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USING to the
APPLE

The first major enhancement to APPLE Basic since APPLESOFT!

GRAFFAK is an Australian software package from CYBERNETICS RESEARCH which extends the power of APPLESOFT for the programmer and computer hobbyist. Designed as a 1.5K boot program GRAFFAK extends the range of BASIC commands to give you the power and features normally only available to experienced assembler programmers or users of far more sophisticated hardware. There are 30 new commands in GRAFFAK which fall into five categories:

1. Screen Handling

12 New commands allowing FULL graphics/text intermixing with OVERWRITE, OR, XOR

2. Tape commands now available with DOS-STDRE, RECALL and SHLOAD with DOS.

3. PRINT USING from Basic

Print Using with COBOL, picture formatting, Zero suppression, decimal point alignment, floating dollar signs, etc

4. ENHANCED APPLESOFT commands

Fast GOTO and GOSUB with up to 40% faster execution times

DYNAMIC redimensioning of arrays.

ONERR fix

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16 bit PEEK, POKE Addressing

Input strings with leading blanks, commas and colons preserved.

5. Miscellaneous Commands and Utilities

Sorting Alpha string arrays

Music routine emulating the One on Programmers Aid.

Demonstration programs

Enhanced disk control with direct RWTS access!

Graphics utilities including

● Shape Maker

● Examine/Alter character set including lower case

● Function Plotter

GRAFFAK is a cheap but powerful extension to APPLESOFT BASIC. It also enables you to utilise features of your APPLE II computer previously unavailable with current software. GRAFFAK has

had a great deal of work put into it and at \$95. recommended retail it represents great value for professional and amateur programmers alike.



MINIMUM REQUIREMENTS:

48K APPLE II or APPLE II PLUS
PLUS APPLESOFT in ROM or Language Card 1 Diskette Drive
(Printer is optional)

CYBERNETICS RESEARCH is an Australian software based firm now specialising in microcomputer programming, consultancy and software development. We give consultancy and advice to any interested parties buying computers —

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especially micros.

We are also very interested in assisting any amateur programmers who would like to develop new software products — particularly on personal computers.

Phone for enquiries

inside your computer

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Rocking to the disk. Music of the future through computers. Page 42.



Something old, something new. The changes in computers from a room full of technology to the micro. Page 20.

editorial



THE MICRO-COMPUTER is now entering a new phase, one which may see the disappearance of some of the older companies. The announcement of machines by IBM, Xerox, Hewlett-Packard and others is threatening the 'traditional' manufacturers, such as Apple and Tandy.

This is just another turn of the wheel. Tandy and Apple previously upturned the market, away from the built-in-the-basement style of computer.

I believe we can expect to see a lot of innovation from the current market leaders, as they try to hold their position; just as the older systems have held on by offering unique capabilities. Apple, for example, will soon release their Logo language, as will Texas Instruments. It is innovations like these which will give these companies a head-start over the rest; — though it can't be for long — IBM already has two Pascals.

Meanwhile, at the older, basement, end of the range, we are seeing the introduction of new UNIX-based operating systems, and languages to support them.

Frankly, there's just so much happening we won't be able to cover it all, but we'll give it our best shot. See you next month.

—Les Bell

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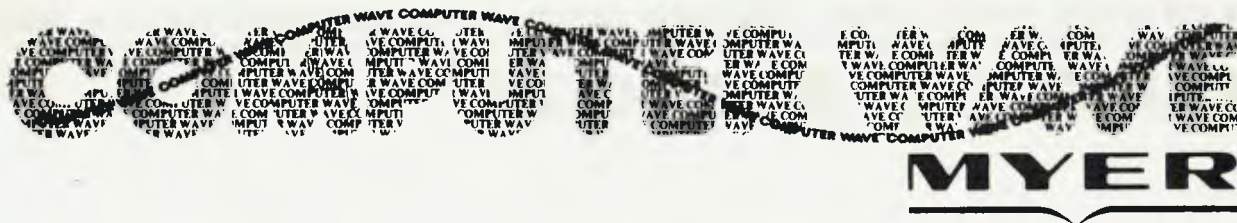
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your computer news



64K For Z80

PLUG IN and run — that's the boast with a new product from Japan. The Victorian Computer Shop has the Australian agency for a Z80 single board computer, which is aimed at the do-it-yourself and OEM markets.

The system runs CP/M 2.2 at 2MHz, has on-board disk controller for 2.5cm (5 inch) and 20cm (8 inch) floppies, blows 2716 Proms on-board, provides parallel and printer ports, and is fully assembled and tested.

Compak supplies floppies and power supply suitable for the board, and will provide support as required.

For enquiries contact Compak at 44 The Esplanade, Brighton Beach, Victoria. □

Quality Circle

DIGITAL ELECTRONICS has released a new computer terminal, the Falco TS-1, made in the US using a highly successful Japanese system of quality control known as "quality circle".

Quality circle is just beginning to be discussed in Australia, but is catching on in the US, according to Falco man Don Naples who has been assisting DE with the launch in Sydney.

Mr Naples, Vice President, Marketing Services, for Falco Data Products of Sunnyvale,

California, said the terminal had a number of important new features.

It has an induction key switch with a ferite core which "senses" switch depression and eliminates contact, producing a fail safe switch.

The keyboard has as standard 12 programmable function keys, an optional additional row of 14 programmable function keys, plus five optional programmable cursor control keys.

It is plug-compatible with TS-1 (Falco Data Products), ADM-31 (Lear Siegler), VT-52 (Digital Equipment) in its standard form and VT-100 (Digital Equipment) as a low cost option.

Mr Naples said that to ensure that manufacture and assembly matched the inherent quality of the product the quality circle system was introduced from Japan.

"Almost the entire semiconductor industry in the United States has come over to it," he said.

"The staff works together, meeting up to 20 times a day for between three and 12 minutes. They set their own goals.

"There are bonuses for discovering problems and better production gets points towards a bonus.

"But the added bonus for us is that the employees take much more pride in what they do." □

The Falco TS1 sells for \$1360, but bulk orders can bring the price down much lower.

Main features of the Falco TS1 include:

- Green P31 Phosphor standard screen
- 24 lines × 80 columns capacity
- Complete 128 ASCII character set
- Normal, double width, double height and double width/double height character sizes
- Detachable keyboard
- Block mode
- 6K ROM memory expandable to 16K
- Two interchangeable I/O ports with independent interface characteristics to allow simultaneous connections with computers, printers or modems
- Extension port feature echoes data from master port through slave port.

The terminal will be sold in Australia as the Digital Electronics TS1. □

Brighton Computers

COMPAK COMPUTER shop has recently been established on the beach road at Brighton, Victoria, to serve the low-cost end of the serious user market.

Word processing, business systems and education are the main areas being addressed. Typewriters interfaced with computers is an area readily apparent when you enter the shop, as Compak has interfaced systems with the Olivetti ET121 electronic daisywheel typewriter, the Olympia electronic ES100 and the IBM golfball.

The firm's low range system is based on the Stringy Floppy, which has been built into an interfacing unit, around the Tandy TRS-80 Model 1. This unit is intended

for the low-cost word processing and educational markets, but additionally has a range of general software including a visicalc competitor — Electric Spreadsheets.

The low-end disk system which Compak has chosen is the TRS-80 Model 3. It is being configured with MPI disks with a range of word processing and general business software. Epson printers, the ARCHIVES system, MPI Disks, Remex Disks and the Diablo printers are some of the other products which Compak are handling.

Fibre Optics

Perkin-Elmer Data Systems announces today, a new communications interface for use with the firms 32-bit Megamini computer systems and RS-232 interfaced devices.

The Single Channel Fibre Optic Converter provides an effective solution for connecting remote RS-232 devices to Perkin-Elmer computer systems in environments where standard wire links would be unreliable, and security is a requirement. The converter supports full duplex asynchronous data communications transmission speeds of up to 19.2K baud over a fibre optic cable at distances up to one kilometre.

Fibre Optics provide a viable communications solution where problems such as corrosive and explosive atmospheres, or electrical interference, exist between the host computer and remote RS-232 devices.

Typical price for a Perkin-Elmer Single Channel Optical Converter Link including two converters and 30 metres of optical cable is \$2300. Additional cable lengths are available up to one kilometre. □

Electric Editors

THE TCG GROUP has released the Hendrix Micro HS40 Series, for the electronic text editing and production of small to medium sized newspapers.

The Micro HS40 Series is a full capacity system, providing up to eight complete Edit II VDTs.

It will support up to eight I/O devices, including low and high-speed newswires, an on-line phototypesetter with 4/SIGHT soft copy terminals, remote input terminals, display ad terminals, printers and interfaces with other Hastech systems.

The system uses the TOPS/4 software system, with three separate enhancement packages capable of handling editorial functions, classified ad functions (including credit checking and over 6000 classifications), and composition functions (including 13,056 permanent formats and up to 1,000 fonts per typesetter).

Its microprocessor-driven controller provides one million character storage capacity on a floppy disk, and

20 megabytes when converted to a dual rigid disk system.

Micro HS40 Series systems are available in three cluster configurations.

In its smallest configuration, the Micro HS40 system supports up to eight VDTs, TOPS/4 software, one low-speed newswire interface with software, one console printer, and one typesetter interface with software.

The largest Micro HS40 cluster arrangement provides up to 24 VDTs, auto-routing of files and classified ads, and complete dependable backup to prevent production interruption.

A remote configuration for newspapers with bureaux, and for small newspapers sharing production facilities is also offered.

A package including three terminals, a console printer, news wire and typesetter interface is priced at under \$50,000.

For further information contact Mr Mike Barraclough on (02) 439 6477, at the TCG Group.



Accounting Power

O'REILLY COMPUTER has released a special version of the Financial and Management Accounting System FAMAS — for under \$10,000.

The system, known as Micro-FAMAS, is aimed mainly at first-time users in small accounting practices.

Its release comes at a time of fierce competition in the market for microcomputer-based accounting systems.

Although a general accounting system in its own right, MicroFAMAS represents a start-up kit to which other software can be added.

"It is a basic system for those who want to do general ledger work and represents a major addition to our product and marketing activities," O'Reilly's managing director, Mr Geoff O'Reilly said.

"It has the necessary and important elements of FAMAS, but is minus such application packages as DOGEN (word processing), debtors, time recording system, annual returns and superannuation.

"The NDK S4000 printer is replaced by an Epson MX80 and the user is provided with a day's in-house training instead of the 24 hours in his own office for the purchaser of FAMAS."

Mr O'Reilly said the system still ran on the ABC 24 microcomputer.

Perkin Profit

THE Perkin-Elmer Corporation of Connecticut has reported fiscal year sales in excess of \$US1 billion, and the 25th consecutive year of higher reported profits.

Sales for the year ended July were \$US1,115.8 million, up 12 per cent from sales of \$US996.1 million the previous year.

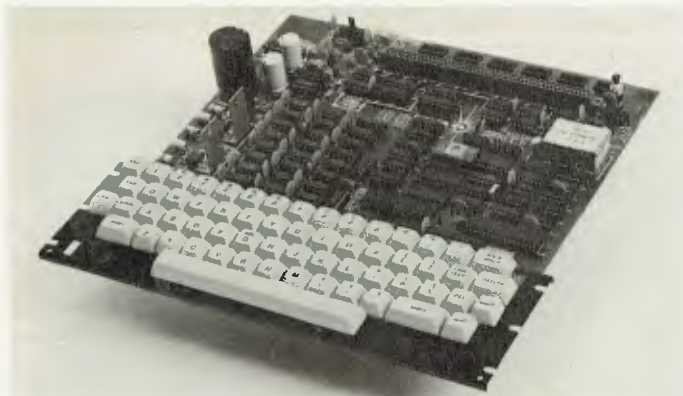
Net income advanced 14 per cent to \$78.1 million from the prior year's \$US68.2 million.

Robert H. Sorensen, Chairman and Chief Executive Officer, said despite the adverse impact of currency fluctuations, Perkin-Elmer was able to improve profitability in fiscal 1981 through cost control and other measures.

Mr Sorensen said that the largest percentage sales gain in 1981 was achieved by Micralign systems used in semi-conductor processing.

Other product areas that gained were 32-bit mini-computers, avionic instrumentation and analytical instruments.





BYO Computer

ELECTRONICS whiz kid Dick Smith is now selling a build-your-own computer, for only \$289.50.

Unlike other computer kits, the system, called the Super 80, has a full size professional 60-key keyboard, for easy operation.

Its features include an in-built cassette interface and an enormous 16 K of RAM onboard, which may be expanded to 48 K.

The Super 80 uses the popular Z80 microprocessor IC, has an inbuilt power supply, and has a direct RF output so you can use the computer with any TV set, saving you even more money.

Listed as Dick Smith Electronic's cat No K-3600, this kit has been designed not only for first-time users, but also for the serious computer user. This kit may be expanded to suit everyone's needs. □

Exam Corrections

THE VICTORIAN Government has commissioned a Perkin-Elmer Model 3220 Megamini, which will be used to cross-examine results from the all-important Higher School Certificate. It's hoped the computer will iron out those few human errors which have popped up in the system over the past few years.

