

Practical Computing



Special Supplement

The 16-bit puzzle solved

Your Guide to 80 leading machines

Published as a Supplement to Practical Computing, April 1984



BY NEXT YEAR, EVEN IBM MIGHT HAVE ONE.

This is the Sanyo MBC 555.

The first high performance business machine of its kind to offer the compatibility and versatility of a true 16-Bit business micro for less than £1,000 + VAT.*

A revolutionary price for a revolutionary machine because with 128K RAM expandable to 256K RAM, both the twin drive MBC 555 and the single drive MBC 550 have an 8 colour graphics capability (640 x 200 dot resolution), an 8088 CPU for high-speed processing, a Centronics parallel printer interface and free bundled software.

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But the real beauty of the MBC 555/550 series is that you don't have to wait until next year for them.

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Tel. no.	_____ (PC)
Return to: Marketing Dept., Sanyo Marubeni (UK) Limited, Sanyo House, 8 Greycaine Road, Watford, Herts.	

*EXCLUDING MONITOR.

● Circle No. 300



SEE SANYO, THEN DECIDE

SANYO

Bits + Pieces

A YEAR AGO, *Practical Computing* published its first survey of 16-bit computers. Over 60 machines were included, as well as introductions to the whole world of eight versus 16 bit, and the associated contest among rival operating systems. The industry has moved on since then; the present survey considers 80 machines, and even this by no means represents the full range. There are probably well over 100 current machines that have some claim to 16-bit data manipulation.

The choice of machines was partly dictated by their nominal importance, either in terms of user base or technical specifications, and partly on the basis of availability of information. When everyone seems to be falling over themselves to get into the 16-bit world, it is surprising that many manufacturers gave the impression of being reluctant to part with information about their activities. Perhaps this is just another sad instance of the British disease of producing good, even innovatory products, and then failing to market them adequately.

In last year's supplement it was predicted that very few of the then current machines would be around in a few years time. The promised shake-out is still promised, and has yet to happen. Increasingly the smaller companies are churning out IBM look-alikes — identical even down to the clock speed. It is estimated that over a million units of the IBM PC have been shipped worldwide. If Apple defined the basic characteristics of the personal computer, then IBM seems to have set the pace for 16-bit personal machines.

The joker in the pack is Apple's come-back machine, the Macintosh. When Lisa was launched in January last year, its tremendous advances in soft and hardware were clear: icons, windows and mouse control. It was also apparent that it was over-priced and over-sized for its intended market of executives. Macintosh builds on the technology, but incorporates the Lisa's innovations in a neat upright box, which costs a more realistic £1,500 or so. Unlike the Lisa, the Macintosh seems likely to be well-supported by software houses.

Macintosh runs a Motorola 68000 — fast becoming the preferred chip for the 16-bit generation after the 8086/8088 which lies at the heart of the IBM PC and practically all other 16-bits. Although the power and elegance of the 68000 has never been in doubt, the old problem of operating system remains. For the 8086 series, MS-DOS has probably moved ahead of CP/M-86 as the favoured operating system, with a little help from IBM's own PC-DOS. But with the 68000 the position is far less clear. Apart from Apple's own idiosyncratic system for the Lisa and the Macintosh, the main contender is Bell Lab's Unix. As yet, this has a small micro software base, and no Unix software means no machines running Unix, which in turn discourages software development. However, IBM recently announced PC/IX — Personal Computer Interactive Executive—its own version of Unix, and doubtless there will be repercussions throughout the 16-bit world.

Meanwhile many machines are capitalising on the growing quantity of straight 16-bit software available while not abandoning the large eight-bit base, by offering dual-processor architectures. Typically an 8088 and a Z-80 are run together, so that both MS-DOS or CP/M-86 packages as well as the old CP/M faithfuls can be handled. Some interesting machines twin Z-80s with a 68000 second processor. In many ways these micros represent the best buys for business, offering proven technology and flexibility at moderate prices.

It is significant that on many of these eight- and 16-bit machines the old CP/M software runs faster on eight-bit than on the supposedly swifter 16-bit systems. Partly a result of the latest generation of souped-up eight-bits, like the Z-80B running at 6MHz, this is also a reflection of the maturity of the CP/M packages. The 16-bit software is only now beginning to exploit fully the extended operational characteristics of these recent processors. One new danger is that with 256K or RAM to play with, programmers will become lazy; one by-product of CP/M's 64K RAM, which now seems so niggardly, was that it encouraged really tight programming.

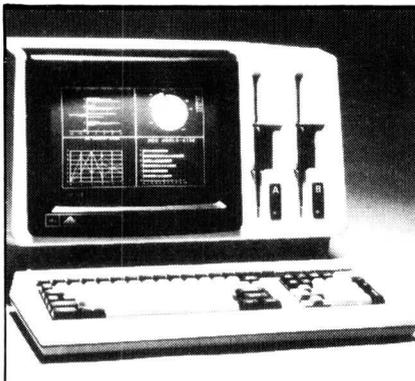
Questions of 16-bits versus 32-bits are therefore increasingly academic. It is performance that counts, not numbers which are misleading when taken out of context. A case in point is the Sinclair QL. Is it a 32-bit, the size of its internal registers, or eight-bit, as in its data bus? Both and neither; what matters is the use to which it puts these and other characteristics. Whether the QL can access one, four or 16 Mbytes of memory is irrelevant, since the maximum RAM available from the manufacturer is 640K. As yet, few programs have begun to exploit even half this memory. So in many ways the present survey is based on a way of looking at machines that is increasingly anachronistic. Perhaps in the future we can concentrate more on a machine's performance than its parameters.

The supplement is divided into two sections. The first gives a brief introduction to each machine, together with the entry system price and key points for and against; these are meant only as a general guide and should not be regarded as definitive reviews. The second section presents the specifications in a tabular form for easy comparison. The figures usually give the entry system configuration. Every effort has been made to ensure the accuracy of these but no responsibility can be accepted for actions taken or not taken as a result of them. Intending purchasers are strongly advised to contact manufacturers direct to confirm what are often rapidly-changing specifications. Moreover, there is no substitute for hands-on experience.

A special feature in the February issue of *Practical Computing* offered a full guide to the more technical aspects of eight and 16-bit processors. Back issues may be obtained from the publishers, please telephone 01-661 8436 for further information.

Editorial Glyn Moody, Editorial Production Sally Clark. Contributors: Della Bradshaw, Keith Holder, Greg Ingham, Bob Piper, Steven Sonsino, Sarah Underwood. 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 April 1984 issue of *Practical Computing* and may not be sold separately. Copyright Business Press International Ltd 1984. ISSN 0141-5433. Typeset by Centrepoint Typesetters, London EC1, and printed by Eden Fisher (Southend) Ltd, Southend-on-Sea.

Cover puzzle shows pieces of the IBM, PC Apricot and Macintosh.



ADVANCED PC

£1,985

For. Graphics. Memory. Price.

The APC from NEC supports up to 640K of main memory. It has a graphics resolution of 1024 by 1024 pixels, of which 640 by 475 can be displayed at any one time. The micro supports the GSX graphics kernel. The 8in. dual floppy can be noisy and is a bit slow, but the storage compensates for this. The APC supports CP/M-86, MS-DOS and the UCSD-p system. Software transport can be easy because of this. There is a wide range of software from NEC as well as from other manufacturers. NEC claims that one reason for the delay in introducing the APC to the U.K. was the preparation of the software.

Against. Noisy discs. Large footprints.

Address. NEC Business Systems (Europe), NEC House, 164-166 Drummond Street, London NW1 3HP
Tel. 01-388 6100



AM-1000

£5,500 +

For. Upgradeability

The Alpha Micro AM-1000 is the entry system for a range of micros, all based on the 68000, and costing from £5,500 to over £33,000. The compatibility between the machines and their software therefore presents a useful upgrade path for the business and professional user. The AM-1000 offers 128K expandable to 384K, with up to two 800K floppies. Up to seven 10Mbyte Winchester drives can be linked to the system, an indication of the general scale of the configurations envisaged. The remaining characteristics are more conventional, QWERTY keyboard with numeric keypad and function keys, three RS-232 ports and a Centronics parallel printer port. All systems components except disc drives are manufactured by Alpha Micro. Interesting data back-up facilities are available via a standard video cassette recorder capable of holding up to 100Mbytes.

Against. Entry price. Non-standard operating system.

Address. Alpha Micro Great Britain, Berkshire House, 56 Herschel Street, Slough SL1 1PY
Tel. (0734) 821922



ALPHATRONIC

£2,345 +

For. Dual processors. Networking. Winchester option.

Better known as a typewriter manufacturer, Triumph-Adler is a relative newcomer to the micro market. It made its deliveries of the Alphatronic in January 1984. At the heart of the system are dual eight- and 16-bit processors, Intel's 8085 and 8088, giving access to a wide range of applications software written to run under the popular CP/M-86 and MS-DOS operating systems. The Alphatronic comes in two versions, the P-30 with twin 5.25in. floppy disc drives of 800K capacity each, and the P-40 with a single 5.25in. floppy plus a built-in 5.2Mbyte Winchester drive. Theoretically up to 254 Alphatronics can be networked using Triumph-Adler's Micromite local area network. Manufactured in West Germany, the Alphatronic comes with 128K of RAM, which is not expandable.

Against. No colour option. Limited RAM.

Address. Triumph-Adler (U.K.) Ltd, 27 Goswell Road, London EC1M 7AJ.
Tel. 01-250 1717



APRICOT

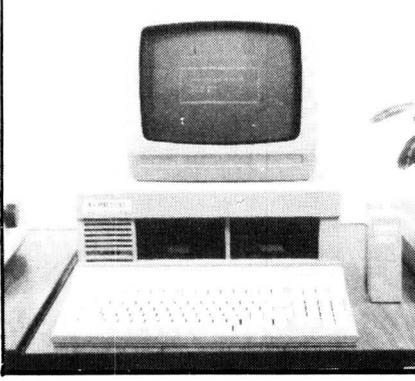
£1,490

For. Portable. Lots of software. Price.

Apricot, ACT's first home-grown micro, caused quite a stir when it was launched in September 1983. The 8086-based machine is packed full of goodies ranging from a mouse, through twin 3.5in. Sony floppy-disc drives, to an innovative microscreen fitted into the keyboard and acting as a clock, calendar and calculator. The microscreen also has six touch-sensitive keys which can be labelled with functions unique to the program being run, and it can be used as an entry line for information. It means that the 14lb. Apricot can be carried around and used without a monitor. Manufactured by ACT at its new factory in Glenrothes, Apricot also boasts a wide range of software, much of which is sold under the company's Pulsar label. With a standard 128K of RAM Apricot is among the best value 16-bit micros on the market.

Against. Not much.

Address. ACT (U.K.) Ltd, Shenstone House, Dudley Road, Halesowen, West Midlands
Tel. 021-501 2284



ARGUS PRO-PC

£2,800

For. RAM expansion. Good keyboard

Argus Pro-Personal Computer is the full name this machine from Ferranti rejoices in. It appeared in November 1982, making it one of the earlier micros to use a fully-fledged 8086 processor, and running at a swift 8MHz. By today's fickle standards the Argus is therefore getting slightly long in the tooth, though you would not think so looking at its elegant styling. Inside, everything is pretty much as it should be, 128K RAM expandable to 896K, two 320K floppies with Winchester options also offered, and three RS-232 ports. The keyboard has 13 function keys as well as six, rather than the usual four, cursor keys, some diagonal movement is possible. CP/M-86 and Basic come with the machine as standard, the former in a menu-driven version.

Against. Unexciting specifications. Lack of IBM compatibility.

Address. Ferranti Computer Systems, Simonsway, Wythenshawe, Manchester M22 5LA
Tel. 061-499 3355

BLEASDALE BDC-680 £8,000

Bleasdale's BDC-680 is certainly not cheap, but then it is not meant to be. Designed for the scientific and OEM markets, it has at its heart Motorola's 68000 processor — with the promise of the 68010 to come — plus the Unix operating system. Claimed by the company to be the first European-built micro to run Unix, it has gained a reputation for reliability and good performance for its price. Although it only runs the Unix operating system it offers a wide range of languages as standard features, and can form part of an Ethernet local area network. Storage is on Winchester discs only, but they have fast access speeds of 30 milliseconds and capacities of up to 46Mbytes. Beware the price tag, it does not include the cost of VDUs and keyboards.

For. 68000 processor. Unix. Ethernet interface.

Against. Too expensive where very high performance is not required.

Address. Bleasdale Computer Systems, Francis House, Francis Street, London SW1.
Tel. 01-828 6661

BRITANNIA S3-10 £7,500

British built and designed, Britannia's S3-10 multi-user system is based on Motorola's 68000 processor. It is supplied with Whitesmith's Unix-compatible Idris operating system. This limits the amount of applications packages available for the S3-10; but Britannia can offer a range covering tasks such as word processing, business graphics and electronic mail. The company also has an agreement with Peachtree, which provides a suite of financial software for the system. Like other 68000-based machines this one costs more than its 8086- and 8088-based counterparts. The price includes an S3-10 configured with 256K of RAM, a 10Mbyte Winchester, floppy back-up, plus eight ports. If you start adding terminals it will cost you extra. Britannia is a subsidiary of the giant Armstrong Group, so at least it should be one of the companies that will be around for some time to come.

For. Multi-user. 68000 processor.

Against. Non-standard operating system.

Address. Britannia Computers, 12 Castle Hill, Dudley, West Midlands.
Tel. (0384) 233433

CANON AS-100 £2,290

Canon was among the first to produce an IBM-compatible micro, introducing its AS-100 only a month after IBM wheeled out its PC in January 1983. Based on Intel's 8088 processor with an 8087 math co-processor as an optional extra, the system has a standard 128K of RAM expandable to 512K and can be configured with a range of floppy and Winchester mass-storage devices. A basic monochrome version with 128K of RAM plus a 1.28Mbyte floppy costs about the same as the IBM PC. The AS-100 can be networked using the Quorumnet daisy-chain network, and if you do not want a fully-blown micro a dedicated word-processing version is also available. Canon, which builds the machine in Japan, also supplies a range of peripherals for the system including a colour ink-jet printer.

For. IBM compatible. Good graphics.

Against. Limited RAM.

Address. Canon (U.K.) Ltd, Waddon House, Stafford Road, Croydon CR9 4DD.
Tel. 01-680 7700

CASU SUPER PX £1,975

Based on Intel's 80186 the Super PX has been designed by Casu as a flexible and expandable system. Three operating systems, CP/M-86, BOS and MS-DOS are available along with a variety of storage configurations based on dual 3.5in. or 5.25in. floppy-disc drives and 20Mbyte or 40Mbyte Winchesters. The standard Super PX has interfaces for two serial devices such as, VDUs, printers and plotters, plus an expansion bus for additional I/O controllers. Casu is a British manufacturer and has already installed some 2,500 of its previous systems in the U.K. It also has the distinction of being a recommended supplier to Government departments.

For. Flexible system with flexible price.

Against. VDU not included in price.

Address. Casu Electronics, Arundel Road, Uxbridge Industrial Estate, Uxbridge, Middlesex UB8 2RR.
Tel. 01-561 6820

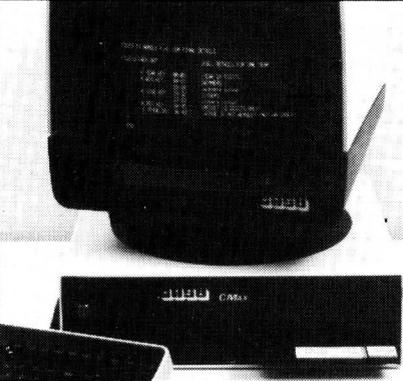
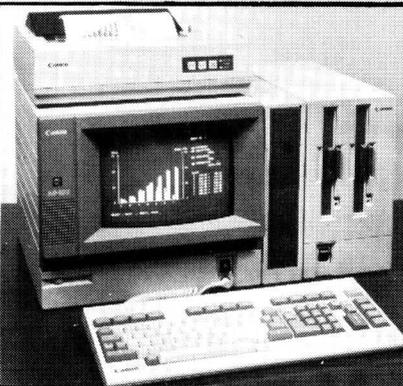
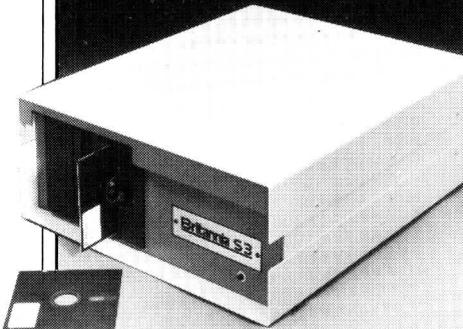
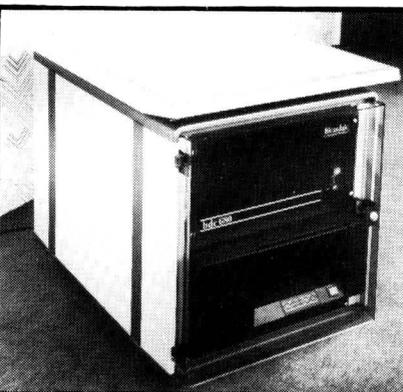
CEEDATA 8400 £2,450

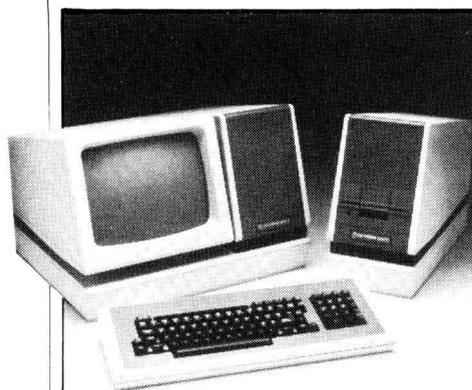
This British-built machine uses the increasingly popular dual-processor architecture to offer ready accessibility to CP/M and 16-bit software. The Z-80B runs at a fast 6MHz, the 8088 at a more sedate 5MHz. Standard RAM of 128K can be upgraded to 512K, and floppies with formatted capacities of 380K or 760K are available. Perhaps the most interesting feature is the advanced keyboard. It contains a Z-80 processor as well as 2K of RAM and ROM, and has 59 soft function keys of which 12 are normally utilised as cursor controls and 11 for the numeric keypad. The remaining 36 can be programmed for particular applications packages, and overlays are available for some of the more popular software. A 12 months on-site guarantee is included in the basic price, and this also extends to any printers purchased.

For. Excellent keyboard facilities. Dual processors.

Against. Lack of colour option.

Address. Ceedata, Glebe House, Armfield Close, West Molesey Trading Estate, Surrey
Tel. 01-941 4889





CIES 680/20

tba

For. Its Pro-IV feature.

The Cies 680/20 is part of a range of four Japanese multi-user systems from Itoh Electronics. This version can support up to four concurrent users. Its major claim to fame lies in the choice of operating systems: Unix, Regulus, or RMCOS, and Pro-IV. The latter is claimed to be the most advanced applications processor on the market. It enables the user to develop customised business applications without programming, without code generation, without interpreting, and without a computer language. Through the use of optional communications controllers it will support industry-standard byte and bit oriented protocols such as 2780, 3780, 3274, SNA, SDLC, and X.25, as well as local area networking. As yet, neither the price nor the selling strategy has been fixed for the Cies 680 range in the U.K.

Against. Can only support three more workstations.

Address. Itoh Electronics, Beacon House, 26/28 Worple Road, Wimbledon, London SW19 4EE
Tel. 01-946 4960



COLUMBIA PC

£2,950

For. IBM compatible. Storage options.

The U.S. manufactured Columbia PC is distributed in the U.K. by Icarus Computer Systems. Based on Intel's 8088 processor, the system comes with a standard 128K of RAM expandable to 896K and two 5.25in. floppy-disc drives. Versions with either one or two 10Mbyte Winchester discs are also available. The Columbia is claimed to be fully IBM PC compatible and even boasts a compatible keyboard, but it is more expensive than IBM's 16-bit micro. Designed as a three-piece desk top unit, the Columbia's 12in. screen displays amber characters on a black background as opposed to the more widely used green characters. CP/M-86 and MS-DOS come as standard with the system making a wide range of applications available. Perfect Software's Writer, Filer and Calc packages and a Fast Graphs graphics package are supplied free with every machine.

Against. Large foot-print.

Address. Icarus Computer Systems, Deane House, 27 Greenwood Place, London NW5 1NN.
Tel. 01-485 5574



COMART CP-1000

£2,295

For. Expandable. Good communications facilities. Well established company.

Comart's Communicator range of single and multi-user micros started life in 1980 and has since grown to include 10 basic systems. At the top of the range is the CP-1000 series which has been on sale since January 1982. Based on Intel's 8086 processor, it supports up to 1Mbyte of memory plus a variety of floppy and Winchester disc drives. Although the basic system is reasonably priced, you are unlikely to opt for a configuration costing so little when the possibilities for expansion are so great. Upgrade kits are available for the CP-1000 allowing a 16-bit single-user system, for example, to be upgraded to a multi-user system. Both CP/M-86 and MS-DOS operating system software is included in the price so you get immediate access to a vast number of applications packages. Digital Research's CP/net is also supported, and for users wanting to communicate with mainframes Comart supplies IBM 2780/3780 and ICL CO2/CO3 protocol emulators.

Against. Old. Space consuming.

Address. Comart, Little End Road, Eaton Socon, St Neots, Cambridgeshire PE19 3JG.
Tel. (0480) 215005



CORONA

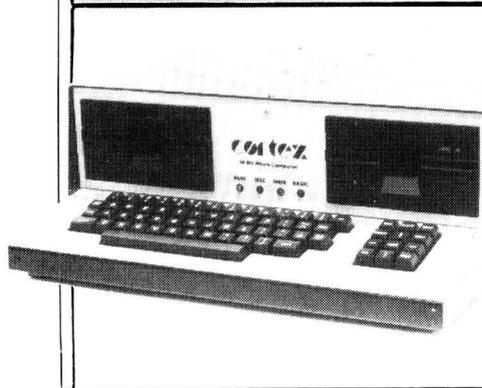
£2,295

For. IBM compatible, so lots of software.

Introduced last year, the Corona portable and desk-top micro was one of a speight of portable IBM personal computer look-alikes. Now it is distributed in the U.K. by Midlectron and is developing quite a name for itself. The U.K. version has 256K of RAM as standard, double the U.S. version, and 320K floppy-disc drives; extra is a 10Mbyte Winchester. As well as MS-DOS, GW Basic also comes with the micro; as for applications needless to say, the micro can run or any of the packages developed for the IBM PC. Extras on the Corona, which overstep the PC itself, are high-resolution graphics which can be mixed with standard text on the screen and have 640 by 325 resolution, and the use of four expansion slots after the printer ports and disc controllers have been attached. Prices start at £2,295 for the portable floppy disc version to £4,225 for the Winchester version.

