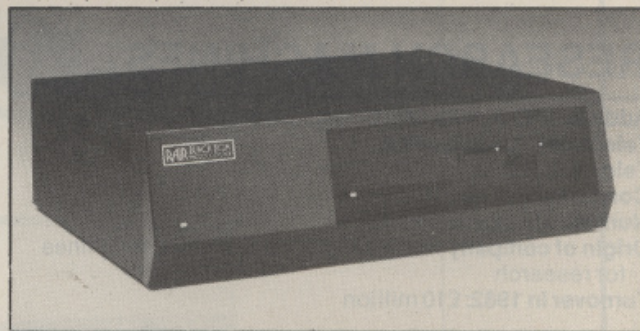
Telex: 298452

Company founded: 1975

Number of employees: 90

Origin of company name: Random Access Instant Response

Company established 1975 as terminal distributors based on contract with Digital Equipment Company. By 1977 had moved into microcomputer business, but due to lack of suitable products Rair made the decision to manufacture its own products, the U 64K Black Box in 1978 using CP/M, and in 1979 BB2 D/S D/D floppies, multi-input/output for up to 16 terminals.



Rair markets both the eight-bit Black Box range of micros and a dual 16-and eight-bit multi-workstation business system. The company's latest addition to the Black Box range is the S series which has three basic models. The low-cost 3/20S is priced at £1,950 and incorporates two 1Mbyte floppy discs and support for add-on Winchester devices, while the 3/30S has an integral 6 Mbyte 5.25in. Winchester and sells from £3,750 for a single-user system to £5,250 for a four-user configuration. Top of the S range is the 3/50SX with a built-in 19Mbyte Winchester disc which comes in at around £6,500 for a four-user system.

Targetted at the professional user the Rair Business Computer has concurrent 16 and eight-bit processors, up to 1Mbyte of memory and 20Mbytes of disc storage supporting up to four colour workstations. A basic system with a 19Mbyte Winchester, 1Mbyte floppy disc drive, and 256K of RAM lists for £5,250, while workstations are priced at £1,250 each.

REDIFFUSION COMPUTERS

Address: Kelvin Way, Crawley, Sussex RH10 2LY

Telephone: (0293) 31211

Telex: 877369

Number of employees: 600

Parent company: BET, British Electric Traction

Rediffusion Computers, formerly known as Redifon Computers, was formed in the late 1960s out of other companies in the Redif- (continued next page)

(continued from previous page)

fusion group to market data entry systems in the U.K. and abroad. The company had substantial growth throughout the 1970s and diversified its products during that period so that today Rediffusion Computers is at the forefront of office computing with its R-range of minicomputers and Teleputer range of microcomputer systems.

While Rediffusion is well known as a £20 million minicomputer company, it has only just entered the microcomputer market with the Teleputer/3. At first sight this looks expensive at £3,595 plus VAT for a Z-80 based micro, but it is actually rather cheap for the power and size of the package. The price includes the operating system, CP/Star, plus a suite of software which share common data files: Startype, Starcalc, Starfile, Startel and Stardata.

The basic machine, which can run CP/M, also includes 128K of RAM, two disc drives, a 14in. colour monitor, and the built-in modem which allows it to act as a powerful videotex terminal. It will also act as a smart terminal to a mini or mainframe computer or run an interactive-video educational program. Its Basic is extremely fast — it runs the standard benchmarks some 30 percent faster than the 16-bit Olivetti M-20.

One of the major packages for the Teleputer/3 is Growlink, which includes access to a videotex database and is aimed at farmers. Other early buyers range from Dudley College of Technology to Banzinol of Bratislava, the Slovak petrol company. The manufacturing plant in Crawley produces special runs of the Teleputer with Cyrillic videotex for use by the Soviet Ministry of Gas on its Siberian pipeline.

