

NEW ZEALAND'S PERSONAL COMPUTER MAGAZINE

# BITS & BYTES

February 1985: \$2.00

## 1985!

### What to watch for in the computer market

Commodore 16 — is it better than the trusty VIC?

Wang PC — another heavyweight joins the PC fray

Build your own modem — instructions inside

Buyer's guide to Micros \$7000 plus

1984 Editorial Index



**Sanyo's back!**  
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**CPC 464**  
complete  
with  
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and  
datacorder

Other computer systems that get anywhere near the new CPC464 on specification cost around twice as much.

Which other home computer, for instance, gives you 64K of RAM (42K available), 32K of ROM and a colour monitor or VDU?

Which other home computer, gives you a built-in cassette data recorder, typewriter style keyboard, numeric keypad and a very fast extended BASIC?

What's more, the CPC464 comes complete and ready-to-go.

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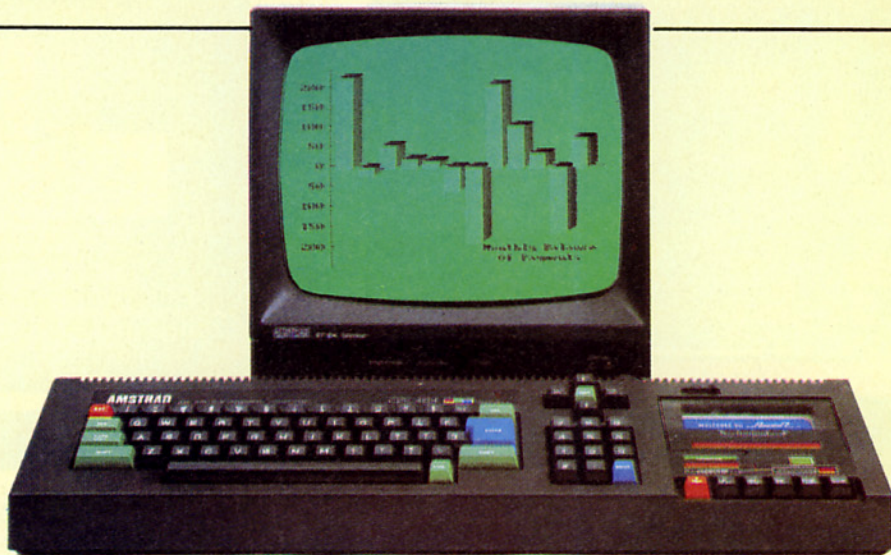
So does the CPC464 with its 3-voice, 7-octave stereo output fed through a hi-fi amplifier and speakers.

### Amsoft. High quality software.

A rapidly expanding range of programs is already available. High quality software that takes full advantage of the CPC464's high specification and speed-loading capability.

Which means even complex programs can be loaded quickly.

Arcade games, educational programs and business applications are all designed to utilise the CPC464's impressive graphics, sound and processing abilities.



CPC464 green screen VDU (GT64)

### Green screen VDU.

Text and numerical data are bright, sharp and easily read at a glance. Which is invaluable for word processing, accounting, budgeting and developing programs. And this purpose designed visual display system has an 80 column text display.

Green screen versions of the CPC464 can be used with a colour TV by connecting the optional power supply and modulator MP-1.

### Amstrad. User Information Service.

Whether you're interested in serious commercial applications or you're a games fanatic you'll want to receive the latest information about your AMSTRAD Computer. Upon request you will be advised about the latest software and its application, special information concerning your CPC464, available peripherals and software reviews. There will also be programs and exercises to try.

### User Clubs.

In addition to the User Information Service you will be given details of where you may contact your nearest independent user club:

### CPC464. Unlimited scope for expansion.

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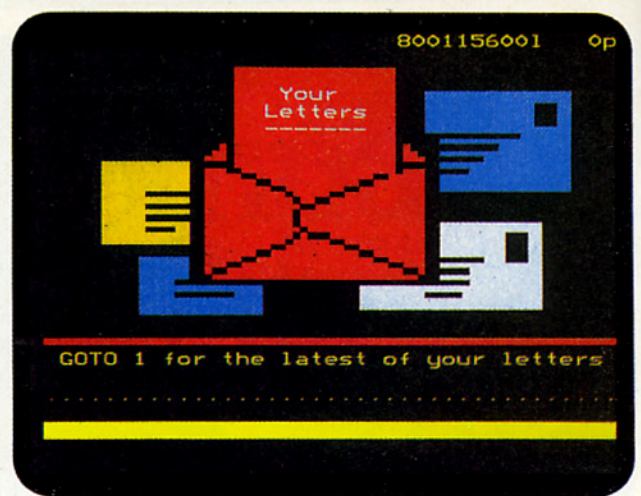
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# BITS & BYTES

February, 1985 Vol. 3, No. 5

ISSN 0111-9826

## FEATURES

### Buyer's Guide: part three

Gordon Findlay completes his round-up of the microcomputer world with a look at "typical bundles" in the over \$7000 range. Compulsory reading for anyone thinking of spending this sort of money or for anyone just wanting to find out how the other half lives.

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### Hardware reviews

John Slane compares Wang's new Professional Computer to a BMW of the motor world. Take a ride with him through this new Wang territory.

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Sanyo has come up with a 16-bit, IBM compatible, the MB 775, and John Slane has given it the once (twice and three times probably) over. He gives his views.

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Commodore's new Commodore 16 really is something new, says reviewer Rob Fullerton. He tells why.

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Airmail — Australia and South Pacific, \$45 a year; North America and Asia, \$72 a year; Europe, South America, the Middle East, \$94 a year.

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**Production Manager:** Dion Crooks.

**Assistants:** Roger Browning, Graeme Patterson.

**Cover and graphics:** Sally Williams.

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## Changes at Bits & Bytes

As from February 7 the head office for Bits & Bytes editorial and advertising will be Auckland. Our administration will also be based there. So all editorial contributions, advertising bookings and accounts should be sent to our Auckland office the address for which is printed in the credits column on the left hand side of this page.

But Christchurch will remain the base for subscriptions, magazine production and the book club. So if you have a subscription or book club inquiry please don't contact our Auckland office as they won't be able to help.

Advertising material can be sent to either office.

A number of staff changes will also take place at the same time. Neill Birss, one of the original founders of Bits & Bytes, is leaving the organisation to pursue other interests.

Paul Crooks, also one of the original founders, is moving to Auckland and will become managing editor of Bits & Bytes when Neil Birss leaves. A number of other staff changes and appointments, including a new editor, will be announced next month.

## Price Increase

Sorry readers, but because of the substantial increase in our printing costs (55 per cent) we have no option but to increase our subscription rates.

As from March 1 the new subscription rates will be \$16 for adults and \$14 for school students.

However this equates to less than \$1.50 per month (compared to a cover price of \$2) and with our continued growth in pages and future expansion we believe Bits & Bytes still offers value for money.

On a brighter note we will be offering a two year subscription from next month which will allow you to beat inflation.

Furthermore, you have until March 1 to take out a subscription or renew your subscription at the current prices.

## ABC Audit

Bits & Bytes has become the first computer magazine in New Zealand to have its circulation audited by the New Zealand Audit Bureau of Circulations.

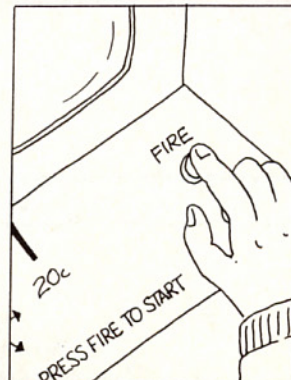
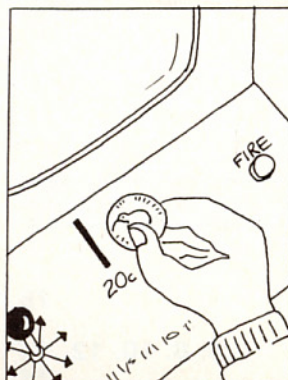
The audit shows Bits & Bytes at September 30, 1984 had an average net circulation of 9294 copies per month (including those distributed free to the computer industry). Average net paid sales then were 8851.

Our circulation has continued to increase since then and paid circulation is now in excess of 10,000 copies per month, (by comparison the largest selling computer magazine in Australia has sales of approximately 25,000 copies per month with a market of five times our population).

In fact Bits & Bytes is believed to have the highest circulation per head of population of any Computer magazine in the world.

## MICRO MOMENTS

BY MATT KILLIP



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## MICRO NEWS

# Jumping for NEC

Renowned for his lineout jumping for the All Blacks, Andy Haden is now jumping up and down over a computer — the new NEC APC III, in fact.

Haden features in all the promotion for the new NEC, including the television advertisements.

But back to the computer which does have some interesting features in its own right.

Perhaps the most interesting is that it is not IBM PC compatible and what's more, NEC's New Zealand agent (Scollay Computers, Box 2377, Wellington) is telling everyone it's not and seems genuinely proud of the fact.

Scollay says the most significant feature of the APC III is its speed of operation, achieved by using advanced hardware (it uses an 8086 processor running at 8MHz) and genuine 16-bit software packages. It claims the APC III runs the same software two to six times faster than other MS-DOS computers.

The APC-III uses an industry standard MS-DOS 2.11 operating system and GW-Basic is included with the system.

Other features include 128K as standard (expandable to 640K), 640K disk drives, integral or external 10 megabyte hard disk available, and the same excellent graphics of the original APC.

The APC III is also said to have the capacity to run Unix but no other details are available.

One thing Scollay has learned from IBM, though, is pricing each individual computer component right down to the operating system — which makes its price list confusing. But a basic unit with twin drives, a monochrome monitor, a printer cable and MS-DOS costs \$6742. Interestingly, the monitor alone costs \$1018 while a colour monitor costs a whopping \$2351.

### PC 85 well supported

The New Zealand microcomputer industry has responded very positively to the PC 85 Exhibition to be held in the Overseas Terminal in Auckland in early May.

Prior to Christmas in excess of 100 stands had been booked at the exhibition and it is now certain to be the largest computer exhibition seen in New Zealand.



Most of the major microcomputer distributors and retail stores in the Auckland area have booked space and they have been joined by several traditional mainframe and mini companies such as NCR and Wang that have recently entered the PC marketplace.

Significantly the largest stand taken at the exhibition so far has been booked by Paxus, the information systems division of NZI. Paxus incorporates a number of computer companies both in Australia and New Zealand and its large presence at PC 85 is an indication of its growing stature in the marketplace.

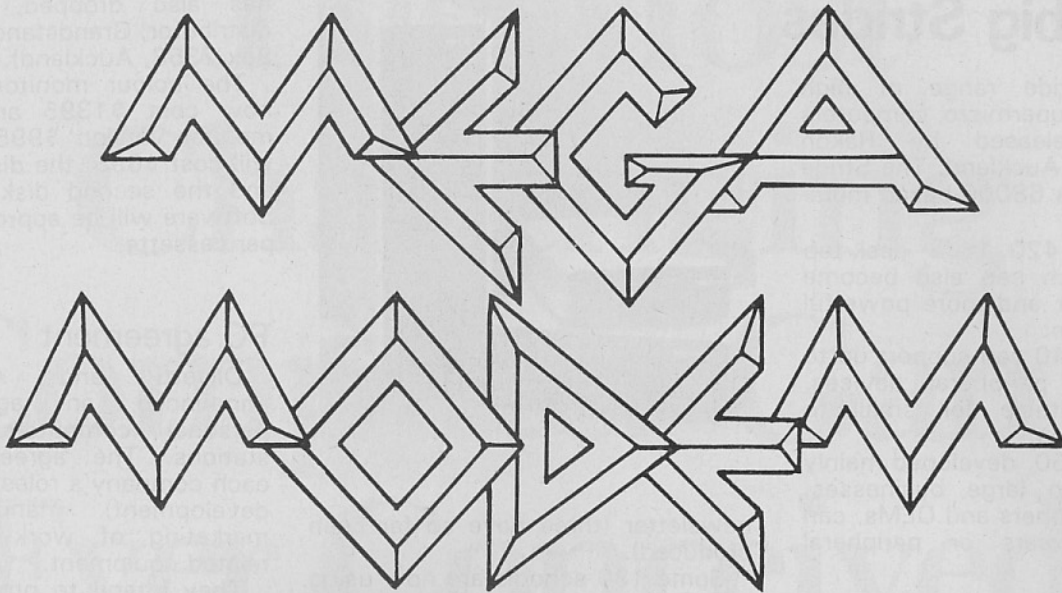
The computer giant IBM has also indicated it will be participating at PC 85.

For further information contact the PC 85 office, P.O. Box 9870, Auckland. Telephone 549-028 or 549-677.

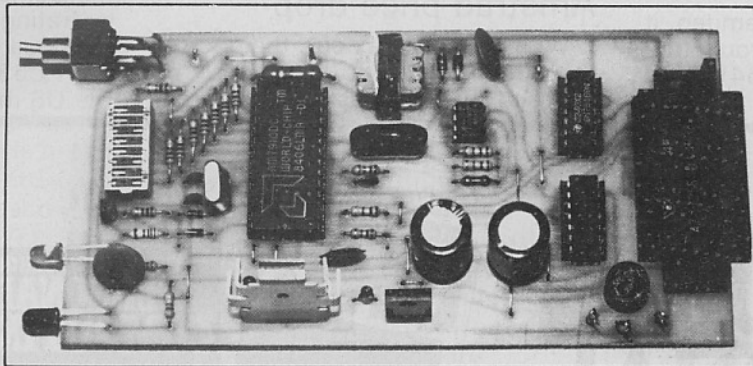
### Visi-On to CDC

The product which was to give any 16-bit machine a perfect windowing environment has quietly moved off its creator's shelves. Visi-Corp has sold Visi-On technology to Control Data. Is the world really ready for windowed Plato?





Data transmission at up to 1200 baud for under \$250  
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With the MEGA MODEM and your personal computer you can send your favourite program to a friend, place an add on a bulletin board or order software – from the comfort of your own keyboard!

This New Zealand designed kitset uses the latest semiconductor technology and direct connection to private phone lines to give "error-free" data transmission. An eight-way DIP switch offers 300, 600, and 1200/75 baud rates, answer/originate and full self test in both Bell and CCITT standards (worldwide compatibility). Features include a phone/modem switch, carrier detect LED and crystal controlled oscillator. Suitable for computers with an RS232C interface and Commodore computers. Note: This modem does not have NZPO approval.

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# Three big Strides

A new Stride range of high performance supermicro computers has been released by Rakon Computers, of Auckland. The Stride 400 Series is a 68000-based multi-user system.

The Stride 420 is a desk-top computer which can also become part of a larger and more powerful network system.

The Stride 440 can support up to 16 users or peripheral devices, making it suitable for small to medium business.

The Stride 460, developed mainly for medium to large businesses, software developers and OEMs, can support 22 users or peripheral devices.



has also dropped, advises the distributor, Grandstand Leisure (P.O. Box 2353, Auckland).

The colour monitor version will now cost \$1395 and the green monitor version \$995. The printer will cost \$695, the disk drive \$795 and the second disk drive \$550. Software will be approximately \$25 per cassette.

## PC agreement

Olivetti and AT&T have announced an agreement on personal computers and work stations. The agreement defines each company's roles in the design, development, manufacture and marketing of work stations and related equipment.

They intend to provide a line of personal computers and work stations aimed at the MS-DOS and Unix markets.

Both partners will manufacture and market the AT&T 3B minicomputers and the Unix operating system. Olivetti will continue to manufacture and supply the PC6300 computer to AT&T for the US market.

## Commodore 64 group

A national user group for the Commodore 64 — largely educational in purpose — has been established.

Organised by Br Bosco Camden, it is called the LXIV User Group (the Roman numerals for 64) and members communicate via a

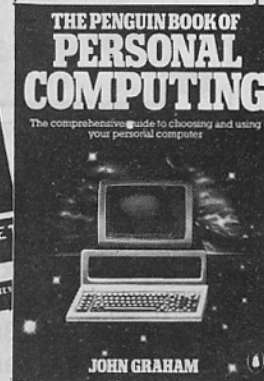
newsletter (three have so far been produced).

Some 130 schools are now using the C64, according to Br Camden, and anyone interested in joining the user group can contact him C/o LXIV User Group, 215 Richmond Rd, Ponsonby, Auckland 2.

## Amstrad price drop

With the sales tax cut, the price of the Amstrad computer (due to be released in New Zealand in March)

# THE PENGUIN PERSONAL COMPUTER COLLECTION



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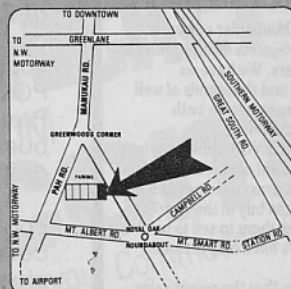
on. If imitation is the 'highest form of compliment', *we are indeed very complimented!* Manukau Computers plan to be first with much, much more in the future. We have Aditel (N.Z.'s only publicly-accessible data base with 4,000 pages and thousands more to come). We now offer Prestel from the U.K. with subscriptions available now. International service is also available. We invite you to visit our new showrooms at Manukau and Pah Roads, Epsom (Auckland) to view our huge selection of Spectrum 16K, 48K and QL; Commodore C64 and SX64; and Oric Atmos...we are authorised dealers for Sinclair & Commodore.

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## An all-on-one

The one per desk — which combines telephone, data communications and personal computing facilities — has been launched by ICL.

It consists of a control unit — containing the telephone handset, full-size keyboard, microchip circuitry and memory — and either a 14in colour or a 9in black and white video monitor. The portable monochrome system weighs less than 8kg. A small desk top printer offering full colour reproduction is optional.

Software built in to the One Per Desk includes a spreadsheet program, a database management system, business graphics software and the facility to prepare notes, memos and reports.

Advanced telephone features include short code dialling, a loudspeaker for hands-free dialling and redialling of engaged numbers.

A personal directory of more than 500 entries can be compiled containing names, titles, addresses, phone numbers and short dialling codes. These details can be stored

long-term on small microdrive cartridges which slot into the OPD control unit.

As a computer terminal, OPD gives direct access via telephone lines to information held on a private company network or mainframe computer, as well as to public information services. A messaging facility allows a user to send brief memo-type messages which are stored when the OPD is unattended.

BASIC is offered for users wanting to write their own programs.

According to a spokesman for ICL New Zealand, the price of a One Per Desk in Britain, converted to New Zealand currency, is \$4000 to \$6000. It is not clear what the retail price in this country would be, "but it is likely to be half the price of an equivalent personal computer system," said the spokesman.

In any case, the sale of this type of device will have to wait for the Post Office to relax its restrictions on the sale of devices that connect into the public telephone network.

Twenty One Per Desks have already been acquired by the New Zealand Post Office for evaluation.

Australia Telecom, the Australian telephone authority, will sell a modified version of the One Per Desk to Australian businesses.

The Australian version will be called "Computer-Phone" and will sell for \$Aust2950.

### First two sales

The first major sale of the New Zealand-made Poly 2 Learning System has been made to Trinity Schools in Masterton. The two systems will be used in St Mathews Collegiate School and Rathkeale College.

The purchase comprises two complete classroom sets of Poly 2 computers, with Proteus network controllers, for each school. A total of 23 Poly 2 computers, two Proteus computers and one printer will be supplied. As well as controlling the POLY 2 educational networks, the Proteus computers will provide for business and commercial programmes.

A wide range of educational courseware will be supplied, covering commerce, typing, biology, physics, mathematics, languages, music, geography and computer awareness.

# TANDY COMPUTERS DISCOUNTED!

	Normal Retail	Our Price
<b>TANDY MODEL 4</b> — 64K — 128K 128K + 2 Double-sided Drives	\$4250 \$4590	<b>\$3790</b> (includes RS232) <b>\$4150</b> (includes RS232) <b>\$4699</b> (includes RS232)
<b>TANDY 1000</b> (IBM CLONE I) — (MSDOS machine with 1 Drive (360K), 128K RAM expandable to 640K and 2 internal Floppies or a Hard Disk)	\$4250	<b>\$3499</b>
<b>TANDY 1200</b> (IBM CLONE II) — with 10 Meg Hard Drive, 1*320 Floppy, 256K RAM, Colour Board, Green Monitor — (IBM EQUIVALENT IS \$14,000)	\$10,450	<b>\$8990</b>
<b>LEADING EDGE</b> (IBM XT CLONE) with 10 Meg Hard Drive, Software TECHMAR Board (can add RAM by adding chips — no need to buy a new Mem. Board to increase RAM TO 640K)		<b>an UNBELIEVABLE \$7790</b>
<b>TANDY 2000</b> (Most Advanced 80186 MSDOS Computer) 128K, 2*Floppies, 256K 10 Meg. Hard Dr.	\$9950 \$14,240	<b>\$8890 \$12,390</b>
<b>TANDY Mod 100</b> (Portable Perfection) 8K 24K	\$1290 \$1690	<b>\$1050 \$1450</b>



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# Info technology survey

A national survey of information technology is being carried out by the D.S.I.R.

The survey will provide input to a discussion paper on the state and future prospects of information technology in New Zealand.

The paper, due to be published about the middle of this year, follows earlier DSIR discussion papers on electronics and biotechnology.

Information technology - quotes the introduction to the survey - is "the acquisition, processing, storage and dissemination of vocal, pictorial, textual

and numerical information by means of computers and telecommunications".

The department says there is little up-to-date information on many of the areas to be covered.

The survey, which aims to identify the current range of information technology applications in New Zealand and obstacles to their further development has been sent to 170 organisations. These include large and small companies, communications and community organisations, professional bodies, unions, government departments and educational institutions.

## New IBM compatible for under \$4000

A new IBM compatible computer the Tandy 1000, costing \$3995 (including a monitor and one disk drive) has been released here (although pricing may vary among the three Tandy agents in New Zealand).

The 1000 comes standard with 128K RAM (expandable to 640K) monochrome and colour graphics, printer, joystick and light pen interfaces, the DeskMate bundled software including word processor, spreadsheet, filer, appointment calendar etc. MS-DOS is also included.

A second disk drive will cost \$795.

A hard disk version, the 1200 with 10 megabyte hard disk, costs \$9995.

## Classroom CAVII

A new development in programmed learning, using a microprocessor to control a video tape recorder, has been developed in New Zealand by Barson Computers (NZ) Ltd and the Department of Media Studies at Christchurch Polytechnic.

Computer Aided Video Interactive Instruction (CAVII) is a series of modules and lesson programme presented to students for individual tuition.

The tutor arranges the programmes and files for the lesson which is transferred to a disk for use by a student.

Data is recorded on the number two audio track of the video control so that individual video frames can be found as needed.

## COMX care

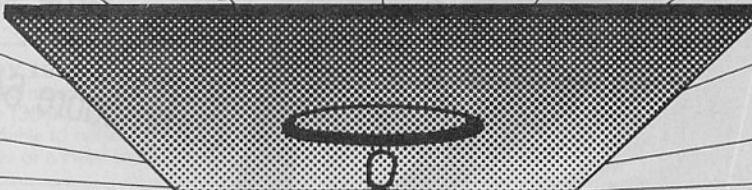
Check Point Computers (Private Bag, Tawa) can supply a range of software and peripherals for COMX 35 computers.

When Orchid Trading went out of the COMX market last year, COMX users were left wondering who they could refer to.

Check Point's managing director, Tony Pointon, visited the COMX manufacturer during a recent trip to Asia. As a result, he can now offer software, printers, disk drives and other COMX ware.

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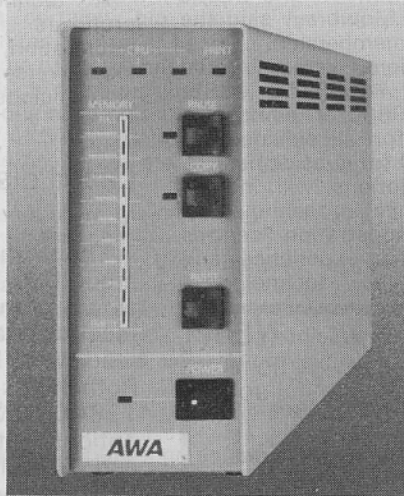
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AWD 2581



# Technology trust

By Pat Churchill

A trust has been set up to promote awareness of the importance, need and benefits of technology. The New Zealand Technology Advancement Trust was launched by the prime minister, David Lange, at the Beehive in late November.

Its objectives include improving technology transfer, fostering closer co-ordination of the research and application of technology in public and private sectors, and establishing New Zealand in the international community as an export nation based on technology.

The trust has initiated a Go Technology programme featuring an extensive campaign to facilitate transfer.

There will be a far-reaching series of technology promotions.

At the launching, Mr Lange said the trust had the encouragement and active support of his government. The trust's chairman, Sir John Mowbray, said the trust was soliciting membership.

Subscription options listed in the prospectus include \$4500 for 1985, then \$500 until 1989 for companies (\$500 and \$250 for subsidiaries) or \$1500 a year (\$500 for subsidiaries).

Technology promotions will include awards for excellence in technological developments, demonstration centres offering "hands on" experience and inspection of new technological

developments and a TV programme on technology and science. Technology Advancement Week will be a major nationwide promotion next August.

A technology inquiry service is proposed for the dissemination of information on current developments from overseas and New Zealand. Other plans include seminars and a newsletter.

## Laser disk technologies

They may always seem just around the corner but laser disks are slowly coming. From a review of the recent advances in technologies for read/write laser disks, read Edward Rothchild's article in *Byte* (October 1984). Developments speak of 2in options with 10 to 20 megabytes, and useful small versions of the gigabyte models using 12in platters. His top-of-the-head prediction is about 10 million drives in the USA by 1990.

## Sinclair Spectrum software

To get full use from a home computer you must have software, but a respectable range will cost far in excess of the computer. The only answer is to 'try before you buy', give the program a proper test at your leisure to see whether it performs as expected. You can then spend your money wisely, on software that uses your computer to the full, instead of getting stuck with a lot of fancy cassette inlays.

Kiwi Computer Services (P.O. Box 822, Taupo) offer this service to owners of the Sinclair ZX-Spectrum. You can hire software for a minimal weekly rate as well as buy new software and hardware. Latest releases are available, anything from arcade games software to alternative languages with quick, personal, efficient service. For more details see page 70.

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# Bits & Bytes buyer's guide

## Part 3: Computers over \$7000 — typical systems

Compiled by Gordon Findlay

In this, the third part of the *Bits & Bytes* Buyer's Guide, we reach the business machines. Perhaps not big enough to run the tax department, but certainly big enough for many businesses with a more limited customer base.

It's worth noting that some of these machines now cost less than \$7000! Thanks to price changes, and the reduction in sales tax, some machines originally classified between \$7000 and \$8000 are now under \$7000 — good news for us all.

How are these machines used? Let me count the ways — there are five of them:

- As "the computer" in a small to medium-sized enterprise, handling all the work with one machine.
- As a tool for performing one of the functions of an organisation — say for maintaining inventory — while other functions are handled by other machines.
- As "the computer" in one of the parts of an organisation, perhaps one office, or a branch, or a department such as advertising.
- As a personal tool ("productivity tool" is the jargon) for an individual business person.
- As a terminal to a larger computer, or as one part of a network of computers.

No doubt, you have thought of the sixth!

There is no point in repeating here what has so often been said about choosing a computer. The basic principles — know your application, software comes first etc — have been spelt out before. There are many similarities between these machines. Indeed, some claim to be compatible with (or clones of) others.

### Pricing

There are two ways of quoting prices in this industry. A bundled system includes all the hardware, and possibly some of the software, needed to get up and running in one price. An unbundled price means the individual components are separately priced. The degree to which prices are broken down varies. Some companies even price the cables separately. All these machines offer a range of options for such things as disk drives, colours, graphics resolution and memory size, so there really is no such thing as a single price for a computer. I have tried to quote a range of prices where possible, or give an indication of a starting price.

The combined effects of inflation, devaluation and the budget have resulted in some companies not having sent me up to date prices as this is written.



### Apple III

Overshadowed perhaps by the Macintosh — and the subject of a chequered career, the III is a desktop unit, with keyboard, processor and a mini-floppy drive in a single unit, which acts as support for the monitor. In practice, I imagine very few are used with just the in-built drive. A 5 megabyte hard disk, the Profile, is designed to sit between the main unit and the monitor; external floppy drives can be added.

The processor is the 6502A, with

extended addressing hardware. Standard RAM is 256K which may be expanded to 512K. A choice of operating systems is given: Apple's own, with the descriptive if not self-effacing name of "Sophisticated Operating System", or CP/M, with the addition of a Z80 processor card. SOS is a powerful operating system with quite a bit of software support; CP/M is, of course, very well known. The standard languages are "Business BASIC" and Pascal.

The keyboard includes a numeric pad, two function keys, and cursor movement

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<input type="checkbox"/>	Mosaic 64K for Atari 400/800 . . . . .	<b>P.O.A.</b>
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## BUYER'S GUIDE

### The second round-up

keys. The text screen is 24 lines of 80 characters, or 40 characters in colour, and there are various graphics modes in up to 16 colours.

Interfaces included are printer and RS-232, RGB and NTSC colour video, audio and joystick. Four expansion slots allow for the addition of other interfaces as needed.

This machine hasn't caught on to the degree it perhaps deserved. Overseas, there are all sorts of rumours as to why, and to the future of the machine. Surprisingly, the III seems more popular in Britain than the USA, but whether the Mac will change this remains to be seen.

Reviewed in *Bits & Bytes*, March 1983. Prices: with green screen and two disk drives (one external), around \$7100; with green screen and "Profile", around \$9500.

### Apple Macintosh

There have been a lot of trees cut down to write about the Macintosh, and every possible pun on Macs has already been made. But it is undoubtedly one of the most novel and most important introductions of recent years. This is the machine which the Lisa should have been.

While it is a small machine physically — it even has a carrying case built like a backpack — it has some very powerful hardware and software. The power of the 32-bit processor is used to present a picture to the user which is as unlike a traditional computer display as possible. The keynotes are icons, a desktop, graphics and the mouse.

