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TS & BYTES

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BITS & BYTES

May, 1984 Vol. 2, No. 8 ISSN 0111-9826

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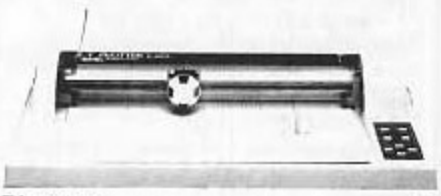
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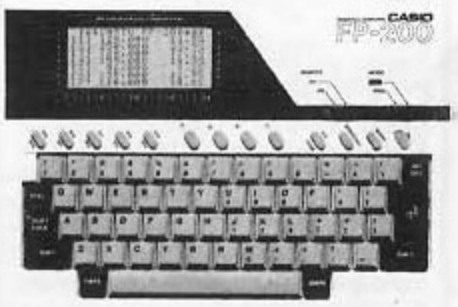
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MICRO NEWS

Universities in $1.5M Apple deal

A consortium of the seven New Zealand universities has ordered $1.5 million worth of Apple Macintosh and Lisa microcomputers. The order is believed to be the largest single purchase of microcomputers in New Zealand.

Six months ago, Apple Computer established a consortium concept in the United States, where there are now 27 members, including Harvard, Yale and Stanford Universities. The American consortium has bought more than 20,000 Macintosh and Lisa micros.

To belong to the consortium, universities undertake to purchase the Macintosh and to develop software, course-ware, and instructional material.

In New Zealand, both students and faculty will use computers for a variety of purposes, as tools for curriculum development and in expanding new educational and commercial applications. Under the agreement with Apple, each university is expected to develop applications on Macintosh and to share this information with fellow consortium members.

The universities will meet regularly with and without Apple to exchange ideas about individual programs and to share courseware developments.

The agent for Apple Computers in New Zealand, CED Distributors, a division of Consolidated Enterprises, Ltd, co-ordinated the purchase with Dr J. White and Dean Myer, of the University of Auckland, and the overseas principals of Apple Computer.

The cost of each Macintosh is believed to have been around $2500, compared to an expected retail price in New Zealand of around $6000.

Franklin

The Apple v. Franklin copyright case has been settled out of court, with the Franklin Computer Corporation paying Apple Computer Inc. $US2.5 million. The settlement allows Franklin to continue business as usual but to begin installing its own operating systems.

Multitech

Taiwan-made Multitech microcomputers have been released in New Zealand by Rakon Computers, Ltd. The MIC-500 series, starting at $2300, includes the CP/M 2.2 operating system and a standard business software package: a word processor, electronic spreadsheet, sorting utility, mailing system, and data-base system. The MIC-500 is a single-board, Z-80A-based computer with 64K of RAM and dual 5¼ in. disk drives, offering 500K bytes of storage.

The MIC-504 model dual disk drive has 2 megabytes of storage. The MPF-V is an IBM-compatible, 16-bit 8088 machine with 128K bytes, expandable to 256K. It has colour graphic capability and full tilt and swivel display monitor.

Enlarged BITS & BYTES

BITS & BYTES has another 16 pages of reading this month and while we can't promise 76 pages every month we certainly expect it will become more the norm.

We have decided to devote most of the extra space to specific machine columns so readers who own computers should find more information on their brand. Our columnists now have access to most of the new games and educational software arriving in the country so watch for their reports and reviews.

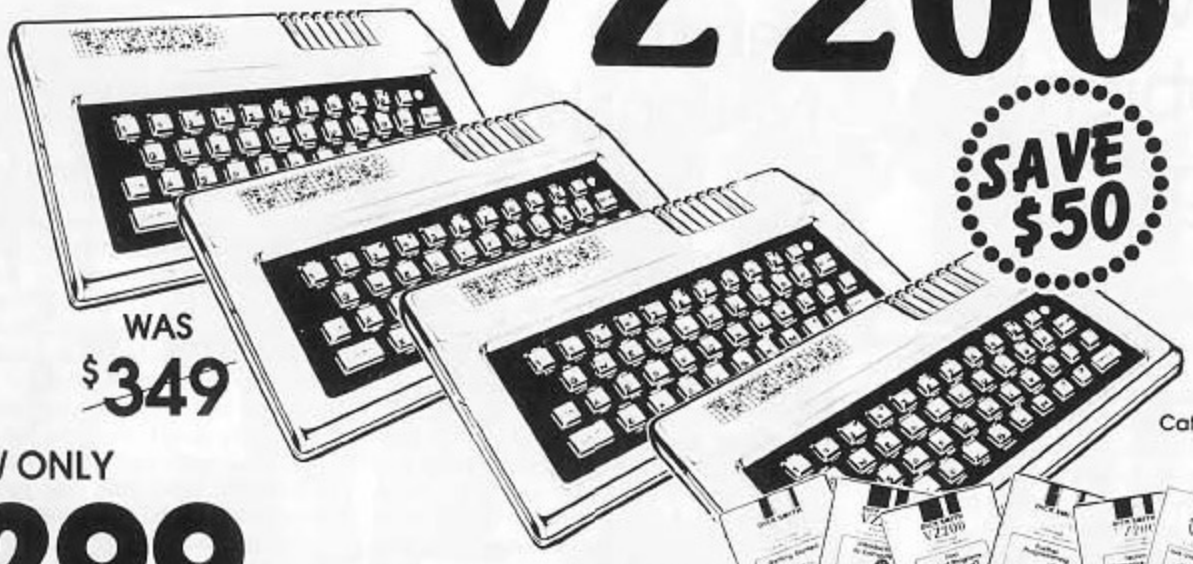
On the business side next month will see the start of a regular series looking at software written for the Commodore 64 and SX 64. These machines are proving popular as relatively low-cost business machines and a number of packages have been written for them in New Zealand. These will be reviewed in the coming months plus a look at wordprocessing and spreadsheet packages.

Also next month we feature another program special full of programs to type and try.

In the slightly longer term BITS & BYTES is involved in negotiations on a couple of exciting projects that we are sure our readers will find extremely interesting. More details as they come to hand.

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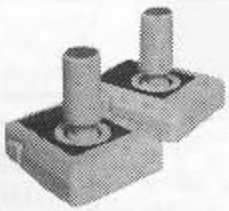
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10% qualifiers

Now the problems begin

By Gaie Ellis

"New technology" is the basis of some debate among companies seeking classification for computer sales-tax exemption purposes. The classifications are dedicated by the Statistics Department in Auckland, where Mr David Archer, a senior department official, says "new technology" is proving to be a huge field with areas of grey.

Traditional classifications are being questioned by some companies, and Mr Archer says his department is open to discussing these grey areas.

Two recent cases highlight the situation. Examining the activities of a North Island publisher the department found the company's activities did not fall within the normal definitions of a publisher, because it did not undertake its own printing. Like many magazine publishers, the firm contracted the printing to a printing company. On this ground it was unable to get an exemption on computer purchases.

A second case involved a South Island company involved in the development of system software that has been sold world-wide (LINC). This company, it seems, is not registered as a research and development organisation. In the department's assessment, research and development were not the company's main activities and it did not qualify.

In fact, according to Mr Archer, few organisations are solely dedicated to research and development in New Zealand and those that are are generally Government or quasi-government departments. The main activities, source of income or profit, and percentage of staff dedicated to a particular activity are the criteria used to classify a company.

"We have to keep within the spirit of the classifications as they have been laid down and classification for exemption is based on classification principles defined in a United Nations agreement."

In fact, it is this same type of classification agreement which caused debate with the Customs Department from members of the electronics industry — largely because the classifications could not keep pace with rapid changes in technology.

It would be a shame if the same birth-pains were to now hinder exemptions which were brought in primarily to help New Zealand industry keep pace with modern technology.

Perhaps the growing pains could be circumvented if communication lines between the Statistics Department and computer consumers were strengthened. Perhaps the department should take steps to keep the industry informed of its classification methods and the recourse open to companies which find them unacceptable, as did the Customs Department and Trade and Industry when they found the onslaught of the new technologies was being slowed by bureaucracy.

Independents versus Nationals

By Gaie Ellis

Some computer retailers, it seems, are taking a leaf out of the New Zealand Party's books and opting for free bargaining, much to the chagrin of their larger brothers, the national distributors (see Micronews item).

The small retailers are buying direct from overseas distributors who are keen to have these "cash-up-front" customers able to land and retail the machines on the New Zealand market at prices lower than they are being wholesaled by the major distributors.

Enter the computer purchaser: "Free enterprise" would be the obvious reaction of the consumer. But the lower prices have their drawbacks, not the least of which are the guarantee and servicing factors. The larger distributors build the cost of promoting, servicing, and maintaining their products into the retail price, a standard business approach. Frequently, too, they put their products through quality assurance procedures before releasing them for sale. When a product does need servicing they have large departments with technical support dedicated to the servicing factor.

The current shortage of electronic components and long lead times in delivery once the components are sourced means these distributors will give preference to those who have paid for it. In fact, they will go to some lengths to provide this servicing: one large Auckland-based distributor said recently: "It makes me cry when I have to take apart a perfectly good machine for parts and I'm obviously not keen to do that for someone who has not paid for the warranty in the first place."

These major distributors say they will stand by all their products but the customers who have bought through their dealers will get preference and others will have to go on the growing waiting lists.

They say that computer purchasers should look beyond the tempting cheaper price tag and check precisely what guarantees and back-up they can expect.

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Plato software released

About 45 titles in the Plato educational software range are being released in New Zealand this month.

Plato software has been developed in the United States over the last 20 years for running on Control Data's educational microcomputers. Now there is a range available for microcomputers and initial titles for New Zealand release will be for Apple computers, Commodore, IBM, and Atari software coming later.

Plato educational products are aimed at primary, secondary, and tertiary levels, although some titles will interest computer users outside educational institutions.

Along with courses and vocabulary building lessons in French and German and courses in algebra, for instance, there is a complete computer literacy course. Disks are available on building relationships and communication skills for teenagers.

Lessons are designed to motivate and direct students and help them develop a sense of achievement and personal progress.

The age range catered for by Plato products is from around 10 to 20.

To launch the range, the local distributor, D.R. Britton, Ltd, is offering free demonstrations for eight different courses. All packages will be priced at $79.95, regardless of the number of disks involved. There will be a special price for schools, although this has not yet been decided on.

It is proposed that up to 150 new titles will be released each year. It is also hoped that local people will come forward and write programs of special interest to the New Zealand market.

— **Pat Churchill**

Osborne stirs

The Osborne Computer Corporation, which is trying to trade its way out of difficulties under a special American bankruptcy code provision, has filed a business plan with its creditors and the court. Under the plan, Osborne will focus 80 per cent of its attention on the international market; will pay back $US15.5 million to secured and unsecured creditors within 15 months; it will give unsecured creditors 20 per cent equity in the reorganised company; it will have all products made under contract by other firms. The firm says in the plan that its Executive 1 will continue to be manufactured throughout this year. A new machine, the Osborne PC, will be ready for volume production mid-year, and another machine, the Vixen, will also be produced. However, the company says, further production of the Osborne 1 is "not clear at the moment."

Apple portable

Apple is about to get into the portable market with the IIc. It will be midway between 2kg lap computers and the 12kg portables, or "luggables". According to some reports the IIc will have 128K RAM, one disk drive, a typewriter-style keyboard, and will run all IIe software. It is said to weigh 4kg.

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Dick Smith Cat

The Australian media is predicting a big future for the just released low-cost Dick Smith Apple work-a-like called the Cat with a writer in *the Australian* newspaper saying it "will send shock-waves through the industry – possibly world-wide."

The same writer quoted a big Sydney dealer as saying that if Apple cannot legally stop the Cat and if, as is apparent, the machine will accept most of the Apple software, then "the future of the Apple IIe in Australia is extremely dubious."

Below are a few more technical details about the Cat (see last month's micro news for earlier report).

The Cat uses two very large scale integrated (VLSI) chips, which allows the motherboard to be a third the size of the Apple and totally different in concept.

It does not use any of the circuitry or operating systems of the Apple, all of which are locked in by countless patents.

As the Cat stands, it will run about 71 per cent of the software written for the Apple. By the addition of an "emulator" at a cost of $99 (about $200 in N.Z.) and a diskette which comes from a third party supplier at $33 (about $70 in N.Z.), the Cat will take more than 95 per cent of the Apple software.

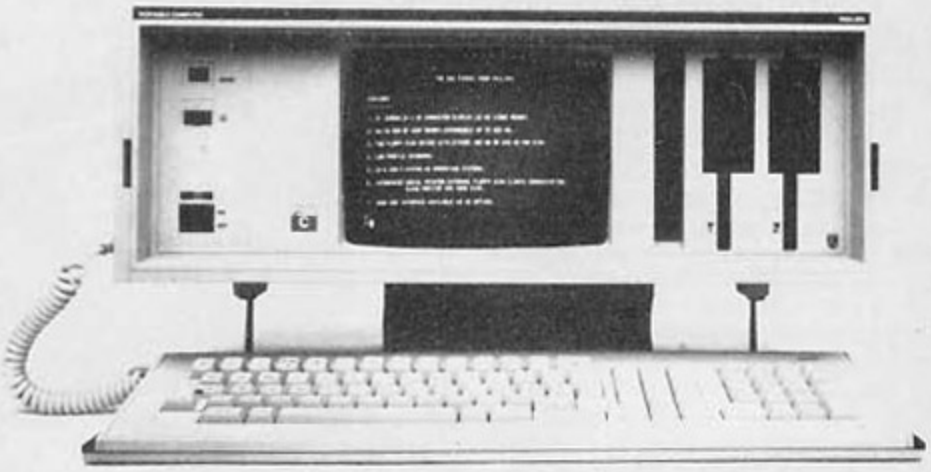
The Cat itself is expected to retail here for $1295 although no New Zealand release date has been formally announced.

Apricot sales

ACT (Applied Computer Techniques) has now sold more than $NZ58.5 million worth of its Apricot computers to 15 nations. The machines are made at ACT's new plant in Silicon Glen (Glenrothes, Scotland), which is being extended by 50 per cent, so that it will be able to manufacture 100,000 machines a year. ACT has now also acquired the world manufacturing and marketing rights for the Sirius (it previously produced them for Europe) from Victor Technologies of California. (See Apricot review in this issue of *Bits & Bytes*.)

Apple foundation

Apple Computer Inc has announced plans to establish an educational grant programme in 10 countries to support new methods of learning through personnel computers, and New Zealand is one of these countries. The company's Apple Education Foundation, at present in the United States and Canada, will establish offices in New Zealand, Australia, Hong Kong, Singapore, the Caribbean, Mexico, Venezuela, Colombia, Saudi Arabia, and South Africa during 1984. The Apple Education Foundation will be represented in New Zealand by an independent local board of advisers, consisting of prominent individuals in education and public service. CED Distributors will administer the programme and has been approaching leading authorities in education and government regarding positions on the board.



P2000

Philips portable

Philips (P.O. Box 2097, Wellington) is the latest company to enter the burgeoning portable computer market with the release here of its 8-bit P2000 range.

There are three models in the range and all have twin Z80 processors, one as the main processor and one for handling input/output functions, which Philips believes makes the P2000 as powerful as 16-bit microcomputers.

The three models all include 64K RAM, nine inch monitor displaying 80 columns by 24 lines and high resolution graphics (512 x 252 pixels), detachable keyboard, twin disk drives, CP/M operating system (p-System is optional) and the software packages Wordstar (wordprocessor) and Calcstar (spreadsheet).

Other packages will be offered at a discount if purchased with the machine.

The differences between the models are that the P2010 has 160K floppy disk storage and costs $4950, the P2012 with 640K storage costs $5950, as does the P2010/2 which has 160K storage but inludes an IEEE-488 interface for scientific and engineering applications.

A 10 megabyte hard disk is available as an option.

The P2000 will also be available from CBL offices nationwide.

Texas Instruments

In the third quarter of its financial year, the first since it dropped production of home computers, Texas Instruments posted an 82 per cent rise in profit. The company says its 1983 pre-tax losses on home computers totalled $US660 million; this included close-down costs. In its latest quarter report, the company made a profit of $US77.5 million, compared with $US42.6 million a year earlier.

Amust problems

The Amust Computer Manufacturing Company whose portable machine was reviewed in the March issue of *Bits and Bytes*, has been placed under a statutory manager in Melbourne.

Under this financial arrangement there is a fighting chance that the firm can re-organise and trade its way out of its difficulties.

Meanwhile, the price of the machine in New Zealand has been cut since the review was printed: from $6175 to $5785.

Rainbow software

Digital says that more than 1000 packages are now available for its personal computer, the Rainbow. Digital runs a special free service for the first year of Rainbow ownership. The new owners can ring Digital free for help and advice. A staff of four run the "Helproom".





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TCC 1006

Under-$1000, ink-jet printer for micros

Hewlett-Packard put an ink-jet printer for microcomputers on the market in New Zealand this month with a suggested retail price of about $900.

The HP 2225 runs quietly (below 50 decibels) and is competitively priced. Fully portable, it may be used with portable or desktop personal computers from HP, and personal computers from a variety of other manufacturers, including IBM, Apple, Digital and Texas Instruments.

With an ink-jet printer, the characters are painted on paper by spraying the ink through tiny holes in a printhead. Since the printhead never touches the paper, there is a substantial noise reduction over other printer types.

"While ink-jet technology is not new, it has been expensive to purchase, messy to refill and difficult to maintain," said Mr Robert Cattell, manager for Hewlett-Packard's New Zealand Computer Group. "The ink-jet mechanism on the HP 2225 has no tubes to clog, reservoirs to be refilled, or moving parts to wear out."

The HP 2225 also combines the printhead with the ink reservoir in one conveniently disposable unit. When a cartridge runs out of ink, the user replaces that unit with one that contains ink and a new printhead for less than $20.

Key specifications include:

150 character-per-second print speed; 11 x 12 dot matrix characters; multiple print sizes; bold and underline that do not slow printing; 8½ in x 11in paper either single sheet or fanfold or 21.0cm x 29.7cm (size A4); 11½ in wide by 8.1in deep by 3½ in high, 5.5in to 6lb in weight; 500-page average ink-cartridge life; 200-page average battery life; Centronix, HPIB, and HPIL (battery powered) interfaces available; tractor and friction paper feed; and full graphics capability (192 x 96 or 96 x 96 dots per inch).

Any paper may be used with the printer. However, the best print quality is on ink-jet paper, which costs and weighs about the same as bond.

Auckland events

Computer Warehouses Ltd, of Auckland, is retrenching and has stopped selling some brands of home computers. Three of its nine employees have been laid off, and part of its building is being closed. The firm blames direct imports of computers from overseas and price cutting with these machines. Three other Auckland firms have moved out of home computers: Micromart, Porterfield Computers, and the Home Computer Centre.

Mr Jim Bulloch, the managing director of Computer Warehouses, said that computer retailers who traditionally relied on national authorised distributors to maintain bulk stocks and "reasonable recommended retail price" levels have been seriously affected by independent importers buying popular brands in bulk overseas from very big distributors, and then selling the machines between 20 and 35 per cent cheaper.

Computer Warehouses was not in a position to compete with the lower prices offered by independent importers, or with the discounts offered by some other retailers, Mr Bulloch said.

The firm has stopped selling a number of brands, but only temporarily, he says. "We will continue to support the New Zealand distributor of the Spectravideo range of computers."

Software deal

The managing director of Computer Stores on Auckland's North Shore, Mr Eike Zimmerman, believes an agreement he has reached with more than 15 software houses overseas will provide support for those generating software locally. Mr Zimmerman's arrangement enables software to be copied on to more than 50 different 5 in. disk recording formats.

In less than five days, Mr Zimmerman can have software recorded on the CP/M 80, CP/M 86, MS-DOS and PC-DOS operating systems from Australia and the FLEX and UniFLEX from the United States, catering for more than 40 major computer brands.

Diary 64

Commodore NZ, Ltd, has just released a time-management, database program, Diary 64, which includes a print-out routine for address labels. The Diary "pages" appear on the screen in blocks of 10 lines, 27 characters per line.

New disk drive

Commodore NZ, Ltd, has released a dual disk-drive unit, the 8250LP. It has its own microprocessor, 4K buffer RAM, and a ROM-based disk-drive system. It takes 5¼ in. diskettes, has double-sided drives, and a total capacity of 2.12 megabytes.

Apple posts

CED Distributors, sole agent for Apple Computer in New Zealand and a division of Consolidated Enterprises, Ltd, has announced the appointment of Mr R.G. Klarwill as national sales manager. Mr Klarwill is no newcomer to the industry, having spent eight years in the IBM Office Products Division and most recently as sales operation manager with Rank Xerox. This is a new position created to assist with the growth in sales of Apple microcomputers. Also announced is the appointment of Mr D.G. (David) Henry, as service manager, and of Mr A. Browghton, as a marketing specialist.

Medical sales

Porterfields is enthusiastic about sales of the Radio Shack Model 100 to the medical field. The Wellington Clinical School of Medicine has recently purchased the machine as an upgrade on its earlier Model 1 purchase which has been used in data recording in breast-cancer research. Another Model 100 has been added by the school to machines it is using in its speech therapy department. The machines are suited for communications for handicapped people, particularly those with problems of vocal expression. Porterfields is currently offering a special deal with this model, with a drop in price of $300.

New U.K. machine

Another new microcomputer is to be manufactured in Britain. The CPC464, made by Amsoft, the computer division of the British consumer electronics group, Amstral, has 64K RAM. With a cassette recorder and monochrome monitor it will retail in Britain at £200. For an extra £100, the British buyer can have a colour monitor. The CPC464 has a Z80 processor.

NEW LOW PRICES ON THE ... BBC Model 'B' MICRO-COMPUTER SYSTEMS

The BBC Microcomputer has a central processing unit (CPU) with a memory of 32K of RAM (Random Access Memory) which can be expanded if required by the addition of a second processor. System software occupies a massive 32K of ROM (Read Only Memory) which includes one of the largest operating systems of any micro and a powerful 16K BASIC. The Keyboard has a conventional layout and an electric typewriter 'feel'. The machine generates high resolution colour graphics — considered vastly superior to those of more expensive machines on the market — and offers a powerful range of commands. The BBC Micro can also synthesise polyphonic music and speech.



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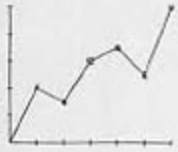
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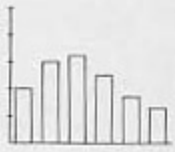
STORES THROUGHOUT NEW ZEALAND

VERSATILE PLOTTER PRINTER

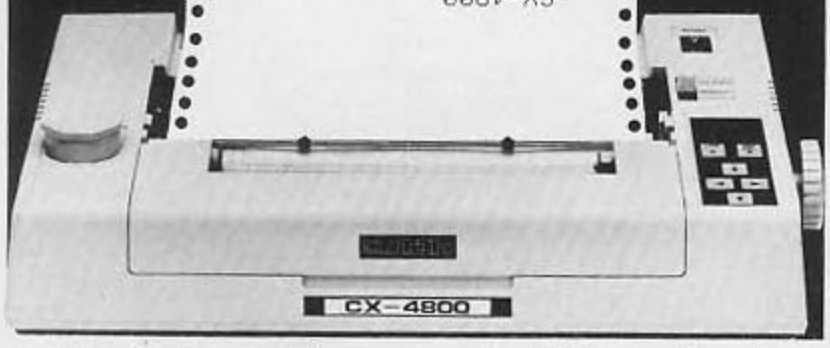
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13183

MICRO NEWS

TRS finally arrives

It seems Tandy Radio Shack computers will finally become freely available in New Zealand with the announcement that the huge Texas company has signed an agreement with the new public company AVM (P.O. Box 2823, Christchurch).

Up till now Tandy, which along with Apple and Commodore ranks as one of the most famous names in the microcomputer revolution, has only been sparsely represented here and most enthusiasts imported the machines direct from America or Australia.

AVM will be wholesaling Tandy's home computer range throughout the country and retailing the business range (including the new Model 2000) from its Christchurch store. Porterfield Computers in Auckland will also continue to sell the business range.

There are two models of Tandy home computers:

- The MC-10, a colour computer in the VZ200 mould with 4K of RAM expandable to 20K and expected to retail here for around $300.
- The Colour Computer which comes in three different versions.
  16K standard, expected to retail for around $600.
  16K extended BASIC with high-res graphics for around $700
  64K RAM for around $1000.

AVM will also have available a large range of peripherals and software for these models.

Tandy 2000

Porterfield's is trying to get the Tandy 2000 into the educational field. While the Tandy 2000 will generally retail in New Zealand at $8995, the educational organisations are being offered the 16-bit machine at $4500.

The 128K machine, with dual disk drives and running MS-DOS, is not an IBM work-a-like. Mr Tom Meyer, of Porterfield's, says bench-mark tests have shown the machine to be as much as three times faster.

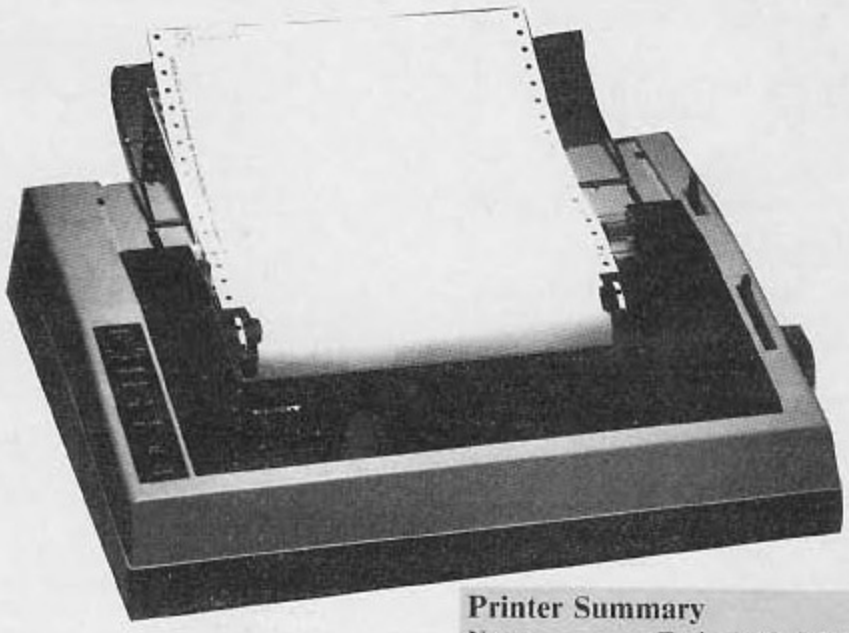
A new delivery agreement for New Zealand which will shorten lead time: weekly air freights are now under way and customers no longer have to wait until 98 per cent of a shipment capacity is reached before an order is sent.

New owner

Computerland, the microcomputer service and supply company has been bought by Idaps, the computer service company.

High Speed — near letter quality printing

FACIT printers where options are built in



The Facit 4510 printer

The Facit Model's 4510 and 4512 are two recently introduced printers. The 4510 is the junior partner and the 4512 the senior partner.

These printers are solidly constructed and are intended for business use.

Print quality is excellent. The normal character height is 2.5mm but this can be varied down to micro script and up to double height on the 4512. Micro script is useful for footnotes and double height for headings.

As well as changing the height of characters, the width can also be changed and furthermore the spacing can be fixed or proportional.

As the carriage speed is adjustable in 3 steps, sloping printing, and italics are possible on the 4512.

Printing speed is good at 120 characters per second (140 for the 4512) and this allows 55 lines per minute at 10 CPI.

Enhanced printing, which is compatible to daisy wheel quality is available about 70 cps. This is five times faster than a daisy wheel, with acceptable letter quality printing.

Line length is a maximum of 80 columns (132 for the 4512) with software controlling any value between 12 and 80 (132).

Tabs are set vertically and horizontally at every 25mm.

The character set is basically 96 ASCII characters plus 8 other national languages, useful for an exporter if you want to write in French or Spanish etc.

The Matrix is 9 x 9 and 9 x 15 in high resolution, (9 x 9 and 18 x 17 for the 4512). Block graphics are available, 64 blocks to the PRESTEL standard and also Pin graphics. Pin graphics allow virtual control of each Pin in the matrix.

Paper feed can be continuous roll, single sheets or fan fold in width from 4 inches to 11 inches (15 inches/4512).

One definite advantage of the FACIT is the built in 2K RAM buffer. This means up to 2K of text can be stored in the prirter freeing the computer for other things. Especially useful for short letters and forms.

Serial, to RS232 standards and parallel to Centronics standard ports are used. This means almost any computer can be hooked up to the printer and two dip switches at the rear allow easy selection of any protocol e.g. IBM, EPSON etc.

The ribbon is the cassette type and good for 4 million characters.