The executive secretary of the Victorian Institute of

Secondary Education, Dr Lindsay Mackay, said the system had been chosen because it offered reliance transaction processing, back-up equipment for use during peak periods, and a high level of customer support.

The new system will process the exam results for over 27,000 students, and provide an automatic mailing service to students and thousands of teachers throughout the state.

The system obviously has application for Education Departments around the country and no doubt other state governments will be watching the success of the project for future possible installment. □

New Synchronous Timer

A NEW budget-priced synchronous timer has been released by Wattmaster Sales Pty Ltd.

The system, which retails for under \$20, is called the TU-5.

It is flush mounted and designed for both domestic and commercial use. The package is made in Japan by Mitsubishi Electric, and has a manual override switch and condition monitoring on up to 13 programs.

Wattmaster says the TU-5 can be used in lighting, irrigation, electric furnaces, air-conditioning equipment, shop window lighting and swimming pool filters. □

Actuarial Application

A LEADING Australian firm of consulting actuaries, Palmer Trahair Owen and Whittle (PTOW), of Sydney, has recently upgraded its computer facilities.

It has added extensive word processing capability, including laser printing techniques for fast document production to extend its wide range of advisory services. These are predominantly in the fields of employee benefit plans, life and general insurance, and superannuation investments, all of which feature extensive demands for statistical information and analysis.

Through a subsidiary, Computing and Statistical Operations Pty Limited (CSO), the firm provides computer support for customers, and general purpose software packages. These include leasing and money market systems, ledger accounting, time recording and billing, and a record keeping system for small company employee benefit plans.

PTOW recently installed an IBM 431 central processing unit with one megabyte of main memory and a diskette drive. Two 8809 tape drives and two 3310 fixed disk drives with 129 megabyte storage capacity (soon to be replaced with 3370 drives with 140 megabytes), a 3262 line printer and a 6670 Information distributor laser printer were also installed.

The system, which is linked to the Melbourne office by a leased Telecom line, includes 13 visual display units in Sydney, three VDUs and a terminal printer in Melbourne.

PTOW has had more than 12 years' experience in computing. From 1968 to 1980 it was an extensive user of a Sydney computer bureau. But in the late 1970's it began developing its current range of specialised computer programs on three IBM 5110 and two IBM 5120 desktop computers.

Other equipment included magnetic card typewriters for word processing, and key punch and key-to-diskette equipment for data transfer.

"We wanted to reduce our work with the outside time-sharing service, while setting up a facility for our own programming and providing a structure for users to work here," said Mr David Stanton, one of PTOW's partners.

"We have developed a lot of systems for clients on the 5110s, generally in the financial sector of life insurance and general insurance, as well as for finance companies in comprehensive leasing, money markets, building and property arrangements, and for superannuation funds."

Due to the highly mathematical nature of the work, CSO uses the technical computer language APL (A Programming Language) for its statistically-based programs, in contrast to the conventional business structured languages.

APL also provides for the handling of large policy master files, which can be written and changed quickly if required. All systems are designed to provide efficient transfer of data between the state branches and the central processing room mainframe in Sydney.

"Actuaries get involved with anything that may happen in the future, and an increasing amount of work is now being done in fields which have only recently been developed. Examples range from the extensive investigation into the investment needs of a company, to the overall design of a health insurance policy," Mr Stanton said.

An important area of consultation is employee benefit planning, where the consultancy gives regular advice to clients whose total assets exceed \$600 million.

The computer assists in record keeping and administra-

tion, as well as production of member benefit advice forms. It also tests against the tax office scale of maximum reasonable benefits, and measurement of investment performance.

In many other aspects of a consulting actuary's work, computers are often used to test, by simulation, more complex and based-on-life situations than could be handled manually. In recent years there have been numerous variations to the traditional life insurance policy.

With the aid of computers, actuaries can not only calculate the charge rates for these contracts, but also the overall structure of the policy.

The computer can assist in the evaluation of alternatives for employee superannuation schemes. □

Pocket Entry

A NEW pocket size hand held portable data entry terminal, designed for traditional data capture applications, has been released in Australia by Sydney based TCG Systems Automation Micronic (SAM).

The M200 is manufactured by Micronic AB of Sweden, and is claimed to incorporate technical features which significantly update other simple PDE terminals currently available in Australia, according to Mr Pat Gallagher, General Manager SAM.

The Micronic 200 features liquid crystal display and CMOS memory. It is powered by replaceable silver oxide or alkaline batteries, which will last more than six months in normal service.

"The M200 has a programmable record format, which in conjunction with the ability to select transmission paramet-

ers, makes it a hand-held data entry terminal ideal for numerous applications," Mr Gallagher said.

"The Micronic 200 can be used for normal keyboard entry without any accessories, or together with one of the accessory modules. A bar code module, for example, can be used for applications where data is entered from bar code labels."

The modules range in complexity from the relatively simple driver to programm-

able microprocessor-based drivers.

The M200 terminal weighs only 150g and measures a tiny 138 x 65 x 17 mm. The keyboard has 18 keys, easy to read and operate to ensure accurate data recording and fast operator training.

Up to 8K numeric characters can be registered and a seven segment LCD display provides for simple store order entry. Data transmission is by acoustic coupler or modem. □



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- MEMORY:** 5K RAM - expandable to 32K RAM.
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- GRAPHICS:** Full PET keystroke graphics.
- LANGUAGE:** PET BASIC
- FUNCTION KEYS:** 4 programmable function keys (8 separate functions).
- EXPANSION PORT:** For 3K direct plug-in memory expansion and for program cartridges. To expand memory further a separate "motherboard" with slots for memory expansion and programmed cartridges will be available.
- ACCESSORIES:** Will include Single Disk Drive, Printer, Tape Cassette, Joystick, Paddles and Lightpen.
- PROGRAMS:** Will be available on cassette and "VIC ROM Packs".

PRICE: \$399.95

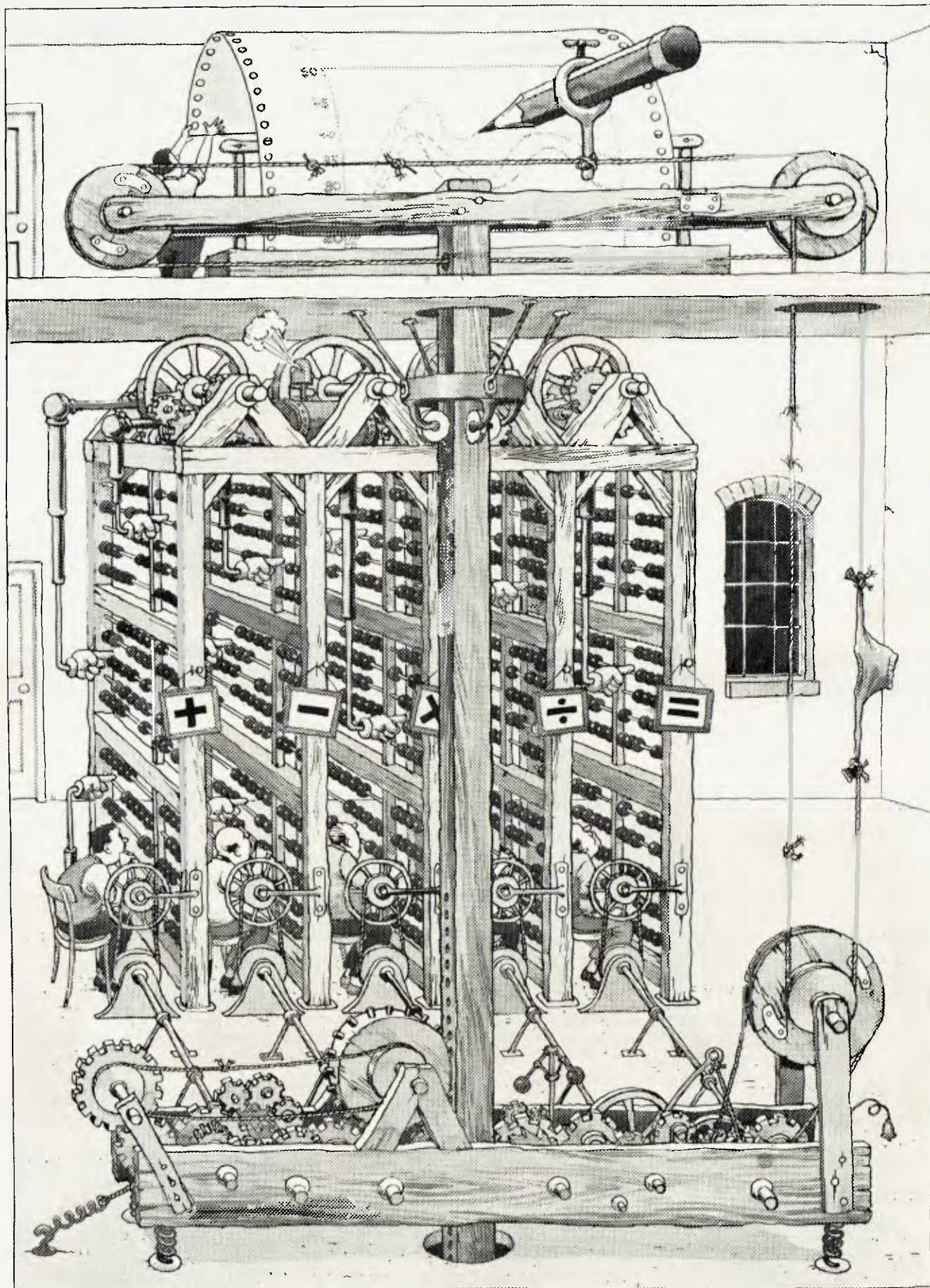


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For a poster of this illustration write to Hewlett Packard.

By processing large amounts of data, vital business decisions can be made quickly and easily.

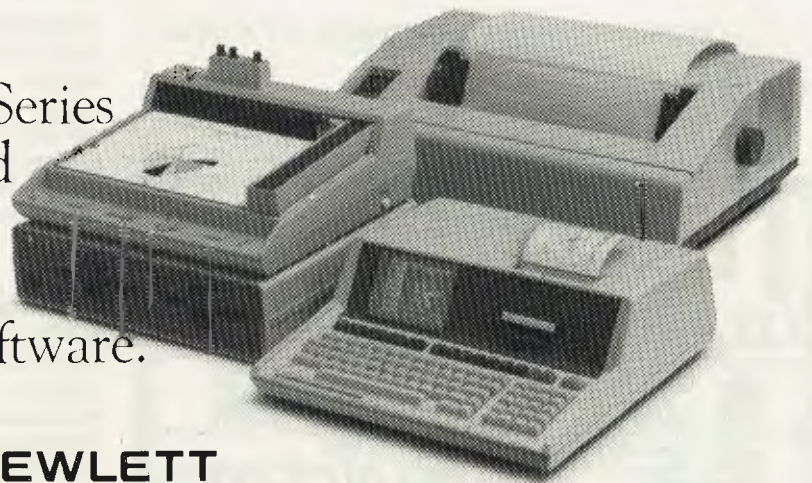
Of course in the fiercely competitive business environment, even the most efficient devices can become obsolete. Hewlett-Packard solve this problem once and for all by putting personal computers to work.

Personal computers that streamline budgeting, forecasting, investment, marketing and statistical analysis.

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Illustrated, the HP Series 80 system with integrated graphics, high speed flexible disc memory and business management software.



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Victorian Smith

TO SATISFY Victorian electronics customers, Dick Smith Electronics has opened another store, at 260 Sydney Road, Coburg.

Dick Smith has over 3000 items on sale at the new store. □

adopted by the CCITT. They define interfaces between processors or terminals, and public data networks.

Recommendation X.21 defines an interface between processors or terminals and public data networks offering leased-circuit and circuit-switched services. It also defines the physical interface for packet-switched services.

Recommendation X.25 defines three levels of protocols and includes "rules" governing packet-switched network services. In packet-switched networks, data is transmitted in discreet groups, allowing different users to "share" common communications lines. Recommendation X.21 is the physical, first-level interface preferred by the CCITT for X.25 packet-switched services.

SNA, introduced in 1974, is IBM's design framework for the programs and devices that handle the transmission of data within networks and provide higher level functions such as routing and flow control, network management and data presentation.

In an SNA system, X.21 or X.25-based services could be used to transport data between processors, terminals and controllers.

IBM Interfaces

PRODUCTS and features offering users of IBM computer systems expanded data transmission options were announced recently by the Data Processing Division of IBM Australia.

The computer program products, hardware device, and features enable IBM Systems Network Architecture (SNA) products to communicate using data transmission services based on the X.21 and X.25 International Telegraph and Telephone Consultative Committee (CCITT) recommendations.

The products allow IBM customers to use packet-switched, circuit-switched and leased-circuit services of the new public data networks, along with conventional telecommunications services in the operation of their IBM SNA networks.