Icons are little pictures — and pictures are easier to work with than words. The screen often pictures a desktop, with calculator, mailing baskets and all, accomplished through very high resolution black and white graphics. The mouse resembles a plastic cigarette box riding on a ball, with a button on top. Move the mouse and the cursor moves. Click the button to select the object pointed at. It isn't perfect, but can be better than a keyboard for some things.

The emphasis has been on major packages, many of which are being released. These are produced by organisations which can invest the time necessary to make the package fit into the desktop metaphor. The flavour has been of a "productivity tool" for the individual to use to get things done.

The Mac has been criticised for having only one drive internally — an external drive can be added — and too little

memory. The norm has been 128K, but now that the "Fat Mac" has arrived with 512K, I expect this to become most popular.

Reviewed in *Bits and Bytes*, March 1984. Price: with 128K, one drive, and Imagewriter printer, around \$7400 (post budget).

### Canon AS-100

AS-100 is a versatile machine, based on the 8088 processor, and running the MS-DOS, CP/M-86 and P-system operating systems. It is a square-looking unit, with detachable keyboard and a variety of disk drives which may be attached to one side of the monitor. The system is available in monochrome or colour, with graphics resolution of 640 by 400 pixels. RAM may be expanded from the basic 128K to 512K. As might be expected given the operating systems supported, many programming languages can be used.

Floppy disk drives. (both 5 and 8in) are available, as is an 8.5 megabyte hard disk. Most common interfaces are standard or can be added, and the AS-100 can be included in a local area network. Communications may be aided by software to emulate common IBM protocols. There is also an optional "pointing device", which sounds rodent-like to me.

Software includes the Canonbrain II, an update of an earlier product, which is described as an "information manager". It includes a spreadsheet, business graphics package and database filing system in an integrated package. Other business application software has developed for general and more specific purposes.

Price: varies with configuration, from around \$9900 with a printer (pre-budget).

### Casio FP-6000S.

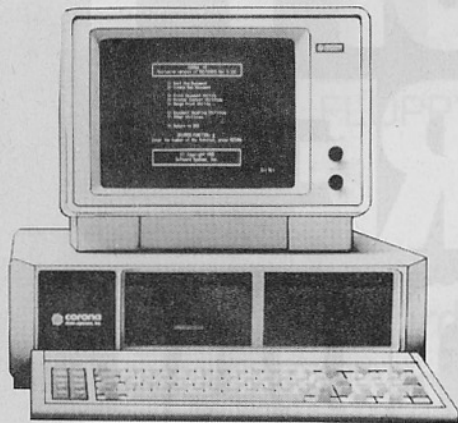
The FP-6000S is a 16-bit machine, with unusual styling. The system unit is a vertical format box, with a matching box for the disk drives. The keyboard is a separate, long and low unit, and the monitor is separate again. The vertical styling looks refreshingly different.

The processor is equivalent to Intel's 8086, but is a proprietary type. RAM is 256K, expandable to 768K. Addition of extra video memory permits use of high resolution graphics in colour. The mother board has three expansion slots, one of which is apparently occupied by the disk drive controller. The others may be used for hard disk, additional RAM, RS-232 interface, etc. A parallel printer interface is standard equipment; serial printers will require the RS-232.

Either eight or 5.25in floppy drives are available; as are 10 megabyte Winchester. The operating system is MS-DOS.

Prices: depend on the drives selected and whether colour or monochrome display, but range up from about \$8000.

## BUYER'S GUIDE



### Corona

Corona produces a number of IBM-PC compatible machines — the PC22 which is a desktop; the PPC22, which is a portable version; and a version with a hard disk (PC-HD).

As is to be expected, to be an IBM compatible machine, the PCs have an 8088 processor, with an increased 256K or RAM now standard, a detachable keyboard, green screen, an IBM-type parallel printer interface, serial interface, and four expansion slots. The text display is 25 x 80, or 640 x 325 graphics. The standard display is monochrome, but colour display drivers are available for the IBM. The video display has reverse, high-intensity, underlining, and blinking attributes.

The operating system supplied is MS-DOS, with GW-BASIC ("Gee Whiz BASIC", known to IBM as BASIC-A). Other software included are Multimate (a word processor) and a self teaching package, PC Tutor.

The disk drives (5.25in) each provide 320K of storage. The PC22 and PPC22 have two, the PC-HD has one, and a 10 megabyte Winchester disk. RAM memory may be expanded up to 512K, which is rapidly becoming a necessity for the integrated packages now in vogue, but would have been regarded as science fiction not long ago.

Prices: PC22, \$6799; PPC22, \$6661; PC-HD \$10,313.

### Digital

The Digital personal computers cannot really be summed up in brief. These are high-end systems, which can be tailored very much to the requirements of the buyer, and his pocket. One thing is clear — they are intended for the serious user, not for the games addict!

The Rainbow 100 is a dual processor machine, with a Z80 and an 8088 to allow the use of CP/M and CP/M-86, giving the best of both eight and 16-bit worlds.

It may be used as a standalone desktop machine, or as a terminal — a very smart terminal! The display is from



80 to 132 characters wide, and very high quality. The monitor screen may be tilted and rotated to suit the user. High resolution colour graphics (800 x 240) are provided. The disk drive has a capacity of 400K bytes, on 5.25in disks. The drive has two openings, for two diskettes using a common drive mechanism. Another drive may be added, giving 1.6 megabyte capacity on four diskettes.

The basic unit has 64K of RAM, expandable to 256K, and it seems most users expand at least some of the way. The keyboard is large, but has a low, streamlined shape. It has to be large to accommodate all the keys — 105 of them! There are numeric keys, editing keys, and more than 30 function keys, some of which are predefined. One of the keys is labelled HELP, and it is hoped the software produced for the Rainbow will fully support this key.

The professional series is a more expensive system, with the Digital F11 CPU, noted for its number crunching power. Memory is an impressive 512K of RAM. There is also a high-resolution graphics option, with 256 colours, and multitasking.

Reviewed in *Bits and Bytes*, April 1984. Prices: difficult to quote — in this range, you get what you need, and you pay for what you get!

### Eagle

The Eagle machines are a line of IBM compatibles, in both desktop (the PC Plus series) or portable (the PC Spirit series) formats. The Plus versions are compact units (one with two minifloppy drives, the other with a 10 megabyte hard drive) with a detachable keyboard and monitor on top. Serial and parallel interfaces are standard; graphics in monochrome or colour are options. A full keyboard has a numeric pad, and 10 programmable function keys.

The PC Plus has 128K of RAM (expandable to 640K), with one or two floppies each with a capacity of 360K formatted; the PC XL has 256K of RAM, also expandable, and the hard drive replacing one floppy. The Spirit and Spirit XL are equivalent, but in standard portable packaging, with an integrated nine inch green screen. The graphics board, giving 640 x 200 resolution, is

included; colour is optional.

Reviewed in *Bits and Bytes*, August 1984. Price: depending on configuration, from around \$6500 up.



### Hewlett-Packard 150

This is an MS-DOS machine, with the usual number of features expected from HP equipment. Physically, it is a small machine. The whole thing, with 256K of RAM (expandable to 640K), three I/O ports, two expansion slots, an optional internal printer, and dual 3.5in microfloppies, occupies just one square foot.

The detached keyboard has many special keys. The screen is a 9in high resolution green monitor, with graphics mode offering 512 by 380 pixels. An internal clock displays the time on the screen continuously. A large number of extras are available, including regular 5 and 8in floppy disks, hard disks, plotters, printers and so on. The machine can cope with up to 12 disk drives at once!

The most advertised, and most novel aspect of the 150 is its "touch screen". Touching the screen's surface interrupts a grid of infra-red beams. This can be sensed by the operating software, and appropriate action taken. This is very easy to use, and unlike a mouse or light pen there is no other object to manipulate or misplace — just your finger.

Reviewed in *Bits and Bytes*, March 1984. Prices: range from \$7745.

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Games available for weekly hire for the following computers:

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The ideal thickness of the magnetic coating is 2.5 micromillimeters. At Maxell we are very proud to achieve that dimension with plus or minus 0.1 micromillimeters on every disk.

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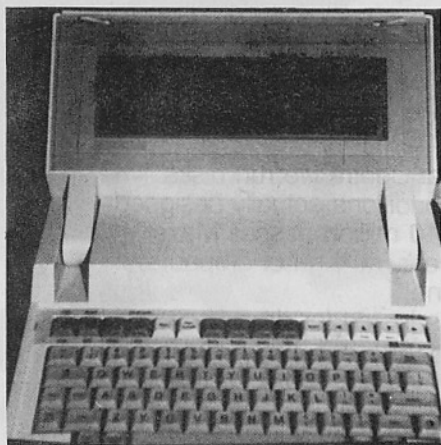
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## The second round-up



### Hewlett-Packard 110

A portable — but what a portable. It's a small machine physically, with a fold-up, 16-line LCD screen, with a 16-bit processor, 256K of user memory and Lotus 1-2-3 and Memomaker built in! Two electronic disks are built in — one has MS-DOS, Lotus 1-2-3 and other software; the other is used for storing programs and data. A computer with 383K of ROM cannot be ignored!

External microfloppies may be added if required. Each 3.5in unit can store up to 710 kilobytes — quite remarkable for a unit which can run on battery power in the interests of portability.

Lots of interfaces are standard and others can be added on, and communication with other systems is allowed for in both the hardware and the resident software.

Reviewed in *Bits and Bytes*, November 1984. Price: from \$6520.



### IBM

The entry of IBM into the microcomputer market certainly caused a stir. The advent of the IBM-PC (for Personal Computer) gave rise immediately to a major industry in third

party hardware and software, to the extent that the PC had, after just a few months, more support available than almost any other computer you can name. Just look at the size and number of the specialist magazines devoted to the PC!

This was, of course, principally due to the IBM name. The Big Blue has built a first class, but not technically adventurous, personal computer. The basic parameters are quickly told:

16-bit processor (8088) with provision for the auxiliary mathematics processor (8087); 64 to 544K of RAM, 40K of ROM, a range of disk drives. The standard RAM size is now 256K. The keyboard is detachable and has caused controversy in some quarters, not because it is no good (it's excellent) but because it follows the European standard rather than the American, which was started by IBM with its Selectric typewriters.

The PC has an 80 character by 25 line text screen in colours, and up to 640 x 200 graphics resolution (monochrome; 320 x 200 with four colours.) The standard interfaces are serial, parallel printer, video (monitor or RGB), and communications. There are five expansion slots, and the number of products available to occupy them is enormous.

As for software, the PC supports three operating systems — CP/M-86, the USCD P-system, and PC-DOS, alias MS-DOS (for Microsoft). This gives any amount of software; the list of packages is endless, and almost all serious, and not so serious, software being produced is obtainable in an IBM version. The list includes a lot of alternative languages and operating system options too. The same applies to hardware options as well. In other words, you aren't buying a computer, you are buying into a major sub-industry.

The PC has larger brothers, the XT and AT, with hard disks and other goodies, and a travelling cousin, the PC-Portable.

The Portable version was introduced after many of the "compatibles" appeared in portable, or transportable, versions. The only differences are in packaging and weight.

An important application of the PC is in communication, and this is an area we can expect to see increasing in importance. PCs can be networked to each other with almost no limit to numbers, and can also be used to communicate with other (larger) computers.

PC reviewed in *Bits and Bytes*, April 1983; the Portable in October 1984. A typical price, for comparison purposes only: system unit with 256K of RAM, two disk drives, and monochrome screen, about \$7807, \$8714 with colour; the portable, again 256K, two drives, monochrome, \$8267; the XT, which has a 10 megabyte hard disk, from around \$12,800, depending on options. The configuration you need, as with many of these computers, can really be determined only after detailed consideration of your needs.

## Intertec Headstart

A very recent arrival, the Headstart has both eight and 16-bit processors, thus trying to cover the entire software field. It's a compact unit too, with a low profile video unit having a disk drive stuck on one side, and the processor etc. in the base. The drive is a 3.5in microfloppy, single or double sided, with up to 1 megabyte of storage (unformatted — less than this usable). An elegant keyboard has 105 keys. All the usual interfaces are built in, as is 128K, 256K, 512K or 1 megabyte of RAM. Memory organisation is under software control, and the RAM may be partitioned into RAM disks.

Operating systems supported are CP/M, for eight-bit operation, and MS-DOS for 16-bit. A special operating system is available for networking up to 255 machines in a local area network.

Price: depending on configuration, from around \$10,000.



### Morrow MD II

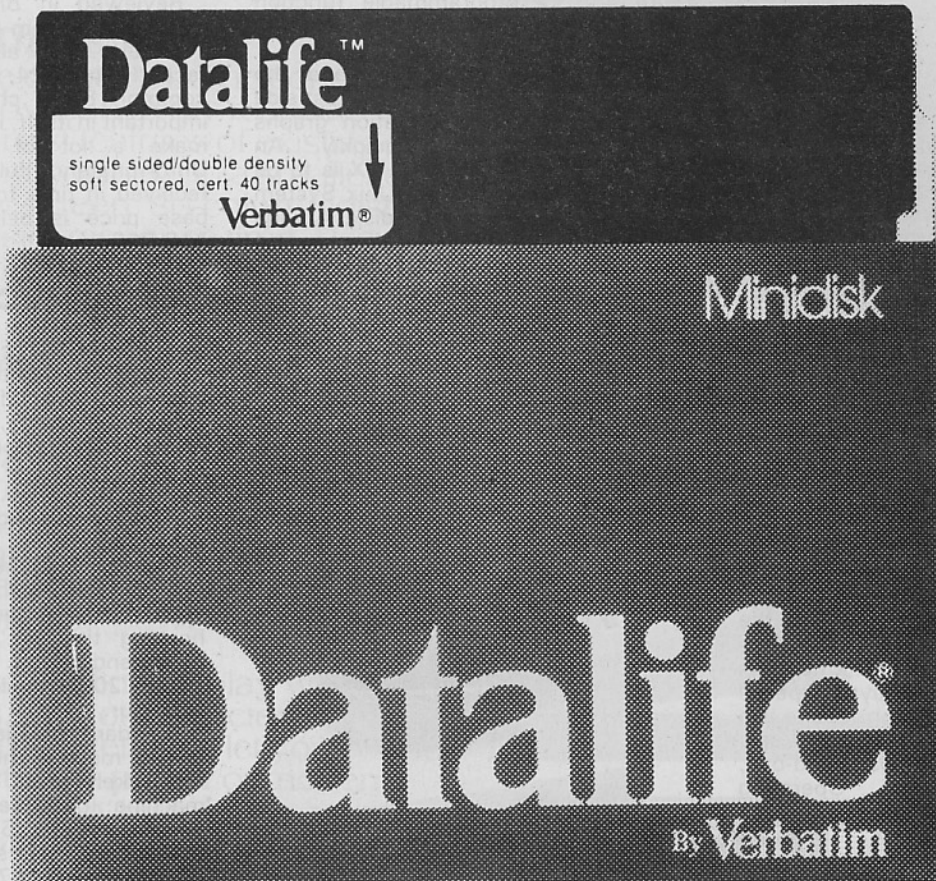
The MDII is similar to the floppy based Morrow machines. Up to two hard disks, each with 11 megabytes of storage, and two floppies can be supported, although only one of each internally. It's a CP/M machine (CP/M 3 is standard), with 128K of RAM, serial and parallel ports, and a terminal with a 30cm green screen, programmable function keys, numeric keyboard etc. Half the RAM functions as a small RAM-disk, giving a good speed boost.

Software bundled with the MD-II includes CP/M, MBASIC, a word processor, spelling checker, database manager, SuperCalc, the Pilot language etc.

A second processor can be added to run MS-DOS, for around \$1700.

Reviewed in *Bits & Bytes*, December 1984. Price: around \$8500.

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## The second round-up

### NEC APC II

If all the favourable comment on the APC (Advanced Personal Computer) were stretched end to end, it would reach the factory I'm sure. The APC II was the first of the family. It comes in three versions: monochrome with one or two 8in floppy, or colour, with two. The CPU is the 16-bit 8086; standard RAM is 128K, expandable to 640K. A parallel printer, and a serial (communications) interfaces are standard, and numerous other options can be added. A music generator and a hardware clock are included.

Each of the drives has a capacity of 243K or 1.2 megabytes, depending on the type chosen. The display is 25 lines, plus a status line, with a number of special characters, and user-definable characters. If a graphics option is added, it gives a 640 x 475 resolution display, with eight colours (unless the monochrome display is chosen!) The keyboard is detachable, with a numeric keypad, 22 function keys, special graphics keys, and provision for the use of a second, user defined character set.

There are a lot of hardware add-ons, and software packages. Operating systems supported (directly) are CP/M-86, and MS-DOS.

Reviewed in *Bits and Bytes*, October 1983. Price: with two 8in disks, \$9675.



### NEC APC III

The APC III is an MS-DOS machine, using mini-floppy drives rather than 8in as in the APC II. It is a recent introduction and I have seen it only briefly. But it seems stylish, and is smaller than its forerunner. Memory is from 128K to 640K, with a low-profile keyboard, built-

in serial and parallel ports, one or two 640K drives and options include a 10 megabyte hard drive, either internal or external.

Monochrome graphics is standard with 640 by 400 resolution; and (with the right monitor) coloured text; colour graphics requires an additional board. There are 12 programmable function keys, each of which has five separate modes.

The screen is very clear, and the machine is claimed to be on the fast side — certainly the demonstration graphs were developed very quickly. An operating system called PC-UX is to be available, and is based on Unix System III. This will require a hard disk. A wide range of software is claimed.

The APC III is a recent introduction, and is sure to be reviewed in *Bits and Bytes*. Prices: with two floppy drives (720 KB), 128K, monochrome screen and graphics and MSDOS, \$6645; with one floppy drive and a hard disk, 256K RAM, \$9714; colour graphics board, \$483; 128K memory expansion board, \$813.



### Olivetti

The Olivetti M20 is interesting in its use of the Z8000 chip, which is the least common 16-bit processor. With keyboard and drives in a unit looking rather like a typewriter, with a monitor supported on a circular column, so as to rotate and tilt for best viewing angle, the M20 has a very striking appearance.

Standard memory size is 128K of RAM, expandable with plug-in boards to 512K. The keyboard is not detachable, has a numeric pad, and is completely programmable. The video display may be monochrome or colour, and is capable of graphic displays with a 512 x 256 resolution. The colour version has eight colours. In text mode, the display may be either 25 x 80, or 16 x 64 as required.

Most users seem to choose two disk drives, although apparently the M20 can be had with just one. These are 5.25in double sided units, giving 340K capacity each. The M20 can be upgraded with a 9 megabyte hard disk.

Olivetti has its own operating system,

PCOS, with BASIC and Pascal languages. Alternatively, CP/M-86 or MS-DOS can be used. Serial and parallel interfaces are supported by the languages, as is the graphics display. An instrumentation bus, and a wide range of scientific and engineering peripherals are also available.

Reviewed in *Bits and Bytes*, June 1983. Price: from \$7000.

Olivetti has also introduced very recently the M24, which uses the more common 8086 chip. While that isn't important in itself, it should, presumably, make a lot of software available. Unfortunately, full details were not received in time for this guide, but the base price is believed to be around \$12,000.

### Panasonic Sr Partner

Another IBM compatible, this is a portable computer, complete with monitor, two disk drives, 40 or 80-column screen, and a built-in thermal printer above the monitor. This is likely to be of most use "on the road" rather than in the office, but a regular printer can be added using the built-in parallel or serial ports.

Closed, it forms a neat square box with a built-in handle. Opened, the keyboard is detached, the main unit housing the 9in green monitor, disk drives and printer. Graphics resolution is 640 by 200 in monochrome, 320 by 200 in colour.

Standard RAM is only 128K, which is low for many of the integrated programs most likely to be used on an IBM-type machine; it can be expanded by plug in boards up to 512K. Naturally, the operating system supplied is MS-DOS. Price: around \$7200, depending on options.

### Sharp

The Sharp MZ-3541 is a business machine, using a Z80 processor as the main CPU, with another for handling peripherals, and a special processor doing duty in the keyboard. The keyboard is detachable, and has a full complement of numeric keypad, cursor and user definable keys etc.

The 12in screen has a text display of 25 lines, is 80 characters wide, and has a graphics resolution of 640 x 400. The version of BASIC used provides many graphic commands, including colour commands, presumably for an optional colour monitor. There is a CRT interface, as well as the serial and parallel ones; an interface for 8in drives is an optional extra.

Each of the built-in minifloppies has a capacity of 320K; RAM is 128K, expandable to 256. A calendar-clock function is also built in. Space is left for up to 32K of ROM for use by peripheral devices. A proprietary operating system, FDOS, or CP/M may be used.

Price: around \$7000, includes a dot matrix printer.



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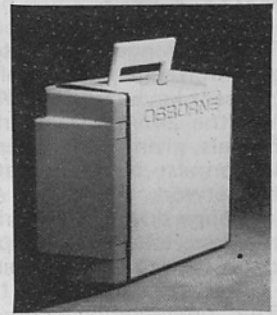
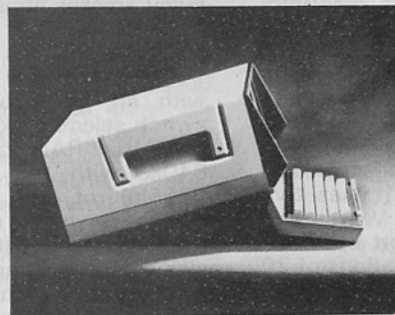
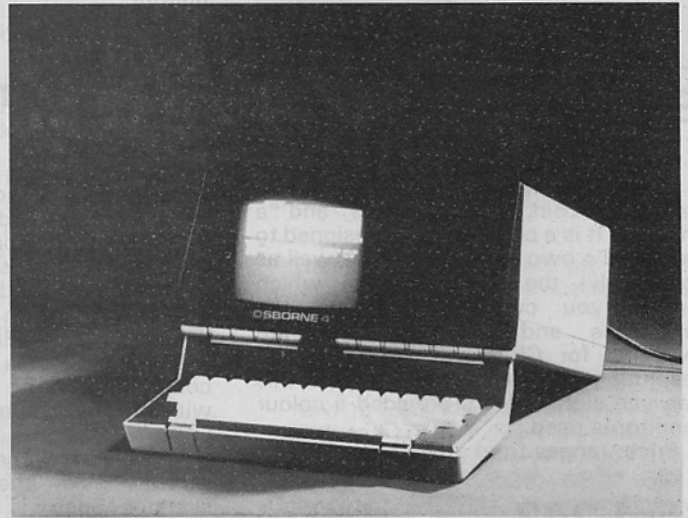
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## BUYER'S GUIDE

# The second round-up

## Sord M23

The M23 resembles a typewriter, with a separate box containing two disk drives (5.25in, 1 megabyte) and a monitor. It is a compact unit, designed to use Sord's own PIPS system, as well as (optionally) the SB-80 system which "gives you compatibility with the languages and programs that are available for CP/M". There is a high resolution graphics capability, and this can use eight colours provided a colour monitor is used.

Price: ranges from around \$6300 up.

## Sord 243

The 243 range is at the top end of the eight-bit range. A small unit with detached keyboard, 192K to 1Mbyte RAM, the 243 can support up to three terminals, giving a four user system. The 243 can also be incorporated in a local area network. The Mark 41 uses two mini-floppy drives, the Mark V uses two 8in drives; either can support up to 80 Mbytes formed from combinations of 20 or 7.9 Mbyte hard drives.

The operating system included in Sord's own PIPS. Various versions of BASIC, Fortran and COBOL are supported, and a special graphics addition to the language repertoire. The colour model provides 16 colours.

Price: ranges from around \$9500.

## Sord M68

The M68 is a 16-bit machine, built around a 68000, with a Z80 as well. RAM ranges from 256K to 1 megabyte; the same disk options as for the M243 are supported.

Operating systems supported include CP/M-68K, the USCD-P system, and

Sord's own KDOS in 16-bit mode; and SB-80 in eight-bit mode. An 8088 card can be added for more software compatibility. Networking is also a feature.

Price: ranges from \$11,500 up.

## Sperry Personal Computer

The Sperry personal computer family comprises six models, differing only in the type of monitor and disk capacities. The Sperry PC is not only software compatible with the IBM PC but also accepts expansion boards and add-ons designed for the IBM.

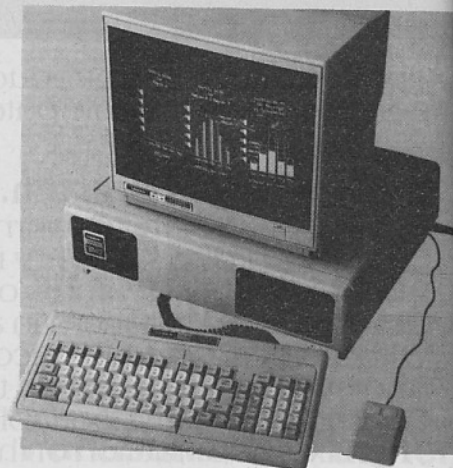
The Sperry name is one of the oldest in computing, dating from the late 1940s with the first commercial computer, the UNIVAC. Sperry has been primarily involved in the largest systems, and only recently made the move into smaller systems. Sperry is not as well known as many smaller firms, and is, in fact, the second largest manufacturer of computer systems in the world.

The PC is a fairly standard looking unit, with an 8088 processor running at switch selectable clock rates of 7.16 or 4.77MHz. RAM ranges from 128K to 640K, with two 360K floppy disks (5.25in) or one floppy and a 10 megabyte hard drive. A real time clock/calendar (with battery backup) is also standard. There are several optional graphics resolutions to choose from and up to 256 colours may be chosen from (16 with the "medium" resolution monitor).

The six models are the Model 20 (monochrome monitor, two floppy drives), Model 25 (med. resolution colour, two floppy drives), Model 30 (high resolution colour, two floppy drives), and the Model 40, 45 and 50 which are the same respectively but with a hard disk replacing one of the floppies.

The standard operating system is MS-DOS; CP/M-86 and the UCSD P-system are also available. GW BASIC is supplied; many other languages are options. There is a large applications software base.

Price: typical system ranges from around \$8000.



## Tandy 2000

Not an IBM compatible! The Tandy machine does operate under MS-DOS, but is not billed as being like the IBM — it is advertised as better of course! The 2000 uses an upgraded processor, the 80186, which is more powerful than the 8088/8086 but compatible, in the sense it can accept their code unaltered. This has allowed a lot of the major programs released for the other machines to be configured rapidly for the Tandy.

In appearance fairly standard, it has a detached keyboard, separate monitor and a box containing two floppy disks, or a 10 megabyte hard disk. The main box may be put out of the way on a floor stand if required. Further expansion is by slide-in boards, with four slots being supplied.

Internally memory starts at 128K, expandable to 768K. The floppies have a formatted capacity of 720K, not bad for 5in drives. Graphics may be monochrome or colour, either requiring the addition of expansion boards. Naturally a mouse is also available.

Software availability appears to be very good, as might be expected under MS-DOS.

Reviewed in *Bits and Bytes*, August 1984. Prices (post budget); with two floppies, monochrome monitor, \$8595.

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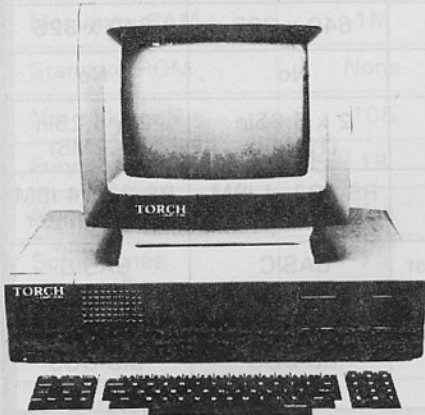
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# The second round-up

## Televideo 1605

Also known as the Tele-PC, this is a desktop version of the portable TPC-II, mentioned in the last part of this guide. It has a 14in monitor, 128K memory, with expansion slots which will accept most boards designed for the IBM. Graphics capability is built in, as are RS-232 and Centronics interfaces. Naturally, this is a MS-DOS machine. The screen resolution is very good indeed, and it seems to be compatible with most software. Price: ranges from around \$6600 up, depending on configuration.



## Torch

Torch computers have two lines — a well known series of second processors for the BBC microcomputer, and a line of business computers.

The Z80 second processor system which connects to a BBC B via the "tube" gives the BBC the ability to run programs under the CPN operating system, which is comparable with CP/M, and "runs CP/M programs normally, but has many advantages". As it uses the device drivers for the original 6502 processor, the implementation is very compact, and uses little memory. Of course, many of the special features of the BBC can be accessed, such as the ROM basic, colour, graphics and so on.

The Z80 extension processor, with additional RAM and system ROM, and considerable utility and applications software (word processor, spelling checker, spreadsheet and filing system) is priced at \$964. The same, with a twin floppy disk pack (400K each) is \$2533, or with a 20 megabyte hard disk \$5903.

The hard disk version may be had with 256K of RAM, and a 68000 processor in addition. This is priced at \$7470, or may be had with full Unix system III, for \$8808. Naturally, all these may be incorporated in networks.

Another set of second-processor options gives the BBC the ability to run MS-DOS and IBM compatibility. The cost Graduate G400 package has an 8088 processor, 128 or 256K of RAM, a double sided disk drive, power supply, two IBM expansion slots and MS-DOS (customised). The projected price is \$2000, \$2200 with 256K. The G800 has two disk drives, and is projected to cost \$2500 (128K) a \$2800 with 256K.

These are expected to be available by the time this issue is published, but prices were not firm at the time this went to press.

The Torch C-series micros have a variety of models, with either twin floppy drives, or with a 20 megabyte hard drive. All feature colour graphics, the CPN operating system mentioned above, serial, parallel and network ports, a built in modem and a variety of other interfaces. Software is bundled with the system, as listed above. A 68000 processor may be added to either for running Unix operating system; the USCD P-system is also supported.

All of the C series may be incorporated in Torchnet or Echonet networks. Prices range from \$7974.

Torch also supplies diskless work stations for incorporation in network arrangements, and the 725 triple processor system, which is outside the limits of this survey.



## Zenith Z150PC

The Zenith company is part of the corporation which brought the world Heathkits. This latest offering is billed as a "totally IBM compatible" desktop machine. This means most expansion cards for the IBM PC should work with the Zenith.