The printing options can be set by a switch on the front of the machine.

One nice feature is that paper is easily fed into the machine as the tractor/friction feed and roller guide is externally controlled saving digging into the machine.

FACIT advertise the printer as the printer where options are standard and the model 4510 and 4512 certainly live up to this.

Printer Summary

Name:	Facit 4510 (4512 – in brackets).
Type:	Dot Matrix.
Character set:	96 ASCII plus 8 national languages.
Print Head:	9 x 9 and 9 x 15 (9 x 9 and 18 x17).
Print Speed:	120 cps at 10 cpi (140 cps).
Print Direction:	Bi-directional with minimal distance logic.
Line Spacing:	6 or 8 LPI plus graphics.
Line Length:	80 or 40 switched, 12-80 software controlled (132, 12-132).
Paper Width:	4-11 inches (4-15 inches).
Paper Feed:	Tractor (detachable) and Friction.
Copies:	Original plus 3.
Buffer:	2K.
Interface:	Serial RS232, Parallel Centronics.
Price:	4510 $1245 (not including sales tax), 4512 $1795 (not including sales tax).
Options:	Included as standard.

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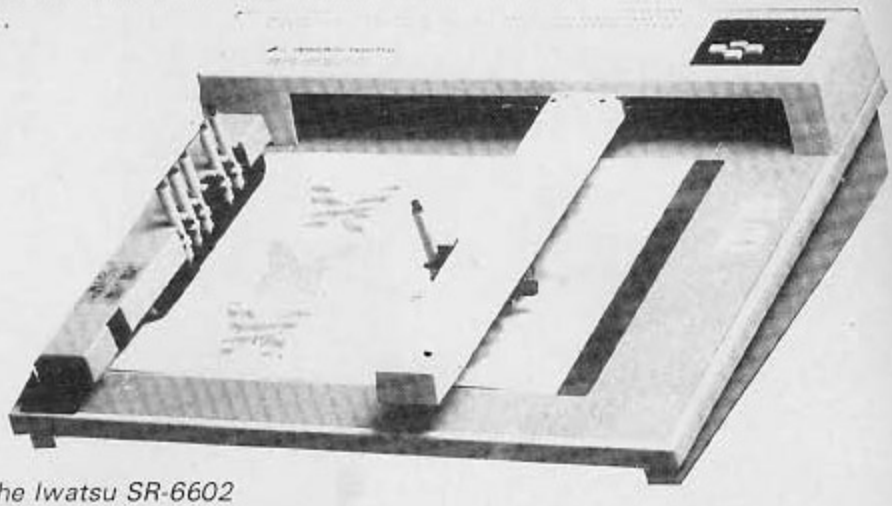
Dealer Enquiries Welcome.

Micro hard copy in colour

By Martin Downey

When the phrase, "computer revolution," was born several years ago many pundits predicted a resulting "peripheral revolution" in the very near future. It seems that this "son of computer revolution" has begun. Slim-line disk drives and dot-matrix printers have dropped drastically in price recently. With these decreasing prices have come equally notable increases in performance. Better print resolution on the printers and higher-capacity, more compact disk drives (most obviously the new 3½ inch disks).

The latest computer add-on to tempt the New Zealand market is the plotter. For as little as $400 you can now pick up a four-colour plotter that will also act as a printer. Plotters are not new, though. Laboratories have used X-Y plotters to produce hard-copy output from many electronic devices, not just computers, for a number of years. Manufacturers originally passed over the plotter as a micro peripheral in favour of dot-matrix printers. But as colour computers began to appear it was obvious that a colour printer was more appropriate. Multi-colour ribbons didn't quite work and ink-jet technology was still too expensive. Plotters were the answer.



The Iwatsu SR-6602

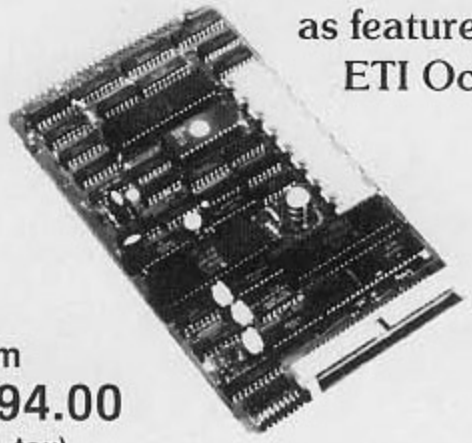
The two main drawbacks with plotters are speed and colour density. Although high-priced plotters can plot quite respectable rates (over 1000mm/sec) home-computer plotters (under $1000) barely reach 60mm/sec (painfully slow). This is not so important to the home user but the small business may need to look at machines over $5000 for more serious work.

Colour density becomes apparent when doing "screen dumps". The act of plotting is ideal for line drawings and graphs but cannot

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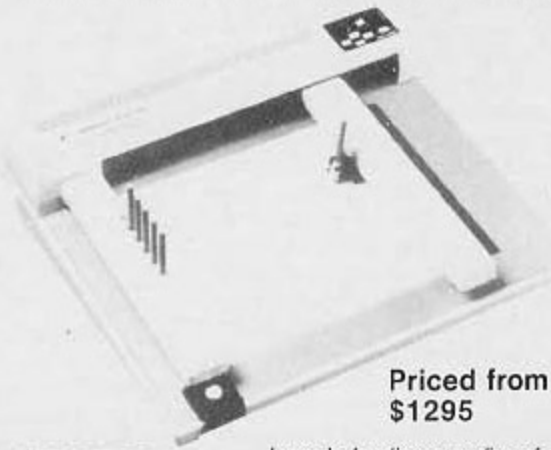


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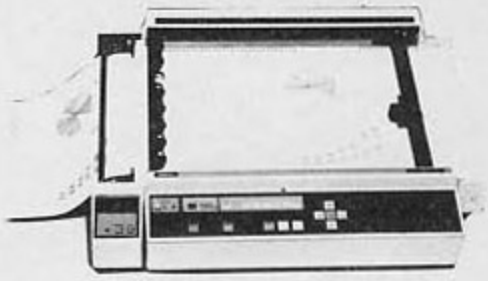
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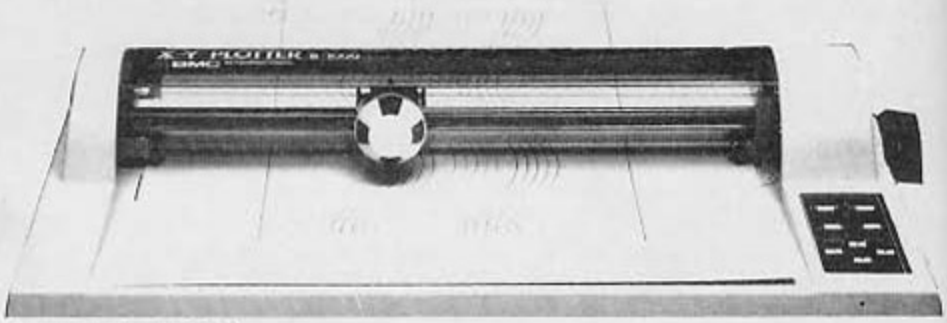
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reproduce the coloured regions of a screen display very well. Multi-colour, ink-jet printers are much more effective for this type of hard copy. Such printers are still a bit expensive for the home user but they should be among the next peripherals to "revolt".

Now to the survey proper. I have tried to glean information from as many sources as possible. All known outlets were contacted directly and I am grateful for the assistance of the distributors who supplied up-to-date information. If I missed anyone then they should contact me through *Bits & Bytes* magazine so any future survey can be more complete.

The survey results cover most of the important features when choosing a plotter. Accuracy is not mentioned, but this is generally related to step size and price. No attempt is made to evaluate the plotters but watch out for reviews of the more popular models in future issues. First, I'll clarify some of the terms used.

Price: This is in New Zealand dollars and includes the 40 per cent sales tax. Educational users don't need to pay this. Some others may get away with just 10 per cent.



The BMC B-1000

Type: **Roll** – a roll of plan paper is fed back and forth by pin-rollers. The pen is moved back and forth across a printer-type platen.

Drum – a single sheet of paper is fed across a drum by friction. The pen is moved back and forth across the drum. Also known as a platen plotter.

Flat – a pen is moved in four directions over a single sheet of paper lying on a "flat bed".

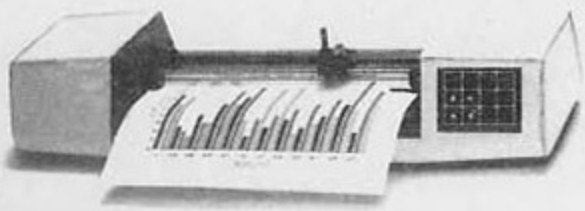
Plot Size: On the roll type plotters only the horizontal size is usually given since theoretically any length can be produced. However, in practice the limit is about 100mm, after which inaccuracies in the feed mechanism become apparent.

Step: This is a measure of the resolution of the plotter. The smaller the step size the better the

Plotters available in N.Z.

MODEL NAME	PRICE $NZ	TYPE	PLOT SIZE mm	SPEED mm/s	STEP mm	INTERFACE	COLOUR PENS
Apple 410	1895	drum	257 x 392	100	.1	S	4
BMC B1000	2560	drum	297 x 420	100	.1	P or S	4
Calcomp 965	46800	drum	865 x 1518	1067	.0125	?	4
Casio	495	roll	115 x –	60	.2	P	4
C. Itoh CX-4800	1645	roll	191 x 203	170	.05	P & S	4
Commodore 1520	595	roll	115 x –	?	.2	?	4
Dick Smith	495	roll	115 x –	60	.2	P	4
Houston DMP-40	1950	drum	297 x 420	106	.127	S	1
HP 7470A	1838	drum	210 x 297	380	.025	S,I or H	2
HP 7580B	23478	drum	594 x 841	600	.025	S & I	8
Iwatsu SR-6602	1707	flat	297 x 420	150	.1	P, S or I	6
National VP-6801A	2379	flat	210 x 297	400	.1	?	6
SEGA SP-400	399	roll	115 x –	60	.2	S	4
Watanabe MP-1000	1495	flat	297 x 420	150	.025	P or S	8
Yew PL 2000	4192	flat	210 x 297	250	.05	?	4

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resolution.

Interface: P=Parallel, S=Serial, I=IEEE, H=HP-IL.

Colour Pens: Some one-pen plotters say "multi-colour". These require the pens to be exchanged manually (e.g. Houston). The others have multiple pen holders which change colours automatically under software control.

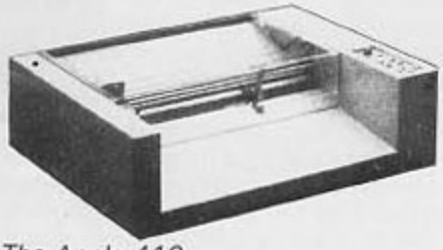
Other points

Some plotters are specified as "printer/plotters". This means they will operate like a normal printer with no additional soft-ware (i.e. you can LLIST and LPRINT). A special character is used to switch to the plot mode. Other plotters will also produce text but may require a special control sequence to enable this.

Epson should be releasing its plotter in New Zealand later this year. I have not seen any specifications yet but its track-record suggests something worth waiting for.

For more information on the plotters discussed in this survey you should contact the following suppliers:

Control Electronics (C. Itoh), P.O. Box 68-474, AUCKLAND.



The Apple 410

Dick Smith Electronics, Private Bag, AUCKLAND.

Tower Computing (SEGA), P.O. Box 25-091, CHRISTCHURCH.

Hewlett Packard (N.Z.) Ltd, P.O. Box 9443, WELLINGTON.

MDL (BMC, Epson), 24 Manukau Rd, Epsom.

CED Distributors Ltd (Apple), P.O. Box 31-245, MILFORD.

S.D. Mandeno (Houston), AUCKLAND.

W.G. Leatham (Watanabe), WELLINGTON.

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The Apricot

The Apricot

Elegant, 16-bit Britisher

By Pip Forer

The Apricot comes from the British firm, ACT, European manufacturer of the leading small-business microcomputer in Britain, the ACT Sirius. Its launch in Britain could be seen both as an attempt to capitalise on the considerable success of the Sirius and as a means of challenging and upstaging the impact of the IMB-PC there. ACT seeks to bestow on it the mantle of "fourth generator computer." Just what does that actually mean in this case?

The Apricot is another 8086-family based microcomputer capable of runnng MS-DOS and CPM-86 with certain claims to IBM-PC compatibility but it also has some very useful attributes which distinguish it from the relentless stream of small-business models in its price class. To save time I will assume that the reader already has an interest in and general knowledge of 16-bit machines and will concentrate on the Apricot's unusual or particularly important features.

There is an exciting air about the machine. It comes in a very elegant, transportable package, perhaps the first British-produced micro to be truly attractive. It has a true 16-bit processor (the 8086, aided and abetted by an 8089 for fast input and output) rather than the more normal hybrid 8088. The 8086 is potentially more powerful than the 8088 although the difference may not be noticeable in many applications. Like the new Hewlett-Packard and Apple machines it uses the Sony 3½ in. disk drives with their bijou but robust hard-shell disks; twin drives are standard. At present these drives are single sided, giving about 315K storage, but double-sided options are expected. They are certainly quiet and efficient in operation and the disks are a considerable improvement on floppy floppies for secure packaging when out of the drives.

The Apricot comes as three components. The monitor is monochrome (green) but of an unusual clarity, supporting 800 by 400 graphics resolution like its Sirius cousin, or 25 x 80 or 132 x 50 text. The housing is small, the screen area at a maximum, giving a neat unit. It sits on a rake-adjustable plinth that can be conveniently positioned anywhere within a broad groove on the top of the processor cabinet (or anywhere else for that matter). The processor unit is mainly notable for three things. The twin Sony drives are one, the 8086 a second. The third is the design, which allows the keyboard to be clipped to the base of the processor, a protective shutter to drop over the disk drives, and a handle to appear. The machine is now virtually a briefcase to carry . . . except for the monitor, which will take up your other hand. Not in

Microcomputer summary

Processor:	Intel 8086.
RAM:	256K.
Disks:	Twin 3½in Sony Microdrives at 315 Kb each.
Monitor:	9in 80 x 24 or 132 x 50 screen.
Ports:	Centronics parallel and 1 RS-232 serial.
Graphics:	800 x 400 monochrome.
Keyboard:	Standard QWERTY plus numeric pad, 8 dedicated keys, 6 special function keys (reprogrammable) and 40 x 2 character microscreen. Built in calendar/clock.
Operating system:	MS-DOS 2.0, CPM-86 and Concurrent CP-M. GSX supplement.
Bundled software:	Spreadsheet, planner, considerable configuration utility base, two BASICs.

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the Kaypro class for portability but certainly easily transportable. Starting at 256K the Apricot is already configured to handle compilers and memory-intensive software such as Lotus 1-2-3 efficiently.

Microscreen in the keyboard

The Apricot's main innovation is in the detachable keyboard. It is a nicely designed board in its own right: good feel and easy lay-out. Its real uniqueness, however, derives from the microscreen in its top right corner. This is a multi-purpose device comprising a two line, 40 column, liquid crystal display with six grey pressure pads just below it. The display can provide numeric or alphanumeric information. It displays the clock time and date when the machine is powered up. This is permanently available through a battery-powered clock on the keyboard. It can also be used at any time as a calculator (say in the middle of writing a report) by using the special dedicated CALC button on the main keyboard. As a calculator it doesn't just add and subtract: it also has memory available to it and any results can be sent directly to the cursor position on the main screen.

The nicest use of the microscreen, however, is for labelling the six special function keys (the pressure pads) that lie just below it. So many "easy driver" applications packages on various 16-bit machines utilise special function keys to drive them, but each key means different things at different times. Of course, you can remind the user what does what by writing to the main screen, but that may be cluttery or inappropriate. The Apricot's microscreen allows you virtually to label the keys direct. As the meaning of the function keys changes so do their labels. The microscreen can also mimic the last two lines of text on the main screen. ACT suggests that it may be useful for inexperienced typists who want to look at the keyboard but still see what is being typed without lifting their heads!

The microscreen is a great aid to user friendliness. It is helped by a row of eight dedicated keys that give access to special functions or requests. CALC is one, HELP another. This emphasis on user-friendliness extends to the software, which comes set up with a "manager" program that will display

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disk options and route the user either to applications or to routines that modify his user environment. Many users can keep the operating system's murkier depths at arm's-length using these utilities; this makes the machine particularly useable by first-timers.

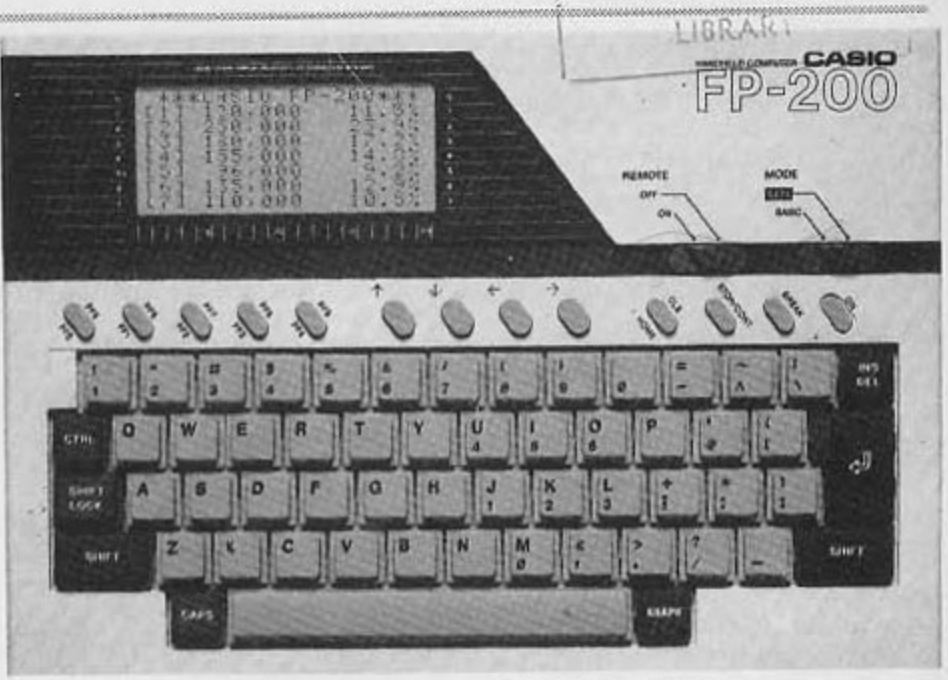
The basic machine is quite a bundled package. It comes with version 2.0 of MS-DOS; a spreadsheet (SuperCalc); a highly versatile diary/engagements/memo pad/appointments-book planner; Concurrent CPM-86; the GSX graphics extension; full configuration utilities; two BASICs; and asynchronous communications and background printer spooling packages. An adequate starter kit by any standards, and suitably documented.

Totally compatible with Sirius

That leads to general software availability. If you are buying a machine to do a job here and now this is an important, possibly paramount, consideration. The Apricot's compatibility with the IBM-PC market is limited, but it is totally compatible with Sirius software: applications can literally be ported from one machine to another. This gives access to an applications base from over 1000 software suppliers in Europe and the United States developed over the last three years. In the 16-bit field that is a good base. It also includes some excellent "in-house" utilities such as the quite exceptional graphics toolkit. For the programmer the range of compilers and alternative operating systems is large, including Pascal, Fortran, Cobol and languages under the P-System. Again this draws heavily from ACT's large, established user base.

The final question might be hardware expandability. The Apricot has two expansion slots and can also take an 8087 numeric coprocessor and a built in auto-modem. The slots permit upgrade of RAM from its 256K standard to (currently) 768K plus enhanced communications options. These include IBM communications emulators, networking cards for LANs, and similar options. When augmented by the standard centronics port and serial port this allows for most needs. It is suggested that hard disks will be available soon, too.

Turn to page 22



The Casio FP-200

Casio FP-200

Good for numbers and tele-links

By Martin Downey

When micros first appeared on the scene they were a marvel of miniaturisation. What once filled a room now left room on the average desk. Pocket computers went further still and they could well get lost on the average desk. But calculator keyboards and 11 character displays did not do justice to the latent power of the electronics. Epson realised this and produced the HX-20 with full typewriter keyboard and 80 character display. The success of the HX-20 has created a whole new family of computers sometimes known as "lap computers".

With big names such as NEC and Tandy, Casio has now entered the market with the new FP-200. Unlike the Epson, which can have both printer and cassette recorder built in, Casio decided to use full-size peripherals and expand the display to 160 characters. Other manufacturers have extended the display to 320 characters, but with the associated increase in price.

The computer, finished in off-white and grey, has a very professional look. The keyboard is a proper full-carry QWERTY with the addition of function and cursor keys. The programmable function keys can be set up by the user with up to 15 characters each. Default values are loaded on RESET but definitions along with all programs, variables and CETL files are retained even when the computer is switched off. The REMOTE switch is used to reserve power when a cassette recorder is not in use. The MODE switch selects either BASIC or CETL (database/spreadsheet). Although graphics characters can be entered directly from the keyboard they are not shown on the keys for aesthetic reasons (Casio would rather the FP-200 looked like an IBM than a Spectrum).

At the back of the machine are a standard Centronics printer port, floppy-disk expansion port, the 300 baud cassette port (slow but reliable with standard cassette recorders), and an RS232C serial port. This gives the FP-200 an awful lot of communications power. Underneath the machine are compartments for batteries and additional RAM/ROM. The right side has plugs for the optional AC adapter and 10-key keypad. A keypad can also be enabled on the main keyboard translating the keys UIOJKLM to 4561230. The left of the machine has the on/off switch.

The display is 20 characters by eight lines and is fully dot addressable to give 160 x 64 resolution. A thumb-wheel allows the screen contrast to be adjusted for best viewing angle. The machine is very portable easily fitting inside the average briefcase. Battery life is quoted at either six or 11 hours,

depending on type (for penlight). Two additional batteries supply the continuous memory and these should be replaced every six months. No rechargable batteries or recharger are supplied (some other Casio machines come with these.)

So far so good. But the FP-200 contains a serious design fault that largely negates the otherwise excellent keyboard. There is no key roll-over! This means that if you press a key while another key is still depressed the second key is ignored. Even the cheapest computers usually have two-key rollover. A touch typist would be driven to turn in an early grave. Even a two-finger typist like myself was forced to slow down. I would be very surprised if other "lap computers" made it to the production stage with such a deficiency. It's sad because under the keyboard the FP-200 packs some very powerful system software.

Spreadsheet and database

The FP-200 comes with 32K ROM which includes a very powerful BASIC and a spreadsheet-database called CETL. You can switch between the two and exchange data freely. The amount of memory allocated to each is selectable using the AREA command.

CETL is a very simple yet powerful piece of software. It lets you create up to 10 files, each containing data in the form of a table. The elements within the table are ordered by record and item. This is very much a simplified version of the VisiCalc spreadsheet but is also a useful database system. Once the file is set up it can be easily edited. You can do part or full sorts off any KEY in ascending of descending order. The search command allows use of most conditional operators including, greater than, less than, AND OR, XOR and NOT.

The only drawback when using CETL is the limited display width. Fairly large tables can be created, but these wrap around on the display and look messy. The option of sideways scrolling would have been a nice feature. Using the optional printer improves matters somewhat. However, the ease with which BASIC can access CETL files meant that I was able to write a simple program which made the screen appear like a window on the spreadsheet similar to VisiCalc (see program listing). This gives a neater, more useful display.

Program listing

```
 1 '**<SCROLLING WINDOW>**
 2 '    BY MARTIN DOWNEY
 3 'Allows a window to be scrolled
 4 'across a CETL table using the
 5 'four arrow keys.
 6 '
10 DEFFN S$(X$)=LEFT$(X$+
   "          ",8)
20 COL=1: ROW=1: CLS
30 IMAX=10: RMAX=10
35 'i.e. 10x10 table
37 T$="SNNNNNNNNN"
38 'i.e. 1st item Strine rest
39 '      are Numeric.
40 GOSUB 150: GOSUB 270
50 CMAX=LEN(S$(1))
60 '
70 I=ASC(INKEY$): F=0
80 IF I=30 AND ROW>1 THEN
   ROW=ROW-1: F=1
90 IF I=31 AND ROW<RMAX-6 THEN
   ROW=ROW+1: F=1
100 IF I=29 AND COL>1 THEN
   COL=COL-1: F=1
110 IF I=28 AND COL<CMAX-20 THEN
   COL=COL+1: F=1
120 IF F=1 THEN GOSUB 270
130 GOTO 70
140 '
150 FOR I=1 TO RMAX
160  S$(I)=""
165  FOR J=1 TO IMAX
170   IF MID$(T$,J,1)="N" THEN
      S$=STR$(FL(0,I,J)) ELSE
      S$=FL(0,I,J)
180   S$(I)=S$(I)+FN S$(S$)
190   NEXT J
200  NEXT I
210 RETURN
220 '
230 LOCATE 0,0
240 FOR I=0 TO 6
250  PRINT MID$(S$(I+ROW),COL,
     20);
260  NEXT I
270 RETURN
```

Computer posts

Mr Kevin Gormican, an American with a background in mainframe and mini computing, has been appointed manager of the MicroMart Computers, Ltd, retail store in Dominion Road, Auckland.

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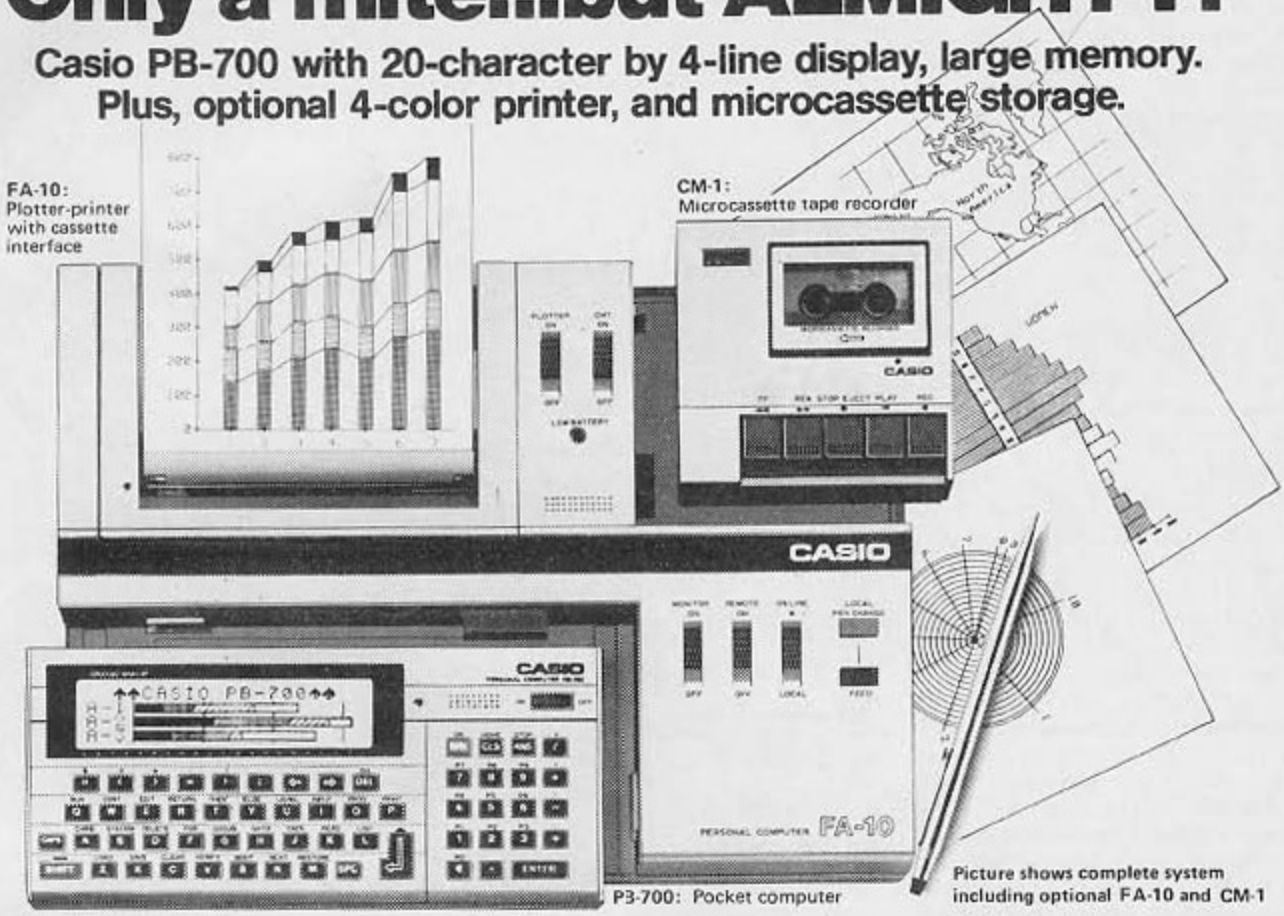
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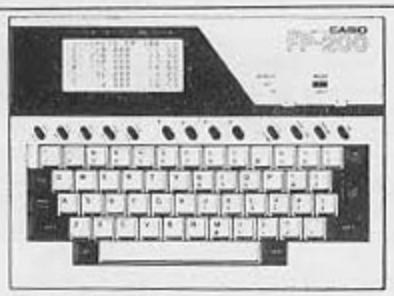
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To use the power of CETL fully you will need more than the 8K of memory supplied, probably 24K. This will cost you another $390, which makes the FP-200 less attractive in price. The floppy disk option with less than 72K storage also seems overpriced. The printer is the only peripheral realistically priced, but since the FP-200 will take any Centronics compatible printer it has to be.