Recommendations X.21 and X.25 are standards

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The monthly licence fee for the X.25 Network Control Program Packet-Switching Interface is \$187. The price of X.21 features is competitive with that of the traditional V24 interfaces which perform a similar function on the DATEL service. □

Datec Showcase

DATEC will be one of the Australian software companies to display at the Software Showcase, set down for the Sydney Hilton Hotel, in March 1982.

Neil Fabian of Datec, who supported the first Software Showcase, said: "Based on the success of the first Software Showcase, it is a worthwhile investment to again support the Software Showcase Exhibitions."

The organisers have announced Software Showcase exhibitions for Melbourne, in November of this year, as well as in Sydney, in March.

Bookings for Software Showcase (Melbourne) already include such companies as Hoskyns Group and Computer Sciences of Australia.

Both Software Showcase exhibitions have the full endorsement of the chairman of the Software Industry Committee for the Australian Computer society, Mr Karl Reed.

The organisers, working with the Software Industry Committee, are also staging a series of software seminars, in conjunction with both exhibitions. These seminars will attract a qualified audience to hear a variety of industry and user speakers. □

Sanyo in Darwin

SANYO OFFICE Machines Pty Ltd has opened a branch office in Darwin.

The company's managing director, Mr Ross Radford, said the new branch was in line with planned expansion, and was designed to service

the growing needs of the Darwin business community.

Sanyo's office is being managed by Mr Terry Maroath, who was previously based in Brisbane. Mr Maroath has over ten years experience in the field of business equipment, particularly in the areas of microcomputers and word processing.

In addition to a showroom, the branch has full sales and service facilities. It is centrally located in Darwin's Smith Street Mall. □

Mitre Micro

THE LARGEST chain of hardware stores in NSW, the Mitre 10-True Value Group, has introduced an electronic ordering system based on the MSI Data Corporation's Model 66 input device.

The MSI 66 hand-held terminal allows store managers to walk through the store punching in code numbers of products and quantities required.

Ordering is then done by hooking the MSI 66 into a special phone line direct to Himaco's warehouse and distribution centre at Silverwater, Sydney.

Ordering is done automatically between the store device and the Silverwater Datapoint computer.

The store manager receives visual and sound confirmation that the order is being transmitted, and that it has been received.

Mr Paul Waite, general manager of Himaco, the NSW arm of the Mitre 10-True Value chain, said the new system had produced enormous savings in time.

The MSI 66 portable data entry devices, which look like large hand-held calculators, can cope with about 300 different product lines at a time.

Every product has a check digit verified code, which provides a double checking system in-built to the computer to further eliminate the chance for error. □

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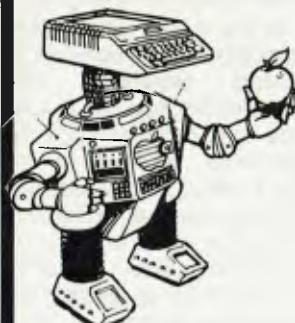
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GM Computerised Parts

THE GENERAL Motors Corporation, the largest industrial employer and car manufacturer in the world, is building one of the most modern and extensive computerised inventory and service parts distribution systems in the industry.

GM is using a Honeywell dual processor Level 66/80 computer system, with two Honeywell Level 6/57 small computers as front-end processors, as the backbone of the new national parts order collection and processing activity.

Two other large computers handle the material control system and parts plant system.

In conjunction with a network of "intelligent" terminals at 34 distribution centres and nine parts plants, the computers will interact dynamically to form one nationwide integrated communication and distribution system.

More than 14,000 employees in the company's warehousing and distribution division keep an inventory of and distribute some 300,000 different parts for the Pontiac, Chevrolet, Oldsmobile, Buick and Cadillac car divisions, and GMC Truck and Coach Division.

They process about 330,000 line transactions per day (more than ten million orders a year) for franchised GM dealers across the country, plus foreign GM dealers and distributors throughout the world. □

Nutritious Computers

BUYERS OF Australian meat with a beef about the product might wish they could take advantage of a service operating in the United States, designed to help food professionals get maximum value for their money.

Whether US buyers are dealing with prime Australian

beef, or a kangaroo which strayed into the abattoirs by mistake, Honeywell can help them to serve it in the most nutritional way possible.

The Honeywell computer has entered the kitchen to assist food professionals who need to know what's in the food products they prepare, produce, sell or serve.

Called the Nutrition Analysis system, the service offers to food manufacturers, restaurants, schools, hospitals, nursing homes and other institutions a quick, easy and reliable means of calculating the amount of each nutrient in a given recipe, without complex, and expensive laboratory tests.

A typical analysis gives moisture content, calories, protein, carbohydrates, fat, unsaturated fat, cholesterol, sodium and potassium, all in grams per serving. It then gives protein, vitamins A and C, thiamin, riboflavin, niacin, calcium, iron and phosphorus content as a percentage of the US Recommended Daily Allowance.

The Nutrition Analysis system is easy to use. Firms using it contact Honeywell DATANETWORK, which provides the service, by using a typewriter-like terminal capable of transmitting and receiving over telephone lines.

The operator, who requires no special training, dials the computer and types the recipes. The two analyses are printed on the terminal in minutes. An analysis of a typical recipe costs users about \$3.

In the future, when home computers are more widespread, Honeywell said home cooks may call in a recipe to find out at once the nutritional analysis of the day's menu, supplement any missing nutrients for the family and check the presence of ingredients either forbidden or required in a special diet, for medical reasons. □

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'Scotch' data recording products all perform with a high degree of excellence. Technology assures that excellence. 3M uses the same technical expertise and quality control programmes throughout the entire line of 'Scotch' products. 'Scotch' products for information processing will help you get the best from your system. We give you our best to make sure.

Diskettes 'Scotch' diskettes are available in standard 8-inch and 5 1/4-inch sizes offering single or double sided. Each 'Scotch' diskette is formatted and verified by 3M for 100% certification of error-free performance. Even storage, mailing and handling is made easier with a variety of packaging configurations available from 3M.

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Do-it-yourself Data protection. Simply saturate the white cleaning fabric, insert into the drive and turn it on. It takes less than 30 seconds to eliminate particles of dirt, dust and oxide that accumulate with normal use.

Personal Computing Cassette The 'Scotch' personal computing cassette is designed for use with microcomputers. Only 'Scotch' personal computing cassettes provide this combination of performance and reliability.

Available from leading computer supply retailers.



A CASE FOR SCOTCH BRAND DATA RECORDING PRODUCTS

Computer Study

THE TECHNICAL and Further Education Department of Victoria (TAFE) is planning to introduce a computer-managed learning system to a range of major study areas.

Three areas — electrical, plumbing and motor mechanics — are already applying aspects of computer managed learning (CML) to their courses. TAFE plans to extend the system to other study areas, as instructors become familiar with its operation.

CML can control and monitor students' progress, then record and report this progress to their instructors. The system provides instructors with an invaluable aid to assist and manage self-paces and modularised educational processes.

For instructors, CML reduces filing and corrections to a minimum. The computer produces reports as required, and record-keeping is automated. In addition, the instructors can communicate with the students via electronic mail, and the system keeps track of students with invaluable status information at all times.

For students, CML enables them to work at their own pace, and encourages them to assume greater responsibility for their own learning and for completion of the course. They are not tied to strict timetables, because CML has the potential to provide them with a highly-motivational and informative self-paced facility 24 hours a day, seven days a week (through computer terminals

in homes, factories and other locations).

CML is a proven and well-developed software system, and its designers at Canada's Southern Alberta Institute of Technology (in Calgary, Alberta) have been using it since 1976.

CML's author, Mr Alex Stephen, SAIT's Assistant Director of Instruction, has just returned to Calgary after conducting a series of workshops in Melbourne for TAFE instructors in Victoria, at which he explained the development of the system and gave detailed instruction in its operations.

As well as the CML software, TAFE has acquired the accompanying course materials, including study guides and supportive banks of questions covering such fields as electronics, mathe-

matics, communication arts, chemistry and medical science.

TAFE has also purchased copyright to the CML package in Australia. □

Medical Software

AN AUSTRALIAN written medical and dental software package is now on the market, to take the pain out of surgery secretarial operations.

The packages offered by deForest Software, cater for patient history, and accounting and filing activities.

Included with the packages are four-day training courses, with full instruction of the different uses for the material in dental and general medical practice.

Both packages are run on the TRS-80 model two, under the CPM operating system.

Keep **your computer** *Magazine neat.*



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Legal Accountability

A COMPUTERISED office and trust accounting system, developed specifically for solicitors, has been issued with a certificate of compliance by the Law Society of New South Wales.

The computer system, called SOLAR, was developed by Diehl Data Systems Pty Ltd, to provide increased office efficiency complete data availability and reduced administration expenses.

Based on the powerful Alpha Micro 16-bit micro-processor, with multi-user, multi-tasking facilities, the SOLAR system provides integrated accounting and word processing in one fully compatible system.

In its opinion, the Law Society believed the Diehl package was capable of enabling records to be created and maintained in accordance with the Solicitors' Trust Account Regulations in New South Wales.

Two of the Diehl Solicitors' systems are already fully operational in solicitors' practices in the Sydney area.

A major feature of the system is its expandability without software revision or hardware replacement. The system can be installed with one screen and a printer and then expanded at a later date with additional screens, printers and memory capacity, as the number of matters outgrow the initial capabilities of the basic system.

The suite of programs in the SOLAR system encompasses fully computerised word processing, trust ledger, office ledger, private ledger, client register, matter register, finished matter register, matter diary system and management reporting.

Diehl Data Systems Pty Ltd is an Australian company providing turnkey mini computer systems for a variety of business applications. It is located at 84 Edwin Street, Croydon, NSW 2132. □



Australian Challenger

A NEW Australian designed micro-computer, the Dyad Dragon is about to take on the foreign market leaders.

The computer, according to the designer, Mr Bill Penrose, "has been designed to compete by price and quality against the best the overseas manufacturers can throw against us.

"The Dragon has been designed and developed over the past three years by Melbourne company, Professional Australian Systems, to meet the specific needs of Australian schools," Mr Penrose says.

PAS Managing Director, Mr Neil McKellar, said the unit has been field tested, and the final product modified to meet any school's needs for both computer education and school administration requirements.

The company also markets another school computer, the DYAD R1, which was designed to meet a single application computer education in a classroom environment.

"Part of the stimulus behind the past three years designing has been the lack of a modular product that will handle all a school's needs effectively," Mr McKellar said.

The Dragon is based on the 6802 microprocessor chip, and has an inbuilt mark

sense card reader. It has 14 Kbytes of ROM, including 10 K of DYAD BASIC. Because of its modular design it can be added to a school's existing hardware, without the need for expensive modems, software or interface cards.

The basic model comes with 16 Kbytes of Random Access Memory (RAM) and can be built to 48 K.

It can be purchased with two disk drives giving a total of 630 Kbytes of storage, and a further two drives can be handled under its DOS.

The reader is computer controlled, and handles up to 60 cards per minute.

The Dragon is to be distributed in Australia by Zephyr Products, 70 Batesford Road, Chadstone, Victoria. □

Cocky Computers

A RANGE of software systems for use by farmers is being offered by Farmplan Pty Ltd, to make life on the land easier.

Farmers will be as happy as pigs in mud with the three programs available, which are alleged to be able to handle all the tedious accounting work, as well as some of the more intricate farm and stock management details.

There are three categories of programs in the complete package; one providing accounting facilities with gen-

eral ledger, nominal, enterprise, overhead, capital and stock ledgers and an added bonus of purchase and budget information.

Another program has intensive enterprise control with beef breeding programs, merino flock testing, dairying, pig breeding and feeding and crop and paddock records. The final program is aimed at small farm management, and has facilities for cash flow projections, feed calculations and pedigree records.

The package includes a backup service of manuals, documentation and training at a Farmplan Computer Vet's office, two boxes of disks and one box of paper.

Farmplan also provides continued updates on new facilities, access to Agricultural library and user information exchanges. □

Dispensing Computers

MICRONIC AB of Sweden has sold 2500 portable data entry terminals and peripherals to Unichem, the largest pharmaceutical wholesaler in Europe.

The order is the largest placed since the introduction of PDE systems in Europe, and is expected to generate considerable interest among Australian pharmaceutical wholesalers.

Micronic is distributed in Australia through Systems Automation Micronic (SAM) Pty Limited, a division of Sydney's TCG Group.

SAM General Manager, Mr Pat Gallagher, said UniChem had ordered the Micronic 445 hand-held terminal, which can receive data as well as transmit. The M445 is already in use in Australia in the retail and wholesaling industries.

Mr Gallagher said UniChem would be using the terminals for order entry in pharmacies and to inform the pharmacist of out-of-stock items at the time of transmission. This service is essential to pharmacy, he said. □

Australia's Fastest Selling Home Computer

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SOLD!**



DICK SMITH'S SYSTEM 80

In just a few short years, operating a computer will be as much a part of everyday life as the calculator and TV set are today.