RESEARCH MACHINES

Address: PO Box 75, Mill Street, Oxford OX2 0BW

Telephone: (0865) 249866

Telex: 837203

Company founded: 1973

Number of employees: 150

Origin of company name: Originally designing machines for research

Turnover in 1982: £10 million

Company formed in 1973 by Michael Fischer and Michael O'Regan manufacturing electronic equipment. In 1977 developed the 380Z which is now widely used in secondary schools. The 380Z was selected for 50 percent funding under the Dol's Micros in Schools scheme. Towards the end of 1981 Research machines introduced the Link 480Z which acts either as a stand-alone machine — using cassettes, ROM packs and discs — or a station on Research Machines Chain network. The Chain network is currently being used in over 300 schools throughout the U.K.



Research Machines' 380Z is a major force in the education marketplace. Built around the Z-80A processor the system includes either 32K or 56K of RAM, a 55-key keyboard and a 40 column by 24 row display as standard. Running under the CP/M

operating system, storage for the system can be provided with either mini discs or 8in. floppy disc drives. A 56K machine with two double-sided mini disc drives giving a total of 288K of storage lists for £1,962.

Besides the 380Z, Research Machines also supplies the Link 480Z, a system with 64K of RAM, a network interface, 40/80 character-line lengths and Basic in ROM. This machine comes in two configurations, the less versatile of which costs £596, but only £483 to educational establishments. Up to 16 Link 480Z systems can be networked using the company's Chain Network which has a dedicated network server as its central unit. Education users typically pay £3,717 for a server and four Link stations.

Made in Oxford, the systems are sold direct by Research Machines which, besides educational establishments, numbers government institutions amongst its users.

SHELTON INSTRUMENTS

Address: 74-77 White Lion Street, London N1 9PJ

Telephone: 01-278 6272

Company founded: 896559

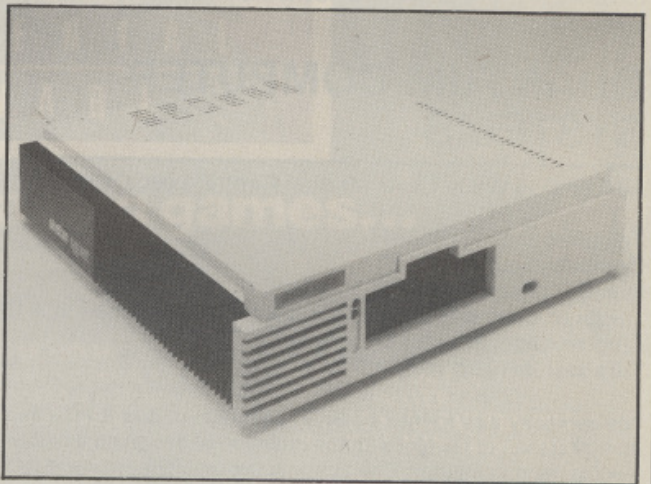
Company founded: 1974

Number of employees: 32

Origin of company name: Founder director

Turnover in 1982: £0.8 million

Company founded by Dr Shelton as a hi-tech design group specialising in instrumentation and later, microprocessor applications. In 1981 research work led to low cost, high performance method for interconnection of microprocessors to communicate as a network to exploit low cost Winchester. This work has led to the Sig/Net range being one of the dominant and most successful multi-processor, multi-user systems in the U.K.

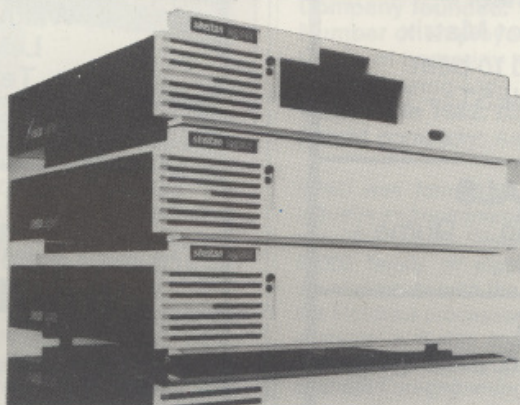


Sig/Net 2 is modular Z-80A based CP/M system which can be expanded from a single-user system into a multi-user system. The entry level Sig/Net 2F comes with 64K of RAM and twin floppies for a price of £1,290, not including a terminal. Systems with hard discs start at £2,650. A typical hard disc system with three users would cost £4,595. Here all three users have their own Z-80A and dedicated 64K area of memory inside the system box, so they can operate independently from each other whilst sharing the hard disc and printers.