The editing features on the FP-200 are so good that, with a little ingenuity, the CETL language can be made to perform like a simple text editor. This is a bonus that Casio doesn't even mention.

Fine version of BASIC

The BASIC on the FP-200 is a very good implementation indeed. It is virtually Microsoft standard with a number of enhancements. Variable names can be up to 255 characters long (all significant), in upper and lower case. Arrays can have up to three dimensions. Up to 10 programs can be held concurrently in memory and you can chain between these using the GOTO PROG and GOSUB PROG commands. The editor is very good. You can step backwards and forwards through a program using the cursor keys, changing lines as you go.

The inclusion of numerous mathematical functions, double precision (19 digits) and a very powerful set of statistical commands (sum, mean, standard deviation, linear regression, and more) should appeal to the student and engineering factions. The TIME$ and DATE$ functions are very useful: they continue even when the machine is switched off.

Graphics are well implemented with DRAW, QUAD, and POINT commands. The 64 x 160, dot-addressable graphics give good resolution on the small screen, and there is also a set of pre-defined graphics characters similar to that found on most dot-matrix printers.

File handling includes all the tried and trusted Microsoft commands such as, FIELD, PUT, GET, PRINT#, and INPUT# allowing both sequential and random files. The device addressed can be the cassette, the floppy disk or the RS232C port.

However, with all the enhancements there are two inexcusable omissions from true Microsoft. There is no STRING$ function and no ON ERROR statement.

Microcomputer Summary

Name:	Casio FP-200.
Manufacturer:	Casio Computer Company Ltd, Japan.
Microprocessor:	MSM80C85 (8085 compatible).
Clock speed:	6.144 MHz.
RAM:	8K standard (Expandable internally to 32K).
ROM:	32K standard (Expandable internally to 40K with 24K RAM).
Input-Output:	Centronics printer port. RS232C (300 baud), cassette (300 baud), floppy-disk expansion slot.
Keyboard:	57-key standard QWERTY, 4 cursor, 5 programmable, and 5 other function keys; 10-key key-pad option ($89.95).
Display:	20 characters by 8 lines built in LCD display.
Languages:	BASIC (enhanced Microsoft standard), CETL (Casio Easy Table Language).
Graphics:	64 x 160 dot-addressable monochrome plus 64 graphics characters.
Sound:	None.
Price:	$795.
Options:	8K CMOS RAM packs ($195 each). 8K ROM utility pack (price unknown). AC adapter (price unknown).
Peripherals:	4 colour mini plotter-printer ($459). 5.25 inch mini-floppy disk SSSD 72K ($1195).
Other Features:	Continuous CMOS memory. Handheld portable computer.
Reviewer's Ratings (Out of 5):	Documentation 5, ease of use 3, language 4, expansion 3, value for money 3.

Review Unit from Turners Ltd, cnr Colombo St and Tuam St, Christchurch.

The documentation included with the FP-200 is very good indeed. The *Operation Manual* gives full instructions for using the computer with example BASIC programs and CETL applications. Memory maps, pin-outs and other technical information are all supplied. The *Reference Manual* gives a clear concise description of all the BASIC and CETL commands. The book is very thorough but may be heavy going for the novice programmer.

Summary

The FP-200 is certainly not a beginner's computer, but to the student or professional it offers some very powerful features. The ease with which the RS232C interface can be accessed from BASIC makes the machine particularly suitable for remote data entry and later "down-loading" to another computer for further processing. However, if the FP-200 was able to interface directly to a VDU then no secondary computer would be needed. I am sure future lap computers will contain this feature. Certainly the FP-200 already has the internal power to rival full size computers. The machine:

- Has very good system software.
- Has no keyboard roll-over.
- Its optional RAM is overpriced.
- It is aimed at the professional user.

From page 19

All in all, the Apricot can match or beat most of its 16-bit rivals. It is small, neat, powerful and endowed with a good software base. Design for friendliness in hardware and software has enhanced its value to the small user, and many of its hardware features are taking advantages of current-generation thinking. It comes bundled with some very useful software and access to much more. For really demanding specialist users wanting to stay with 16 bits and needing more expansion slots or some very specialist software a Sirius, IBM-PC-XT, or NEC-APC might be more attractive.

However, the real challenge will probably emerge over the next year with low-cost 32-bit machines, but they will clearly take time to develop a complete software base. Meanwhile the 16-bit market will grow.

The Apricot is a well-provided starter system that is clearly competitive in this market. Its edge over its many rivals will depend on its price. Although figures as low as $5800 have been quoted, it seems that the final price may be creeping nearer $7600 tax paid.

Televideo portable

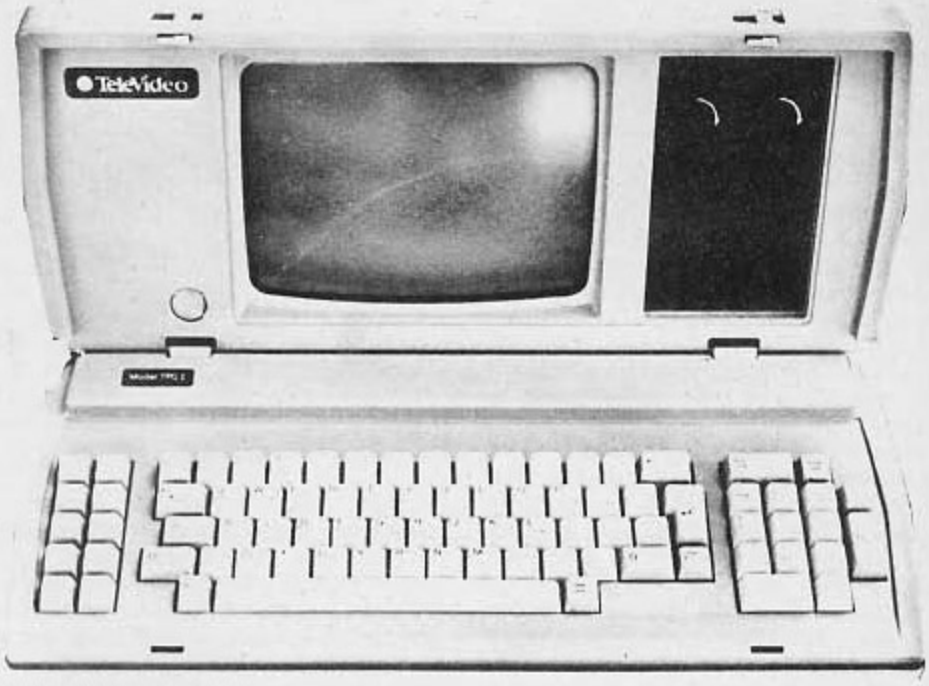
Serious business contender

By Gordon Findlay

Televideo is a company well respected for its high-quality terminals, and more recently its desktop computers. Like many other companies, Televideo has noticed that one of the fastest growing segments of the computer market is for business portables. Televideo's entry, the TPC-I (Televideo Portable Computer, 1), is the result.

The Televideo is a light-coloured box, with screen and disk drives in the front, plugs, switches, and connectors in the back. The unit has a flap underneath which folds out, allowing the computer to tilt. The keyboard is detachable, connected to the computer by a curled cord. The keyboard also tilts. The keyboard cable must reach right around to the back of the computer; a small plug on the front would have been very convenient.

The case is made from injection-moulded plastic, which seems fairly rugged, although the demonstration model I was using had a broken catch. These small pieces of plastic seemed rather fragile, as did the removable back cover which covers the connectors and holds the power and keyboard cords in transit. The keyboard latches on to the front, covering the screen and drives, when being shifted. The TPC-I is no feather weight, at 13.6kg, but is still quite portable, at least from office to car.



The Televideo TPC-1

The screen measures 22.9cm (9in) diagonally, and has an amber phosphor. The resolution is very good, and I was ale to read text easily with the keyboard in my lap. The text display is 24 lines of 80 characters; a graphics mode allows 640 x 240 pixels resolution, not in colour. A neatly recessed brightness control on the front panel made adjustment easy.

The text screen may be normal or inverse video, selected by either a dip switch on the back panel or (more normally) from software. Text may be underlined, blinking, half-intensity, or even invisible (for passwords and so on). These are selected from the keyboard or a program by sending sequences of characters to the screen (''escape sequences''). Sequences also provide for placing the cursor at any point on the screen – a program can define a function for this very easily.

The keyboard has many keys. As well as the usual alphabetic, numeric, and so on, there are 10 function keys, a numeric-control keyboard, control, escape and alternate keys, and some others which curiously are not used. The function keys may also be used with the control key, and some may be

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shifted, giving a total of 32 different sequences which may be assigned. Programming the function keys was easy, but I couldn't find how to save them to disk – I hope there is a way. The shift-alt key combination toggles the screen between text and graphics displays, and the computer is reset by the Ctrl-Alt-Del sequence, which is almost becoming the standard. The numeric keypad keys also function as control keys, depending on the "position" of the "numeric lock" key. As this key doesn't lock down, and has no light or other indicator, it is impossible to say which mode the keys are in. The same can be said for the "Caps Lock".

The most irritating thing about the computer was the racket made by the keyboard. The keys made a mechanical noise as they were pressed, and another coming back up. An electronic "click" made three noises per keystroke, which is at least two too many! The electronic click can be turned off, but the noises still made the keys sound rattly. The feel was quite good, perhaps a little sloppy.

CP/M nicely implemented

Two double-sided, mini-floppy drives are mounted vertically alongside the screen, with 368.6K characters capacity each. The format is the same as that used by the TS803/803H desktop computers, providing for some compatibility. The operating system is CP/M – quite a good implementation, with sensible error messages such as "Please shut the door of disk A", rather than "BDOS ERROR ON A: SELECT". It was interesting to test the operating system by such (usually foolish) actions as copying a disk from one drive to another while opening and closing the doors randomly. Each time the computer (or operating system anyway) was able to recover, tell me to shut the door, and continue without losing data.

Other interfaces and connectors on the back panel provide for serial and parallel output (to printers, modems, etc.), with switch or software selection of communication parameters. A connector is provided for the Televideo "Supermouse", which is a three-button mouse, available as an extra for about $430. These connectors, and the on-off switch, are all in a recessed section of the back panel.

Microcomputer summary

Name:	TPC-I.
Manufacturer:	Televideo Computer Systems.
Microprocessor:	Z-80A.
Clock speed:	4 MHz.
RAM:	64K, expandable to 128K user RAM, 32K screen RAM.
I/O ports:	RS-232, Centronics, mouse.
Keyboard:	Typewriter style, detachable.
Display:	24 lines by 80 characters, amber screen built in, with various attributes (see text).
Languages:	Many CP/M, e.g. MBASIC.
Graphics:	One colour, 640 x 240 resolution.
Sound:	Yes.
Cost:	With twin drives, built in screen, TeleSolutions software, Cashman etc. $4,590 (including 40 percent sales tax).
Options:	SuperMouse $431, other peripherals as required.
Other features:	Compatibility with other Televideo machines.

Test machine supplied by Computer Plus, Christchurch.

The TPC-1 has a graphics capability especially selected for use in business. The resolution is very good. Programming is taken care of by the GSX extension to the operating system, which provides a collection of calls for common operations such as drawing lines, shading, and so on. A utility (GENGRAF) is provided to link an applications program with the GSX loader. The software supports a number of printers, and plotters if required, by using independent device drivers, details of which are in the System Reference Manual. A sample of the Televideo graphics is shown in an illustration – this was produced using a dot matrix printer.

Documentation for the machine is in two parts. A good, well written user manual covers setting up, connection of peripherals, using the keyboard, formatting and copying disks and disk handling, at the novice level, with lots of illustrations. The Reference Manual is not so simple of course, and covers much more ground. A useful chapter explains most CP/M commands, including the use of STAT and PIP. Almost everything is included and tables and specifications are collected in appendices for easy reference. The manual is fairly well organised, although, I still cannot save function key definitions – maybe I didn't look hard enough.

Software comes with the machine of course. As well as the operating systems and graphics extension, utilities for copying and formatting disks, setting up the system (e.g. connecting the mouse) and demonstration programs are included. The TeleSolutions software package comes with the machine as well. This is a text-processor, TeleWrite, a spreadsheet, TeleCalc, TeleChart for making graphs and charts from TeleCalc data, and Cashman, an invoicing, stock control, and debtors accounting package.

TeleWrite is billed as an executive word processor, and is quite easy to use, although not as comprehensive as a full wordprocessor, which presumably is for a typist rather than an executive!

TeleCalc is a different spreadsheet – menu driven rather than command driven – but very powerful and easy to use. TeleChart provides for production of pie, bar and line graphs, in a variety of styles and combinations. This also is menu driven.

The TPC-I is a serious contender in the business portable market, particularly as the Televideo range of desktop computers is compatible with it.

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Home Sharp with printer and plotter

By Shayne Doyle

This computer is the latest home market offering in New Zealand by Sharp. It is billed as a "clean machine", referring to its lack of a resident language interpreter. It is also clean in design: a full configuration of computer, keyboard, cassette deck, and printer/plotter is in a compact package about the same size as an average electric typewriter. In Britain, the base model without cassette and printer is the MZ700. Add the cassette drive and it becomes the MZ721, which is the base version on the Australasian market. Further addition of the four-colour printer plotter makes it an MZ731.

The front lower face is occupied by the keyboard, 58 main keys, four cursor keys to the right, five shiftable programmable function keys to the upper left, and above the cursor keys, INSert and DELete keys which when shifted, give home or clear screen home. The keys are true key-switches and have what I feel is an ideal degree of resistance. It is not an "ergonomic" keyboard, but is very nice to use, and best of all, the keys are quiet and do not "clack" as so many keyboards do.

Each standard key has two graphics characters marked on the lower face, and these are activated by a GRAPH key. The two characters are then accessed by shift/unshift. An ALPHA key reverts it to the standard upper case ASCII set. While there is no obvious CAPS LOCK key, pressing SHIFT & ALPHA performs this function (this is not documented in the manual). The function keys are assigned present values when BASIC is loaded, but may be dynamically redefined directly or by program statement, to a maximum of 15 characters per key.

The rear top face of the computer is divided into three sections, the left third being power supply ventilation grille. The centre takes the plotter, and the right third contains the cassette drive. On the rear panel is a comprehensive array of I/O connectors for: second cassette deck, two joysticks, system bus,



The Sharp MZ-721

parallel printer interface, speaker volume control, system reset, frame ground terminal, AC power socket, on/off switch, RF modulated video to TV, composite video to B/W monitor, and RGB colour monitor output. The joystick sockets would not match the plugs fitted to most joysticks, and the parallel printer socket is an edge connector extension of the main PC board. These are fine if using Sharp supplied cables/joysticks, but a problem if using anything else.

26 CHARACTER MODE

NORMAL 40 CHARACTER MODE

80 CHARACTER MODE - STILL AMAZINGLY LEGIBLE ISN'T IT ?

Sharp print examples

The black and white monitor output is good and steady, but no matter how well tuned my National TV, I could not get a good colour picture; a high degree of colour wash and blurring was evident. Another recently reviewed machine produced monitor quality R= colour on this TV. I was unable to check the RGB output, but if you have seen a computer operating into an RGB monitor, you will know what the quality is like.

The normal display format of 25 lines of 40 characters is a 1K "window" on the true display area of 2K. The "window" may be scrolled around this virtual display by using the cursor keys.

A machine-coce monitor program is resident in ROM, allowing LOAD/SAVE/VERIFY from cassette, memory modify, print memory, jump to address, and transfer control to free RAM area. The rest of memory (about 61K bytes) is available for machine-code programs. The other languages are loaded from tape by the monitor load command.

With BASIC loaded, free user memory is reduced to 36.4K bytes. This version of BASIC is a bit unusual in that it also has a machine-code monitor embedded in it, with the following commands: switch output between display or printer, dump memory, modify memory, find string, move memory block, SAVE/LOAD/VERIFY memory to cassette, call subroutine, and return to main program. Alternatives to the BASIC interpreter are Pascal and the Zen editor/assembler.

Although it only takes about three minutes to load BASIC on the 1200 baud cassette deck, it must be added to the program load time. An obviously better scheme is to provide pageable Eprom space as some machines do now.

Drawback with the graphics

The second major drawback with this computer is the lack of any standard high resolution graphics facility or programmable character/sprite system. The normal 25 x 40 character screen has a very low resolution 80 x 50 pixel system accessed by the standard SET/RESET statement pair, having

```
Ready
BYE
*D 1000 101F
:1000=00 00 00 00 00 00 00 00 /........
:1008=00 00 00 00 00 00 00 00 /........
:1010=00 00 00 00 00 00 00 00 /........
:1018=00 00 00 00 00 00 00 00 /........
*R
Ready
BYE
*D 0000 001F
:0000=C3 DA 00 C3 20 01 C3 FE /.... ...
:0008=04 C3 FA 04 C3 31 05 C3 /.....1..
:0010=02 05 C3 33 05 C3 DA 04 /...3....
:0018=C3 DA 04 C3 F0 02 C3 A0 /.......q
*R
Ready
LOAD
. PLAY
Found      "ACCOUNTANT"
LOADING    "ACCOUNTANT"
Ready
RUN
```

An example of the Sharp's printing ability

an extra parameter to define the pixel colour. There are, however, a very large number of predefined graphics characters — about 624 in all, and these may be combined to form some quite complex images.

The BASIC dialect supplied for the computer is not remarkable; it has some good features while omitting one or two essential constructs. It does have a full screen editor and will accept everything on a line no matter where the cursor is placed. The notable extras are a MERGE statement that allows other source lines to be read off cassette and appended to the current program; BYE which jumps into the BASIC machine code monitor program; the function key handling commands KEY LIST and DEF KEY. It provides extensive facilities for formatted printing, and a set of five commands for handling cassette data files. While not permitting full motor control over the tape deck, it will stop the deck when reading has finished.

The commands for handling the printer/plotter are extremely versatile and allow the BASIC programmer to manipulate this unit easily. For accessing machine code routines

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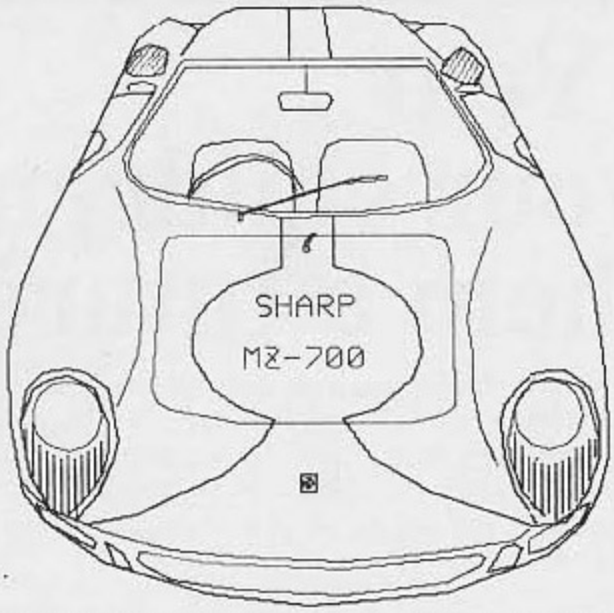
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SHARP



Graphics . . . . Sharp style

from BASIC, PEEK, POKE, USR and LIMIT are provided, the latter setting the upper limit of memory for BASIC to use — it sets an artificial RAM top for protecting machine-code routines.

A useful statement concerned with the display is PLOT ON/OFF. This allows the printer/plotter to be the display device — acting as both keyboard echo and output device (see example). This feature does allow limited use of the computer away from a video monitor or TV, although the printer goes through some amazing gyrations when waiting for INKEY input!

The annoying omission is the lack of the IF . . . THEN . . . ELSE extension. This BASIC leaves off the ELSE part, restricting the power of IF . . . THEN.

Printer/plotter versatile

The printer/plotter is a versatile little device, particularly with the software support given it by Sharp.

The printer may be operated in either text or graphic mode. The former provides for 26, 40 or 80 characters per line. Other text mode instructions are SKIP for linefeed, PAGE to set lines per page, LIST/P, PRINT/P and PRINT/P USING. TEST prints a four square test pattern in the four colours. In the GRAPHIC mode are commands to draw solid or varying degrees of dotted lines, circles, and axis lines. Pen lift and move, home and origin setting, and a statement that prints standard characters in any direction and subject to a scaling factor of 0 to 63. The printer/plotter has a tiny barrel that contains four micro biros and this revolves to select the different colours. A most amazing example of Japanese micro technology and a versatile peripheral for a home computer even though the paper is only 4.5 inches wide.

Sound capabilities are not impressive: the machine does not use either of the two common three channel plus white noise sound synthesiser chips, but has a single square wave generator. This produces a monophonic organ style of sound and is controlled by two statements, MUSIC specifying the note to be played and TEMPO the speed.

The manual is one of the best I have seen for a while. Illustrated with cartoons and with plenty of examples throughout, following a brief tutorial, the BASIC section is arranged in logical operational groups: assignment, input/output, looping and branching, Data file I/O, etc. The manual includes several memory maps, monitor user manual, circuit diagrams, charts of monitor subroutines (addresses and details), character code tables, a good Z80 instruction set list, and a monitor source listing.

In summary, I feel this computer will find a niche in the New Zealand market. It does have a few advantages. The built-in cassette and optional compact printer/plotter are very convenient and may help to overcome the language graphics drawbacks. The price, of $995, puts it in a bracket that offers some excellent value-for-money competition. A large range of software is available for it: games, educational tapes, word processor, personal data handling programs, club membership, and many more.

Microcomputer summary

Name:	Sharp MZ-721.
CPU:	Z80A 3.5 MHz.
RAM:	64K, 36.5K available when BASIC loaded. 4K video RAM – 2K colour ram, 2K screen RAM with a scrollable 1K window.
ROM:	4K machine code monitor. 2K character generator.
Display:	25 lines by 40 characters, 8 x 8 character pixel. RGB colour to monitor. PAL colour RF to TV input (no modulated audio). Composite B/W video to monitor.
Graphics:	Very low resolution (80 x 50) pixel graphics. Large number (about 620) pre-defined graphics characters.
Languages:	BASIC loaded from cassette. Pascal loaded from cassette. Assembly language editor/assembler on cassette. Machine-code monitor in ROM.
Keyboard:	58 standard true key-switches, auto repeat on all keys, five shiftable function keys, four cursor keys, two special purpose keys.
Audio:	Amplifier and speaker with volume control.
I/O:	System I/O bus (PC board edge connector). Connectors for a second cassette deck. Parallel printer interface (PC board edge connector). Two joystick sockets (do not match standard plugs).
Price:	$995.
Options:	Four colour printer/plotter $321. Universal Interface board. Floppy disks.
Reviewer's ratings (Scale of 1 to 5):	Documentation 5, ease of use 4, language 3, expansion 3, value for money 3, support 4.

Review unit supplied by Excelsior Supply Company, Wellington.

MBC 550/555

Sanyo bids for the computer market

By John Wigley

Sanyo is well known for domestic electrical goods. With the MBC 550/5, Sanyo seems to be aiming to become equally well known in the computer field.

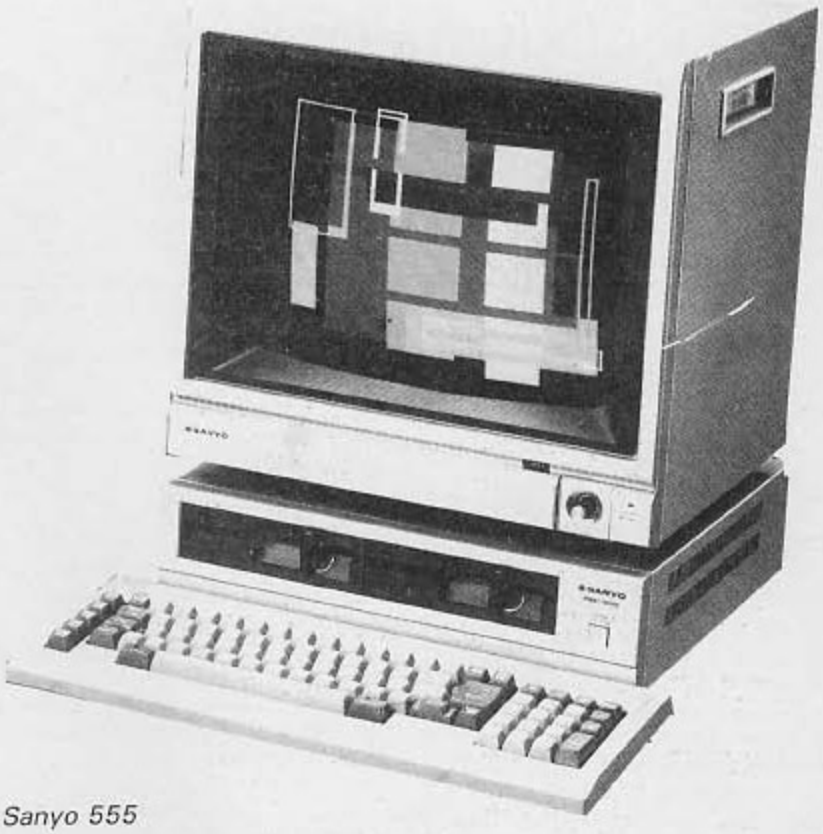
The MBC550 and 555 are single and twin disk drive versions of the basic machine. A 360mm deep by 112mm high by 380mm wide base houses the single sided, single or twin 5¼in drives, and the CPU and hardware. At the back of this base is a slot for the air inlet (a fan is built in), a printer (centronics type) port, two video ports, black and white and glorious colour, the keyboard input and ready to fit slots for joystick/paddle external and line ports.

The 81-key keyboard is detachable, and includes five programmable keys (using shift gives 10 functions) and a numeric keypad. This is controlled by a numeric key so that it works either as the keypad or alternately as the cursor control keys.

In the current style, the monitor sits on top of the main base. The choice is colour or black and white, well green or whatever. So a nice package without lots of dangling wires. How does it perform?



The Sanyo 550



The Sanyo 555

Colour first. Already, the phrase, "glorious colour", has been used. It is. Simple BASIC commands allow generation of excellent colour graphics. Splash out and revel in the ease of use. In monochrome, so dull after colour, the same high quality graphics are just as easily designed. Text is well formed and easily read — portables have their place but a large screen is much nicer.

The software is impressive — MS DOS, BASIC, WordStar, ReportStar, DataStar, CalcStar — and has its own impressive manual. Not perfect, but very good and self-training manuals are available. Printing is good and readable. With its extra capacity, the 555 can run the Mailmerge, SpellStar and InfoStar as well.

MS DOS is a Microsoft 16 bit versionof CP/M 2 (for eight bits). It is obviously CP/M-based and can be learnt if you want to make the effort. The MS DOS manual is the only manual that is obtuse — ideal for centres of higher learning. Fortunately, all the other sensible programs are easily called up, and their manuals are clear and lucid. So it is not necessary to learn MS DOS. It also includes an Auto Execute function which means programs can be set up to load and run as a turnkey function.

Plenty of software is available right now — definitely a plus.

The disk drives are somewhat restricted in size.

The immediate future will bring double sided disks, a hard disk and networking.

And IBM compatibility? Some IBM disks (must at this stage be single sided) will run with no problem. Anything under MS DOS seems okay but if it makes calls to ROM, no. While this machine is good enough to stand on its own, some degree of compatibility is a bonus.

Summing up, another good package at a very attractive price. Marketing will decide the success of this computer but if sales in the USA are any guide, it will be a success. Just look at the price.

A final word. This is a 16 bit machine. Whatever the experts might say about eight bits being enough, it is not. The extra, addressable memory is very worthwhile, especially with Calc sheets.