And it's the people that have a knowledge of computers today that will certainly have the best chances in tomorrow's highly competitive and technical world.

What is a home computer?

- The ultimate multiple TV game. An untiring tutor who will teach you almost anything and at your own speed. A way of familiarising yourself with computer technology.
- How does it do this?
- With the help of computer programs available on common audio cassettes.

What programs are available?

- Virtually an infinite range: from us, and from thousands of other suppliers.
- Everything from teaching the kids to read properly, teaching yourself to type . . . right through to programs which will help you run your business and even do your income tax calculations for you!
- And, as we said before, once you understand your computer, you'll be able to write your own programs to do just what YOU want to do!

The Dick Smith System 80. Great Value at only \$750.00



This is just a sample of the wide range of software available for use on your System 80.

Are they difficult to use?

Lets answer that question by asking you a question: Do you use a cassette recorder in your home?

The Dick Smith System 80 home computer is just as easy to use. You turn the computer on (just like turning on the cassette), pop in the program cassette, press the 'play' button (just like on your hi-fi cassette) and you're ready to go computing. You tell the program to run by typing the letters 'RUN' and you're away! The program itself generally tells you what to do next.

It couldn't be easier!



Why is the System 80 Australia's fastest selling computer?

Simply because it offers, by far, the best value for money for a practical computer system.

A 'practical system' quite simply means one that **you** can use (and that includes program availability).

There are cheaper computers, no-one is disputing that. But you need to be a boffin to work some of them out. Others have little or no programs available.

Yes, there are a lot of computers to choose from at the moment. Just like the early days of colour TV. Where have they all gone now?

Some computers are being offered as various bits and pieces. This is quite okay: as long as you understand what you are buying! The System 80 computer, as it comes to you, is a fully operational computer. You don't need to buy another thing to make it work: plug it in to a TV set and a power point - and it works.

Many other computers are little more than fancy plastic boxes: until you start buying the 'add-ons' to make them work, they're not much use to you.

Beware of seemingly attractive 'computer only' prices. Make sure you take into account the 'add-ons'!

And it's over \$500 cheaper than the Tandy TRS-80!

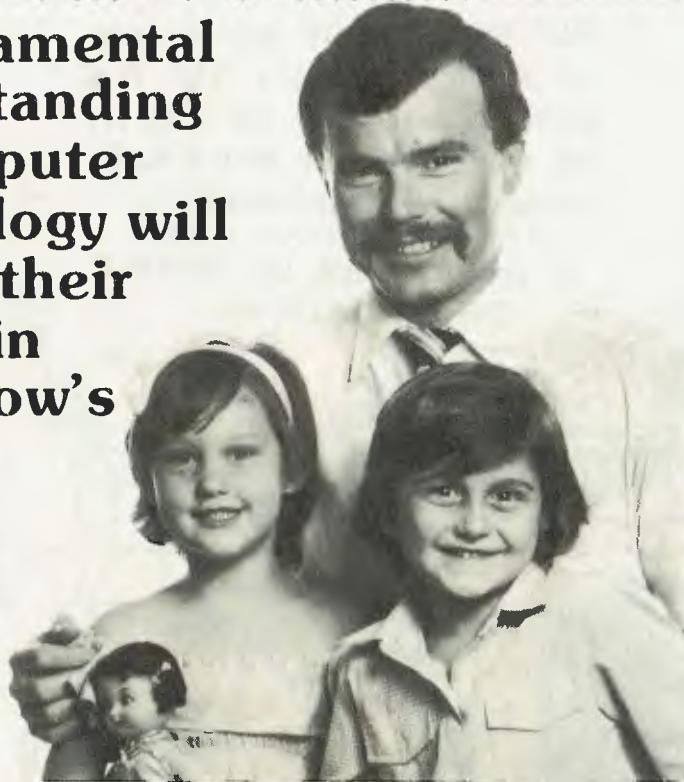
If you buy the Dick Smith System 80, you'll save over \$500 on the current Tandy computer.

The closest equivalent current model! Tandy Computer is the TRS-80 model III, with 16K of memory, monitor, but no cassette recorder. Add a cassette recorder and the system sells for over \$1450. We do not compare the System 80 against the TRS-80 model I as it has been discontinued in the USA, the country of manufacture and no longer sold here.

The Dick Smith System 80 is supplied with 16K memory and built-in cassette recorder. It doesn't need a separate monitor, as it will plug in to any TV set. If you do add a separate monitor, the price is only \$899.

So you can save a bundle by buying the Dick Smith System 80 - and still have access to the huge range of software for the TRS-80!

A fundamental understanding of computer technology will secure their future in tomorrow's world.*



Want to know more?

We've prepared a detailed brochure showing you just what the Dick Smith System 80 Home Computer can do for you. All you have to do is ask for a copy.

Call in to your nearest Dick Smith store — have a chat with the helpful computer specialist in the store — or drop us a line and we'll gladly send you a copy free of charge.



Or even better . . .

Take advantage of our exclusive trial offer below. There's nothing better than 'hands on' experience! And you're under no obligation.

How will a home computer help my children?

From what we've said, you might imagine that a computer might make us lazy.

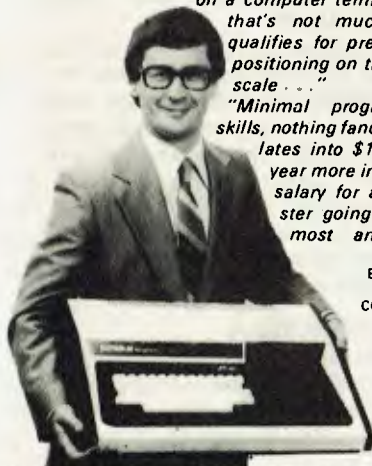
Far from it! Teachers report that students with access to computers at home are usually much more receptive to learning, and they learn faster. Consequently, they get better grades. But a computer can do much more than this for your children. It can teach you to read better, understand English or Mathematics easier, learn spelling, even teach you to touch type or read music. And much, much more.

Very quickly, your children will learn how a computer works. What makes it go. You'll find that they're even writing their own programs after a few weeks. And the more they learn, the more they want to learn. Because they can see the results of their learning immediately, it's enjoyable, so they want to learn more and more!

***Read what a leading US magazine says:**

"If a youngster graduates from school with no particular skills and applies for a job with Pacific (the local utility and telephone company) and if on the application he can claim 10 hours experience on a computer terminal and that's not much — it qualifies for preferential positioning on the hiring scale . . ."

"Minimal programming skills, nothing fancy, translates into \$1000 per year more in starting salary for a youngster going into almost any job."



Extract from PERSONAL COMPUTING September, 1981

This is a list of private companies and Government departments who have chosen the System 80 computer above other brands.

Australia Post
Sydney University
Blue Metal Industries
A.I.S. Port Kembla
Lysaghts

RAAF Base Williamtown
Department of Navy
Department of Home Affairs
Philips Consumer Products
University of Adelaide

Department of Health
Macquarie University
Philips Consumer Products — Clayton
NSW Police Department

EXCLUSIVE 14 DAY TRIAL OFFER

If you've been thinking about a home computer for your family, but haven't quite been able to make up your mind, here's an offer you shouldn't miss out on, for your family's sake.

Buy a Dick Smith System 80 and use it in your own home for up to 14 days. If you're not completely happy, you may return it (as long as it is in original condition and packaging) for a full refund of the purchase price — no questions asked!

You can even charge it to your Bankcard if you wish: for extended credit should you require it.

With your System 80 computer, we'll send you a free pamphlet detailing the programs currently available from Dick Smith Electronics. And remember — there are literally thousands of other programs available that will run perfectly in your System 80 computer.

DICK SMITH Electronics



MAIL ORDER CENTRE: PO Box 321, North Ryde, 2113.

Phone: (02) 888 3200

Yes! I recognise the need for investing in the future. Please rush me a System 80 computer. (Cat. X-4005) I understand I can return it within 14 days for a full refund.

I include \$760 (\$750 plus \$10 insured road freight anywhere in Australia)

Name

Address (not a PO Box!)

Postcode

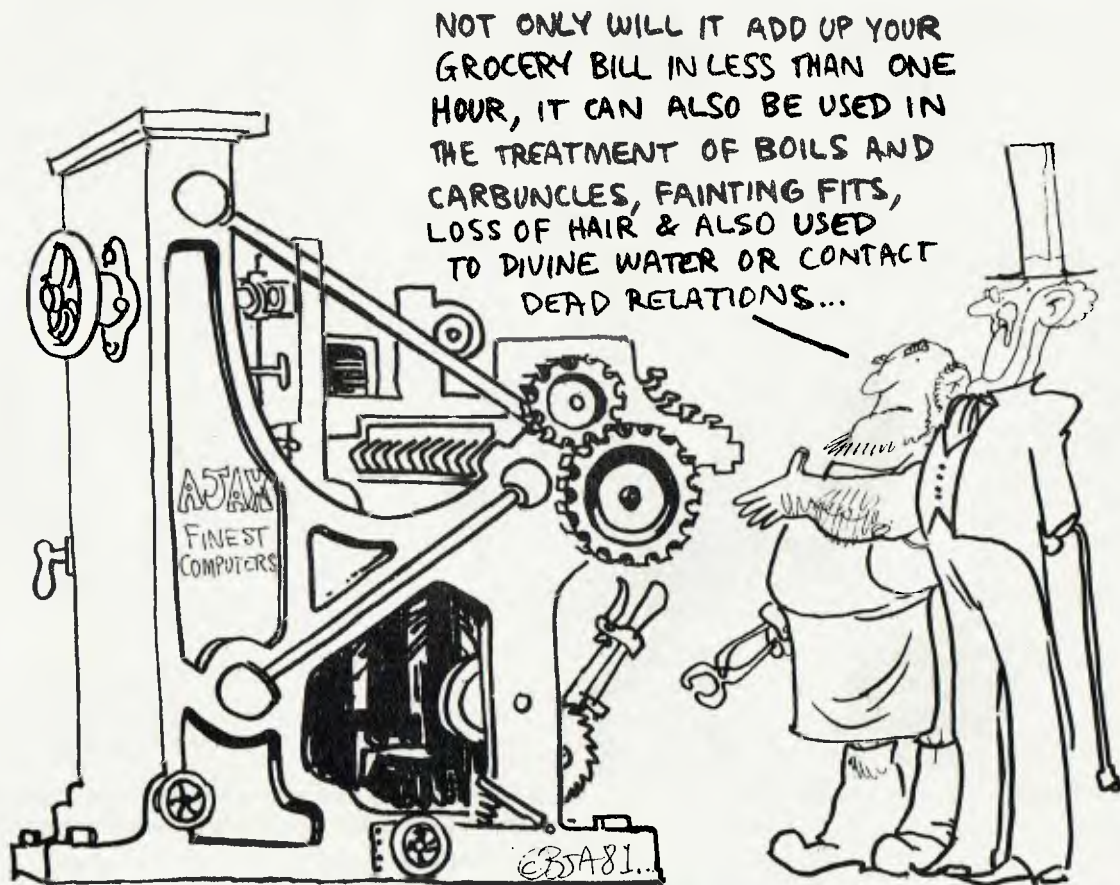
Method of payment: Bankcard No.

Cheque enclosed

Expiry Date

Postal Order enclosed

Please charge to my Bankcard Signature



COMPUTER GROWTH

The Art of Getting Smaller

Computers have caused an intra-generation technological change, having been with us for less than 40 years. The impact on society has been massive, but most people are still unaware of the full applications of computers in business, industry and the home.

The changes have been so rapid in technological research that equipment is 'dated' as soon as it appears.

JOHN MELLOR, in Melbourne, and TONY BLACKIE, in Sydney, have been looking at these changes, and talking to academics involved in the building of the first computers in this country and the subsequent modification of those machines.

IN THE folklore building up around electronics, it is said that if the aviation industry had developed as fast as electronic technology, the Jumbo jet would have taken off a few weeks after the Wright brothers first rose above the earth at Kitty Hawk.

While the timing might need tidying up by a week or two, the analogy is a valid illustration of the most rapid development in technology seen by man since 100,000 Egyptians, and sundry slave drivers, developed the principles of trigonometry in blocks of rock, near the banks of the Nile.

Few people in this country are as aware of the pace at which this technology — the science of the useful — has accelerated than Dr Trevor Pearcey, Dean of the School of computing and Information Systems at the Caulfield Institute of Technology in Melbourne.

Dr Pearcey was a member of the team which built Australia's first computer during the late 1940s and early '50s, and now

trains 750 students in the latest computing techniques.

He says digital technology has developed at such a fantastic speed over the last 30 years because the computer was such an effective tool for designing even better computers and electronics componentry.

The pace was also very rapid as there were so many potential uses for digital technology, and these uses were only realised once electronics was going.

Dr Pearcey first began working on computers during World War Two, when rudimentary computing devices were used for cracking codes, and for heavy computations involving weapons development and radar wave optics.