Against. A bit pricey. Small screen

Address. Midlectron, Midlectron House, Nottingham Road, Belper, Derby DE5 1JQ.
Tel. (077 382) 6811



CORTEX

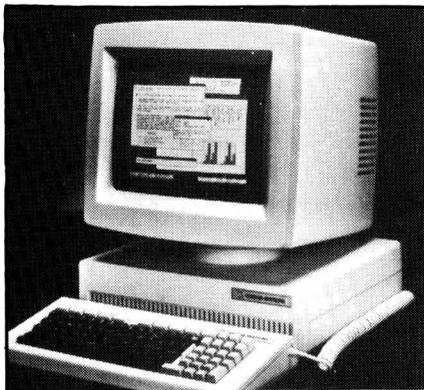
£295 +

For. Good graphics Extensive memory

The Cortex is available in kit form as well as ready built. It is supplied with 64K of RAM and 24K of Basic and Assembler. In addition, the VDU has 16K of RAM outside the CPU memory map. The VDU has 36 planes, 32 of which are sprite planes. Up to 16 colours are available and these generate eight grey levels on a black and white screen. The kit is quite cheap at about £300 — but who wants to build one? Technically speaking, the theory behind the choice of chips is quite sound, but whether they can be used to the best advantage is another matter.

Against. Keyboard attached.

Address. Powertran Cybernetics, Portway Industrial Estate, Andover, Hampshire SP10 3NN
Tel. (0264) 64455

**CORVUS****£3,125**

A network workstation as well as a micro is Keen Computer's sales pitch for its Corvus micro, which sports a built-in Omninet interface as standard. A twisted pair cable can connect the Corvus to up to 64 other micros, including Apples, IBMs and Commodores. The most distinctive thing about the Corvus is dual-orientation screen, which can be turned at an angle of 90 degrees to give vertical or horizontal screen. The hard discs are particular to this micro, and range from 5.7Mbyte formatted to 19Mbyte formatted, with floppy disc and back-up options as well. The Corvus has a UCSD Pascal file structure and Fortran 77, but does not run under CP/M although it is compatible. Some proprietary packages are available, like Corvus Logicalc and the Edword text editing and word-processing package.

For. Omninet interface.

Against. Possible lack of off-the-shelf packages.

Address. Keen Computers, Minerva House, Spaniel Row, Nottingham NG1 6EP
Tel. (0602) 412777

**CROMEMCO CS-1****£3,845**

The Cromemco CS-1 features a 68000 running at 8MHz, and a Z-80A at 4MHz. The operating systems employed are CDOS and Cromix, claimed as eight-bit CP/M compatible and Unix-type environments respectively. Standard options include 256K RAM and Winchester discs from 20Mbytes to 600Mbytes. Any RS-232 VDU and keyboard can be used with the unit. Expansion facilities include eight slots, optional centronics and IEEE ports, and an Ethernet local area network; a S-100 bus structure is used internally. As well as standard languages like Basic, Cobol and Pascal, the Cromemco CS-1 also supports C and 68000 assembler. Extra cards can be added for colour and digitising output from a video camera. The machine is manufactured in the U.S., and distributed in this country by Jarogate.

For. Colour. Analogue to digital facilities.

Against. Non-standard operating systems. No VDU or keyboard supplied.

Address. Jarogate, 197-213 Lyham Road, Brixton, London SW2 5PY
Tel. 01-671 6321

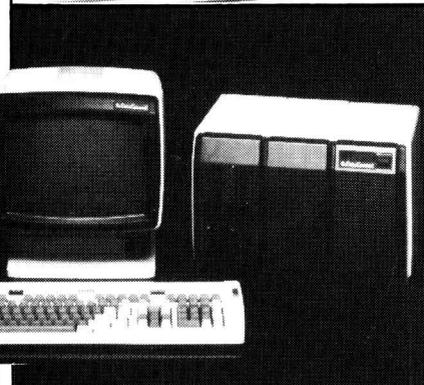
**CRYSTAL 68000****£4,300 +**

The little known Crystal 68000, assembled at the Aston Science Park, is one of the few 16-bit machines that runs under the fashionable Pick operating system. A bit old-fashioned looking, the Crystal 68000's main claim to fame is its software capabilities; it runs Basic, Cobol, Fortran, Pascal, APL and C programs as well as the Pick systems builder, an applications generator which can also run on IBM machines and purports to give users the power to develop their own applications programs. The single-user desk-top version starts at £4,300, the floor-cabinet model uses the screens as intelligent workstations and can accommodate up to 16 of them. Both desk-top and floor-cabinet versions come in two versions, the Series R which uses standard RS-232 ports to communicate with terminals, and the series C which is a networking system using high-speed coaxial cable.

For. Pick O/S. Lots of software

Against. New system. Relatively untried. Not widely available.

Address. Aston Technology, Aston Science Park, Love Lane, Birmingham B7 4BJ
Tel. 021-359 4861

**DATA GENERAL****£2,532 +**

Less than a year old, Data General's desk-top model is the minicomputer manufacturer's first microcomputer offering. Built around the Intel 8086, the system comes with a standard 128K RAM and runs industry-standard CP/M-86 and MS-DOS, giving a wide range of standard software to the user. Backed up by Data General's worldwide reputation and sales support the Desktop Generation is targeted at the small business and the more technical office, and claims to be both IBM and DG Eclipse compatible. The machine is manufactured in the U.S. and sold in the U.K. through 10 dealers. For networking it uses the Zodiac system, and has either a 12in. monochrome or 13in. colour display. Graphics on the 13in. version are relatively sophisticated, using the GKS software package which conforms to the draft standard for graphics, ISO/DIS 7942.

For. Graphics. Back-up of a big organisation. Some nice applications such as CAD/CAM.

Against. Not very attractive display unit.

Address. Data General, Hounslow House, 724-734 London Road, Hounslow, Middlesex TW3 1PD
Tel. 01-572 7455

**DEC****£2,433**

Digital Equipment came in for a lot of harsh criticism last year regarding supply problems, although now its micro range seems to be readily available. Originally introduced simultaneously in the U.S. and Europe in the autumn of 1982, the micros at that time looked very attractive. Now they seem a little bit old-fashioned. The Rainbow 100 is the smallest micro in Digital's range, using a standard Intel 8088 processor and a Zilog Z-80. The system unit is large, but can be placed vertically beside the users desk, as well as on it. There are 15 versions of the keyboard available to cover all European countries, and the monochrome screen comes in three different colours. Colour graphics are an optional extra and supplied by plugging in an extra board to the main module. The Rainbow comes with 12 month's support, although one of the main selling points of the machine has always been the ease with which defunct parts can be replaced.

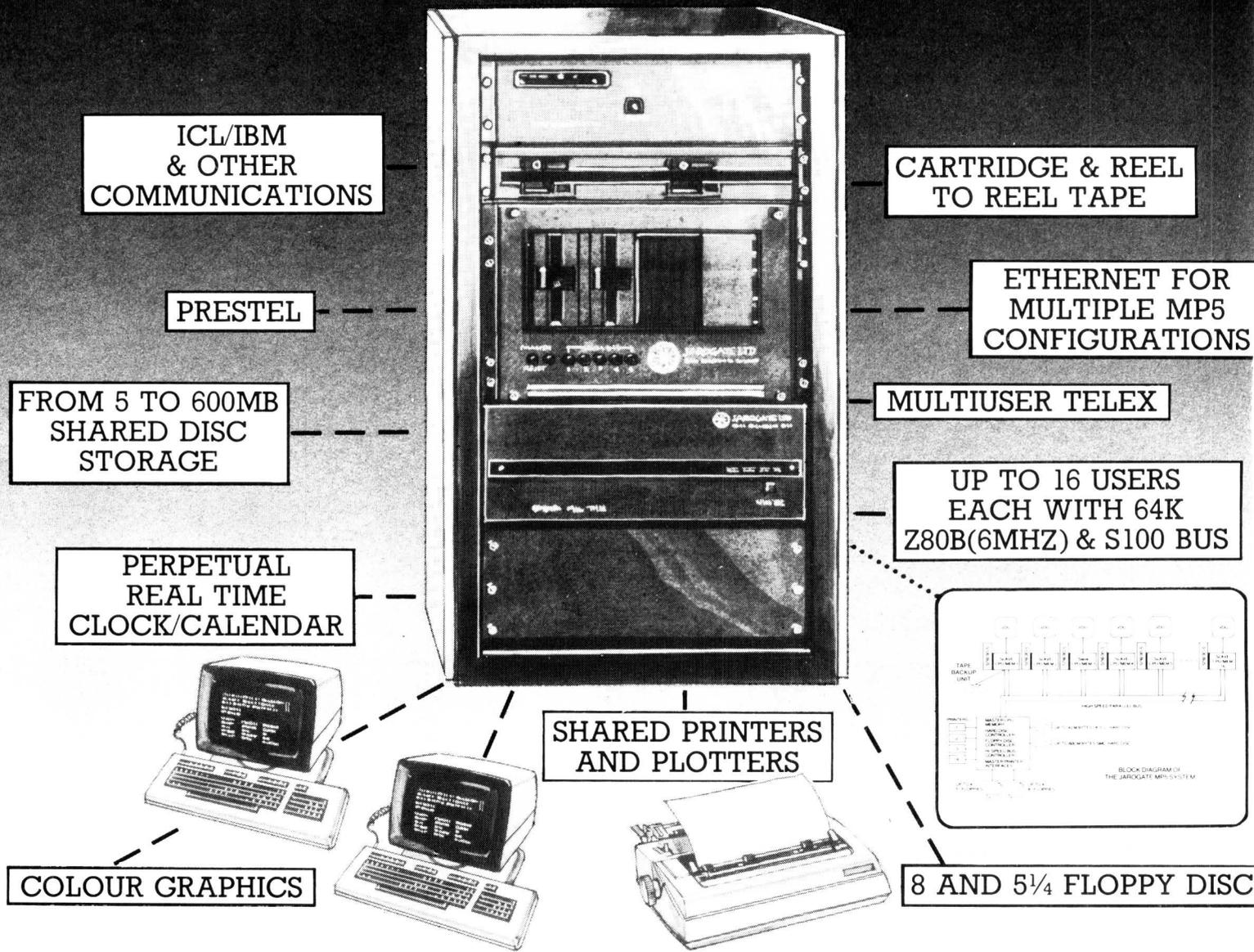
For. Lots of software. Good communications. Good optional graphics.

Against. Large footprint. A bit old-fashioned.

Address. DEC, PO Box 110, Reading RG2 0TR
Tel. (0734) 868711

*If you are thinking of buying
more than one PC—think again about*

Jarogate's MP5 the CP/M multiprocessor



Z80H (8MHZ) & IAPX 286 (16 BIT) PROCESSOR OPTIONS.
WILL SUPPORT ANY CP/M OR MP/M APPLICATIONS SOFTWARE.

**YOU HAVE JUST THOUGHT
ABOUT A BRITISH MADE, LOWER COST,
HIGHER PERFORMANCE SOLUTION.**

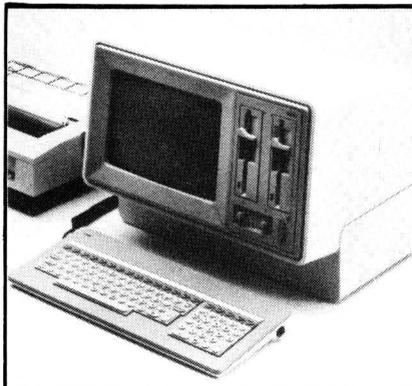
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SUPPORT**



DECISION MATE V £2,135 +

The Decision Mate V is aimed at the business and professional user. The base unit has 64K of memory, a 12in. NEC chip-based monochrome or colour video display and dual 5.25in. floppy discs. The standard dual processor, eight-/16-bit version supports Basic, Cobol and Pascal. Software is available from various houses promoted by NCR. It is possible to link up to 64 Decision Mates in Decision Net, which uses an NCR LAN based on Omnet and an NCR file server. There has been such a demand for this micro, says NCR, that the company has been able to cut prices by about 25 percent. Enhancements to the product include colour business graphics packages, memory and disc storage products, and a disc utility that allows Decision Mate to exchange data with other micros.

For. Available software. Easy upgrade.

Against. Expensive, but coming down.

Address. NCR, 206 Marylebone Road, London NW1 6LY
Tel. 01-388 8440



DUET-16 £2,595

The Duet-16, sold in the U.K. by Lambart Computer Products, was jointly designed in Japan by Fujitsu and Panasonic. It is a standard 8086-based micro but it is one of the faster micros around, beating the Olivetti M-20, IBM PC, Hewlett Packard HP-125 and Sirius I on its benchmark timings. The micro, which is modular in design, has a choice of three screens: a colour one, an amber one, and a mini high-resolution screen with 640 by 400 pixels. Two types of Basic come as standard, along with L-11 Cobol and a Macro Assembler, and Unix will be available in the next couple of months. The Duet-16 is not IBM compatible, it is marketed as a terminal in the place of Digital Equipment or IBM machines. Lambart Micros is part of the Lambart Group, which also retails management systems and Digital and Digital-compatible equipment. Prices for the Duet-16 start at £2,595 for the mono screen, and £2,995 for the colour one.

For. Reliable pedigree. Fast.

Against. Lack of IBM compatibility.

Address. Lambart Computer Products, 52 Moorbridge Road, Maidenhead, Berkshire SL6 8BN
Tel. (0628) 75001



EAGLE £2,565 +

Eagle's IBM compatible 16-bit micro, launched in the U.K. about a year ago, is now also available in a portable version selling for about £4,200 compared to about £2,565 for the desk-top version. The standard version comes with 128K RAM, one 320K floppy disc, and a monitor. The portable version comes complete with a 10Mbyte hard disc and a floppy-disc drive. The monitor for the portable version is 9in. across and has 84 keys, as opposed to the 105 keys on the desk-top version. It comes in a padded carrying case for those who want true portability. On the software side both machines run under CP/M-86 and MS-DOS, and Basic is standard. Proprietary Eagle packages include Eaglecalc and Eaglewriter. Manufacturer in the U.K., the Eagle 16-bit machine is sold in the U.K. through Geveke Electronics.

For. Price. Lots of software.

Against. Large footprint.

Address. Geveke Electronics, RMC House, Vale Farm Road, Woking, Surrey GU21 1DW.

Tel. (048 62) 26331



EQUINOX £2,695

The Equinox SX-5000 is assembled in the U.K., even though the parts are all made in the U.S. The machine first appeared in 1981. Based on the new generation of 8086 processors, the 80186, the SX-5000 offers 256K RAM and two 750K floppies with further options of 5, 10 and 20Mbyte hard discs. There are two RS-232s and one centronics port. CP/M-86 and MS-DOS are offered as standard operating systems, and Turbodos is also available. The 12 expansion slots allow additional up-grade options, and bus expansion via the S-100 bus is also possible. The keyboard is a standard QWERTY with 15 extra function keys. The screen includes an additional monitor line at the bottom of the display.

For. Main operating systems.

Against. Unexciting layout.

Address. Equinox Computers, 16 Anning Street, New Inn Yard, London EC2A 3HB
Tel. 01-729 4460



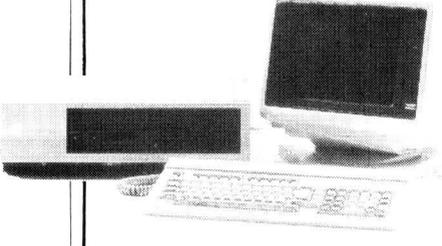
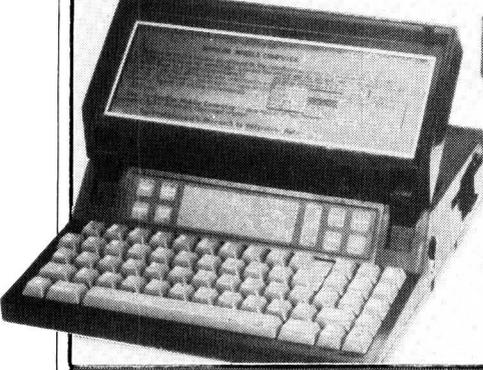
FORTUNE 32:16 £5,070

The Fortune 32:16 was one of the first machines to use the now well established Motorola 68000 running under Unix. The PS-20, part of the Professional Station family, offers a 20Mbyte Winchester and a 1Mbyte floppy disc as standard. The 384K of RAM can be upgraded to 512K, and there is 40K of boot and self-test diagnostics in ROM. In addition to RS-232C and IEEE ports there are facilities for IBM communications. The 11in. screen swivels on its own separate mounting, though only block graphics are available. The keyboard includes 20 program keys and a numeric keypad and cursor controls. The Fortune system is intended as a high performance single-user system with the option of expanding into a full two- or three-user version. Fortune are a U.S.-based company.

For. High performance. Multi-user capability.

Against. Cost. Limited graphics.

Address. Fortune Systems, 2-14 Shortlands, Hammersmith, London W6 8DJ
Tel. 01-741 5111

	<p>FUJITSU £2,250</p> <p>Launched in the U.K. in November 1983, the Fujitsu micro has still to make its real debut in the shops in about May. The basic Micro 16-S has a 6809 processor to handle graphics, as well as an 8086 standard 16-bit processor and a Z-80A to give access to the full library of CP/M programs. The 16-S can support the attachment of two standard terminals, with all three units being used simultaneously. Although the appearance of the micro is relatively undistinguished the graphics capabilities are impressive, with 640 by 200 graphics pixels. The 16-S comes with bundled software including Wordstar, Supercalc, CP/M-86, and F Basic, and the makers claim that the applications programs run at least three-times faster than the IBM Personal Computer. Fujitsu has set up its own sales team in the U.K. to market the micro, including a microcomputer express which will chug its way round the country.</p>	<p>For. 16- and eight-bit processors, so lots of software available.</p> <p>Against. Not very attractive. Not available yet.</p> <p>Address. Fujitsu Microelektronik, 1 Curfew Yard, Thames Street, Windsor, Berkshire SL4 1SN Tel. (075 35) 50551</p>
	<p>FUTURE FX-20 £1,875 +</p> <p>The FX-20 is at the heart of the British-built range of Future Computers. It has an 8088 processor and is quite a fast machine; the memory speed, for example, is 150nanoseconds. The machine was first launched at the end of 1982, but its distinctive appearance has not dated, with its low profile processor box and 109 key board. The 128K of RAM is standard as is its twin 5.25in. floppy discs, plus the ability to read standard IBM-formatted floppy discs. It also has an IBM bus option, so that IBM cards can be added for which space has been designed into the machine. The FX-20 also has a LAN communications port which operates at a speed of 800K per second, a main communications port with a RS-232/V-24 modem for HDLC and SDLC communications and a serial RS-232/V-24 printer interface.</p>	<p>For. Fast. Good-looking. Reasonably priced.</p> <p>Against. Not much.</p> <p>Address. Future Computers, PO Box 306, Purley, Surrey. Tel. 01-683 0111</p>
	<p>GALAXY 3 £3,000</p> <p>The Galaxy range of computers from Gemini Microcomputers use bus-based systems. A standard Z-80 running at 4MHz handles the I/O functions and CP/M programs. The 80186 processor card runs CP/M-86 and other cards allow additional memory, high-resolution colour graphics, and further serial and parallel ports to be added. In addition to CP/M-86 and MS-DOS, Concurrent CP/M is available. The resolution on the 12in. monitor is 256 by 256 pixels. The keyboard is a basic QWERTY with numeric pad and 10 function keys. A 10.8Mbyte Winchester is included as standard with a 800K 5.25in. floppy.</p>	<p>For. Price. Expandability.</p> <p>Against. Limited keyboard. Inelegant construction.</p> <p>Address. Gemini Microcomputers, 18 Woodside Road, Amersham, Buckinghamshire HP7 0BH Tel. (024 03) 28321</p>
	<p>GAVILAN £3,495 +</p> <p>The Gavilan, a U.S. import 16-bit mobile micro, is not cheap at £3,495 for the basic eight-line model, with the additional costs of a 12in. monitor, printer unit and any extra micro floppies you need. For your money you get the basic system with 32K memory, 80-character liquid-crystal display, numeric keypad, RS-232 interface and 300baud modem. A 3.5in. micro-floppy disc drive is standard along with a video-monitor interface. The Gavilan runs MBasic and under MS-DOS, and has five integrated packages: word processing, spread sheet, data communications, portable secretary, and forms processing. Other software comes in Capsuleware options to plug in, five of those will cost you another £1,395. Lots of standard MS-DOS options are available as well.</p>	<p>For. As portable as it claims.</p> <p>Against. Price.</p> <p>Address. Adam Computer Systems, Ripon Way, Ripon Road, Harrogate, North Yorkshire Tel. (0423) 501151</p>
	<p>HEADSTART £2,800</p> <p>The Headstart is typical of 90 percent of the growing number of IBM PC-compatible systems to enter the market in recent months. Through its 8086 and Z-80A chips, both supplied as standard, it combines both eight- and 16-bit functions, which gives it greater flexibility than many in its range. At 25lbs. it qualified as a transportable, yet its basic RAM capacity is 512K. Intertec's RAM-disc concept emulates a typical second drive, which partly explains the Headstart's solo disc drive. The machine is a move up-market for the company from its eight-bit Superbrain. The change to both MS-DOS and the Intel 8086 chip are radical departures for Intertec. Each unit has built-in networking, allowing up to 255 users with up to 200 Mbytes of central disc storage. The Headstart is being distributed in the U.K. by Icarus Computer Services and Cambridge-based PM Professional Micros.</p>	<p>For. Versatile machine. Impressive memory.</p> <p>Against. Made by U.S. company still not well known in U.K.</p> <p>Address. Icarus Computer Systems, Deane House, 27 Greenwood Place, London NW5 1NN Tel. 01-485 5574</p>