The main unit houses 320K of RAM, colour graphics card and so on, with all

the usual interfaces, and contains single or dual floppies, with provision to plug in a hard disk in place of one. There are seven modes for video output, with four different type fonts.

MS-DOS is the operating system; all IBM software seems to work just fine.

Reviewed in *Bits and Bytes*, December 1984, Price: ranges from around \$7500.

## Part 2 update

These machines missed part 2 of the guide, published in the December issue.

## Apricot

New models in this brand have been introduced. All are MS-DOS machines, with 8086 processor, 3.5in micro-floppies, with MS-DOS, CP/M 86 on Concurrent CP/M, communications interfaces and software, provision for a mouse graphics option and many others.

The F1 is a small, compact machine, with 256K of RAM, a double sided drive, cordless infra-red keyboard, colour graphics and bundled software. The E (economy?) model has half the amount of RAM and a single sided drive.

The AP1 is a portable, with full size flat screen, cordless keyboard, 256K of RAM and a single or double sided drive. The AP2 adds colour, the AP4 has both colour and 512K of RAM.

The desktop range previously available now has four models, differing in RAM size and disk drive options. The Apricot xi-5 has a 5 megabyte Winchester, the xi-10 has 10 megabytes. If you don't need the hard drive, the PC1 has a single sided drives; the pC4 has two double-sided drives, totalling 1.4 megabytes, totalling 1.4 megabytes.

Price: ranges from about \$4200 to round \$12,000.

## Bondwell.

The Bondwells are CP/M machines, with two drives, in portable form. The keyboard forms the front of the carry case, in the manner originating with Osborne and Kaypro, and now familiar to all. A plastic case houses a 9in amber monitor, two slimline drives, two serial and a parallel port, voice synthesiser etc. The keyboard is full size, with programmable keys, numeric pad, editing keys and cursor control keys.

There are two models. The Bondwell 12 has 64K of RAM, and each drive has a formatted capacity of 180K. The model 14 has 128K RAM, and the double sided drives are twice the capacity.

The model 12 supports CP/M 2.2, the model 14 CP/M 3 (CP/M plus). Each comes with Wordstar, Mailmerge, CalcStar, DataStar, ReportStar, and accounting software.

Prices: model 12, \$3495; model 14, \$4495.

# Computers: over \$7000

NAME	Apple III	Apple Macintosh	Canon AS100	Canon FP6000	Corona PC2	Corona PPC
Type	Desktop	Desktop	Desktop	Desktop	Desktop	Portable
Processor	6502B @ 2MHz	68000 @ 8MHz	8088 @ 4MHz	8086 @ 8MHz	8088	8088
Standard RAM	256K	128K	128K	256K	128K	128K
Maximum RAM	512K	512K	512K	768K	512K	512K
Standard ROM	4K	64K	8K	None	8K	8K
No. of keys	74	59	93	94	83	83
Function keys	No	No	12	10		
Numeric keys	No	No	Yes	Yes	Yes	Yes
Screen lines	24	Pixel controlled	25		25	25
Columns	80	18 x 91max	80		80	80
Resolution	640 x 240	512 x 342	640 x 400	640 x 400	640 x 325	640 x 325
Colours	16	No	Optional	Optional	No	No
Disk drives	2 x 5.25in (286K)	1 x 3.5in (400K)	2 x 5.25in (1.2MB)	Various	2 x 5.25in (1.2MB)	2 x 5.25in (1.2MB)
Interfaces	RS-232	Serial (2), 2nd disk & mouse	Centronics, IBM & Networking	Serial parallel	RS-232, 4 IBM slots, printer	RS-232, 4 IBM slots, printer
Languages	BASIC & most others	BASIC, Pascal, LOGO & FORTH	BASIC, Pascal, COBOL, FORTRAN	BASIC & most others	BASIC	BASIC
Operating systems	SOS & CP/M	Proprietary	CP/M-86 & MS-DOS	MS-DOS	MS-DOS	MS-DOS
NAME	DEC Rainbow 100	Eagle PC Plus 1	Hewlett Packard HP 110	Hewlett Packard HP 150	IBM PC	IBM PC Portable
Type	Desktop	Desktop	Portable	Desktop	Desktop	Portable
Processor	Z80A & 8088	8086 @ 4.77MHz	8086 @ 5.33MHz	8088 @ 8MHz	8088 @ 4.8MHz	8088 @ 4.77MHz
Standard RAM	128K	128K	272K	256K	64K	128K
Maximum RAM	832K	640K	272K	640K	512K	512K
Standard ROM	24K	None	384K	160K	40K	64K
No. of keys	103	84	75	107	83	83
Function keys	16	10	8	12	10	10
Numeric keys	Yes	Yes	No	Yes	Yes	Yes
Screen lines	24	25	16 LCD	27	25	25
Columns	80/132	80	80 Display	80	80	80
Resolution	800 x 240	640 x 200	128 x 480	512 x 390	640 x 200	640 x 200
Colours	Optional	Optional	No	No	Optional	Optional

# Computers: over \$7000

Disk drives	2 x 5.25in (800K)	1 x 5.25in (320K)	Optional	2 x 3.5in (528K)	1 x 5.25in (320K)	1 x 5.25in (360K)
Interfaces	Printer & RS-232	RS-232 (2) Parallel	HP-IL, RS-232, Desk-top Link	RS-232 (2) & HP-IB	Centronics	Expansion Slots (5)
Languages	BASIC & C	BASIC & most others	BASIC & FORTRAN	BASIC, Pascal, COBOL, FORTRAN	BASIC & most others	BASIC & most others
Operating systems	CP/M-86 & MS-DOS	MS-DOS & CP/M	MS-DOS	MS-DOS	PC-DOS. Also CP/M & UCSDp	PC-DOS, UCSDp
<b>NAME</b>	<b>Intertec Headstart</b>	<b>Kaypro Model 10</b>	<b>Morrow MD 11</b>	<b>Morrow MD 5E</b>	<b>NEC APC II</b>	<b>NEC APC III</b>
Type	Desktop	Desktop	Desktop	Desktop	Desktop	Desktop
Processor	8086 @ 8MHz, Z80A @ 4MHz	Z80A	Z80A @ 4MHz	Z80A @ 4MHz	8086 @ 5MHz	8086 @ 8MHz
Standard RAM	128K	64K	128K	128K	128K	128K
Maximum RAM	1M	64K	128K	128K	640K	640K
Standard ROM	None	None	8K	8K	4K	32K
No. of keys	105	77	91	91	108	102
Function keys	18	No	9	9	22	12 x 5
Numeric Keys	Yes	Yes	Yes	Yes	Yes	Yes
Screen lines	25	24	24	24	25	25
Columns	80 or 132	80	80	80	80	80
Resolution		400 x 216	720 x 288	720 x 288	640 x 475	640 x 400
Colours	—	No	No	No	8	8
Disk drives	1 x 3.5in (500K or 1MB)	1 x 10MB & 360K	1 x 11MB 1 x 384K	1 x 5MB & 384K	1 or 2 x 8in (1.2MB)	2 x 5.25in (640KB)
Interfaces	Serial, parallel, networking	Centronics RS-232 (2)	RS-232 & Centronics	RS-232 (2) & RS-422	RS-232 Parallel	RS232
Languages	BASIC, Pascal, most others	BASIC	BASIC & PILOT	BASIC & PILOT	BASIC, Pascal & most others	BASIC, Pascal, & most others
Operating systems	MS-DOS, CP/M	CP/M	CP/M	CP/M	CP/M-86, MS-DOS UCSDp	MS-DOS
<b>NAME</b>	<b>Olivetti M20</b>	<b>Olivetti M24</b>	<b>Panasonic Senior Partner</b>	<b>Sharp MZ 3541</b>	<b>Sord M23F</b>	<b>Sord 243</b>
Type	Desktop	Desktop	Portable	Desktop	Desktop	Desktop
Processor	Z8001 @ 4MHz	8086 @ 8MHz	8088 @ 4.77MHz	Z80A @ 4.0MHz	Z80A	Z80B @ 6MHz
Standard RAM	128K	128K	128K	128K	128K	192K
Maximum RAM	512K	384K	512K	256K	128K	1MB
Standard ROM	Bootstrap	16K	16K	8K	None	None
No. of keys	72	83	83	92	91	108

# Computers: over \$7000

Function keys	3	18	10	15	7	15
Numeric keys	Yes	Yes	Yes	Yes	Yes	Yes
Screen Lines	25	24	25	25	25	25
Columns	80	80	80	80	80	80
Resolution	512 x 256	640 x 200	640 x 200	640 x 400	640 x 256	640 x 400
Colours	8	Optional	Optional	8	Optional	16
Disk drives	2 x 5.25in (320KB)	2 x 5.25in (1.4MB)	2 x 5.25in (360K)	2 x 5.25in (1.3MB)	2 x 3.5in (2.4MB)	2 x 5.25in (2.4MB)
Interfaces	RS-236, Parallel	RS-232 & Centronics	RS-232, RAM Port, Parallel	Centronics, RS-232	RS-232 (2) & Centronics	RS-232 (4) Centronics
Languages	BASIC, Pascal	BASIC, Pascal, FORTRAN, COBOL	BASIC & most others	BASIC	BASIC, Pascal, FORTRAN, COBOL	BASIC, COBOL, FORTRAN, Pascal
Operating systems	PC-DOS, CP/M-86 MS-DOS	MS-DOS, Con-current CP/M	MS-DOS	FDOS & CP/M 80	PIPS, SB 80	PIPS, SB80
<b>NAME</b>	<b>Sord M68</b>	<b>Sperry PC</b>	<b>Tandy Model 2000</b>	<b>Televideo TS 1605</b>	<b>Torch CF 500</b>	<b>Zenith Z 150</b>
Type	Desktop	Desktop	Desktop	Desktop	Desktop	Desktop
Processor	68000 @ 10MHz	8088 @ 8MHz	80186 @ 8MHz	8088 @ 5MHz	Z80A @ 4MHz & 650	8088
Standard RAM	256K	128	128K	256K	64K	128K
Maximum RAM	1MB	640	768K	256K	256K	640K
Standard ROM	None	None	1K	8K	16K	8K
No. of keys	92	84	90	85	102	86
Function keys	7	10	12	10	19	10
Numeric keys	Yes	Yes	Yes	Yes	Yes	Yes
Screen Lines	25	25	25	25	25 or 32	25
Columns	80	80	80	80	80	80
Resolution	640 x 400	640 x 200	640 x 400	640 x 200	640 x 256	640 x 200
Colours	16	16	8	Optional	16	Optional
Disk drives	2 x 5.25in (2MB)	1 x 5.25in (320K)	2 x 5.25in (1.4MB)	2 x 5.25in (1MB)	2 x 5.25in (400KB)	2 x 5.25in (1.4MB)
Interfaces	RS232 (2), Centronics, IEEE-488	Parallel, Comms, 7 expansion slots	RS-232	Centronic, IBM slot, RS-232	RS423, Centronics Network, A/D	RS-232 & Centronics
Languages	BASIC, most others	BASIC, Pascal, & most others	BASIC, Pascal & FORTRAN	BASIC & most others	BASIC & most others	BASIC
Operating systems	CP/M-68K, USCDp, KDOS, SB80	MS-DOS, CP/M-86 & UCSDp	Concurrent CP/M, MS-DOS	TELE-DOS (MS-DOS compatible)	CPN, Torchnet VSCDp	MS-DOS

## WANG PC

# A BMW rather than a Cortina

By John Slane

Wang is an international name in medium and large office computers and the company has paid special attention to the field of word processing which includes dedicated word processing units. Readers, who have seen Wang's sophisticated print and TV advertising, would expect the Wang PC to be a classy unit in keeping with the image the company tries to project.

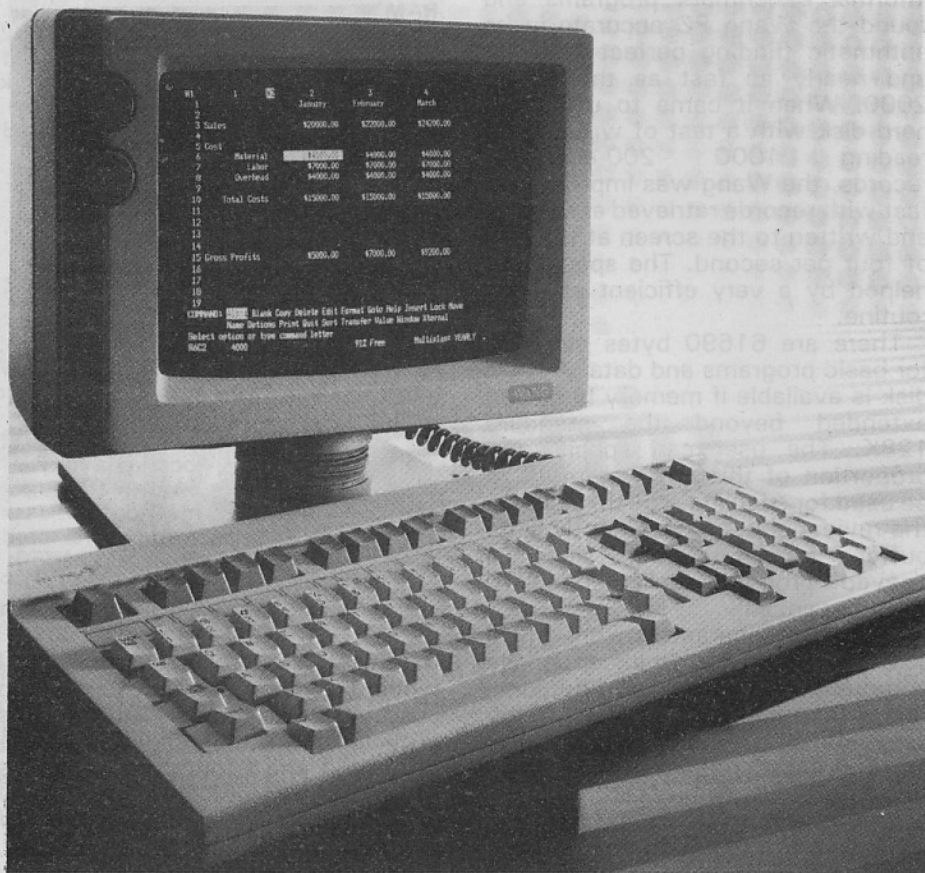
And this is the case. There's little that's cheap and nasty about the Wang PC. There's nothing bargain basement about this computer — not the price, and not the quality. Mind you, the review unit was not without its faults, but I won't start with those!

The Wang package consists of three units. There's a very large processor box with, in the case of the review unit, a 10Mb Winchester-plus 360K floppy installed. The green screen monitor is on a tilt stand and the keyboard is a separate unit connecting to the back of the processor unit via the usual coiled cable. The total set-up is remarkably similar in size and appearance to the Tandy 2000. And like Tandy, Wang makes provision for the processor unit to fit in a frame beside and below the operator's desk. A sensible solution since it's really too big to go anywhere else.

The keyboard is of suitable quality but persists with the IBM configuration of having some keys (RETURN, SHIFT, TAB, etc) with raised islands rather than full-sized as on professional typewriter keyboards. What a pity the typing ergonomics and computer design experts don't get together. At present, the broader keys of the Wang keyboard stick if pressed anywhere but on their raised surfaces.

### Keyboard geared to word processing

The keyboard reflects Wang's judgement that word processing will be a universally used application on this computer. Of the 16 function keys laid out across the top of the full width of the keyboard, all but one are labelled with commands for word processing. Generally, this provides for the most common commands to



*The Wang Professional Computer*

be single keystrokes. However, a recessed channel under all these keys allow for a label strip (such as that provided with Multiplan) to be used to redesignate the keys to their new functions under another software package.

Another keyboard feature is that the often used functions such as cursor controls, insert, delete, previous, next, are sensibly not shared with the keys on the numeric keypad. The keyboard finishes up, therefore, substantially wider than many versions. I don't consider this a disadvantage.

All keys have their obligatory squeak, but mercifully this can be turned off via the system utilities menu.

Another obligatory feature is the systems diagnostic test on power-up. Takes a little longer than some, but it's only a once-a-day thing. The auto-routine finally brings up a starting menu. Since I don't tinker with the auto-routine, at this point I would usually select the System

Utilities and from that systems menu, select options to turn off the keyboard noise, shift to the character/conventions for Canada (because this comes reasonably close to New Zealand conventions), then enter the date in the way all "civilized" people do — day before month, of course! I was interested to see this format operated only while in the DOS mode. When in BASIC, the date reverted to illogical USA.

The hierarchy of menus provided was easy to use and got you efficiently to where you wanted to go — including directly into DOS.

Under DOS, the environment was much as I was used to with the other 16-bit MS-DOS units. Some enhanced commands are available, distinguishable mainly because they have got "Wang" or "W" at the beginning of their titles ("Wang-copy", "Wcompare", "Wdskcopy", etc).

BASIC has the full set of commands that look and act like Microsoft, but nowhere could I find

Microsoft mentioned. The BASIC is described as "The Wang Professional Computer Basic Language". However, it worked as expected and was supported by a well presented and very full manual.

While in BASIC, I entered my informal benchmark programs and found the Wang PC accurate in its arithmetic (finding perfect squares) and nearly as fast as the Tandy 2000. When it came to using the hard disk with a test of writing and reading 1000 200-character records, the Wang was impressively fast with records retrieved at random and written to the screen at the rate of four per second. The speed was helped by a very efficient scrolling routine.

There are 61690 bytes available for basic programs and data. A RAM disk is available if memory has been extended beyond the standard 128K. The user can specify the proportion of this extra memory to be used for spooling or RAM disk. On the review unit, a conveniently large buffer was operating since a "saved" program recalled, loaded at lightning speed.

Accessible characters from ASCII 126 to 254 provide an exceptionally comprehensive range of additional text, mathematics and foreign language symbols to cover virtually any European language requirements — some of these are automatically accessed according to the National Default selected from the utilities menu. Graphics characters are not provided, so your pictures will have to be drawn by other means.

## Remarkable accuracy

The system date/clock has remarkable accuracy, even during I/O operations. I checked its loss at about one second per hour. That's good enough to be useful for most timing requirements.

Another nice feature is that the Wang is not fussy about the power up and power down routines. Apparently, the read/write heads are in "safe" positions when not actually in the process of accessing the hard or floppy disks. You can turn the unit off or on whenever you feel like it — without removing the floppy and without using a parking routine for the hard disk. In fact, a parking routine isn't even provided. I'll be looking for that feature in future reviews of hard disk units!

As a basic unit operating with MS-DOS and 16-bit (Microsoft) BASIC,

## Microcomputer summary

<b>Name:</b>	Wang Professional Computer.
<b>Manufacturer:</b>	Wang.
<b>Processor:</b>	16-bit Intel 8086.
<b>Clock speed:</b>	8MHz.
<b>RAM:</b>	128K expandable to 640Kb.
<b>Input/Output:</b>	Keyboard 2 x RS232 ports, up to eight expansion slots.
<b>Keyboard:</b>	101-key detached unit; 55-key typewriter keyboard; 10 cursor control keys; 18-key numeric pad; 18 programmable function keys.
<b>Display:</b>	Green on black, 800 x 300 pixel density, 80 x 25 lines, 224 character set.
<b>Operating systems:</b>	MS-DOS (native), CP/M-80 emulation, UCSDp-system, Unix (soon).
<b>Languages:</b>	Microsoft, BASIC, COBOL, Fortran + Pascal. Microfocus level II COBOL.
<b>Graphics:</b>	800 x 300 pixels.
<b>Sound:</b>	Three-tone.
<b>Cost:</b>	Basic unit, one diskette, 128Kb, monitor, keyboard and operating system, \$5708; with two diskettes, \$6990; the same with 10Mb Winchester and 256K memory, \$13,061; the same with 30Mb disk, \$18,420.
<b>Options:</b>	Communications — T.T.Y.; VT100; SNA; 2780/3780; 3270; TD830; Wang VS; Wang OIS; Wang 2200; voice Attachment; local area networking; memory expansion (in 128K, 256K or 512K modules); additional 10Mb disk; additional 30Mb disk; monitor arm; desk clamp.
<b>Software:</b>	Wang core products — PC Multiplan \$330; PC Word Processing \$750; PC Graphics \$410; PC Database \$885; PC Notebook \$275; PC Windows \$375; Wanglaw; wide range of applications packages in MS BASIC and CP/M.

the Wang is all you would expect. I would be happy to use it to develop customised programs. The manuals provided are comprehensive, well-presented and I found no instances of sloppy proof reading. Very detailed instructions are given for installation of optional cards, peripherals and communications modes.

All software, other than MS-DOS and BASIC, comes as optional extras. The review model was supplied with several of the customised Wang software programs, and I explored some of them to see what the user would be getting for the relatively expensive application programs.

As mentioned earlier, Wang makes something of a claim for its word processing role, so I made fairly extensive use of its standard word processing package which includes a spelling checker. At \$750, it would be reasonable to expect an outstanding product — after all, it's getting on for twice the price of other micro word processing packages.

Well, the Wang word processor is pleasant to use. It does sensible things like automatic line adjustments when format is changed and when insertion and deletions are done. The dedicated and permanently labelled function keys make for efficient calling of common commands, and highlighting of

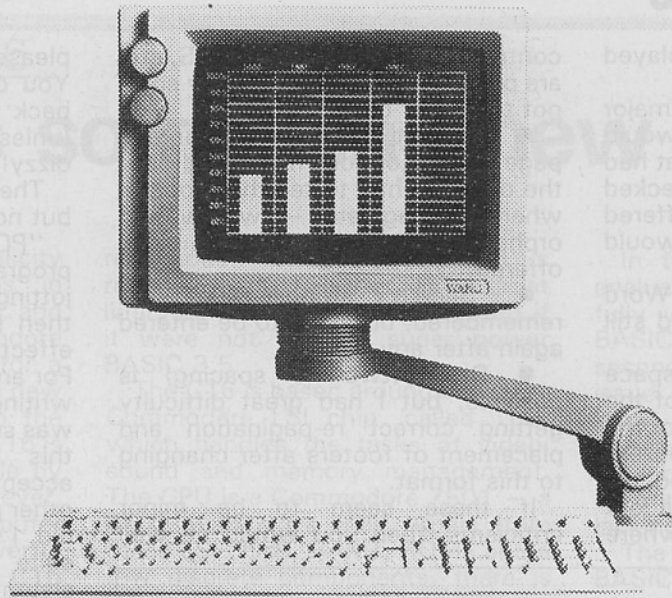
insertions and deletions make it easy to see what is happening. Setting of headers, footers, indents, centring, etc, are very straightforward and easy. Even though a novice user of this particular program, I found I seldom needed to call up the HELP key since most of what was needed was there, labelled on the keyboard.

## Hard disk a great asset

The hard disk was a great asset, of course, since delays in bringing up files, calling pages and previous and next screens were pleasantly short — as was the time taken to check spelling. Some exceptional features included the sub and super scripting which actually shifted on screen to show exactly how they would print.

However, there were two problems with the review unit. First, the printer driver was not matched to the supplied FX100 printer, so none of the bells and whistles such as a variety of font changes, super-scripting etc could be demonstrated. Second, the highlighting feature did not appear to work — which made the spelling checker virtually useless because I could not see the words in context alleged to be unknown to the dictionary. I eventually discovered that the contrast control on the monitor was jammed in the low contrast position. When freed by





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# WANG

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## HARDWARE REVIEW

brute force, the monitor displayed highlighting as intended.

I was not impressed that a major company, such as Wang, would provide a system for review that had not been scrupulously checked before despatch. Certainly, it offered to put things right — you would hardly expect less.

Aspects of the Wang Word Processing program I feel could still be improved are:

- "Insert" opens a large space and leaves only three or four of the following words at the bottom of the screen. I found I was losing context information when this happened.

- The designers could take a leaf from the typesetter's format, where

control codes (RETURNS, TABS, etc) are printed at reduced intensity so as not to clutter basic text.

- I did not identify an automatic page ending option. It seemed as if the operator had to tell the program where to paginate — widow and orphan suppress did not seem to be offered.

- Search strings are not remembered, but have to be entered again after any editing.

- Draft (two-line spacing) is possible, but I had great difficulty getting correct re-pagination and placement of footers after changing to this format.

If these seem to be minor criticisms, then you would be well

pleased with Wang word processing. You certainly wouldn't want to go back to 'WordStar or its clones (unless the Wang's price knocks you dizzy!).

The spelling checker is efficient but nothing remarkable.

"PC Notebook" is an interesting program which allows author's jottings (or addresses, names, etc) to then be selected by any keyword, effectively grouping and reordering. For anyone who does a great deal of writing, this is an excellent facility. I was surprised to note, however, that this particular program did not accept initial letter menu selection as other programs in the Wang package did. I would have thought the Wang suite of programs would be consistently co-ordinated.

A business graphics program is also available and produces a range of possible graphic representations of data from the keyboard or from existing files. Because of the printer problem mentioned earlier, I was not able to transfer the graphics to paper. This, of course, would be the main use of such a program.

Other applications programs are listed in the data box.

### Compatibility with IBM/MS-DOS software'

What about compatibility with other IBM/MS-DOS software?

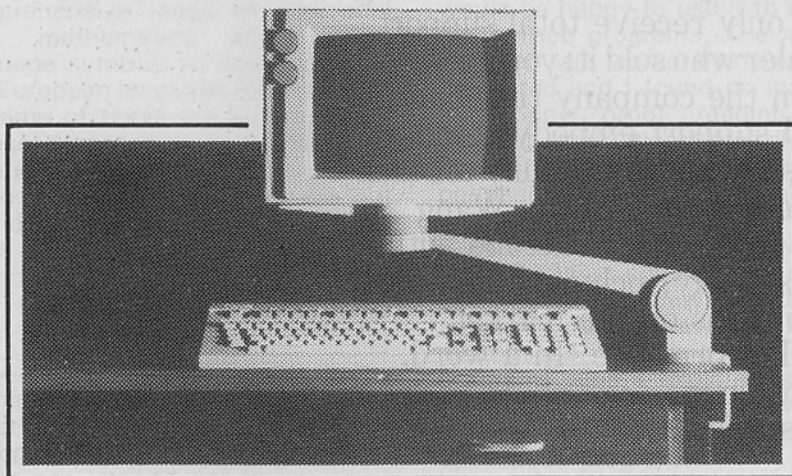
I tried several PC DOS and MS-DOS programs, including dBASE II. All files could be read and manipulated. None would load or run. IBM BASIC would not load either. No basic programs using colour commands would run as that option was obviously not installed on this Wang.

Purchasers of the Wang PC cannot, therefore, expect to run much in the way of third party software not specifically designed for the Wang — unless the IBM emulator card is also purchased and installed. I am not able to report how successful this emulator is.

In its promotional material supplied to me, Wang claims the purchaser has: "Your choice of MS-DOS operating software for 16-bit operation, or CP/M-80 emulation for 8-bit." If running MS-DOS software is to be an important factor for a prospective user, the Wang capability to run that software needs to be confirmed with the Wang salespeople.

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PPAD2

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## COMMODORE C16

# It really is something new

By Rob Fullerton

There has been a lot of publicity about "clones" and "look alike" in the microcomputer world lately, and at first sight, the new Commodore 16 could easily be mistaken for a Commodore 64 or VIC-20 in the new season's colours. Packaged in the familiar Commodore case, the C16 is only superficially distinguishable by its dark charcoal colour. However, inside is a completely new computer with many exciting and powerful features which make the C16 destined to create its own unique slot in the personal computer market.

This review is based on a short experience with a pre-production model. Production stocks are expected in New Zealand early this year.

Since the C16 looks so much like the C64 and VIC-20, it begs comparison. So here is a quick list of the major features:

- RAM — 16K (12K available for BASIC).
- ROM — 32K.
- Screen display — 40 column x 25 lines.
- Colours — 121 (15 colours x 8 luminance levels + black).
- Graphics — hi-res and multi-colour.
- Sound — two tones + white noise generator.
- Interpreter — BASIC 3.5.

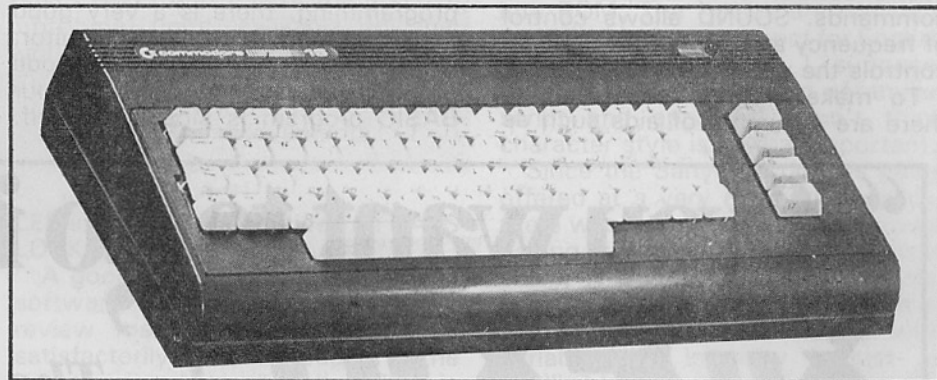
In view of the development of personal computers with more and more available RAM, the C16 seems almost deprived, with only 12K available for BASIC. Restrictions of small memories, of course, can be offset if the operating software is powerful — and this is most certainly the case with the C16. More of this later.

On power up, the screen announces 12,277 bytes free — a lot for a computer with only 16K RAM. But, unlike the 64, the BASIC does not overlap the RAM. As on the 64, the screen display is 40 characters by 25 lines. The usual Commodore border, display area and character screen format are used and colours of these areas may be changed. The video display on the monitor is rock steady with no annoying flickers or judders.

There are four display modes — text and three hi-res modes. In the hi-

res mode, the available RAM is reduced to 2K. This would be a great limitation to serious programming if it were not for the super power BASIC 3.5.

The C16 is based around a custom Commodore LSI chip, called TED, which handles the tasks of video, sound and memory management. The CPU is a Commodore 7501 — a 6502 with extra frills. Apart from these LSI chips, RAMs, ROMs and a few discrete components, there is little else on the board which looks rather lost inside the case. The board is very well shielded with a large perforated metal cover which no doubt contributes to the very stable video signal.