The First Wave

He worked with differential analysers, of which there were only two full scale versions in Britain at the time. These were mechanical incremental devices, with



Pic 1. CSIRAC's control panel operation. The computer was fed coded punch tape. Pic 2. Operator on left uses a special ticker tape keyboard to punch out coded instruction tape for CSIRAC.



screw shafts and gear wheels driven by an electric motor. They were in a class called analogue calculators, and were non-digital.

These devices were the first wave of a series of evolutions towards the true computer, and were followed by the electro-mechanical punch-card machines. These were digital and had electro-magnetic wheel counters. They could transfer from counter to counter, and one counter to another, and subtract in a controlled way.

The progress was specified by plug board. The programs were very short, and in that sense the machines were more calculators than computers. They operated at about two operations a second, at most.

Towards the end of the war, the Bell System, which knew all about relays from its telephone exchanges, built an electro-magnetic system. This was a sequenced calculator, using thousands of telephone exchange relays.

Calculations were made by relays opening and closing and setting up a network through the controls and interconnections.

It was an expensive machine, but at between four and five operations a second, it was twice as fast as the IBM punch card system. The relay machines were punch-tape fed, and were very reliable.

Dr Pearcey said: "You could load your program tapes into the readers, leave it running, and close up for the night. There would be a load of punch-tape results to pick up in the morning."

At this stage, still the late 1940s, these machines were still used mainly for military work (the relay machines are used extensively for ballistics calculations), and had not graduated into business or civilian fields.

18,000 Radio Valves

Around the same time, another US

development was the ENIAC — the Electronic Numerical Integrated Automatic Calculator — which was electronically sequenced, and used about 18,000 radio valves. It ran at 5000 instructions per second. The amount of work ENIAC could do in an hour would take the relay machine at least a week.

But it was far from reliable, and the best you could expect with ENIAC was about an hour of fault-free running, where the relay machine would go for days without a fault.

However, these machines were not true computers in which instructions were internally stored. The early true computers came out of Britain.

The first was a rudimentary device at the University of Manchester used as a test bed for storage systems, using a cathode ray tube for storing digits.

At the same time, about 1948, researchers at Cambridge University built EDSAC (the Electronic Delay Storage Automatic computer), and this became the first computer to produce useful results for public scientific use, rather than military use.

It was available to any users who were prepared to programme it, and as a result of this arrangement, a considerable amount of today's basic programming principles (such as the sub-routine) were developed by EDSAC.

The development of these thermal vacuum tube (radio valve) computers could never have taken place without the mass production of valves for the then prospering radio industry, as the machines used thousands of valves. But they were notoriously unreliable, and in the late '40s the Bell System in the US deliberately set out to produce a reliable and compact semiconductor device.

The Transistor Arrives

They came up with the transistor in the early 1950s.

Transistors improved through the '50s, and by the early 1960s, stimulated by the Cold War, the first elementary integrated circuits were developed. Then miniaturisation began to accelerate. Large scale integration saw thousands of transistors on a slice.

Then came the chip, initially hosting just a few transistors. By the late 1960s the chip was in service on the market in non-military applications.

The Rise of the Processor

THE USE of machines for information processing can be traced well back into history. The ancient abacus was followed by the mechanical calculators of the 17th century, developed by people like Blaise Pascal (a name computer users will no doubt recognise) and William Von Leibniz.

These inventions were limited to the technology of the time, and were therefore extremely unreliable. But they provided the prototypes for the modern calculators and computers.

One of those who is mentioned in literature as being the father of computers is Charles Babbage, an eccentric British mathematician, with a genius for inventions.

He created the Difference Engine and the Analytical Engine. These were steam driven calculators, which solved difference equations.

In 1944 Howard Aiken, of Harvard University, completed the Harvard Mark 1 Automatic Sequence Controlled Calculator.

The Mark 1 was outdated before it was completed, because it was too slow. The mechanical parts took too long to move from one position to another. For example, it took six seconds for a multiplication, and 12 seconds for a division. The Mark 1 was a massive piece of machinery, filling a large room with banks of complex wiring.

A short time later one John W. Mauchly designed ENIAC, Electric Numerical Integrator and Computer. ENIAC used vacuum tubes for computing and memory. For control it used an electrical plugboard, like a telephone switchboard. It was 500 times faster

than the best electro-mechanical computers, and rendered all the mechanical computers obsolete.

The next machine in the race to perfect the computer was called EDVAC, the Electronic Discrete Variable Computer. It was built around the basic framework provided by the brilliant Hungarian-American mathematician John von Neumann.

Two of the advances made with EDVAC have been incorporated in almost every computer built since. The first was binary notation and the second was the storage of programs within the computer's memory.

In the late 1950s the greatest advance in computer technology was made — the use of the transistor.

It allowed researchers to reduce the size of computers, and therefore make them more acceptable to business and commercial use. At the same time magnetic core memory was introduced, allowing for safe storage of information, and easy and quick retrieval of data.

In the early 60s integrated circuits were used, and hundreds of transistors were placed on a single silicon chip. This allowed the size of computers to be reduced even more, so the home and office computer were born.

As technology advanced, and more and more transistors could be placed on a single microprocessor and micro-computer came into being.

After a slow start, computers have now taken off. Innovations are coming at such a rate they make a machine produced today 'old fashioned' within months. □

Today, says Dr Pearcey, there are tens of hundreds of thousands of transistors on the chip, with increasingly complex interconnections.

The computer project on which Dr Pearcey was a joint designer — know as CSIRAC — was put together in the CSIRO's division of radiophysics on the campus of the University of Sydney.

The theoretical design was completed at the end of 1947. While it was developed quite independently of the Cambridge EDSAC, both computers used mercury delay-line information storage, in which bits circulated down columns of mercury about a metre long.

The computer was housed in two huge steel cabinets, about seven metres long, a metre deep, and a little under three metres high. It used so many radio valves it was necessary to have forced fresh air cooling to control the heat rising from bank after bank of these glowing vacuum tubes. CSIRAC was a hungry beast, consuming between 30,000 and 40,000 watts of power.

Information circulated through the machine in a series of timed and amplified pulses, read off 12-hole and five-hole tape (ticker tape). This tape was punched out on a coding machine, before being fed to the computer itself.

CSIRAC began operating late in 1950, and found a number of homes for itself. It was finally decommissioned in 1964, while in the hands of the University of Melbourne, then spent 16 years in exile in the vaults of the Melbourne museum. CSIRAC is now in a sizeable display area at the Caulfield Institute of Technology.

The Shrink Continues

When Dr Pearcey casts his mind back to CSIRAC, and compares it with today's technology, the Jumbo jet analogy takes on a new meaning.

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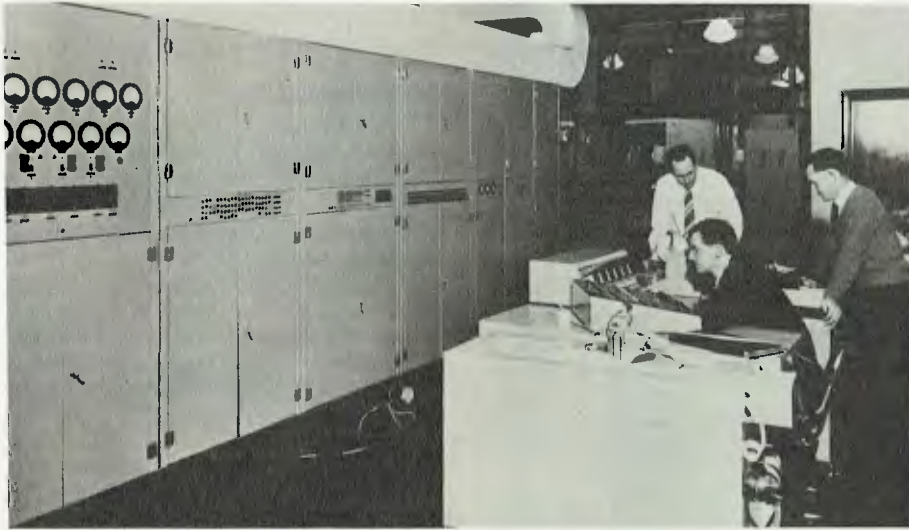
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One of the huge cabinets housing the works. There is a second bank, just as big, behind the one pictured. Today the lot could fit into a matchbox, use a million times less power and be 100 times more capable.



He says ignoring the input and output, which still have to be tailored to a size humans can handle, the same computing capability today would fit inside a matchbox. As a bonus the speed would have risen from 1000 instructions a second to 100,000 instructions a second, and the power consumed would be about a million times less — milliwatts instead of kilowatts.

"If you design a lot of chips together, using a special kind of architecture, it is possible today to get 50 million instructions per second," he says.

Dr Pearcey estimated CSIRAC would have cost about \$300,000 to buy. Yet the same capability would cost only a few hundred dollars just 30 years later. He says a desk-top business computer worth about \$5000 in 1981 would, in 1960, have

consisted of bank after bank of cabinets taking up a large amount of floor space, and would have cost about \$500,000.

"But in those early days the field was entirely new. Everything you did was new, and because it was a completely new field, it really didn't take very bright people to do new things.

"On the other hand, what is left now are the difficult problems; very sophisticated techniques that will only be carried out by the very bright people, because all the easy stuff has been done by people like me.

"It might end up like the motor car. It did not take long for the car to become a defined shape and for the technology to be established. Then all that was left was applying refinements and changing fashion.

"But I think there are still some major advances yet to be made in electronics. We may, for example, combine our electronics with genetic engineering, and produce a race of people better than ourselves. We humans might die out. There are now a small number of people working on this.

"The major development will be the spread of the computer into every field. Beyond ten years ago, computers were big, expensive and hidden away. They were having effects on our economy and our business procedures that were quite

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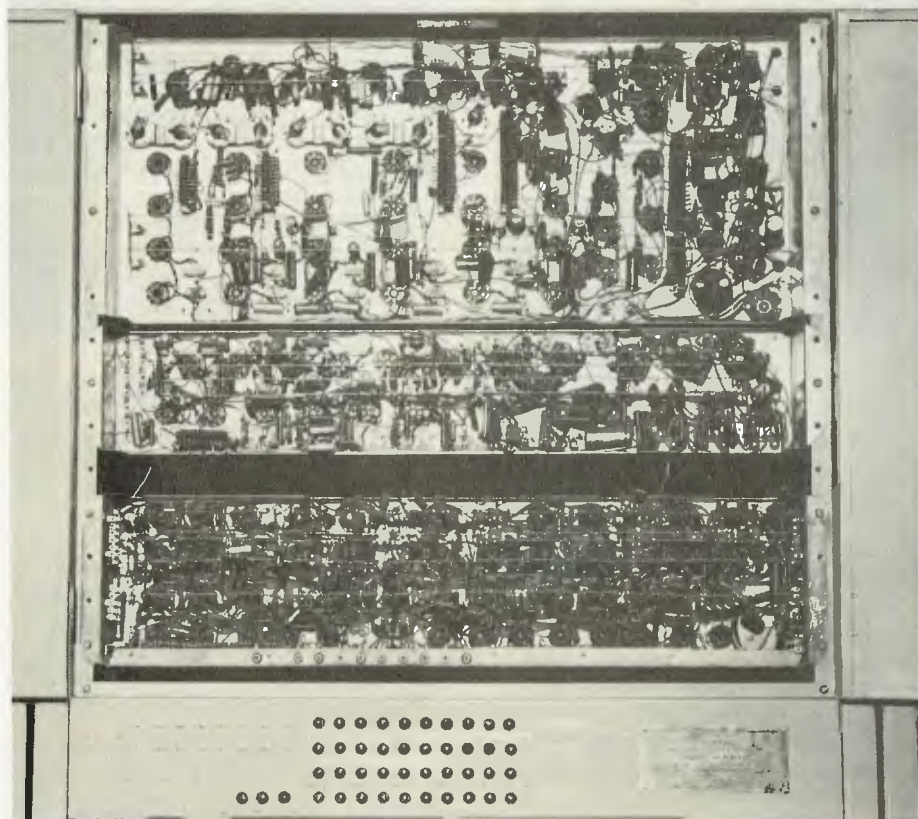
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Bulk wiring! This panel measures a little less than a square metre. These days its capability would come close to fitting on a pin head.

revolutionary. They affected everybody, but no-one noticed them.

"Now the computer has come out into the open and everybody can make contact with them and they can see them."

Shortsighted Seers

Turning the clock backwards for a moment, in 1951, the US Defence Department released a statement saying five Univacs 1s, the computer then in use, would be able to handle computing needs for the foreseeable future.

This was shortsightedness in the extreme, given the myriad of computers the US armed forces now use to operate their massive array of highly sophisticated weaponry systems; but it was not an uncommon view in those 'dark ages' 30 years ago.

But according to Professor V.X. Gledhill, Dean of the Faculty of Mathematics and computing Sciences at the NSW Institute of Technology, the changes in computer technology were predictable.

"From a computer scientist's point of view, the most interesting aspect of the evolution of computers has been the predictable nature of their growth," he says.