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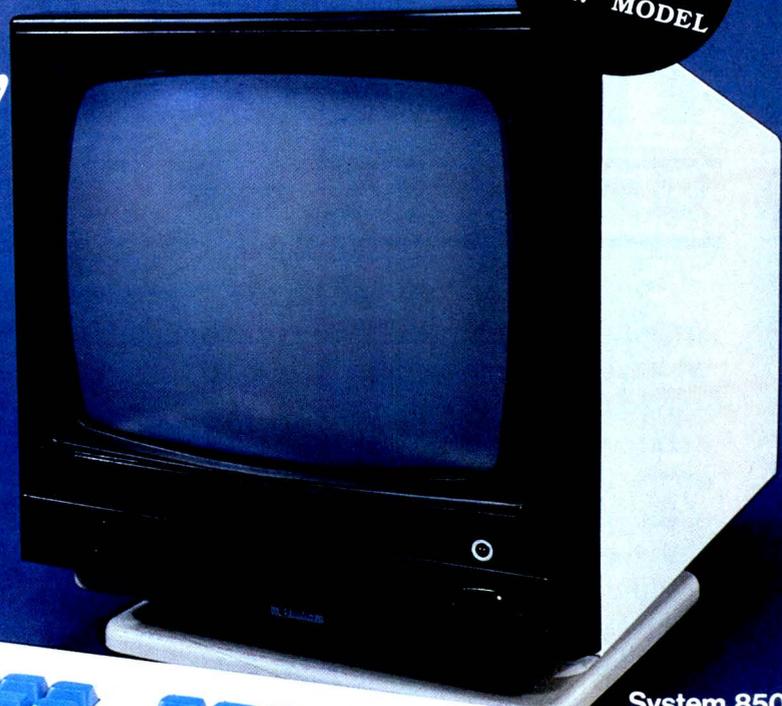
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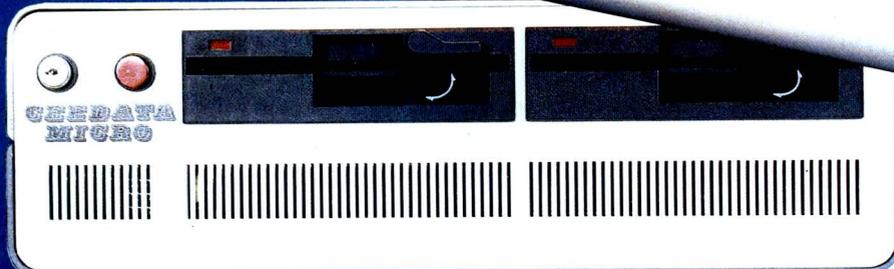
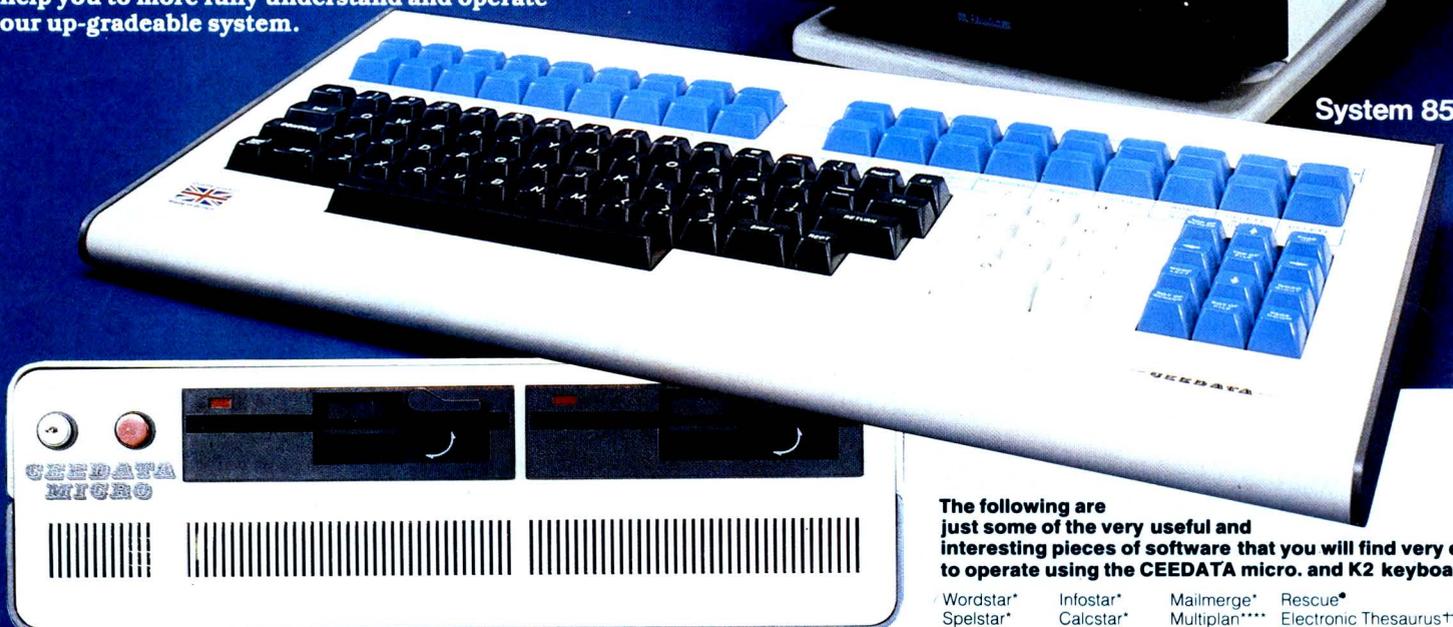
Our "K2" keyboard with user-friendly function keys (processor in the keyboard as well) will show you how to find your way round all sorts of home and business packages.

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'1984' THE YEAR OF 2000

SAPPHIRE 2000 SERIES REMOTE CONTROL PRINTERS

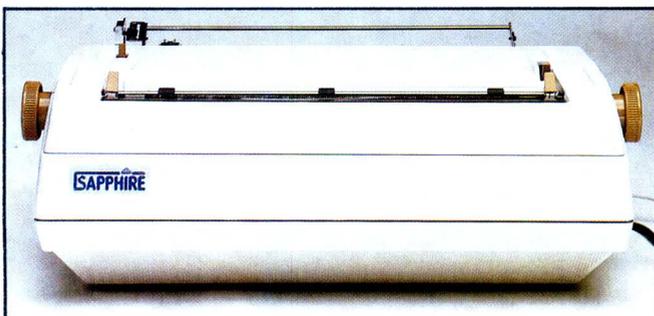
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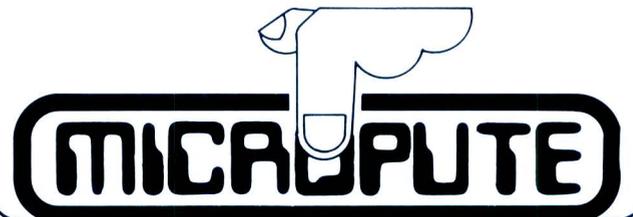
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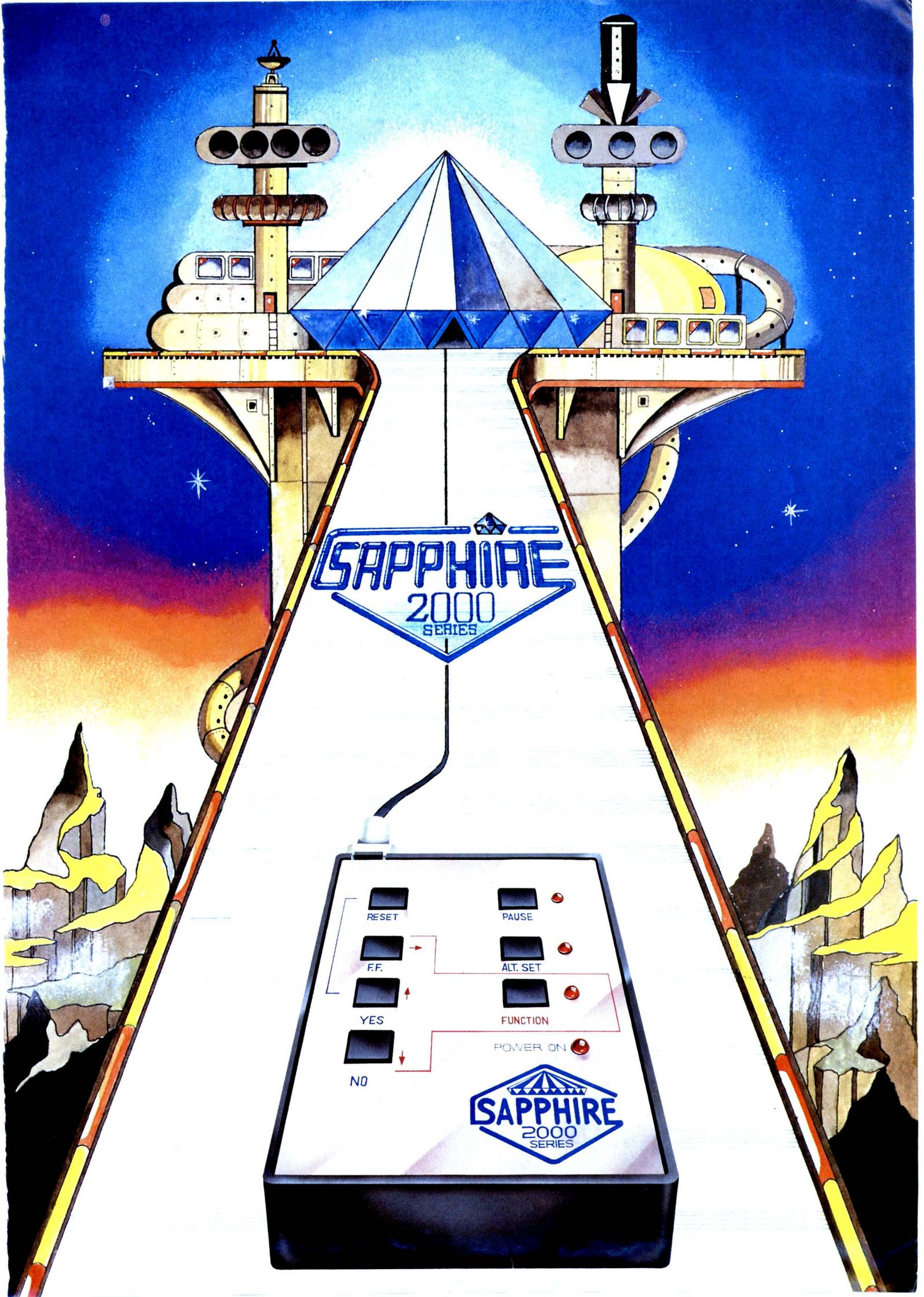
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MICROPUTE, Catherine Street, Macclesfield,
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THE YEAR OF THE SAPPHIRE 2000.



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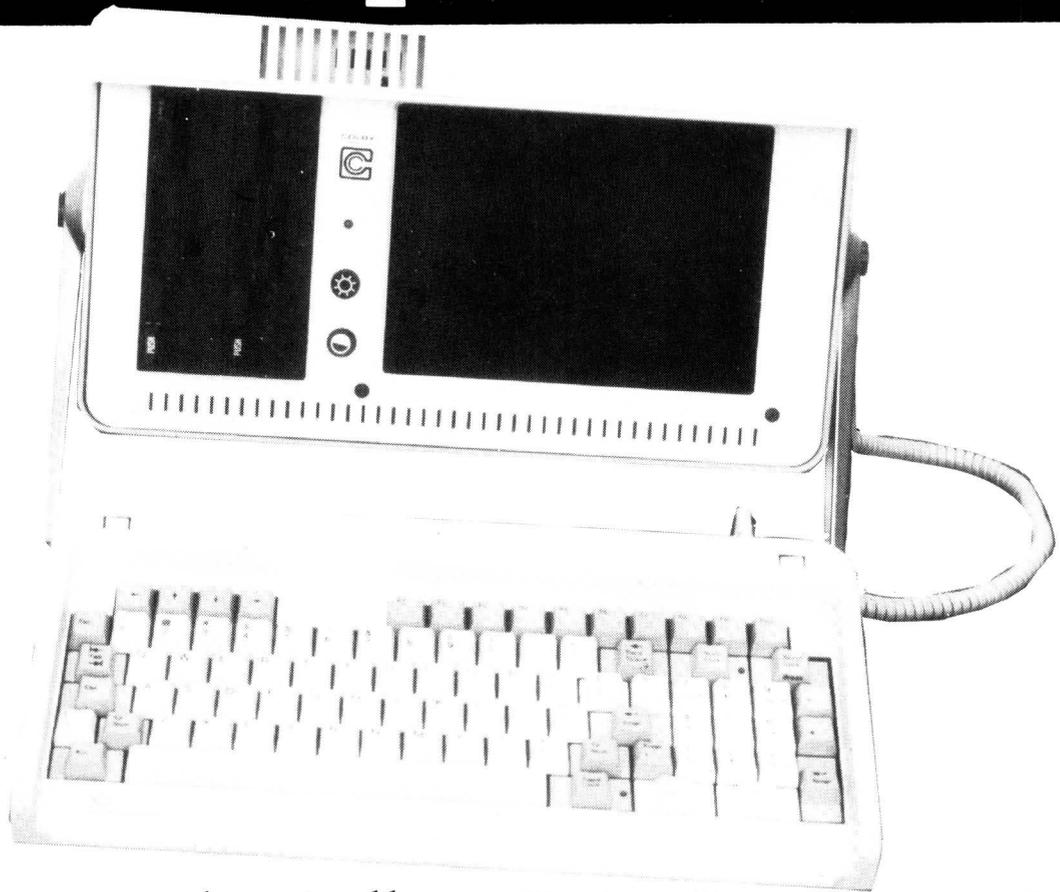
F.F. ALT. SET

YES FUNCTION

NO POWER ON

SAPPHIRE
2000
SERIES

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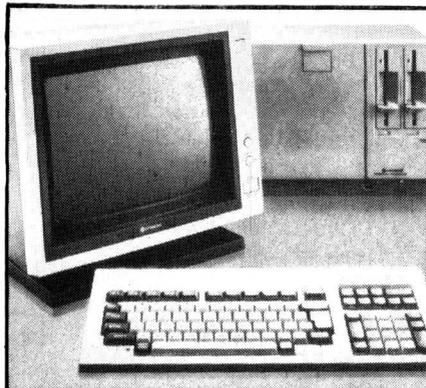
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HITACHI PC

£2,595

The Hitachi PC was announced as long ago as June 1981; the pre-sales drive has been so extended as to appear leisurely. Now that it is here, the company is offering a two year on-site warranty carried out by its own engineers, and for the first six months is bundling the Hitachi Nucleus System Generator package from Compact Software International. Hitachi has also assembled a catalogue of 64 applications software packages, 13 of which are the company's own and the rest are from the likes of Ashton-Tate and Microsoft. Hitachi stresses that many of these packages make use of its micro's active colour. Up to 15 colours may be on screen at one time, or any eight used for graphics. Hitachi is the eighty largest computer company in the world.

For. Useful array of software. Good colour/graphics.

Against. A long time coming.

Address. Hitachi Sales (U.K.) Ltd, Station Road, Hayes, Middlesex UB3 4DR

Tel. 01-848 8787



HP-150

£2,900

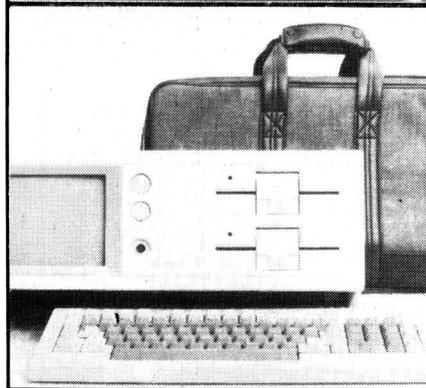
For a number of years, HP in a high-tech context has meant high price. Hewlett-Packard thinks that its HP-150 will dispel this notion — possibly. It also says that it is aiming for a 15 percent share of the U.K. market — again, possibly. It will be surprising if the HP-150 achieves this, solid machine though it is. Its most remarkable feature is its touch-screen facility. The micro, like many in its performance and price range, has IBM compatibility of sorts and can be used as a terminal in a network. HP has chosen a dual 3.5in. micro-floppy disc drive for the HP-150, and its 256K of internal memory is expandable to 640K. There is also an optional built-in printer priced at £365. It will be sold through HP's 350 plus outlets.

For. Its touch-screen facility.

Against. Smallish screen.

Address. Hewlett-Packard, Nine Mile Ride, Wokingham, Berkshire RG11 3LL

Tel. (0344) 773100



HYPERION

£2,599

This Canadian-built portable has made much more of a splash in the U.S. than it has here. But it is a genuine IBM-compatible machine, and has seven card slots that accept IBM compatible cards in its expansion chassis. And it is also genuinely a portable, for it weighs just 18lbs. To facilitate this, the company has made available a dowdy, workman-like soft vinyl travelling case that may be effective, but does little to enhance its contents. As befits a micro named after one of the Titan gods, the Hyperion has the Greek alphabet in its character set. The Hyperion is distributed in the U.K. by Bytec Gulfstream, and is sold through 25 dealers.

For. Portability. IBM compatibility.

Against. Small screen.

Address. Bytec Gulfstream, Unit 3a, Tunnel Estate, 726 London Road, Grays, Essex RM16 1LS

Tel. (040 26) 4926



IBM PC

£2,209

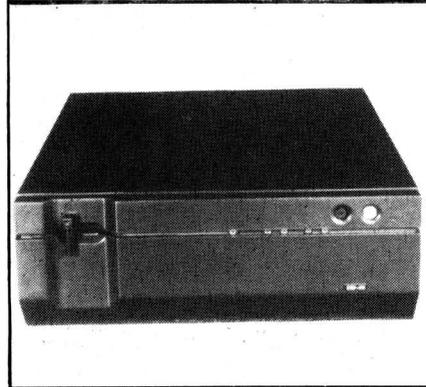
The IBM PC has carved a substantial slice out of the 16-bit market, despite its relatively late arrival. It was launched in the U.S. in August 1981, but did not officially surface over here until January of last year. But more important than that, it has become the industry standard that pretty much has to be followed by all new manufacturers. Consequently, there has been a whole rash of IBM PC look-alikes, think-alikes and software compatibles. The machine itself is unspectacular, yet is carried by the company's image and, of course, by the massive, unmatched array of software packages. Because the corporate initials are irretrievably embedded in the western consciousness, the IBM PC is frequently bought on the strength of its name alone. It is sold through about 130 independent dealers.

For. It is the IBM PC.

Against. Unadventurous spec.

Address. IBM (U.K.) Ltd, PO BOX 41, North Harbour, Portsmouth, Hampshire

Tel. (0705) 321212



IMP-68

£7,950

The IMP-68 is a powerful multi-user computer of British design and manufacture. It is scarcely the most attractive machine in the world, but the company behind it, Integrated Micro Products, are not looking for volume sales. It is pitched at the OEM, software house, research and development markets, and the company boasts that it is faster than the VAX 730 at less than a third of the price. The principle quality of the machine is its speed. On-board 5.25in. disc drives have capacities of between 10Mbytes and 70Mbytes, with an access time of 30 milliseconds. Up to four outboard SMD discs enable Gbyte capacities and very fast access time, less than 20msec., and transfer 10Mbits per second. Its price does not include a keyboard or screen. The IMP-68 is sold through 25 dealers.

For. Speed

Against. Design. Lack of screen and keyboard.

Address: Integrated Micro Products, No. 1 Industrial Estate, Consett, Co. Durham

Tel. (0207) 503481

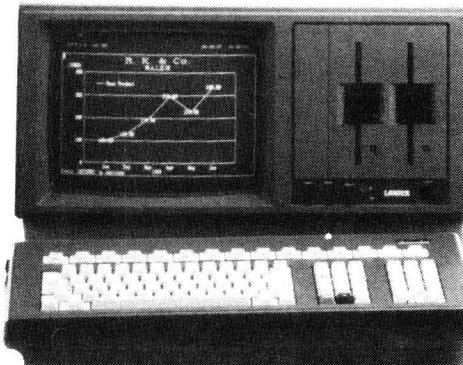
**JONOS****£2,685**

For. Transportable. Large RAM. Upgrades.

Against. 9in. screen.

Address. Jonos International, 5 The Curfew Yard, Thames Street, Windsor SL4 1PL
Tel. (075 35) 54272

To the long list of IBMulators has been added Jonos which, like the Hyperion, is also transportable. Like the IBM PC it runs the 8088, but at a rather faster 8MHz; it also offers an 8087 co-processor upgrade. The 128K RAM can be expanded to a full 1Mbyte, and each of the 5.25in. floppies also offers this capacity unformatted. 3.5in. microdrives and hard disc options are also available. The screen has a 9in. diagonal, and the keyboard is a full Selectric — that is old-style IBM — with 10 function keys. Colour is available, as are high-resolution graphics with an extra card. Other features include two RS-232s, a centronics port, network capability and a battery-backed real-time calendar/clock. Although billed as a portable, the machine weighs 25lb.-30lb., depending on disc configurations.

**LBP-1000****£3,280**

For. It is from a well-established company.

Against. Too word-processing oriented.

Address. Lanier House, 171 Gray's Inn Road, London WC1X 8UE
Tel. 01-837 6400

The American manufactured Lanier Business Processor 1000 seems firmly pitched at the word-processing market, where Lanier has previously concentrated. This is reinforced by Lanier's own operating system which is fitted as standard and is designed for the word-processing environment. To act as a network, a thumping great System 5000 is necessary, which can link up to 4,000 LBP 1000s. Equally, the machine can operate as a stand-alone micro. At the moment, Lanier functions through one U.K. distributor and sells via 19 independent outlets. It also has a direct sales force for larger accounts. The head company has recently merged with Harris, and thus offers a range of office automation, personal computer and communications equipment, which ranges from stand-alone word-processing machines to satellite link-ups.

**LISA****£5,500**

For. High Quality product. Impressive software.

Against. Sales. Image. IBM.

Address. Apple Computers U.K. Ltd, Eastman Way, Hemel Hempstead, Hertfordshire HP2 7QH
Tel. (0442) 60244

Alas, poor Lisa — exciting product, looked good, launched badly, short of software, over-priced, did not sell. It may have captured the computer world's imagination, but IBM captured corporate America's desk-tops. Planned sales were 30,000 to 50,000 in its first year; actual sales were around 15,000. Now, though, its price has tumbled from £8,000 to £5,000, its software has been rewritten to make it run faster, and packages can be bought separately. There are rumours that the whole thing is going to be relaunched. But for all these problems, Lisa is an immensely sophisticated machine that deserves a better fate. Its innovative use of the mouse and the quality of its software have been transferred down-market to the new Macintosh micro, leaving Lisa out on something of a limb. It is sold through 80 specialist dealers from Apple's 350 strong network.

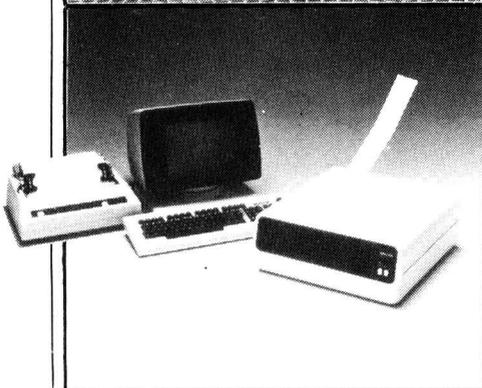
**MACINTOSH****tba**

For. Advanced technology. Windows. Icons.