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Microcomputer summary

Name:	Sanyo MBC 550/5.
Manufacturer:	Sanyo Electric Trading Co. Ltd.
CPU:	8088 @ 3.6MHz.
RAM:	128K expandable to 256K.
ROM:	8K.
Video RAM:	48K, including 16K of main memory.
Input/output:	Printer, Video, RGB, Keyboard ports (RS232C, joystick/paddle, external available as extra), 1 or 2 disk drives (5¼").
Keyboard:	81 keys, including five programmable dual function keys, numeric keypad, and cursor keys.
Video:	Monochrome 80 x 25 lines, 640 x 200 dot graphics. Colour (RGB), eight colours, 80 x 25 lines, 640 x 200 dot graphics.
Speaker:	Beep.
Operating system:	MS DOS.
Software:	Any under MS DOS, e.g. BASIC, CPM/86, WordStar, Mailmerge, CalcStar, InfoStar.
Reviewer's ratings:	Documentation, 4; Ease of use, 4; Value for money, 5; Support, 5; Expansion, 3.
Price:	MBC 550 $2395.00 includes MS DOS, BASIC, WordStar, CalcStar. MBC 555 $3295.00 includes all above plus Mailmerge, InfoStar and SpellStar.

Review machine supplied by Sanyo Business Division.

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ZETA-C682 cassette deck

By Tony Graham

The ZETA-C682 data cassette deck should be able to solve LOAD/SAVE problems for quite a few micro users.

The attractively presented unit has all of the features required for low-cost data storage, using the standard C type cassettes. Input and output connections are via a 5 pin DIN plug for which there is no indication of pin connections, or by 3.5mm phone plugs as normally used for microphone and earphone. A 2.5mm plug is used for remote.

If your computer has provision for remote tape operation, it will still be necessary to pull out the remote plug to allow fast forward and rewind to operate. A monitor with on/off switch is included so that tape signals are audible on both SAVE and LOAD.

A tape counter is provided.

The sample unit was able to cope with input signals of less than half and more than five times the manufacturer's rated input level without any noticeable change in output level (checked with 1KHz square wave). The output wave form varied considerably with the setting of the level control. About 25 percent of output was present with the control at minimum. Maximum output voltage level was achieved at approximately mid-setting of the level control. The output wave form at this point had a very sharp spike – nowhere near a square wave. But as the level control was increased further the wave form changed so that at maximum level an acceptable square wave was obtained. This is obviously the reason the manufacturers suggest starting to load with the level control at ¾ setting and moving up or down as required. At this setting all program tapes produced a successful first-time load.

One disadvantage of the 'Datacorder' is that the batteries are only the AA, or penlight, size. Alkaline cells are recommended but at N.Z. prices a power adapter is probably a better buy. A 6-volt adapter is required with a current rating of at least 140MA.

One curious statement in the instructions is, "Be careful not to demagnetise the erase head." This suggests that a permanent magnet is used for erase. This is not the case as the erase head is in contact with the tape during loading, and if magnetised could be just as much a problem as a magnetised record/play head.

Specifications –

Input: 50mv +/- 10mv P-P square wave.
Input impedance: 2k ohm +/- 1k ohm.
Frequency used in recording: 800 HZ to 2400 HZ square wave.
Output: 3.5v +/- 0.5v P-P square wave.
Output Impedance: 68 ohm.
Recommended Retail Price: $79.95.

Sample unit provided by David Wells, Ltd., P.O. Box 2823, Christchurch.

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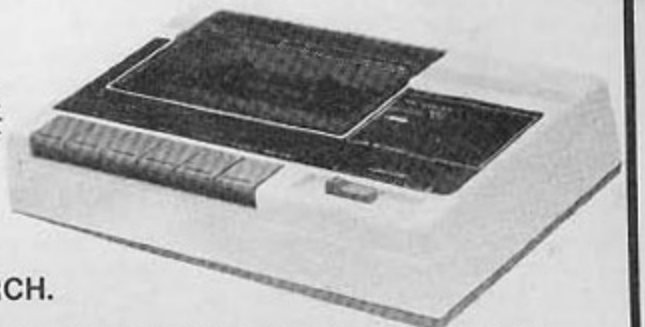
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GARTH CARPENTER

Astrologer an early micro user

By Pat Churchill

I met three of Garth Carpenter's pets when I visited his home recently — two sleek grey cats and a CBM 3030. While the felines are undoubtedly dear to him, the PET computer is a major asset for this Wellington astrologer. It has taken much of the donkey work out of his astronomical computations and daily proves its worth by freeing Garth for other pursuits.

In his pre-PET days, it could take Garth up to 45 minutes to construct a map for an interpretation. The computer has whittled the time down to 1.8 minutes.

"An eight-hour day's work can be done in 16 minutes."

Garth Carpenter was one of New Zealand's early PET owners.

"When Commodore brought out the PET, and the Radio Shack the TRS-80, I thought what marvellous number-crunching tools. But there wasn't any astrological software around at that stage for these machines."

It just happened that the PET designer, Chuck Peddle, was also a leading American astrologer. And Peddle's close friend, Michael Erlewine, was one of that country's leading technical astrologers. Astrological software was an early PET development.

Garth bought his machine at the beginning of 1980. There were lots of early hassles. "Initially I was supplied with the wrong DOS support."

It became a monotonously regular occurence for Garth to send his disk drive back to the Auckland firm he bought it from. They would check it, say it was working OK and return it. This happened six times and left Garth $400 poorer for the air freight.

Eventually the firm sent someone down to check out the drive.

"He couldn't get it going either. That was when we discovered I had the wrong DOS support system."

Garth had to teach himself to program the computer. At the end of the first day he had produced his first program. Just cause for a celebration.



Garth Carpenter

"It took me a year to become proficient in BASIC."

He says he is not a tidy programmer, in fact describes his style as "sloppy", but it suits him.

Over the last three years he has been putting together a program for his astrological work. It is operational, but is so far about three-quarters finished. It uses 20K. Garth reckons this could be streamlined, but is reluctant to meddle with it yet for fear of dropping something vital.

"There are a few bits of program that never get executed because GOTOs never return." They will probably stay that way unless Garth needs to clear them out for operating space. So far that hasn't been required on his 32K PET.

Garth is critica of the instruction book that came with his machine. It took two years for him to sort out one algorithm because of inadequate documentation.

"Instruction books are a lot better now."

In spite of his initial hassles, he feels there were some advantages in being in early. While there may now be various software packages available to lighten the astrologer's load, Garth has the satisfaction of having tailormade a program to suit his needs.

He has found writing the program a challenge, at times a thrill when problems have been solved.

"I'm a relentless seeker after the truth of something. I'm not happy till I get to the end of a thing. Some days I get depressed but the spur is that experience has showed that I get there in the end."

When programming goes awry, he likes to ask himself, "What do all these errors have in common?"

Garth Carpenter is very interested in the jurisprudence affecting programming. "No-one can own an algorithm. A program is made of algorithms. But it can be argued that while you can't own an algorithm, you can own using it creatively."

It is an interesting point to explore, he feels.

While the computer has whittled down his work load, he is amused to sometimes find himself impatient with the machine. "It takes only a maximum of 10 seconds to calculate any planetary position" — a task that could take an astronomer, working things out in his head, a day — "but I find myself wishing it would hurry."

Unfortunately, in terms of learning things the hard way, Garth lives in an

area prone to power cuts and spikes. He appreciates the value of saving new material while he still has a chance.

THE POWER AND THE STORY

He tells a delightful story from his early computing days. He often wondered what was inside the machine, but wasn't game to look. Then another of Wellington's early PET owners visited him, a veteran of the chips. He opened Garth's machine and pointed out the various features; "he even told me it was all right to vacuum clean inside it." Which they did. Then closed it up, turned it back on and...you guessed it. Nothing happened. "He went very white."

It just happened to coincide with yet another loca power failure.

Garth has Commodore's 8050 dual disk drive. A Diablo printer which he describes as "very robust," completes the configuration. This printer runs non-stop from 9am to 6pm anc in four years Garth has had only one minor problem with it. He finds it invaluable for a correspondence course in astrology which he runs. He uses Wordpro 3, his "greatest asset."

But while Garth Carpenter has his machine doing the donkey work, one thing hasn't been computerised... the interpretation of his clients' charts.

"I wouldn't do it on a computer. It's an aspect of your mind. The variables in astrology never repeat themselves. A program would be constantly qualifying. If this, if that..."

Even with the computational part of the process computerised, Garth's personal contribution takes time.

People still ring up expecting to get an instant horoscope.

"The role of the astrologer is changing. We're not a fortune-telling device, but we do have a therapeutic role in continuing counselling."

While the computer has freed some of Garth Carpenter's time for other aspects of his work, it has also presented him with a personal challenge that he apparently relishes. That program, when it is finished, will open up research facilities, he says, with a glint in his eye.

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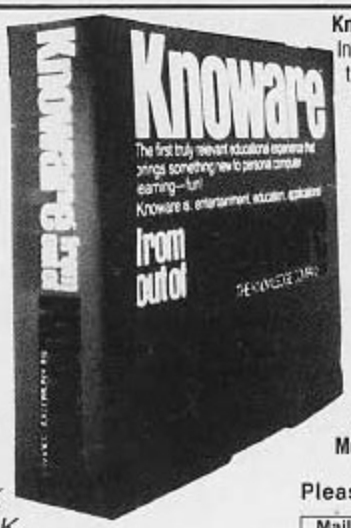
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Horace and the Spiders, for 16K ZX Spectrum, $29.95.
Reviewed by Steven Cragg

The Hobbit is based on the famous book by Tolkien. The player is cast as Bilbo Baggins, the main character. The player meets Gandalf, Thorin (who seems to take the place of all the dwarfs), and most of the other characters and varied nasties Bilbo meets during the course of his adventure in the book.

The program comes with a very comprehensive instruction booklet, which is well written without giving too many of the game's secrets. This game is really a text-only game, but it has an 'artist's impression' of each major scene the first time the player comes across it.

The communication with the computer is carried out using Inglish (sic). This gives limited use of English and allows the player to construct short sentences of the form "GO NORTH AND HIT DOOR AND KILL GOBLIN".

This is a big advantage over other adventure games I have used.

A feature called Animaction controls the other characters in the adventure. For example Thorin often tells the player to hurry up and can carry items that the player has found and can be called upon to perform various deeds.

Over all, I would say that this is probably the best adventure game I have played and is one of the best games I have seen on any computer.

As the titles of the other three games suggest, al have one thing in common, Horace. He is a small round creature with two legs and he slightly resembles a Pacman.

Hungry Horace is loosely based on the Pacman theme. In the game, Horace is in a park and the object is to eat as many flowers as possible while avoiding the gardeners. Bonus points may be gained by ringing the bell which is situated in one corner of each of the four mazes. Also bonus points may be gained by eating the fruit gardeners leave behind from time to time.

Hungry Horace is a game that makes good use of the Spectrum's colour and sound facilities, but the game itself seems to be aimed at the slightly younger age category.

In Horace Goes Ski-ing Horace desires a quick run down a giant slalom course.

To get his skis he has to cross a busy two-way highway, complete with cars, trucks and the odd stream of motor-cycles, as well as an ambulance equipped with a particularly irritating siren.

Once Horace has crossed the road twice he gets to go ski-ing. This is good the first time but the course never changes, which is a great pity.

However, if you want a good demonstration of Spectrum graphics the busy road is one of the better examples.

Once again, as with all games in this series it seems to be aimed at the eight to 14-year-old age group.

The object of Horace and the Spiders game is to avoid the spiders in each of the three different levels.

In the first level the player has to jump over the spiders, which approach from the right of the screen. This is essentially a qualification stage and is tiresome.

The second level consists of spiders dangling threads down over a chasm which the player uses, Tarzan fashion, to cross safely. The only snag is that while the player leaps from thread to thread the spiders pull up their threads with the player on the bottom. Needless to say, if the spiders succeed you lose one serum (life).

The third stage consists of a large web with several spiders resident. You have to knock holes in the web and then wait for the spiders to drop into the holes. When they drop in the player jumps on them to kill them.

This is not the most exciting game, but younger players find it fairly stimulating.

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Zap, Pow, Boom: 30 Games for your VIC 20 — **Mark Ramshaw**

Arcade games covering space, mazes, wars, marathons, driving, draughts.

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Handbook which leads you to advanced work without wading through screeds of background material. More than 50 sample programs to adapt and modify to your needs, all open-ended modules. Many hints and tricks for troubleshooting and debugging programs, how-tos for constructing modular programs and making flow charts, and a guide for translating programs written in any BASIC dialect to the BASIC on your VIC-20.

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Key Into Your VIC-20: The Basic Course for your New Computer — **Albert Sickler**

After dealing with hardware and software to give you an idea of the scope for expanding the VIC-20 to meet your experience and requirements, there is a complete beginner's course in BASIC. A number of short example programs are included in the programming course and further programs are provided for immediate use. Summary of all VIC-20 instructions and a table of error messages.

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Commodore

Basic Subroutines for Commodore Computers — **Eddie Adams**

Easy-to-use manual which offers access to more than 300 BASIC subroutines — powerful building blocks you can combine and adapt to create programs for a wide range of business, educational and personal applications. Explanations for each subroutine with suggestions for modifying it to your needs. Each program is ready to run on any Commodore system.

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How to Use The Commodore 64 — **Jerry & Deborah Willis**

Introduction to the computer and its basic components, explains what the components do and how they work together, step-by-step instructions on setting up and installation; shows how to load and save programs on diskette or cassettes; tells how to type in, use and modify programs; presents other sources of information.

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More Than 32 BASIC Programs for the Commodore 64 Computer — **Tom Rugg & Phil Feldman**

Chock full of programs covering games, applications, education, graphics, mathematics. Each program is fully documented with a complete source listing; the program's purpose and how to use it. Also information on how to adapt programs by making simple modifications.

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General

Illustrating Computers (Without Much Jargon) — **Colin Day & Donald Alcock**

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Microcomputer Colour Graphics Systems — **Donald Bell**

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Analog Electronics for Microcomputer Systems — **Paul Goldsbrough, Trevor Lund & John Rayner**

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Personal Computers Handbook: 2nd edition — **Walter H. Buchsbaum**

Covers functions of personal computers and provides an insight into the key functions of the microprocessor. Discusses computer memory and how it is used, connecting computers to the outside world, peripherals, printers, modems etc. Explains programming and BASIC language principles, deals with information storage and hardware trouble shooting. Takes a look at 12 typical personal computers.

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Sets out to carve the extraneous mumble-jumble from computers and allow you to get the most from them without any worries. Investigates the reasons for computer anxiety and tells how to use the computer to your best advantage.

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Microprocessor Interfacing: A Designer's Guide to Memory Devices, Input/Output Ports, and Interfacing With the Analog World — **Joseph J. Carr**

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The Microprocessor Handbook — **Elmer C. Poe**

Single source of complete specifications for all widely used microprocessors. Annotated specifications for operational details, uniform layout and standard terms (explained in first chapter). Allows for easy comparison and includes printouts, signal definitions, timing diagrams, address modes and instruction sets for each microprocessor discussed.

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Word processing

Wordstar Made Easy — **Walter Ettlin**

In 14 easy lessons, this handbook demonstrates all the powerful features of the MicroPro Wordstar system. Lessons cover everything from loading, using the unique printing, text manipulation, and formatting functions. Spiral bound, it is ideal to use while working at the terminal.

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A quick reference for defining and immediately using a function; it describes and illustrates the 10 most commonly used CP/M commands and 63 Wordstar word processing operations. Organised into modules which deal with each system function in detail — each function is described, common applications presented, a word processing operation demonstrated.

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For users wanting to do their own programming. Provides straightforward introduction to data processing, with explanations of routines in BASIC. Examples of system designs for home and business use, which you can combine and expand. Systems for names and addresses; catalogue/index; diary; stock control; bank account/budgeting; debtors list/sale/purchase ledger; payroll.

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Simple, functional, cross-referenced data base management program in Applesoft BASIC allowing you to learn the basics of storing and organising information on your Apple II Plus or IIe. Shows how to apply techniques to common chores, while line-by-line commentaries and variable indexes enable advanced programmer to get into more ambitious and specialised tasks.
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The authoritative work on database systems from Stanford University's professor of computer science. Relates database ideas to concepts from programming languages, algorhythms and data structures. Large section devoted to relations, their algebra and calculus, and the query languages designed with these concepts. Also examines recently developed protocols for guaranteeing consistency in databases.
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Our new selection

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After an introduction to the bits and pieces of the 64, you move to the process of learning to program on the keyboard. Concentrates on the key words and techniques to have you writing programs as quickly as possible, then allow you to refine the process at your leisure.
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A book to help both parents and children grasp the basic ideas of computing and provide an elementary knowledge of programming in BASIC language. Both can learn together through a "come-on" visual approach attractively laid out and easy to follow.
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Computers cannot go wrong but those who run, use or program them do. This book catalogues more than 100 crimes, errors and disasters – real and imaginary – featuring computers. The author has culled incidents from published and unpublished sources over more than a decade, classified them and analysed their causes. He then applies the experience to better ways of managing computer-related risks.
Chapman & Hall — Our price $57. Save $3 and earn 5 bonus points.

Exploring Applesoft — Roger McShane
Teaches programming in Applesoft through a series of graduated programming tasks. Instructions are kept to a minimum – the accent is on actually working with the Apple.
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Basic Keyboarding — Catherine Gibson & Tod Carter
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The Computer Book: An Introduction to Computers and Computing — Robin Bradbeer, Peter de Bono & Peter Laurie
The book which has taken Britain by storm . . . written for the lay person in plain English to explain what computers can do, how and why they were developed, and how they work. Looks at problem solving, provides an introduction to programming, explores how the micro can be used as tool in many areas, and looks into crystal ball about the direction and limitations of this technological revolution.
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Bright and breezy introduction to what you and your Apple turtle can do together . . . talking to the turtle, controlling the screen, wrapping, cursor control, humming, repeats, rotating, spiralling hums, turtle writing, colour.
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Basic Commodore 64 BASIC — James S. Coan
An easy-to-read guide to computer operation and BASIC programming. Simple, direct approach involves mastering short programs, then adding a new command and watching as the program is created and illustrated. You then move on to another capability. Programs are divided into manageable segments, and special features and advanced programming techniques are explained.
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The Art of Computer Programming — Donald William Drury
Covers basics of computer languages and introduces basic terms and ideas, then outlines the sequence of program development and discusses alternatives in program design. Programs are then taken in three languages — BASIC, TI 59 coding and Z80 assembler — to illustrate many of the concepts. Testing, debugging and documentation are also discussed, and a comparison is made of six versions of BASIC.
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The Tool Kit Series: VIC-20 Ed. — Ted Buchholz & Dave Dusthimer
Bright, snappy collection of five to 15-minute subroutines combining colour, sound and graphics to form a variety of educational programs and computer games. Do-it-yourself approach of learning to program by doing it.
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FORTRAN 77: A Top-down Approach — Nonna Kliss Lehmkhul
Guide to FORTRAN with emphasis on good programming style. Assumes elementary algebra knowledge and written at student level. Deals with main topics, and gives quick access to the computer before getting involved with rules of input/output format.
Collier Macmillan — Our price $43.65. Save $2.30 and earn 4 bonus points.

Getting Acquainted With Your VIC-20 — Tim Hartnell
Contains more than 60 games arranged to lead you, step by step, through most of the VIC's commands and statements. Each program is accompanied by an explanation and hints on how to get the best from it.
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Pascal at Work and Play — Richard S. Forsyth
An introduction to programming in Pascal, starting at an elementary level and working up to problems of realistic complexity. Approach is based on two principles – that computing is no longer a specialist subject; and that the second-best way to learn programming is to read non-trivial programs (the best is to write plenty of them).
Chapman & Hall — Our price (hardback) $57.70. Save $3.05 and earn 5 bonus points. Our price (paperback) $24.20. Save $1.30 and earn 2 bonus points.

Instant Spectrum Programming: How to Program the Spectrum in just 60 minutes — Tim Hartnell
A true bargain from one of the master computer writers . . . a C-60 instructional cassette backed by the complete text of the tape and 19 demonstration programs. Plus a further 30 games, utility and graphics programs.
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Problem Solving With FORTRAN 77 — Larry Nyhoff & Sanford Leestma
Provides a complete and modern presentation of FORTRAN, but is intended as more than just a programming manual. Adopts view that the main reason for using a computer is as a problem-solving tool. Deals with problem analysis and algorhythm development, transformation of algorhythm into a program, and program execution and validation. Brief sketch of computer history and description of some of main features of a computer system.
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Shake Hands With the Apple II Plus — P. Kelly-Hartkey & J. McKneil
Individualised program for learning how to operate the Apple II Plus. All instructions relate specifically to the II Plus, although some will also apply to other Apple micros. Straightforward style assumes no knowledge of computers or jargon. Starts with simple programs and programming and progresses to graphics and word processing.
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Second time round

Revised for Apple II Plus and Apple IIe



Applesoft Basic: A Teach-Yourself Introduction — B. M. Peake
Second edition revised to cover the Apple II Plus and IIe. A manual for New Zealanders to learn BASIC with the Apple, instead of picking information from two or three sources. Includes model answers. Enquiries for class sets welcome.
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BBC

Assembly Language Programming on the BBC Micro — John Ferguson & Tony Shaw

Gentle introduction to writing in assembly language and speeding up your program execution. New topics are tackled progressively in accordance with difficulty. Specially written for those with some knowledge of BASIC but starting from scratch on assembly language. Many practical examples and illustrations.

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BBC Micro Graphics and Sound — Steve Money

Practical guide to the BBC's graphics and sound facilities, detailing techniques to make the most of the machine's capabilities. Learn how to produce graphs and charts, draw pictures and use colour. Explains animation, perspective, the world of 3D graphics and the operation of the sound generator. Many short, easily handles illustrative listings, plus complete listings to try yourself.

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The BBC Microcomputer for Beginners — Seamus Dunn & Valerie Morgan

Complete introduction to the machine and programming in BASIC. No computer experience or mathematical skill needed. Each step illustrated with sample programs and screen responses. Detailed description of machine's special features.

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Discovering BBC Micro Machine Code: How to get more speed and power — A. P. Stephenson

Unlocks machine code which holds the key to the BBC's powers. Tells how to generate fast-moving graphics, make effective use of peripherals and ancillary equipment, save memory. Short programs and routines show the way.

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The BBC Micro Book: BASIC, Sound & Graphics — Jim McGregor & Alan Watt

Starts by describing BBC BASIC clearly and simply, then covers graphics animation and sound facilities. Designed to have you inventing and playing games, writing and listening to music, producing and watching animated graphics.

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Assembly Language Programming for the BBC Microcomputer — Ian Birnbaum

A guide on how to get the most from your BBC. Covers addition and subtraction, decision making and loop structure in assembly language, indexed addressing, multiplication and division, the stack, subroutines and interrupts. Offers some utility programs and provides answers to exercises.

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Structured Programming With BBC BASIC — Roy Atherton

Some ideas on exploiting the advanced graphics and control structures of the BBC version of BASICS. Uses graphics as a major theme for its own sake and as an interesting, visually appealing vehicle for learning the principles of problem analysis and programming. Recognises increasing importance of logic and programming. Practical approach with more than 100 worked examples or solved problems. Structure diagrams and line drawings illustrate discussion.

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Language/programming

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Up-to-date treatment covering the three major methods of computer graphics production. Backgrounds the subject and principles of production, then works through block, pixel and line graphics, colour, movement and three-dimensional drawing. Appendix summarises graphics facilities of various micros. Readily understandable by non-mathematical user and is machine dependent.

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Introduction to FORTH — Ken Knecht

Complete information of the MMSFORTH version of the language, describing the basic syntax. No previous FORTH knowledge needed, although some exposure to Microsoft Level II BASIC helpful. Many program examples and direct comparisons between MMSFORTH and Level II BASIC. Designed specifically for MMSFORTH version of Radio Shack TRS-80 models I and III but most examples can be adapted to other microcomputers using different versions of FORTH.

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Microsoft COBOL — Ken Seidel

An aid to understanding and using COBOL under the CP/M and MS-DOS operating systems. Intended to help you bypass the complicated writings of manuals, it describes COBOL from creation to sophistication, and presents applications pragmatically. Helps develop COBOL programming skills and a handy teaching aid. Almost every chapter has a complete COBOL program.

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FORTH Fundamentals: Volume 1 — C. Kevin McCabe

Devoted to explaining FORTH, with a detailed examination of the language and its internal operations. Introduces fig-FORTH and FORTH-79 with full, non-technical descriptions of words and programming methods. Annotated listings of all fig-FORTH language model definitions. Numerous examples can be combined into more complex operations.

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Your First Basic Program — Rodnay Zaks

The author of more than 15 best-selling computer books teaches the basics of BASIC. It doesn't matter whether you're eight or 88, if you want to learn how to program a computer, this book is aimed at you. No computer experience is needed. Written in Zaks' entertaining style and attractively produced with lighthearted but telling graphics.

Sybex — **Our price $20.85 Save $1.10 and earn 2 bonus points.**

Microsoft Basic (2nd edition) — Ken Knecht

Shows how easy it is to learn to program. A comprehensive tutorial on programming using Microsoft versions 5.0 with the TRS80/System 80 and other generalised CP/M based systems as examples. This edition has a new chapter on the Microsoft BASIC compiler.

dilithium Press — **Our price $33.70. Save $1.80 and earn 3 bonus points.**

Program Your Microcomputer in BASIC — Peter Gosling

No previous knowledge of computing is assumed. The author says this book is designed to cut in just where the manuals have allowed you to get your new micro up and running. Instructions or groups of instructions are dealt with in activities, giving a complete course in the elements of BASIC.

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Apple

Pascal Programming for the Apple — T.G. Lewis

Step-by-step guide and examples for both the hobbyist and the professional. Covers fundamentals of Pascal and demonstrates techniques for programming, graphics modules in turtlegraphics, musical tone generators and structure operations. Also many ready-to-run programs for home mortgage repayments, stock market charting and cash flow analysis.

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Hardware Interfacing With the Apple II-Plus — John E. Uffenbeck

Shows how to program your Apple to turn on a room light, display the exponential charging curve of voltage on a capacitor or the temperatures versus time of day. Thirteen experiments help explain digital technology and integrated circuits. All programs fully documented and answers provided to complex programs.

Prentice-Hall — **Our price $30.10. Save $1.30 and earn 3 bonus points.**

Applesoft for the IIe — Brian D. & George H. Blackwood

Written in Applesoft language for the IIe, it presents instructions in a lesson-type format. Rules for programming are given progressively, and programming techniques developed to advanced levels. Gives details on writing and running programs in an 80-column mode, and presents an 80-column formatter program.

Sams — **Our price $39.80. Save $2.10 and earn 3 bonus points.**

Your First Apple II Program — Rodnay Zaks

Another from an author who knows how to entertain while he explains. Superbly illustrated with snappy diagrams, this book provides the basics of Apple II programming, whether you've got a II-plus or a IIe. A fun and easy introduction to programming.

Sybex — **Our price $20.85. Save $1.10 and earn 2 bonus points.**

Apple II: Basic Programs in Minutes — Stanley R. Trost

Collection of versatile, ready-to-enter programs for more than 65 home and business tasks on the Apple II, II-plus or IIe. Programs for home finances, business calculations, real estate, data analysis, record keeping and education. No knowledge of BASIC programming needed to use programs which can be entered and ready to run in less than 10 minutes.

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Programming the Apple II in BASIC — Paul Tebbe

Programs and exercises work on Apple IIe, II and II-plus without modifications. Clear progression through the programming skills with each step reinforced by exercises. After an introductory section, it covers string variables, decision making, editing, data management, bunching variables, extending arrays developing data files, using random access files, graphing, "how to do it" routines and subroutines and special programs.

Prentice-Hall — **Our price $36.25. Save $1.90 and earn 3 bonus points.**

TRS-80

Clean Slate Word Processing for the TRS-80 — Henry Melton

For the user — full explanation of commands, examples, hints and shortcuts; manual of functions and applications. For the programmer — information from original design to finished commented source code, concepts, suggestions and necessary facts to implement a custom version of Clean Slate.

Sams — **Our price $32.40. Save $1.70 and earn 3 bonus points.**

TRS-80/Sharp Pocket Computer Programs — Howard Berenbon

Useful programs for education, business, investment, home, science, mathematics, game and utility uses. Sixty-two programs in an easy-to-read format.

Sams — **Our price $31.85. Save $1.65 and earn 3 bonus points.**

119 Practical Programs for the TRS-80 Pocket Computer — John Craig

Collection of software created for the pocket model. Programs range from statistics, numerical analysis and finance to electronics and engineering. Author is a professional programmer.