"And there is no doubt that computers will continue to grow at a predictable rate. There will always be forecasters who can accurately predict what will happen with computers."

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This is a very fast two pass disassembler written in machine code. It produces a Z-80 assembly language source file with labels that is directly compatible with the Sourcerer Development Pac.

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The output can be set to video, printer or cassette. The cassette file can be read into The Editor or Assembler of the Development Pac.

Several versions on tape at different memory locations. (N.B. Development Pac not necessary). \$21.95.

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Professor Gledhill says academics have plotted the changes which have occurred in the area of computer technology, and the changes which will occur in the future.

"If you plot out the changes in computers on a plotter on semi-log paper, they all fall on a straight line," Professor Gledhill says. "Technically, from the academic's point of view, it has all been fairly transparent.

"This method of plotting also shows up the forecasts, such as the continued miniturisation of computers and the lower costs. For example, we can accurately predict that there will be one megabyte of power in a wrist watch by the year 2000

Available, But Usable

"What exactly they will do with all that power is not known, but we do know that it will be available!"

Professor Gledhill says the transparency of advances in computer technology is shown by looking at how changes came about.

"We used valves until 1958, but we knew about transistors long before that, and we knew they would be used in computers.

"Now we know optical discs are there, and Joseph's Injunction machines are there. All the technology is available, and we know they will be used in computers of the future; they just won't be working for a while.

"Anyone who does their homework wouldn't be surprised by the changes."

But while the technological changes have come as no surprise to the academics, the use of computers, and socio-economic change they have caused, has been (and will be) far greater than perceived.

The rate the community has adopted the new technology has been so wide spread and rapid that none of the seers could have picked it.

Professor Gledhill admits no-one could have predicted the impact of home computers and their functions.

Predicted Shrinkage

"The predictions now are for a factor of ten reduction in size and price each year, and the sorts of things computers will be capable of will increase at a much faster rate," he says. "The computer manufacturers see the market is well below saturation point. IBM, for example, sees one computer in every home before the end of the century.

"And the future is not for one computer in every home, but one computer in every room."

When Dr Pearcey looks forward, he talks about the spread of robots — not only in processing industries, but in the service industries as well — and the paperless office.

The Secret of Colossus

MANY OF the technical and scientific advances which had the greatest impact on society were born in times of war, when researchers appeared to make the supreme effort to produce ideas.

An obvious example is the jet engine, a less well known one was the advancement of the electronic computer.

Finding out what the enemy was doing, through what he was saying to his commanders in the field in secret codes, was all important. So machines were built to break these codes.

In 1943 British Post Office researcher T.H. Flowers, a specialist in high speed switching, and Cambridge mathematician M.H.A. Newman, of top secret decoding centre at Bletchley Park manor house, near London, collaborated on the design of what was the world's first electronic computer — Colossus.

In terms of its size, the name was rather apt. Colossus was huge, filling a room in one of the huts at Bletchley.

The machine came about as a result of work on deciphering messages from the German Geheimschreiber, or secret-writing machine, which was used for German Foreign Office dispatches and sending strategic plans.

Some messages were solved by laborious pencil and paper methods; later by comparing certain 'runs' in the messages or with an imitation of what the enciphering machine did on the 'other side'. Around 1942 a mechanical switching device was built at the British Post Office Research Station, to do this work for the cryptanalysts.

This machine, nicknamed 'Heath Robinson' because of its whirling tapes and pulleys, was superseded in 1943 by Colossus.

Flower said of his machine: "It occurred to me that electronic equipment, including valves, could be made to do the same function as mechanical switches very much faster and more reliably, and that this would solve our problems."

The machine had 1500 valves (where 'Heath Robinson' had between 30 and 80) far more than any single device built at that time, and it required a small army of operators.

The machine used ten 'rings' of thyatron triode valved, containing argon gas, to act as high speed switches and mirror the ten encoding 'wheels' of the German Geheimschreiber. Only one valve in a particular ring was conducting at any time, then the electrical pulse passed to its neighbour, simulating the rotation of the Geheimschreiber rotor wheels.

As each thyatron conducted electricity, pulses were passed to other circuits, which performed counting in binary arithmetic and Boolean logical operations. All this reproduced the enciphering telegraph keycode, which was subtracted from the figures in the garbled message, to reveal it as text.

The machine read tapes, punched in the Murray code five-unit tape, at a then staggering 5000 characters per second.

The method of operation was the now familiar 'on line' programming system, taking the form of synergy: a dialogue between man and machine. This has only become general with modern computers relatively recently, because the details of Colossus were kept secret for 33 years by British intelligence.

An improvement to the Geheimschreiber machine, and lessons learned from the first Colossus, led to a Mark II version, which had a built-in function of conditional (branching) IF logic. Colossus II could make decisions; an ability of course fundamental in modern computers, but Colossus was the first to have it.

The machine had 2500 valves and by paralleling five readers, it could read at 25,000 characters per second — a speed not matched by postwar commercial computers for a decade. By mid 1944 there were ten Mark II Colossi at Bletchley Park, supported by 20 cryptanalysts, 20 engineers and 250 operators.

The British Office of Public Records did not release any details of Colossus until 1976, 33 years after it was built. Some photographs were released, with very basic captions. In a lecture to Britain's National Physical Laboratory, Teddington, in 1976, Colossus was said to have been "capable of 10" consecutive elementary Boolean (and/or) operations without error.

It's contribution to the war effort — how many important messages were intercepted — has never been revealed; that's still ultra-secret.

So after the war computer technology was forced to go through a teething period again, as no information was available from intelligence organisations. But scientists picking their way through the rubble of Germany, found huge air-defence radars, which were then given new electronics and allocated to universities. One was used to discover the Hydrogen line on 23 centimetres, founding the new science of radio astronomy, which has since discovered Pulsars, Quasars and Black Holes and reached to the far limits of space. □

But possibly the most significant development in computers will be the spread of a high-speed communication system, which will eliminate the need for many of today's normal personal face-to-face transactions within the office and the community.

All departments within a company will be integrated through the one central computer. Communications like reports, memos, instructions, messages and so on will be electronic, rather than on paper. This communication will spread between branches, and then between companies, where letters, orders, billings and normal inter-company actions will be carried out on the cable network.

The Office Eliminated

The need for the traditional central office will be eliminated. Employees will work, if not from home, then from suburban computer centres, where they will have an office containing their communication system.

Electronics within the home will also integrate. First of all appliances will continue to increasingly be fitted with their own electronic controls. Right now there's the home computer, intruder alarms and security systems, the answering machine, the video recorder, and controls on cooking and heating/cooling systems —

all separate and self-contained. These will be integrated into a single central control system, installed during home construction.

The real breakthrough in the home will take place when each home has access to a co-axial cable network. Not only will there be access to the knowledge of the information banks, it will see the end of mail. Bills and 'letters' will come by cable and be paid or answered at the touch of a button.

The scenario goes on.

Take the normal weekly shopping list, punched into the home computer rather than scratched on the back of an envelope. The computer has access to all supermarket pricing and selects the warehouse that can supply that list at the best price.

But the list is over budget. The essentials (based on previous ordering patterns) are included, but luxuries and their prices are highlighted, for selection or rejection. When the choice is made the order is placed for delivery or collection, and the household account debited by the supermarket.

Intra-Generation Change

Professor Gledhill believes that computer literacy is perhaps the most important educational function of the 80s.

He points out that computers are the first intra-generation technological change, and they have created gaps in knowledge not only between parents and children, but also between children in one generation.

And he says the projected advances in computer technology will mean people being trained now for certain occupations will find, before they retire, their qualifications will no longer be relevant.

Despite this, Professor Gledhill doesn't see a backlash against computers, as he says the advantages will far outweigh the disadvantages.

In short, the modern computer will increase the quality of life.

Dr Pearcey foresees the bionic man, robot dump trucks in open cut mines, robots at the coal face controlled from an air conditioned office, robot tractors that plough and harvest from laser reference beams; the scenarios you can draw are as big as your imagination.

In fact, just about anything you can dream up for the computer is possible right now. It is simply a matter of waiting for it to become an economic possibility before that dream will be put into place, and become a reality.

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Club members have twice weekly access to problem-solver Les Bell, Editor of "Your Computer" and technical consultant to the Mi Computer Club. His new book, "The Birdwatcher's Guide to BASIC" will be discounted 20% to members as a pre-publication offer.

Incidentally, the Club has asked Les to investigate the feasibility of introducing a Bulletin Board service for members. You can read the full story in issue 3 of the Club newsletter, Interface.

Join now and share in all the benefits!

A few of the many good reasons to join the Mi Computer Club:

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In the first part of this series (in the September/October issue), we covered the INPUT statement. LES BELL now continues his introduction to programming in BASIC.

Basic for Birdwatchers

Part II

your computer



tutorial

Deluxe INPUT (continued)

WHENEVER the INPUT statement includes a string of letters (in quotes) before a semicolon, it will output the string as a prompt to the user. This makes BASIC programs a lot friendlier, and a whole lot more useful.

For example, our circle calculator program could be changed to ask for its input:

```
10 INPUT "WHAT'S THE RADIUS"; R
20 PRINT "THE CIRCUMFERENCE IS";2 *
   3.14159 * R
30 PRINT "THE AREA IS"; 3.14159*R*R
40 END
RUN
WHAT'S THE RADIUS? 5
THE CIRCUMFERENCE IS 31.4159
THE AREA IS 78.5398
Ok
```

Notice that BASIC automatically supplies a question mark after the prompt.

Stringing Along

So far, we've been doing a lot of number-crunching. Although computers were originally designed for just that, they're good at other things, too — like handling text.

Just as variables are memory locations, pigeon holes if you like which can hold numbers, so we can have variables that hold text.

These are called string variables, and the text they hold is called a string.

String variables are named in the same way as number variables, except they

have a \$ sign on the end. So A\$, Z\$, D9\$ and FRED\$ are all valid names for string variables. What's more, they are completely different from the numeric variables, A, Z, D9 and FRED.

How are the strings used? As we've already seen, the computer will print literal strings -- that is, strings of letters between double quotes ("). So try this:

```
NEW
10 A$ = "HELLO THERE"
20 PRINT A$
RUN
```

Did you get this? You should have:

```
HELLO THERE
Ok
```

The INPUT statement we've already learnt about will work with strings, too. For example:

```
NEW
10 INPUT "HELLO, WHAT'S YOUR NAME";N$
20 PRINT "HI, ";N$;", NICE TO MEET
   YOU"
```

```
30 INPUT "HOW OLD ARE YOU";A
40 PRINT "JUST THINK, AT THE TURN OF
   THE CENTURY,"
50 PRINT "YOU'LL BE";A+19;"YEARS OLD"
60 PRINT "SO LONG, ";N$;", NICE
   CHATTING WITH YOU"
70 END
```

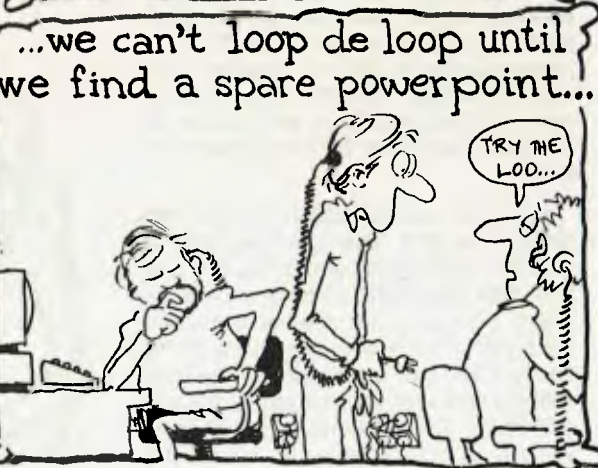
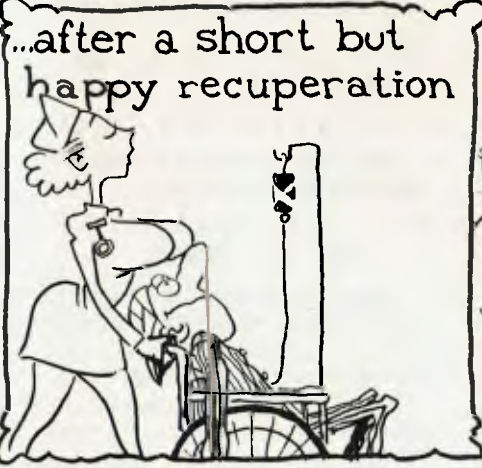
Try running this program. You can see how, by just adding more INPUT and PRINT statements, you could make a program that lets you have a conversation with the computer.

Decisions, Decisions. . .