Against. An unknown quantity. No IBM compatibility.

Address. Apple Computer (U.K.) Ltd, Eastman Way, Hemel Hempstead, Hertfordshire HP2 7HQ
Tel: (0442) 60244

If Lisa was Apple's great white elephant, then Macintosh is surely their great white hope. With it, they hope to regain supremacy in the micro market. The product is certainly impressive, combining the advanced technology of the Lisa with a neat A4 footprint and reasonable price — probably around £2,200 for a complete system including printer. The Macintosh is one of the few machines to exploit the full capabilities of the 68000 chip, with windows, icons, pull-down menus, software integration and mouse commands. It also looks as if Lisa's problems of software starvation will be avoided; Apple claims that a number of leading software houses are writing or converting programs for the Macintosh. If it proves to be more than another executive toy, this machine could well put Apple back on top.

**MICRO FIVE****£4,500**

For. Available software. Number of configurations.

Against. High entry price.

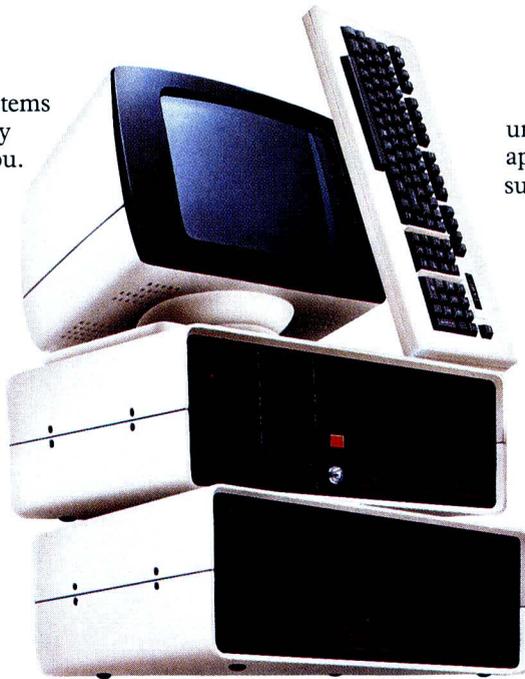
Address. Five Technology, Unit 9, Britannia Way, Lichfield, Staffordshire WS14 9UY
Tel. (05432) 57701

The Micro Five Series 1000 is a multi-user system aimed at the small business market. The system expands to handle up to 10 VDUs, printers, and large capacity Winchester discs. A typical system costs about £10,000. The series is based on an Intel 8088 operating at 8MHz. The memory can expand from 256K to 512K of RAM. A 16K PROM contains self-test diagnostics, disc loaders and other system utilities. The series can have two, six or 10 serial RS-232 I/O ports. It is possible to make one port RS-422 compatible. CP/M and MP/M operating systems are available on the series, as well as IBM PC-DOS, StarDOS and Business Basic. Because of the variety of system, a considerable amount of applications software is available. It also means the cost can be anywhere between £4,000 and £14,000.

If the number of computer systems on the market leaves you totally bewildered, we don't blame you.

And that's not your only problem. If you are not very careful, the system you buy today could well be obsolete tomorrow. That's how fast computer technology is progressing.

But take heart. There is one computer system that won't become obsolete. Because it is modular in concept it can be expanded both inside and outside to accommodate extra capacity and new advances—as well as being able to increase in size and capability to keep pace with your own growth or changing requirements.



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COMART COMMUNICATOR SPECIFICATIONS

	CP100 Series Systems	CP1000 Series Systems
Microprocessors:	8 Bit Z80A (1 to 6)	16 Bit 8086
Memory:	64K-512K bytes	256K-1M byte
Storage:	390K or 790K byte diskettes 5M or 20M byte hard disks	390K or 790K byte diskettes 5M or 20M byte hard disks
Operating Systems:	CP/M, MP/M11 & CP/NET, Multi-processor, 1 to 5 users	CP/M86, MP/M86, Multi-processor, 1 to 8 users
Features common to both CP100 & CP1000 Series Systems		
Keyboard/Display:	105 Key, detached 14" green screen, swivel/tilt.	
Expansion:	Internal—S100 cards, mainframe communications & protocols. External—stackable modules inc. cartridge tape & 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.

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Tel: (0480) 215005. Telex: 32514 Comart G

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The Byteshop
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CAMBRIDGE
Hi-Tek
Tel: 0954 81931

CAMBS (ST NEOTS)
Westcom
Tel: 0480 217217

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Computer Services Scotland
Tel: 0592 773710

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Holdene
Tel: 0532 459459

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Tel: 01-248 4883

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Datafit
Tel: 01-385 6141

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The Byteshop
Tel: 01-387 0505

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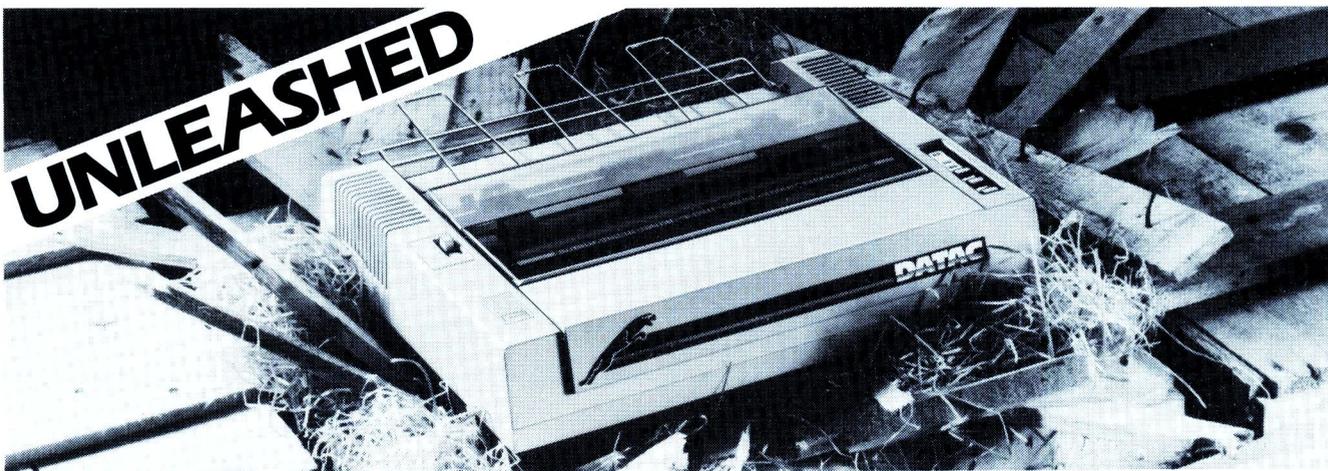
Hand-picked by ACT for their expertise in understanding business problems, and successfully implementing microcomputer systems, each Pulsar Software Centre has a proven track record; from business analysis and hardware and software selection to implementation support and training. For a demonstration of professionalism in action, contact your nearest Pulsar Software Centre now.

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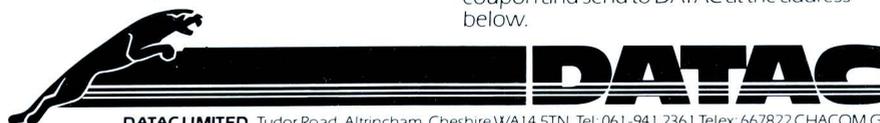
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Birmingham	Micro Dynamics	021 455 7971	London W1	Spiro Enterprises	01 499 1608
Birmingham	*The Byte Shop	021 622 3165	London NW1	*The Byte Shop	01 387 0505
Blackburn	Dextrafile	0254 691 235/6	Maidstone	*Advanced Computer Services Ltd	0622 58289
Blackpool	Western Computers Ltd	0253 404676	Manchester	*The Byte Shop	061 236 4737
Brighton	Micro Nationwide (Brighton)	0273 672505	Newcastle	*Thos Hill International	0632 739 261
Bristol	*Concorde Micro	0272 279720	Northampton	Danetre Business Systems	0604 36231
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*Stockists of Pulsar Blue for the IBM - PC

8-bit business software



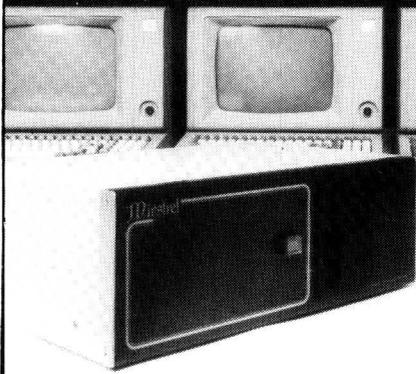
MICROSYSTEM 7000 £3,520 +

The Microsystem 7000 may be bought as a stand-alone system or as an upgrade for the 7800 VDU. It offers a choice of eight- and 16-bit processors using standard operating systems. This gives access to a wide range of software. The 16-bit version uses an Intel 8086, operating under CP/M-86. A Z-80A is used as a co-processor performing the I/O functions. The system has various storage media. The user can choose between dual 5.25in. or 8in. floppy-disc drives, or a single floppy paired with a 20Mbyte Winchester disc. With the Winchester there is the option of a tape streamer back-up, if required. The system can be upgraded to include the facilities of the 7800 graphics terminal. There is an optional joystick for this mode. The system can emulate many host processors. A networking system is being introduced for up to 64 terminals.

For. Powerful. Available options.

Against. Price.

Address. Pericom, 5 Tanners Drive, Blakelands, Milton Keynes MK14 5LJ
Tel. (0908) 614242



MINSTREL £4,665

The Minstrel is a British micro with an S-100 bus. It is available in various configurations with a range of options. Winchesters are available in 5Mbyte to 40Mbyte capacities. Floppies and tape cartridge drives are also available. The basic Minstrel includes 8086 or 68000 processor, 128K of RAM, two RS-232 serial ports and one Centronics parallel printer port. The serial ports provide baud rates up to 19,200. In addition, many other boards are available for the S-100 bus, including Prestel, colour, black and white displays, modems, counter/timers and A/D converters.

For. Good peripherals. Wide range of options.

Against. Not designed for small or home user.

Address. H M Systems, 69 Loudon Road, London NW8 0DB
Tel. 01-328 8737/8



OCTOPUS £2,090 +

The Octopus is the latest in a line of products from LSI, whose previous machines included the M-2 and M-4. The Octopus offers dual 8088 and Z-80 processing, with 128K RAM expandable to 768K. Disc options vary from one 400K floppy to 40Mbyte Winchester. Two keyboards are offered, a straight IBM look-alike, and an LSI word-processing keyboard with 32 function keys. In addition to a centronics port and two RS-232s, the Octopus has its own Multibus expansion slot allowing a local area network, communications, modems and graphics options to be plugged in. Colour is also available along with a wide range of operating systems and disc formats, set by the user if necessary. The Octopus also supports CP/M Plus and Concurrent CP/M. A facility called Fontgen allows personalised fonts to be set up in addition to the two supplied as standard.

For. Upgradeability. Processor structure.

Against. Skimpy manuals.

Address. LSI, St John's, Woking, Surrey GU21 15X
Tel. (048 62) 23411



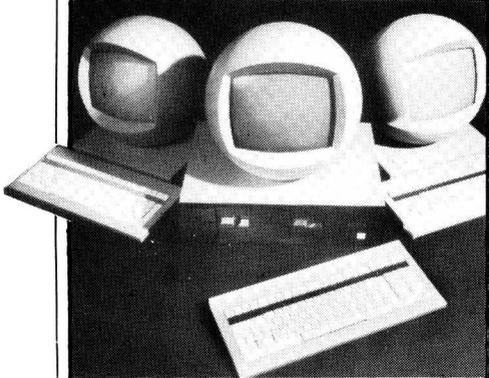
OLIVETTI M-20 £1,795

Olivetti's machine is idiosyncratic in the extreme. First, it uses the Z-8001 16-bit chip from Zilog — a brave decision, but one looking increasingly like leading into a lonely cul-de-sac. As a result, the machine's main operating system is PCOS, though some kind of compatibility with MS-DOS and CP/M-86 is claimed with the addition of an 8086 processor board. The keyboard sports the tedious IBM back-slash key next to the shift key — or rather one of the shift keys. Four function keys are produced from the QWERTY keys by holding down additional command keys. It is also possible to install Basic keywords, making the M-20 rather like some up-market ZX-81. The floppies start small, 160K, though larger options are available, as is a 11.25Mbyte Winchester. There are eight colour graphics facilities included and PCOS offers multiple-window techniques.

For. Stylish exterior. Colour. Windows.

Against. Non-standard processor and operating system. Poor keyboard design.

Address. British Olivetti, 86-88 Upper Richmond Road, Putney, London SW15 2UR
Tel. 01-785 6666



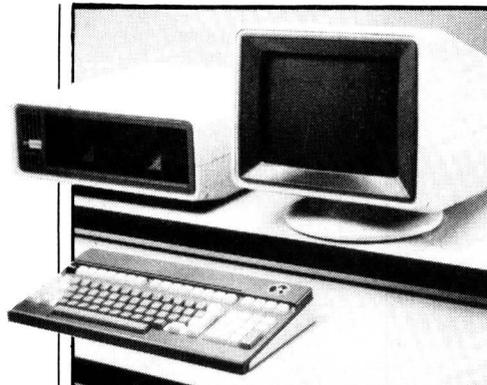
ORB £5,950

Orb is a multi-user, multi-tasking micro built in Brighton by ABS computers. Apart from the iAPX-186, an advanced version of the 8086, running under MP/M, the Orb offers 256K RAM as standard expandable up to 1Mbyte. The two 5.25in. floppy-disc drives each hold 1Mbyte unformatted; a Winchester option is also available. Distinctive features of the system include the spherical VDU casing and built-in digital clock. The stylish keyboard includes 23 function keys, which as default assume the main Wordstar function like Delete, Move Block, etc. The whole system is designed very much with the commercial market in mind.

For. Advanced processor. Multi-user/tasking.

Against. Cost. Lack of MP/M software.

Address. ABS Computers, North Street, Portslade, Brighton, Sussex BN4 1ER
Tel. (0273) 421509



ORION **£2,400 +**

The Orion business management system has an Intel 8086 processor with a clock rate of 8MHz and RAM from 128K up to 896K. The system has six expansion slots, three RS-232C ports and two 1Mbyte or 2Mbyte 5.25in. floppy discs. The system also offers a 20Mbyte Winchester. Orion uses CP/M-86 for single stand-alone systems and M/PM-86 for multi-users, with one master and up to six terminals. Concurrent CP/M-86 is available for single-user multi-tasking up to four applications. Orion has access to viewdata and Telecom Gold. Orion has a range of its own applications software; Peachtree or Micro Modeller is available too. IBM and ICL protocols are also available. The starting price of £2,400 includes 128K RAM, twin floppies, screen, keyboard and operating system and manuals.

For. Available software. Price.

Against. No colour. No sound.

Address. Office and Electronic Machines, 140-154 Borough High Street, London SE1 1LH
Tel. 01-407 3191



OSM PC **£2,490**

The OSM PC is yet another machine whose external appearance and internal specifications are not entirely dissimilar to another well-known machine. In this case even the name is 33 percent compatible. Otherwise the numbers are all-too familiar: 8088 running at 5MHz, two 320K floppies with a 10Mbyte or 20Mbyte Winchester option. The keyboard has the wretched backslash key where the good old shift should be, and colour options are available. Although the standard monochrome monitor is currently a badge-engineered OEM unit, OSM Computer Corporation has promised a home-grown version at some stage. Perhaps most interesting is the Zeusnet facility. This allows up to eight machines to be linked together via a RS-422 port with a maximum transfer rate of 800K. The OSM PC was launched at the Comdex show in Las Vegas last year, and should be available in this country sometime in April.

For. IBM compatibility. Networking.

Against. Lack of originality. Insufficient price differential from IBM.

Address. Millbank Computers, Millbank House, Amyand Park Road, Twickenham TW1 3HW
Tel. 01-891 4691



PANASONIC JB-3000 **£2,150**

The JB-3000 is based on the Intel 8088 microprocessor, with memory ranging from 128K to 256K, it has a variety of peripherals and so is suited for many applications. The system runs CP/M-86 or MS-DOS but both are extras. The micro can attach the Panasonic 120 printer or any other printer having a Centronics parallel interface or RS-232C. Additional I/O ports allow access to communication lines and analogue control or measuring equipment. Additional facilities include colour, graphics and sound. One JB-3000 may also be linked to a network.

For. Large memory. Available peripherals.

Against. Unremarkable spec.

Address. Panasonic Industrial (U.K.), 107-109 Whitby Road, Slough SL1 3DR
Tel. (0753) 75841



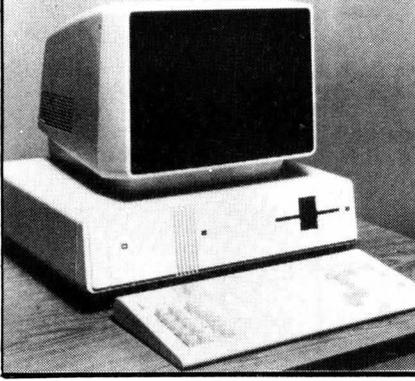
PEOPLE **£2,498**

The People is offered with CP/M-86 and MS-DOS, giving access to a wide range of software. The electronics are contained on two boards and the heart of the system is an Intel 8086 microprocessor. The main unit has 128K RAM, and another 128K for the screen memory. The People has two interfaces, a serial RS-232 for synchronous and asynchronous transmission, and a parallel Centronics interface. Four expansion slots are available on the main board. Two 5.25in. slimline floppy-disc drives are standard, with a capacity of 655K each. The People can be upgraded with a Winchester hard disc, which has a 10Mbyte capacity. There is also a colour monitor, which can display eight foreground and eight background colours.

For. Available software.

Against. Not much.

Address. Olympia Business Machines, Olympia House, 199-205 Old Marylebone Road, London NW1 5QS
Tel. 01-262 6788



RAIR **£6,500**

Rair continues to sell a lot of machines under its own name and others, like ICL. Support and distribution for this range was stepped up last year through a new dealer network. The Rair Business Computer itself, has been designed to give users a lot of flexibility with software and runs the most popular operating systems, including CP/M-86 and MS-DOS. It is a multi-user machine, up to four may be linked, and Ethernet is an option. Cache memory and virtual disc are standard and up to 19 Mbytes of memory can be added. Like many competitors, the machine is completely IBM PC compatible, which means that a large, and useful, software library already exists. But all this versatility comes at a cost premium.

For. Flexible. Useful options.

Against. Price.

Address. Rair, Wellington House, 6-9 Upper St Martins Lane, London WC2
Tel. 01-836 6921



SAGE II

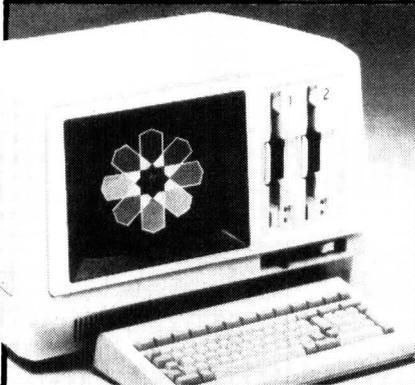
£3,130

For. UCSD-p system. Keyboard facilities.

Against. Limited RAM.

Address. TDI, Stork House, 288-292 Hotwell Road, Bristol BS8 4NJ
Tel. (0272) 276447

The Sage II has a number of distinctive features, as with many path-breaking machines running the Motorola 68000. For example, the main operating system is the highly thought of UCSD-p, claimed by some as the ultimate portable system. Whether it becomes the CP/M of the future remains to be seen, certainly it allows a wide range of software written for other machines supporting the UCSD-p system to be run. Other operating systems available include BOS, Idris and CP/M-68000. The hardware specifications are more conventional, 256K RAM expandable up to 512K, 640K floppies. The Sage Terminal QVT-108 has 11 function keys, 12 edit keys in addition to the normal QWERTY. The Sage IV version has an 18Mbyte Winchester instead of the floppy. The Sage machines are manufactured in the U.S. and distributed in this country by TDI, itself part of a North American-based company.



SAMURAI S-16

£2,395 +

For. Versatile. Good expansion potential. Reliable.

Against. 8in. discs.

Address. Micro Networks, 382 Kensington High Street, London W14 8NL.
Tel. 01-602 7405

Samurai's debut into the 16-bit market is probably best remembered because it was one of two machines which won the London computer marathon for reliability. Though it compares favourably with other machines of its class, the S-16 is fairly conservative. It does have good potential for expansion and its graphics capability is worthy of note. Its 8in. discs which are still popular in Japan will not be so welcome in the U.K., as most IBM PC software, which the machine could run, comes on the 5.25in. variety. There is a useful diagnostics package and excellent maintenance deal, which provides same day call out. It can also interface with most networks, and has a Teletext option. IBM emulators are available allowing connection to IBM mainframes. There is a wide range of software, principally from Peachtree. The system can cost up to £3,995.



SANYO

£699 +

For. Price. Dealer support. Good graphics.

Against. Limited expansion. No network capability.

Address. Sanyo Marubeni (U.K.) Ltd, Sanyo House, 8 Greycaine Road, Watford, Hertfordshire.
Tel. (0923) 46363

Since launching the MBC-4050 Sanyo has announced that MS-DOS will be available shortly, supplementing the now secondary CP/M-86. In its favour is the software package, Wordstar, Mailmerge, Spellstar and Calcstar, which is included in the purchase price. Apart from anything else, this makes it good value for money. The MBC-550/555 by comparison are pure MS-DOS machines, and though limited are very cheap. The 550 only supports one disc drive and the screen costs extra. It is, however, an eight colour model which supports some good graphics. All the machines are supported by an extensive dealer network with a high level of service support. The 550 and 555 are newcomers to the market, so it might be advisable to wait and see if any enhancements emerge.



SEIKO 8600

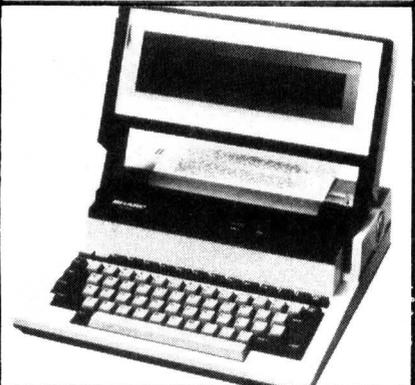
£3,587

For. Multi-user capability. Price.

Against. Slow multi-user response time.