To expand beyond three users you simply stack up additional boxes, each one capable of supporting a further three users. Where workstations need to be located more than 100 feet away from the central processor the Arcnet local area network is available. This lets you link up to 255 devices, either Sig/Net stations or other systems.

(continued on page 43)

MCNOS — Probably the best multi-user, CP/M compatible, multi-processor operating system in the world



A computer is only as good as its software, so we wrote MCNOS. It makes our Sig/net microcomputers run multi-user software and provides the flexible, fast, powerful and dateless performance you need.

Flexible — because MCNOS manages files centrally, making all the storage available to each user at any time.

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having their own processor directly linked by parallel transfers.

Powerful — because MCNOS has valuable additions such as sixteen directories for each user, a unique job control language, automatic time and date and many utilities. Plus, of course, the power of CP/M applications software.

Dateless — because, like our British hardware, it can grow with your needs.

Contact: Shelton Instruments Limited, David Winebloom, 74-77 White Lion Street, London N1 9PJ. Telephone: 01-278 6272.

Please send me further details of Sig/net ☐ I am interested in a Sig/net dealership ☐

Name: _____ Position: _____

Company: _____ Tel No: _____

Address: _____

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£125, 48K £155.
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1 Church Farm Lane,
Willoughby, Waterleys,
Leicester LE8 3UD
Tel. 0537-58486

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AT LAST! BBCBASIC to run on YOUR CP/M Computer
Now available for the TORCH and DISKPACK with full GRAPHICS

BBCBASIC(Z80)

WHY STRUGGLE ON using OLD FASHIONED BASICs when you can
have ALL THE ADVANTAGES of BBCBASIC(Z80) on your computer?

Of course, we can't turn your computer's video display into a high
resolution colour monitor, but we can give you all the other features
of BBCBASIC including:-

- > LONG VARIABLE NAMES
- > MULTI-LINE REPEAT UNTIL STATEMENTS
- > MULTI-LINE NAMED FUNCTIONS
- > MULTI-LINE NAMED PROCEDURES
- > POWERFUL DIRECT MEMORY MANIPULATION USING
THE INDIRECT OPERATORS
- > AN IN-LINE ASSEMBLER USING STANDARD Z80
MNEMONICS
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CALL STATEMENT
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THE ABILITY TO ACCESS ANY BYTE IN THE FILE
- > CLEAR SCREEN, TAB(X), TAB(X,Y), POS, VPOS and TIME
Plus ALL THE OTHER STANDARD COMMANDS etc.

You can copy any program written in older 'standard' versions of
BASIC with little change OR you can write well-structured and easy
to read programs like a professional.

You need never say GOTO again. But we won't stop you.

TORCH version including SOUND and GRAPHICS £110 + vat
Price, including postage, £95 + vat

BBCBASIC(Z80) will run on any computer using CP/M 2.2 or later
and a Z80 processor. It comes complete with an instruction manual,
a tutor on file handling and configuration notes.

Not yet available for MCP

M-TEC Computer Services, Ollands Road, Reepham, Norfolk
Telephone Norwich 870620 Trade enquiries welcome

• Circle No. 318

(continued from page 40)

SINCLAIR RESEARCH

Address: Stanhope Road, Camberley, Surrey GU15 3PS
Telephone: (0276) 685311
Company founded: 1979
Number of employees: 70
Origin of company name: Company founder is Clive Sinclair

Sinclair Research was established to conceive, develop and market new consumer electronics products. It is now the world's largest volume manufacturer of personal computers, with sales of over 1 million units and monthly production of over 100,000 units. Other current Sinclair Research products include a new range of personal computers, computer peripherals, flat-screen televisions and consumer applications of solid-state technology. This excludes Sinclair's electric vehicle, a private project.