The Commodore 16

Across the back of the case, there is a flat socket marked "memory expansion", although its prime role will be software cartridges. There is a RF modulator and video output along with a serial interface for a 1541 disk drive or printer. The cassette port interfaces to a Commodore 1531 datasette which is not compatible with other datasettes, at least physically, as it uses a miniature DIN plug not provided on the 64 or VIC-20.

Along the side is the power connection, on/off switch, reset button and joystick ports. The reset button replaces the keyboard RESTORE function as this key is now used for other functions. The keyboard is physically the same as the VIC-20 and 64 but some of the key assignments are different. The cursor is now controlled by four individual direction keys in the top row and the function keys provide pre-defined BASIC commands.

In the limited time available to evaluate the C16, I was unable to fully explore all the features of BASIC 3.5 (over 75 commands). A second article may follow in a later issue when I have "got to grips" with the system. The manual supplied with the review computer was only a draft and a complete description of all the functions was lacking.

The most obvious enhancement to BASIC is the provision of a whole set of commands to handle graphics and sounds. This is clearly necessary in the hi-res mode where the remaining 2K RAM requires very lean BASIC statements to contain a complex program. This also means the

disappearance of PEEKs and POKEs. Great!! Programming is now straightforward, as it should be, making the C16 ideal for educational use.

In fact, the whole concept is towards educational use as the graphics commands do the sort of thing children expect of a computer and in plain English. In this respect, it is not dissimilar to LOGO. If you wish to draw a line from one point on the screen to another then the command is:

```
DRAW X,Y TO X,Y  
where X and Y are the screen co-ordinates. A circle can be drawn with the command:
```

```
CIRCLE X,Y,R  
where X and Y are the screen co-ordinates of the circle centre and R is the radius — delightfully simple yet powerful stuff! Rectangles and squares can be drawn with the BOX command and shapes can be "coloured in" with the PAINT
```

## HARDWARE REVIEW

command.

Text characters can be written to the hi-res screen to any X,Y location with the CHAR command, allowing labelling to graphs and shapes. Each of these graphics commands has a variety of forms which allow complex shapes such as polygons and ellipses to be drawn and rotated in just a few lines of BASIC. Shapes can even be saved and recalled by name with the commands SSHAPE (Save Shape) and GSHAPE (Get Shape). I can imagine a cartridge containing a whole library of pre-defined shapes — just what educational software needs.

As well as the hi-res graphics with 320 x 200 pixels, there are multi-colour graphics which can display four colours as opposed to the hi-res two-colour display. In this mode, resolution is reduced to 160 x 200 pixels. The sound generator provides two tones or one tone and white noise. Definitely not up to 64 SID standards but very useable. Again all sound control is by simple BASIC commands. SOUND allows control of frequency and duration while VOL controls the volume.

To make program entry simple, there are a number of aids such as

AUTO numbering and RENUMBERing as well as INSERT and DELETE keys. The HELP function key is used to highlight the offending section of a statement which has given rise to an error. This is most useful for syntax errors. Formatted printing is extensively enhanced with the inclusion of PRINT USING; now you can make the output look exactly as you wanted it, not as the computer thought you should have it.

BASIC 3.5 has new loop commands. DO . . . LOOP is supported as well as DO WHILE . . . LOOP and DO . . . LOOP UNTIL. IF . . . THEN is improved with the inclusion of ELSE. Commands for TRON and TROFF are available for debugging and hexadecimal to decimal — decimal to hexadecimal conversions are added. The TRAP command is most useful, allowing all errors to cause program transfer to the line number specified.

For those intrepid programmers who like assembly language programming, there is a very good inbuilt machine code monitor. Creating your own machine code programs and adding them to your BASIC program is simplicity itself.

There were many other new features of BASIC 3.5 I was unable to try, but there is no doubt the inbuilt software lifts the Commodore 16 from "just another low price micro" to a most exciting machine. The monitor includes Assemble, Disassemble, various forms of memory display and examination of the 6502 registers.

### Summary

The Commodore 16 is an excellent machine for beginners or primary level education. The hardware and software features make it a truly "user friendly" computer. The small 16K memory is all but lost to the hi-res screen so its use as a games machine is limited without memory expansion or games cartridges.

There is no way the C16 replaces the 64 but many of the best features have been incorporated. The power of BASIC 3.5 will appeal to programmers, especially the demise of PEEKs and POKEs. The C16's place in the micro market must be squarely with the educational user or the first computer user. With a projected cost of "below \$500", the Commodore 16 will take a lot of beating.

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**A 16-bit, MS-DOS tradesman**

By John Slane

Sanyo is pleased with sales of its 550 and 555 MS-DOS computers which seem to be attracting customers who want 16-bit computers (with software) at the best possible price. As first in the market with the lowest priced 16-bits, Sanyo has had it all its own way.

Now the giant Sanyo Corporation hopes to do the same with its just released MBC 775, "IBM-Compatible" portable computer. With MS-DOS, GW-Basic, WordStar and CalcStar - and a built-in colour monitor - Sanyo might even have another winner at \$5000!

As with the Tandy 1000, the Sanyo portable is being released in New Zealand about the same time as it is appearing on dealers' shelves in USA. It's interesting to speculate whether this indicates an overseas interest in the not inconsiderable potential market in our country.

The MBC 775 is similar in size to the IBM portable, and attractively presented in three-tone grey plastic. The 9in screen is a perfectly adequate size for desk use. Two 360K disk drives are notably efficient for their latching and pop-out mechanisms and for their virtually noiseless operation. Easily the quietest floppy drives I have used.

The keyboard is basically "IBM type" with some minor modifications. However, the keys are a better shape and have a good feel.

**Sanyo's reply**

This computer has been designed as an IBM compatible, both in software (runs Lotus 1-2-3, Framework etc.) and hardware (accepts IBM expansion cards). The characteristics of this computer (including colour resolution) therefore conform to the IBM standard.

Most major software products already support colour, and a colour monitor has been included as standard by Sanyo because this feature will become increasingly important for users in 1985.

The review machine supplied to *Bits & Bytes* was one of the first 10 prototype units available in the world. The production model which should be available in New Zealand late February 1985, will obviously include several improvements.

LED indicators are provided on CAPS LOCK and NUM LOCK.

A good range of IBM (third party) software was provided with the review machine and all operated satisfactorily - which supports the company's claim that the 775 is compatible with its IBM master. Some of this software (and some of my own) exploited the colour facility and graphics resolution which comes

as standard with the unit. If it's colour you are looking for, this presentation will please you.

The disadvantage of a medium resolution colour monitor (shared by other computers with a similar VDU) is that text resolution is very poor. On the Sanyo MBC 755, this is exacerbated by an inferior character generator which produces a very ugly font (in my judgement). Apparently, this is not necessarily a serious fault, since the 550 and 555 models, which use the same character generator, are still popular among computer purchasers.

Regular readers of my reviews will by now know I have very low tolerance for poor screen presentations since a pleasing text is only a matter of what design is burnt into ROM. The Asians are not very good at this design aspect for English orthography because, I suppose, they are working with an unfamiliar script and apparently don't think character style is all that important.

Since the Sanyo portable is being offered at a very competitive price, there won't be much quibbling about having a colour VDU. But unless colour is a very high priority to the user, it needs to be appreciated that a good green or amber monitor with variable text intensity is just as intelligible as colour and has the added advantage of greater sharpness of text.

The review was carried out under some difficulties, since only a couple of early prototype models were available for trial and these had not been thoroughly checked out and aligned. There was no operator's manual and the fact the review unit kept on locking up (from both BASIC and from applications programs such as SuperCalc) may have been due to my ignorance of special procedures or to uncorrected faults in the prototype. When lockup occurred, the only correction available with a machine of this type is to turn off the power and start again.

The only reset available is the CONTROL+ALT+DEL sequence as for the IBM. Of course, if the keyboard is not accepting information, reset is not available through the keys. No "hard" reset is offered. Incidentally, one of the fatal faults is described by the operating system as "System prity error". I

**Microcomputer summary**

<b>Name:</b>	Sanyo MBC 775 Portable Computer
<b>Manufacturer:</b>	Sanyo Electric Trading Co. Ltd.
<b>Microprocessor:</b>	8088 16-bit
<b>Clock speed:</b>	4.77 and 8Mhz
<b>RAM:</b>	256K (expandable to 640K)
<b>ROM:</b>	40K (includes 32K video ROM)
<b>Input/output:</b>	Centronics standard, RS-232C option; external video; two expansion board slots (both IBM compatible).
<b>Keyboard:</b>	Detached unit, IBM style with some additions
<b>Display:</b>	24 x 80
<b>Graphics:</b>	Graphics as for IBM; black & white: 640 x 200; eight-colour: 320 x 200; 16-colour: 160 x 200.
<b>Languages:</b>	MS-DOS, GW-BASIC supplied
<b>Sound:</b>	Inbuilt speaker
<b>Cost:</b>	\$4995
<b>Software:</b>	"Almost all" IBM software; supplied with WordStar and CalcStar for above price.
<b>Reviewer's Ratings:</b>	(1-5, 5 the highest): Ease of use 3; documentation (none available yet); languages 5; support 5; expansion 4; value for money 5.

## HARDWARE REVIEW

assume this is a built-in spelling error.

### *Anticipating criticisms*

As a consequence, I could only describe the review model and the software used as "unfriendly". The New Zealand distributor is equally concerned about this observation and is anxious to take steps to put matters right before the release of general models.

My criticism of the poor screen scrolling routine was anticipated by the distributor which indicated it had already been in touch with Sanyo to have that aspect improved, again before the model is released. A time of 4 minutes 22 seconds to write 1000 text lines to the screen is unacceptably long and this screen procedure made the MBC 755 very slow on some of my informal benchmark tests. Where writing to the screen was not involved, the Sanyo portable compared favourably in speed with other MS-DOS machines.

The distributor also advises that steps will be taken to quieten the noise of the cooling fan.

As a bonus, the clock speed is switchable from 4.77Mhz to 8Mhz. But on the prototype model, I was not able to report on this.

Overall, the new Sanyo 16-bit portable is a very interesting configuration and with the standard and bundled features, has to rate as very good value among the IBM work-alikes. With this machine, the buyer isn't going to have to decide straight away what else he/she needs to buy to make it usable. Just about everything is there already. However, it's not a Rolls Royce, so your expectations need to be realistically matched to what is potentially a workmanlike, low-cost, 16-bit unit which includes colour, sound and graphics as standard.

## MICRO NEWS

### Enhanced Touchscreens

Hewlett-Packard's two newly enhanced HP 150 Touchscreen Personal Computers will allow information and printer sharing, not only with HP personal computers, but also with IBM PCs and compatibles.

These communications capabilities, provided through a 3Com-manufactured local area network, will also allow HP and IBM

PC users to send each other electronic mail.

The enhanced HP machines include new double sided 3.5 in disc drives with 710Kb per disk.

They have been named the HP Touchscreen Personal Computer, to designate the flexible disk-based system, and HP Touchscreen MAX which is the 25 megabyte hard disk system.



*The enhanced HP Touchscreen Personal Computer*

### IBM-PC, TopView & 32016

The new operating system for the

PC-AT, Top View, has been given media exposure in the USA. Comments so far are guarded (including a remark that it was just like PC-DOS 3.0 was first hoped to be like). Top View supports full concurrent processing but reviewers seem to want to reserve judgement until a full working evaluation is possible.

Meanwhile, if your IBM-PC is feeling tired and listless, a West German firm has the answer — a 512Kb, 32-bit coprocessor running the Xenix variant of Unix. DFE of Stutensee, is offering a NS32016 to these specifications for about \$5000. There might be cheaper ways to get a 32016.

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# Index to *BITS & BYTES* — 1983-4

The following is an index to the second volume (11 issues) of *Bits & Bytes* (September 1983 to August 1984).

Subjects covered are listed alphabetically in the index and each reference to that subject noted with issue number first followed by the page number.

For example an article on adventure programs can be found in issue number 6 beginning on page 34.

If you discover an article or articles you want, back

issues of *Bits & Bytes* (except number 4) are still available and can be ordered on the back copy order form elsewhere in this issue. Or simply note the issue numbers you require, enclose \$1.50 payment for EACH issue and post to Back copies, *Bits & Bytes*, Box 827, Christchurch.

Our thanks to Gerald Fowler, a subscriber to *Bits & Bytes* and a professional indexer, who prepared this index.

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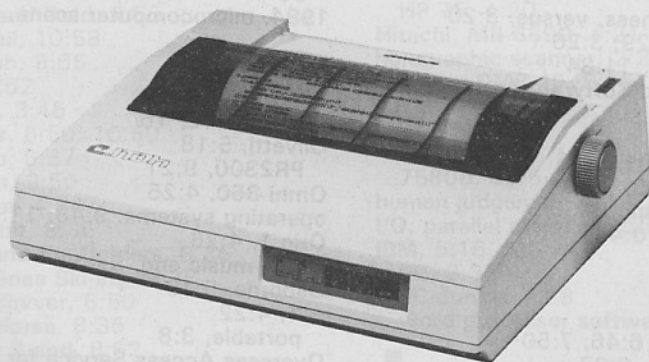
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# Predictions for the 1985 Micro Market

*Encouraged by his success at forecasting the computer trends for 1984 (Pages 40, 41, February 1984 issue), Paul Crooks has decided to try his hand again with some predictions for 1985. He stresses that they are his own personal opinions and reliant as they are on human as well as electronic actions a few may develop bugs and even turn out to be wrong.*

- Of the 23 computers under \$2000 covered in the first part of our buyer's guide (November, 1984 issue) only a third (7 or 8) will still be on sale in New Zealand by the end of 1985.

- Of the 35 computers \$2000-\$5000 covered in the second part of our buyer's guide (December 1984 issue) only approximately 20 will still be on sale in New Zealand by the end of 1985.

- The IBM PC Junior will be released here in the next few months and will be more successful in New Zealand than it has been in the United States. The expected price \$3-4000 (with one drive) and compatibility with the IBM PC will make it attractive as a small business/professional computer.

- The Sinclair QL won't emulate the success that the Spectrum and ZX 81 have enjoyed in New Zealand. A combination of bad overseas press, high price (expected to be \$1995), inferior keyboard and no defined market will make it only a modest seller.

- Commodore will release four new computers in 1985 but none will be as successful as the Commodore 64 which will continue to be its biggest seller. Nevertheless a combination of its extra models and greater financial strength (two public companies bought 70 per cent of Commodore New Zealand just before Christmas) could see Commodore capture an even greater share of the home market than it did in 1984 (then put at 50 per cent). It will also make a comeback in the business market (where it used to be quite strong) as at least one of the new models will be a proven business computer (the Hyperion portable that Commodore recently purchased the manufacturers of).

- The extent of Commodore's low end dominance will depend on the success of the Amstrad, due for release here next month. This is picked to capture a significant share of the home computer market as long as the New Zealand distributors Grandstand Leisure, repeat the excellent marketing that has boosted the average Sega computer to sales unheard of elsewhere in the world.

- Jack Tramiel, former head of Commodore and now head of the rival Atari Corporation will release a new computer, probably similar to the Macintosh only at a much lower price, in a last ditch attempt to save Atari.

- Some MSX (the standard agreed on by most of the major Japanese

computer manufacturers) computers will appear here in 1985 but will achieve little or no success. Mainly because of lack of marketing backing rather than on technical performance.

- Portable computers which, with one or two exceptions, have had disappointing sales in New Zealand

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will improve in 1985 but won't achieve the earlier confident predictions of many until 1986 due to a general lack of awareness among potential users.

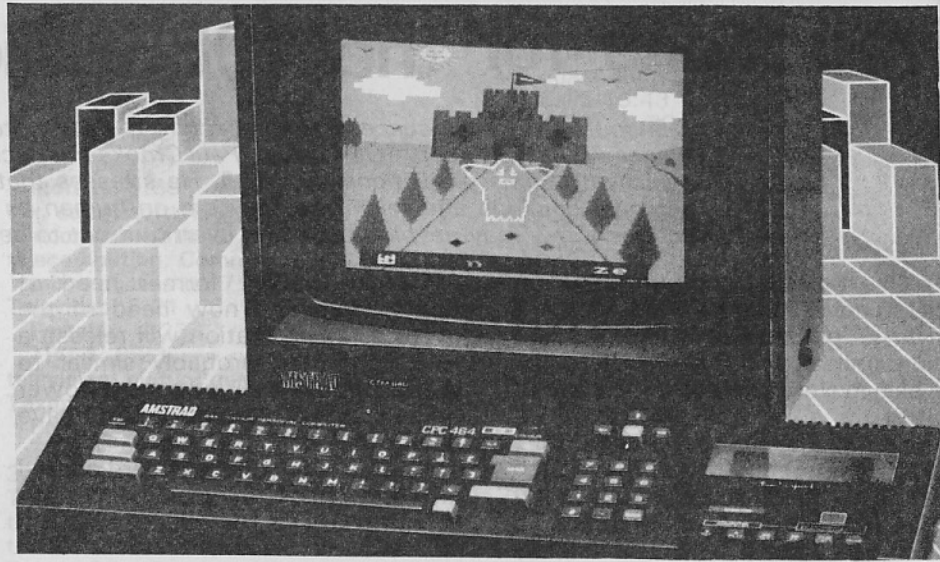
- The fortunes of portables will be helped by IBM releasing a truly portable version of its PC (which may or may not reach our shores by the year's end).

- Sanyo will continue to be the most successful Japanese computer manufacturer in New Zealand. Its low cost MBC range carried it from nowhere to third (behind IBM and Apple) in the business computer market in 1984 and the addition of an IBM portable to its line-up should see it maintain that place. However, it will face increased competition from the IBM PC Junior and other computers such as the Tandy 1000 which are coming close to matching the price/performance of the MBC range.

- AT & T won't have a big impact on the computer market in 1985 and especially not in New Zealand. But no predictions for 1986.

- 1985 will be a crunch year for Apple here. The Macintosh, undoubtedly the most exciting computer released in 1984 and selling very well in the US, has still to prove itself a big seller here and the Apple IIc has only just been released. The flood of hardware and software now becoming available for the Macintosh should ease any reservations New Zealanders have about its future.

- In general 1985 will be a more interesting year for computers than 1984, which, apart from the



The Amstrad

Macintosh, was a ho hum year in terms of new computers. Look for more advances in voice recognition in 1985 and 256K RAM chips allowing software to become more powerful and sophisticated (and hopefully from the users viewpoint easier to use).

- Financially freed of the sales tax millstone, 1985 will be a very good year for the New Zealand computer industry and (if the economy doesn't worsen too much) could be close to a boom year. Videotex, which adds another dimension to computer use, will boost home computer sales in particular in 1985 and business sales in 1986. But as usual the rewards won't be spread evenly among all computer distributors and retailers.

- Prices for computers, peripherals and software won't ease much (if at all) in 1985 but users will continue to be able to buy more "bytes for their buck" whether that be more RAM, more disk space, more characters per second for printers or more powerful software.

*And now for two predictions I know will come true...*

- Bits & Bytes will continue to prosper in 1985, in spite of increased competition from publishing giants here and overseas, with increased colour, better layout and most importantly more and meatier articles.

- I will receive several telephone calls from computer companies to disagree with some or all of these predictions.

## POST BUDGET PRICES

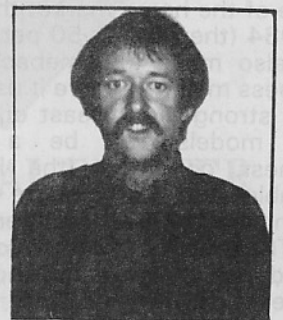


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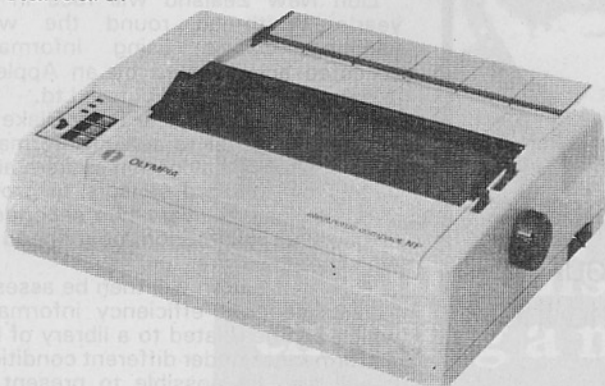
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\* These are post budget prices, recommended retail, including 10% sales tax.

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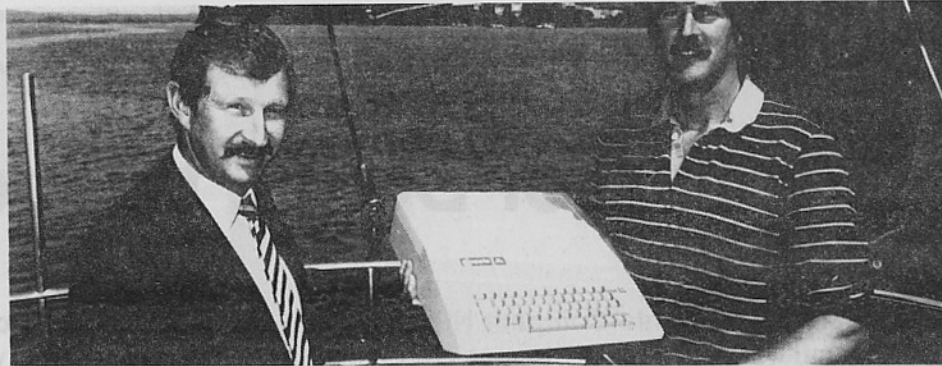
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Rod Klarwill (left) of CED Distributors Ltd, presents the computer to skipper and navigator Peter Blake.

## Round world by computer

By Gaie Ellis

Lion New Zealand will race in this year's Whitbread round the world yachting classic using information collected and collated by an Apple IIe donated by CEO Distributors Ltd.

Skipper and navigator Peter Blake will use the computer to collect information from a satellite navigation system and a variety of on-board sensors to provide data as often as every two seconds on position, wind direction, boat speed and water temperature.

This information will then be assessed to provide boat efficiency information which can be related to a library of best performances under different conditions. It will also be possible to present the information in graphic form on a VDU so that different conditions can be plotted and assessed.

The computer data will help the skipper determine matters such as the optimum number of crew to send forward to make a sail change. Analysing the boat's speed and the time taken for a sail change will help him determine whether to send a large number forward for a fast change or maintain better boat trim and hence, more speed, by using fewer men and making the change more slowly.

Individual performances of individual helmsmen can be analysed using the computer so that Blake can choose the best for differing conditions.

The package includes a word processing program which will be used to provide a spare parts inventory, prepare full crew lists for arrival in foreign ports and to prepare the yacht's regular newsletter.

The computer will be housed in the yacht's tiny navigation area and office which has been mounted centrally for warmth and minimum movement.

The race starts from Portsmouth in September and includes ports of call in Cape Town, Auckland and Punta del Ests, Uruguay.

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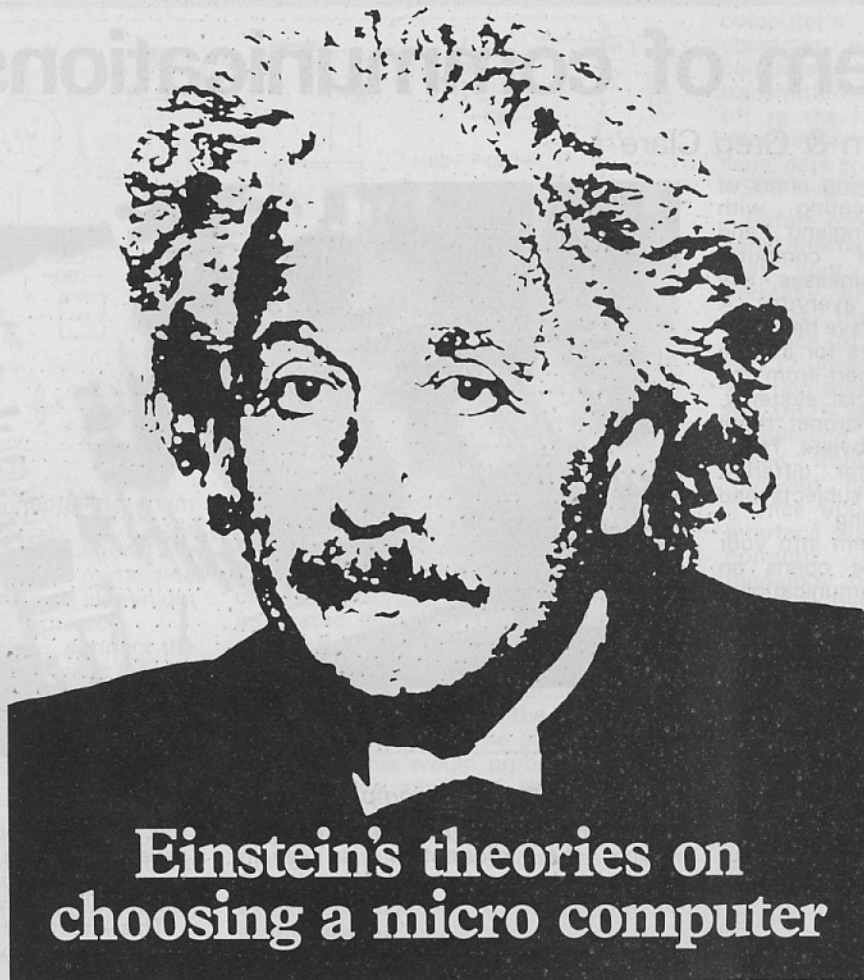
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## Einstein's theories on choosing a micro computer

Choosing a micro is a daunting task for the new-comer and with an ever increasing number of micros emerging on the New Zealand market. Even up-grading, say, from a ZX81 can be a risky and expensive exercise with the wrong decisions made. At Einstein Scientific Ltd, we believe it is important to look at the real facts and specifications, and check exactly what you get for your money before choosing your micro computer system.

### THE PIT-FALLS.

#### Don't buy a games machine.

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

#### Software.

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

#### Check the quality of the product.

Low quality components and bad design will seriously affect the reliability of the end product, and lead to false economy. Watch out for unreliable edge connectors, corrosion and poor PCBs. Make sure that your supplier can provide an after sales service in case of product failure.

#### Don't let the add-ons add up.

A number of outlets are offering packages that seem to be good value at low cost. Unfortunately these offers have a hidden sting in as much as the essential accessories such as power supply, peripherals and

software often carry a very high cost premium. Make sure you get an 'all-up' price to enable you to start operating the system. Software for low cost hardware usually costs between \$50 and \$100 for a ROM cartridge.

#### KEY POINTS TO LOOK FOR. Computer language.

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

#### Expansion.

As your interest and knowledge of computing grows you will need a computer system that will grow with you, able to accommodate printer, disk drive, joystick, communications modem and colour monitor as well as produce Hi-Fi sound effects.

#### Software.

The computer you choose should have a growing selection of utility software to make the most of its capabilities. Remember, computing is here to stay. You can't learn to compute on a toy or a device that does not behave like a real computer.

#### High resolution colour.

In general most home computers have a poor graphics resolution (or detail). Check on the vertical and horizontal resolution in graphic mode and multiply the two numbers together — if the result is less than 35,000, then the graphics can hardly be considered high resolution. Low resolution graphics displays, such as those used in games, tend to be "chunky" in appearance.

#### Keyboard.

For accurate entry of programmes and data into a computer it is important that the keyboard has a good tactile feel and operation. A standard computer keyboard layout will familiarise the user with the vast majority of computers which are used in the world of business and professional applications, very important if the purpose of purchasing the computer is educational.

#### RAM (Random Access Memory).

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

In short look out for a computer which offers all the points above and you will be sure of getting good value for money.

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# A modem of communications

By Maurice Bryham & Greg Clare

One of the fastest growing areas of computing is communicating with personal micros. In England and America, thousands of computer hobbyists as well as businesses, use modems to communicate everyday. A number of bulletin boards have been set-up by keen computer users for a wide variety of applications. Apart from the large number of commercial systems, such as Comuserve and Micronet, there are free databases for hobbyists. These smaller systems cater for different computer brands, special subjects and interests — such as "hacking".

Plugging the Mega modem into your computer and phone line opens an exciting new door to communications. By using your computer as an "intelligent terminal", you can become part of a world-wide network of computer users who access databases and information services everyday. Now you can send your favourite program to a friend, place an add on a bulletin board or order software from the comfort of your own keyboard!

The modem, is an array of filters and oscillators which convert your computer's digital signals into audio

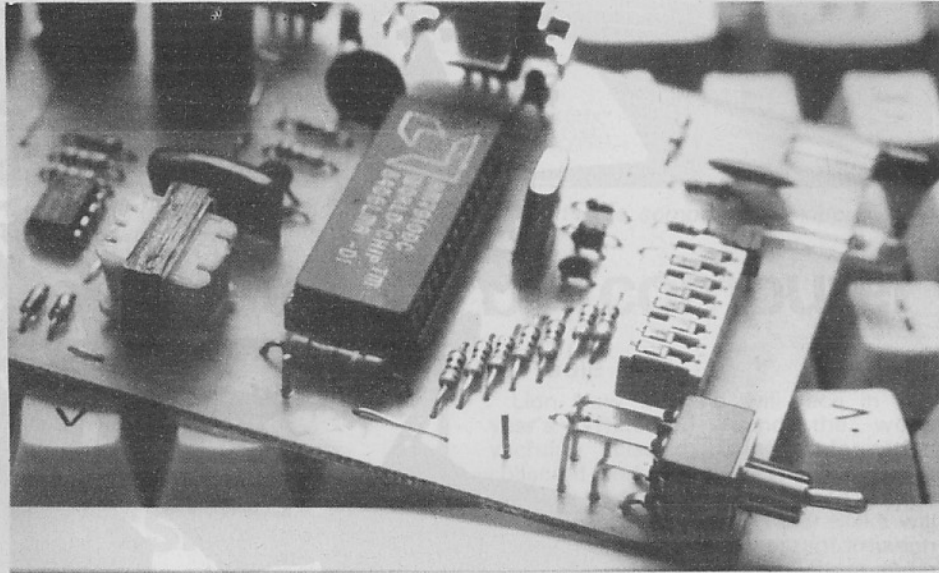


Figure 1: Photo of complete kit.

tones and, vice versa. The speed at which the information is serially transmitted and received can be altered,

too. All you need is a computer with a serial interface, a modem and phone line, a video monitor and some sort of "terminal" program.