Address. Intelligence Distribution, Nelson House, 271 Kingston Road, London SW19 3NW
Tel. 01-543 3711

The Seiko 8600 system sports a conventional 8086 main processor, and eschews fancy dual-processor architectures. What it does offer is a natural upgrade path to two- and three-user configurations running under MP/M-86. Up to four such users may be connected to the main unit via RS-232s. Printers may be connected to each of the subsidiary terminals separately or to the central unit, using standard centronics ports. The disc options begin with two 5.25in. floppies with a capacity of 655K each, and progress to a full 20Mbyte Winchester version. The Seiko 8600 is very well-endowed with function keys and additional character sets. Each monitor and keyboard unit comes complete with an 8085 processor and 64K RAM for buffering; independent on-screen editing is available.



SHARP PC-5000

£1,195

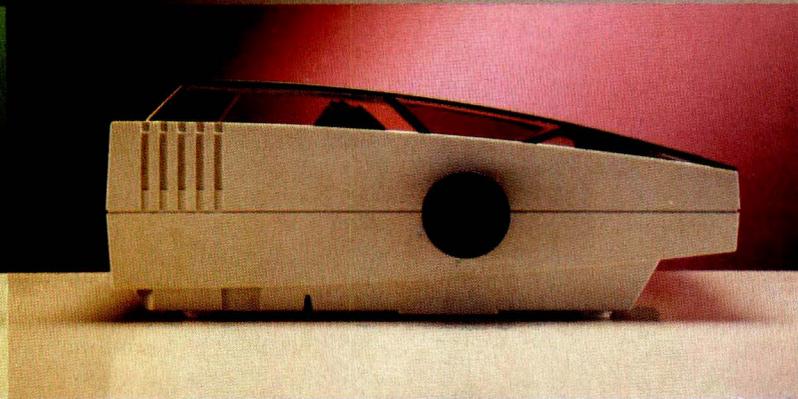
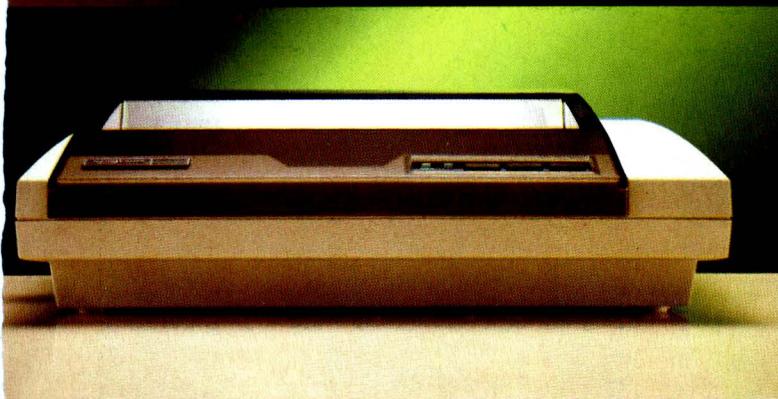
For. Truly portable. Compact. Access to large software library. Reasonable price.

Against. No colour screen. An unknown quantity.

Address. Sharp Electronics (U.K.) Ltd, Sharp House, Thorpe Road, Newton Heath, Manchester M10 9BE.
Tel. 061-205 2333

Sharp with its personal computer has entered the portable market at an early stage. Unlike its earlier bid to get into desktop micros, this time the company seems to have done its homework on what the market needs and has come up with a reasonably priced package. The machine is truly portable, weighing a mere 9.5lb. It does not even need a convenient power point, as it is battery powered. Optional extras include a printer which fits into the main body and a 192K ROM to include Basic. The eight function keys may be shifted giving 32 options, enough to carry out some pretty sophisticated operations. Disc drives, bubble memory, and a cassette interface is provided. Compatibility with some IBM software is also bound to make the machine attractive.

THE MT80. SHAPED BY EXPERIENCE



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The MT80 is a high quality, low cost 80 column, 80 cps printer that will complement any of today's micros in looks and quality; in either the home or the office.

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Stuart Nicholls

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07 084729 0



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This is a support tape to accompany the book *ASSEMBLY LANGUAGE FOR ARCADE GAMES AND OTHER FAST SPECTRUM PROGRAMS* by Stuart Nicholls, and contains a selection of Assembly Language and Machine Code Routines that will help you produce arcade-style games programs.

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REACTION, demonstrating the machine-code high speed counting and scoring system.

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MOVEMENT, demonstrating high-resolution multiple movements.

RND/DEMO, fast screen graphics using a machine-code **RAWD** function.

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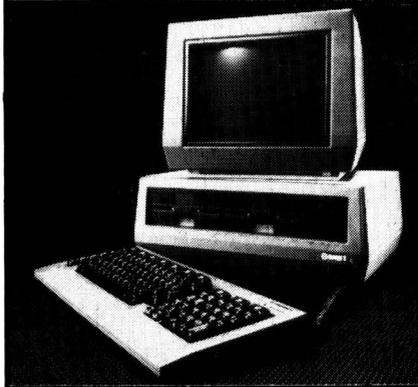
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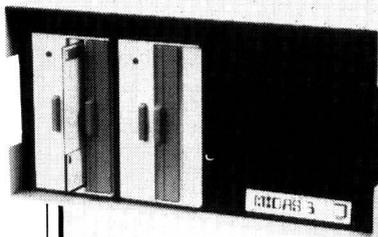
● Circle No. 310

**SINCLAIR QL****£399****For.** Price. Bundled software. Windows.**Against.** Microdrives. Lack of compatibility.**Address.** Sinclair Research, Computer Division, Freepost, Camberley, Surrey GU15 3BR
Tel. (0276) 686100

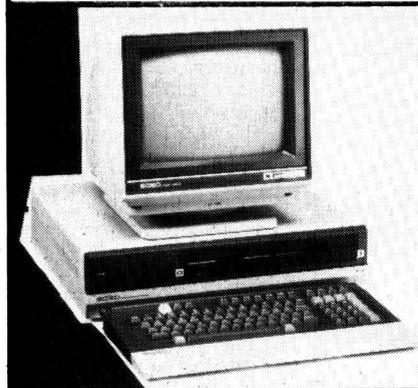
Sinclair's QL uses an interesting version of the 68000, the 68008, whose eight-bit data bus allows easy communication with more common or garden chips. The 16-bit address structure allows up to 1Mbyte of RAM to be accessed; the QL actually offers a maximum of 640K. Using these very healthy specifications, Sinclair has been able to offer single-user multi-tasking and multiple window facilities. Of course, all these are becoming increasingly less earth-shattering — except at QL's price of £399. This also includes four applications packages, spreadsheet, word processing, database and business graphics, all in colour. In fact, the QL is geared very much to the business market, particularly the lower end. The only weakness of this otherwise remarkable machine is its microdrives, still unproven and unloved. A number of add-ons are promised, including 0.5Mbyte RAM, local area network and a modem.

**SIRIUS 1****£2,195****For.** Flexible. Cheap. Well designed for its market. Large software base.**Against.** Not much.**Address.** ACT (U.K.) Ltd, Shenstone House, Dudley Road, Halesowen, West Midlands.
Tel. 021-501 2284

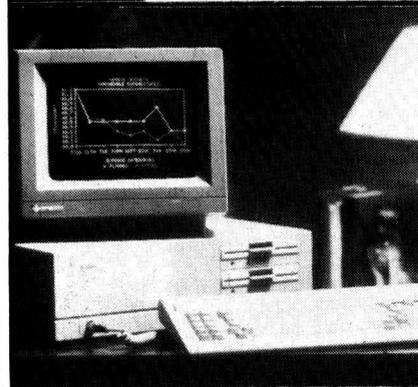
Sirius is a well-designed system aimed mainly at the specialist engineering/scientific and business user, and has several specialised features. The company claims that it will act as a low cost CAD/CAM system and has provided high-resolution graphics, a large 8K ROM to drive the screen, and a 50-pin user-programmable port. Full audio facilities are provided through a codec chip. The machine can be built into a powerful multi-user system linking with up to 54 other Sirius computers and 10 file servers. It is IBM-software compatible, using an emulator, and will run some of the more exotic languages like UCSD, Lisp and Forth, though these are extras. There is no colour option. The price must make this a very attractive proposition for its target market.

**SIRTON MIDAS****£2,425 +****For.** Extremely versatile. Powerful.**Against.** Single source supply. Too much left for the user to specify.**Address.** Sirton Computer Systems, Unit 14, 29 Willow Lane, Mitcham, Surrey CR4 4NA.
Tel. 01-640 6931

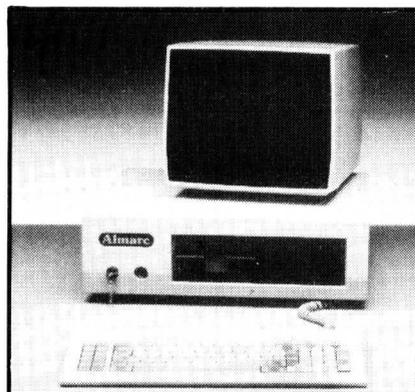
Sirton Midas S-100 is definitely not for the mass market. Although the price is competitive, almost everything in the machine is optional. Processors, disc drives, screens and keyboard may be specified by the customer, along with outputs and operating systems. The choice is far from limited and covers all the most popular contenders in each category, but, unless the user knows exactly what he requires and is willing to design his own system, the choice is too wide. The company is aiming the machine at research and scientific establishments, which perhaps justifies this approach. Another limiting factor for the mass market is that the machines are only available for a single source. The machine is not IBM compatible but can run standard CP/M software Ethernet and Arcnet are available for networking.

**SORD M-68/M-343****£2,995 +****For.** Versatile. Good expansion options. Graphics. Software.**Against.** Expensive.**Address.** Socius Computer Systems (U.K.), Samuel House, 6 St Albans Street, Haymarket, London SW1Y 4SQ.
Tel. 01-930 4214

Sord, the fastest growing micro-maker in Japan, launched these machines as dedicated multi-user business systems; the M-343 series features some very attractive options. Among these are the most sophisticated graphics seen on a machine this size and the Pips no-programming system. The latter makes this an easy system to get to grips with, especially for the first-time user. Operating systems include Sord's RDOS and RMDOS together with the more conventional MS-DOS and CP/M-86, which open the door to Multi User Basic, Fortran-77 and an assembler/debugger — for the dedicated. The M-68 is a low-cost option which retains some of the M-343's features and offers others as optional extras. It has no networking capability. All the machines use either 5in. or 8in. floppy discs. A wide variety of peripherals including pen plotters, dot-matrix printers, and a light pen are available. The M-68 costs £2,995, the M-343 costs £5,200.

**SPERRY****tba****For.** Large software base. IBM compatible.**Against.** Too early to tell.**Address.** Sperry Computer Systems, Sperry Centre, Stonebridge Park, London NW10 8LS.
Tel. 01-965 0511

Little is known about this newcomer to the field as it has not arrived in the U.K. yet — though Sperry assures us that the first shipments have started. It is an enhanced IBM-compatible machine, offering up to one and a half times the performance of the IBM PC. Two 5.25in. discs provide 680K of removable storage together with 10Mbytes on fixed disc, which are standard. Options include colour, high-resolution graphics and IBM 3270 BSC and SNA networking. A dealer network is being set up to provide support and service. Sperry claims that the keyboard is specially enhanced to be user-friendly and full diagnostic ROM is provided. The machine is limited to MS-DOS and CP/M-86 operating systems, but these two should provide an ample supply of ready-made software. If the quoted dollar price of \$2,598-\$5,708 converts to the same figure in sterling, the machine should be competitive.

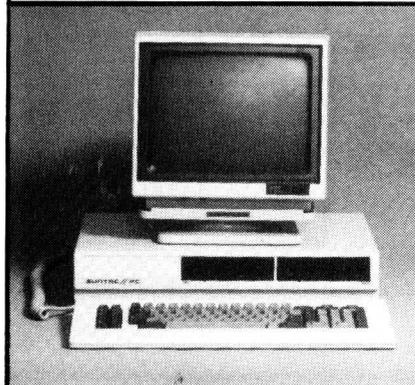
**SPIRIT 1/2****£2,995 +**

The two machines from Almarc Data Systems represent a surprise package, which offers a lot of choice. The Spirit 2 confines itself to one main processor, but can run hard and floppy discs, has 13 expansion slots for slave processors, extra memory, I/O, etc. It gives users the chance to expand into the Spirit 3 and 4 ranges for multi-user or distributed processing with up to 10 other machines. The price of the machine does not include terminals and there are no graphics. The Spirit 1 offers users a choice of central processor including a 68000, 12.5MHz version. This supports the Unix operating system. The flexibility of both processor and architecture allows multi-user systems to be built, and graphics are available. Neither machine has colour or networking facilities, though the latter is planned for the Spirit 1. The machines will cost you from £2,995 to £4,995.

For. Expandable. Competitively priced. Versatile. Lots of software.

Against. No colour. No networking.

Address. Almarc Data Systems, Great Freeman Street, Nottingham
Tel. (0602) 52657.

**SUNTAC PC****£2,195**

Yet another machine claiming complete compatibility with the IBM PC; just how complete is complete is a moot point. The only sure test is to run your favourite piece of IBM software on it and see what happens. Otherwise the specifications are fairly standard. The 8088 runs at 4.7MHz, like the IBM PC, and has 128K RAM expandable to 512K. It has two floppies each with a capacity of 320K, and RS-232 and centronic ports. The monitor is slightly different in design, hard square corners whereas the IBM has more rounded contours. The main unit and keyboard differ only in that they are marginally more attractive than the familiar PC versions. Perhaps the most interesting thing about the Suntac is that it is made in Japan — the first of many such copies perhaps.

For. IBM look-alike, styling.

Against. Unoriginality. Unknown manufacturer.

Address. Sun Computing Services, Concorde House, St Anthony's Way, Feltham, Middlesex
Tel. 01-890 1440

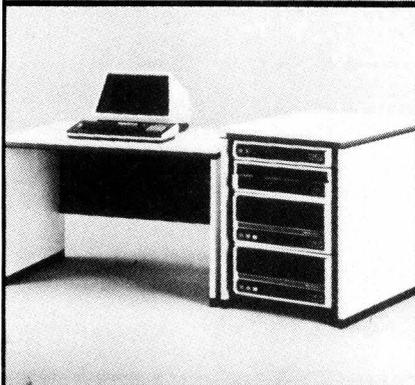
**SUPER STAR 16****£5,975**

Introduced earlier this year, Bromcom's Superstar 16 has yet to make a name for itself, but its specification certainly looks promising. A true multi-user system with features such as record-file locking and spooling, it incorporates up to 16 Intel iAPX-186 processors each dedicated to a terminal. Operating systems available are CP/M-86 and Concurrent CP/M-86, with the promise of MS-DOS to come. Finding applications packages to run on this machine will not be a problem. Superstar 16 has a two-user system plus 10Mbyte Winchester disc drive. Bromcom graduated to hardware design after starting life in 1978 as a consultancy specialising in microsystems.

For. Multi-processor. Wide range of available software.

Against. As yet untried.

Address. Bromley Computer Consultancy, 417-421 Bromley Road, Bromley, Kent BR1 4PJ
Tel. 01-697 8933

**SWTP S +****£7,550 +**

The Southwest Technical Products S+ is a modular computer system which can be expanded from a single-user micro with floppy-disc storage to a multi-user, multi-tasking unit accessing up to 160Mbyte Winchester hard discs. The operating system, Uniflex, is based on Unix and has been used for many years on DEC PDP-11 minicomputers. A large variety of languages are available including C, Sage, Pilot, Forth, Fortran, Cobol, Basic and Pascal. As a multi-user unit it can be connected to cash registers to produce a point-of-sale terminal system.

For. Modular system easily expanded. Wide variety of mass storage options.

Against. Unusual processor. Unusual operating system. Expensive.

Address. Southwest Technical Products, 12 Tresham Road, Peterborough PE2 0SG
Tel. (0733) 234433

**SYSTEM 3200/4200****£4,000 +**

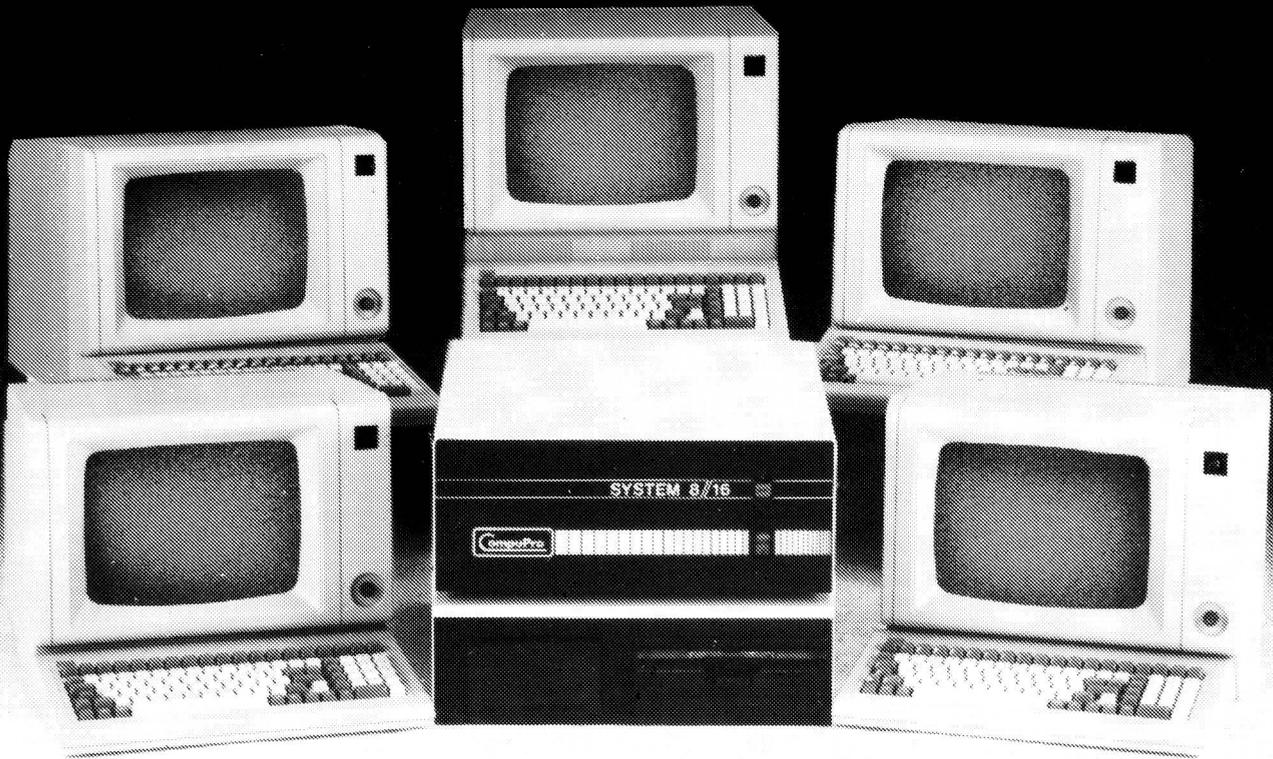
The 3200 product line offers desktop and floor cabinet systems. These support multi-tasking, single and multiple users via co-axial cable. The range runs several languages concurrently. These include Basic Four and SMC compatible Basic, RM Cobol and APL-68000. Applications developed under CP/M can also be supported by system 3200. The system 4200, however, uses the Pick operating system and system builder. The top of the 3200 range, the floor-standing model 3240, includes 256K of RAM, which is expandable to 4Mbyte. It also has 21Mbyte streaming cartridge tape drive and an 8in.70Mbyte Winchester disc drive. The system has either 19 RS-232 ports or three ports and two station controllers. System 4200 is available in two models, the desktop 4220 and the floor-standing 4240.

For. Operating systems. Available configurations.

Against. Price. Unusual software.