TAB — **Our price $18.95. Save $1.00 and earn 1 bonus point.**

TRS-80 Interfacing: Book 1 — Jonathon A. Titus, Christopher A. Titus, David G. Larsen.

If you want to apply your TRS-80 to more than just standard peripherals, you need to know the internally generated signals and how each can be used under BASIC language program control. A book for the reader with a good understanding of commands in level II BASIC, and midway between the beginner and the advanced programmer/hardware designer.

Sams — **Our price $19.80. Save $1.05 and earn 1 bonus point**

Sinclair

Using & Programming the ZX81/TS1000 Including Ready-to-Run Programs — Albert N. Sickler

Offers an understanding of how the machine works, how to program in BASIC and information on extension capabilities. Also includes introduction to machine-level programming and a collection of ready-to-run programs, ranging from games to mathematical programs. Covers essential hardware and software concepts and special characteristics of the ZX81 or TS1000, including the variations.

TAB — **Our price $18.00. Save 95 cents and earn 1 bonus point.**

Timex/Sinclair 2068 Beginner/Intermediate Guide — Fred Blechman

Written specifically for the Timex 2068 personal colour computer, the book takes a learn-by-doing approach. Shows beginners how to get the computer up and running, demonstrates basics of BASIC programming, and uses practical programs to acquaint you with keyboard and commands. For intermediates, there are programs for home and hobby use demonstrating the machine's functions and capabilities, and you find out how to add the frills — colour, music and graphics — for added impact and attractiveness.

Sams — **Our price $19.85. Save $1.05 and earn 1 bonus point.**

A Kid's Manual for Programming the Sinclair/Timex Computers — Ed Hoornaert

A programming manual in straightforward language, supported by diagrams and appealing illustrations. Fundamentals of computer operation are broken into simple and entertaining segments of "lessons". Gradual introduction to BASIC commands and how they work.

TAB — **Our price $16.10. Save 85 cents and earn 1 bonus point.**

Programming Arcade Games for your Spectrum — Adrian Jones

Looks at what makes an arcade game and studies techniques used in their development and production. In-depth look at more sophisticated methods of programming, including brief look at using machine code to speed up and improve programs. Followed by complete breakdown of 10 arcade games and how they can be simulated on the Spectrum.

Foulsham — **Our price $15.45. Save 80 cents and earn 1 bonus point.**

Z80 Assembly Language Programming — L.A. Leventhal

Comprehensive coverage of the Z80 microprocessor assembly language. Examples illustrate software development concepts and actual assembly language usage. Assemblers and assembler directives are explained. Includes more than 80 sample programming problems. All problems solutions in source code and object code. Each Z80 instruction fully explained.

Osborne/McGray-Hill — **Our price $33.95. Save $1.78 and earn 3 bonus points.**

Drive Your Spectrum — Anthony Camacho

Have fun while getting to know your machine. That's the philosophy behind this book which concentrates on showing results for efforts. A section on basic essentials is followed by colour, graphics and sound. Spiced with plenty of diagrams, four-colour pictures, and a broad selection of programs to teach you as you use them.

Foulsham — **Our price $15.70. Save 80 cents and earn 1 bonus point.**

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*                    IMPLIED, IS AVAILABLE.                          *
*                                                                    *
*     REMEMBER OUR GUARANTEE - YOU BOUGHT IT, YOU OWN IT!"           *
*                                                                    *
**********************************************************************
```

Krackowicz — daddy of the pirates

By John MacGibbon

Last month we looked at the activities of computer phreakers in America, as chronicled on electronic bulletin boards.

A number of files from these "pirate" boards, downloaded on to floppy disk, have fascinated New Zealand Apple users in recent months. As well as giving an insight into illegal *Wargames* style activity, the files contain an enormous amount of information on software protection and cracking techniques.

A gentleman (or is it a lady?) named Krackowicz is the articulate and often amusing host of the cracking section of a New York bulletin board called the Jolly Roger.

Krackowicz has lofty "ideals", and with a little inspiration from America's founding fathers he declares that his activity is dedicated to the proposition that "all men are equally entitled to the knowledge and enjoyment of computers and software." (!!!)

His self-appointed task is to "... provide information and stimulate dialogue among the international brotherhood of software crackists."

His disclaimer warns:

"The management of this system, as well as your host, certainly do not advocate or advise any illegal acts, and all information presented here is intended to educate, inform, or amuse those who read it."

As any self-respecting Blackbeard would snort, "Yo ho ho ..."

Undoubtedly a good deal of plain software theft is being encouraged by these pirate boards, but Krackowicz and his ilk appear equally motivated by the intellectual challenge of it all.

Indeed, the pirates appear to feel kinship with devisers of software protection schemes. Talking to beginner crackists on the subject of "obfuscation, or intentional lack of clarity," Krackowicz gives warning that the major software companies, "... know we are out here waiting for their latest output. They often try to misdirect us or find innovative ways of hiding sensitive portions of the program with a variety of techniques."

Trainee pirates who find this disconcerting are assured the defeating of such attempts to obscure the trail will bring nothing but joy. But the task will not be easy: "This is a discipline: perhaps not so demanding as championship karate or the Unification Church, but it requires knowledge, patience and attention to detail."

Pastime for the experienced

Krackowicz says his tips are aimed at the beginning to intermediate software crackers. That doesn't mean beginning computer users. A good knowledge of assembly language is assumed, and if you haven't passed BASIC yet, forget it.

The Jolly Roger files amount to a long (nearly 25,000 words) series of tutorials describing a variety of protection techniques, and teaching

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```
**************************************

MSG LEFT BY DR NIBBLEMASTER
DATE POSTED: WED JULY 28  6:51:47 PM
TO ALL YE PIRATES: HOW TO CRACK [PROGRAM X]

BOOT 3.3
RESET INTO MONITOR
C091 C091 D000<9000.BFFFM
16K CARD IN SLT 1
FFFC:59 FF N C091
BOOT GAME
RESET INTO MONITOR
C090 9D00<D000.F2FFMN C091
7FD:4C 0 B
9DBFG
16CA:4C 00 48
A964:FF
BSAVE [PROGRAM X], A$7FD,L$8FF0F

NOW YOU HAVE A CRACKED [PROGRAM X]!

**************************************
```

the process of memory snooping (". . . the unglamorous activity that occupies most of the time of the dedicated Krack!st"). Instructions are provided for a hardware aid available through the bulletin board: the "Romswitch with Krakom NMI".

Popular software given the Krackowicz treatment includes Cyclod, Type Attack, Super Puckman, and the Arcade Machine.

Krackowicz is quick to compliment new and clever protection schemes, but he scorns software houses that make it too easy:

"After the excellent and challenging protection Sirius put on the Bandits/Cyclod group, it was discouraging to see the putrid litdos command change on Escape from Rungistan."

Other bulletin board files doing the rounds lately have come from a board called Pirates Harbour. Unlike the Jolly Roger files, this material consists mainly of shorter messages which detail general cracking techniques plus specific solutions for a large number of programs.

Few contributors leave their real name, preferring pseudonyms such as Mr Xerox, Dr Nibblemaster, Red Rebel, Long John Silver, Disk Zapper, and the Eig Toe.

Sample contribution headings:

- How I cracked Superscribe II Ver 3.2 over Christmas weekend (Cloneman).
- Cracking Softporn, VisiCalc and Visiterm (Richard Brandow).
- Using the ramcard as a major cracking tool (Axe Man).
- Some places to look for good ideas and help on cracking.

Messages can be long and complex, but most are short and cryptic.

This is not for amateurs. Trying to keep up with the experts evidently caused a deal of frustration for one Earle Bestick, who left the following message on Pirates Harbour:

"Try'd & try'd & try'd to crack a disk, but only managed to bend one! 'til after many tryes (sic), I succeeded. My magic formula follows, and will work on any disk of any manufacturer:

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Pascal, FORTH and C

By Gordon Findlay

BASIC is, as I said last month, the most common, and therefore the most important, programming language in the micro world. Other languages though are used, and have their own special features.

Pascal

Pascal was designed by Nicklaus Wirth to be a language which was relatively easy to learn, but which was also very powerful, and included lots of the programming and data structuring features which were being invented in the early 1970s. It is based on the earlier ALGOL language. Pascal is not an acronym, but the name of an important mathematician of the seventeenth century.

Program structure is to do with the sort of constructions which you can write. Pascal has many statements for coding loops for example, so that the programmer can choose the most appropriate. Pascal programs are written in pieces, called PROCEDUREs, which are like small programs, which are called up in order. This makes program testing and debugging simpler, as each procedure can be tested independently.

Pascal handles many different types of data. Numbers, characters, and strings, or course, but also pointers, sets, arrays, and records. A record is a collection of several related items, such as a name, address, telephone number, account number, amount owing and credit rating in an accounting program. There is also a facility in Pascal for incorporating special data types for the convenience of the programmer.

Pascal programs don't use line numbers, as BASIC does, so an EDITOR must be used to build the program. Pascal is also (usually) a compiled language, so developing a program becomes a cycle: edit – compile – test – edit (to fix problems) – compile – test, etc. This can become tedious if it means loading the editor, then loading the program into it; changing the program; saving the result to disk or tape; loading the compiler; compiling the program; saving the result (the OBJECT code); testing it, only to have it crash straight-away, requiring you to go back to the editor!

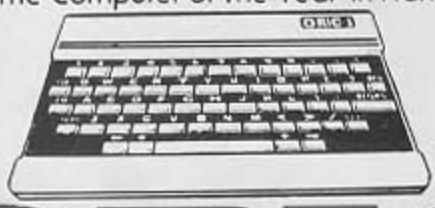
If each load or save causes a noticeable delay, this can be slow compared with the interactive way in which BASIC is written. On the other hand, both the nature of the Pascal language, and the need to go through the edit – compile – test cycle, forces the programmer to plan ahead, and write carefully. The result might well be that the Pascal program is written faster over all. Less debugging cught to be required in a Pascal program than a BASIC one.

Pascal is available almost exclusively for disk systems, because of the need to load large amount of code before starting. The TRS-80, Apple, IBM, BBC, and Commodore systems support Pascal, among others, and there are a number of versions of Pascal for CP/M systems. The BBC has a version of Pascal in a plug-in ROM.

FORTH

FORTH is a strange language, designed to be extended by the user as he programs! In fact programming in FORTH means extending the language until it includes a command to accomplish whatever the program is required to do. FORTH provides a kitset of elementary operations, which can be combined into different

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ones, which can be combined further, until operators are built which do whatever is required.

FORTH programs are hard to follow, and hard to read. Because of this, FORTH programmers can write code which is short, but does a lot, and which takes a lot of work to understand. Needless to say, that isn't good programming practice!

FORTH systems usually include an assembler, to allow incorporation of machine code directly into your programs. FORTH is a highly interactive language, lending itself to immediate testing and modification of each program step as it is written. The addition of an assembler gives (almost) an interactive machine-code facility, which is sometimes very useful.

There are a few minuses with FORTH. It is hard to read, and there are too many standard versions! There are so many standards in fact that it is crazy to talk of "Standard FORTH", even though there are published standards documents. FORTH uses a "virtual storage" scheme, in which disk or tape is regarded as a (slow) extension of the computer's main memory. FORTH is available for many systems, including the Apple, TRS-80, ZX-81 and Spectrum, the BBC, and numerous others no doubt. One micro, the Jupiter ACE, appeared with FORTH in ROM instead of BASIC; unfortunately at latest report the company was at the point of collapse.

C

Well at least the name is easy to spell! C was created in 1972, at Bell Laboratories to meet the need for a language which would improve the efficiency of systems programming. Systems programs are things like operating systems, assemblers, compilers, and so on. The idea of using a high-level language to write these was considered outrageous – after all, how could they possibly be fast enough? However, it happened that the language was carefully designed in such a way that the compiler (translating program) could produce code which was very fast. From this beginning, C has gradually become more and more commonly used, for applications programs as well as systems work.

C is a.blend of high and low level language constructs. There are many features in common with Pascal, and yet many in common with machine code. The programmer has the direct access to the hardware which is needed for writing systems programs and utilities, with the sort

of structured language which is required to write good applications programs. C is a compromise: it has the high-level data types, such as records, and also the low-level types, even down to direct bit manipulation.

Thus far C isn't common on home micros. There is a version for some TRS-80 systems, and various versions for CP/M machines.

Choosing a language

If you find yourself in the happy position of being offered a choice of programming languages, what should you do? The languages each have their own strengths and weaknesses, but what is a strength and what a weakness is a fairly subjective opinion. I am lucky in that I can choose between BASIC, Pascal, FORTH, and machine code for my system. For a "quick and dirty" program I still use BASIC (shame!). For any program which requires a lot of data to be stored on disk, or a long program, I tend to use Pascal. FORTH, I reserve for writing low-level programs, which might otherwise be written in machine code. But these are my preferences, and I guess nobody else shares them!

In order to give you a taste of the various languages, I have written a very small program in BASIC, Pascal, FORTH and C. All the program does is to count to 100 in tens, so obviously they don't cover very many features!

```
BASIC version:
    10 FOR I=1 TO 10
    20 PRINT I*10
    30 NEXT
    40 END
Pascal version:
    PROGRAM EXAMPLE;
    VAR I: INTEGER;
    BEGIN
        I:=1;
        WHILE I <= 10 DO
        BEGIN
            WRITELN(I*10);
            I:=I+1
        END
    END.
C version:
    Main()
    {
        Int count;
        Count = 1;
        While (count <= 10) {
            Printf(count*10);
            Count++;
                                }
FORTH version:
    :TASK 10 0 DO I 10 * . LOOP;
```

(Please note that two reverse brace signs at the end of the C listing are not reproduced because of difficulties with the Findlay printer. — Editor.)

The examples show that Pascal and C are lots more wordy than BASIC and FORTH. They cannot show that often this is a very great advantage, and that the constructions used in the examples are much more powerful than their very simple uses here.

There are hundreds of programming languages. They are all, in some senses, similar; and in other senses widely different. The days are gone in which a programmer who knew just one (usually COBOL or BASIC) could be satisfied. My prediction is that anybody thinking of entering the field professionally will need to become fluent in several in the course of his or her career.

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COMPUTER REVIEWS

Disks 2: Physical aspects

By Gerrit Bahlman

Presuming that you have avoided all the major pitfalls of disk ownership such as destruction of the recording surface by exposure to the local idiot, you may be wondering how the system works.

In the March Issue of *Bits & Bytes* I explained the formatting of disks. Imaginary circles (tracks) and radii (track dividers or sectors) were constructed on the disk's surface which are then used to locate and store information on the disk. A directory or volume table of contents *(VTOC)* is constructed at a particular point on the disk which the computer first accesses to find out where to go next.

In this article we will have a closer look at the function of the disk drive itself and learn about its various tasks and how it is controlled by the computer.

The mechanism of the disk drive is relatively simple. There are two electric motors that cause two different movements. The big motor causes the disk to spin at a constant speed. The disk is clamped or trapped in some way so that it sits on the shaft of the motor. The motor is calibrated to spin at a precise speed. The second, smaller motor moves the read/write head back and forwards along an arm which lies on the radius of the disk.

The movements are jerky and always end up at precise points of the radius. Those points are over the tracks on the disk. The amount of power delivered to this motor determines which track is being covered.

These comments relate to floppy disks only, but the principle is the same for larger, hard-disk systems. In these you may find a read/write head for each track so that the second motor is not needed. You may also find several hard disks being spun by the same motor. For all that, the mechanical problem of spinning the disk and finding the correct track is the same.

The precision of the read/write head and the arm movement motor will determine how many tracks can be placed on a disk.

Terms such as "double density" refer to the number of tracks on a disk compared to the "standard" (whatever that may be). "Double sided" means that there are two read/write heads, one on each side of the disk so that you have access to twice as much disk space on the same disk.

The read/write head is technically similar to the read and write heads on a tape recorder. On disk drives they are smaller and more compact. When writing information on to a disk they "spray" a magnetic field on to the disk surface. The surface retains the pattern of magnetism which can later be read as bits and bytes.

The distance from the disk surface and the subtlety of the write head is of critical importance to the inter-track distance. If tracks are too close then it would be possible to get spray from one track interfering with information stored on another track. In large mainframe disk systems the heads are so close to the disk surface that a jet of air is forced out of the end of the read/write head to keep it off the disk. To such systems even

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small particles of dust or human hairs would represent boulders to the minute read/write heads. Hence the extreme care in major installations.

The same level of precaution is not necessary with floppy, mini-floppy, or micro-floppy disks. However, wear and tear will not be improved in dirty or dusty surroundings.

The benefit of such microscopic read/write heads is the number of extra tracks that can be used. Clearly, the smaller the read/write head the less spray there will be to worry about.

When the computer wants to access the disk drive and obtain information from it, it needs to know two things; which track is it on and at which sector does it start. Once that is known the mechanical job of placing the read/write head in the correct spot can be organised.

Physically, the disk drive must have a starting point on the disk. It is all very well to label the tracks, but the disk drive must be able physically to identify where the first track starts. The position of the read/write head gives this information.

What about the first sector? How does the disk drive know where it starts? The solution is rather straight forward. In every disk there is a marker that physically aligns the disk in the drive. On floppy disks this is done with a small hole near the centre of the disk.

Once the disk drive knows where the start of the track and sectors on a disk are, the two pieces of directory information (which track, which sector) can be used. The actual sector can be found just by counting!

In the next article the role of disk operating systems will be discussed and explored.

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Games as a tool in the classroom

By D. R. Greenfield

Professor Tom Stonier reminds us that secondary schools are largely curricula based, and that the educational programs in primary schools are more child-centred, emphasising the social development of the child without the pressure of academic achievement.

He points out that . . . The use of computers in secondary schools has followed exactly the same pattern utilising Computer Aided Instruction (CAI) (drill and practice software) and Computer Aided Learning (CAL) (tutorials) and has usually begun in the mathematics department and then spread throughout all curricula areas of the school.

The direction for the use of microcomputers in secondary schools in New Zealand has come rather belatedly from the present Government in the form of recommendations to the Minister of Education by a Consultative Committee formed around 1980.

Question: What direction has been given to the Primary sector which is child-centred?

Answer: None at all (so far).

It is not relevant merely to implement a simpler version of the secondary schools curricula-based programs, nor is it applicable, nor even desirable. What is needed has to be child-centred.

I will discuss just one of the many options open to primary schools that reinforces the Piagetian theory of "Learning through Play".

I consider the use of games to be a valid alternative educational tool. I believe that using carefully selected games in the classroom can create a highly desirable learning environment that has been virtually untapped.

Paul Vincent (visiting teacher fellow) on the subject of games . . . There is an abundance of computer games from which teachers can choose. The main selection criterion is the educational value of the game in relation to time required to play it. A downturn in violent ideas is helping to make games less objectionable than before.

We are all made painfully aware of how deeply our children can become engrossed in television, arcade games and computer games, and yet the same magnetism that holds them is not being replicated in the classroom with traditional instruction. I think that the two can, to some measure, be combined.

Computer games can be broken down into two broad areas: entertainment and educational. They also fall into various sub-categories of which only those with educational value will be considered.

The proliferation of computer games on the market may fall into one or more of the following categories.

Arcade games: Mere entertainment. These have little or no educational value and consist only of a never-ending variety of ways to move about and destroy alien objects.

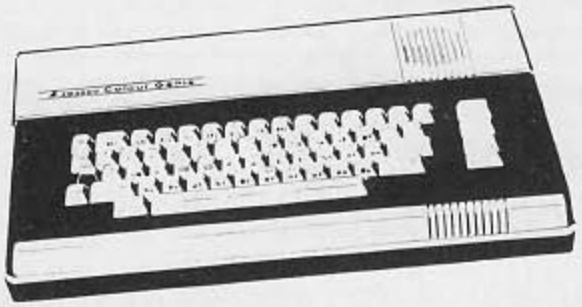
Maze games: Often these include an element of realism through the use of 3-dimensional graphics. The maze may be multi-layered to increase the level of difficulty and

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further tax the memory. Sometimes an overlap of a maze type game and an adventure game occurs. Some children get very involved with these.

Board games: These encourage mental exercises, memory recall, patience and strategy with traditional games such as chess, draughts, backgammon and some newer variations of these.

Simulation: Often a model for a real-time situation that may be too dangerous, too expensive, too time-consuming or too difficult to do otherwise. Simulations and models are becoming commonplace in job training, e.g. airline pilots.

Educational games: Some of the more recent CAI packages are subject related and although they are often purely a drill and practice program, they may include many of the gaming features found in other types of games as a method of reinforcing 'correct' responses. The quality of this type of program is increasing as teachers are becoming more particular and discerning in their choice for classroom use.

Adventure games: I consider these generally to be of the greatest value of all. Many are written as interactive fiction where strategy, logic, and problem-solving skills play an important part of the game. Participants also benefit from increasing their familiarity with the keyboard. They increase their reading skills within the language boundaries of the game, improve memory recall, and learn to cope with frustration.

Without encouraging an invasion of aliens or lots of shoot-ups, many packaged games do serve an educational purpose, are non-violent, and are a lot of fun.

Encourage the development of a strategy

Processes of reasoning, logical thinking, and problem solving have always been among educational objectives. Perhaps the particular value of the best computer games is that they encourage the development of a strategy.

By interacting with the computer competitively, by discovering what effect an action or play has, and by working out a systematic strategic plan based on these observations, a child is learning to apply processes that go to the heart of reasoning, thinking and solving problems.

Many pupils will want to try writing and playing their own game programs, either by copying listings from magazines and books, or by learning programming in a language like BASIC themselves. Having made a move into the programming side of games gives a child a tremendous sense of achievement and control over the computer that is hard to match in any other way.

In conclusion, I believe that carefully selected computer games can be a valuable alternative educational tool that could use computers in the classroom to advantage.

However, I see this only as a means to an end. Through the use of games, pupils readily learn the syntax of languages, develop problem-solving skills, and reinforce educational concepts that will stand them in good stead for information processing, which by the year 1990, may very well involve 90 per cent of the world's labour force in some form or other.

The drill-and-practice approach of some schools is a very expensive way to do things that schools already do. There is something better to be done in New Zealand's primary and secondary schools that involves the use of the computer as a tool . . . a word processor for example, or a data-base manager, a music editor, or a graphics editor . . . a tool that helps pupils accomplish tasks defined by the pupils, not by the computer.

All this could be achieved by using skills acquired through the playing of worth-while games.

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Quest for an intelligent machine

By John Durham

When does a computer cease to be just a machine, and become something more than a machine? Most people would take a guess, and say, "When it can do this or that," while some would say emphatically "never". I am often aware that when a new machine emerges which can do something much better than ever before, I look at it and subconsciously raise my standards so that whatever the new innovation, it somehow always falls just short of being that special something I was hoping for. It is a personal conflict of this type which prevents many of us computer nuts from taking the responsibility for this kind of development on our own shoulders and actually starting work.

In an article on computer intelligence in the October, 1983, issue of *Bits & Bytes*, I attempted to lay out a machine in general terms, which exhibits a real and tangible potential for intelligent behaviour. The exchange of ideas which followed allowed me to get a better idea of what the parts of this machine would be like, and although many vital pieces of the puzzle have still to be found, enough exists so that a tentative start can be made.

Some starts indeed have already been made. In the November issue of *Electronics Today International* was an article on TOPO, the robot. TOPO is being made commercially by a team of engineers, scientists and computer programmers under the leadership of the founder of Atar, Nolan Bushnell. TOPO and BOB, a more advanced big brother, are personal robots which can learn the lay-out of your home, know each room by name, and be trained to fetch your slippers or serve drinks at parties. BOB can even analyse objects and find his way around furniture and other obstacles by using ultrasonic sensors.

Someone recently asked me if I had built any robots yet (probably after having read the same article), and I very sheepishly had to say no. Is this kind of robot your idea of an intelligent machine? Probably not, although it does fit most people's concept of Buck Rogers's "Tweeky", it is really only a pre-programmed commercial and household job doer. By itself it represents an enormous effort from many talented people, but in terms of intelligent machine development it seems to contribute only a useful casing into which such a machine could be put. TOPO and BOB both fit quite well into the category of a mechanical peripheral, which could be hooked up to something much more powerful in future.

So what is this intelligent machine likely to be any way? You could just as easily ask what is a human being anyway? It is an entity which spends its time monitoring its environment, gathering useful information, working out how to best satisfy its primary needs (power, rest, mobility, awareness, survival and lastly more information), pondering upon the best way to spend its period of existence, communicating with other entities, and inevitably making some mistakes. After all, a mistake is something you make when you don't have enough information. Humans do it all the time, and no matter how all-knowing a machine could become, it would still be limited by the information it does not have.

The type of machine being described here is as far beyond TOPO and BOB as men consider themselves to be beyond the laboratory rat.

What about the practical problems of intelligent circuits? A mainframe, with all its miles of wire, hundreds of terminals and vast memory is not really an intelligent circuit, is it? Almost without exception, they share the same problem as the humble micro-computer: that of having only one or two central processors doing all the work, and having to manage all that hardware at the same time.

Bigger processors add more hardware to the machine, but also make the circuits work harder, and there seems to come a point where with the most powerful processor available, you just can't make it do any more work than its circuit limitations will allow. Multiple processors are the answer to this problem. Make small units with average power which can fit together on a form of multi-processor bus in large numbers. Give each processor an interface, which

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it can use to access outside devices, and put into each one an EPROM containing an "autonomous operating system". This means that individual units in the machine work by themselves under the direction of a master processor, and never need to be accessed by a human user at all (with the exception of general maintenance and expansion work).

Each master processor in turn is programmed to seek out and evaluate new information, and pass it between one unit and another, or to other master processors in other places. This is all fine, but it implies building a machine which will quietly tick over without producing any tangible results at all, and I would hardly be writing an article about them if this were true, so what do you do with it all when it is built?

The value of any machine lies in its peripherals, and the things those peripherals can do. It's a bit like saying, "Isn't the brain a wonderful piece of equipment." But if it didn't know it had all those peripherals, such as arms, legs, eyes, ears, mouth etc, it would just sit there in your head and tick over without producing any tangible results. It therefore seems reasonable that if the machine is to communicate with a user, it would be supplied with the standard issue keyboard and video display. Therein, however, lies the first problem in developing such a machine. Do you re-invent all the existing technology to suit the new machine, or do you build a machine to suit existing technology?

At first, you have to begin somewhere, so while the problems of multiprocessor bus interfaces are being considered, why not build a unit with the ability to plug into the main bus system of a specified micro-computer and use the existing keyboard, tape, disk and video equipment which it already has, to solve your biggest headaches and get down to the real problems at hand. Taking over the internal hardware, or just sharing it briefly with the resident processor is not all that difficult to do for a device plugged into the average micro-computer in this way, and besides, it has the reminiscent appeal of R2D2 of *Star Wars*.

VOICE CONTROL PREFERABLE

Voice-controlled operation or learning would be much more preferable to having to type in data from the keyboard, so consideration could then be given to the problems of speech synthesis and voice recognition. Speech synthesis units are becoming more common now than they were a year ago, units such as the Votrax voice synthesiser becoming widely known. These units accept phoneticised speech as text and decode it into sounds that you or I could recognise. They require an audio output and a micro-computer to supply data for decoding. The output of speech is done by breaking down text into identifiable sounds, or phonemes, and then playing the phonemes from a ROM speech pattern recording out to an amplifier.

Voice recognition is more difficult, since everyone's voice sounds a little different from everyone-else's, so it is often carried out by using the same set of phoneme patterns, and carrying out tests to find the best match from all phonemes available, and then reporting a standard phoneme back to a micro-computer. Standard units for doing this are not yet commonly available, and are usually found only on large machines in expensive industrial environments where regular contact with a keyboard or control panel is impractical or hazardous. If you are not technically inclined then skip the next paragraph.

A high speed analog-digital, and digital-analog converting circuit as shown in figure 1 is the solution I would put forward for these problems, at least until a better one comes along. For incoming data (that is when the computer is listening) the two CMOS counters are used to produce an analog voltage through the resistive bridge, which is used by the CA3140 operational amplifier to direct the counters to count up or down in order to follow the incoming signal. The count on the counters is proportional to the input voltage, and is reported back to the computer through the 74LS244 buffer

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chip. Sampling data from here, the computer can produce a record of any incoming signal and test it for validity. To reproduce the same signal, the computer outputs this data to port 80H, which turns the counters into registers, and produces identical voltages out because it uses the same resistive bridge to produce a voltage from the data. The output signal causes the output amplifier (the second CA3140) to be switched on, and a signal is produced at the output. Thus it is conceivable that one unit could handle both speech output and recognition, and pass the data back to the main system.