This kitset has been designed in New Zealand for New Zealand conditions. Because the latest semiconductor technology has been used, only four integrated circuits have been used. The simple design means easier construction and greater reliability for a very low price.

Your computer will become a window to the world. You might even be the first to set-up a bulletin board in your neighbourhood. If you carefully follow the construction details, you should have no problems with the operation of your modem.

## Construction

Note: The PCB used in this kit is of medium component density and has "through-pin" copper tracks. Its operation and reliability depend largely on the quality of your soldering.

1. Check all parts are present and are the correct value, by marking them off against the parts list.

2. Using figure 2 as a guide, solder the 16 solid core links into position.

3. The resistors can now be soldered onto the board. Bend the leads at the resistor body so that the resistors are mounted horizontally. Don't forget the 680 ohm 1/2 watt resistor.

4. The 11 different capacitors can now be mounted. Watch the orientation of the electrolytic and tantalum capacitors.

5. On one end of the board is the mounting position for the DB25 socket. Secure the socket to the board using the two 3mm nuts and bolts. Only the pads

### Parts list

Qty	Description		Supplied
1	100ohm 1/4 watt resistor	R1	_____
2	270ohm 1/4 watt resistor	R2,3	_____
10	1Kohm 1/4 watt resistor	R4-13	_____
1	560ohm 1/4 watt resistor	R14	_____
1	10Kohm 1/4 watt resistor	R15	_____
2	22Kohm 1/4 watt resistor	R16,17	_____
1	1Mohm 1/4 watt resistor	R18	_____
1	680ohm 1 watt resistor	R19	_____
2	0.1uF Ceramic capacitor	C1,2	_____
1	0.047uF Ceramic capacitor	C3	_____
1	0.0022uF Ceramic capacitor	C4	_____
2	22pF Ceramic capacitor	C5,6	_____
1	0.33uF Greencap capacitor	C7	_____
2	1uF Tantalum capacitor	C8,9	_____
2	11000uF Electro capacitor	C10,11	_____
1	DS557 Transistor	D1	_____
2	IN4148 Diode	D2,3	_____
1	WO-4 Bridge Rectifier	D4	_____
2	5.1V 1 watt Zener Diode	D5,6	_____
1	5mm Red LED	D7	_____
1	5mm Green LED	D8	_____
1	DS1488 RS232 driver	IC1	_____
1	DS1489 RS232 receiver	IC2	_____
1	LM741 Op-amp	IC3	_____
1	7805 5V positive regulator	IC5	_____
1	7905 5V negative regulator	IC6	_____
1	AM7910 Modem "World Chip"	IC4	_____
1	Flag type heatsink		_____
1	One to one transformer	M1	_____
1	DB25 Right angle PCB socket		_____
1	28 pin IC socket		_____
1	Right angle PCB DPDT switch	S1	_____
1	2.4576 MHz crystal		_____
10	PCB solder pins		_____
1	2-way terminal block		_____
1	M-2851 12.6V CT transformer	M2	_____
1	Mains cord with plug		_____
1	DSE Mega modem circuit board		_____
1	8-way dipswitch		_____



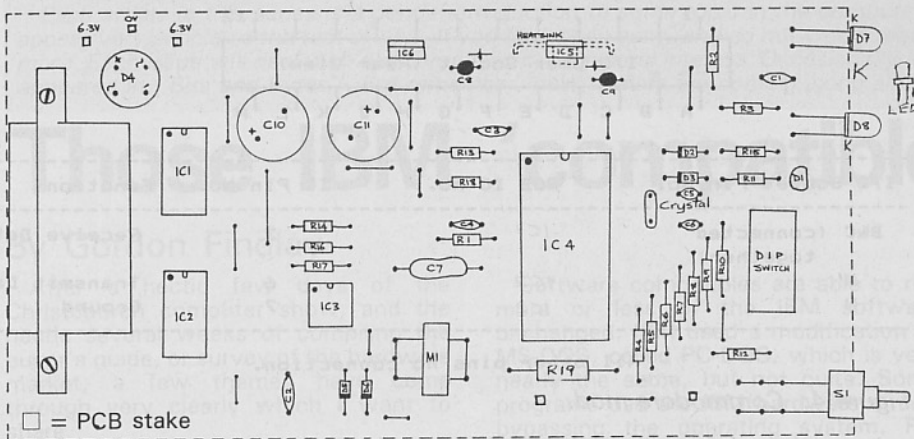


Figure 2: PCB overlay.

which have tracks connected to them need to be soldered.

6. The two voltage regulators are soldered to the PCB with the metal side facing out. Secure the small aluminium heatsink onto the 7805 regulator.

7. Placing the PCB aside, connect the mains cord to the flying leads of the mains transformer using the two way terminal block. If you are placing the modem in a metal box, the green earth wire should be secured to the chassis.

8. The five PCB solder pins should now be mounted on the board. The bridge rectifier, diodes, LEDs and transistor should be mounted next. Note all these semiconductors are polarised and their orientation should be checked against figure 2.

9. The crystal, one-to-one transformer and eight-way DIP switch can now be soldered into position. The 2.4576 MHz crystal is non-polarised, so it is not important which way round it is mounted. The DIP switch is mounted so that the "ON" position is closest to the crystal.

10. The 741 op-amp can be soldered in position using figure two as a guide. If your modem is to be used on a VIC-20 or Commodore 64 computer then IC1 and IC2 are not used — refer to figure four for the Commodore modification. For applications which require a RS232 interface, IC1 and IC2 should be soldered onto the PCB as shown in figure two.

11. Connect the mains transformer secondary windings to the three PCB solder pins using 20cm lengths of hook-up wire. The 28-pin IC socket can now be soldered into position — do not insert the AM7910 at this stage.

12. The PCB should be fully populated with the exception of the AM7910 IC. You should give the entire circuit board a complete visual check of solder joints and component positions, correcting mistakes as you locate them.

13. Before inserting the AM7910, complete the voltage test table:

IC Number	Pin Number	Test Voltage	Check (tick)
4	2	+5V (±0.25V)	_____
4	4	-5V (±0.25V)	_____
4	9	0V (ground)	_____
4	22	0V (ground)	_____

14. Once the voltage rails have been checked and the power switched off, the AM7910 can be inserted into its socket, carefully checking the orientation (pin 1 closest to the regulators). This integrated circuit is sensitive to static electricity and is very expensive, so extra care is required! Remove IC4 from the protective foam using your thumb and forefinger on each end of the IC package. Do not touch any of the pins with your fingers as this would probably damage the sensitive inputs of the chip. Still holding the IC by the ends, insert it carefully into the socket. Double check that the AM7910 is positioned as shown in figure two (it would be a very expensive mistake to insert the IC incorrectly!)

15. Providing you have no mistakes in your construction, the modem should be fully operational. Now it's just a matter of connecting your computer and running a terminal program.

## Making the connection

Although setting up the modem is a reasonably easy process, there are a few points you should be aware of. You need some software. This may be a listing from later in this article or a commercial communications program. The most basic "terminal" program will serially transmit and receive data via your

computer's serial interface. Each character which is typed on your computer's keyboard must be transmitted, bit by bit, to the modem and off to the host computer. To receive information, your computer must accept serial data and display the corresponding ASCII symbol on your screen.

Before connecting the modem to your serial interface, it's a good idea to check that your software is functioning correctly. An easy way to do this is to connect the output of your serial interface to its input. If you have a RS232 interface, this is achieved by shorting together pins two and three of the DB25 plug. When the software is functioning correctly, every character typed from the keyboard will be "echoed" to the screen.

Once you are confident your serial interface and software are functioning correctly, you are ready to test the modem's operation. Plug the serial interface plug from your computer into the DB25 socket on the modem. Set the DIP switch to analogue loopback (refer figure five). Note, you don't need to connect the phone line yet.

Now the final connection. Simply connect the two phone wires to the PCB solder pins. The phone wires can be connected either way around, refer to figure three if you have difficulties.

Many first-time modem users dial popular databases and because their modems and communications software is not properly configured, they can cause problems by tying up the host computer. If possible, you should arrange with another modem owner to have a test transmission with your complete modem. Remember you will have to decide which modem will be set to the "answer" tones and which will be set to the "originate" tones.

When your modem and software operate correctly, you are ready to dial up a database. You may need to contact your local computer club to find out what free bulletin boards are operating in your area. Most commercial databases require a registration fee to gain access to the system — you will need to phone or

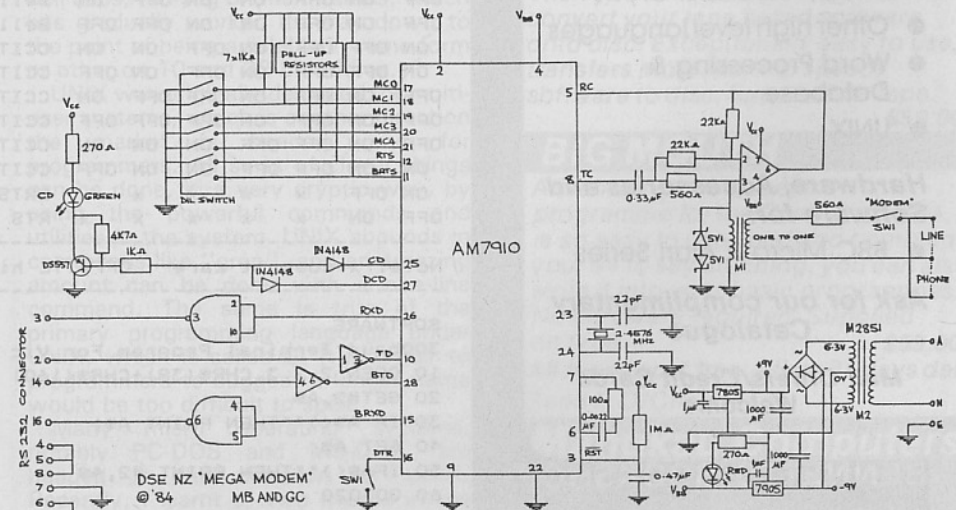


Figure 3: Circuit diagram.

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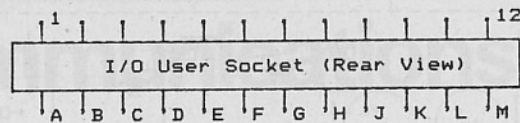
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**COMMUNICATIONS**



I/O Socket Pin No.	PCB IC No.	IC Pin No.	Function
B&C (connected together)	IC1	2	Receive Data
M	IC2	6	Transmit Data
N	IC2	7	Ground

All other pins no connection.

Figure 4: Commodore mod.

write to these information services for more information.

Some personal computers support the standard videotex terminal configurations. The information from a videotex host computer is sent at 1200 baud; however, the frequency response of phone lines does not allow 1200 baud full-duplex. One way round this problem is to have a slower "back channel". This allows a videotex terminal to receive information very quickly (at 1200 baud), and send back information at a slower rate (75 baud). This dual speed configuration requires a RS232 port which has different receive and transmit baud rates. Unfortunately, most personal computers have a RS232 port which can be programmed only at a single speed for both receive and transmit.

The Commodore 64 is an exception. With suitable software, the C64 can be loaded with the videotex character set and the serial port can support the 1200/75 standard. Figure six shows the Commodore 64 and Mega modem connections for videotex terminal emulation.

Note: The Mega modem does not have New Zealand Post Office approval.

**Software**

Basic programs are suitable for some of the popular micros available: CAT. This short program will set up the Cat computer as an 80-column terminal. The baud rate is determined by the DIP switch settings on the RS232 interface.

S7	S6	S5	S4	S3	S2	S1	MODE
ON	OFF	ON	ON	ON	ON	ON	Bell 103 Originate 300bps full duplex
ON	OFF	ON	ON	ON	ON	OFF	Bell 103 Answer 300bps full duplex
OFF	ON	ON	ON	ON	OFF	ON	Bell 202 1200bps half duplex
OFF	ON	ON	ON	ON	OFF	OFF	Bell 202 w/qualizer 1200bps half duplex
ON	OFF	ON	ON	OFF	ON	ON	CCITT V.21 Orig 300bps full duplex
ON	OFF	ON	ON	OFF	ON	OFF	CCITT V.21 Ans 300bps full duplex
OFF	ON	ON	ON	OFF	OFF	ON	CCITT V.23 Mode 2 1200bps half duplex
OFF	ON	ON	ON	OFF	OFF	OFF	CCITT V.23 Mode 2 " " " w/eq
OFF	ON	ON	OFF	ON	ON	ON	CCITT V.23 Mode 1 600bps half duplex
ON	OFF	OFF	ON	ON	ON	ON	Bell 103 Orig loopback
ON	OFF	OFF	ON	ON	ON	OFF	Bell 103 Ans loopback
OFF	ON	OFF	ON	ON	OFF	ON	Bell 202 Main loopback
OFF	ON	OFF	ON	ON	OFF	OFF	Bell 202 with equalizer loopback
ON	OFF	OFF	ON	OFF	ON	ON	CCITT V.21 Orig loopback
ON	OFF	OFF	ON	OFF	ON	OFF	CCITT V.21 Ans loopback
OFF	ON	OFF	ON	OFF	OFF	ON	CCITT V.23 Mode 2 main loopback
OFF	ON	OFF	ON	OFF	OFF	OFF	CCITT V.23 Mode 2 with equalizer
OFF	ON	OFF	OFF	ON	ON	ON	CCITT V.23 Mode 1 main loopback
ON	ON	OFF	OFF	ON	ON	OFF	CCITT V.23 Back loopback
ON	OFF	x	x	x	x	x	BRTS disabled
OFF	ON	x	x	x	x	x	RTS disabled

Note: x=doesn't care OFF=TTL high ON=TTL low S8 is not connected

**SOFTWARE**

```
300baud Terminal Program For Vic 20/C64
10 OPEN 2,2,3,CHR$(38)+CHR$(160)
20 GET#2,A$
30 IF A$(">") THEN PRINT A$;
40 GET A$
50 IFA$(">") THEN PRINT #2,A$
60 GOTO20
```

Figure 5: DIP settings.

## BEGINNERS

Each article in this series is a gentle introduction to some topic in the computing field. It is written for the beginner, so may appear very simple to the rest of you. If you find it too easy, and so not worth reading, congratulations — you are a beginner no more. Each issue will deal with a different topic, of general interest. Occasionally, material may seem to repeat what has already appeared in "Bits and Bytes". But remember, new readers are coming along all the time.

# Those IBM 'compatibles'!

By Gordon Findlay

After a hectic few days of the Christchurch computer show, and the hectic several weeks of compiling the buyer's guide, or survey of the hardware market, a few themes have come through very clearly which I want to share.

The survey has shown several changes in the computer marketplace over the 12 months since I compiled the first "guide". IBM has arrived in force! There were very few IBM machines at the show, but there were a lot of "compatibles", and a lot of MS-DOS machines. The compatibles seem to fall into three groups: those which claim to be hardware and software compatible; the software compatibles; and those which are "data compatible" only.

The hardware compatibles are able to accept unchanged IBM software, and peripheral boards designed for the IBM. In other words, a special graphics card built for the IBM-PC will plug into the compatible and run.

Software compatibles are able to run more or less of the IBM software unchanged. IBM used a modification of MS-DOS, called PC-DOS, which is very nearly the same, but not quite. Some programs use the IBM hardware direct, bypassing the operating system. For these reasons, programs written for the IBM may not run on other MS-DOS machines. There is no infallible test for complete software compatibility. The folklore test is to run Lotus 1-2-3, and the IBM version of Sub-logic's flight simulator. Computers which cope with these are felt likely to cope with all IBM software!

Data compatibles can read and write to IBM disks, and access data in IBM format. They will probably handle BASIC programs too. The implementation of BASIC which IBM calls BASICA is otherwise known as GW-BASIC in the MS-DOS environment.

Of course, MS-DOS machines don't have to be IBM-compatible at all. One important example is the Tandy 2000, which makes no claim to compatibility, preferring to do things in whatever seemed the best way to its designers. Major software houses have learnt it is sound common sense to be able to configure major packages for a variety of machines without too much rewriting, so that many of the big packages are available in versions for the IBM, the Tandy, other MS-DOS machines, and even the Macintosh. Bye the bye, Tandy's latest release in the States is an IBM-compatible.

Everyone seems agreed that operating systems are headed in the direction of UNIX. This is a system originating with Bell Labs, running on mainframes, which has gradually worked its way down to the point of being available in some form or other on 10 and 32-bit micros.

UNIX was originally designed for multi-user systems, which is another direction the market is headed, and for programmers. All sorts of clever things can be done, in a very cryptic way, by using the powerful commands and utilities in the system. UNIX abounds in commands like "grep", and an amazing amount can be done with a one-line command. The same is true of the primary programming language under UNIX, which is called C. It is unfair to programmers to suggest a longer name would be too difficult to spell.

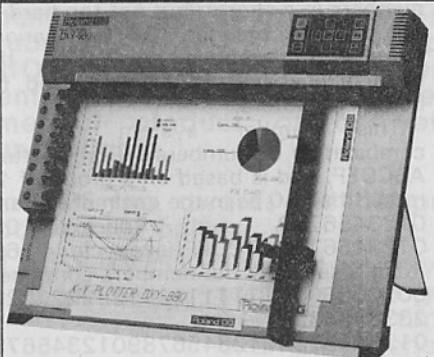
Many micro operating systems, notably PC-DOS and MS-DOS, are headed in the direction of UNIX. Recently, I learnt of two micros in the \$7-9000 range which have or will have UNIX available very soon. Others are

supporting stripped down versions. The implications are that programmers will need to be ready for the new languages and systems, and that more powerful software, fully using the 16-bit and 32-bit processors, will be written.

Which brings me to one of the disturbing conclusions after the show. The hardware is well ahead of the software in many instances. There are quite a lot of 16-bit machines running only slightly reconfigured versions of 8-bit software. There seems little point in using a 16-bit machine running at 6MHz if the results are no better or faster than running an 8-bit machine at 2MHz.

Most of the action at present seems to be in the small business segment. Nothing really different has appeared in the home sector

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# Merging programs . . . storing variables & strings

By Dick Williams

Last month, I showed you how to use the memory scanning program to see the numerical contents of each of the Sega memory locations in decimal, hexadecimal and the translation to Ascii code.

There are only a few areas in the memory where the numbers stored directly translate to recognisable English characters. One of these is where the computer stores your programs. This is hexadecimal location 9800 onwards.

I found I learned a lot about the computer by studying this area. I also found I had to become more familiar with the hexadecimal numbering system to get the most out of the information available.

So for those of you just starting out, here is a quick introduction to the land of hexadecimal numbers. Let's start with decimal which is the normal numbering system we all use every day.

Suppose we want to write down all

the numbers starting from one and finishing at 20. It's quite straightforward. We start with 1 and put down all the numbers finishing with 20. If you do this, you will see we have 1 through to 20.

This is the way we normally count. To illustrate the need for a change from decimal counting to another method, suppose we increase the size of our computer until it is as large as a warehouse.

A warehouse has about 64,000 boxes on the shelves. Each box represents one of the memory cells in the Sega. Each box has a number on the outside which is its address in the warehouse and each box contains information the computer needs.

The computer has to keep a record of the addresses, and the longer numbers reduce the amount of memory available for more useful work.

## Numbering systems

It would be an advantage if we had a numbering system able to express large numbers in a shorter but not too hard to comprehend manner. Of the various numbering systems available, the hexadecimal system is most used for home computers.

This number system uses a combination of numbers 0-9 and letters ABCDEF, and is based on a group of 16 rather than 10 as in the decimal system.  
0123456789 decimal (10S)  
0123456789ABCDEFhexadecimal(16S)

Let's see how the numbers continue  
000000000011111111112222222222-  
233333333  
01234567890123456789012345678-  
901234567  
00000000000000001111111111111-  
111222222  
0123456789ABCDEF0123456789AB-  
CDEF012345

The first line shows decimal numbers starting at 0 (00) up to 37 and the second line the equivalent in hexadecimal. Abbreviations for hexadecimal are hex, H, or, as used in the Sega, &H.

The last number in the top line is decimal 37. The last in the second line is the hex equivalent 25 which is pronounced hex two five or H two five or two five H. This distinguishes hexadecimal numbers from normal decimal numbers.

So far, there does not appear to be an advantage in the hex system of numbering, as both require two characters to represent a number. However, continue the numbers up past 99 and decimal needs 3 but hex only two.



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The organisers feel it is time New Zealand software is given the national and international recognition it deserves. The establishment of the awards will provide an opportunity for that recognition and in particular it is hoped they will lead to increased export sales of New Zealand software.

The awards are open to any company or individual to enter and there is no limit on the number of entries (a suite of programs may be submitted as one entry or as separate entries). A \$10 nomination fee applies per entry. Programs entered can be an already established commercial product or as yet commercially unavailable.

In 1985 the awards will be presented in two categories only:

**1. Business** - This category covers any software program aimed at general commercial use. For example general accounting, wordprocessing graphics and farming programs. Vertical market packages i.e. those aimed at one particular industry (other than the farming industry) are excluded.

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1. The software must be wholly developed and written in New Zealand.
2. It must run on at least one microcomputer model.

## THE AWARDS

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**4.** Entries will be judged on commercial appeal as well as technical excellence.

Decimal 100 is six four in hex. You can see this in the Sega manual (pp 154, 155 and 156). On p154, lower case D is decimal 100 in the character code, and the same character on p156 is (along the top then down) Hex 64.

The last position on p155 is 255 decimal and the last position on p156 is Hex FF. 255 decimal equals Hex FF. The Sega has a decimal to hex conversion routine which is handy for gaining a better working knowledge of hex and can be used in direct mode like so: Q\$=HEX\$( ):PRINT Q\$ CR. Put the decimal number you want converted to hex inside the brackets and press the CR key. The hex equivalent will be displayed. (Limit 32767 decimal).

The maximum number one Sega byte can hold is 2 to the power of 8.

2 power 0 = 1	= 1
2 power 1 = 2	= 2
2 power 2 = 2*2	= 4
2 power 3 = 2*2*2	= 8
2 power 4 = 2*2*2*2	= 16
2 power 5 = 2*2*2*2*2	= 32
2 power 6 = 2*2*2*2*2*2	= 64
2 power 7 = 2*2*2*2*2*2*2	= 128
2 power 8 = 2*2*2*2*2*2*2*2	= 256

This gives a range of 1 to 256. However, we need zero as well so we end up with 0 to 255 in decimal or 00 to FF in hex.

This range of numbers is not nearly enough to address the memory locations in our warehouse which requires an addressing possibility of about 64000. The way around this problem is to put two address bytes together.

## Arranging the memory cells

We can now arrange the memory cells in groups of 255 and arrange for one of the bytes to determine which group we need to look at, and the other byte to determine which specific memory location within the group. This will extend the range considerably because we can now address the last group which is FF and the last cell in that group which is also FF for a total of FFFF hex or 65535 in decimal.

	FF	
Most significant byte (MSB)	↑	FF
Least significant byte (LSB)	- - -	↑

We are now able to describe the address of any of the Sega memory cells using a two-byte combination in hex, and can peek into these to determine what's going on inside the computer.

Well, almost. What we will get are the numbers held in the memory cells and if we can interpret these correctly, we will know what's happening. The memory locations, 8160 to 8167, hold some very useful information.

Let's have a look:

- 8161/8160 Start of program storage
- MSB LSB Pointer
- 8163/8162 End of program storage
- MSB LSB Pointer
- 8165/8164 Start of string storage
- MSB LSB Pointer
- 8167/8166 End of string storage

## MSB LSB Pointer

These memory locations, 8160-8167, contain the numbers which point to the relevant starting and ending places in the Sega memory. The method to use is: Q=PEEK(&HXXXX):PRINT Q CR. XXXX being the memory cell under consideration.

Load in a program and run it for a few minutes so that any variables used in the program will have become active. Break the program and have a pencil and paper handy.

Let's say we want to find out where a program normally starts from:

Q=PEEK(&H8161):PRINT Q. Result 152

Q=PEEK(&H8160):PRINT Q. Result 0

We have PEEKed into 8161 and 8160 and the answers should tell us where the Sega is hiding our program. But these numbers, 152 and 0, are decimal numbers so we have to convert them to hex. Decimal 152 is 98 hex and 0 decimal is 00 hex. Putting the most significant number first, we have 9800 hex.

The start of program pointers have told us the program in the computer starts at memory location 9800 hex. This is correct. Most programs start at 9800 hex. PEEK the end of program pointers to find out where the end is.

## Merging with the pointers

We can use the start and end pointer information to merge two (or more) programs together. In essence, what we do is load in one program, alter the start pointer to point to the end of the first program, load in the second program and then re-alter the start pointer to point to the start of the first program.

Hex conversion is not necessary because we already know the address of the pointers.

First you need two programs, the second with higher line numbers than the first. Use the renumbering facility. Load in the first program and PEEK the end of program pointers &H8163 & H8162. Write these numbers down.

POKE the numbers into the computer this way: the number you PEEKed from &H8163, POKE into &H8161; the number you PEEKed from &H8162, deduct one and POKE into &H8160.

The start pointers have now been moved to the end of the first program and another program can be loaded without rubbing out the first. Load in the second program and POKE 0 into &H8160 and POKE 152 into &H8161. The start pointers have been moved back to their original position and you have two programs in the memory which are treated as one.

This process can be repeated with additional programs. All you have to remember is that the second program should have higher line numbers than the first.

For those just learning, the way to POKE information into the computer is: using memory location &H8160, for

example, POKE &H8160,0.

The first word, POKE, is telling the computer we are going to put in some information. The &H lets the computer know the next number is in hexadecimal. The four characters 8160 are the memory location and after the comma, the number we want to put in.

The number after the comma can be in hexadecimal (in which case you have to use &H followed by the appropriate hex number) or it can be in decimal. This example shows the two ways.

```
POKE &H8161, &H98
Hex      Hex
POKE &H8161, 152
Hex      decimal
```

The Sega manual does not mention how to save strings or variables to tape, and it may be handy to know how. By suitable manipulation of the pointers already mentioned, this turns out to be a relatively simple matter.

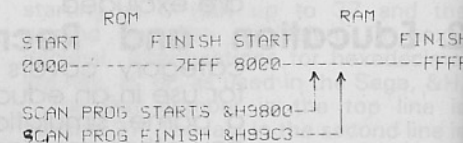
When preparing to save a program and its strings and/or variables, PEEK &H8160 &H8161 &H8162 &H8163 &H8164 &H8165 &H8166 &H8167. Keep these numbers and POKE the value from &H8166 into &H8162. POKE the value from &H8167 into &H8163.

This changes the end of program pointer to be pointing to the end of the string area and the whole block of memory from start of program to end of string can be saved to tape in the usual manner.

On loading that program back into the computer, it is necessary to POKE the values you originally PEEKed and wrote down back into the respective pointers &H8160 - &H8167. When this has been done, your program will be back in the computer as it was before saving to tape.

You cannot use RUN to start the program because this will set all variables and strings to zero. Use GOTO the first line number, for example if your first line is 10, GOTO 10 CR.

In the December issue (p84 middle column) is a diagram to represent the memory of the Sega. This is not as clear as it should be in some issues, so here it is again.



Memory diagram for Sega with reference to starting position of normal BASIC programs and, in particular, the memory scanning program.

Next month, I will show you how to get a simple but powerful filing system up and running.

If you have any questions, send them to me, care of the editor, and I will endeavour to provide an answer.

# DOSes — a hot topic

By Gordon Findlay

The subject of operating systems is often debated hotly in the '80 fraternity. It isn't hard to see why — there are so many different DOSes around. This sort of discussion is rare among the devotees of other brands, who almost always have no, or a very limited, choice. There are many reasons for the multitude of operating systems:

- The TRS-80 has been one of the most popular machines with disk capacity.
- The machine has been around for a very long (in microcomputer terms) time. In 1977, Tandy and two other firms whose names escape me (something about a fruit tree and a car) introduced appliance computers to the mass market. A lot of work has since been done with the TRS-80 — first in model I form, then as the almost compatible model 3, and now the model 4.
- The model I attracted a great number of clever programmers because of its basic architecture, and a large aftermarket grew up in both hardware and software.
- A lot of different hardware add-ons, particularly different types of disk drive, were marketed for the 80.
- When the first DOS (disk operating system) was released by Tandy — which naturally called it TRSDOS — it had a number of unfortunate bugs and quirks. This proved an irresistible attraction to people who thought they could do better. TRSDOS has been through many versions — I have a manual for the preliminary version, dated July 7, 1978 — which have not always been advances in the direction the marketplace thought right.
- As more and more sophisticated uses were found for the 80, and particularly as more use was made of the machine in business (especially in the USA), demand for more sophisticated operating systems developed.
- Much criticism has been levelled at the "mother" of all DOSes, TRSDOS. Don't forget though, that it is better than almost all other micros can show. In many ways, it is a better operating system than the other major contender at the time of its introduction, CP/M. It lacked portability to other computers, and initially at least, it lacked an easy interface for assembly programs. Compared with most of the hobby machines, it is magnificent (look at the other machines introduced that year, or even this year).
- It has been knocked for two reasons. Because at the outset, it supported only one type of disk drive — 35 track, single sided, single density. And because the bugs did little to help its reputation.
- During this year, we will look, on and off, at the DOS question. Before we can make much progress though, we need to clarify a few issues on the border

between hardware and software. Those of you who know of my considerable lack of expertise with a soldering iron, please be tolerant; and those who know all this anyway, skip forward a bit!

Let's start with a disk as delivered by the manufacturer. It is a sheet of inert substance, coated with a magnetic iron oxide — in other words, rusty plastic. Data (programs, numbers, whatever) are recorded on the disk by changing the orientation of some magnetic "domains" in the iron oxide.