Sinclair Research sells its ZX-81 and ZX Spectrum home computers through a wide variety of high street shops and department stores. The ZX-81, priced at £39.95, incorporates a Z-80A microprocessor and 8K Basic ROM. Its standard 1K of RAM can be expanded using an add-on 16K RAM pack. The Spectrum comes in both 16K and 48K versions, the first priced at £99.95 and the latter at £129.95. Both machines use TV sets to provide a colour display and are made by Thorn EMI in London and Timex in Dundee.

Peripherals supplied by Sinclair are the ZX printer which can be used with either machine and the ZX Microdrive which is used in conjunction with the ZX Interface 1 to provide data storage for the Spectrum on tiny cartridges. The Microdrive costs £49.95, while the Interface costs a further £29.95.

SIRTON COMPUTER SYSTEMS

Address: Unit 14, 29 Willow Lane, Mitcham, Surrey CR4 4NA
Telephone: 01-640 6931/2/3
Company founded: 1978
Number of employees: 9
Origin of company name: Company began trading as Sirtan Products
Turnover in 1982: £0.8 million
Parent company: Cejam Electronics Ltd

Sirtan Computers was formed to produce reliable multi-function computers based on the two corner-stones of CP/M and S-100 bus. By manufacturing computers the company is able to evaluate and choose only those boards that are best for the job rather than being forced to use one particular range. This independence allows it to produce a system to meet the customers exact needs at the best price and delivery and enables it to update its products

rapidly as the market changes. As technology and operating systems change the inherent flexibility of the Midas systems is demonstrated by the way in which these advances can be easily incorporated.

Midas 1, 2 and 3 are Z-80 based CP/M systems with varying disc options, while Midas 86 is a 16-bit 8086 system. Sirtan sells the range, which are all built around the S-100 bus, mainly to industrial and scientific users and Government departments. Sirtan also produces a multi-user system. The entry level Midas 1 comes with a five-slot motherboard, a Z-80A and no drives, and costs £850. The Midas 2 with 64K of RAM and twin 5.25in. discs providing a total of 280K costs £1,790, while the Midas 3 has a 10-slot motherboard and twin 8in. drives for £3,150. A wide range of other disc options and card cages are available, including hard discs. CP/M Plus, the latest version of Digital Research's operating system, is available for these machines.

The 16-bit Midas 86, with 10-slot motherboard, 8MHz 8086 processor, 64K of RAM and twin 8in. discs costs £3,150. Midas also produces a multi-user system, the Midas MPS.

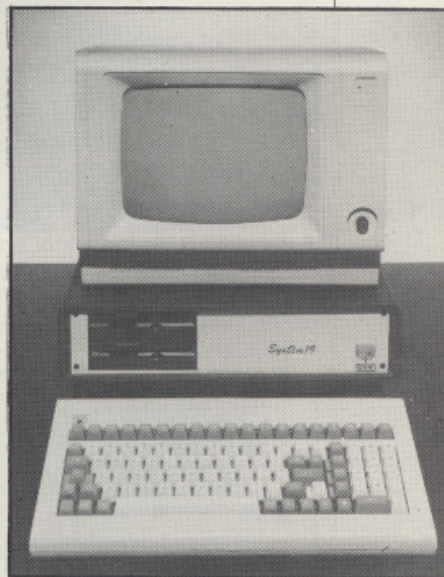
STRUMECH ENGINEERING ELECTRONIC DEVELOPMENTS

Address: Portland House, Coppice Side, Brownhills, Walsall, West Midlands WS8 7EX
Telephone: (0543) 378151 or 34321
Telex: 335243
Company founded: 1977
Number of employees: 13
Origin of company name: A division of Strumech Engineering Ltd.
Turnover in 1982: £0.2 million
Parent company: Associated with Strumech Engineering

SEED was formed in 1977 to provide a service for education, industry and commerce in the area of microprocessors and related software. SEED Systems are based on Motorola's 6800, 6809, 68000 family of eight and 16-bit microprocessors. Its future developments with the 68000 processor reflect its commitment to the Motorola processors. The System 19 is one of the most flexible systems available today with an almost unlimited number of possible configurations to meet its users' needs exactly. The most desirable programming languages are supported: Basic, Pascal, Cobol, C and Assembler. Each language is a super set of the industry standard to assure software portability and gain access to vast libraries of existing applications software.