Address. Kode, Station Road, Calne, Wiltshire SN11 0JR
Tel. (0249) 813771

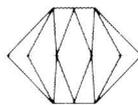
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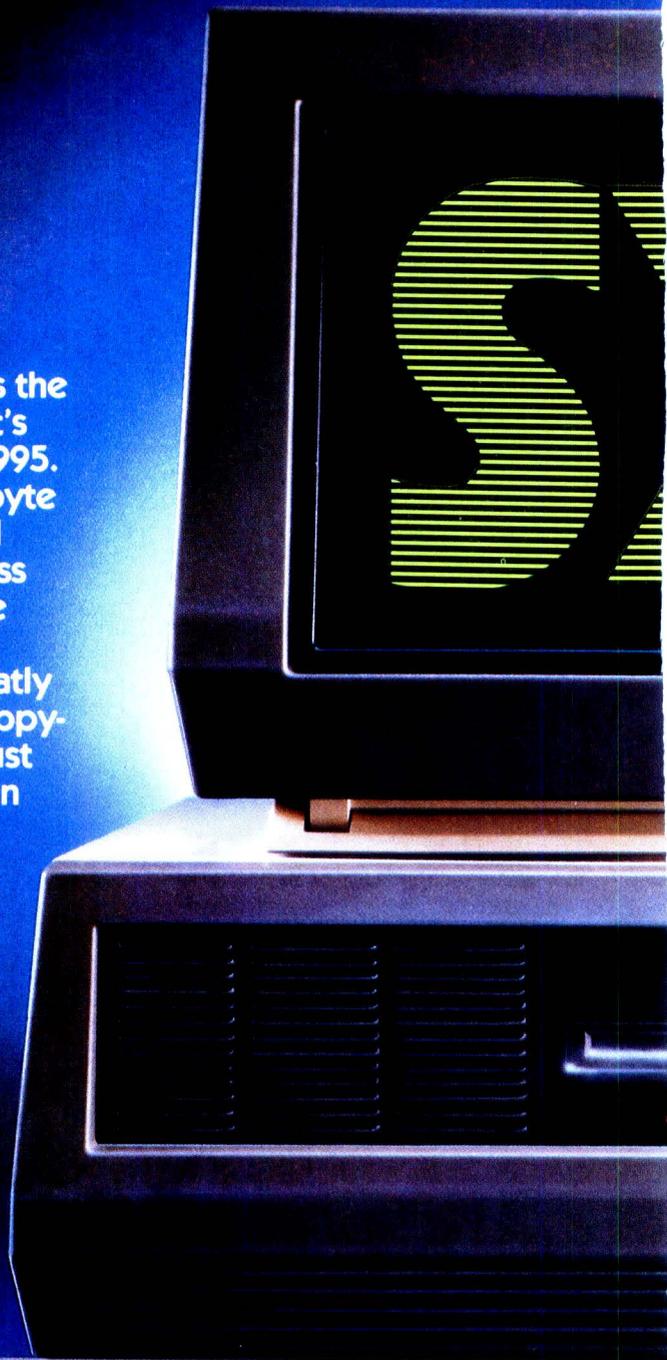
£3995.00

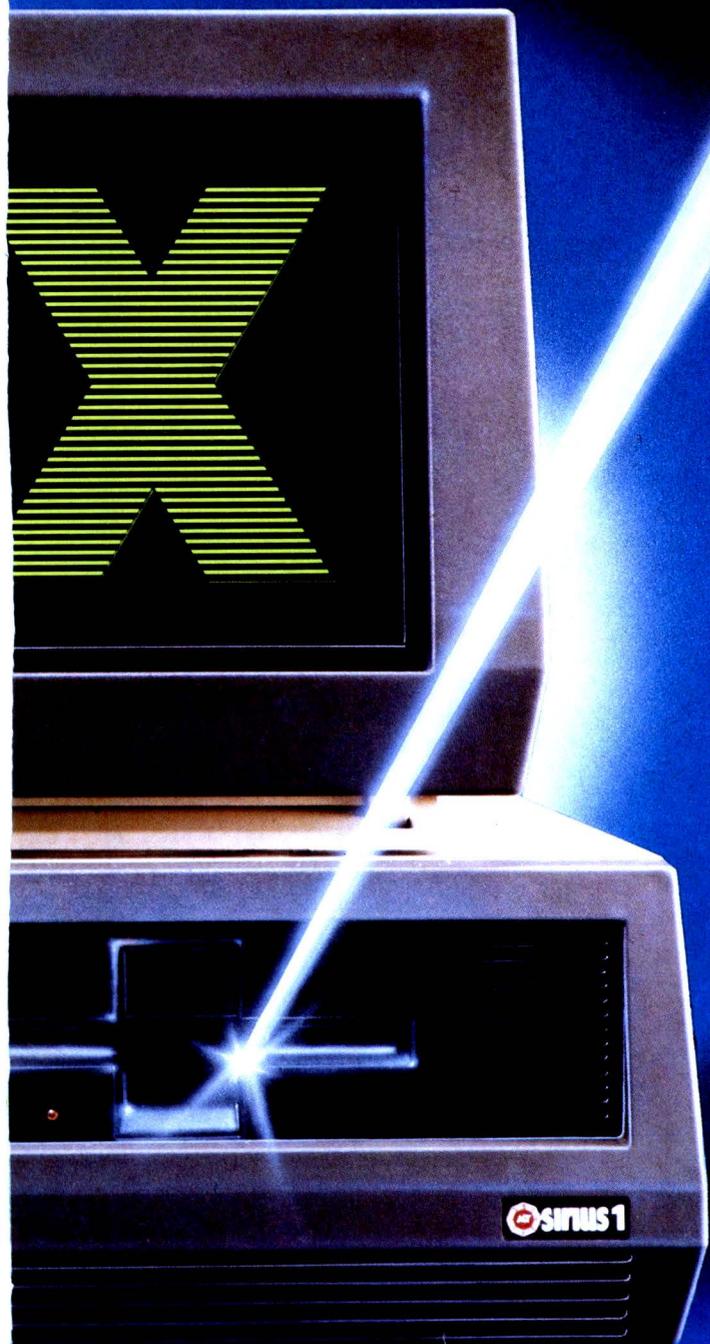
Built with a commitment to quality, the new Sirius SX is the latest addition to the 16-bit ACT Sirius family. And it's available now, at a complete system price of only £3,995. With 256Kbytes of internal RAM and an integral 10Mbyte Winchester hard disk, it is extremely powerful and extremely fast – ideal for those large volume business applications which previously required much more expensive minicomputer equipment.

The Winchester drive is the heart of the machine, greatly improving on both the speed and data integrity of floppy-based systems. Average access time is reduced to just 134 milliseconds while the average transfer rate is an astonishing 104,000 characters per second.

Like all the Sirius range, the Sirius SX is backed by the strength and resources of ACT. The Pulsar range of true 16-bit application software for accounting, planning and word-processing; over 1,000 hardware/software add-on products; ACT Training Centres open to all; nationwide field service; a full range of printers and consumables. And the most complete and professional dealer network in the United Kingdom.

Sirius prices start at just £2,195 for a dual floppy drive system with 1.2Mbytes and £2,695 for the double-sided floppy drive version offering 2.4Mbytes.





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WINCHESTER SUBSYSTEM

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User configurable

GENERAL SPECIFICATIONS

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Multiple operating systems
Parallel/IEEE 488 port
2xRS232 asynchronous/synchronous ports
Internal user port

For more information on the new ACT Sirius SX, clip the coupon and return to:



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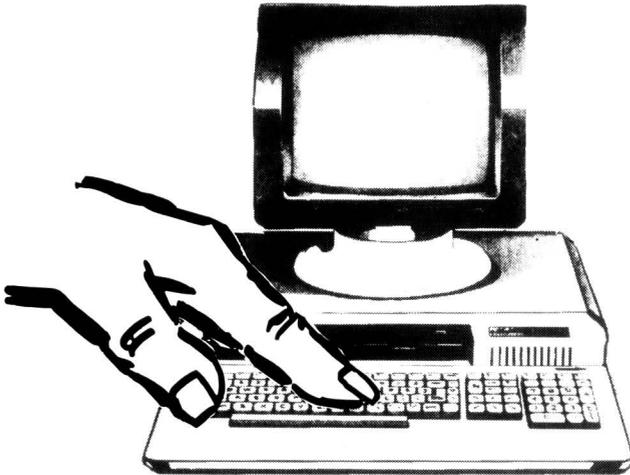
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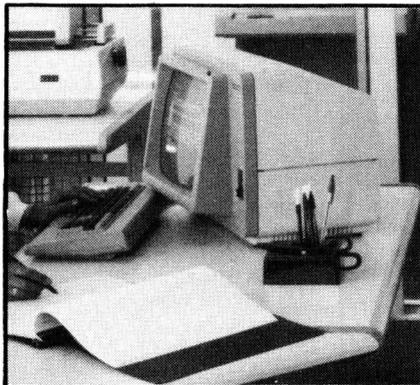
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SYSTIME S-300 £3,250 +

Systime is a highly respected name in the mini-computer market. In July 1981 Systime launched the S-500, an 8086 based small business system, at a starting price of £7,250. In January 1983 the S-300 was released, based once again on the 8086 but supplied with less RAM and smaller storage devices. Nevertheless, it is a capable machine. It is supplied with CP/M-86 as standard and MP/M-86 to permit multi-user operation. The S-300 supports all well known programming languages. It has the ability to drive five serial devices, which can all be configured as RS-232C ports. It will cost from £3,250 to £6,500.

For. Memory expansion. Established company. High capacity floppies.

Against. MS-DOS not supplied. Expensive.

Address. Systime Computers, Millshaw Park, Leeds LS11 0LT
Tel. (0532) 702277



TANDY MODEL 16 £2,399 +

Tandy is a name well known in the High Street, but until recently lacked a new serious business machine. The Model 16 is based on the Motorola 68000 processor. It is available with a multitude of options. Unfortunate idiosyncrasies remain, however, in the form of the standard operating system TRS-DOS. TRS-Xenix, a development of Unix, is also standard but CPM is only available in eight-bit form as an extra. Tandy has included a second eight-bit processor which enables the Model 16 to run software written for TRS-80 Model II, of which there is no shortage.

For. Tandy support. Plenty of software. Many hardware options. Good processor.

Against. Weird operating systems. 8in. floppies.

Address. Tandy Corporation, Tameway Tower, Bridge Street, Walsall, West Midlands WS1 1LA
Tel. (0922) 648181



TELEVIDEO 1603 £2,417

Televideo started off manufacturing computer terminals in the U.S. It moved into the micro market a few years ago and its products, although selling reasonably well in the U.K., are far more popular in the U.S. The 1603 is a conventional 16-bit computer with an 8088 processor and 128K RAM as standard. Maximum memory size is stated as 256K and this may not be sufficient to allow full use of the latest generation of operating systems. The disc drives can hold a healthy 1Mbyte each and are housed in a vertical box, which is located to one side of the 14in. monochrome monitor. The 1603 has no fan so, apart from the disc drives, should be silent in operation. There are no expansion slots or bus expansion facilities, but it can work as part of a Televideo TS-806/816 multi-user system. CP/M 86 is supplied as standard, and is the operating system Televideo seems to favour.

For. Large capacity disc drives. Multi-user capability.

Against. Limited memory. Not IBM compatible.

Address. Midlectron, Midlectron House, Nottingham Road, Belper, Derby DE5 1JQ
Tel. (077 382) 6811



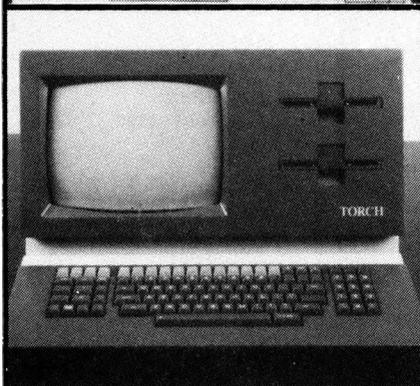
TI PROFESSIONAL £2,650 +

Texas Instruments, whose withdrawal from the home-computer market was well publicised, has pledged to retain and develop its range of business micros. The Professional is a good, no-nonsense business computer based on the 8088 processor with the option of an 8087 arithmetic co-processor. Disc-drive capacities are somewhat limited at 320K each, and do not boast full IBM compatibility although they can read IBM data files. A colour-graphics board is included in the base model, so all a user needs to buy is a colour monitor. Operating systems, however, are listed as an extra and include CP/M-86, Concurrent CP/M-86 and MS-DOS. An annoying omission, that it shares with the IBM PC, is an RS-232C port for a serial printer. It has to be purchased as an extra board and is, therefore, costly.

For. Cheap colour option. Established name. Plenty of software.

Against. Operating systems not included. Limited capacity floppies.

Address. Texas Instruments, Manton Lane, Bedford MK41 7PA
Tel. (0234) 67466



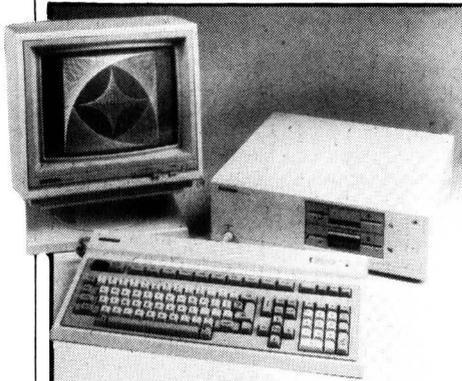
TORCH £3,550

The Torch is a dual-processor machine from the Cambridgeshire company of the same name. The 68000 runs at 8MHz and the Z-80B at 6MHz; these run under Unix and CP/M respectively, allowing access to a wide range of languages and software. In addition to the 288K RAM expandable to 1Mbyte, there is a sizable 64K ROM, which includes Basic and Acorn MOS. Although no expansion slots as such are available, bus expandability is possible via a 1MHz bus. Standard options include eight colours and four music channels plus speech synthesis. The keyboard has a total of 103 keys, including a block of 17 function keys. Torchnet allows disc usage to be mixed between local and remote systems and between CP/M and Unix files. In addition to the standard double 400K-floppy option, a 20Mbyte Winchester version is available.

For. Dual processor architecture. Full keyboard. Large ROM.

Against. No expansion slots. No IBM compatibility.

Address. Torch Computers, Abberley House, Great Shelford, Cambridgeshire CBQ 5LQ
Tel. (0223) 841000

**TOSHIBA T-300****£2,495**

The Toshiba T-300, launched in late 1983, is a robust, attractively-finished, Japanese micro. The processor unit is a bit bulky and will not leave much room on a normal size desk for the keyboard. A 12in. green-screen monitor is supplied with the base system, but it is worth considering the colour option to exploit this machine's excellent graphics capabilities. Based on the ubiquitous 8088 processor, it runs slightly faster than most at 6MHz. Memory supplied as standard is 192K and disc drives have a useful 640K capacity each. With capacity at exactly double that of the IBM PC disc drives it is interesting that Toshiba claim full compatibility. MS-DOS is supplied as standard with CP/M-86 available as an optional extra, just like IBM. The promise of Japanese reliability should also be a strong selling point.

For. Large capacity disc drives. IBM compatible. Good value compared to IBM.

Against. Size.

Address. Scan Computers, Chanctonbury House, Church Street, Storrington, West Sussex
Tel. (090 66) 5432

**ULTRAFRAME****£3,145 +**

Dataday Computing plans to have the Ultraframe in full production by mid 1984. It is a company that can offer complete hardware/software solutions, bespoke for special applications or customised from standard products. The Ultraframe itself, is a very advanced micro based on Intel's super chip, the 80186, running at a fast 8MHz. It can be configured to suit almost any conceivable application where high speed and large memory are important. The Ultraframe can handle Winchester's up to 145Mbytes capacity and is available with a variety of terminals. The sophistication of the machine rules out to a large extent the use of standard operating systems, like CPM-86 or MS-DOS — and neither is offered.

For. Fast. Modular. Vast memory and storage capacity.

Against. Not available yet. Expensive.

Address. Dataday Computing, Bechers Building, Racecourse Estate, Ormskirk Road, Aintree, Merseyside L9 5AI
Tel. 051-521 3966

**VECTOR 4-S****£2,500 +**

The Vector 4-S, launched at this year's *Which Computer* show, is a serious attempt at producing a truly versatile micro which can read IBM PC and other manufacturers' soft-sectored floppy discs. The 4-S will read eight or nine sector, single- or double-sided CP/M-86 or MS-DOS discs with 48 or 96 tracks per inch. To the user this should mean a greater choice of software and easier transfer of data from one system to another. A wide choice of storage options are available from dual 630K, 5.25in. floppies up to 36Mbyte Winchester hard disc. CP/M-86 is supplied as standard with version 2.0 of MS-DOS available as an optional extra. As the 4-S has a second processor, the eight-bit Z-80, it can also run software under CP/M-80. GSX-86 Graphics is included, providing monochrome graphics with up to 16 levels of grey. The system of your choice will start at £2,500, but could cost up to £8,000.

For. Dual Processor. Partial IBM compatibility.

Against. Limited memory expansion.

Address. Vector Graphics, Vector House, William Street, Windsor
Tel. (075 53) 69375

**VITESSE****£2,750**

The Vitesse is a distinctive British-built micro from Logica. It is a straightforward machine, perhaps a little short of memory. The large, 15in. screen with the choice of an amber phosphor, is the Vitesse's most distinctive feature. It currently operates as a stand-alone, but Logica stresses that a Polynet networks connection should be available shortly. Its applications software includes dBase II, Mars, Tabs and Micromodeller. ICL and IBM comms facilities are under review. There is already a degree of IBM-software compatibility via the option of IBM PC-format MS-DOS as an operating system. Logica which has been around since 1979, longer than most British computer companies, sells its machine through a network of 25 independent dealers.

For. Big screen. Stylish machine.

Against. Lack of market impact. Delay on networking.

Address. Logica VTS, Drakes Way, Swindon, Wiltshire
Tel. (0793) 36291

**WANG****£2,675 +**

Wang, best known for office-automation and word-processing equipment, launched its Professional micro at the beginning of 1983. The physical configuration of the system is unusual. It consists of a processor/storage unit intended to be either free-standing, or mounted well out of the way under a desk or even clamped to the side of it. The keyboard follows traditional practice but the monitor sits on top of a swivel leg whose base can also be clamped to the desk. This configuration takes up a lot less space on the desk top. The remainder of the technical specification is pretty standard using an 8086 processor and claiming a degree of compatibility with IBM PC discs. The Professional does, however, offer above average communications facilities with large IBM and Wang computers.

For. Flexible hardware configuration. Communications capability. Big name company.

Against. Expensive.

Address. Wang (U.K.) Ltd, Wang House, 661 London Road, Isleworth TW7 4EH
Tel. 01-560 4151

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AT LAST – a database designed to let you organise your business the way you want it!

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- Provides full colour support and screen style customisation.

System Features:

- A list of users can be kept, with passwords and security levels.
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- Database back-up and restore functions are integrated to reduce errors.

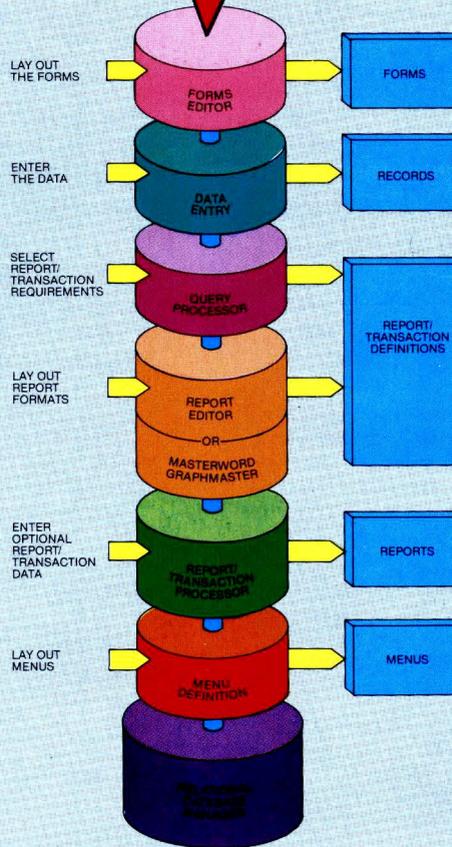
System Requirements:

- Available on IBM-PC, SIRIUS, NCR, TEXAS, WANG-PC, DEC and other 16 bit computers. Requires a minimum of 128K memory and 2 disk drives (on some micros a minimum of 192K memory is required).
- Supports floppy or hard disk drives.
- Supports all popular printers.

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- Reports are automatically formatted in several ways, or specify your own format using the Report Editor.
- To format a report complete with text, data, and graphs; use the optional MASTERWORD word-processor or the GRAPHMASTER graphics facility.
- Display or print the report output, or take it to your spreadsheet, word processing, or graphics programs.
- Organise the access to your forms and reports by setting up your own menus.
- The underlying Relational Database Manager provides efficient storage and retrieval of records. It uses B-tree indices for efficient accessing of records, and cache memory to retain the most recently used disk sectors to reduce disk access by 50 percent.

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Please debit my:

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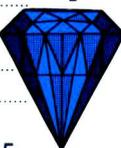
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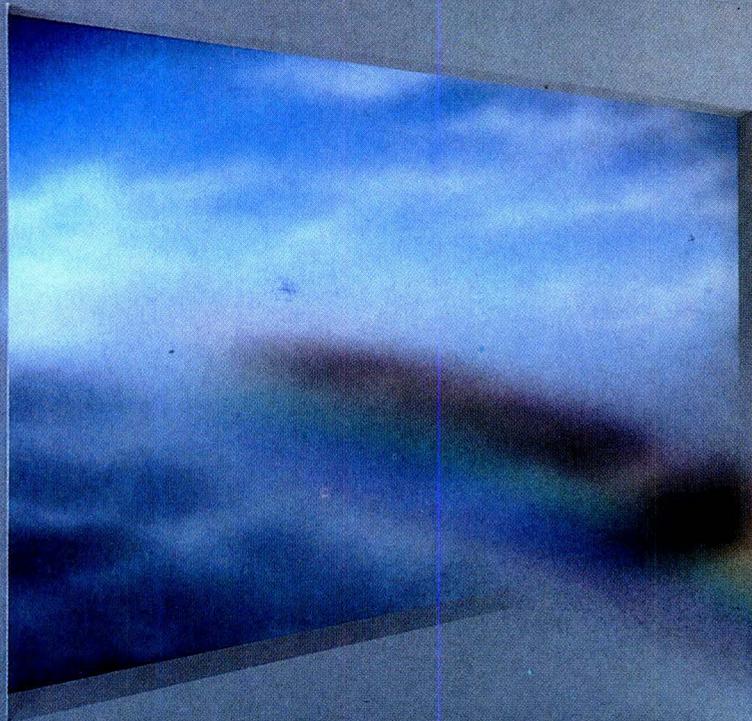
Computer type

Please allow 28 days for delivery Reg. No. 1467831 VAT No. 250078973

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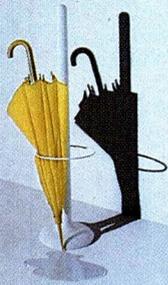
Call our Customer Information Centre on 0256 59299 for more about the new Rainbow 100+.

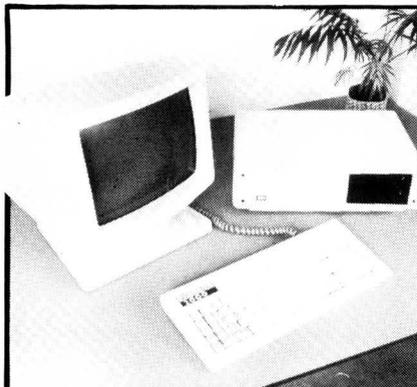
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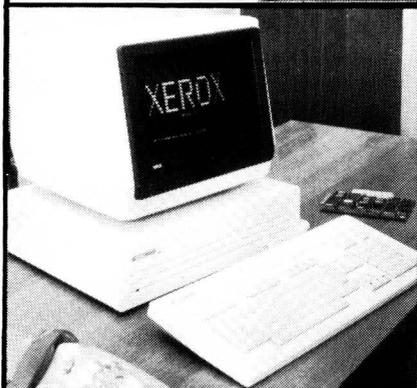
**WILCOX 2000****£3,500 +**

Wilcox Computers specialises in the sale of turnkey systems including hardware and software. The Wilcox 2000 is an 8088-based machine supplied with 64K RAM as standard. Although the keyboard is an IBM PC look-alike, the two systems are in no way compatible. There is a second processor option enabling users to run software written for use under CP/M-80. Wilcox offers a variety of software with the 2000 including nominal, purchase and sale ledgers. Also available are packages to assist in estimating and contract costing. The company places great emphasis on customer training and after-sales support.

For. No hardware/software compatibility problems. Dual processor.

Against. Small standard memory. Hard to assess value for money.

Address. Wilcox Computers, Rackery Lane, Llay, Wrexham, Clwyd LL12 0PB
Tel. (0978) 834866

**XEROX 16/18****£1,961**

Xerox's micro uses an interesting combination of the 8086 and Z-80A running concurrently at 4.7MHz and 4MHz respectively. The RAMs start at 128K and 64K, and can be increased to a maximum of 192K and 256K in each case. Thus most of the main operating systems are available, CP/M-86, MS-DOS and CP/M Plus. The rest of the specification is more conventional. Floppy drives start at a meagre 155K each, and upgrades to 980K, 8in. drives and 8.2Mbyte Winchester are offered. The monitor is available in a range of phosphors including white and green. As might be expected from a company deeply committed to dedicated word processors, such as the 823, a package is available for the 16/8 Professional with word-processing functions based on the 823 implemented as single strokes. The micro is manufactured at a variety of U.S. and European plants.

For. Attractive keyboard. Dual processors.

Against. Small floppies. No IBM compatibility.