The disk controller has the ability to write on the disk — record information there — and read back what has been written. To do so, it is necessary to organise the blank disk.

For our purposes, the disk is totally featureless when we get it, with the exception of one small hole punched through it. This is the index hole, which is used basically to give the disk controller electronics a fixed point from which to take measurements so that it can tell which part of the disk it is reading. Before the disk can be used, it must be organised into tracks and sectors, or formatted to use the jargon.

A track is a circular band on the disk, and a sector is a part of a track. The divisions aren't visible; they are just magnetic marks used to locate positions on the disk (I'm ignoring checksums and all that for now!). The number of tracks on a disk, and the number of sectors, are established when the disk is formatted.

Now, an Apple user can, at this point, say his disks have 35 tracks, and (in all but a few very old examples) 16 sectors in each track. But pity the TRS-80 user! He might have 35, 40, 80 or more rarely 77 or 96 tracks. These are the recognised choices. He might have some non-standard number, such as 42. The number of sectors might be 10, 18 or 20!

Some disk drives have just one head. They record on one side of the diskette

only, not surprisingly! Many users punch some extra holes, and turn the disk over to use the back, but this is really only making another, quite separate disk.

More recently, disk drives have appeared with two heads, enabling the drive to read and write to both sides of the disk, without turning it over. There are two ways in which a DOS can handle this — as two separate diskettes which happen to be mounted at once, or as one large disk. In the first case, a file will be on one side or the other of the disk; in the second, it may be spread between the two.

There are various ways of actually writing the information on the disk. Two are common — single and double density. Double density became very popular as an add-on modification because it almost doubles the amount of information which a disk can hold. Unfortunately, TRSDOS for the model I didn't support double density for a long time, and when it did, it was in a rather unsatisfactory way. This was another force for the creation of new operating systems.

So there are three major variables associated with drives — the number of tracks, the number of sides, and the density. For example, a drive might be described as 35-track, single sided, single density (that's the TRSDOS standard) or 80 track, double sided, double density (which will hold more than eight times as much).

The ways in which the various DOSes handle the differences between drives is an important factor in their versatility and ease of use. One guy I know has one 40-track, single sided, and one 80-track double sided drive. Between them these can handle almost everything, provided the DOS can be manipulated suitably.

Good grief! I've run out of room, and still not even mentioned files or directories. More next time. Remember, I'm interested in your contributions on DOS, particularly likes, dislikes and suggested improvements.



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# Watershed year ahead

By Steven Darnold

1985 looks like being a very significant year for home computer users in New Zealand. Interesting developments are happening in several areas and the combined effects will sharply increase the popularity and utility of home computers. Commodore 64 users will be at the forefront of these developments.

For several years, Americans have been hooking up their home computers to phone lines. Hundreds of thousands of users subscribe to big nationwide services like CompuServe, and even more use local bulletin board systems. In Britain, too, there is a lot of interest in telecomputing, even though British Telecoms started approving modems only a year ago. Now that the New Zealand Post Office has finally begun approving modems, we should see a rapid growth in this area.

Several videotex services have already been set up. Many are servicing particular interest groups, but some will be of interest to home computer users. Aditel provides a service for farmers and businessmen, but it also contains sections of a more general appeal. Computel is developing a service for all Commodore 64 users, with particular emphasis on home and educational applications. *Bits & Bytes* will soon be providing a videotex service for its readers and other computer users.

On the local level, I expect to see many user groups and computer shops setting up bulletin board systems. Initially, these will probably be more popular than the videotex services. After all, with post office videotex charges of 8 cents a minute and system charges up to 20 cents a minute, heavy videotex activity is pretty expensive. On the other hand, bulletin boards are free to local users, and even toll calls cost no more than 34 cents per minute after 11pm.

At any rate, the next year should see a lot of activity on the phone lines. At first, this will be just for fun, but the potential to change our lives is enormous. Imagine for a moment what the world will be like when the telecomputing services in Britain, America and New Zealand link up. Not only will we be able to communicate directly with computer users all over the world, but we will also be able to order goods from overseas suppliers and have them arrive within a week. This will make the world a much smaller place.

Another important development in 1985 for New Zealand home computer users is the demise of the junior computer. Until recently, the typical home computer was a VIC-20 or Spectrum. Such computers are really just junior computers, which lack the power and flexibility of a fully-featured

The winner of November's competition was Jason Stevenson, of Palmerston North, who has been sent a copy of "Dicky's Diamonds" (donated by Alpine Computing).

This month's competition has two prizes — a tape of "Killer Watt" (donated by Micro Utilities) and a disk of "Cuddly Cuburt" (donated by Fountain Marketing). Please specify in your entry which prize you would prefer.

Your task is to list five different magazines which specialise in Commodore computers. Send your list with your name and address to: Magazine Contest, P.O. Box 546, Blenheim. Entries close on February 25. The winners will be selected randomly from among the correct entries. Only one entry per person.

computer. Certainly, most people would prefer a fully-featured computer, but until recently the cost has been too high.

The reduction in sales tax on computers has helped put fully-featured computers within reach of more families. But even more important is the ongoing competition between Commodore and Atari, which has taken the prices of the 64 and 800XL below what the VIC-20 and 400 were selling for not long ago. As the prices of these fully-featured computers fall, junior computers become less and less attractive. By the end of the year, most junior computers will probably be squeezed out.

As the fully-featured 6502 computers move down towards the lower end of the market, something very interesting is happening at the top end. The 68000 microprocessor is emerging as the chip of the future. Apple uses it in the Macintosh; Sinclair uses it in the QL. Commodore uses it in the Amiga. The battle lines are drawn for the next generation of home computers, and the one common feature is the 68000.

As 1985 progresses, more and more serious programmers will set aside their 6502 manuals and start learning 68000 machine language. It will be several years before the 68000 machines push the fully-featured 6502 computers out of the home, but the foundation is being laid now. Those of you who wish to be pioneers, look toward the 68000.

Another interesting development for home computers in 1985 is in pre-school education. Several American software houses are specialising in this area, and many high-quality programs are being produced for young children. Good supplies of these programs have recently become available in New Zealand. I predict there will be a growing interest in these programs, particularly among C-64 owners.

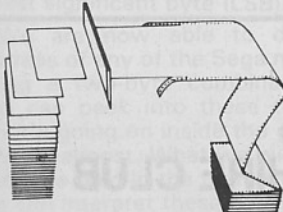
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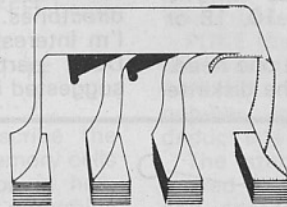
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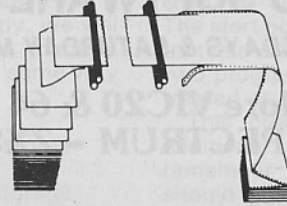
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# Mixture of extremes

By Steven Darnold

I have recently encountered three Handic products, and I am impressed and appalled at the same time. The software is of very high quality, but the hardware leaves a lot to be desired.

I was particularly impressed with Easy Calc Result. I had assumed by its relatively low price that it would be inferior to VisiCalc. But in fact, it does everything VisiCalc does, plus quite a bit more. It is a fully-featured spreadsheet which should meet the needs of most users.

Of particular interest is its ability to use either tape or disk. This means a workable spreadsheet system can be sold for as little as \$1000. I'm surprised more dealers aren't pushing this fact.

The software in the Handic Teledata cartridge is also impressive. It does a very nice job of turning the Commodore 64 into a videotext terminal. It implements all the videotex graphics and colours and provides a wide range of facilities for information providers uploading screens. There are one or two minor features missing, but overall the Teledata software does an excellent job.

My main complaint about the Handic products is their flimsy, cheap construction. The cartridges are held

together by plastic lugs, and the only support for the little circuit board is a single plastic stem which is very easily broken. I have inserted lots of VIC-20 and C-64 cartridges, but the only one that has ever broken was Handic. The Handic modem is similarly held together by plastic lugs — appalling for a \$400 product.

The problems are not limited to plastic construction. Two of the four Teledata cartridges which arrived in Blenheim were faulty. One had trails of garbage running through the RAM where screens were supposed to be stored, and the other occasionally crashed in the middle of telecomputing.

The modem, too, is not without its problems. Telecomputing sessions are sometimes marred by strings of garbage from the modem. This may be due to a bad telephone line, but I believe the modem is the main problem. A technical person (who should know what he's talking about) tells me the Handic modem is so noisy he's amazed it ever received type approval.

Perhaps I've been unlucky to run into so many problems with Handic hardware; however, the overall impression I get is of shoddy design and shoddy production.

# Good news

Not long ago, I asked a New Zealand distributor why \$20 seemed to be the minimum price. He claimed dealers were reluctant to stock cheaper games because there wasn't enough profit per unit. Dealers would rather sell a \$20 game than a \$10 game. However, this is very short-sighted. Cheaper games mean higher volumes, and the real choice facing a dealer is whether he sells one \$20 game or three \$10 games.

Surely dealers and distributors must eventually realise that high prices only reduce sales and encourage piracy. The biggest market for games is children, and the existing \$25-\$80 price structure is way out of reach for most of them. Let's hope that over the next few months, we will see most prices come down to the \$15-\$40 level. This is still slightly on the high side, but it should give a big boost to sales. In the longer term, I would hope to see most prices in the \$10-\$30 range.

Until recently, you had to pay around \$80 for a top quality game, but now there is a good selection for under \$40. If you want a really good game, there is no need to pay more than \$40.

In Britain, Commodore 64 games normally sell for between two and 10 pounds. The 10 pound games correspond roughly to our \$40 games, so you might expect to see some of the two pound games selling here for \$8. However, nobody seems to be selling cheap games in New Zealand. The cheapest games I can find are selling for \$20, and that's not cheap.

# Press SHIFT

Most programs need to pause at some point to give the user time to read instructions or other information on the screen. Often, this is done by putting the computer into a loop:

```
50 GET G$: IF G$=" " THEN 50
and the user is instructed to "Press any key to continue."
```

This approach, however, is somewhat clumsy. The loop requires a separate line all to itself, it adds a byte of variable garbage every time it is used, and it permits inexperienced users to break out of the program by pressing the STOP key.

A much more elegant approach is to use WAIT 653,1 and instruct the user to "Press SHIFT to continue." On both the VIC-20 and the C-64 memory location 653 registers a 1 whenever the shift key is down. WAIT 653,1 is shorter, faster and neater than the usual GET loop.

If there are several pages of instructions with a WAIT 653,1 at the end of each page, the user can skip through them simply by holding down the shift key. If this is undesirable the program can check to see that the shift key is released each time. This is done with a WAIT 653,1,1.



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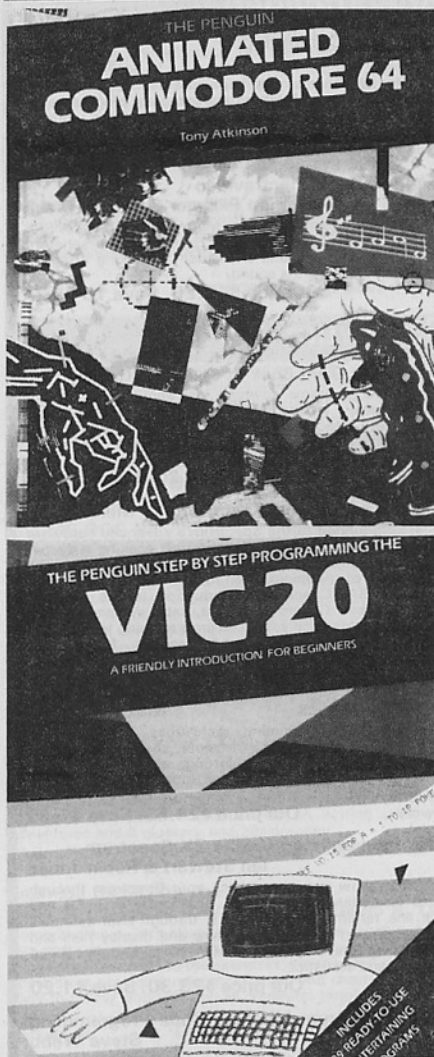


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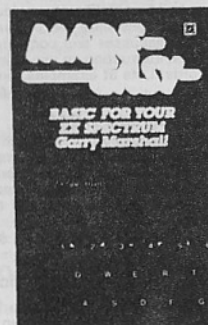
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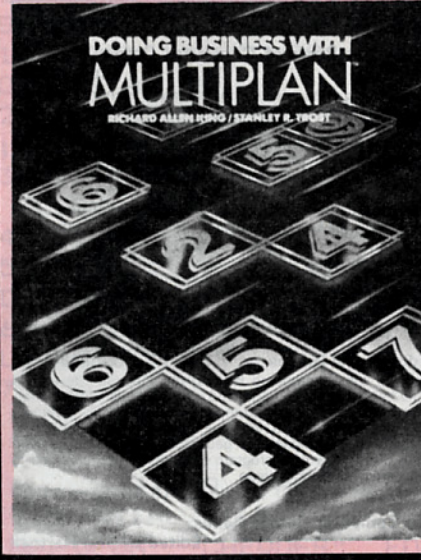
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# Data files in BASIC

By Cam Firenze

One of the more difficult aspects of BASIC programming for beginners is using data files. While this article is an introduction to using files in BASIC on the IBM PC, much of the information applies to other computers using similar versions of BASIC.

There are two kinds of data files in Microsoft BASIC — random and sequential.

"Random" means random access. You can access any record at any time, for instance by saying (in BASIC) "get the contents of record number 77", or "put this information in the position for record number 9".

"Sequential" means access from the start of the file. To read the 77th item, you first have to read the 76 items before it, and new information is always added to the end of the file.

As a general rule, use random files unless the data will not need to be changed during the time you want to use the file. Random files are harder to use but a lot more flexible, and faster for most purposes.

Random files have defined records — for example, one record may contain several items of information about a customer. You have to decide on an appropriate record length when the file is first set up. This is the maximum number of characters each record requires.

For instance, allowing 20 characters to store each customer's name (one character per letter of the longest likely name), plus 40 characters for the address, would give a record length of 60, if that was all the information you wanted to store for customers.

You might also want to record some details of the last purchase, and amount currently owing — information that will need to be changed as sales are made and payments received.

How do sequential files differ? Well, you don't have to consider how long each field, or the whole record, should be. BASIC creates "bookmarks" between data items on the file.

Now to get down to business — using data files in programs.

Listing 1 shows how to set up a new sequential file to store cheque butt records. Cheque number, value and description are entered at the keyboard for each cheque. The steps required to store this information are to "open" the file called "CHEQUES" (line 10), obtain the information for each cheque (asked for in lines 20 to 50), and put this on the file (line 60). The file should be closed when there are no more cheques, signalled by a dummy cheque number of "X" being typed (line 30).

Further cheques can be added to this data file in subsequent runs of the program if line 10 is then changed to: 10 OPEN "CHEQUES" OF APPEND AS #1.

```

1 'LISTING 1 - SET UP
SEQUENTIAL FILE
10 OPEN "CHEQUES" FOR
OUTPUT AS #1
20 INPUT "Cheque number"
;CHEQNO#
30 IF CHEQNO# = "X" THEN
CLOSE : END
40 INPUT "Value"; VALUE
50 INPUT "Description";
DESCRIP#
60 WRITE #1, CHEQNO#,VAL
UE,DESCRIP#
70 GOTO 20

1 'LISTING 2-READ FROM
SEQUENTIAL FILE
100 OPEN "CHEQUES" FOR
INPUT AS #1
110 IF EOF(1) THEN CLOSE:
END
120 INPUT #1,CHEQNO#,
VALUE,DESCRIP#
130 IF VALUE > 100 THEN
PRINT VALUE,DESCRIP#
140 GOTO 110

1 'LISTING 3 - ADD
RECORD TO RANDOM FILE
10 OPEN "HUMBUG" AS #1
LEN = 128
20 FIELD #1, 20 AS PERSON
$,40 AS PRESENT1984$,4 AS
COST1984$,40 AS PRESENT
1983$,4 AS COST1983$,20
AS LEFTOVER#
30 INPUT "Lucky person";
LUCKY#
40 IF LUCKY# = "X" THEN
CLOSE : END
50 INPUT "1983 present";
PRESENT#
60 INPUT "Cost (to
nearest dollar)";COST
70 LSET PERSON# = LUCKY#
80 LSET PRESENT1983# =
PRESENT#
90 LSET COST1983# = STR#
(COST)
100 NEXTREC =(LOF(1)/128)
+ 1
110 PUT #1, NEXTREC
120 GOTO 30

1 'LISTING 4 - READ AND
UPDATE RANDOM FILE
200 OPEN "HUMBUG" AS #1
LEN=128
210 FIELD #1,20 AS PERSON
$,40 AS PRESENT1984$,4 AS
COST1984$,40 AS PRESENT
1983$,4 AS COST1983$,20
AS LEFTOVER#
220 LASTREC = LOF(1)/128
230 FOR J = 1 TO LASTREC
240 GET #1,J
250 PRINT J; PERSON#;
TAB(28);"1983 ";PRESENT19
83#;COST1983#
255 PRINT TAB(28);
"1984 "; PRESENT1984#;
COST1984#
260 NEXT J
270 INPUT "Record to
change (999 to end)";K
280 IF K = 999 THEN CLOSE
: END
290 IF K > LASTREC THEN
GOTO 270
300 GET #1,K
310 PRINT PERSON#
320 INPUT "1984 present";
PRESENT#
330 INPUT "Cost (to
nearest dollar)";COST
340 LSET PRESENT1984# =
PRESENT#
350 LSET COST1984# = STR#
(COST)
360 PUT #1,K
370 GOTO 270

```

Existing data in the file is destroyed when a file is opened for "output"; APPEND puts new data on the end of the file instead.

File numbers are used for both random and sequential files. This allows more

than one data file to be used in a program at the same time. The sample listings all open the file as number "1". This is the "1" appearing in lines 10 and 60 of Listing 1, and also in lines 10, 20 and 110 of Listing 3.

# Benchmark times

By Alex Bridger

Listing 2 reads the file you have set up and prints cheques for over \$100 on the screen. The steps involved are opening the file (line 100), and reading the next record (line 120). There is also a test for the end of the file (line 110) and printing of selected information (line 130).

Listings 3 and 4 show some of the features of random files — first, setting up records on a file (Listing 3), then printing them to the screen and allowing new information to be added (Listing 4).

When random files are opened, record length must be stated (line 10, where a length of 128 is used). The record is then "fielded" (line 20), defining what information is in each record and the maximum number of characters used to store each variable. In this example, the first 20 characters are defined as PERSON\$ (used to store a person's name), the next 40 characters are PRESENT1984\$, the next 4 store COST1984\$, and so on.

The last 20 characters in each record (LEFTOVER\$) have not been used in these programs, but could be in the future, if the programmer wanted to add up to 20 characters of extra information to the file at some stage. All variable names in the FIELD statement must be strings (ending with "\$").

Data is entered at the keyboard — person's name, 1983 present and its cost (lines 30 to 60). The next setp is to transfer data to the special variable names set up in the FIELD statement, using the function LSET (lines 70 to 90). The next unused record number is found using the length-of-file function LOF and the record length of 128 (line 100).

New data is then written to file in this record position (line 110). With random files, new records need not be added at the end of the file — any record number can be used, taking care, of course, not to overwrite existing data. Always CLOSE files (line 40) after data has been changed, otherwise the last changes may not be made.

Taking a deep breath, we can move on to reading and updating random files, shown in Listing 4, using the file set up above. Again, the file must be opened and fielded (lines 200 to 210). All records are printed to the screen (lines 220 to 260) by reading each one in turn with a GET statement calling the record number. Records are then updated if required.

The record number is typed (line 270), information for this record is entered (lines 320 to 330), and LSET is used to put this information into the special variables (lines 340 to 350). Variables not replaced with LSET statements do not change, so when the revised record is written back (line 360), using the same record number as when it was obtained from file, only 1984 present and cost will change, while person name and 1983 details will stay the same.

This has been a very quick review about using data files. Refer to manuals for more details on the statements shown in the listings, type in the listings, and try some variations. Happy filing!

Back in August, a bit carried away by all the Olympic fervour, I decided to race my SV318 against other microcomputers. The results I and others came up with contained some surprises.

A number of standard benchmark programs have been widely published in various magazines. However, I feel the most interesting is Eratosthenes sieve which finds prime numbers by knocking out all the non-primes. Only the sieve and benchmarks 3, 7 and 8 are listed at the end, since all others are subsets of these.

The most useful features of running these programs on your machine, whether it's a SpectraVideo or some other micro, is that it makes you aware of how much time your machine takes to execute certain standard BASIC commands.

My initial motivation, however, was to compare different machine performances. The benchmark programs repeat certain commands and functions 1000 times to produce a measurable time.

After repeatedly timing some of the shorter programs with a stop watch, I concluded that human error was the greatest source of variation. So I made two small changes to the official benchmark programs to get the computer to automatically time itself. The PRINT 'S' and PRINT 'E' (start & end) commands were replaced by 20 A=TIME:PRINT A and 120 PRINT TIME;(TIME-A) respectively. This modification uses the SpectraVideo TIME function which is a counter that goes up to 65535 (16-bit register).

The starting time was put in to prevent the confusion of a negative time difference when the counter rolls over from 65535 to 0. I found this happened about every 22 minutes which meant the time constant was not the same as the SV Basic Reference Manual's indication of 60 counts per second. An accurate estimation of the time constant then gave 50 counts per second or 0.020 seconds per count on our machine.

## Single, double or integer precision arithmetic

When running Benchmark 3 (BM3:1000 additions, subtractions, multiplications & divisions), I found single precision arithmetic was fastest, then double and integer. Integer operations were eight per cent slower than single precision! This apparent anomaly for integer arithmetic arises because I was timing a mixture of operations. The individual arithmetic operations were separated, times measured for each precision type for each operation, with the base overhead subtracted to get the time taken for each operator.

```
10 REM Benchmark 3
20 PRINT "S"
30 K=0
40 K=K+1
50 B=K/K*K+K-K
60 IF K < 1000 THEN 40
70 PRINT "E"
80 END
90 REM benchmark2 has line 5
0 deleted.
95 REM for self-timing repla
ce 20 A=TIME:PRINT A and 70
PRINT TIME;TIME-A
```

```
10 REM Benchmark 7
20 PRINT "S"
30 K=0
35 DIM M(5)
40 K=K+1
50 B=K/2*3+4-5
51 GOSUB 85
53 FOR L=1 TO 5
55 M(L)=A
57 NEXT L
60 IF K < 1000 THEN 40
70 PRINT "E"
80 END
85 RETURN
90 REM benchmark6 has line 5
5 deleted.
92 REM benchmark5 additional
ly has lines 35,53,57 delete
d.
94 REM benchmark4 additional
ly has line 51 deleted.
```

```
10 REM Benchmark 8
20 PRINT "S"
30 K=0
40 K=K+1
50 B=K^2
55 C=LOG(K)
57 D=SIN(K)
60 IF K < 1000 THEN 40
70 PRINT "E"
80 END
```

## Eratosthenes Sieve

```
10 DEFINT A-Z
20 SIZE=8190
30 DIM FLAGS(8190)
40 PRINT "only 1 iteration"
50 COUNT=0
60 FOR I=0 TO SIZE
70 FLAGS(I)=1
80 NEXT I
90 FOR I=0 TO SIZE
100 IF FLAGS(I)=0 THEN 180
110 PRIME = I+1+3
120 K=I+PRIME
130 IF K>SIZE THEN 170
140 FLAGS(K)=0
150 K=K+PRIME
160 GOTO 130
170 COUNT=COUNT+1
180 NEXT I
190 PRINTCOUNT;"primes"
```

The results shown in Table A were obtained by dividing the single precision times into the double and integer time differences to get the reported ratios. For Table B, the addition times for each precision type were divided into the corresponding times for the other arithmetical operators.



**TABLE A: Comparison of precision type**

opr:	double	:	single (time s):	integer	
Base ovhd	(6.9s)	:	(6.7s)	:	(5.6) secs
+	1.24	:	1.00 (1.2s)	:	0.61 ratio
-	1.24	:	1.00 (1.2s)	:	0.17 ratio
*	1.08	:	1.00 (3.6s)	:	1.13 ratio
/	1.08	:	1.00 (3.3s)	:	1.19 ratio

From Table A, as expected integer addition is about 40 per cent faster than single precision (subtraction result shown has large round-off and truncation error); however, division and multiplication are about 15 per cent slower. Table B shows that multiplication and division is about 2.5 times slower than addition in single or double precision, and more than five times slower in integer arithmetic. Again, the integer subtraction result is somewhat suspect because it is the divided difference of two small numbers. The base overhead was found by replacing the arithmetic line with 50 B=K i.e. no arithmetic.

### Timing of functions

The next task was to measure the time taken for the mathematical functions on the SpectraVideo by using the modified version of Benchmark 8. Lines 150 and 160 were deleted and lines 20 and 120 had the timing modifications mentioned above. To measure just the time taken to execute one of the functions 1000 times, the base "overhead" was established with line 140 A=K giving a time of 6.9 seconds which was then subtracted from the times measured.

### Function (secs) SV318

VPEEK(K)	0.7
HEX\$(K)	1.7
RND(K)	7.6
K <sup>2</sup> k squared	11.7
SIN(K)	81.9
ATN(K)	89.4
LOG(K)	132.9

### 328

PEEK(K)	1.3
OCT\$(K)	1.7
RND(-TIME)	8.5
EXP(K) *	28.1 *
COS(K)	82.6
TAN(K)	189.4
SQR(K)	175.5

\* Extrapolated approx result since for K V 145 overflow occurs.

### Eratosthenes Seive:

Finally, the simplest allround benchmark to get a quick one-off view of each microcomputer's speed is that interesting little program called Eratosthenes Seive. This program finds all the prime numbers up to a given number by knocking out factors of the lowest remaining prime — a simple concept put forward by Eratosthenes in 200BC.

Pass 0 count all nos.: 1234 56789  
1011121314 1516171819.

**TABLE B: Comparison by type of operation**

opr :	double	:	single	:	integer	
+	1.00	:	1.00	:	1.00	1.00
-	0.95	:	0.95	:	0.95	0.26
*	2.51	:	2.51	:	2.87	5.32
/	2.34	:	2.34	:	2.69	5.24

Pass 1 remove multpls of 2: 3 5 7 9 11 13 15 17 19.  
Pass 2 remove multpls of 3: 5 7 11 13 17 19.  
Pass 3 remove multpls of 5: . . . etc.

These were the times on various machines.

SpectraVideo 179 seconds, comparison ratio 0.94; IBM PC 190, 1.00; Commodore 64 338, 1.78; Apple II & III 223, 1.17; TRS 80 189, 0.99.

A word of caution on these results. The normal version of the Seive as used here is a heavy user of integer arithmetic. The Commodore 64, which doesn't have a DEFINT command, has to rely on the % alternative for integer precision. However, this cannot be done with the FOR . . . TO loops where the index register has to be a floating point number. More importantly, these times are a reflection of the speed and efficiency of the BASIC compiler.

## Straightforward storage

By Barbara Bridger

This is the type of program which demonstrates the versatility of a home computer as opposed to a games machine.

Spectra File Cabinet consists of two programs — one allows you to specify the format of the records in your file; the other is used to enter and manipulate data. Both programs are straightforward to use after careful reading of the detailed instructions.

The screen layout when entering data is clear and when the cursor is moved down to the next line or ENTER is pressed, the cursor is automatically moved to the start of the next field which saves time. (A beep when you are trying to type over the end of the line would be helpful for those of us who are not touch typists.)

A variety of ways of manipulating the data is possible, including sorting the records alphabetically on any field, searching for a particular set of characters (both of which were very quick on my small file of seven records), summing data over a particular field, and printing out all or any part of the file. When saving the file to tape, it is necessary to press ENTER after typing in the file name, something which is not obvious from the instructions or the screen display. While a file is being loaded, the screen displays the file name, the number of records in the file, and the number of fields/record.

The main drawback to this piece of software is that it uses a lot of space and

I would be most interested in the items in which other microcomputers run these benchmarks and functions, so write to me at: "Benchmarks", 11 Mawson St, Lower Hutt and tell me your results. If the response is worthwhile, I will collate and try to publish the results. If you want this compilation, send a stamped addressed envelope with your results, but don't expect an answer for six to eight weeks.

I would like to acknowledge the help given by M. Foster and T. Farmer, and the inspiration of Steve Ciarcia's article in the May issue of *Byte*.

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therefore only a small file can be created if you are running the program on an unexpanded SV318. I also found it necessary to alter the DIP switch on our printer to the setting that causes extra linefeeds in normal use. Otherwise, this program is very good value at \$18 for anyone wanting to make good use of the information storing capabilities of their SpectraVideo.

### Those gaps!

The December/January article contained some errors. The short program illustrating colour running had a comma and a bracket missing. Here is the correct version:

```
10 SCREEN 1
20 CIRCLE(123,100), 11,15
30 LINE(111,90)-(111,110),1
40 LINE(135,90)-(135,110),1
50 GOTO 50
```

The diagram illustrating screen numbering had some gaps that were not intended. It should have looked like this.

If you vpoke the number 255 into successive compartments, the numbering in SCREEN 1 is:

0	8	248
1	9	249
2	10	250
3	11	251
4	12	252
5	13	253
6	14	254
7	15	255
256	264	
257	265	
6143 .		

# Close encounter of the Joust kind

By Michael Fletcher

No doubt about it, one of the strangest arcade games in New Zealand is Joust(tm) by Williams. Just the name sounds wacky, let alone the game itself.

I first encountered Joust when strolling past my local burger bar. Oh, this is new, I thought, as I plunged a crisp new 20 cent piece into the machine. Thirty-seven seconds later, a frustrated Michael Fletcher left the machine muttering: "It's a bit hard isn't it". Three weeks later, Monaco released Joust for the Atari computers. I must get even with this game, I thought, just to prove to myself that apart from Shamus and Adventure 12, there isn't a game I couldn't conquer.