The SEED System 19 is based around the Motorola 6809 eight-bit processor with 32K of RAM expandable right up to 1Mbyte. The system is built using the SS-50 bus, and is therefore modular and expandable, and is a development of earlier systems from SEED based around the Motorola 6800. Prices start at £1,304.

A wide range of disc options, including hard discs and cartridges are available, and there is a choice of two operating systems. DOS-69 is a compact single user OS particularly suited to assembly level work, while OS-9 is a powerful multi-tasking, multi-programming OS which supports the full range of System 19 disc hardware.



(continued on next page)

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SWTP (Southwest Technical Products)

Address: 12 Tresham Road, Orton Southgate,
Peterborough, Cambridge

Telephone: (0733) 234433

Telex: 32600

Company founded: 1977

Number of employees: 30

Origin of company name: Southwest Technical Products Corporation (U.S.)

Parent company: Imtec Group

Southwest Technical Products started in the micro computer business as Computer Workshop in Victoria, London over six years ago and was therefore the first microcomputer retail outlet in Europe. From those early pioneering days the company and its product line has grown by several orders of magnitude. No longer do SWTPc supply kit computers or hobbyist machines but full multi-user, multi-tasking business machines. In fact SWTPc was the first company to supply a Unix-type operating system on a micro, an implementation which is in fact faster than any other micro based Unix look-alike it has seen. After selling the first thousand or so machines SWTPc realised that one company could not hope to cover the whole U.K. business market and therefore started to build a nationwide distributor network. Hindsight has shown that this decision was correct and SWTPc has gone from strength to strength with larger more powerful machines, an ever increasing range of software, full on site maintenance policies carried out by our own engineers and a complete range of distributor support. Over three and a half thousand systems in the U.K. alone show that the SWTPc package of technology and support really does work.

SWTP is a Texas-based American company which dates back to the early days of microcomputers, producing systems using the 6800 and 6809 processors. The launch of a U.K. manufactured machine is imminent. The new machine is expected to be an eight/16-bit dual processor multi-user system running the Uniflex operating system. A four-user system with 256K of RAM will probably cost about £5,000.

SYSTIME COMPUTERS

Address: Millshaw Park, Leeds LS11 0LT, West Yorkshire

Telephone: (0532) 702277

Telex: 556283

Company founded: 1972

Number of employees: 1,400

Origin of company name: Suppliers of real time systems, hence Systime

Turnover in 1981/82: £44 million

Originally founded by John Gow, the company operated from the front room of his home and concentrated on the provision of software and DEC hardware for small businesses — an innovation at that time. Over the last 10 years the company has grown rapidly and expanded into the field of systems manufacture, hardware and software, development and support, training and services. The company recently opened a £20 million headquarters in Leeds which serves as the manufacturing centre of the worldwide operations in the U.K., the Gulf, Europe and Asia.



Leeds-based Systime manufactures two micro product ranges at its newly-opened factory in Millshaw Park. The S-500 small business system is available in two versions, the floppy-disc model at £7,250, and the hard disc model which sells at between £12,750 and £21,900. Both are multi-user — they can handle up to nine terminals plus one parallel printer — and run under CP/M-86, MP/M-86, MS-DOS, MBOS-5 and Systime's own operating system, MPS. The systems are sold through a network of 70 dealers.

The S300 series is a range of desktop micros, again using the Intel 8086 processor. The 16-bit machines are available with twin floppy discs at £3,250 or with a single floppy and fixed Winchester at £5,410. The systems run under the multiuser MP/M-86 operating system, and CP/M-86 and MS-DOS are also available. The S-300 range is sold via 40 dealers.