To operate any system where commands are to be given in the form of speech, it is necessary to have a command library stored so that the device can interpret what you say, and respond, even if only on a rudimentary level. If, as is implied by the subject under discussion here, the library of words is to be very large, then separate units must be created so that they can store, assess and actively manipulate the language required. Words might be stored either phonetically, or as a dictionary having a phonetic conversion system for plain text output. A typical exchange between human and computer with an extensive library might then consist of:

USER: Where did I leave that screwdriver?

COMPUTER: You put it in your pocket.

Having described some typical interfaces of the many possible, there comes the point where it is necessary to have all this working together, so that when the user says, "Where did I leave that screwdriver?", the computer hears, understands, and can compose and produce the reply, "You put it in your pocket."

Without mentioning how the computer goes about keeping track of the screwdriver without being told to by the user, it seems reasonable on a more fundamental level to have these signals passing easily backwards and forwards from the library CPU's to the speech CPU with greatest efficiency. Having a background in Z-80 hardware and software, my answer is therefore from this point of view. Certain machine instructions, notably of the IN A, (C) and OUT (C), A types are known to place the contents of the B and C registers of the CPU on the upper and lower halves of the address bus during port operations. This gives the option of having 64K of ports available instead of only 256 ports usually associated with an 8 bit CPU. To this end 64K of RAM can be set up as a message centre to interface between CPU's, and by allocating different areas of this to different CPU's, messages can be sent in many different ways without waiting for one message to be cleared before another can be sent (unless it is to a CPU which has not yet cleared its message area). Part of the RAM is given to the master CPU, and this always has the greatest priority to use it at any time.

NIFTY HARDWARE REQUIRED

Getting messages backwards and forwards along a bus to put them in this RAM area requires some nifty hardware, since the information travels very rapidly (at CPU speed), and any unit may try to use the bus while another one is already doing so. Designs for this are still pretty tentative, but it is fairly certain that none of the standard computer bus systems (i.e. S50, S100, IEEE etc) are quite up to this kind of thing. I am keen to exchange designs with interested readers, should anyone have some suggestions on this.

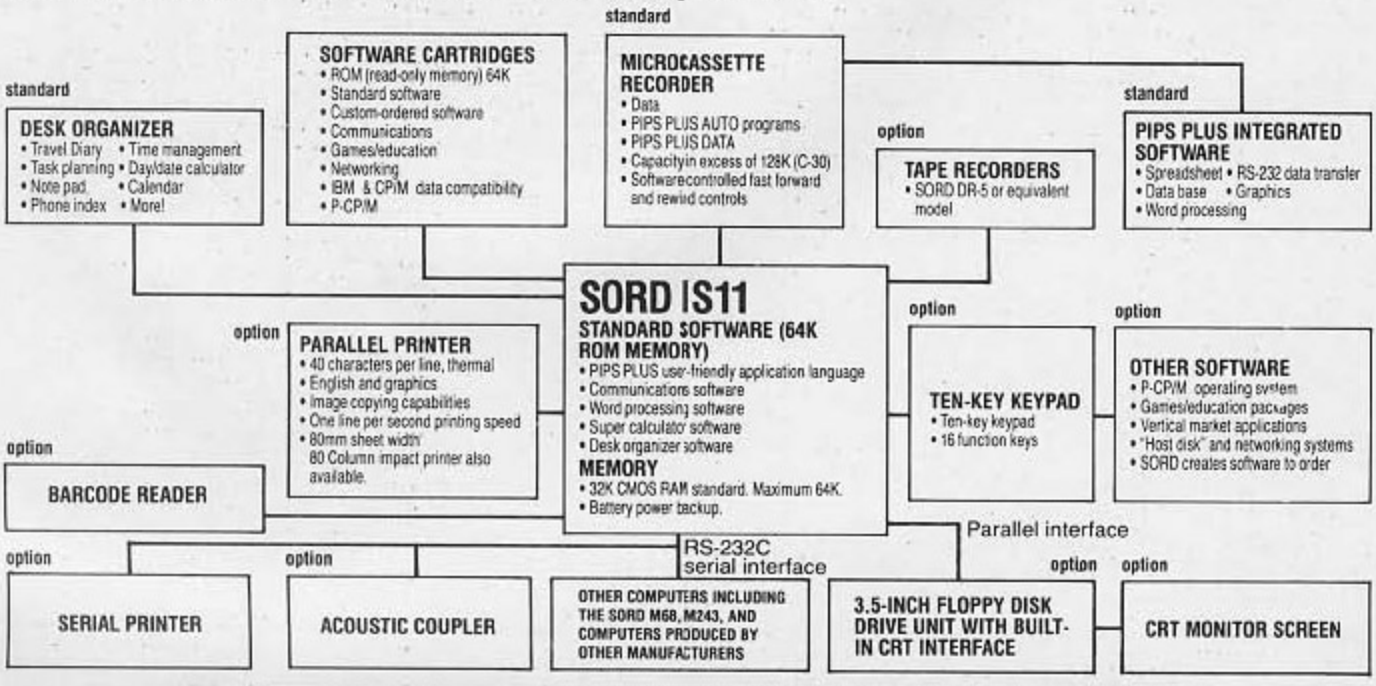
Information storage is required so that many units operating in the same machine can all store their flexible operating systems. Three main options for mass storage are open to a project of this nature: Disk, Tape loop (Corvus systems 200Mb drive), or magnetic bubble memory. They are all fairly expensive, and all very sophisticated methods of data storage. Disks are about the commonest and cheapest, but involve constantly changing disks unless you have many drives, and powering down the system requires removal of disks by the user. The tape loop system provides the greatest mass storage, but also the longest access time (up to 10

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seconds), and requires cassette removal on power down. Bubble memories of this size would be extremely expensive, but provide non-volatile storage with a fairly high speed of access (no power is required to maintain the data when the system is switched off). In any event, a separate micro-computer devoted to this job is a logical extension of the intelligent systems idea, and it would provide a buffer for storing and retrieving data at much higher speeds.

Creating and extending operating systems on EPROM is currently being taken in hand, with an EPROM programmer design which will interface to almost anything having a 24 pin EPROM socket spare and a source of READ, WRITE and IORQ (input/output request) signals.

Finally, a system of this nature is impossible without the help of highly skilled people, so if you have any interest in this type of development, and particularly if you are mechanically skilled (all the response so far has come from people with electronic skills), then I would be very interested to exchange ideas and suggestions with you. If you are interested to play a part in this type of development then write to:

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PLI defended

An article on languages in the March issue of *Bits & Bytes* mentions PL/I and manages to repeat the all-to-common fault of damning with faint praise. The catty comment about IBM that always seems to be included with references to PL/I is quite unnecessary. I wonder if all the experts who comment on PL/I really have any practical knowledge of the language.

A very good PL/I compiler is available on micros and was produced by Digital Research, no less. Some benchmarking results were published in *Byte* magazine some time ago that showed it to be the best performer of all on the test program.

Certainly, it is not a language for novices to take up. BASIC remains the best option for novices. However, for anyone serious about computing including micro computing and wishing to be professional in their programming, PL/I is without a doubt, the best language for general purpose use.

It has the mathematical routines you might need Fortran for, the file processing you might need Cobol for, the structured programming support that you might need Pascal for, and in addition gives the programmer control for storage allocation, and recursive procedures, and the ability to do list and string processing.

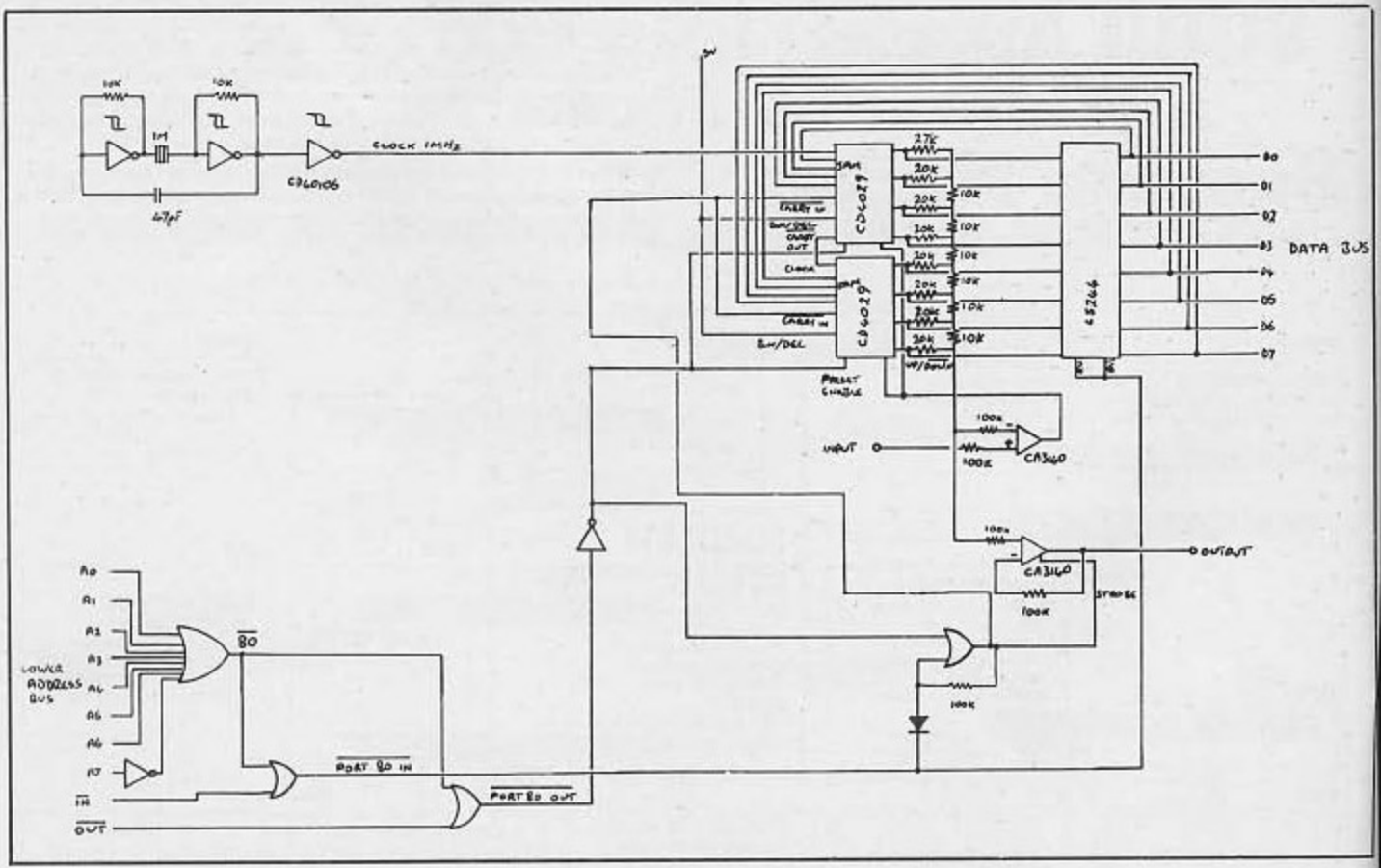
PL/I would have been more successful if it had not been bad-mouthed from the start. However, it is an excellent programmer's tool and is highly successful in a very wide spectrum of uses.

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Teach yourself typing

By N.E. Whitehead

What can be more important for the personal computer enthusiast than to be able to communicate with his pet in the most efficient possible way? Until good and cheap voice commands are possible touch-typing seems essential. This program drills you in that.

This program runs on an Osborne 1, under MBASIC-80 revision 5.21. It fits in less than 3K. Other users may need to change some things. Those are described later.

It will help to buy a book on the subject, but briefly your left and right fingers should sit as much as possible on letters ASDF and JKL, respectively, and only the finger required for the current letter should move away from there i.e. the whole hand should move as little from there as possible and return home early like a good boy after any excursions. The finger to type a letter should be the one nearest it. Index fingers do a lot extra!

The program therefore drills you first in ASDF JKL. If you use it sensibly, it then drills you progressively for the remainder of the alphabet in the order of approximate frequency of occurrence of those letters as they occur in English. This includes comma and full-stop. It does this by generating a line of pseudo words for you to copy made up only of the range of letters you select. At the end of the line it reports statistics on how fast you typed and how many errors you made. The figure for characters per second is probably more sensible to measure progress with than the figure for words per minute. Note that to achieve a relatively modest 40 words per minute you are aiming for about five characters per second which is almost as challenging as a video game!

If you really must finish your copying with a carriage return before the line ends it will still give you a progress report.

To use the program, note the display it gives you of the letters in the order you will be taught them. You select one which is the one marking the end of the range within which you wish to practise. The program assumes that letter may be a new one for you, and hence supplies many more of that letter per line than you would expect. If you specify the last letter of the entire range (Q) it will still be present in greater than normal frequency, but you will be able to practise on all the letters at once.

After you are fairly proficient with the random garbage the program produces you may wish to practise on some of the random garbage found in books or magazines. The computer cannot tell you what your error rate is, but if you specify to it that you are copying real text it will let you continue line after painful line (you must insert carriage returns and the bell warns you 7 places before the end of the screen) until you press ESCAPE, when it will present you with your statistics for that run.

Some warnings: this program is a hard task-master. Random material is quite difficult to type. However, it really will train your fingers to be independent. Also, if you type an extra space or non-printing character in your copy, the program is liable to count all your subsequent efforts on that line as errors because they are one space displaced from the truth. And please – don't end a line of copy with a lot of spaces – they won't be in the supplied random material, and will give you a gratifyingly high (but sadly false) total in words per minute.

Please also note that regularity of typing is important and that the program can help with this. It includes a statistic "% erratic" which is actually the standard deviation of the time between characters. You should see this drop as you type more regularly. However, when you start copying real text it may rise because of the disturbing effect of carriage returns.

Changes for other machines

Here follow the changes other users may need to make. Specifically: the Osborne has a screen 52 characters wide. For your use, change SCRCOL to your particular value; check function ASC (ASCII value of character) and LEN (length of string) and ELSE are in your BASIC vocabulary. Check that the ASCII equivalents of space, carriage return, bell and ESCape really are 32,13,7 and 27.

The timing will need to be individually adjusted also. To do this you must type a very slow line of typing in exactly 100 seconds! The program will report how many seconds it thinks it was – then use that figure for SC (line 8) – i.e. substitute it for the '100' given alongside.

The program teaches you only upper case at the moment and not even numbers. It teaches you 29 keys. If you want to extend this you must extend both the figure for SET, and the DATA statements accordingly.

Good hunting! (But hopefully, not much more hunting and pecking!)

Dr Neil Whitehead, a nuclear physicist formerly of Wellington, is now working with an international research agency in Monaco.

Footnote: Just before *Bits & Bytes* went to press, a note was received from Neil Whitehead in Monaco. He says that line 293 of his listing should be changed to:

293 PRINT 100*S/(SZ/CHRS), "% ERRATIC".

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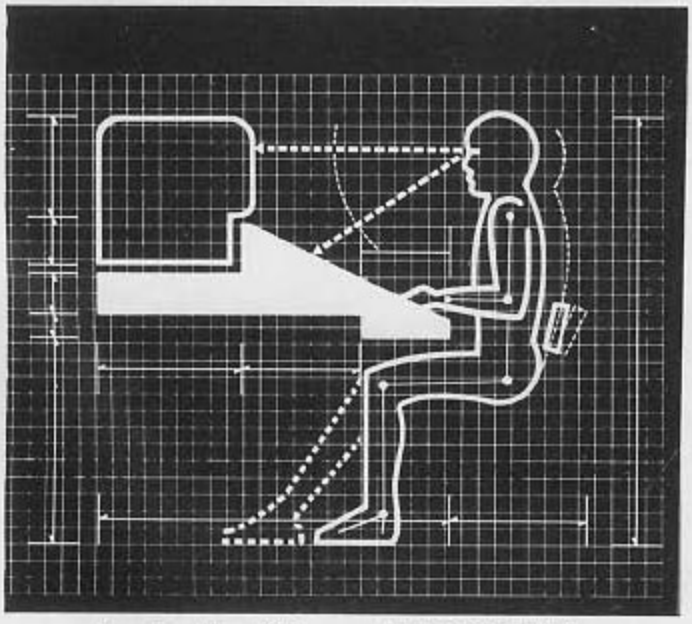
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```
1 REM  PROGRAM TO TRAIN IN TOUCH TYPING
3  SET = 29:REM NUMBER OF CHARACTERS IN PRACTICE SET
7  SCRCOL=52:REM WIDTH OF SCREEN IN CHARACTERS
8  SC=100
10 TICS=108.94#SC/100: REM NUMBER OF ADDITIONS TO TIME/SEC (EMPIRICALLY FOUND)
20 DIM A%(SCRCOL) :REM THIS STORES THE CREATED MATERIAL FOR COPYING
30 DIM AA%(SET):REM THIS STORES THE PRACTICE CHARACTERS IN ORDER
35 INPUT "PROGRAM TO SUPPLY TEXT?(Y/N):",D$
36 IF D$="N" THEN REAL =1 ELSE REAL =0
37 IF D$="N" THEN GOTO 195
40 FOR X=1 TO SET:READ AB$:
41 DATA A,S,D,F,J,K,L,";",E,T,I,O,N,C,R,H,M,U,",",".",P,B,G
42 DATA W,Y,V,X,Z,Q
46 AA%(X)=ASC(AB$)
48 NEXT X
50 PRINT:FOR X=1 TO SET:PRINT CHR$(AA%(X));:NEXT X
55 PRINT:PRINT
60 PRINT "TYPE CHARACTER "
65 INPUT "ENDING SEQUENCE FOR PRACTICE: ",AB$
70 FOR Y=1 TO SET-1
80 IF AB$<>CHR$(AA%(Y)) THEN NEXT Y
110 FOR X=1 TO SCRCOL: A%(X)=AA%(INT(RND#(Y-1))+1):NEXT X
111 REM NEXT SECTION BIASES SELECTION OF LAST CHARACTER
112 FOR X=1 TO SCRCOL
113 IF INT(RND#5)=1 THEN A%(X)=AA%(Y)
114 NEXT X
117 PRINT
120 FOR X=2 TO SCRCOL-1
135 IF A%(X-1)=32  THEN GOTO 160
140 C%=INT(RND#4)
150 IF C%=1 THEN A%(X)=32
160 NEXT X
170 FOR X=1 TO SCRCOL:PRINT CHR$(A%(X));
190 NEXT X
195 PRINT:PRINT:PRINT "WHEN READY START COPYING  "
197 TIME=0:WORDS =0:CHRS=0:ERRORS =0:COLS=0:T1=0
198 SZ=0:SZ2=0
200 D$=INKEY$: IF LEN(D$)= 0 THEN GOTO 200 ELSE GOTO 215
205 REM HERE STARTS THE TIMING
210 D$=INKEY$:IF LEN(D$)>0 THEN GOTO 222
215 TIME=TIME+1
220 IF LEN(D$)=0 THEN GOTO 210
222 Z=TIME-T1:T1=TIME:SZ=SZ+Z:SZ2=SZ2+Z#Z
225 PRINT D$;
230 CHRS=CHRS+1:COLS=COLS+1
240 IF D$=" " THEN WORDS = WORDS+1
243 IF D$=CHR$(27) AND REAL =1 THEN GOTO 280
246 IF D$=CHR$(13) THEN GOTO 272
250 IF REAL =1 THEN GOTO 265
260 IF D$<> CHR$(A%(CHRS)) THEN ERRORS= ERRORS +1
265 IF SCRCOL-COLS=7 AND REAL=1 THEN PRINT CHR$(7);
267 IF REAL =1 THEN GOTO 210
270 IF CHRS<SCRCOL THEN GOTO 210
272 WORDS=WORDS+1:COLS=0
275 PRINT
277 IF REAL =1 THEN GOTO 210
280 PRINT WORDS," WORDS"
285 PRINT TIME/TICS," SECONDS"
290 PRINT WORDS#TICS#60/TIME,"WORDS PER MINUTE"
291 CPS=CHRS#TICS/TIME:S=SQR((SZ2-SZ#SZ/CHRS)/(CHRS-1))
292 PRINT CPS,"CHARACTERS PER SECOND"
293 PRINT 100#S/(TIME/CHRS),"% ERRATIC"
294 IF REAL =1 THEN GOTO 195
295 PRINT ERRORS, " ERRORS."
300 GOTO 50
310 END
```


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Wolf Pack

In this game by Kevin Clark, of Wellington, the player commands a destroyer. An enemy submarine is displayed beneath the destroyer. By careful timing the commander can depth charge the sub, hitting the conning tower.

Instructions:

5 move left
8 move right
0 drop depth charge

Stephen Baker, the Bits & Bytes ZX81 editor, says this is a very good game, but it requires very careful timing to hit the sub. The game is over when the sub is hit, but unless the player is accurate, the game can continue for a long time. Stephen suggests the following changes:

1. Delete line 270 and substitute
   265 FOR N = 1 to 10
   270 NEXT N
   This should eliminate screen flicker.
2. Change line 920 to: PAUSE 100
   This should return to the game quickly

```
110 LET D=13
120 LET C=-1
130 LET C=C+1
140 LET SX=27
150 LET SY=INT (RND*10)+4
160 LET Y=0
170 LET X=D+4
200 CLS
210 PRINT AT 0,D;"▗▄▖"
220 PRINT "▝▀▀▀▀▀▀▀▀▀▀▀▀▀▀▀▀▀▀▀▀
▀▀▀▀▀▀▀▀▀▀▀▀▀▀▀▀▀▀▀
```

MULTIDOS easy to use

By Gordon Findlay

This month is a first for this column — a review of a major piece of software. This is MULTIDOS, a disk operating system designed to be used in place of TRSDOS. First a few words about disks and DOS's in general, as many will be ready to think about adding disk to their systems.

Most readers of the column use either a System 80 or a Model 1 TRS-80, both of which machines are, technically, obsolete. They are still well supported, however, and expansion units, providing for disk operation, are available from a number of sources in New Zealand. Adding a disk drive is not merely a matter of money, though. Software must be obtained to interface the disk to the computer, looking after such things as saving programs on the disk, keeping track of where they are, and what parts of the disk are "empty"; backing up and erasing disks, and so on. This software is a program, or more usually a group of programs, called a Disk Operating System, or DOS for short.

The original DOS was produced by Tandy, and called TRSDOS (pronounced Triss-DOS). This was a relatively simple package, because the hardware was relatively simple, and users were not terribly sophisticated. As a variety of hardware appeared, a variety of "improved" DOS's have appeared as well, offering additions to the TRSDOS commands.

Usually, an effort is made to maintain some compatibility with TRSDOS. Commands which are in TRSDOS are usually kept, or added to, rather than replaced. But the wide variety of hardware has led to a lot of incompatibilities. Disks come in double or single density, and can be double or single sided. They may have 35, 40, or 80 tracks. And the various operating systems are not usually compatible with each other. Even DOS's which have the capability to use a variety of hardware often require a lot of work to make it happen. MULTIDOS is intended to function as easily as possible with either single or double density, and single or double sided disk drives, and to be able to read and write to OTHER operating system disks as well as its own. This it does very well indeed.

The manual lists a lot of other system disks which can be read or written to, including most varieties of TRSDOS, NEWDOS/80, DOSPLUS, DoubleDos, and LDOS for the model 1 or model 3. As well, most operations with VTOS and Ultrados will be okay. This is very useful for people with a variety of disks, or who need to read or write to other people's systems.

As well as this capability, MULTIDOS is much simpler than many of the others, as far as communicating information to the system about the hardware, so is easier for the beginner to use.

I use a double-sided disk drive, which MULTIDOS treats as two separate drives, numbers 0 and 0'. NEWDOS treats both sides as being part of the same disk, and this stopped MULTIDOS from reading a NEWDOS double-sided disk properly. However, NEWDOS itself permits a transfer to single-sided media, which can be read by MULTIDOS.

Table one summarises the commands

Table 1: MULTIDOS commands.

APPEND	ATTRIB	AUTO	BLINK	BOOT
BREAK	BUILD	CLEAR	CLOCK	CLRDSK
CLS	CONFIG	DATE	DDAM	DEAD
DEBUG	DEVICE	DIR	DO	DUMP
FORMS	FREE	HASH	HELP	KEYBRD
KILL	LIB	LINK	LIST	LOAD
PATCH	PRINT	PROT	RENAME	RESTOR
ROUTE	SETCOM	SKIP	TIME	TOPMEM
VERIFY				

Table 2: SUPERBASIC additions.

EDITING	SINGLE STEPPING	BREAKPOINTS
VARIABLE		
REVIEW		APPEND
RENUMBER	CROSS REFERENCE	KILL
LOAD	MERGE	SAVE
NAME	OPEN	CLOSE
DEF FN	&H, &H	INSTR
MOVE	DUPLICATE	
INPUT#	LINEINPUT	DEFUSR0 — DEFUSR9
GET	PUT	TIME$
DATA		FILE LOCATION COMMANDS
CONVERSION		
COMMANDS		
and 15 "CMD"		
options.		

e=mc² e=mc² e=mc² e=mc² e=mc² e=mc² e=mc² e=mc² e=mc² e=mc² e=mc² e=mc² e=mc² e=mc² e=mc²

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in MULTIDOS. There is no point in running through all of them, but I will mention the most notable.

BLINK starts or stops cursor blinking, BREAK enables or disables the Break key. BUILD creates a file of commands, for use later by a DO command. This means that a whole series of operations can be saved for use later. FORMS allows you to set the various parameters of the print-out – the number of lines per page, characters per line, the number of lines to skip at the end of each page, and so on.

KEYBRD sets the keyboard attributes. These include the character to be used as cursor, repeating keyboard or not, lower case keyboard or not, and so on. A special keyboard driver is also provided which allows the direct typing of graphics characters. The SHIFT and CLEAR keys together act as a toggle between ordinary and graphics keyboard.

LINK permits cutput to go to more than one device; ROUTE redirects output from one device to another. SKIP is used to read a 40 track disk in an 80 track drive.

System utilities are provided to backup a disk, copy files, get a directory of an alien disk, time a disk drive, test memory, transfer between disk and tape, spool printer output, and for machine code debugging. A "zapper", or program for direct alteration of disk contents, is also there, but was rather elementary.

Disk systems treat BASIC as a program. Entering BASIC adds lots of commands to BASIC, including those to interface with the disk drive. SUPERBASIC adds commands as listed in table 2. These give extended editing and tracing, including a provision to review variables as they are changed in a program. Used selectively, these are powerful tools indeed.

MULTIDOS commands are not usually permitted from within a BASIC or other program. A special overlay is called up by pressing both the ; and : keys, which allows you to copy, kill and list files, and obtain a disk directory, from within a program, and return with the program intact.

There are a mass of other minor commands in MULTIDOS, but there is no point in listing them all here.

The manual is adequate, but could have done with many more examples. In places it is terse, and disorganised. The manual has an irritating habit of including important information in a paragraph which is an aside or additional, less important material.

MULTIDOS is a product of Cosmopolitan Electronics Corporation and is distributed by CSPE Electronics Christchurch.

Corrections to VISISORT

A.G. Briggs has supplied some corrections and amendments to the VISISORT program of his printed in *Bits & Bytes* in March.

Line 140 should have a "RANDOM" added to reduce the tendency for the same list to be generated.

Line 540 should have been FF=0 not F=0

Line 1180 should now read:

```
1180 PRINT @ N3,USING"###";NE;:PRINT
@ N2,USING"###";NO+1;
```

This was to update the Total Operations counter correctly. As it was, it would be in error where a Swap occurred as the last event.

Line 1890 has had the FL=0 deleted and instead inserted in Line 1880.

Line 1940 has another conditional test added. It should now read:-