So far, the operation of our programs has been pretty predictable. It's been a steady progression from one line to the next. Let's start putting a little bit of life, some unpredictability, into our programs, so different things happen at different times. We'll do that with the IF statement. And our first real program, should be a game!

```
NEW
10 REM      ***GUESSING GAME VERS 1.1
20 REM      PROGRAMMED IN MBASIC 4.4
30 REM      21/9/81
40 N = INT(99 * RND(1) + 1)
50 PRINT "I'M THINKING OF A NUMBER
   BETWEEN 1 AND 100"
60 PRINT "YOU'VE GOT TO TRY TO GUESS
   IT"
70 INPUT "WHAT'S YOUR GUESS";G
80 IF G > N THEN PRINT "TOO HIGH"
90 IF G < N THEN PRINT "TOO LOW"
```

...In the last part of this series we had difficulty grasping basics...



```

100 IF G = N THEN PRINT "YOU'VE GOT
    IT!!!!!!"; GOTO 40
110 GOTO 70
120 END

```

There are quite a few new features of BASIC in this program. The first three lines are REMark statements. The computer will ignore them; they're simply there for the benefits of humans reading the program. They give the title and version number, the language used and the date.

Line 40 contains two new functions. The INT(whatever) function takes the integer part of whatever. In other words, it chops off the part after the decimal point. So INT(1.37) equals 1, INT(27.294) equals 27, and INT(0.005) equals 0.

The RND(1) part generates a random number. In other words, it lets the computer 'choose' a number entirely at random. In fact, it's not really random — it only seems that way — and so, to be pedantic, it's a *pseudo-random number*.

The RND function on your computer may be different. On mine, RND(1) generates a random number between 0 and 1, while RND(0) repeats the last random number. On the TRS-80, things are different: RND(0) returns a value between 0 and 1, while RND(X) returns an integer between 1 and X inclusive. It's worth spending a little time experimenting on your computer to find out what its preference is. If it's like the TRS-80, then line 40 can become

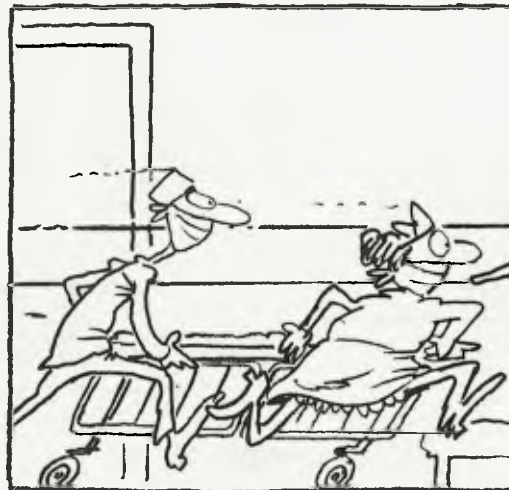
```
40 N = RND(100)
```

which is a bit easier to understand. Try working out the operation of the old version, though.

Lines 50 and 60 print the instructions for the game, and line 70 asks the player for his guess.

In line 80, we come across the IF statement. It simply says that if the player's guess is higher than the number, then print a suitable message. In line 90, if the player's guess is too low, another message is printed. Note that only one (or none) of these messages can appear, as the guess can't both be too high and too low!

In line 100, we check to see whether the player was right. This is an example of multiple statements appearing on one line. After the PRINT statement there's a colon, signifying that another statement will follow. If the IF at the beginning of the line is false, then execution will continue with the next line, not necessarily the next statement. Consequently, the GOTO 40 will only be executed if the IF statement is



true, in other words, if the player's guess is correct.

Let's dig into the theory of the IF statement a bit deeper. Basically, its syntax is IF something (is true) THEN do whatever. For example:

```
IF X = 0 THEN GOTO 720
```

```
IF N$ = "FRED" THEN PRINT "SHORT
FOR FREDERICK, I PRESUME"
```

```
IF A$ <> "Y" THEN END
```

If the 'do whatever' part of the statement is a GOTO, then the word GOTO can be omitted:

```
IF X = 0 THEN 720
```

If the 'something' part is false, then the program will go on to the next line, ignoring whatever follows the THEN part of the statement.

The content of the 'something' part is what is called a relational operator. These are:

```

> is greater than
< is less than
= is equal to

```



```

<> is not equal to
>= is greater than or equal to
<= is less than or equal to

```

For example, the relationship 5 is less than 2 is obviously false. So is the relation 5 is not less than or equal to 2. But 5 is greater than 2 is true, as is 5 is greater than and not equal to 2. Relational expressions can be quite complex. Try this one for size:

```
X * 5 / 2 + Y >= 6 * Y - 2 * 3 / Z
```

Is it true or false, when X = 3, Y = 4 and Z = 6?

It's false. The left hand side calculates out at 11.5, while the right side is 23.

Loopin' de Loop

We've already seen how, using the GOTO instruction, we can make a program go round and round in circles. But there's an even easier way to do it. suppose we want to calculate a factorial.

A factorial is a number multiplied by every integer smaller than itself, down to zero. For example, factorial 5 (written 5!) is:

```
5! = 1 x 2 x 3 x 4 x 5 (= 120)
```

Similarly, 10! is:

```
10! = 1 x 2 x 3 x 4 x 5 x 6 x 7 x 8 x 9 x 10 (= 3628800)
```

Let's write a program to calculate this, using the GOTO statement.

```
10! = 1 x 2 x 3 x 4 x 5 x 6 x 7 x 8 x 9 x 10 (= 3628800)
```

This program works, but it's not terribly elegant. It took two attempts to get it to run correctly (I forgot to set F = 1 first time around) and I still don't like it.

BASIC provides a statement which is ideal for controlling loops. It's called the FOR...NEXT statement, and it's really a

pair of statements — one at the top of the loop and one at the end. Let's look at an example (and clean up the factorial program at the same time!):

```
10 REM   ***FACTORIAL PROGRAM***
20 REM   WRITTEN IN MBASIC 4.4
30 REM   21/9/81
40 INPUT "NUMBER";N
50 X = 1: F = 1
60 IF X=N THEN PRINT
   "FACTORIAL";N;"=";F:END
70 X = X + 1
80 F = F * X
90 GOTO 60
```

This version ran first time. It's a lot easier to see the structure of the program too.

There's a loop, clearly outlined by the FOR statement at the top, and the NEXT statement at the bottom.

This is what happens: The first time the computer encounters the FOR statement, it sets the loop counter (X in this example) to its initial value (1 here), and then proceeds into the loop body. When it reaches the NEXT statement, it tests the loop counter, to see if it has reached its terminating value (N in this example). And if it hasn't, it returns to the top of the loop and increments the loop counter.

If the loop counter has reached its terminating value, the computer carries on from the bottom of the loop.

The basic form of FOR...NEXT loop is

```
10 REM   **FACTORIAL PROGRAM USING FOR**
20 REM   WRITTEN IN MBASIC 4.4
30 REM   21/9/81
40 INPUT "NUMBER";N
50 F = 1
60 FOR X = 1 TO N
70 F = F * X
80 NEXT X
90 PRINT "FACTORIAL";N;"=";F
100 END
```

It is possible to specify an increment other than 1 (?) by using the format

```
FOR (initial condition) TO
(terminating condition)
.
.
(loop body)
.
.
NEXT (loop counter)
```

For example, try this:

```
10 REM   *** SINE CURVE PLOTTER ***
20 REM   WRITTEN IN MBASIC 4.4
30 REM   21/9/81
40 W = 64
50 H = 16
60 FOR A = 0 TO 6.28 STEP 6.28/H
70 PRINT TAB(W/2 + W/2 * SIN(A));"*"
80 NEXT A
90 GOTO 90
```

This is an example of a simple curve plotting program. Line 40 should be set to the width of your terminal, and line 50 to the depth.

Line 60 is the first part of the FOR...NEXT loop. It loops from 0 to 6.28, in steps of 6.28/H, so there will be H steps.

If you have a 16-line terminal, the loop increment will be 0.3925. Line 70 does the plotting: the TAB(n) function moves the cursor n spaces across the screen, so the first W/2 moves it half-way across the screen (to centre the plot).

The remainder of the formula takes the sine curve, which varies from -1 to 1, and multiplies it by half the screen width, to provide the complete TAB position.

The PRINT statement then moves the cursor, and prints the "*" at the correct place. This is a useful trick to remember if you want to produce plots from calculated data, but don't have 'full' graphics capabilities. Of course, the graph comes out sideways, but it's better than nothing!

Line 90 of the program is simply a 'dynamic halt' which holds the computer up to prevent it printing 'OK' and lousing up the pretty pattern on the screen!

Convenience Functions

We're now at the stage of writing some fairly lengthy programs, and unless you're an accomplished typist, you may be starting to feel the strain! Microsoft BASIC has a number of functions which are designed to make life easier for you.

For example, it can be a bit of a strain remembering to enter line numbers, but MBASIC has a function to do that for you. Try typing this:

```
AUTO
REM *** PROGRAM TO GENERATE
6 RANDOM NUMBERS ***
REM WRITTEN IN MBASIC 4.4
REM 23/9/81
FOR N = 1 TO 6
PRINT "RANDOM NUMBER"; N ; " IS: "; RND(1)
NEXT N
```

Then hit the Control C key to stop the automatic line-numbering. If you don't have a control key, then you should hit 'BREAK'. If you don't have a break key, you'd better check in the manual!

The computer should respond with its usual prompt, eg 'Ok'.

Now type LIST. You should see:

```
10 REM *** PROGRAM TO GENERATE
6 RANDOM NUMBERS ***
20 REM WRITTEN IN MBASIC 4.4
30 REM 23/9/81
40 FOR N=1 TO 6
50 PRINT "RANDOM NUMBER"; N ; " IS: "; RND(1)
60 NEXT N
```

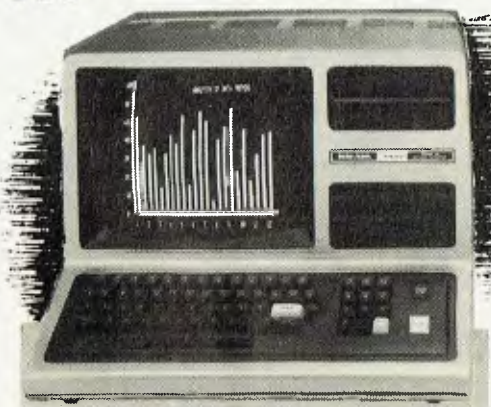


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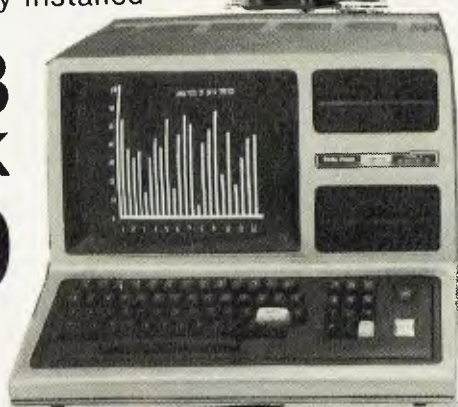
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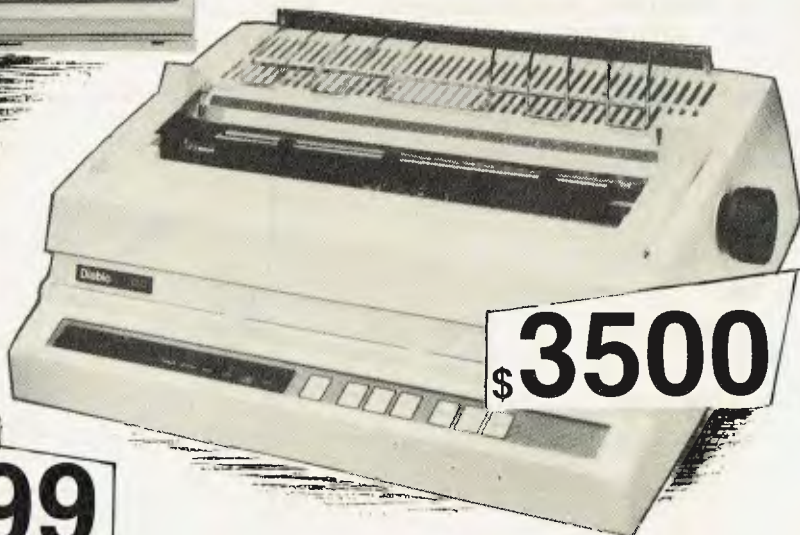
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The AUTO command will generate line numbers as required. For example, the command "AUTO 100,20" will generate line numbers starting at 100 and increasing by 20's. If AUTO comes to a line number which is already allocated to a line, it will print an asterisk after the line number. It carries on only if you want to overwrite previously existing lines, otherwise hit control C or BREAK.

Now, suppose we want to add extra lines to our program. How do we do this without starting from scratch?

Take the example of printing a random bar chart, rather than random numbers.

First, we delete line 50 (simply by typing in 50 — it replaces the old line with nothing), then we add 6 new lines:

```
35 W = 64 'TERMINAL WIDTH
45 V = INT(W * RND(1)) + 1
47 FOR I = 1 TO V
50 PRINT "*";
52 NEXT I
55 PRINT
```

The resulting program should look like this:

```
10 REM *** PROGRAM TO GENERATE
6 RANDOM NUMBERS ***
20 REM WRITTEN IN MBASIC 4.4
30 REM 23/9/81
35 W = 80
40 FOR N=1 TO 6
45 V = INT(W * RND(1)) + 1
47 FOR I = 1 TO V
50 PRINT "*";
52 NEXT I
55 PRINT
60 NEXT N
```

Try running this modified version of the program. There's still something wrong.