TORCH COMPUTERS

Address: Abberley House, Great Shelford, Cambridge

Telephone: (0223) 841000

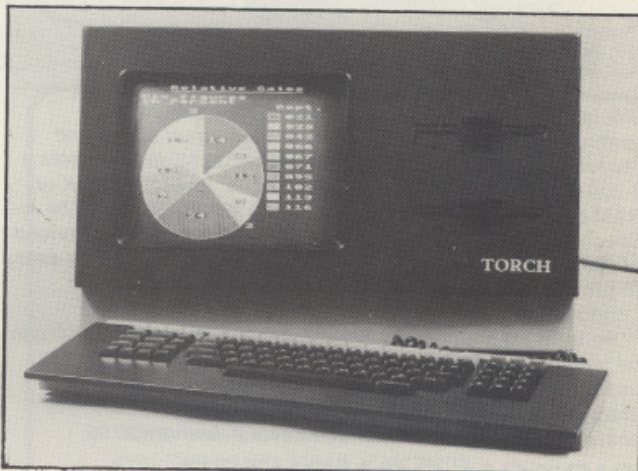
Company founded: 1981

Number of employees: 90

Origin of company name: Intends to set the micro world alight

Turnover in 1982: £3 million

The company was started in July 1981 to produce a business version of the BBC micro in collaboration with Acorn. At the end of 1981 Torch produced its own hardware and launched the Torch CF-240 communicating business micro in April 1982. In December 1982 the Torch Z-80 disc pack provided BBC users with the computing power of the Torch, and in July 1982 Torch launched the full Torch range including 300 series workstations, C-Series PCs and 700 series triple processor units capable of running Unix.



Torch sells three micros plus its own local area network, Torchnet. The 300 Series workstation is designed to work on Torchnet, or can be used as an IBM- or ICL-compatible terminal. It has a 6502 peripheral processor and a Z-80 application processor and has up to 16 drives accessible through the Torchnet network. The retail price is £1,245.

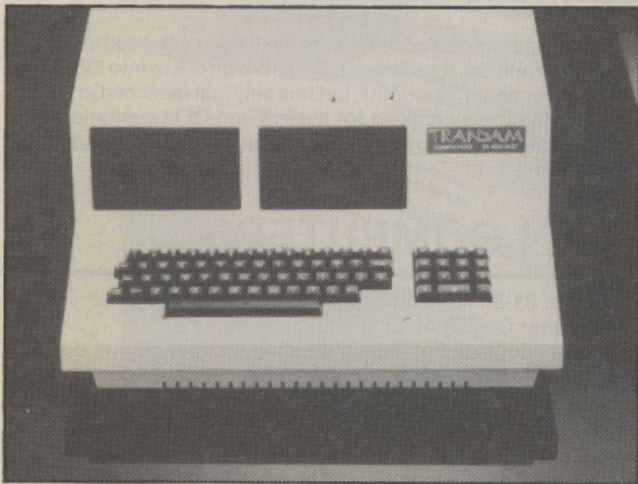
The C-Series communicating colour computer uses the same processors as the 300 series and can have either two 400K formatted floppy disc drives or one floppy disc and one 10Mbyte or 20Mbyte hard disc drive. C-Series models have 16-colour high-resolution graphics, a CP/M compatible operating system and comes complete with word processing, database and communications software packages. Using its built-in autodial modem the machine can access Prestel, Telecom Gold, PSS and Torchmail. The system costs £2,795.

At the top of Torch's product line is the 700 series with a 68000 Unix processor, 288K RAM and 64K ROM. Disc storage is twin 400K floppies with an optional 20Mbyte hard disc drive. As the 700 series is compatible with the Torch micro and terminal, the inclusion of a 700 in a network provides Unix to the other terminals. Prices for this series start at £5,500.