A couple of days later, Joust was happily sitting in my cartridge slot and after reading a relatively short instruction booklet, I plugged in my joystick and started.

The game play for Joust is quite complicated. Briefly, you control a flying ostrich(?) on which your knight rides. Flying can be achieved by pushing the action button and flapping your wings: direction is controlled by pushing the joystick either left or right.

"Jousting" with one of the many flying knight opponents on the screen entails colliding with them; the victor is the knight whose mount (ostrich or vulture) is positioned higher on point of impact. If you succeed in "jousting" your opponent, the enemy bird flies off riderless, leaving an egg behind which you must retrieve before it hatches into a new opponent. If the enemy knight wins, you lose a life (don't despair however; you have several).

The scenario for Joust is quite diverse, the game field (for a start) is essentially floating rock platforms suspended above a boiling lava pool. Atari Joust starts when an ostrich rises from the rock at the bottom of the screen. A man holding

a lance is seated on the bird's back – that's you. However you don't have much chance for a rest as the action starts furiously with dozens of enemy rides appearing from numerous points on the screen. All have one intention – to kill you. The graphics are surprisingly good and totally demolish the Spectrum Joust graphics.

The object is to kill the enemy riders and survive to battle in the harder later screens. But the reason why you are in this benign scenario in the first place is because you and your feathered steed must complete this task before you can become fully fledged knights.

When you lose a joust, your ostrich will fly off the screen and reappear by rising out of the trap door in the least crowded portion of the screen. When you win a joust, your opponent's steed drops an egg and flies off the screen. These eggs are very rubbery, and can survive an immense fall. Collecting an egg (by landing on it or running over it) can get you up to 1000 points. A special bonus is awarded for catching an egg in mid-air (500 points). If a fallen egg is left for a while, it will hatch and a deadlier foe will emerge.

Every fifth wave is an egg wave, on which there are no evil opponents to battle, but 12 eggs randomly strewn across the rock ledges. These eggs must be collected by flying from ledge to ledge or they will hatch. If you are quick enough to pick up all 12 eggs, the wave is worth 10,500 points.

Like most attack-wave games, Joust has a "baiter" to keep you honest and efficient. Known as "The Unbeatable?? Pterodactyl", it lunges across the entire screen, occasionally changing direction in mid-air. Contact with any part of the pterodactyl will cause you to be knocked off your ostrich. This will happen even if you touch it with your lance. The only

way to kill a pterodactyl is to ram your lance down its throat until it dies in the lava. This is a difficult manoeuvre, but standing on one of the rock islands in the middle of the screen can give you a good enough base to pull it off.

## A significant health hazard

As in most games, there are many complexities. For example there are three kinds of enemy knights (red, blue and grey, in order of difficulty to kill) and if an egg from a killed enemy rider hatches, it hatches into a knight of a more dangerous kind.

Another significant hazard to your health is the dreaded lava troll that controls all the lava at the bottom of the screen. Like all trolls, it hates to be disturbed from eternal rest at the bottom of the lava pond, and if anybody or thing interrupts this rest, it reacts quite violently by plunging its huge hand out of the lava, grabbing the offender and devouring him at the bottom of the lava lake. This gruesome possibility is faced by all riders who fly above the lava pool.

## A welcome relief

Joust's sound effects are a welcome relief from the hi-tech nickelodians found on many computers. These games provide meaningless musical backgrounds and theme music usually smothered by games room sound systems. In Joust, every sound – from the flapping of ostrich wings to the hatching of eggs – conveys a message. One of the best sounds is undoubtedly the pterodactyl's scream – a loud, shrill screech that would put even Dame Kiri Te Kanawa to shame.

One of the game's best features is the dual-player mode. The second player controls a stork and both players have the opportunity of fighting the evil riders and/or each other. A bonus of 3000 points is awarded if one player unseats the other.

The only complaint I have about Atari Joust is that the change from round to round is done too quickly, and it is often hard to position your knight for the beginning of the battle round.

Apart from this minor inconvenience, Joust has got to be one of the best around for Atari computers. It's sound, colour, graphics, and speed make it more than a rival to variations on other computer systems. Joust, a 16K cartridge, costs \$89.95 from most Atari stockists.

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# Snake gets a good press

By Alex & Fred Wong

At last, here is something which might counteract all the bad publicity generated by the snake that tempted Eve into eating the original apple. The Video Viper, designed and built in Wellington, lives inside on Apple II Plus or IIe to produce digitised images from any composite video source.

The Video Viper expansion card is very easily installed. It plugs into any slot without other hardware adjustments and needs the connection of only two wires, a BNC connector for the video input and a brightness control pot. The card is very well made and every chip is socketed. There are no rough edges and even the designer's initials are on the bottom. The BNC cable connects to any video source such as a video camera or recorder.

Since we are using Fred's II Plus as a guinea pig, he gets to boot up the Viper's control and utility software... while I take notes from the corner!

Entirely memory resident, the Viper menu offers many choices. Utilities include catalogue and a change slots option. Pictures may be deleted from the disk or loaded from disk and viewed.

To digitise a picture takes 0.3 of a second (quick even by overseas standards), and this can be done continuously. The digitised picture appears on the screen and can be saved to disk as an ordinary DOS 3.3 34 sector binary file. It can then be dumped onto the printer or manipulated using a program like Mousepaint (which is tremendous fun!)

Besides the use of the brightness control to adjust the picture quality, four other controls are mounted on the board itself to change the output. These are Synchronisation (necessary only in the unlikely event that the picture is twisted), Contrast, Picture Width (which affects both the screen and the printer), and Nature of the Shading, which changes the pattern made by the digitised pixels (and definitely is the ultimate adjustment!).



*The pictures (above and below) are examples of Video Viper's capabilities.*

We tried both a video camera and a video recorder input and found the



quality excellent, although as in ordinary pictures, a lot depended on the lighting conditions. The pictures turn out with Apple's 256 x 192 pixels used to great advantage to give very realistic (and sometimes not entirely flattering, as I discovered) images. It is very easy to use, and needs no technical expertise. The software, co-written by David Pairman, is very friendly, bug free and idiot proof, even though the preliminary documentation is somewhat confusing.

The Video Viper is an excellent product, both in design and quality, and works beautifully. If, despite the rather high initial cost of \$429 and the necessary equipment to provide the video signal, you find a use for it or are content to play with a very nice gadget, you will find it most satisfactory.

Further information is available. Tom Lewitt, 30 Elmslie Rd, Pinehaven, Wellington (Wellington 288-250).

# The IIc has mice

By Alex & Fred Wong

At its launch, we were told the IIc is a great computer for business as well as the educational and home markets. After reading of all the products which have been updated, re-programmed or written entirely from scratch, we are no longer cynical.

In just the few short months since its introduction in the USA, a wealth of hardware and software products, from hard disks to adventure games, have been released for the IIc (especially with the mouse). Most take advantage of the IIc's standard 128K RAM, 80 columns and mouse interface to provide options that otherwise would have been available only to fully equipped IIs.

Here is a summary of these products. Expect the list to grow spectacularly, soon.

- Integrated business packages featuring a word processor, spreadsheet and database are AppleWorks, Jack 2 and Jane.
- Graphics packages include Apple's own MousePaint, Dazzle Draw, Blazing Paddles, Beagle Graphics, The Graphics Magician and the Complete Graphics System.
- Word processors include Cut & Paste and Bank Street Writer (Filer and Mailer are on their way), as well as the Write

Choice.

- Two accounting packages have been released - The Financial Cookbook and the Home Accountant, plus the Dow Jones Investor's Workshop.
- One entirely new database (Superbase) and an old Apple III favourite, the Catalyst, a floppy to hard disk transfer program.
- Two typing programs, The Write Choice and Mastertype, both of which include updates for the Dvorak key configuration which the British IIc (unfortunately) doesn't have.
- In the educational field, there are Crypto-Cube, Grandma's House and Cell Defense, not to mention the Imagination

Series of Music, Picture and Quilt or the 'How About a Nice Game Of' series, which includes Chess, Checkers, Backgammon, and Odin.

• IIc/mouse updated games include Wizardry (all three scenarios), Mouse 2.1, Pinball Construction Set, The Summer Games, Music Construction Set, Sargon III and Transylvania.

• In the hardware category, there is the serial-to-parallel printer port adapter for those who want to use their existing parallel printers with the IIc's serial output. The mockingboard, previously available only as an expansion slot card, is now available in cartridge form

## Wirth does an encore

The great Pascal controversy over which version is better has found a solution of sorts. Niklaus Wirth, the author of Pascal, has written another language, Modula-2.

Modula-2 is a fusion of the best in several languages and, it is hoped, will answer programmers' complaints about Pascal. The language has a minimum of commands and a library of routines with special functions for input and output, which makes it compact and

transportable to other machines.

Modula-2 is now available for the Apple II computer from Volition Systems, and works in conjunction with Apple Pascal 1.1 operating system. Although it is not recommended for the beginning programmer, those well versed in Pascal should find this new language absorbing.

For more information, contact Volition Systems, P.O. Box 1236, Del Mar, CA-92014, USA.

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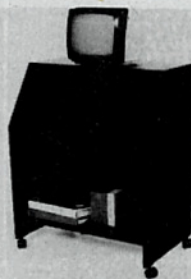
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# Where goes the Beeb?

By Pip Forer

Having survived the Brighton bomb blast (he was about 10 rooms along from Maggie Thatcher at the time), Acorn's managing director, Chris Curry, has presumably spent the Christmas break relaxing and contemplating Acorn's future directions. On the positive side, Acorn has captured the British education market, done well internationally and has a reasonable (and inevitably growing) share in British home micros. It has retained the BBC microcomputing project contract and in the first months of this year, will deliver the final set of components for the BBC system — an extremely powerful 32-bit second processor, the NS32016, and a hard disk from Econet or standalones.

These "official" products can now stand alongside third party offerings available for some time. With complete versions of Pascal and LOGO available and the cost of memory boards to support graphics dropping, the original single-processor BBC is reaching a plateau, albeit a very comfortable one. With continuing growth of significant quantities of what is generally good

quality educational software, 1985 can be approached with confidence.

However, on the less rosy side, Acorn's foray into the USA has been predictably unprofitable and the future of its new business computer sales is, naturally enough, still unclear. Certainly, Acorn must be thinking about where to go to capitalise on success. The standard BBC remains an excellent eight-bit computer that can outrun most of its rivals. At present it is significantly cheaper than 16 or 32-bit alternatives . . . but that may not last. What will Acorn do to meet challenges to its markets? Let's speculate.

Presumably, for a start it is looking over its eight-bit shoulder at Apple, which has gone for a semi-portable IIc with expanded memory. The logical equivalent for Acorn would be to capitalise on a lot of the components it already has to hand. Cut down the number of ports supplied but expand the sideways ROM space and build in both a second 6502 processor and a variety of ROM-based software including word processing, spreadsheet, a program editor such as Toolkit and perhaps a disk

drive. Place it all in a redesigned case and you have something to compete with any eight-bit option. You could even build in a large memory board with a RAM disk capability. The problem is not technical but marketing; the British market is insufficiently affluent.

On the other hand, the 16-bit machines may start to appeal to Acorn's markets, particularly with "friendlier" designs emerging. To match power with power, Acorn has to look to a relatively cheap 32016 machine with a good operating system. This would not be marketed as the upmarket "second processor for the demanding scientific user" which Acorn is talking about, but as a standard, low cost working option. Acorn will have to have that on the counter by late this year, with an eye not just to business or university work station markets but for general school use. The next generation of the Beeb, which can't be too far away, will be Beeb-compatible but may well follow the two routes outlined. With developments in optical disks and networking under way, the change, when it comes, should be interesting.

## About networks

The southern hemisphere appears to lead in educational networking. If you are a teacher and want a book to explain simple Econet level 2 to other staff members, try Bob Napier's "Networking with the BBC Microcomputer". Nothing new in it, and nothing on really programming the network, but inevitably a more digestible and ordered account of all the higher level commands, and better aimed at the new user than a reference manual.

## Coming up . . .

A promise to really review the new languages in March plus hard disk and 32016 comments in early 1985. Also in the pipeline are a review of input devices (digitisers and the AmX Mouse, MacClone) and of available author languages. BBC may not have PILOT but some other options are around including Microtext from Britain and ProForma from our own Waikato University. Maybe later in the year we can even get a look at a version of PROLOG that doesn't need a Z80 second processor and discuss how to create multi-player simulations (also known as games) using Econet primitives.

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## '85: Year of the spreadsheet

I have been working on the new Acorn ROM-based spreadsheet, Viewsheet. An initial reaction is that this is an excellent product and I would rate it among the best non-CP/M spreadsheets for eight-bit machines. (I put that caveat in because I am pretty ignorant on CP/M spreadsheets but Viewsheet would certainly eat normal VisiCalc for breakfast). The package deserves to become a standard. It is fast and offers a variety of powerful commands with considerable control over output to the screen or printer. It will work in 80-column mode with enough space for the sort of simple models a school might use, or across the tube for larger applications. It loads quickly for network use (compared with UltraCalc which we had previously used) and can even link in to other spreadsheet models on disk, a facility pioneered by the business-

oriented Multiplan. It is just a bit slow on this however. You can also transfer portions of the spreadsheet into a VIEW word-processing file. In fact, VIEW and Viewsheet use very similar user interface commands and make a nicely compatible set.

Spreadsheets and word-processing are likely to be the growth areas in school micro use in 1985. It would be good to see the BBC community standardise on Viewsheet and VIEW to aid inter-school co-operation, especially with spreadsheet models and databases. Neither product is cheap on a one-to-one basis and from talking with teachers, neither is yet widely used. Perhaps everyone would benefit if Barsons and Acorn looked closely at promotional deals for these two packages. It would be to the advantage of both the BBC and the school user community.

## Further suspense

Where is the promised expose of Acorn LOGO and Pascal? Well you may ask. I sit here (in December remember) with two operating LOGO ROMS (but no documentation) and a thick Pascal system manual, but no run-time module to benchmark it with. I must suspend full judgement again. However applying ideas from other LOGOs, the Acorn LOGO works well, has an easy-to-use editor and some enhanced features such as supporting multiple turtles and mechanical "floor" turtles. It is

marketed with 200 pages of documentation . . . apparently still en route from Britain and is compatible with the core of most common LOGOs (although not completely so with the excellent Turtlegraphics subset marketed by Acorn).

I understand a Pascal compiler that will create portable assembler code (without a run-time module being needed) is on the way. Proper coverage in March . . . I hope.

# Useful machine code routines

By Gary Parker

Roll up, roll up! Ladies and gentlemen, prepare to witness a dazzling display of machine code routines such as has never been seen by man nor beast!

But seriously, machine code routines can be quite useful. Here are eight machine code routines which you can incorporate into your own programs. They perform tasks which would be difficult to accomplish or far too slow with BASIC. Each routine was either written by me from scratch, or adapted from routines given in magazines.

To use any of these routines, you should first type in Listing 1 and save it on tape. Listing 1 is a loader program, which will READ the machine code from DATA statements, and POKE it into memory. Then clear the memory by turning the computer off and on (or by doing RANDOMISE USR 0 as a direct command), and type in lines 110 and 120 of the machine code routine you want to try. Take care not to make any mistakes in line 120.

Then save these two lines on tape, just in case you've made a mistake typing them in, and MERGE the loader program (Listing 1, which you saved first). Now you'll have a program consisting of lines

5 through to 120. RUN this, and the machine code will be POKEd into place, and you'll be asked to start the tape, when the area of memory which now holds the machine code will be saved.

In future, whenever you want to use the routines, just load it with LOAD " " CODE, and use  
LET x=USR 23296

where x can be any variable name you're not using, to run the routine. All the routines are stored in the printer buffer, which begins at address 23296 and contains 255 bytes. This is a handy place to store machine code, since it is seldom used and will work without change on both 16K and 48K Spectrums.

If you use a ZX printer, the routine will be wiped, and you'll have to reload it again. Anything stored in the printer buffer can be saved with SAVE "name" CODE 23296,255.

paper squares to white ink and black paper. Since when the computer is turned on all squares are this colour, it will reverse the screen colours with a spectacular flash. You can control which colours are altered. POKE 23297 with the attribute to be replaced, and POKE 23299 with the attribute which will replace it. As described in October, the attribute is made up of  
INK colour+8xPAPER colour+64  
xBRIGHT+128xFLASH

So when the computer is turned on, all attributes are set to  $0+8x7+64x0+128x0 = 56$ . This routine could be used in your own program to, for instance, change all red objects on cyan paper to invisible cyan ones with  
POKE 23297,42: POKE 23299,45: LET r=USR 23296

Then all those objects could be made to suddenly reappear in blue with  
POKE 23297,45: POKE 23299,41: LET r=USR 23296

Listing 3 will shift the top third of the screen to the bottom third. This could be done with BASIC, but it would take quite a while! To alter it to shift the bottom third to the top, POKE 23298,80: POKE 23301, 64. To get it back to normal, POKE these two addresses with 64 and 80 respectively.

Listing 4 is a utility which will replace any specified character in a program listing with any other. Since all BASIC keywords are stored as a single character, you can replace any of these as well. As given, the routine will change all READ statements to INPUT statements. You should POKE 23297 with the code of the character to be

## Swapping attitudes

Listing 2 is an attribute swap routine. The attributes are the colours of the screen. There are 704 byte of attributes, one for each square on the screen, and each byte contains a number which controls the INK, PAPER, FLASH, and BRIGHT of that square. This routine allows you to selectively change the colours of squares, by altering the attributes.

For example, it can instantaneously change all black and white squares to blue and yellow flashing ones. As given, it will change all black ink and white

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This excellent game is the only version of soccer I have seen on the Spectrum, and is sure to be very popular. Before I played this game, I doubted a game such as soccer could be very well done on computer, but this version has dispelled my doubts.

Each team has six players, and the user controls the player closest to the ball. Dribbling, passing, and tackling are realistic, although there is the inevitable flickering when players overlap which can make them difficult to tell apart. Players can run and kick the ball in all directions, and the controls are responsive, especially when using the two joysticks of interface two. One person can play against the

computer, or up to nine people can enter the World Cup. A two-person game using the keyboard requires some dexterity!

To win these prizes, I want you to write a program which makes maximum use of the machine code routines given. It should display some text which tells me what you want to see in these Spectrum columns. Is there interest in machine code routines? Would people like to be taught simple machine code programming?

Send in a program which tells me what you want, in a visually effective manner, and you could win one of these prizes. Send the program on tape, and if you want the tape returned, include a stamped, self addressed envelope. The address is:

Gary Parker  
World Cup Contest  
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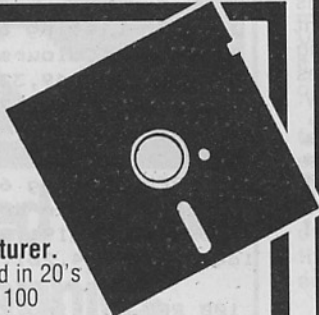


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## BOOKS

# VisiCalc duo

*Simply VisiCalc* by Barbara S. Chirlan. dilithium press. 152pp. \$22.95.

*Using VisiCalc* by Carol Klitzner and Matthew J. Plociak, Jr. Wiley Press. 277pp. \$39.95.

Reviewed by Kerry Marshall

Simply VisiCalc aims at introducing the general principles of the original spreadsheet, VisiCalc. The author states in the introduction that not every option

will be dealt with and after reading the book, I would say the objective has been achieved.

The chapters follow what seems to be a common format of an introduction to the product and the underlying principles, followed by chapters that lead the reader through the features of VisiCalc. This process is done in a logical way, and one of the good points about this book was the use of a simple example developed as the book went on.

Overall impression was of value for money as an introduction, although whether anyone would buy the book to see whether VisiCalc suited their needs, as suggested by the author, is open for discussion.

*Using VisiCalc* also begins with a description of the principles of spreadsheets and some background to VisiCalc. But it has a different approach in the sequence and in the degree of detail to which each option is taken.

The reader is taken through the operation of VisiCalc in stages using examples. The authors have chosen to include several examples in each section and although this may assist the more experienced reader, it does have the effect of losing continuity between operations. However, this book gives more detail about the options available in VisiCalc, and I found myself referring to it several times for details about the operation of various functions.

It would be useful for the more frequent user of VisiCalc, and includes a section on layouts that can be used in business. Each layout is shown blank and then with data with an explanation of its uses. The book includes details of the layout which can, with patience, be entered.

Given this, the book will be of most benefit to first time users if the layouts are relevant.

## A real comfort

*What to do when you Get Your Hands on a Micro-computer* by Charles P. Holtzman. \$24.95.

Reviewed by John Durham

This book is for the person who, faced with using a microcomputer for the first time, is scared. It teaches the reader both how to handle the machine from scratch, and how to pick up the basic language.

The approach taken by the author is to teach those things likely to be universally applicable to all micros with BASIC,

Full of graphic and often humorous illustrations of the way the computer works, and what the basic terms mean, the book is so universal it would be almost impossible to tell from reading it what kind of micro the author uses. And although many of the more advanced BASIC

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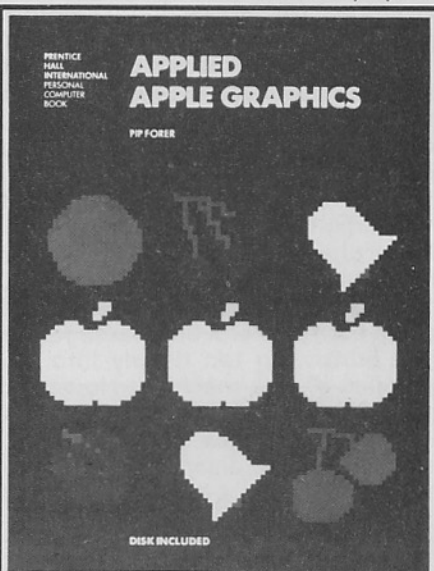
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## BOOKS

expressions are not mentioned, enough material is presented to give the reader a good understanding of the subject.

The introduction reveals the depth of the author's imagination, and reads like a futuristic science fiction

paperback. The last few pages contain a list of all the most often asked questions about micros and BASIC, and gives good straight answers.

The author is clearly a patriotic American, as indicated by his short discussion of the reasons why the USA will become the world leader in computer technology, and this might have to be taken with a grain of salt by some readers, but overall it is a superb piece of work, and at \$24.95, I'd buy it.

book is directed mainly toward beginning programmers, but it can also serve as a ready source of reference for experienced programmers wanting to check the syntax of a command or determine how an unfamiliar function operates.

The book is potentially very useful; however, there is a serious problem. Explanations of the keywords are too insubstantial. Instead of focussing on the essential details, the book generally gives only superficial coverage to a keyword before turning its attention to a sample program, most of which is irrelevant to the particular keyword. Beginners may profit from such a shallow, wandering tour through the keywords, but experienced programmers will wish for more solid information.

Hergert has written similar books for the Apple II and the Sinclair ZX-81, and it is understandable he should take a more general approach, rather than burrowing too deeply into the specifics of one machine. However, most Commodore programmers will need such specifics sooner or later, and they will be disappointed if they look to this book for full explanations.

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## Nothing too specific

*"The Commodore 64/VIC-20 BASIC Handbook"* by Douglas Hergert. Sybex, 185pp, \$21.95. Reviewed by Steven Darnold.

Each BASIC keyword is listed in alphabetical order and a page or two spent on each explaining how it works. Scattered among the explanations are numerous sample programs, some of which include pictures of the screen display. The

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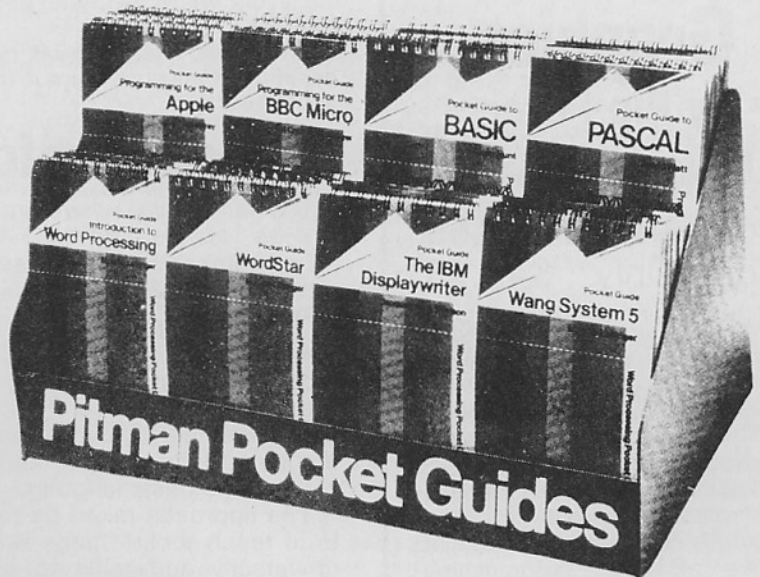
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**SANYO USER GROUPS** have been set up in Auckland, Wellington and Christchurch. Contact P.O. Box 6810, Auckland for further information.

**SHARP PC1500 USER GROUP**: Contact: Allan Thomas, P.O. Box 155, Napier. Newsletter.

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**KERIKERI COMMODORE 64 USER GROUP**: Contact: Brett Snow, Skudders Beach, Kerikeri. Ph 78-888.

**WHANGAREI COMPUTER GROUP**: 15 James Street, Whangarei. Phone 84-416. Meets every second Wednesday of the month at Northland Community College.

**N.Z. MICROCOMPUTER CLUB**, PO Box 6210, Auckland. A meeting is held on the first Wednesday of each month at the OSNZ Hall, 107 Hillsborough Rd, Mt Roskill, from 7.30 pm. Visitors are also welcome at Micro Workshop 10am — 5pm at the same hall on the Saturday following the above meeting.

The following user groups are part of, or affiliated with, the N.Z. Micro Club. Meetings start at 7.30pm at the OSNZ Hall. Those shown "M" are held at the VHF Clubrooms, Hazel Ave, Mt Roskill.

**APPLE USER GROUP**: Ross Bryon, ph 761-670 (h). Meetings: 3rd Tuesday.

**BBC USER GROUP**: Dave Fielder, ph 770-630, Ext 518 (w). Meetings: 2nd Wednesday.

**BUSINESS USER GROUP**: Cathy Arrow, phone 491-012. Meetings: 4th Tuesday \* even months, visits on odd months.

**CP/M USER GROUP**: Kerry Koppert, 2/870 Dominion Rd, Balmoral. Phone 695-355 (h). Meetings: 1st Wednesday 9pm.

**IBM PC USER GROUP**: Terry Bowden, ph 452-639 (h) 778-910 (w). Meetings: 3rd Thursday.

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**POCKET COMPUTER USER GROUP**: Peter Taylor, 14 Gollan Rd, Mt Wellington 6, phone 576-618 (h).

**SINCLAIR USERS GROUP**: Doug Farmer, phone 567-589 (h). Meetings: 4th Wednesday.

**SORCERER USER GROUP (NZ)**: Selwyn Arrow, ph 491-012 (h). Meets at Micro Workshop.

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**TOMORROW USERS GROUP**: Chris Cotton, phone 789-153. Meetings: 3rd Thursday, 7.30pm, 20 Kingsley Street, Grey Lynn.

**WIZZARD USER GROUP**: Richard McFadgen, 11 Hilling St, Titirangi, ph 8178-219 (h).

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The above contacts can usually be found at N.Z. Microcomputer Club meetings and micro workshops, or via P.O. Box 6210, Auckland.

Other Auckland-based groups:

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**ATARI MICROCOMPUTER USER GROUP**: Ian Mason, 25 Manutara Ave, Forrest Hill, ph 467-347 (h). Meets 2nd Tuesday, Western Suburbs Radio Club, Gt North Rd, New Lynn.

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**OSI/BBC USERS' GROUP (AK)**: Secretary: Ken Harley, 77 Boundary Road, Auckland. Meets third Tuesday, VHF Clubrooms, Hazel Ave, Mt Roskill.

**SYMPOOL (N.Z. SYM user group)**: John Robertson, PO Box 580, Manurewa, ph 2675-188 (h).

**A.Z.T.E.C.**: Brian Mayo, Church Street, Katikati. Phone 490-326. Members use all micros.

**BAY MICROCOMPUTER CLUB (Tauranga)**: G.L. McKenzie, Secretary, Snodgrass Road, Tauranga. Phone: 25-569.

**BAY OF PLENTY TAURANGA COMMODORE USERS GROUP**: Contacts — phone 62-083, 65-311, and 83-610. Meets first and third Monday of month, 7 p.m.

**BAY SHARP USERS GROUP**: Contact — Phone 86132. Meeting 2nd and 4th Monday. 417 Cameron Road, Tauranga.

**BEACH COMPUTING CLUB (Waihi)**: Jamie Clarke, Box 132, Waihi (Ph: 45-364 Waihi Beach).

**TAURANGA MAC GROUP**: Contact: Clive Bolton, 81-779 (w) 62-811 (h).

**WAIHI COMPUTER ENTHUSIASTS**: Contact: G.C. Jenkins, 10 Smith St, Waihi (h) WAH 8478. Workshops every Tuesday. Meetings last Tuesday of month.

**THE ATARI CONNECTION**: Contact: Paul Cormack, 29 McDiarmid Cres, Huntly. Ph (h) 88-695.

**HAMILTON SUPER 80 USERS'**: P.O. Box 16113, Glenview, Hamilton.

**WAIKATO ATARI USERS' CLUB**: P.O. Box 6087, Heaphy Terrace, Hamilton. Ph Dave (071) 73-888, Bob (071) 78-434.

**WAIKATO COMMODORE USERS' GROUP**: Secretary, Mrs Eileen Woodhouse, 32 Kenny Crescent, Hamilton.

**WAIKATO COMPUTERS IN EDUCATION SOCIETY**: Secretary, Geoff Franks, Fraser High School, 72 Elliott Road, Hamilton. Phone (h) 81-050.

**WAIKATO SPECTRUM USERS' GROUP**: Secretary: Roger, Loveless, 18 Heath St, Hamilton. Phone 492-080. Meetings: First Tuesday of the month.