Address. Rank Xerox (U.K.) Ltd, Bridge House, Oxford Road, Uxbridge, Middlesex UB8 1HS
Tel. (0895) 51133

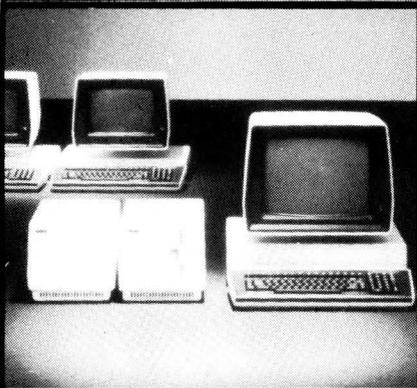
**ZENITH****£2,576**

The Zenith range of machines are unusual in combining a standard 8088 with the less common 8085, using MS-DOS and CP/M-85 respectively. The latter operating system can run most CP/M packages. MP/M-86 is available as an additional option. Systems come in various configurations, with or without monitor, and with two 320K floppies or with a 10Mbyte Winchester. The RAM can be expanded from 192K to a maximum of 960K; 32K of ROM deals with monitor functions. In addition to two RS-232 and a centronics port, there are four expansion slots. The hard-disc version includes the extended spreadsheet package, Lotus 1-2-3, as standard bundled software. Colour options are standard, and networking and IBM compatibility are also available on the Zenith.

For. Range of options. Bundled software with Winchester version.

Against. Low capacity floppies.

Address: Zenith Data Systems, Bristol Road, Gloucester GL2 6EE.
Tel: (0452) 29451.

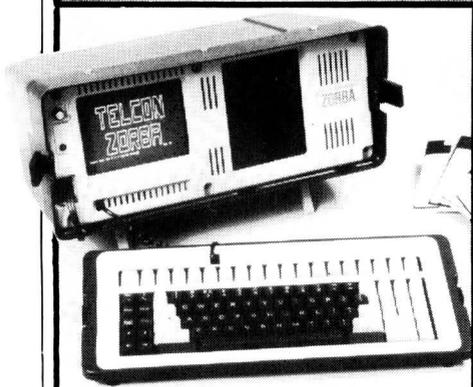
**ZENTEC****£7,000**

The Zentec Series 2000 is a multi-user system specifically designed to optimise running Xenix — Microsoft's micro version of Unix. The processor is an 8086 running at 8MHz. RAM starts at 256K and can be expanded up to 1Mbyte. Various disc configurations are available, ranging from two 738K 5.25in. floppies to two 40Mbyte Winchesters, as well as the floppies. The Zentec keyboard has 103 keys including numeric keypad and function keys. The 12in. monitor allows 80 columns by 25 lines, plus an extra status line. Although a RS-232 port is provided there are no expansion slots as such, nor any networking facility. The Zentec Series 2000 was launched in 1982.

For. Multi-user. Expandable.

Against. Price. No expansion slots.

Address. Zentec International, Index House, Ascot, Berkshire SL5 7EU.
Tel. (0990) 23377

**ZORBA****£1,195**

The Zorba was originally launched as an upmarket version of the standard eight-bit Osborne transportable micro. One particularly useful facility was the ability to read various disc formats, including those for the IBM PC and Osborne. This has been carried over to the dual-processor version, where an 8088 card has been added to the basic Z-80 system. The self-contained unit includes a 7in. or 9in. screen, two 400K floppies and a detachable keyboard that forms the base. As well as standard QWERTY numeric keypad and cursor controls, the Zorba has an unusually generous number of function keys, 19 in all. Although billed as a portable its weight, 22lb., makes it more of a luggable. The plastic casing is sturdy and seems designed to cope with the rough and tumble of life on the move.

For. Price. Keyboard. Various disc formats.

Against. Looks. Small screen.

Address. Sun Computing Services, Concorde House, St Anthony's Way, Feltham, Middlesex TW14 0NH.
Tel. 01-890 1440



Background information to the table of the 80 leading machines, which begins overleaf.

THE FOLLOWING pages present in tabular form the main specifications of the 80 machines considered in the previous section. Where possible the characteristics are presented in the same way, to allow ready comparison of the micros even where machines are fundamentally different. But it is hard to compare computers built around an S-100 bus where additional cards are slotted in to provide specific options, with, say, a portable IBM-compatible machine with bundled software. Reference to the full descriptions of the machines may help to clarify important features such as size, configuration — single box or linked workstations — and the nature of the software packages offered.

The table refers to the entry system; the prices shown generally represent the starting point for various levels of available upgrades. Remember that the vast majority of machines can be expanded. This may amount only to a colour monitor or hard disc, or range to radical revampings of the machine. Again, reference to the first part of this supplement will often yield further information on the options offered.

Processors. These lie at the heart of the micro, and provide the defining characteristic for this survey. The clock speed is given where possible, and usually this indicates the speed at which data is processed. However, some 16-bit chips, like the popular 8088, process data at this speed, but only access data in eight-bit bundles which detracts from the nominal power. Other complications arise with the introduction of a second co-processor. If the main chip is a 16-bit, such as the 8086, the second unit will

often be a Z-80. It allows CP/M software to run, and may also speed up I/O functions. A further possibility is to add a maths co-processor, usually an 8087. This chip is specifically designed to handle straightforward arithmetical operations very efficiently. A system involved with processing large quantities of numbers, say, in accounts, rather than general purpose functions could well benefit from such an extra.

RAM and ROM. Where possible the standard and maximum RAM is given. The ROM column details the uses to which ROM is put in the machine; typical functions include autostart routines and diagnostics. **Discs.** Usually 5.25in. floppies will be found on entry-level systems. A few of the newer machines are offering 3.5in. microfloppies, older models may be fitted with 8in. discs. Most machines also offer Winchester options of varying capacities. **Keyboard.** Almost all micros come with detached keyboards these days. An indication is given of the total number of keys, the user-programmable function keys, (F), and the scope of the numeric pad and associated cursor keys, (N). **Screen.** The measurement given refers to the screen diagonal. The first set of figures indicates number of columns by number of lines; the second set gives an indication of the total number of pixels available.

Operating systems and languages. The quantity and quality of the bundled software can be a crucial factor when choosing a micro. Filled in blobs indicate the software supplied as standard with the machine, and included in the price. Open blobs indicate other options

available from the manufacturers. Third party software may be another option. **Colour options and sound.** Colour may be either standard or extra. If it is extra an additional card may be necessary. Facilities for sound vary widely from polyphonic music channels to beeps and bells.

Output ports. Standard ports normally available on micros are the serial RS-232 and Centronics-type parallel port, usually used for a printer. Other possibilities are for keyboards and light pens.

Networks. Options for linking micros to networks are becoming increasingly popular and important. It could be a key feature in years to come. **Expansion slots and bus expansion.** Slots in the machine allow for various upgrade paths, usually within a limited range. Access to an internal bus permits a far wider choice of add-ons.

IBM compatible. So just how compatible is compatible? Two broad classes have emerged. Disc compatible machines allow any IBM-format disc to be read. They may not, however, be able to run them. This requires true software compatibility. Most micros that run under MS-DOS can run software written for the IBM running under PC-DOS. The only sure test is to try out your favourite IBM software on the machine.

When shown/available. These dates give some idea of how long the machine has been around and whether it is currently available. Dates like March 1984 and April 1984 may prove to be optimism on the manufacturer's part. **Price.** It excludes VAT, and refers to the entry system. You are unlikely to pay less — and usually rather more.

Name of machine	Processors		RAM	ROM	Disc drives	Keyboard	Screen display		Sound
	Speed	Optional co-processor	Standard Maximum	Amount Content	Size Capacity	Type and number of keys Numeric pad/function keys	Size, characters x line, Graphics pixels	Colour option Extracard	
Advanced PC	8086		128K 640K	8K bootstrap, diagnostics	2 x 8in. 1Mbyte each	86-key F(44)	12in. 1024 x 1024, 640 x 475 displayable standard		
Alphatronic	8088 5MHz	8085	128K 128K	4K Micro O/S	1 or 2 x 800K, 5.25in. floppies, 5.2Mbyte Winchester	QWERTY 86 N F(6)	12in., 80 x 24 160 x 72	no	no
AM-1000	68000 8MHz	Z-80A	128K 384K	4K boot and self-test	2 x 5.25in. 800K	105 N, F	80 x 25		no
Apricot	8086 5MHz	8087	256K 768K		1 x 3.5in. or options 315K	QWERTY 96 N, F(8)	9in., 80 x 25 or 132 x 50 800 x 400 pixels	no	3 tone generators white noise generator
Argus Pro-PC	8086 8MHz		128K 896K		5.25in. 2 x 320K	94 N(14), F(13)	12in. 80 x 24	tba	no
BDC-680	68000 10MHz	floating point array processor	768K 4Mbytes	256K monitor and diagnostic software	5.25in. Winchester 40/46Mbytes	separate keyboard	separate VDU		
Britannia S3-10	68000 8MHz		256K	8K	1 x 5.25in. Winchester 10Mbytes. + 1 x 5.25in. floppy 800K	separate keyboard	separate VDU		yes
Canon AS-100	8088 4MHz	8087	128K 512K	4K debugger, bootstrap loader	2 x 5.25in. 1.28Mbytes, 2 x 8in. 2Mbytes, Winchester 84Mbytes		80 x 25, 640 x 400 pixels	yes, yes	yes
Ceedata 8400	8088 + Z-80B 5MHz 6MHz		128K 512K	4K diagnostics and boot	5.25in. 380K	120 N(11), F(36)	12in. 80 x 24	no	bell
Cies 680/20	68000 8MHz		256K 512K		5.25in. Winchester 10Mbyte	85-key detached N(18), F(4)	12in., green, 80 x 24		
Columbia PC	8088 4.77MHz	Z-80	128K 896K	16K bootstrap	5.25in. floppies 2 x 320K, Winchester 10Mbyte	IBM PC compatible 83 keys numeric pad, F(10)	12in. amber, 80 x 25, 720 x 250 pixels	yes, yes	yes
Communicator CP-1000	8086 6MHz		256K 1Mbyte	4K bootstrap	5.25in. floppies 2 x 790K, 1 floppy + 1 Winchester 1 x 790K + 5, 20 or 40Mbyte	QWERTY, 105 keys, numeric pad, F(8)	14in., 24 x 80, 8 x 10 matrix in 10 x 11 cell	no	no
Corona PPC	8088		256K 512K		1 x 320K	83 keys	80 columns x 25, 9in. 16 x 13 dots	yes	beep
Cortex	TMS-9995 12MHz		64K 512K	3 x 8K firmware	2 x 5.25in. floppies 125K/1Mbyte	66-key F(12)	40 x 24 48K, 256 x 192 pixels	16 colour	
Corvus			526K 512K			91 N(15) F(10)	15in. 120 x 56		
Cromemco C-S1	68000 + Z-80A 8MHz	floating point arithmetic	256K		Winchester 20-600Mbyte	any RS-232 terminal	any RS-232 terminal	yes	no
Crystal 68000	68000 10MHz		256K 4Mbyte	64K self-test and bootstrap	5.25in. from 13.3Mbytes	ASCII 102 N, F	80-132 x 25 500 x 500 pixels	yes	12
Decision Mate V	Intel 8088 5MHz	Intel 8087	96K 608K	4K bootstrap, diagnostics	5.25in. 2 x 500K floppies/12.76Mbyte Winchester	100 key detached DIN, F(20) programmable	12in. 80 x 24 640 x 400 pixels	yes	yes
DEC Rainbow 100	Z-80 + 8088		64K 192K		5.25in. 2 x 400K	105, N, F(20)	12in. 80, 132 x 24	yes	
Desktop Generation Model 10	si20 500ns	8086	128K 768K		5.25in. 15Mbyte	112 N(14), F(15)	12in. 80 x 24 640 x 240 pixels	yes, yes	
Duet 16	8086 8MHz	8087	128K 512K	8K initial diagnosis	2 x 5.25in. 722K	ASCII, 98 keys N(10), F(16)	12in. 80 x 25, 640 x 400 pixels	yes	beep
Eagle	8088 4.77MHz		128K 512K		5.25in. 320K	105 24	12in. 25 x 80, 720 x 352 pixels	yes	
Equinox SX-5000	80186		256K		5.25in. 750K	F(15) and numeric pad			
Fortune 32:16	68000 6MHz	no	384K 512K	40K boot and self-test	5.25in. 1Mbyte + Winchester 20Mbyte	20	11in., 80 x 24 block only	no	no
Fujitsu Micro 16s	8086 8MHz	68000	128K 1024K	10K + 2K monitor and character generator	5.25in. 320K	98 38	12in. 40/80 x 25, 640 x 200 pixels	yes	yes
Future Computers FX-20	8088 8MHz	8087	128K 1Mbyte	4K	5.25in. 2 x 800K	109 30	80 x 25 16 x 11		

RS-232C	Output ports			Network	Operating systems				Languages					No. of Expansion Slots	Bus expansion	IBM PC compatible?		When first shown	When available	Price (excl. VAT)
	IEEE 488	Centronics	Other		CP/M-86	MS-DOS	MP/M-86	Other	Basic	Cobol	Fortran	Pascal	Other			Software	Disc			
yes		yes			0	0	0 Concurrent CP/M	0	0	0	0				yes		July '83	ex-stock	£1,985	
2	opt			Micromite	•	0	0 UCSD-p	0	0	0	0		2	yes	no	no		Jan '84	£2,345	
3		1					• AMOS/L	•	0	0	0	• Assembler	1	SASI			June '82	ex-stock	£5,500	
1	1				•	•	Concurrent CP/M-86, UCSD-p, BOS	•	0	0	0	UCSD-p, C, PL/1, Forth	2	2	yes with emulator	no	Sept '83	ex-stock	£1,490	
3					•			•	0	0			3	no	no		Nov '82	ex-stock	£2,800	
10				Ethernet	0		• Unix, 0 Berley enhancements for Unix	•	•	•	•	• C, • APL	6	yes, Multibus	no	no	'81	ex-stock	£8,000	
8		RS-422 opt.	yes				• Unix, 0 Idris, 0 Unix, 0 M/BOS, 0 Mirage, 0 CP/M-68K	•	•	•	•	0 C							£7,500	
4 optional	1 std. + 1 opt.	synch. comms. port		Quorum net opt.	0	0	0 BOS, HAL-BAS	•	•	0	0		4	yes	yes	yes	Feb '83	ex-stock	£2,290	
3		1			•	0	• CP/M Plus	0	0	0	0		no	yes	yes	no	Jan '84	March '84	£2,450	
4	1						• Unix, • Regulus, • RM COS	0	0	0	0	• C	1		no	no	early '83	early '84	t.b.a.	
yes	yes		yes		•	•	0 UCSD-p	•	0	0	0		8	no	yes	yes	Sept '82	ex-stock	£2,950	
yes	yes			CP/Net	•	•		0	0	0	0		7	S-100 bus structure	no	no	Jan '82	Jan '82	£2,295	
yes	yes		no			•						• GW Basic	4	no	yes	yes	Sep '83	ex-stock	£2,295	
opt		cass/disc			0		MDEX	•			0	0				with 8in. disc.		ex-stock	£295, kit £395, £3,125	
yes	opt	opt	opt	Omninet	•					0	0		4		no				£3,845	
yes	opt	opt	opt	yes			• CDOS, • CROMIX	0	0	0	0	0 C	8		no		'81	ex-stock	£3,845	
yes	yes	various		coax ports for intelligent workstations			• Unix III, • Pick	•	•	•	•	• APL, • C	3	yes			Sep '83	ex-stock	£4,300	
yes	yes	various		Decision Net	0	0	0 UCSD-p, 0 CPM-80	0	0	0	0	0	7 external, 1 internal	no	no	yes	Feb '83	ex-stock	£2,135	
yes		RS-422			•	•		•			•		3	no	no	no	Autumn '82	ex-stock	£2,433	
2	yes	yes	RS-422 + 20MA	Xodiac	0	0	0 AOS, 0 RDOS	0	0	0	0	0 PL/1	6	yes	yes	yes	July '83	ex-stock	£2,532	
2	yes	yes			0	•		•	0	0	0	0 C, 0 Macro Assembler	2				March '84	March '84	£2,595	
2		yes	VTR adaptor interface	opt interface board	•	•	0 Concurrent CP/M from June	•	0	0	0	0 all p-system languages	3		yes	yes	Nov '83	ex-stock	£2,565	
2	1	1	IBM	yes	•	•	• Turbodos, • Unix	0	0	0	0	0 APL	12	S-100			'81	ex-stock	£2,695	
1	2							0	0	0	0	0 C Basic	3	no	yes	no	'82	ex-stock	£5,070	
yes	yes	yes	hard disc, light pen	Omninet, Ethernet	•	0	0 Unix, 0 CP/M	•	0	0	0	0 C Basic	4	yes	yes	yes	'83	April '84	£2,250	
2	opt	opt	RS-422	in-built LAN	•	0	0 CP/M 80 emulation, 0 Concurrent CP/M	0	0	0	0		2 opt.	yes	yes	yes	Dec '82	ex-stock	£1,875	

Name of machine	Processors		RAM	ROM	Disc drives	Keyboard	Screen display	Sound	
	Speed	Optional co-processor	Standard Maximum	Amount Content	Size Capacity	Type and number of keys Numeric pad/function keys	Size, characters x line. Graphics pixels	Colour option Extracard	
Galaxy 3	80186, Z-80A 4MHz		64K 256K	24K	5.25in. 800K + Winchester 10.8Mbyte	57 31	12in. 80 x 25. 256 x 256 pixels	yes	no
Gavilan	8088 3.5MHz		64K 288K	48K Gavilan O/S	3.5in. 360K	58 N, F	80 x 8. 440 x 60 pixels	no	no
Headstart	8086 8MHz	1 X-80 (also std.)	512K 1Mbyte		3.5in. Microdrive 340K-780K	108 key detached N(18), F(18)	12in. mono, 132 x 25 924 x 250 pixels	no	
Hitachi Personal Computer	8088 5MHz	8087	320K 576K	16K CG. BIOS	5.25in. 2 x 320K	94 key detached 10 + numeric pad	colour, 80 x 25 640 x 200	15 colours std	
HP-150	8088 8MHz		256K 640K		3.5in. 2 x 500K	107 key detached N(18), F(12)	9in. green 80 x 24 199 x 680 pixels		
Hyperion	8088 4.7MHz	8087	256K 512K	8K diagnostics	5.25in. 2 x 320K	84 detached numeric pad (F10)	7in. amber 80 x 25 640 x 250 pixels	yes	
IBM Personal Computer	8088 4.7MHz		64K 544K	40K Basic, BIOS, self test	5.25in. 160K per surface	82 key detached 48 alpha N(10), F(12)	11.5in. (diag). 80 x 25, 350 x 720 pixels	yes yes	
IMP-68	MC-68000 8MHz-10MHz	floating point	256K 4Mbytes	32K boot, monitor	5.25in. Winchester, 8in. SMD 10-500Mbytes	any RS-232 terminal	any RS-232 terminal	inserted into main bus	
Jonos LBP 1000	8088 8MHz 8088 6MHz	8087	128K 1Mbyte 192K 256K	1K boot 4K cold start ROM	5.25in. 1Mbyte 5.25in. floppy 160K, 180K, 360K, 720K	92, 10 detached N(12), F(30)	9in. 80 x 24 640 x 250 24 x 80 640 x 400 pixels	yes n/a	yes n/a
Lisa	MC-68000 5MHz		1Mbyte 1MByte	8K bootstrap protocol, diagnostics	2 x 860K	77 keys detached, numeric keypad + mouse	12in. colour 144 x 45 364 x 720 pixels	no	
Macintosh	68000 8MHz		128K	64K operating system	3.5in. 400K	Apple-type, all keys definable	9in. 80 x 24 and others 512 x 342 pixels		polyphon.
Micro Five Series 1000	Intel 8088-2 DMA processor 8MHz		256K 512K	16K bootstrap, diagnostics	5.25in. Winchester x 2 6.3-40Mbyte	100-key detached F(20), 11 definable	12in. 80 x 24	yes	beep
Microsystem 7000	8086-2 8MHz	Z-80A	256K 1Mbyte	8K bootstrap	5.25in. Winchester 20Mbyte/5.25in. or 8in. floppy 780K or 1.2Mbyte	66-key N(28), F(25)	132/80 x 24/25 1024 x 780 opt.	yes	
Midas S-100	various	various	various 16 Mbyte	various, boot	5in. or 8in hard and floppy up to 1.2Mbytes	various	various	yes	yes
Minstrel	8086/68000 8MHz	Z-80A	128K 16-Mbyte		5.25in. 2 x 400K. up to 4 x 40Mbyte				
Octopus	8088 8MHz, Z-80 6MHz	8087	128K 768K	diagnostics	5.25in. 2 x 400K	IBM or LSI yes F(32)	12in. 80 x 25	std	no
Olivetti M-20	Z-8001 4MHz		128K 512K	bootstrap, self- diagnostics	5.25in. 160K	72	80 x 25, 512 x 256 pixels	yes	yes
OSM PC	8088 5MHz		128K 256K	up to 16K	5.25in. 320K	IBM PC type	12in. 80 x 24, 640 x 200 pixels	yes	opt
Orb	iAPX-186		256K 1Mbyte		5.25in. 2 x 1Mbyte	F(23)	12in. 80 x 25	no	
Orion	8086 8MHz		128K + 72K video memory 896K	bootstrap, diagnostics	5.25in. floppy 1Mbyte; Winchester 5, 10 or 20Mbyte	yes/ F(13)	12in. 80 x 25, 800 x 400 pixels		
Panasonic JB-3000	8088 5MHz		128K 256K	16K bootstrap	5.25in. /8 in/Winchester 720K/1.2Mbyte/8.4Mbyte	93 F(8)	80 x 24, 640 x 400 pixels	8 colour (standard)	yes
People	8086 5MHz		128K 512K	2 x 4K	twon 5.25in. 640K each	U.K. ASCII. F(12)	12in. 80 x 25 640 x 480 pixels	yes	
Rair Business Computer	8088 8MHz	8085 std	256K 1024K	256K boot system	5.25in. 19Mbyte hard, 5.25in. 1Mbyte floppy	83-key detached N(13), F(10)	12in. colour, 80 x 25 pixels	no yes	no
Sage II	68000 8MHz		256K 512K	8K debugging routines	5.25in. 640K	Sage QVT 108, N(14), F(11)	80 x 24	no	no
Samurai S-16	8086 4.6MHz	8085, 8087	120K 640K	8K boot, diagnostics	8in. 2 x 1Mbyte	86-key detached N (13), F (12)	12in. mono, 80 x 25 720 x 400 pixels	yes	no
Sanyo MBC-4050	8086 5MHz	8087	128K 384K	8k boot	5.25in. 2 x 640K	100-key detached N (18), F (15)	12in. mono 80 x 25 8 x 12 cells	no	beep
Sanyo MBC-550/555	8088 4MHz		128K 256K	8K IPL/CG for 555)	5.25in. 160K (2	100-key detached N, F (5)	extra. 12in. colour 80 x 25 200 x 640	8-col std	alarm