TRANSAM COMPONENTS

Address: 59/61 Theobalds Road, London WC1
Telephone: 01-405 5240
Telex: 24224
Company founded: 1978

Originally set up as a distributor of microcomputer-related products, Transam rapidly realised the need for British-designed products for the home market. After the successful launch of the Triton personal computer, which was the first British-produced machine with a Basic resident in ROM, Transam expanded rapidly into the area of general-purpose microcomputers and related software. The second generation machine was another British first, combining the flexibility of the Z-80A with the CP/M operating system and the widely-used S-100 expansion bus. The current range is based around the Tuscan micro, an in-house design concept that, due to its flexibility, can be configured to any customer specification.



TYCOM CORPORATION

Address: 8-12 New Bridge Street, London EC4V 6AL

The main feature of the Tycom Microframe is that it uses a versatile base-bus connect or VBC architecture. The bus is controlled by an Intel 8088 microprocessor, which treats the main CPU as a peripheral. The main CPU may be a Z-80 running CP/M, or a Motorola 68000, or something else, or all three together. This is claimed to make the Tycom future-proof.

The Microframe is available in three sizes, with six, 12 and 22 slots respectively, allowing expansion from a single-user up to a 30-user system. The basic machine with 8088 and one optional processor card, detached keyboard and monochrome monitor, two 720K floppy disc drives, operating system and Microsoft Basic costs £3,335 including VAT. The 8088 has 128K of RAM expandable to 576K, and the optional processor has its own memory. A colour monitor and hard discs from five to 20Mbyte are among the expansion options.



TRANSTEC COMPUTERS

Address: Unit 22, IDA Complex, Macken Street, Dublin 2
Telephone: 718521
Telex: 91229

Company founded: 1981
Number of employees: 35
Turnover in 1982: £1.5 million

TERMINAL SYSTEMS SERVICES

Address: 1 Frognall Parade, Finchley Road, London NW2
Telephone: 01-431 3100
Telex: 378113
Company founded: 1980
Parent company: Visionhire

VIDECOM

Address: Newtown Road, Henley-on-Thames, Oxfordshire RG9 1HG
Telephone: (04912) 78427
Telex: 847953
Company founded: 1972
Number of employees: 120
Turnover in 1982: £4 million

Videcom a manufacturer of terminals and controllers, was started approximately 10 years ago, and made a name for itself in the travel industry. In 1976 it pioneered the concept of multi-access reservations, going on to establish systems in U.K., New Zealand, Bermuda, Hong Kong, Dubai and Eire. The comms side of the business was expanded to provide terminal emulations to mainframes such as Burroughs, IBM, ICL, Dec, etc., and also multi-emulations from one terminal. The Company launched a micro in 1982 and were pleased to be included on the CCTA list earlier this year. The Company is British, privately owned and has its headquarters in Henley-on-Thames, and a manufacturing facility in Reading, Berkshire. Turnover has increased by approximately 50 percent per annum to a projected 1983/84 turnover of £6 million.



Videcom's Appollo range of eight-bit micros comes in three models, the Model 1, Model 2 and Model 2W. All of them have two Zilog Z-80A mainprocessors with 16K RAM and run under CP/M. They also have two RS-232/V-24 asynchronous ports and one RS-232/V-24 synchronous port. The model 1 has two 5.25in. floppy disc drives, giving 64K of usable space, and sells at £1,795. Model 2 has floppy drives which give 1.6Mbytes of usable space and retails at £1,995. The Model 2W has a 20Mbyte Winchester disc.

Videcom has three dealers and is aiming specifically at volume purchase of fifty machines or more. There are optional mainframe communication emulations. The printed circuit boards and basic components are manufactured in Reading, and final assembly carried out in Henley-on-Thames.

(continued on next page)

ADVANCE

Address: 8A Hornsey Street, London N7 8HR.

Telephone: 01-609 0061

Telex: 296701

Advance is a new private company set up to market the two Advance computers, Models A and B. Both feature an Intel 8086 full 16-bit microprocessor, and promise compatibility with the IBM Personal Computer.