**WAIKATO SPECTRAVIDEO USERS' GROUP**: P.O. Box 16113, Glenview, Hamilton.

**MORRINSVILLE COMPUTER SOCIETY**: Contact: Alison Stonyver, 49 Coronation Road, Morrinsville. Phone 6695 (h). Meets 1st and 3rd Wednesdays.

**GLOWWORM COMPUTER ENTHUSIASTS**: Meets every second Sunday of the month in the Otorohanga District Council's board room. Contacts: president, Colin Wilkings, Oto 8331; vice-president, Hugh Button, Oto 7228; secretary, Laurence Bevan, Oto 7066.

**GISBORNE MICROPROCESSOR USERS' GROUP**: Stuart Mullett-Merrick, P.O. Box 486, Gisborne. Phone 88-828.

**ROTORUA COMPUTER CLUB**: Contact: Ken Blackman, 6 Urquhart Place, Rotorua. Third Tuesday of each month at 7pm, Waiariki Community College, Rotorua.

**ELECTRIC APPLE USERS' GROUP**: Noel Bridgeman, P.O. Box 3105, Fitzroy, New Plymouth, Phone 80-216.

**TARANAKI MICRO COMPUTER SOCIETY**: P.O. Box 7003, Bell Block, New Plymouth: Mr K. Smith. Phone 8556, Waitara.

**SOUTH TARANAKI MICROCOMPUTER SOCIETY**: Contacts: Apple, Jim Callaghan, 86-667 Hawera; Commodore, Allen Goodhue, 86-194 Hawera; S80, TRS80, John Roberts-Thomson, 84-495 Hawera; Sega, Dave Beale, 85-108 Hawera; Spectrum, Guy Oakly, 8060 Manaia. Sub groups meet on the third Wednesday of the month. The whole society meets periodically in the Hawera High School computer room. Written inquiries to Allen Goodhue, 21 Princes Street, Hawera.

**NAPIER VZ-200 USERS GROUP** — Contact: Peter Cox, Ph 435-126 after 4pm or write to Peter Cox, 9 Cranby St, Orepkawa, Napier.

**HAWKE'S BAY MICROCOMPUTER USERS' GROUP**: Bob Brady, Pirimai Pharmacy, Pirimai Plaza, Napier. Phone 439-016.

**HAWKE'S BAY COMMODORE USER GROUP**: Contacts: Mike Phillips, 401 Lascelles Street, Hastings (president); Mark Hodgson, 1108 Oliphant Road, Hastings (secretary). Meetings: first Tuesday of month at H.B. Community College.

**INTERACT USERS GROUP**: for more information write to Denis Clark, 43 Charles Street, Westshore, Napier.

**WANGANUI COMMODORE 64 USER GROUP**: Contact — P. Northway, Phone (h) 42-916. 7 Broadhead Avenue, Wanganui. Meets first and third Thursdays of month at Wanganui Community College.

**HBCE (Hawke's Bay Computers in Education Society)**: Contact — Grant Barnett, 89 King Street, Taradale, Napier. Ph: 448-992.

**MOTOROLA USER GROUP**: Harry Wiggins, (ZL2BFR), P.O. Box 1718, Palmerston North. Phone (063) 82-527 (h).

**MANAWATU MICROCOMPUTER CLUB**: Contact: Richard Anger, 64-108 (W) or 63-808 (H). Meets twice a month at PDC Social Club rooms.

**HOROWHENUA MICROCOMPUTER CLUB**: Meets on second and fourth Thursday of month. President, Wally Withell, P.O. Box 405, Levin; secretary, Dennis Cole, 22 Edinburgh Street, Levin. Ph (069) 83-304.

**WAIRARAPA MICROCOMPUTER USERS' GROUP**: Geoffrey Petersen, 27 Cornwall St, Masterton. Ph (h) 87-439.

**CENTRAL DISTRICTS COMPUTERS IN EDUCATION SOCIETY**: Rory Butler, 4 John Street, Levin (069) 84-466 or Margaret Morgan, 18 Standen Street,

Karori, Wellington. (04) 767-167.  
**UPPER HUTT COMPUTER CLUB**: Shane Doyle, 18 Holdsworth Avenue, Upper Hutt. Phone 278-545. An all-machine club.

**BBC USER GROUP**: Users of other machines welcome too. See entry head of list.

**MICROBEE USERS' CLUB**: P.O. Box 871, Wellington, 2nd Sunday of month.

**NEC COMPUTER USERS' GROUP**: C/- P.O. Box 3820, Wellington.

**N.Z. SINCLAIR USERS' GROUP**: P.E. McCarroll, 11 Miro Street, Lower Hutt.

**NZ SUPER 80 USERS' GROUP**: C/- Peanut Computers, 5 Dundee Pl., Chartwell, Wellington 4. Phone 791-172.

**OHIO USERS' GROUP**: Wellington. Secretary/Treasurer: R.N. Hislop, 65B Awatea Street, Porirua.

**POLY USERS GROUP**, Wellington: Contact — Christine Greenbank, Computer Studies, Wellington Teachers' College, Private Bag, Karori, Wellington.

**ATARI USERS' GROUP**, Wellington: Eddie Nickless. Phone 731-024 (w), P.O. Box 16011. Meetings: first Wednesday of month.

**WELLINGTON APPLE USERS GROUP**: Inquiries to secretary, Grant Collison, 58 Lonsdale Cres, Wellington 3. Ph 872-537, evenings. Meets last Saturday of month.

**WELLINGTON COMMODORE USERS' GROUP**: P.O. Box 2828, Wellington. Contacts: Peter March (h) 86-701, Robert Keegan (h) 789-157.

**WELLINGTON MICROCOMPUTING SOCIETY INC.**: P.O. Box 1581, Wellington, or Bill Parkin (h) 725-086. Meetings are held in the Fellowship Room, St Johns Church, 176 Willis Street, on the 2nd Tuesday each month at 7.30pm.

**SEGA OWNERS CLUB**: Lower Hutt. Meets 1st Monday each month. Contact: Murray Trickett. (w) 724-356, (h) 662-747.

**WELLINGTON SPECTRAVIDEO CLUB**: Contact — Don Stanley, C/- Box 7057 Wellington South. Ph. 746-906 (w). Meets on one Monday a month at Staff Common Room (Level D), Wellington Clinical School, Mein Street, Newtown.

**WELLINGTON SYSTEM 80 USERS' GROUP**: Contact: W.G. (Bill) Lapsley, day 286-175; evenings, 268-939; or Andrew Vincent 780-371 (evenings).

**HUTT VALLEY COMMODORE USER GROUP**: Contact — Ken Alexander, C/- 16 Enfield St, Wainuimata or phone Wainuimata 645-830. Meetings, first and third Mondays of month at St. Bernard's College, from 7.30 pm.

**NELSON COMMODORE USERS' GROUP**: Peter Archer, P.O. Box 860, Nelson. Phone (054) 79-362 (h).

**NELSON HOME COMPUTER CLUB**: Contact — Mike Jenkins, Box 571. Ph 87-930. Meets, 7 p.m., first and third Tuesdays of the month at Nelson Intermediate.

**BLENHEIM COMPUTER CLUB**: Club night second Wednesday of month. Ivan Meynell, Secretary, P.O. Box 668. Phone (h) 85-207 or (w) 87-834.

**MARLBOROUGH COMMODORE USERS GROUP**: Secretary, Robin Vercoe, 42 Rogers Street, Blenheim. Meetings: Second Thursday of month, 7.30 p.m., IHC rooms.

**HOKITIKA COMPUTER USERS GROUP**: Contact — Adrian Mehrtens, 185 Sewell Street. Ph: 943.

**CANTERBURY COMPUTER EDUCATION SOCIETY**: Contact — Graeme Sauer (secretary), P.O. Box 31-065, Ilam, Christchurch 4.

**CHRISTCHURCH APPLE USERS GROUP** — Contact: Peter Fitchett, ph 328-189. Meets first Wednesday of month, third floor, Tower Building, Christchurch Teachers' College.

**CHRISTCHURCH ATARI USERS GROUP**: Contact Ron van Lindt, 10 Silverdale Place, Christchurch 6. Ph 891-374.

**CHRISTCHURCH SPECTRAVIDEO USERS GROUP** — Contact: Lester Reilly, ph (h) 428-686. Meets third Tuesday of month.

**CHRISTCHURCH TRS-80 COLOUR USER GROUP**: Meetings: last Wednesday of month. Contact: Dennis Rogers, 21 Frankleigh Street, Christchurch 2. Phone 34-731.

**CHRISTCHURCH '80 USERS' GROUP**: Brendan Thompson. Phone (h) 370-381. P.O. 4118, Christchurch.

**OSI USERS' GROUP (CH)**: Barry Long, 377 Barrington St., Spreydon, Christchurch. Phone 384-560 (h).

**SINCLAIR USERS' GROUP CANTERBURY, INC**: Contact: Gary Parker (president). Phone 894-820, P.O. Box 4063. Meets 7.30 p.m. last Monday of month. Phone for latest meeting place.

**CHRISTCHURCH COMMODORE USERS GROUP**: John Kramer, 885-533 and John Sparrow. Phone 896-099.

**CHRISTCHURCH BBC and ELECTRON USERS GROUP**. Meets alternate Monday nights at 6.30 except Saturday or Secondary-School holidays, at Hagley High School. Secretary, Mrs R.D. Nolan, 87 Palmers Road, Christchurch, 9.

**PANASONIC (JB-3000) USERS' GROUP**: Contact: Prof B.J. Clarke, Dept of Accountancy, University of Canterbury, Private Bag, Christchurch, 1.

**CHRISTCHURCH COLOUR GENIE USERS' GROUP**: Meets 2nd Wednesday, 7.00p.m., Abacus Shop, Shades Arcade. Secretary, Robert Wilson, 17 Warlington Street, Christchurch, 7. Ph: 881-456.

**CHRISTCHURCH SORD MS USERS GROUP**: Meets first Thursday of month, 7pm. Ph: 792-771 for details.

**DICK SMITH WIZZARD COMPUTER CLUB**, Christchurch: Contact — Tony Dodd, 34 Mayfield Ave. Ph: 557-327.

# GLOSSARY

**Acoustic coupler:** Connects the RS232 part of a microcomputer to a telephone handpiece.

**Algorithm:** A list of instructions for carrying out some process step by step.

**Applications program:** A program written to carry out a specific job, for example an accounting or word processing program.

**Array:** A data type found in high level languages, which is stored in a contiguous block of memory. Accessed by the array name and an index making it easier to process groups of data in many situations.

**ASCII:** American Standard Code for Information Interchange. An 8-bit code.

**BASIC:** Beginners' All-purpose Symbolic Instruction Code. The most widely used, and easiest to learn, high level programming language for microcomputers.

**Baud:** Speed of transferring data, measured in bits per second.

**Bidirectional:** A printer that prints when moving left as well as when moving right.

**Binary:** The system of counting in 1's and 0's used by all digital computers. The 1's and 0's are represented in the computer by electrical pulses, either on or off.

**Bit:** Binary digit. Each bit represents a character in a binary number, that is either a 1 or 0. The number 2 equals 10 in binary and is two bits.

**BASIC:** Beginners' All-purpose Symbolic Instruction Code. The most widely used, and easiest to learn, high level programming language for microcomputers.

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**Block graphics:** Chunky graphics, built up in small blocks rather than fine points.

**Boot:** To load the operating system into the computer from a disk or tape. Usually one of the first steps in preparing the computer for use. Short for bootstrap.

**Buffer:** An area of memory used for temporary storage while transferring data to or from a peripheral such as a printer or a disk drive.

**Bug:** An error in a program.

**Bus:** Also called a trunk or highway - a path on which several parts of a computer system may be connected so that signals can be passed between them.

**Byte:** Eight bits. A letter or number is usually represented in a computer by a series of eight bits called a byte and the computer handles these as one unit or "word".

**CAL:** Computer Aided Learning. CAL programs are written to take different actions on different student answers.

**Card:** In hardware, a circuit board.

**CCIT:** An abbreviation for International Telegraph and Telephone Consulting Committee. A standard maker.

**Chip:** An integrated circuit on a single crystal of semiconductor, far smaller than fingernail size.

**CMOS:** Transistor technology - when a pair of transistors of opposite type are used together. Means low power use.

**Computer language:** Any group of letters, numbers, symbols and punctuation marks that enable a user to instruct or communicate with a computer.

**Courseware:** Name for computer programs used in teaching applications.

**cpi:** Means character per inch. A common way of describing character density, i.e., how close together characters are in printers.

**CP/M:** An operating system for Z80 based machines. It is by far the most widely used DOS for Z80 based machines and there is an extremely large software base for it. See also disk operating systems.

**cps:** Characters per second. A common way of describing speed in printers.

**Cursor:** A mark on a video that indicates where the next character will be shown, or where a change can next be made.

**Daisywheel printer:** A printer in which the letters are formed by impact of a letter on a disk rotated until the required character is in position. Daisywheel printing is close to traditional typing in appearance.

**Data:** Any information used by the computer either I/O or internal information. All internal information is represented in binary.

**DC:** Direct coupling (telecomputing); or direct current.

**Disk:** A flat, circular magnetic surface on which the computer can store and retrieve data and programs. A flexible or floppy disk is a single 8 inch or 5 1/4 inch disk of flexible plastic enclosed in an envelope. A hard disk is an assembly of several disks of hard plastic material, mounted one above another on the same spindle. The hard disk holds up to hundreds of millions of bytes - while floppy disks typically hold between 140,000 and three million bytes.

**Disk drive:** The mechanical device which rotates the disk and positions the read/write head so information can be retrieved or sent to the disk by the computer.

**Diskette:** Another name for a 5 1/4 inch floppy disk.

**Disk operating system:** A set of programs that operate and control one or more disk drives. See CP/M for one example. Other examples are TRSDOS (on TRS 80) and DOS 3.3 (for Apples).

**DOS:** See disk operating system.

**Dot matrix:** A type of print head, made up of a matrix of pins, e.g. 8x8. When a character is to be printed the appropriate pins push out and strike the ribbon to paper forming the character.

**Dot graphics:** These graphics are individual screen pixels. Used by either turning on or off one pixel.

**Double-density:** Floppy drives that store twice the standard amount of data in the same space.

**Dump:** Popular term for sending data from a computer to a mass storage device such as disks or tape.

**EPROM:** Erasable, user-programmable, read-only memory.

**Execute:** A command that tells a computer to carry out a user's instructions or program.

**File:** A continuous collection of characters (or bytes) that the user considers a unit (for example on accounts receivable file), stored on a tape or disk for later use.

**Floppies:** Thin plastic disks with a magnetic coating used for storing information. Called floppies because they are flexible.

**FORTH:** A compact language. The programmer extends the language as he programs.

**Friction feed:** A type of paper-feeding system for printers: normal paper in a continuous sheet is gripped between two friction rollers as on a typewriter.

**Hardware:** The computer itself and peripheral machines for storing, reading in and printing out information.

**Hex:** Abbreviation for hexadecimal notation, a base-16 numbering system convenient to use with computers.

**High-level language:** Any English-like language, such as BASIC, that provides easier use for untrained programmers.

**IEEE:** A standardisation based on the Institute of Electrical and Electronics Engineers.

**Ink-jet printer:** These printers form images by spraying droplets of ink on to paper. Each droplet is electrically charged and is deflected into the required position by magnetic plates.

**Input:** Any kind of information that one enters into a computer.

**Interactive:** Refers to the "conversation" or communication between a computer and the operator.

**Interface:** Any hardware/software system that links a microcomputer and any other device.

**I/O "Input/output":**

**Inverse video:** When the background is coloured; e.g. on a black and white screen white becomes background and characters are written in black.

**Justified:** Printing is justified when the lines are flush on the left and right sides.

**K:** The number 1024. Commonly refers to 1024 bytes. Main exception is capacity of individual chips, where K means 1024 bits.

**Kilobyte (or K):** Represents 1024 bytes. For example 5K is 5120 bytes (5 x 1024).

**LCD:** Liquid-crystal display.

**Line feed:** A control code character found in the ASCII character set. Its normal purpose is to move the cursor down one line (on screen) or move paper up one line (on printer). Does not return the cursor to the left-hand margin.

**Lower case:** Non-capital alphabetical letters.

**Machine language:** The binary code language that a computer can directly "understand".

**Mainframe:** The very large computers that banks and other large businesses use are called mainframes. Also in microcomputers the term is sometimes used to describe the core of the machine, i.e. the CPU plus memory.

**Mass storage:** A place in which large amounts of information are stored, such as a cassette tape or

floppy disk.

**Megabyte (or Mb):** Represents a million bytes.

**Memory:** The part of the microcomputer that stores information and instructions. Each piece of information or instruction has a unique location assigned to it within a memory.

**Memory capacity:** Amount of available storage space, in Kbytes.

**Menu:** List of options within a program that allows the operator to choose which part to interact with (see Interactive). The options are displayed on a screen and the operator chooses one.

**Microcomputer:** A small computer based on a microprocessor.

**Microprocessor:** The central processing unit or "intelligent" part of a microcomputer. It is contained on a single chip of silicon and controls all the functions and calculations.

**Minicomputer:** Originally a computer that went with a single equipment cabinet. Now a computer between a microcomputer and a mainframe. Note that the boundaries between mini's and the classes on either side of it are unclear.

**Modem:** Modulator-demodulator. An instrument that connects a microcomputer to a telephone and allows it to communicate with another computer over the telephone lines.

**Mother board:** A large circuit board that has other boards attached to it.

**Network:** An interconnected group of computers or terminals linked together for specific communications.

**Output:** The information a computer displays, prints or transmits after it has processed the input. See input and I/O.

**Parallel interface:** A type of communications interface used mostly for printers. It sends a whole character of data down eight (commonly) lines, one bit down each line. The most common type of parallel interface for printers is the Centronics interface.

**Pascal:** A high-level language that may eventually rival BASIC in popularity. It incorporates the form of structured programmes.

**PEEK:** A command that examines a specific memory location and gives the operator the value there.

**Peripherals:** All external input or output devices: printer, terminal, drives etc.

**Pinfeed:** (also called sprocket feed). A method of paper feed in printers using sprockets.

**Pixel:** Picture element. The point on a screen in graphics.

**Plotter:** An output device for translating information from a computer into pictorial or graphical form on paper or a similar medium.

**POKE:** A command that inserts a value into a specific memory location.

**Program:** A set or collection of instructions written in a particular programming language that causes a computer to carry out or execute a given operation.

**RAM:** Random access memory is the very fast memory inside your computer. The access time for any piece is the same. Your program and run-time data are usually stored in RAM.

**REM statement:** A remark statement in BASIC. It serves as a memo to programmers, and plays no part in the running program.

**Resolution:** A measure of the number of points (pixels) on a computer screen.

**ROM:** Read only memory. Any memory in which information or instructions have been permanently fixed.

**Serial interface:** A type of communications interface used for a wide variety of purposes (printers, terminals, telephone correction etc.). It uses a minimum of two wires, and sends the data one bit at a time down one wire. The most common type of serial interface is RS232C.

**Sheet feed:** A type of paper feeding system normally used for high-quality document printers. A special device picks up a sheet of paper and feeds it into friction rollers.

**Software:** Any programs used to operate a computer.

**SP:** Second processor.

**Sprocket feed:** See pin feed.

**System:** A collection of hardware and software where the whole is greater than the sum of the parts.

**Tractor feed:** A type of paper feeding system for printers. Special computer paper with holes along both sides is fed by the tractors gripping these holes.

**Word:** A group of bits that are processed together by the computer. Most microcomputers use eight or 16 bit words.

**WP:** Word processor.

# HARDWARE REVIEW

## From page 32

I wouldn't personally be much worried about the compatibility question if the claim hadn't been implied by Wang. It is relevant to note that many major software houses are already customising their products for those 16-bit machines which are winning a significant share of the computer market. It is likely third party Wang-compatible software will be available, if not now, then in the near future. I have already reported such customised software in earlier reviews of other 16-bit machines.

I found the Wang PC a splendid machine to use. Many of its features are designed to make it relaxed and

easy for the operator and for users who want to write their own utility programs. The optional Wang software I used was basically well designed.

During several weeks using the review unit, I didn't find any bad features with which I couldn't live. Wang will probably find its market among the business world where the managers drive BMWs rather than Cortinas. Wang does what many cheaper computers do, but with rather more class!

**Postscript:** Wang management staff say they all drive Cortinas. But, in view of the reviewer's comments, they think they will now apply for BMWs.

# USER GROUPS

## From page 74

- CHRISTCHURCH VZ-200 USERS GROUP: Meets second Tuesday of month. Contact Ian Birse, Ph 523-915, Graham Dillon, Ph 324-117, or P.O. Box 22-094, Christchurch 1.
- ASHBURTON COMPUTER SOCIETY: Mr. J. Clark, 52 Brucefield Avenue.
- SOUTH CANTERBURY COMPUTER GROUP: Caters for all machines from ZX81 to IBM34, Geoff McCaughan. Phone Timaru 84-200 or P.O. Box 73.
- NORTH OTAGO COMPUTER CLUB: Contact: Peter George, P.O. Box 281, Oamaru. Phone 29-106 (b) 70-646 (h).
- LEADING EDGE HOME COMPUTER CLUB: Elaine Orr, Leading Edge Computers, P.O. Box 2260, Dunedin. Phone 55-268 (w).
- OTAGO COMMODORE 64 CLUB: Meets first Tuesday of month, 7.30pm. Contact: Geoff Gray, 41 Eglinton Road. Ph 53-986.
- DUNEDIN SORD USERS' GROUP: Terry Shand. Phone (024) 771-295 (w), 881-432 (h).

- CENTRAL CITY COMPUTER INTEREST GROUP: Contact: Terry Stevens, Box 5260, Dunedin. Phone 882-603. Meetings every second Tuesday.
- OTAGO COMPUTER EDUCATION SOCIETY: Jim Ferguson, Arthur Street School, 26 Arthur Street, Dunedin. Ph. 776-524.
- ATARI USERS GROUP, Dunedin: Contact - Harvey Kong Tin. Phone 741-509. Meets every second Thursday, cater for 400/600/800.
- SPECTRUM AND QL COMPUTER CLUB - Contact: James Palmer, 37 Sunbury St, Dunedin. Phone, 44-787, Monday to Friday after 4pm.
- SOUTHERN MICRO USERS GROUP (Invercargill) - Contact: R.J. Edgeler, ph 56-052, P.O. Box 612, Invercargill. Meets every second Tuesday.
- SOUTHLAND COMMODORE USER GROUP: (VIC 20 and 64s). Address: C/- Office Equipment Southland, Box 1079, Invercargill.
- SOUTHLAND COMPUTER EDUCATION SOCIETY: Secretary, Bob Evans, Southland Boys' High School, Herbert Street, Invercargill. Ph (h), 73-050 or ZL4LX.
- GORE COMPUTER CLUB: Meets first and thirs Tuesdays of month, 7pm. Contacts: Allan Rodgers, ph 7488, Dave Clarke, ph 5836.
- N.Z. SOFTWARE EXCHANGE ASSOCIATION: Non-profit group for exchange of software written by programmer members. Contact: Ian Thain, Box 333, Tokoroa.

**Note:** Clubs would appreciate a stamped self-addressed envelope with any written inquiry to them.

If your club or group is not listed, drop a line with the details to: Club Contacts, *BITS & BYTES*, Box 827, Christchurch. The deadline for additions and alterations is the first weekend of the month before the next issue.

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# CLASSIFIEDS

**WANTED:** IC 8271 and IC 7438. Phone Shane collect 4380 Ashburton.

**C-64 GAMES:** 'Pitstop', 'Booga Boo The Flea', 'The Hobbit'. \$120 or sell sep. D. Lynch, Tomarata, R.D.4, Wellsford. Ph 7239.

**BBCs AND AGRICULTURE.** Is there any farm or high-school agriculture course software running on BBCs please? Write to Richard Shannon, Greymouth High School, Box 192, Greymouth.

**WANTED:** Student needs unwanted computer parts (donated). Write: Nigel Keenan, 22RD Peel Forest, Geraldine.

**FOR SALE.** System 80 & BW monitor & software \$600 ono. Brent Pearce, 9 Porter Street, Ashburton.

**'VIC 20' PROGRAMMERS:** Wanted to buy ANY Educational Programs especially reading for four to six year olds. Mrs Jennifer Hay, 51 Peter Street, Ashburton.

**ACORN ELECTRON.** User would like contact to swap information and software. Write: Ronald Stewart, P.O. Box 23, Winchester, South Canterbury.

**TRS-80/SYSTEM 80:** Users interested in joining a public domain for business who require programmes, or can supply please write (s.a.e.) to Box 30, Waihi Beach South.

**FOR SALE:** Vic 20 computer, datasette, joystick, app. \$300 games and \$100 books. \$300. Phone Kerikeri 79376 or write I. Harris, c/o Post Office.

**PRINTER** Seikosha GP80-M & Dick Smith printer i/f. \$290 or sell sep \$225 & \$100 ONO. Write 23 Citrus Ave, Waihi Beach.

**IBM PC OWNERS:** Shugart hard disk drive system in superior case & supply now available on preorder. For details SAE to COMSEC, PO Box 30, Waihi Beach South.

**PERIPHERALS:** Quality printers, drives & monitors at warehouse prices brand new & guaranteed. SAE to COMSEC, P.O. Box 30, Waihi Beach South.

**WANTED TO BUY:** Apple IIe colour computer with disk drive: monitor and printer not required. Particulars including price to E.R. Dennis, 172 Nelson Street, Invercargill: Phone 66-333.

# OEMs, Dealers and Distributors:

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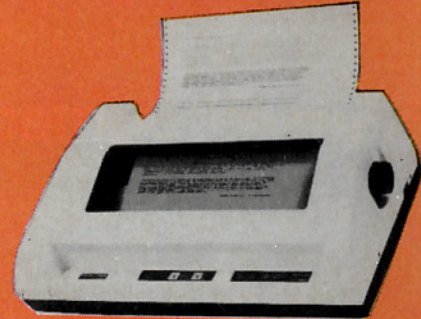
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- DOT MATRIX

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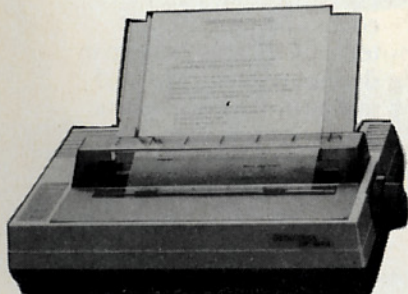
RETAIL (tax incl.)



**TOP VALUE!** What other printer can match these standard features?

- 420 cps Draft, 104 W.P. mode
- 18 K print buffer
- A switch for easy user font/print style selection at draft, italic, correspondence or graphics modes
- Multi type style
- Both serial & parallel interfaces fitted
- Pin or friction feed
- I.B.M. compatible
- Sound absorbent case, for whisper quiet printing

Others in the SEIKOSHA range include:



### SP SERIES SP 800

- 96-160 cps
- Multi-type styles, function
- Draft and near letter quality
- Tractor or friction feed
- Bi directional, Logic seeking
- 9-12 pin heads
- 10" Carriage

**\$800-\$1500**  
Retail (tax. incl.)



### GP 700 COLOUR PRINTER

- 7 colours: black, red, yellow, purple, blue, green, magenta.
- 50 cps
- Friction & tractor feed
- 10" Carriage

**\$1038**  
Retail (tax incl.)



### GP 50 FOR POINT OF SALE, VIDEOTEX OR HOME COMPUTING

- 40 cps
- Unihammer
- 5 inch carriage
- Graphics and type

**\$389**  
Retail  
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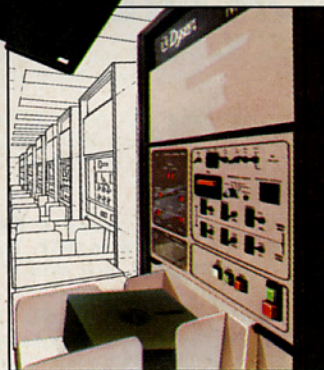
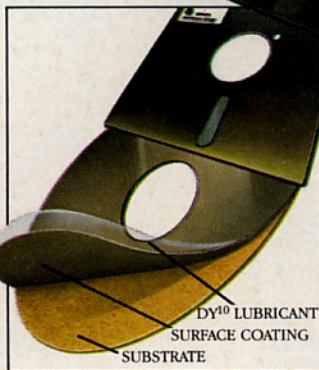
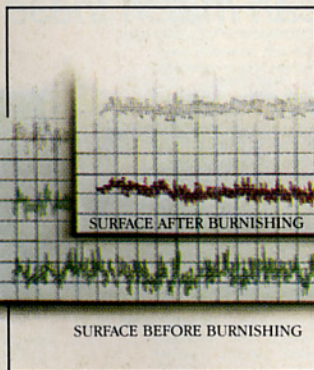
There are many more printers in this range.  
Contact us for further information.

OEMs, DEALERS NATIONAL DISTRIBUTORS:  
Price negotiable dependant upon quantity.

CONTACT: A. F. (Tony) Eastwood  
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Single units sold at full retail from N.Z. Peripheral Distributors.

# Four Reasons Why The Dysan Difference is Worth Paying For



## 1. 100% Surface Tested

Only Dysan provides fully usable diskette surfaces that are truly 100% error-free across the entire face of the diskette. An exclusive on-and-between the track testing procedure guarantees error-free performance regardless of temperature and humidity distortions or slight head misalignments.

## 2. Advanced Burnishing Techniques

Dysan's advanced polishing methods create a smoother, more uniform diskette surface. This results in better signal quality on each track, less wear on drive heads and reliable access to data after millions of head passes.

## 3. DY10™ Lubricant

Dysan's proprietary DY10 lubricant complements the advanced burnishing process. Both maximize error-free performance while minimizing headwear. Optimal signal presence is maintained between the head and diskette surface during millions of write/read interfaces.

DY10 is a trademark of Dysan Corporation

## 4. Auto-Load Certification

Dysan's unique quality control methods reflect technological leadership in designing, producing and testing precision magnetic media. Each diskette is unerringly certified by Dysan-built, automated and microprocessor controlled certifiers. Your system and data base will benefit from Dysan's diskette reliability and unsurpassed quality.

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