RS-232C	Output ports			Network	Operating systems				Languages					No. of Expansion Slots	Bus expansion	IBM PC compatible?		When first shown	When available	Price (excl. VAT)
	IEEE 488	Centronics	Other		● = Standard 0 = Extra	CP/M-86	MS-DOS	MP/M-86	Other	Basic	Cobol	Fortran	Pascal			Other	Software			
yes	opt	yes		yes	●	0		0 concurrent CP/M 0 C	0	0	0	0	0	2	yes	yes	no	March '84	Mid '84	£3,000
yes			printer port			●			●				0 C	4	8	yes	yes	May '83	March '84	£2,695
1		1			0	●		0 LAN DOS for multi user	●						S-100 bus, 50 pin exp. slot	yes	no	Jan '84	Jan '84	£2,800
1		1				●						0 Assembler	5		yes			Nov '83	ex-stock	£2,595
2			1 HO-IB	HP-NET, IBM 32780	●				●					2	8-bit bus	yes		Nov '83	Jan '84	£2,900
1		1	yes	0	●			0 PC-DOS	●	0	0	0		7	yes	yes			ex-stock	£2,599
1	1			no	0			0 UCSD-p ● PC-DOS	●	0	0	0		5				Jan '83	Jan '83	£2,209
2.18				Ethernet or Cambridge Ring				● Unix	0	0	0	● 0C, 0APL	6	yes	no	no	Feb '82	ex-stock		£7,950
2	1	1	yes	yes	●				●	0	0	0	0	4	STD bus	yes	yes	Nov '83	Feb '84	£2,685
1				Proprietary LAN	●			● own (WP environment)						none	n/a	yes	yes	Nov '83	ex-stock	£3,280
2			parallel external video compo site	Applenet				0 Lisa operating system, 0 UNIX, 0 Xenix	0	0		0		3		no	no	Jan '83	ex-stock	£5,500
2			1	RS-422					0	0	0	0	0 various			no		Jan '84	tba	tba
10			RS-422 opt.	BOSnet	0	0		0 MBOS, 0 Stardos, 0 SMC Basic	●	0	0	0	0 Microcobol			yes	yes	Nov '82	ex-stock	£4,500
3				PDS/NET	●	0		● CP/M-80	0	0	0	0		1		no	no	Oct '83	ex-stock	from £3,520
2		yes		Ethernet, Archet	opt			0 CP/M68, Unix	0	0	0	0		4-20		no	no	'82	'82	£2,425
2		1						0 Xenix 0 Idris	0	0	0	0	0 C	10				'82	ex-stock	£4,665
2		1		Archnet-type	●	0		0 Elsie	0	0	0	0		1	multibus	yes	yes			£2,090
yes	yes				0	0		● PCOS						5						£1,795
1	1	RS-422			●			● PCDOS	0	0	0	0		4		yes	yes	'83	April '84	£2,490
8	1					●			0	0	0	0			no	no		June '83	ex-stock	£5,950
yes			telex, printer, viewdata		●	0		0 Concurrent CP/M-86				0 C, ● MBasic	6			yes		Jan '83	ex-stock	£2,400
opt		yes	yes		0	0		0 Magic	0	0	0	0	0 ASSM	3		no	no	Oct '83	ex-stock	£2,150
yes	yes				●	●	0		●	0	0	0		2	yes			Sept '83	ex-stock	£2,498
2				Ethernet	●	●	●	● CP/M	0	0		0	0 various	3	yes	yes	yes	'82	ex-stock	£6,500
2	1	1						● UCSD-P	0	0	0	0	0 APL0	none				Aug '82	ex-stock	£3,130
2		1		Hi-net options	0	●		0 UCSD-p	0	0	0	0		2 + options	yes		yes	Apr '83	ex-stock	£2,395
1	1				●	●			●				0 various					'83	ex-stock	£2,566
yes	yes					●			●				0 various			some		Jan '84	Jan '84	£699 (550); £899 (555)

Name of machine	Processors		RAM	ROM	Disc drives	Keyboard	Screen display		Sound
	Speed	Optional co-processor	Standard Maximum	Amount Content	Size Capacity	Type and number of keys Numeric pad/function keys	Size, characters x line, Graphics pixels	Colour option Extracard	
Seiko 8600	8086 5MHz		128K 512K		5.25in. 2 x 655K	100 N, F(10)	12in. 80 x 25		
Sharp PC-500	4MHz	no	128K 256K	64K MS-DOS	5.25in. + bubble, 2 + 320K	72-key fixed F(8)	LCD 80 x 8, 80 x 640 pixels	no	yes
Sinclair QL	68008 7.5MHz	yes	128K 604K	32K QDOS and Superbasic	none	65 F(5)		yes no	
Sirius	8088 5MHz	8087	128K, 256K (SX) 896K	12K boot	5.25in. hard and floppy 128K floppy, 10.6Mbyte hard	95-key detachable N, F(10)	12in. mono 80 x 25 800 x 400 pixels	no	yes
Sord M-68	68000 10MHz	Z-80A	256K 1Mbyte	8K boot	5in. or 8in. hard 1.20Mbyte	86-key detachable F (14)	12in. mono 80 x 25 640 x 400 pixels	yes	yes
Sord M-343	8086 5MHz	8087, Z-80A	256K 768K	24K boot, video	5in. and 8in. hard 1.2-20Mbyte	122-key detachable N (10), F (20)	12in. colour 80 x 25 640 x 400 pixels	yes, no	yes
Sperry Personal Computer	8088 4.77MHz or 7.16MHz	yes	128K 640K	20K BIOS, power on	5.25in. 320K	84-key detached, F(10)	12in. 320-400 to 640 x 400 pixels	yes	yes
Spirit 2	8086 4-8MHz	8087	128K 1Mbyte	8K	5.25in. 800K	100-key detached N, F(10)	12in. mono 80 x 24	no	no
Super PX	80186 6/8MHz	no	256K		3.5in./5.25in. floppies up to 1.3Mbytes, optional Winchester 20/40Mbytes				
Superstar 16	iAPX 186 8 MHz	8087	128K 1Mbyte	4K boot and optional monitor	5.25in. floppies 2 x 750K 5.25in. Winchester 2 x 10-40Mbytes	Hall, 100 numeric pad and 43 function keys	12in. 80 x 25 optional	yes, no	beep
Suntac PC	8088 4.7MHz		128K 512K	16K	5.25in., 2 x 320K	83, yes	12in. 80 x 25	yes	yes
SWTP S +	6809 2MHz		256K 1.2Mbyte	2K monitor	4in. x 8in. floppies 1.2Mbyte each or options		12in. mono. 82 x 25	no	no
Systime S-300	8086 5MHz	8087 opt	256K 1Mbyte	16K	2 x 5.25in. floppies 1Mbyte each	96 key N(13), F(19)	15in., 80 x 25	yes, no	beeper
System 3200/4200	68000 10MHz	Z-80	256K 4Mbyte	8K	5.25in. or 8in. floppy 1/1.6Mbyte; Winchester 10-420 Mbyte	90, various	12in., 80 x 25 line graphics	yes	bleep
Tandy Model 16	68000 6MHz	Z-80A	128K 756K	2K bootstrap	1 or 2 x 8in. floppies 1.25Mbyte	76 keys N, F(2)	12in. green, 80 x 24 640 x 240 pixels	no	beeper
Televideo 1603	8088 5MHz		128K 256K	4K	2 x 5.25in. floppies 1Mbyte	111 Keys N(17), F(26)	14in. mono, 80 x 25 640 x 240 pixels	no	beeper
Texas Instruments Professional	8088 5MHz	8087 opt.	256K 768K	16K diagnostics	2 x 5.25in. floppies 320K each and options	97 keys N, F(12)	12in. mono, 80 x 25 720 x 350 pixels	yes, no	beeper
Torch	68000 + Z-80B 8MHz + 6MHz		288K 1Mbyte	64K Basic, Acorn MOS	5.25in., 2 x 400K	103 N(15), F(17)	12in. 80 x 32, 640 x 256 pixels	yes	4 channel music, speech synthesiser
Toshiba T-300	8088 6MHz	8087	192K 512K	4K diagnostics	2 x 5.25in. floppies 640K each	detached, tilt, 103 keys N(18), F(10)	12in. mono, 80 x 25 640 x 500 pixels	yes	no
Ultraframe	80186 8MHz	Z-80A	256K	4K monitor, boot	2 x 5.25in. floppies 630K each plus many options	various types, detachable 102/103 keys N(14), F(11-16)	12in. or 15in., 80 x 24 512 x 512 pixels	yes	
Vector 4-S	8088 5-1MHz	Z-80A std.	128K 256K	4K boot, diagnostics	2 x 5.25in. floppies 630K each and options	90 keys N(18), F(15)	12in., mono, 80 x 25 640 x 312 pixels	yes, no	yes 3 tone
Vitesse	8086 4MHz	no	128K 256K	2K bootstrap, power-up diagnostics	2 x 5.25in. floppy 600K	75-key detached N(12), F(22)	15in. 80 x 24	no	buzzer
Wang Professional	8086 8MHz	8087 opt.	128K 640K	16K boot, diagnostics	1 x 5.25in floppies 360K, and options	101 keys N(18), F(18)	12in. mono, 80 x 25 800 x 300 pixels	yes	beeper
Wilcox 2000	8088 4MHz	Z-80A std.	64K 512K	28K boot, diagnostics	2 x 5.25in. floppies 320K each plus options	IBM type, 83 keys N(15), F(10)	15in. mono, 80, 132 x 25	yes	beep
Xerox 16/8 PC	8086 + Z80A 4.7MHz + 4MHz		128K + 64K 256K + 192K	12K	5.25in. 2 x 155K	97, (N) 18	80 x 24, 640 x 256 pixels		
Zenith	8088 + 8085 5MHz		192K 960K	32K monitor	5.25in. 2 x 320K	95 N(18), F(13)	external monitor	yes	
Zentec Series 2000	8086 8MHz	8087	256K 1Mbyte	16K	5.25in. 738K	103	12in., 80 x 24	no	bleep
Zorba	Z-80 + 8088 4MHz		128K 256K 8K		5.25in. 2 x 400K	95 N, F	7in./9in. 80 x 25	no	yes

16-bit table

RS-232C	Output ports		Network	Operating systems ● = Standard 0 = Extra				Languages ● = Standard 0 = Extra					No. of Expansion Slots	Bus expansion	IBM PC compatible?		When first shown	When available	Price (excl. VAT)				
	IEEE 488	Centronics		Other	CP/M-86	MS-DOS	MP/M-86	Other	Basic	Cobol	Fortran	Pascal			Other	Software				Disc			
4		2			0	0	0	0	Oasis-16	0	0	0	0	0	0	none		'83	ex-stock	£3,587			
yes			8-bit parallel		●			●		0	0	0			8-bit parallel	some	yes	Sept '83	Jan '84	£1,195			
2			yes					●	QDOS					none	no	no		Jan '84	tba	£399			
2		1	50-pin port	Omininet	●	●		●	● BOX, UCSD-p, CP/M-80	0	0	0	0	0	various	4	yes	yes	no	'82	ex-stock	£2,195	
2	1	1	yes		0	0		●	0 CP/M-88, RDOS	●	0	0	0	0	PIPS, SGL, C		yes	yes		Oct '83	ex-stock	£2,995	
4		1	S-100		0	0		●	USCD-p ● RUOS 0 UCSD-p RM DOS	●	0	0	0	0	PIPS, Assembler, SGL		no	yes		Jan '83	ex-stock	£0,100	
yes	via third party	yes	clock	Uniscopy, SNA, BSC	0	●		●		●	0	0	0			3-5	yes	yes	yes	Nov '83	Jan '84	\$2,598	
2		2			●	●		●	DPC-OS	●	●	●	●	C		13		yes	yes	June '83	ex-stock	£2,995	
2					●	●		0	BOS	0	0	0	0	0	Assembler		yes	yes				£1,975	
yes	opt	yes	yes		●	●		●	0 Xenix	●	0	0	0			up to 20	S-100		yes	Dec '83	Jan '84	£5,975	
yes		yes			0	●		0		0	0	0	0			3		yes	yes	'83	Feb '84	£2,195	
								●	Uniflex (Unix) ● MPS	0	0	0	0	0	0	C, 0 Assembler	32	yes	no	no	'81	ex-stock	£9,000
5			opt		●	●		0		0	0	0	0			1	yes	no	no	Jan '83	ex-stock	£3,250	
yes				Co-ax	0			●	0 Pertec OS, 0 Pick, 0 Bos, 0 Unix	●	●			●	Assembler 7 or 15		yes	no	no	Oct '83	ex-stock	£4,000	
2		1	Arcnet	Arcnet				●	● TRS DOS, ● Xenix, 0 CP/M-80, 0 BOS					APL	6	no	no	no	no	Feb '82	ex-stock	£2,399	
2			RS-422	yes	●	0		0		0	0	0	0	most		no	no	no	no	Jun '83	ex-stock	£2,417	
opt		yes		Ethernet, Omnicopy	0	0		●	0 C, 0 CP/M-86, 0 UCSD-p, 0 BOS	●	with MS-DOS or CP/M	0	0	0	0	C, 0 Compiler	5	yes	no	yes	Jan '83	ex-stock	£2,650
yes	opt	yes	cassette, A to D	Torchnet				●	0 Unix	●	0	0	0	0		no	yes	no		Sept '83	ex-stock	£3,550	
1		1		no	0	●		●								5	no	yes	yes	Sept '83	ex-stock	£2,495	
1			RS-422	yes				●	● P-Net, 0 Turbodos 1.3	0	0	0	●	0	C	16	S-100 type	no	under development	Jan '84	Mar '84	£3,145	
2		1	RGB	yes	●	●		●	● CP/M-80	●	0	0	0	0	GSX Graphics	3 x V-100	S-100	yes	yes	Jan '84	Feb '84	£2,500	
1		1		Polynet opt.	0	●		●	0 Bos	●	0	0	0			2	no	no	yes	Nov '82	ex-stock	£2,750	
1		1	yes			●		●	0 CP/M-80, 0 UCSD-p Compiler	0	0	0	0			5	no	semi	yes	Jan '83	ex-stock	£2,675	
2		1			0	0	0	●		0	0			0	C	4	yes	no	no	Nov '83	Feb '84	£3,500	
2		1	yes		●	●		0	0 CP/M Plus	0	0		0	0	Assembler	1	yes						
2		1	yes		0	●	0	●	● CPM/85	●	0	0	0			4	S-100	yes		Oct '82	ex-stock	£2,576	
yes				no				●	● Xenix	0	0	0	0	0	C		no	no		'82	ex-stock	£7,000	
2	1	1			●	●		0		0	0	0	0			none	none	yes		'83	ex-stock	£1,995	

NEW

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Specification

CPU Type	16-bit 8086 running at 4.77 MHz.
RAM	128K or 256K with parity plus 16K video
ROM	64K.
ROM Contents	Diagnostics, Basic, Cassette O/S
Languages Included	Basic
Type of Keyboard	Full 84 keys tactile
Keyboard Facilities	10 programmable keys
Character Set	256 in ROM
Method of Display	TV, RGB, Comp/Sync colour or monochrome monitor
Display Facilities	Full screen handling, 4 screen paged
Text	80 x 25 or 40 x 25
Graphics Resolution	320 x 200 or 640 x 200
Colours Available	16
Graphics Facilities	Scroll, reverse image
Cassette Recorder	Audio
Interfaces Included	Cassette port, light pen, joystick, Centronics
Sound	Built-in speaker
Operating System	Built-in ROM
Printers	Any using Centronics parallel interface
Comments	Hardware and software compatible with IBM PC User-upgradeable to Model B Provision for 8087 Arithmetic Processor



The business user can upgrade to Model B by adding the Advance Expansion box containing 2 x 5.25" disc drives providing 720K storage at £902.18.

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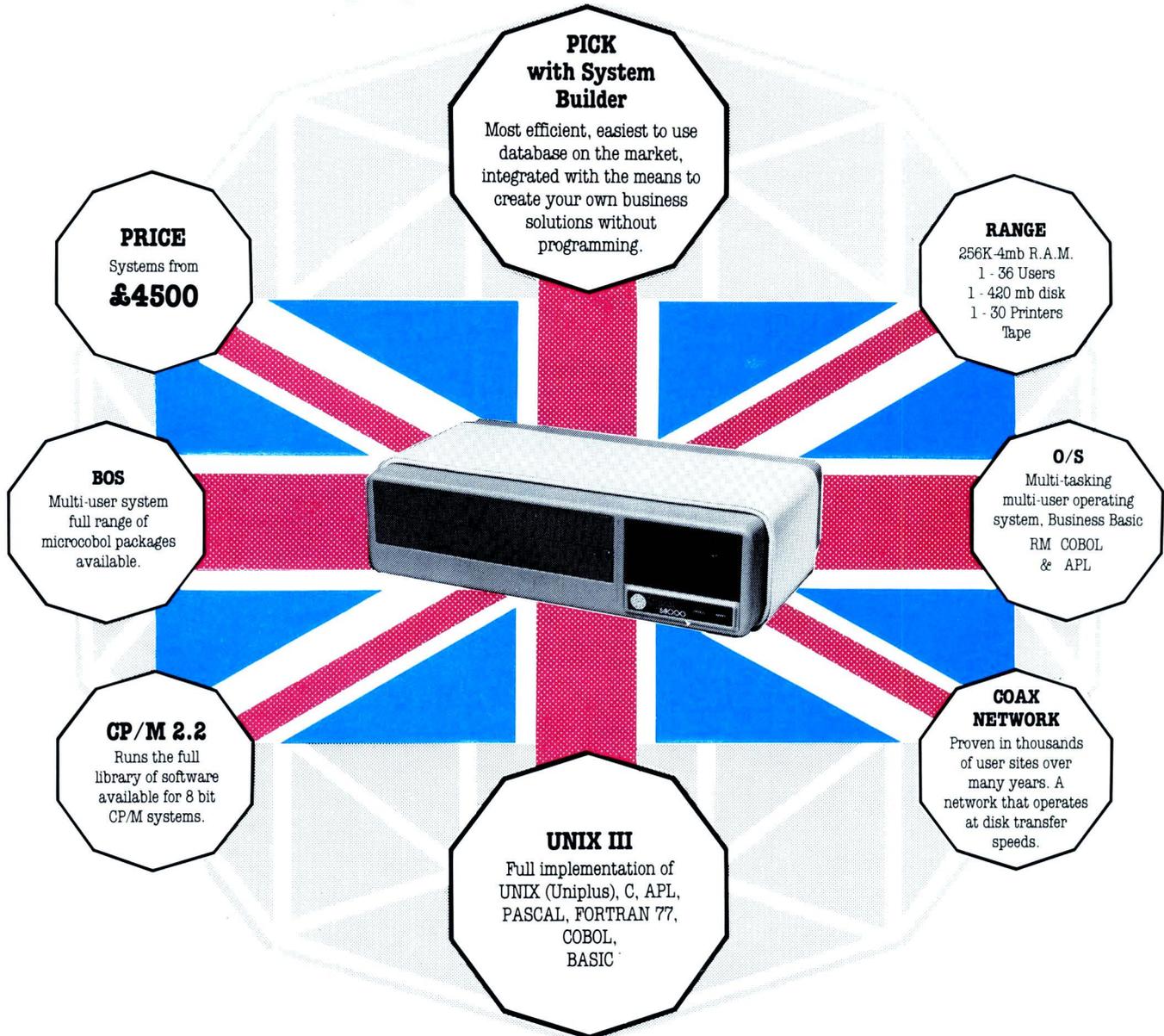
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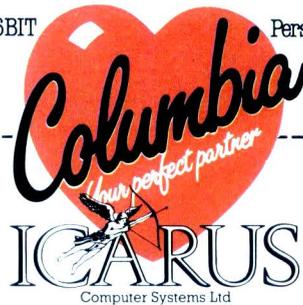
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7	Marketing
8	Other
9	TOTAL Fixed Cost
10	
11	Variable Costs
12	Labor
13	Materials
14	Packaging
15	Other



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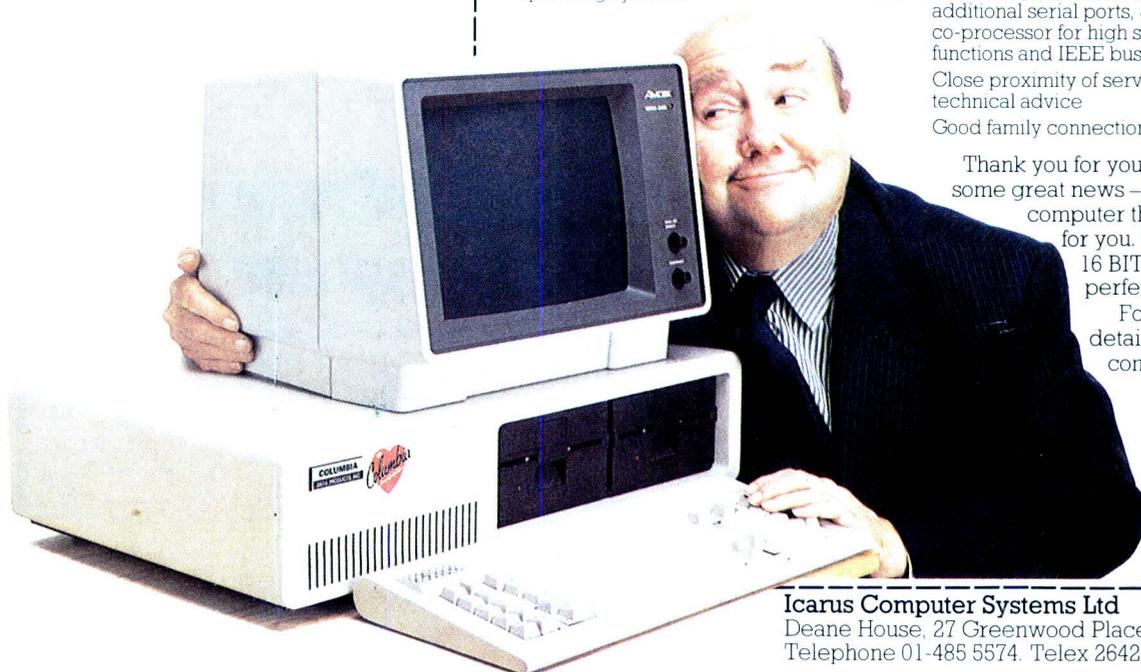
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