The Model A has 128K of RAM in its system box, plus a detached keyboard. The Model B adds another item in the form of an expansion box which includes two 5.25in. disc drives providing 640K of storage. The RAM can be expanded up to 768K. Software includes MS-DOS, Microsoft CW Basic, WordStar, Mailmerge and CalcStar.

Not the least attractive thing about the Advance models is the prices. The Model A is to cost £350 and the Model B only £1,200, a comparable system now costs two to three times as much. It is planned that manufacturing will be done at four sites, of which three are in the U.K. The planned launch date is early September.



ASTON TECHNOLOGY

Address: Aston Science Park, Love Lane, Birmingham B7 4BJ.

Telephone: 021 359-4861

Telex: 334535

Company founded: 1983

Origin of company name: connection with the University of Aston in Birmingham

Aston Technology is a new venture funded by Birmingham Technology, a company formed by the City of Birmingham, Lloyds Bank and the University of Aston.

Aston's new product is the Crystal 68000, which uses the Motorola MC-68000 CPU. There are two basic versions. The Series R uses RS-232C communications to run up to 36 terminals. The Series C is a networking system where the terminals have their own 64K of RAM. Floor-standing and desk-top versions are available. RAM can be from 256K to 4Mbyte. Disc storage can be from two 5.25in. floppy discs with 1Mbyte each up to 420Mbyte of

hard discs in the floor-standing model. Operating systems range from CP/M 2.2 through Unix III to Pick. Prices start at £4,795.

The Crystal 68000, due to be launched in September 1983, is assembled in Birmingham and will be sold via a dealer/distributor network.

CEEDATA

Address: Glebe House, Armfield Close, West Molesey Trading Estate, East Molesey, Surrey.

Telephone: 01-941 4889

Telex: 291881

Company founded: 1979

Origin of name: Cee from Ceefax

Ceedata began as components supplier then specialised in providing monitors. It has been selling its own micro into EEC countries for about 18 months, but has only just launched in the U.K. Ceedata is now looking for dealers and OEM customers. Further micros, including a 16-bit machine, are currently under development.

ELAN COMPUTERS

Address: 31-37 Hoxton Street, London N1 6NJ.

Telephone: 01-739 4142

Company founded: 1983

Number of employees: planned to be 90

Elan is a new company which has been formed to design and market a range of Z-80-based home computers. The design and development has been controlled by three directors, David Levy, Kevin O'Connell and Robert Madge, who are also directors of Intelligent Software Ltd — a company with a high reputation for quality software. The new micros are to be launched for the Christmas of 1983 market. It is planned to set up a production facility in the U.K., employing up to 90 people.

LEENSHIRE

Address: Moorside Road, Winnall, Winchester, Hampshire SO23 7RX

Telephone: (0962) 64175

Telex: 477300

Company founded: 1981, from 1970 beginnings

Parent company: Pilkington Brothers plc

Leenshire specialises in colour graphics and industrial control applications and offers a range of terminals, plus the VCT-6930 microcomputer manufactured near Winchester. It uses a 6809 CPU with 64K of RAM plus dual floppy-disc drives. The 14in. screen offers 64 background/foreground colours/intensities with resolution up to 512 by 512 pixels. The system costs £4,500. Users include many leading U.K. companies such as BAC, the BBC, British Leyland, British Steel, EMI, Marconi, Ferranti, and Reed International.

Free reader enquiries

The circle numbers on the advertisements in this supplement refer to the postage-paid card bound into the October issue of *Practical Computing*, facing page 146.

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BM. 4.	9.8	12.6	17.5
BM. 5.	10.5	13.6	19.8
BM. 6.	18.7	23.5	35.4
BM. 7.	29.6	37.4	55.9
BM. 8.	5.1	3.5	4.3

These figures are extracted from a recent article in, 'Personal Computer World' Publication.

Micropute Ltd

Catherine Street, Macclesfield,
Cheshire SK1 6QY Tel: (0625) 615384.

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