```
1940 IF FL=1 AND M=1 THEN 1880 ELSE
1870
```

These last two alterations were to correct an error which prevented the SHELL sort from correctly sorting odd number lists, e.g. 9, 1, 13, 15, etc.

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Microdrive, Interface 1 tested

By Gary Parker

About a year ago, Sinclair revealed plans to produce a microdrive, a disk drive using a tiny disk about 3cm across, which would hold 100K of data, and transfer it at disk drive speeds. The price was going to be "less than £50".

After many hold-ups and major design changes, the microdrive is finally becoming widely available. How does it measure up to Sinclair's earlier specifications?

The major change has been that Sinclair has given up the disk idea, and turned the microdrive into a high-speed tape drive. Also, the microdrive is a little slower, and a little more expensive than predicted: an interface is required to connect the microdrive to the Spectrum. In New Zealand, Interface 1 and the microdrive were to retail at $395 each, but this has been reduced to $295 each. Cartridges are expensive, even in England, costing £5, which is about twice as much as a normal disk, and cartridges cannot store as much as most disk drives. They are guaranteed to store at least 85K, but may store up to 100K. This is because the microdrive automatically avoids bad spots on the tape, so that a tape with several bad patches will store 85K, while a perfect tape will store 100K.

The tape is a continuous loop, 1.9mm wide and about 3m long. The tape is very narrow considering the stresses it must endure while being wound through rollers at high speed, and a cartridge cannot be expected to last as long as a disk. This was said to be the major production hold-up: finding a tape capable of withstanding such stresses. Sinclair has used a video tape with lubricant backing, and a cartridge is said to last for 5000 read/write cycles, which is not as much as a disk, but is far more than an ordinary cassette tape.

Those are the microdrive's bad points, which I was aware of before I was lent a microdrive for review. Somehow, they faded into the background when I actually saw and began to use the system.

The microdrive is a small, simple-looking black box, 9cm by 8cm, and 5cm high, or about the size of a squat cassette tape case. The cartridge is incredibly tiny, just 44 by 33mm in its case, and 7mm thick. That is smaller than a matchbox, and I couldn't help liking it for its minute dimensions alone.

The cartridge is easier to put in than a disk; you can't put it in the wrong way round, and the cartridge end closes off the slot so that there is no flap to open and shut.

The microdrive connects to Interface 1 with an 8cm ribbon cable. The interface sits beneath the Spectrum, causing the computer to be tilted to what Sinclair describe as "a pleasing ergonomic angle", and the microdrive sits on the left side of the Spectrum.

While Spectrum owners may resent having to pay extra for an interface, it is actually very powerful. It contains a new ROM which replaces the ROM within the Spectrum, adding new commands. At last Spectrum users can make use of those mysterious words on the keyboard such as CAT and FORMAT!

Apparently the new ROM provides the possibility of the user's being able to write extensions to the BASIC language, since the ROM can be paged, so that the machine calls routines stored in RAM. But that is for the most advanced of Spectrum users.

The interface also contains an RS232 interface, so that large printers can be connected, or the Spectrum could communicate with other computers, or use telephone modems.

Network of 64 machines possible

Interface 1 also allows networking. This means that Spectrums can be connected, allowing programs to be almost instantaneously passed from one computer to another, and enabling complex multi-player games between computers to occur. This could be the most significant advance since computer games began! Up to 64 Spectrums can be connected, each with its own number, so that information can be passed between any two particular computers, or, using the broadcast facility, to all the other computers on the net. Broadcasting would be very useful in schools, since, for example, a teacher with a microdrive could broadcast a

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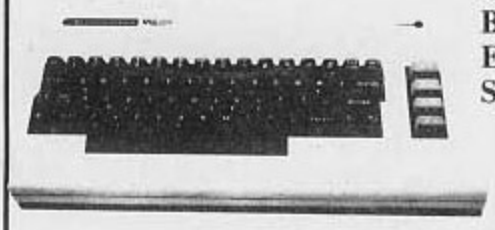
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By entering CAT 1, a list of the programs on the cartridge is displayed on the screen. This takes about seven seconds, during which a red light on the microdrive lights up, and the microdrive motor can be heard whirring, very much like a normal disk drive. The number after the CAT indicates which microdrive is to be accessed (up to eight microdrives can be connected).

To load a program into the computer, you use the form:

LOAD *"m";1;"name"

This looks complex, and is a bit tedious to type out, requiring 13 key presses, but it is easy enough to remember once each symbol is understood. The asterisk indicates that the LOAD refers to a microdrive, and the "m";1; identifies which microdrive is being accessed. Saving a program is just the same, using SAVE instead of LOAD.

The time taken to load a program depends on how long it takes the microdrive to find the start of the program on the tape. It takes about nine seconds for the tape loop to go right round, so it can take up to nine seconds to find the start of a program. But once found, even a large program only takes a few seconds to load.

Data can be saved on cartridges, using PRINT. Normally, of course, PRINT causes things to appear on the screen, but with a microdrive you can define where you want PRINT to print things, so that you can PRINT to a microdrive cartridge. The place you want things to be printed to is called a channel; the screen is a channel, and so is a printer, a microdrive file, or another computer. You send information to a channel through a stream. A stream has no physical form, it is just a route through which data can pass. There are 16 streams. This means that you can have lots of information going through many streams to several channels, so the new possibilities for data storage and manipulation are immense.

Data is stored on a cartridge as a file. First you must open a file using OPEN. Then data can be saved into a file using PRINT. Then it must be finished with CLOSE. You can have up to eleven files in use at once, each identified by a number. For example:

```
OPEN #7;"m";1;"text"
PRINT #7;"hello"
```

would put the string HELLO into the file named text, which was connected to stream 7 with the OPEN command.

If you want to remove a file, all you have to do is enter ERASE as you would LOAD or SAVE.

Once you have closed a file, it cannot be re-opened to add more data. You have to read a file, erase it, open a new file, and put the data in there.

Moving unprotected programs from one microdrive cartridge to another is easily done, using the MOVE command. Unprotected programs on cassette can be put on to cartridge easily enough by loading and saving them. But protected programs will be almost impossible to transfer from cassette to cartridge, because the Spectrum's memory map and system variables are altered when a microdrive is present. Also, each stream you open uses 595 bytes, so if you use all 16 channels (rather unlikely) you would lose over 8K of memory. So a machine-code program, or one that uses all the memory, would need modifying to be able to be stored on microdrive cartridge. This means that even if you do buy a microdrive, you will probably be stuck with your slow-loading commercial software.

In conclusion, after exploring the capabilities of the microdrive and Interface 1, I must say that I am impressed. In use it is just as good as a true disk drive.

The Microdrive eliminates manually having to wind through a tape, trying to find a program. It loads the largest of programs in a matter of seconds. It is easy to use, and extremely powerful; its file-handling and networking capabilities mean that the Spectrum can become a serious tool as well as an absorbing toy.

The disadvantages which I mentioned at the start are minor compared with the advantages that the system offers, and doubts are based on the tape, not the microdrive. No doubt the tape will be improved to offer a longer life expectancy and greater storage capacity.

The microdrive is excellent. It only remains to be seen whether people are prepared to pay New Zealand prices for it.

Interface 2 offers much for games

By Steven Cragg

One of a number of peripherals now available for the ZX Spectrum, the ZX Interface 2, provides the games player with just about all he needs: two joystick ports and a ROM cartridge port.

The interface is only 75mm by 30mm by 115mm and is moulded in "Sinclair black" plastic. It is designed to slot into either the expansion port of the Spectrum or Interface 1. An interesting point is that the edge connector at the back of Interface 2 (obviously intended for further expansion) is only 23-way instead of the normal 28-way. This means that about the only thing that can be plugged into Interface 2 is the ZX printer. This is especially annoying if you want to use other peripherals at the same time as Interface 2.

The joystick ports are of the standard 9-pin type (surely a first for Sinclair) so just about any joystick will work. However, there is a great difference between joysticks, so be sure to get one that is comfortable for you to use. The joysticks are read from either BASIC or machine code. Reading the joysticks from BASIC is done by either using INKEY$, where each function of each of the joysticks corresponds to one of the keys on the top row of the keyboard, or the joysticks can be read using the IN function where IN61438 reads joystick 1 and IN63486 reads joystick 2.

The interface also includes a cartridge port. The cartridges are probably the smallest made. They measure only 4cm by 6cm by 1cm. However, they have some nice features, for example a little rubber skirt to protect the edge connector.

The two big advantages of cartridges are that no loading is required (you just plug one in, switch the computer on and hey-presto! there is your game); and, as the cartridges take very little RAM to run even large games, many games that previously needed 48K RAM now can run in only 16K.

Over all, at $99, this interface is very reasonably priced. When buying, remember that you will probably need at least one joystick and budget for the cartridges, which are $79.95 each.

This interface will, I feel, really come into its own when cartridge-based languages (e.g. Forth, Pascal, etc.) become available. Then Interface 2 and the Spectrum will outperform many of their more expensive rivals.

Test interface supplied by Computer Plus, Christchurch.

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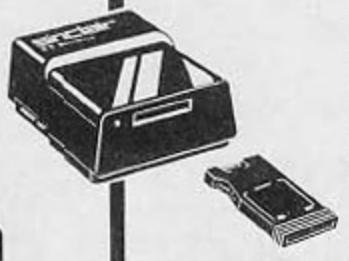
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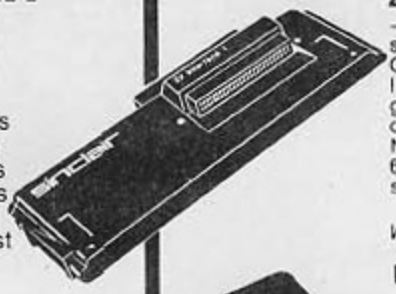
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How to box your titles

By Brian Strong

I've seen some nicely written programs that do all sorts of wonderful things, but they all failed miserably in one aspect. They looked lousy on-screen.

One of the reasons you find articles in a newspaper or magazine easy to read (not necessarily understand) is they are visually well laid out. A publication can fail, no matter what the content may be, simply because the layout is confusing and hard to follow.

Many programs that display information on-screen suffer from this problem. Some programmers seem to have a fetish about cramming every available inch (or millimetre, whatever) of the screen with text, the same sort of thinking that has people inscribing the works of famous poets on the head of a pin.

Instructions for the user have far more impact if only a few lines at a time are displayed. They have time to read and understand them, then press a key to get the next lot on the screen. And while you're at it, double space the lines for clarity.

Maybe you have already tried this, but the result has been like some sort of insane course in speed reading, the text cycled up the screen with the speed of a nudist away from a wasp nest.

Let's fix this one up before we go any further with a handy subroutine you can use.

```
1000 VTAB 23:HTA33:PRINT"PRESS ANY KEY TO CONTINUE":POKE -16368, 0:GET Z$:PRINT Z$:HOME:RETURN
```

Don't worry about it, just use it. The words "Press any key to continue" will appear on line 23 of your screen. As you write the PRINT statements for your screen text, keep checking how it looks. When you decide there's enough on-screen, then just add the next line, we'll assume line sixteen to illustrate:

```
16 GOSUB 1000
```

When the amount of text you have decided for each screen appears, the GOSUB will send the program off to line 1000 and execute the subroutine. All that happens as far as the user is concerned is that text appears on-screen, then an instruction to press a key for more. Having executed the subroutine the program then returns and proceeds to line seventeen. Try it!

To double space text, just add an extra PRINT statement to the line, like this

```
10 PRINT"THIS IS THE FIRST LINE":PRINT
20 PRINT"THIS IS THE SECOND LINE"
```

For an extra bit of class, try this short routine to put a box around your title.

```
100 REM. TOP BORDER
200 VTAB 4:HTAB 9:FOR X = 1 TO 23: PRINT"*";:NEXT
300 REM. THE TWO SIDES
400 FOR X = 1 TO 23:HTAB 9:PRINT"*";: HTAB 32:PRINT"*":NEXT
500 REM. CLOSE BOX
600 VTAB 16:HTAB 9:FOR X = 1 TO 23: PRINT"*";:NEXT.
```

You can adjust the size of the box by changing the values of the loop. Play around with it any way, and see what you can do with it. Your text is tucked away within the routine, so work it out, there ain't no such thing as a free lunch.

Apple tip

Some calculations come up with decimal places that run forever past the bounds of practicality.

Here is a routine you can use which will round off to two decimal places.

```
100 BW = ONETHING*NOTHERTHING
```

The answer could be BW = 7.4074074.

```
200 BW1 = INT (BW*100+.5)/100
300 PRINT BW1
```

BW4 will now print out as 7.41.

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Looking after your machine

By Steven Darnold

I bought my Commodore PET in 1979 and have given it more than 6000 hours of use. In that time I have fitted four new tyres to my bicycle, blown up an electric heater, and worn out the heads on my cassette recorder, but the PET has not required a single repair. I am confident that in 1990 my PET will still be going strong.

My Commodore 64 is only a year old, and of course it, too, has had no problems. In fact, considering that the 64 has only half the number of chips of the PET, it should last twice as long before something goes wrong. Therefore, in the year 2000, my 64 will probably still be alive and kicking.

The question you should ask yourself is whether your 64 will have a long life. Just as smoking and drinking can shorten a human life, your 64's life span will depend on how you treat it. Here are some hints to keep your 64 out of the repair shop.

Don't plug anything into your 64 with the power on. This includes cartridges, joysticks, cables and dongles. Most of the 64's ports have a power line; if this line accidently makes contact with the wrong pin, a delicate chip may be zapped.

Don't take chances: turn off your 64 before you plug anything in.

Avoid turning your 64 off and on. You've probably noticed that when a light bulb blows, it usually happens when it is just turned on. The same thing applies to your 64. Every time you turn on the computer, a little surge runs through the chips. Do this too often and a chip will blow. When I am finished using my 64, I don't turn it off unless I am sure that I won't be using it again that day. It's better to leave the computer running unused for a few hours than to turn if off and then on again.

Buy a reset button. Many commercial programs disable the RESTORE key: a reset button will enable you to regain control without turning the 64 off and on. In addition, a reset does not wipe the computer's memory. This enables experienced programmers to recover crashed programs by resetting the computer and fixing the pointers. Reset buttons cost less than $10 in New Zealand. There are versions for the user port and for the serial port, and some cartridge port extenders have built-in reset buttons.

Cover your 64 when you are not using it. Otherwise dust will build up in the keyboard contacts and eventually make some keys unreliable. It is also a good idea to keep food and drinks well away from the computer. It takes only a dribble of Coke to produce a very big repair bill.

If possible, give your 64 a place of its own, where it sits permanently with all its peripherals. Otherwise, if you set up the 64 anew each time you use it, it will be subject to much more wear and tear. The daily plugging and unplugging of cables may wear out the connectors, or you may accidentally jar something loose.

The above measures will help to protect your 64's good health. However, there is one final precaution you may wish to consider: a surge suppressor. All electric power supplies have occasional surges and spikes, which may stress the 64's chips. However, if you plug a surge suppressor between the computer and the wall socket, such spikes will be dampened. I paid $20 for my custom-made surge suppressor five years ago, but the current price for off-the-shelf suppressors is as high as $200.

I have applied all these measures to my computer, and I attribute to them its consistent good health. If you do likewise with your 64, it should give you many years of useful service.

Billiards on the monitor

I have recently received three new games from Alpine Computing: Pottit, Quintic Warrior, and Hexpert. All of the games come on cassette and they are reasonably priced at $24.95. My favourite one is Pottit.

Pottit is a two-player game based on pocket billiards. On the screen is a representation of a four-pocket billiard table with three balls. Each player has a joystick and uses it to control one of the

'it's a little cutie'

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balls. The third ball is neutral and moves only when hit by another ball. Points are scored by pocketing the neutral ball or the opponent's ball. Points are also scored from cannons, i.e. hitting the opponent's ball and then the neutral ball.

•The balls have a realistic inertia. Once you get your ball moving, you cannot suddenly stop it or change its direction. This makes Pottit primarily a game of momentum and angles. Fast reflexes are useful, but less important than the ability to foresee and anticipate positions.

The Pottit graphics are simple, but effective. Black, white, and red sprites are used for the balls, and normal graphics characters are used for the green table and the blue scoreboard. In some respects, however, the graphics are a bit disappointing. For example, no attempt is made to animate a ball falling into a pocket; instead, the ball just disappears. Moreover, the pockets themselves have no depth; they are just lines on the table. In total, the graphics are adequate, but not spectacular.

The Pottit sound effects are excellent. In fact, without the sounds, Pottit would probably lose much of its charm. When one ball strikes another, the sound of the collision is extremely realistic. This solid click gives the graphics real depth and makes the coloured circles seem like real balls. The sound of balls rebounding from the cushions is similarly realistic.

Pottit is a good two-player game. The rules are easy to learn, and you can start playing and enjoying the game almost immediately. There is plenty of excitement as both players struggle to guide their balls into and around the other balls. If you have two joysticks, this game is well worth considering.

Fighting off the alien hordes

This game does not appeal to me, but it may be of interest to aficionados of Gridrunner and other blast-the-aliens games. Hordes of tiny aliens march up the screen, and your task is to shoot them before they reach the top. The aliens do not fire on you, but there are X-Y zappers and an occasional stream of missiles across the screen from right to left. If you clear the screen, you go on to a new set with more of the same aliens and faster X-Y zappers. Occasionally, between the sets, you will be attacked by a mutant worm.

Over all, Quintic Warrior is competently put together. The graphics are okay. The sound is okay. The game is okay. But somehow I just can't get excited about it. Part of the problem is the lack of originality. The X-Y zappers and the mutant worm are straight out of Gridrunner, and there's certainly nothing new about rows of marching invaders. In addition, I soon grew tired of shooting the aliens. First, the aliens are so small that I was constantly having to make tiny readjustments to reposition my ship on the right line for the shot. Second, in order to avoid the X-Y zappers I was driven into a tedious, repetitive pattern of movement.

In fairness, Quintic Warrior has some nice features. I like the way the aliens say, "Zap!" when they are shot. I like the way the X-Y zappers kill you only when you are caught in intersecting beams. I like the freeze game feature. However, in total, Quintic Warrior is not nearly as good as Gridrunner.

Joystick control spoils game

This is the fourth Anirog game I have played in recent months and I must say that something is seriously wrong. When I played Kong, Moon Buggy, and Frog Run, I noticed a certain lack of responsiveness in the controls. In the first two games, it was a minor problem; but in Frog Run it was seriously affecting the game. Now with Hexpert, the joystick control is so bad that it totally ruins the game.

Perhaps the boys at Anirog intentionally make their games awkward to control. Perhaps they think that unresponsive controls add to the challenge. If so, they are making a big mistake. The little man on the screen is my alter ego. The more responsive the man is to my directions, the more I am drawn into the game. If the man does not move when I direct him to, then I might as well not be playing.

Hexpert looks like a lovely game, and I wish I could play it. But when I direct the man to hop, sometimes he hops and sometimes he doesn't; sometimes he hops one space and sometimes he hops two; sometimes he hops up and sometimes he hops down. It's infuriating. Such unintentional hops are often fatal. It is very easy to collide with something or hop right over the edge.

I find it incredible that such an attractive game should have this flaw. Perhaps I'm doing something wrong.

Unfortunately, when Alpine produced the cassette card for this game, they accidentally left off a section of the instructions. It's this section which tells you how to move the man. By trial and error, I discovered that the joystick diagonals seem to work, but I am far from happy with the result.

Another problem with Hexpert is the use of the sprite collision register. Hexpert takes place on a tilted plane of hexagons; there is a definite 3-D perspective. As the little man hops from hexagon to hexagon, he is pursued by a snake. Sometimes, because of the perspective, the little man's sprite touches the snake's, even though the man and the snake are on different hexagons. Because the sprite collision register is used by the program, this registers as a hit. This is wrong. The program should only register a hit, when the snake is on the same hexagon as the man.

Over all this game has considerable potential, but in its present form it is fatally flawed.

Getting the best from joysticks

Many popular games for the 64 use joysticks, and a good joystick will help you improve your scores. However, to get the best performance from your joystick, you also need a good foundation. The people who designed the Quick Shot joystick recognised this when they put four suction cups on the base. Plunk the Quick Shot down on the table and the improved leverage gives you surer, faster control. However, the Quick Shot's suction cups are not perfect. In moments of arcade frenzy, it is easy to jerk the suction cups right off the table.

. The best foundation you can give your joystick is a solid piece of wood, which you can rest on your knees. An old breadboard is just about right. To attach the joystick to the board, you will need four L-shaped hooks. They cost about 20 cents each and come in various sizes. Choose a hook whose long leg (excluding the screw) is slightly shorter than the height of your joystick's base.

Place the joystick in the middle of the board, and screw the hooks into the board next to the joystick on each of its four sides. The short leg of each hook should extend over the base of the joystick and hold it firmly to the board. If at any time you wish to remove your joystick from this platform, it is a simple matter to give each hook a quarter turn and lift the joystick straight up.

I use such a platform with my Wico joystick and consider it almost essential. The Wico is similar in design to the joysticks in arcade machines, and it really needs a rock-solid base. Other joysticks, as well, will profit from such a base, particularly if they have fire buttons on the handle. Even Quick Shot users should consider abandoning their unreliable suction cups and building themselves a solid platform.

Competitions

The winner of March's competition was Peter Middelkoop, of Christchurch. Peter has been sent a copy of Pegasus Odyssey (donated by Alpine Computing).

The prize for this month's competition is a cassette tape of Pottit (donated by Alpine Computing). Entries close on May 25. The winner will be selected randomly from among the correct entries. Only one entry per person.

Your task this month is to write a program which accepts a number input between 1 and 9999 and then print it out in words. For example, an input of 4537 would produce FOUR THOUSAND FIVE HUNDRED THIRTY SEVEN. Send the program with your name and address to Pottit Contest, P.O. Box 201, Alexandra.

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Getting to know your machine

By Brian Gibbs

Vigorous marketing by the distributors of the Sega SC3000 has seen this machine rise quickly to become one of the fastest selling home computers in New Zealand and Australia.

The distributors have finally sourced some cassette-based software and a Wellington company is offering some locally produced software at a reasonable cost. June sees the introduction of the microdrive and I/O controller for about $600.

For those of us not in a position to buy the ROM pack games software, the alternative has been to convert or write our own software.

Fortunately, the SC-3000 uses a version of Microsoft BASIC that is relatively easy to comprehend, even for the beginner. To offset this, the BASIC handbook supplied with the Level IIIA and IIIB cartridge has been translated with its Japanese origins still painfully obvious.

In this and some following articles, I hope to be able to give Sega owners some helpful information on both the hardware and software of their computer.

The SC-3000 uses a Z80 8-bit processor as its CPU. This runs at a clock speed of 3.57 MHz.

The video display is controlled by a Texas Instruments TMS9929 video display processor. This VDP provides up to four display modes, although only two of these are accessed by BASIC in the SC3000. The other two modes are a 24*38 graphics mode and a multicolour mode. It is possible to use the multicolour mode by the use of a machine-language subroutine. The VDP gives access to 32 sprites, and also has associated with it, 16K bytes of dedicated video RAM.

The video RAM has no direct connection to the CPU, but is updated by writing to the VDP, which is memory mapped at ports &HBE and &HBF. The video RAM is MB8118 and is IC10-IC17 on the main circuit board.

The sound generator is an SN76487 IC(IC4). This has three sound channels and a noise generator, while each channel has its own attenuator to control its output volume. A 2K RAM IC (IC3) is used for system RAM. This is memory mapped at &HC000-&HC7FF. It is used by plug in cartridges for stack/data storage.

IC5 is a 8255 PIA (peripheral interface adapter). The keyboard, cassette, printer and joysticks are all interfaced to this IC, which has three ports and a control register. Ports A&B are input and mapped at &HDC and &HDD respectively. These two ports are connected to the x columns of the keyboard. Port C (&HDE) is output and connected to the y columns of the keyboard. The control register is mapped at &HDF.

Plug-in cartridges interface to the main PCB, via a standard edge connector. Pin numbering of the edge connector is 1-22 both on the solder and component sides.

On the solder side, pins 1-14 are for address lines AO-A13, and pins 15-22 are for data lines DO-D7. On the component side, pins 1+ 2 are Vcc (5 volts), and pins 21+ 22 are ground. Pin 5 is RD (active lo), pin 6 is WR (active lo) and pin 10 is MREQ (active lo). Address lines 14+ 15 are on pins 18+19.

The video output is either RF or composite video with audio. The video connector is a standard 180 degree DIN: pin 1 is audio; pin 3 is video; and pins 2, 4, 5 are ground.

Much has been written about the ability of various home computers to define the user's own high-resolution graphic symbols. The SC3000 enables this by the use of the PATTERN command on the text screen. Additional 25 characters can be added. These codes are normally blank and are &HDO-DF, &HED-&HEF, &HFO-&HF4 and &HFF. These user defined graphics can be written to the screen by the PRINT CHR$( ) command. Try this for example:

```
10 SCREEN 1,1:CLS
20 PATTERNCE&HDO, "3048B4CC8484
8484"
30 PRINT CHR$(&HDO)
```

It is important to note that the characters defined by the pattern statement on the text screen are expressed as 8*6, so when you are defining your own characters, remember not to use the two least significant bits of your 8*8 grid. If desired, the complete character set could be redefined by allocating your new patterns to the existing character set, for example: PATTERN CE&HF8 would redefine the existing club character.

The Texas Instruments VDP also allows the use of sprites on the graphic screen. This permits excellent animation but unfortunately, things run rather slowly in BASIC.

Each sprite is allocated space in the sprite generator table. Eight bytes are required per sprite–thus sprite 0 is located at &H1800-&H1807, sprite 1 at &H1808-&H180F.

There is also memory space allocated to a sprite attribute table. Four bytes are required per sprite, beginning at &H3B00.

Therefore, &H3B00 contains the "Y" position of sprite 0.

&H3B01 contains the "X" position of sprite 0.

&H3B02 contains the sprite name.

&H3B03 contains the colour of the sprite.

Try creating a sprite like this:

```
10 SCREEN 2,2:CLS
20 FOR X=&H3B00 TO &H3B03
25 READ A:VPOKE X, A:NEXT X
30 REM LOCATION 0, 120, SPRITE 0,
COLOUR DARK GREEN
35 DATA &H78, &H00, 0, &H0C
40 REM SPRITE 0 PATTERN
45 FOR X= &H1800 TO &H1807 :VPOKE X,
&HBB
50 REM MOVE SPRITE RIGHT
55 FOR M= &H00 TO &HF4:VPOKE
&H3B01,M:NEXT M
60 REM MOVE SPRITE UP
65 FOR M= &H78 TO &H04 STEP-1:VPOKE
&H3B00, M:NEXT M
70 REM CHANGE COLOUR AND A SMALL
DELAY
75 FOR C= &H00 to &H0F:VPOKE &H3B03,
C:FOR DE =1 TO 200:NEXT DE
80 VPOKE &H3B03,4:STOP
```

Next, change the values for the positions, the sprites, and their shapes. But remember, sprite movement is not automatic . . . you must control it by software routines.

Next, a note about colour information. For the text screen, this is held at location &H9339 in the reserved RAM area. The byte is split into two nibbles. The least significant nibble contains the colour information for the background, while the most significant nibble contains the writing colour information.

For the graphic screen, location &H933A holds the information in the same manner as for the text screen. Page 100 of the manual gives the colour information. Try converting the colour numbers to their hex values, and poking them into the above location.

Finally, a couple of tips discovered by accident.

To stop the screen scrolling when listing a program, hit the space-bar . . . another hit will restart the scroll.

Also, when playing some ROM cartridge games, a touch of the reset button will stop the game running . . . another touch restarts where you left off. This is particularly useful when the going gets tough in some Space Invader-type games.

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BBC

Menus and ROMs for graphics

By Pip Forer

This month's column picks up the threads from April (user friendliness) and touches on a new topic (the graphics extension ROM from Computer Concepts).

First, the graphics ROM. This is a 16K sideways ROM that offers the user access to several graphics facilities through 29* calls to the operating system. It is interesting because, unlike BASIC or word processor ROMs (which are "language" ROMs in the BBC), this ROM is a utility ROM. This means that when switched on (and this ROM can be turned on or off by *FX162) it checks all *calls to see if they contain commands it can act upon. This means it can be accessed from a variety of language ROMs. If such commands are found it promptly actions them, otherwise it passes them on to ROMs further down the line. Clearly this means if the ROM is first in line it gets to act more quickly than if in a lower priority socket.

The ROM offers the user of BASIC (or any language) extended graphics facilities. These consist of three major components: Sprite graphics, Turtle graphics and some general graphics enhancements. The latter include a variety of special shape functions (circles, elipses, arcs, et cetera), plus a 3-D perspective generator.

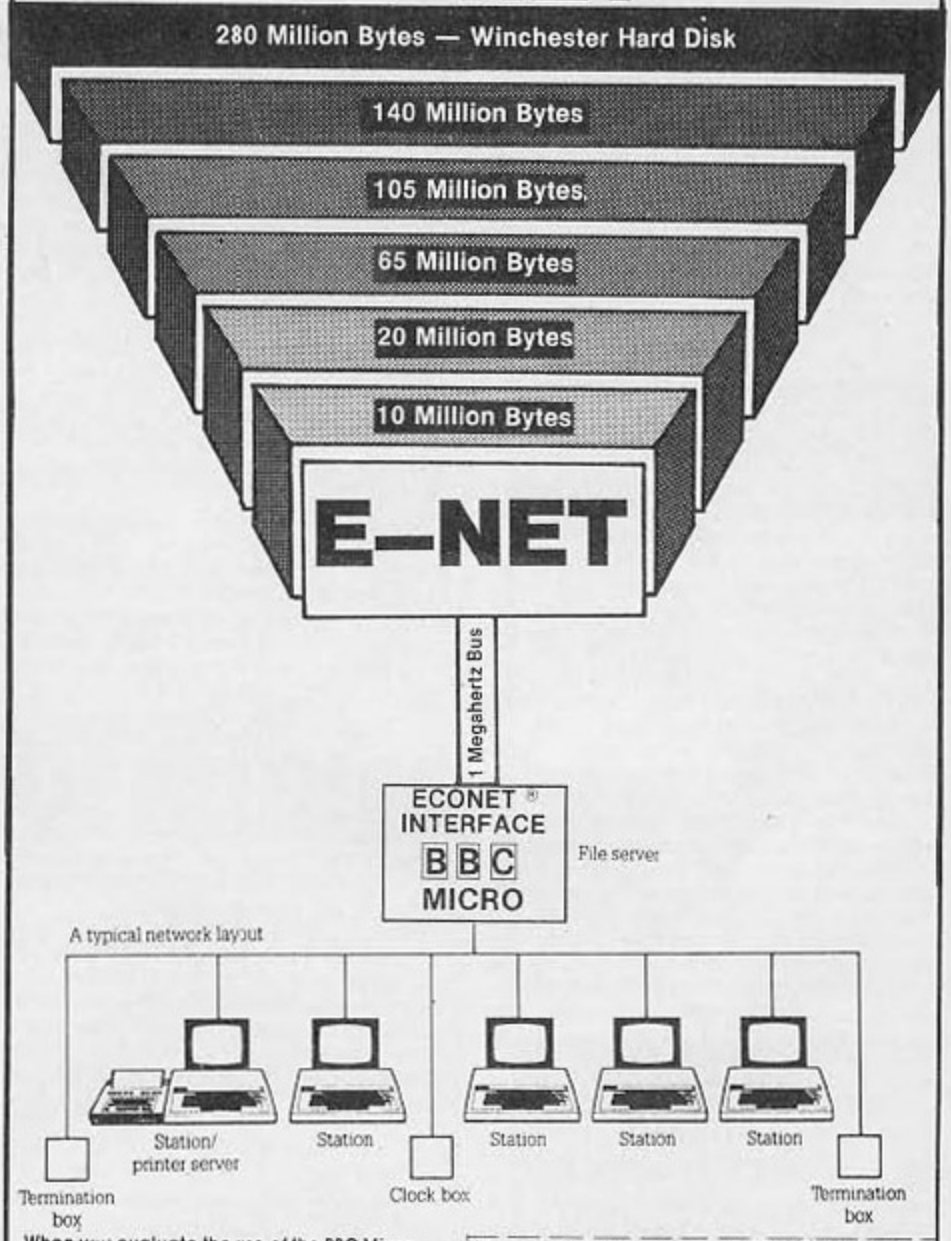
The area that may attract most interest immediately is the Turtle graphics facility. This consists of eight commands to define and move a turtle over the screen (forward, right, left, et cetera). The more unusual Turtle/LOGO commands such as TOWARDS are missing, but with a suitably structured BASIC program you can create named graphics procedures such as LOGO. However, if you really wanted LOGO to start with you miss the easy-going interaction of sketching via the LOGO operating system. There are benefits though in that the commands allow full access to the normal PLOT statement codes so your turtle can draw dotted lines or even triangles as it moves. As an extension to graphics syntax turtles are undoubtedly useful and the speed of this implementation (unlike some early commercial routines) is quite acceptable.

The sprite commands allow you to call up an interactive sprite editor in any mode and design multicolour shapes that can be recalled or animated from any language. This is simple (primary kids love it), powerful, and fast. The only missing feature is that no precedence rules exist controlling which shape might pass behind which other shape if they crossed. Using the 16-colour mode and the flashing-colour option some very

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useful animation effects can nonetheless be achieved (an ant moving its jaws for instance) and the sprites can be combined programatically with the Turtle graphics.

The general graphics routines are rather an odd bunch. They include a complex shape fill in any colour (which is disappointingly slow and offers no "quilted" colour variations), reasonable circle and arc routines, options for large text and automatic screen rotation and a 3-D perspective routine (which is fairly trivial code any way).

In all, there is nothing startling but together the package is a significant enhancement to the graphics programmer. It is very well documented, works well and merits its price (in Britain about $80). One interesting comment is the method by which commands are called from a BASIC program. Using * calls means only one statement per line. Normally, when used with a sideways ROM, it also means that arguments can be sent only by numbers, not variables. Thus a circle of radius 40 at (X,Y)=(100,100) would be drawn by *CIRCLE 100,100,40. However, the graphics ROM allows values to be passed by the integer variables A% to Z%. In programs this means that you have to get your desired parameters into the right variable before any call (say from an array) which is messy. However, it gives the necessary flexibility and is certainly an easy system to use.

User menus

The second topic goes back to April's theme of designing a good user interface. The program and procedure listed this month offer you a means of minimising user input errors in any situation where there is a set of simple choices open to the user. Basically, it allows you to create a screen on which the user choices are listed. One of the choices is highlighted by being set against a bar of a different colour to the screen background (if you want, the text could be coloured differently, too). The up and down arrow keys can be used to position this bar over any one of the choices until the desired option is highlighted. Hitting RETURN then accepts that option as the user's choice and the program can proceed accordingly. Of course, the user can still make the wrong decision between the options, but at least mistypes and a lack of familiarity with the range of possible options have been removed from contention.

The code is quite short and uses the BBC's Teletext character mode. It takes in a series of options by READing strings describing the choices for the user into array A$. The number of choices is read in as variable NZ and the position of the first choice on the screen is provided by the variable LAG%. These are used to calculate the top and bottom line of the screen used for choices (TTEXT% and BTEXT%).

The program works like this: line 15 colours out the screen (the CHR$ values there are colour blue and background respectively). After reading the choices into A$() and establishing their location on the screen the choices are printed (line 60) and instructions on using the menu given (lines 70-80). The program then calls PROCmenu.

This procedure starts by disabling the cursor keys so that hitting up or down arrow does not send an editing cursor off up the screen. The VDU call supresses the normal flashing cursor. The next line prints the first choice against the reverse bar colour at line TP%. The program then repeatedly waits for a key press that is either an up or down arrow or a RETURN (line 230-250). If RETURN then the choice is made and the procedure is quitted. Otherwise the current "barred" choice is printed in normal colours (line 265) and the current value of the choice line (TP%) incremented or decremented (line 270) depending on the arrow pressed. The next two lines check that the new choice is within the correct lines on the screen and if not "roll over" the bar. The procecure then goes back to print the bar in the new position via line 220 and awaits a new instruction. Line 290 restores the cursor and editing keys by the way.

The program is pretty elementary, but it is enormously helpful in making programs nicer to use. Although the example here is imited by the lines on a screen to a choice between a maximum of twenty options each of one line length the principle can be expanded and made more flexible to allow for a wider variety of choices. Also, although the mode used here is Teletext the same ideas can be used in other modes. The program would just need to alternate fore and background colours as the bar moved by setting a one-line text window (VDU 28), using the COLOUR command and doing a CLS instead of using Teletext control codes to get the same effect.

Next month I hope to report in depth on the long (long), awaited 6502 second processor and the promised Econet level III expansion. New Zealand deliveries started in early April. We will also review some data-base and Teletext editing software from the British user-group co-operative, BEEBUGSOFT.

```
   5DIM A$(7)
  10 MODE 7
  15 FOR I=0 TO 24:PRINTCH
R$(132);CHR$(157):NEXT I
  20 DATA 7 ,"AREA ELEVATI
ONS","AREA SLOPE","CONTOUR L
INES","MESH OVERLAY","SHADED
 SURFACE","SKYLINE ASPECT","
QUIT"
  30 READ N2:FOR I%=1 TO N
2:READ A$(I%):NEXT I%
  40 LAG%=5:TTEXT%=LAG%+1:
BTEXT%=TTEXT%+N2-1:TP%=TTEXT
%
  50 PRINTTAB(0,TTEXT%)
  60 FOR I=1 TO N2:PRINTCH
R$(132);CHR$(157);CHR$(130);
"    ";I;A$(I):NEXT I
  70PRINT:PRINTCHR$(132);C
HR$(157);CHR$(133);"USE THE
ARROW KEYS FOR SELECTION"
  80PRINTCHR$(132);CHR$(15
7);CHR$(133);"Press RETURN t
o enter choice"
  90 PROCmenu
 100REM CHOICE IS TP%-NLAG
%...ACT ACCORDINGLY
 105CLS:PRINT"CHOICE MADE
";TP%-LAG%
 110 END
 200 DEFPROCmenu
 205 VDU 23,1,0;0;0;0;:*FX
4,1
 220 PRINTTAB(1,TP%):PRINT
CHR$(129);CHR$(157);CHR$(134
);"    ";TP%-LAG%;A$(TP%-LAG
%)
 230 REPEAT
 240 A%=INKEY(20)
 250 UNTIL A%=13 OR A%=138
 OR A%=139
 260 IF A%=13 THEN 290
 265 PRINTTAB(1,TP%):PRINT
CHR$(132);CHR$(157);CHR$(130
);"    ";TP%-LAG%;A$(TP%-LAG
%)
 270 TP%=TP%-(A%-139)*2-1

 275 IF TP%<TTEXT% TP%=BTE
XT%
 280 IF TP%>BTEXT% TP%=TTE
XT%
 285 GOTO 220
 290 VDU 23,1,1;0;0;0;:*FX
4,0
 299 ENDPROC
```

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Which one? Some answers

"Businessman's Guide to Microcomputers"
by Deloitte, Haskins & Sells, Prentice Hall, 202pp. $29.35.
Reviewed by Brian Strong.

This Australian publication, written by a team of chartered accountants, takes a subjective look at the question of "which one?"

Well laid out with the information easy to find in colour-coded chapters, the authors tell you where to start, teach you the jargon, then look at specific business requirements in the confusing world of hardware, software and add-on products.

There are detailed reviews of Apple, Commodore, Tandy (Radio Shack), Sord, IBM, DEC, NEC, Sirius, Wang, ICL and WICAT systems, plus a comparison chart.

Software packages for financial modelling, database, word processing and general accounting are also reviewed and compared.

The book rounds off with some common pitfalls for first-time buyers.

Although running the danger of becoming dated by covering specific systems and software, all systems and models, except maybe one, are currently available in New Zealand and as far as I can tell, so are most of the software packages.

If you own a business and are looking for a computer system you should be forced to read this book before you see a brochure or listen to a sales pitch.

This book is value for money and is not just a catalogue or shopping list of computer gear. The only thing to ignore in it are the Australian prices — some of them are more like our deposits unless you can remove the tax.

Widening horizons

"Computer Languages and Their Uses" by Garry Marshall, Granada, 108pp, $19.95
Reviewed by Martin Downey.

This book sets out to inform programmers of alternatives to the BASIC language for particular applications. As is rightly pointed out, BASIC is a good all-round beginners' language but other specialised languages exist and they should not be overlooked.

Although most popular languages are mentioned in the introductory chapter, only four are covered in detail in the remaining chapters. They are PROLOG, GINO-F, COMAL and LISP. Each of these is suggested as more desirable than BASIC for specific applications. To emphasis

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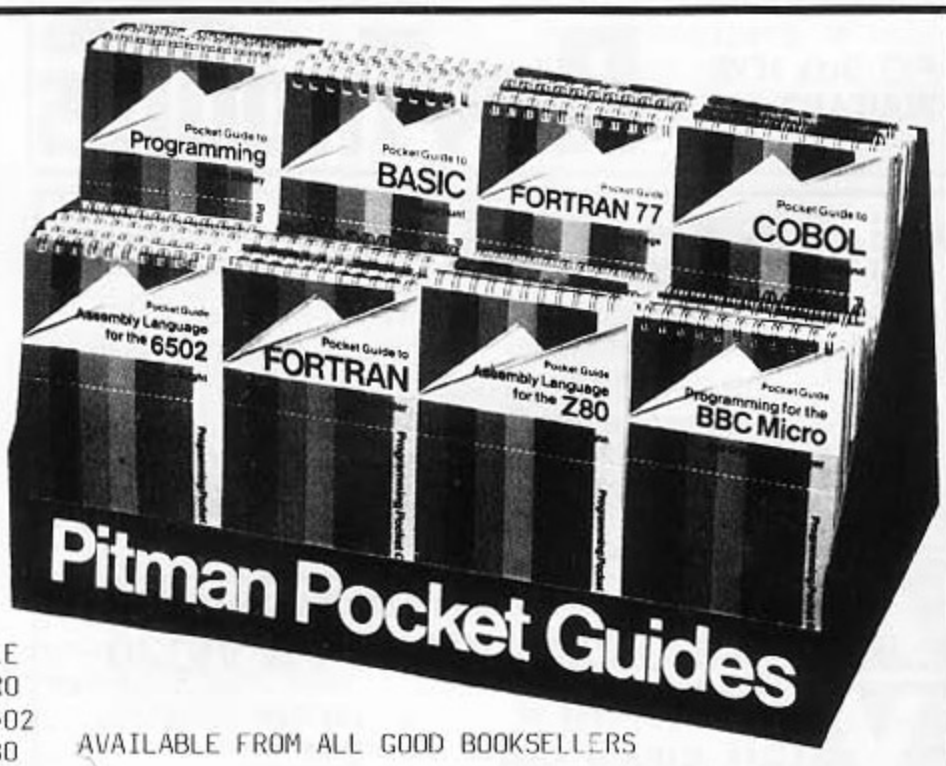
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this, each chapter starts with a BASIC version which is compared with the same application programmed in the specialist language.

The four applications covered are database (PROLOG), 3D graphics (COMAL), simulation (COMAL) and block graphics (LISP). The first three are very well covered and even the BASIC programs supplied should be of interest to the reader. The last chapter on block graphics is a bad choice though and does not do LISP justice. It may however, make this rather fascinating language more easily understandable.

If you are a BASIC programmer interested in one of the above applications, even if you don't plan to give up BASIC, you will certainly get something from this book. If you have a particular interest in one of the languages mentioned, you would probably be better served by a book specific to that language.

A bit too routine

"BASIC Subroutines for Commodore Computers" by Eddie Adamis, John Wiley & Sons, 312pp, $31.95. Reviewed by Steven Darnold.

The title contains two misnomers. Most of the book contains trivial conversion programs, not subroutines. And the programs are written for any computer with Microsoft BASIC, not just Commodores.

The bulk of the book is made up of 100 conversion programs: metres to feet, metres to yards, Celsius to Fahrenheit, and so on. Each program is given a full listing and a printout of a sample run. In this way, a huge amount of space is devoted to what are inherently very simple programs. Most of the conversions require only a one-line formula; the rest is just padding.

Beyond the conversion programs are a few useful subroutines – mostly business programs to measure cost and profits, and maths programs to calculate progressions, permutations, and the like. Of particular interest is a set of routines for manipulating matrices. There is also a very simple sorting routine.

It is a mystery why the title should mention Commodore. All the programs will work on most brands of computers. In fact, they run much better on a non-Commodore 40-column computer than on the 22-column VIC.

This book will not appeal to many people. However, the business and maths routines may be very useful to some. Overall, the book is nicely presented. The routines are carefully described and there seem to be no typograhical errors.

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WHANGAREI COMPUTER GROUP: Tom Allan, 3 Maunu Rd, Whangarei. Phone 83-063 (w). 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 '*' are held at the VHF Clubrooms, Hazel Ave, Mt Roskill.

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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.

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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:

ACES (Auckland Computer Education Society): C/- Director, Computer Centre, Secondary Teachers' College, Private Bag, Symonds Street, Auckland. Meetings, third Thursday of month, at the College.

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.

BBC Club: See entry at head of this list.

EPSON HX20 USERS' GROUP. Contact: C.W. Nighy, 231 Khyber Pass Road, Auckland, (Ansaphone, 774-268).

HP41C USERS' GROUP (Auckland): C/- Calculator Centre, P.O. Box 6044, Auckland: Grant Buchanan, 780-328 (w). Meets third Wednesday, 7pm, at Centre computers, Great South Rd., Epsom.

NZ TRS-80 MICROCOMPUTER CLUB: Olaf Skarsholt, 203A Godley Rd., Titirangi. Phone 817-8698 (h). Meets first Tuesday OSNZ Hall, 107 Hillsborough Rd, Mt Roskill.

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 COMMODORE COMPUTER CLUB: D.J. McVay, of 40 Esk Street, Tauranga.

BEACH COMPUTING CLUB (Waihi: Jamie Clarke, Box 132, Waihi (Ph: 45-384 Waihi Beach).

ATARI 400/800 USER CLUB: Dave Brown, P.O. Box 6053, Hamilton. Phone (071) 64 692 (h).

HAMILTON SUPER 80 USERS': Bruce White, (h) 436-878.

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

WAIKATO COMPUTERS IN EDUCATION SOCIETY. Chairman, Derek Greenfield, 33 George St, Morrinsville, (h) Morrinsville 7767. Secretary, Geoff Franks (h) 81-050.

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

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

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.

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

HASTINGS COMMODORE USERS' GROUP: Contact, Mike Phillips, 401 Lascelles Street.

HBCES (Hawke's Bay Computers in Education Society): Contact — Grant Barnitt, 89 King Street, Taradale, Napier. Ph: 446-992.

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

HOROWHENUA MICROCOMPUTER CLUB: Meets on second and fourth Thursday of month. President, Wally Withell, P.O. Box 405, Levin; secretary, Dennis Cole, 28 Edinburgh Street, Levin. Ph (069) 83-904.

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 Awitea Street, Porirua.

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

WELLINGTON COMMODORE USERS' GROUP: P.O. Box 2828, Wellington. Contacts: Peter March (h) 886-701, Robert Keejan (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.

WELLINGTON SYSTEM 80 USERS' GROUP: Contact: M. Trickett, Phone: 724-351 (w), 662-747 (h).

NELSON MICROCOMPUTER CLUB: Dr Chris Feltham, Maraden Valley Rd, Nelson. Phone (054) 73-300 (h).

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

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

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 ATARI USERS GROUP: Contact Edwin Brandt. Phone 228-222 (h); 793-428 (w).

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.

CHRISTCHURCH PEGASUS USERS' GROUP: Don Smith, 53 Farquhars Rd, Redwood, Christchurch. Phone (03) 526-994 (h), 64-544 (w), ZL3AFP.

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.

CHRISTCHURCH COMMODORE USERS GROUP: John Kramer, 885-533 and John Sparrow. Phone 896-099.

CHRISTCHURCH BBC USERS' GROUP: Contact: Michael Hopkins (h) 582-267 or Rodney Derham (h) 893-215.

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 Warbington Street, Christchurch, 7. Ph: 881-456.

CHRISTCHURCH SORD M5 USERS GROUP: Meets first Thursday of month, 7pm. Ph: 792-771 for details.

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).

DUNEDIN COMMODORE USER GROUP. Contact: Mrs S.I. Downes, C/- The Micro Shop, P.O. Box 5518, Dunedin: (w) 740-469. Meetings: second Monday of month, 7pm-9pm.

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: C/- Peter Brook Otago Girls' High School, Dunedin.

SOUTHLAND COMMODORE USER GROUP: (VIC 20 and 64s). Address: C/- Office Equipment Southland, Box 1079, Invercargill.

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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GLOSSARY

Acoustic computer: 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 Intercharge. 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.
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.
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.
Bubble memory: A non-volatile memory (i.e., it is not erased when the power is turned off). The information is stored as microscopic pieces of magnetic polarisation.
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.
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".
C: A systems program developed for implementing the UNIX operating system. Combines data structure of a high-level language with ability to address machine at a level usually associated with assemblers language.
CAL: Computer Aided Learning CAL programs are written to take different actions on different student answers.
Computer language: Any group of letters, numbers, symbols and punctuation marks that enable a user to instruct or communicate with a computer. See also Programming languages and Machine language.
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.
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 5¼ 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 5¼ 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.
Firmware: Programs fixed in a computer's ROM (Read Only Memory), as compared to software, programs held outside the computer.
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 provices easier use for untrained programmers. There are now many such languages and dialects of the same language (for example MicroBASIC PolyBASIC etc).
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.
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.
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. There is internal memory inside the microcomputer itself, and external memory stored on a peripheral device such as disks or tape.
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. Menus allow user to easily and quickly set into programs without knowing any technical methods.
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.
Modem: Modulator-democulator. An instrument that connects a microcomputer to a telephone and allows it to communicate with another computer over the telephone lines.
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.
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.
Phreaking: Breaking into guarded computer systems via telephone links.
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. Types include x-y (flat-bed plotter) and drum plotters. The distinction is how the pens and paper are moved.
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.
Simulation: Creation of a mathematical model on computers that reflects a realistic system.
Software: Any programs used to operate a computer.
Structured programming: An approach to program writing that puts emphasis on over-all program design, readability, and other features.
Sysop: Systems operator. Person(s) who runs a bulletin board.
System: A collection of hardware and software where the whole is greater that 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.
VDU: Visual display unit. A device that shows computer output on a television screen.
Word: A group of bits that are processed together by the computer. Most microcomputers use eight or 16 bit words.

Correction

In the March issue of *Bits & Bytes,* Shayne Doyle, in reviewing the Brother HR-15 printer criticised the "non-standard parallel interface socket". Shayne Doyle now comments: "This was a misunderstanding on my part. It is in fact the socket for the keyboard or cut sheet feeder. The printer comes in either serial OR parallel versions."

CLASSIFIEDS

Wanted to Swap: Home written or public domain games for the Apple computer or Apple compatible computers. Write to: Ian Harris, R.D. 2, Kerikeri, Pungaere.

System 80/TRS80 Software Games etc, all half price to clear. Send for list to: Kane Agencies Ltd, P.O. Box 710, Nelson. Phone NN 84-066.

Save Over $1000: BBC 'B' 1.2 DOS, Dual Disc Drive (800K) switchable 40/80, wordwise, printer and software, $4300. Owner going overseas. Phone Waller 478-482 Christchurch.

Pegasus Computers: A group of Pegasus owners in Christchurch is interested in corresponding with any others who want or have information about these machines. Especially wanted is information from the manufacturers about expansion boards, video controller, disk interfacing, colour graphics, etc. Information is available about local add-ons and software. Contact G. Barbour, 168 Pacific Road, Christchurch 9.

ZX81 Contributors: *Bits & Bytes* has received in the mail in a damaged envelope a tape-cassette, labelled with the word, "Snaptrap". The parcel was posted at Riccarton on February 27. Would the sender please write to the Editor of *Bits & Bytes.*

For Sale: Colour monitor 12" BMC with Apple compatible interface $500. Phone Auckland 583-002.

Printer For Sale: Star DP-8480. As new just $500. Phone Martin, 888-032 Christchurch.

For Sale: System 80 computer with software $850.00 o.n.o. Phone 7488 Gore or write to A. Rodgers, 6 Onslow Street, Gore.

Wanted to Buy Urgently: Serial terminal — Screen and Keyboard. Please contact: Brent Copp, 2 Maidstone Road, Christchurch 4. Phone 516-892.

Wanted to Swap: Home written and public domain Sega games. Please send games and a blank C-60 tape to: William Lau, 6 Watters Place, Onekawa, Napier.

Warehouse Prices; Printers GEMINI 10X 120cps f/t $765 ($890 normal retail). GEMINI STAR DELTA 10" 160cps f/t 8K buffer $1111 ($1311.42). GEMINI STAR POWERTYPE 15" daisywheel 18cps f/t serial/parallel $999 ($1119.14). SHUGART DISC DRIVE SA300 $440 ($537). ZENITH AMBER MONITOR $329 ($429). Write to: COMSEC, P.O. Box 30, Waihi Beach South.

FOR SALE: ZX Printer, hardly used $150. Mono Cassette recorder (works with ZX81) $90. Games tape with several machine code games $10. Phone Levin 832-85.
DISK DRIVE: 1541, new $795. Speech Synthesiser micro vax, new $495. Ph. Auckland 482-119.
FOR SALE: Word Processor, PEL-TEK's Word Machine 2.0 (U.S.A.) for TRS-80 1/111 32/48K Disk System. $35.00. P. Clarke, 8 Norway St, Kelburn, Wellington.
FOR SALE; ZX-81, 16K, leads, manual, 2 books, extra long TV cord. Todd Dixon, 2/72 Takutai Ave., Bucklands Beach, Auckland, Ph 534-3865.

System 80 Upgrades: 48K, clock speed up, fast tape mode, internal disk controller. Repairs. S.A.E. for details. Spartacus Micro, Box 11, Waihi. Phone (08163) 7571.

Commodore 2031 Disk Drive for sale with IEEE/PET cable; well below cost price and brand new. Phone Andy, Wellington 759-759 evenings.

ZX81 16K 3D Game: Defense Penetrator. All machine code. $19.95. Write to: 34 Mataroa Rd, Auckland 6. One tape only.
Wanted to Swap: Public domain games or utilities for Apple II or IIe (Disk). Write to: G. Peterson, 27 Cornwall Street, Masterton.

Classified policy

There are two sorts of classifieds:
1. Commercial Classified – i.e. those where the person or organisation is seeking to make a profit. Rates – 50 cents per word payable in advance unless by prior arrangement. BITS & BYTES reserves the right to determine if any advertisement is a commercial classified.
2. Reader classifieds – i.e. those where a reader is selling privately owned computer hardware or software, seeking information, publicising a user group etc. Rates – the first 20 words are FREE. Thereafter 20 cents per word (payable in advance).

FOR SALE: Visicalc version 1.10 for IBM PC. Original disks and manual. As new, open to offers. Contact R. Cox, Phone 666-949, Wellington.
FOR SALE: C-64 Rabbit cartridge. New version with back-up. $95 ono. Ph Blenheim (057) 81-581.
IBM PARTS: from older composing equipment suitable for making a computer printer. Phone 482-059, Ext. 8021, Christchurch.
MYSTERY SUBSCRIBER: Would the person who subscribed and also ordered 10 back copies with a Bank of New Zealand bank cheque drawn on the Queen St branch, please forward your name and address!

British Software for BBC, CBM-64, VIC-20, Spectrum, ZX-81. Send S.A.S.E. for FREE mail order catalogue. Dealer enquiries extremely welcome. Paragon Software, 16 Archibald Street, Dunedin. Phone DN 44-242 Mon-Thur after 4pm.

OS-80 Users (MicroDos): Enhance your DOS, save Machine Language files (No Basic loader), Renumber plus many more features. For further information on this and other original software for the TRS-80 and System 80, send a S.A.E. to: Briggs Software, 14 Allan Berry Ave, Napier.

Printer For Sale: C-Itoh dot matrix, serial. Wide carriage (15"). RAM buffer, selectable baud rate, 3 typefaces. Phone Gordon, 33-703 Christchurch.

Radio Amateurs: Use your Commodore-64 or VIC-20 to generate morse from the keyboard. Top quality, reasonable cost program. Also program to predict H.F. propagation. Write to the N.Z. distributor: Personal Computer Systems, P.O. Box 860, Nelson.

Commodore Users. For details of the best printer deal in N.Z. Write to: Personal Computer Systems, P.O. Box 860, Nelson.

Scott Adams Voodoo Castle cartridge for VIC-20 for sale $40 ono. Write: Mark Cathro, 22 Bantry Street, Alexandra, Otago.

For Sale: Commodore VIC-20, 3 months old, excellent condition. Sell VIC-20, Datasette and books $495. Contact: S. Shearman, Fairway Dr, Kerikeri.
Printer Cables $34 for most micros. Centronics printer cable for Commodore $45. Disk drive and video/audio cables nad interfaces. Spartacus Micro, Box 11, Waihi. Phone (08163) 7571.

Commodore 64 software. Job register, a general purpose data storage and retrieval program, $21.50. Music teacher, learn to read usic on yout 64, $14.95. Prices include postage. Please send payment to freepost 690 Compusoft, Box 290, Manurewa.

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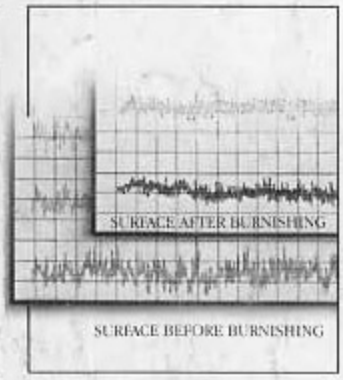
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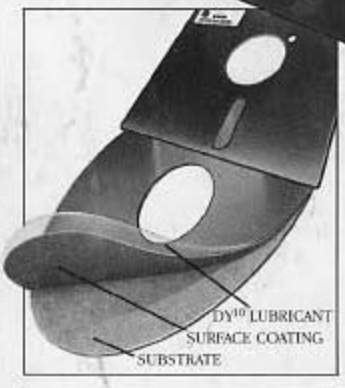
DISCOVER THE DYSAN DIFFERENCE

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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