Being Pedantic

Pedantic as it might seem, the documentation of a program is very important, and we have the title of our program wrong. It should say 'Program to draw 6 random bars', so change it.

There are two ways of doing this. As we've already seen, we could simply re-type it. But this is tedious, and we could

make mistakes. Instead, we can edit it in order to correct it.

Here's how. Type EDIT 10 and the computer will respond with the line number and nothing else (for the moment).

Now we hit the space bar, and the computer will type a character at a time across the screen. Keep hitting the space bar until the computer has typed:

```
10 REM *** PROGRAM TO
```

And include the space after the word 'TO'. Now we want to delete the word 'GENERATE', which is eight characters long. Type '8D', and you should see:

```
10 REM *** PROGRAM TO \GENERATE\
```

The next step is to insert the word 'DRAW', by typing:

```
!DRAW
```

Nothing happens when you type I. But following characters will be put into the line. To terminate the insert made, use the ESC (escape) key.

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Digital Research Sound Effects Board

As you've probably realised, a large part of the fascination of arcade games is the sound effects they produce. You only have to cruise down George Street in Sydney on a warm evening to realise just how noisy the things are!

In the belief that sound was an important means of man/machine communication, editor LES BELL has added sound effects to his computer. Here's his report.

DIGITAL RESEARCH — no relation to Digital Research of CP/M fame — is a Texan company, perhaps best known for its single-board computers. One of its other products caught my imagination recently though — the S-100 Sound Effects Board.

If you've ever played a TV game with the sound turned down, you'll know how dull they seem. Sound is an important part of these games.

I recall watching that classic movie "2001-A Space Odyssey" on American television, and expecting to be disappointed at the loss of impact of the special effects on the small screen. In fact, it was the loss of the bass rumbling noises, through the tele's small speaker which mostly diminished my enjoyment.

Those deep rumblings from Space Invaders machines have the same effect: they start the adrenalin pumping.

Apart from the constant whirring of the fan at the back, my computer has always been a very quiet animal.

For a while I messed around with speech synthesis. But the computer was definitely not musical, and the lack of sound effects had been one of the reasons why I never bothered with games on the system.

But having recently arranged graphics drivers on the machine, games became a possibility, and sound effects were a definite requirement.

The Digital Research board has two General Instrument AY-3-8910 programmable sound-generator chips, plus stereo amplifier circuitry right on the board. The board isn't particularly dense, and part of it is laid out as a wire-wrap prototyping area.

All of the sound effect generation is done by the GI chips, so let's see what's in them.

Noisy Chips

Each chip contains three tone generators, a noise generator, three mixers, three digital-to-analogue converters; and an envelope generator and amplitude control circuits. There are three audio outputs from each chip; although on the DR board, the outputs from each chip are combined into one channel.

The whole fandangle is controlled by a set of registers; 16 in all. Each of the three tone generators has its pitch set by a number stored in a pair of registers. For example: channel A is set by registers 0 and 1; B by 2 and 3; and C by 4 and 5.

You could view the channel as being controlled by a 12-bit number. Of course, since the chip works with 8-bit words, this won't fit. And it must be split into two parts — of 4 and 8 bits — to fit into the registers.

Thus for channel A, register 0 contains the least significant 8 bits, or fine tuning, and channel 1 contains the 4 bits of coarse tuning.

The numbers sorted in these registers are proportional to the period of the output waveform, and consequently inversely proportional to pitch. So the higher the pitch, the lower the number.

Register 6 controls the period of the noise generator.

Register 7 enables and disables the noise and tone outputs. The most significant two bits control the direction of the two input/output ports, which are also built into the chip. The next three bits enable noise into the three channels; while the remaining bits control the tone outputs in the same way.

Amplitude Controls

Channels 8, 9 and 10 are the amplitude controls. Bit 4 sets the amplitude mode. With this set, the amplitude control has no effect, allowing the envelope generator control. Otherwise, the remaining 4 bits control output in a logarithmic manner.

Registers 11 and 12 together form a 16-bit value, which controls the period of the envelope. Depending upon the values of the control bits in register 13, the envelope can be set to attack, decay, ramp up and then down, or sawtooth repeatedly.

Finally, registers 14 and 15 are two 8-bit I/O ports, which can be used for any purpose desired.

Although the board is connected up as a set of I/O ports, it does not require an

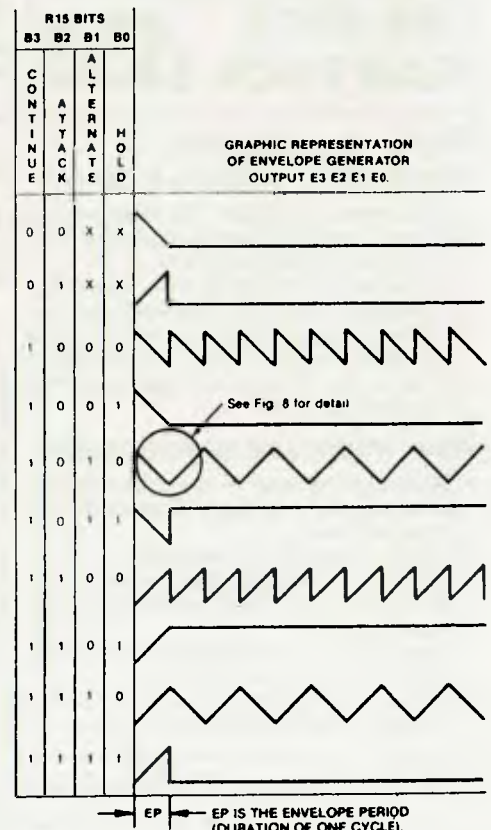
address for each register. Instead, each chip occupies only two ports, due to the address decoding circuitry of the GI chips, which are designed to work with a GI microprocessor.

The lower port in each case is used to output the register number, which will be addressed next. Then the upper port is used to access that register. If it sounds complex, it isn't. And it saves a lot of I/O ports!

Digital Research provide a simple BASIC program which can be used to write and read the various registers. This program can be used to carry out simple experiments, but it's tedious to use. The best way to use the board is to program it as part of your games programs.

The reprint of the chip data sheet provided with the manual gives extensive information on the functions of the various registers. It also gives various special effects examples, which can be programmed in machine code. The only problem

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with the manual is all values are given in octal, which can cause a bit of confusion.

The manual gives details of how to produce chiming sounds, explosions, even a wolf-whistle! There's instructions for rac-

It's possible to write sound effects in BASIC, although fast frequency-sweeping effects are not possible, due to the slow speed of the BASIC interpreter. My solution was to program some sound effects in

BDS C, so they can be linked into games and other programs as required.

ing car sounds, gunshots and sirens. A table of values allows notes to be translated into the appropriate period numbers, and there are some notes on the basics of music theory.

Playing music with the board is somewhat of a challenge. DRC has made available a disk-based Sound Command

Language (also available on EPROM) which makes the generation of sound effects and music easy. Although I haven't used this language, I have heard very effective demonstrations of the system, generating up to six tones at once.

Two-Part Harmony

My own attempt at music generation took an evening's work and resulted in a simple music language interpreter, which accepts as input a disk text file, and plays it. The resulting music is quite tolerable, and I'm now trying to add chord-playing facilities and two-part harmony.

I haven't yet attempted to use the I/O ports on the chips, but I've bought a couple of joystick controllers, so by next week, who knows what might have happened!

In summary, the Digital Research Computers Stereo Sound Effects Board (phew!) is a whole lot of fun. The instructions included are not for the complete novice, but it's a simple board to build and start working.

The sounds generated are not of high-fi quality. But they're certainly good enough to add life to those 'silent classics' of computer games, such as Star Trek and Adventure. □

PSG REGISTER ARRAY

REGISTER	BIT	B7	B6	B5	B4	B3	B2	B1	B0
R0		8-BIT Fine Tune A							
R1	Channel A Tone Period	/				4-BIT Coarse Tune A			
R2		8-BIT Fine Tune B							
R3	Channel B Tone Period	/				4-BIT Coarse Tune B			
R4		8-BIT Fine Tune C							
R5	Channel C Tone Period	/				4-BIT Coarse Tune C			
R6	Noise Period	/				5-BIT Period Control			
R7	Enable	IN/OUT		Noise			Tone		
		IOB	IOA	C	B	A	C	B	A
R10	Channel A Amplitude	/		M	L3	L2	L1	L0	
R11	Channel B Amplitude	/		M	L3	L2	L1	L0	
R12	Channel C Amplitude	/		M	L3	L2	L1	L0	
R13		8-BIT Fine Tune E							
R14	Envelope Period	8-BIT Coarse Tune E							
R15	Envelope Shape/Cycle	/				CONT	ATT	ALT	HOLD
R16	I/O Port A Data Store	8-BIT PARALLEL I/O on Port A							
R17	I/O Port B Data Store	8-BIT PARALLEL I/O Port B							



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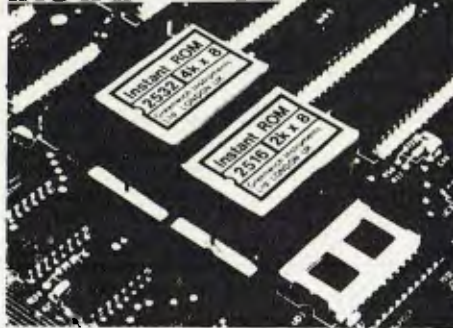
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Digital Research Sound Effects Board

```
/* functions to drive sound effects board */
```

```
#define ADDRESS 128
```

```
#define DATA 129
```

```
#define ENBL 7
```

```
tone(side, channel, period, amplitude)
```

```
int period, amplitude;
```

```
char side, channel;
```

Specifications and Report Card

Unit:	Digital Research Computers sound Effects Board
Made By:	Digital Research Computers, Garland, Texas
Processor:	Operates on S-100 bus
Clock Speed:	2MHz or 4 MHz
RAM:	N/A
ROM:	N/A
I/O:	Low level output to external amplifier, or Loudspeaker output from on-board amplifiers
Languages:	Runs under BASIC, Assembler, C, Pascal
Keyboard:	It's a thought. . .
Display:	N/A
Graphics:	N/A
Peripherals:	It is one
Expansion:	On-board wire-wrap area
Best Points:	Entertainment value
Worst Points:	No sins to speak of

Ratings:	excellent	good	well, maybe	poor
Documentation		✓		
Ease of Use		✓		
Functionality	✓			
Support	✓			
Value-for-money		✓		
Extras included:	N/A			
Options:	Sound Command Language (SCL)			
Price:	\$92.50 (tax exempt) in kit form SCL: \$28.75 on disk, \$21.75 on 2708			
Review unit from:	Acoustic Electrical Developments (AED)			

```
{
    channel = channel - 'a';
    #set(2 * channel, side, period % 256);
    #set(2 * channel + 1, side, period / 256);
    #set(channel+8, side, amplitude);
}

tonk(side, channel, period, amplitude)
int period, amplitude;
char side, channel;
{
    channel = channel - 'a';
    #set(2 * channel, side, period % 256);
    #set(2 * channel + 1, side, period / 256);
    #set(7, side, 0xfe);
    #set(channel + 8, side, 16);
    #set(11, side, 255);
    #set(12, side, 15);
    #set(13, side, 0);
}

knot(side, channel, period, amplitude)
int period, amplitude;
char side, channel;
{
    channel = channel - 'a';
    #set(2 * channel, side, period % 256);
    #set(2 * channel + 1, side, period / 256);
    #set(7, side, 0xfe);
    #set(channel + 8, side, 16);
    #set(11, side, 255);
    #set(12, side, 15);
    #set(13, side, 4);
}

rstaus() /* reset music chips */
{
    int i;
    for(i=1; i<15; i++)
    {
        #set(i, 'l', 0);
        #set(i, 'r', 0);
    }
}

#set(reg, side, value)
int reg, value;
char side;
```

```

(
    if(side == '1')
        side = 0;
    else side = 2;

    outp(ADDRESS + side,reg);
    outp(DATA + side,value);
}
chime(side, level)
char side;
int level;
(
    aset(2,side,75);
    aset(4,side,107);
    aset(7,side,248);
    aset(8,side,16);
    aset(9,side,16);
    aset(10,side,16);
    aset(11,side,255);
    aset(12,side,43);
    aset(13,side,0);
)

explode(side, period)
char side;
int period;

(
    aset(6,side,period);
    aset(7,side,7);
    aset(010,side,020);
    aset(011,side,020);
    aset(012,side,020);
    aset(014,side,070);
    aset(015,side,000);
)

laser(side)
char side;
(
    int i,n,m;

    mreset(side);
    aset(007,side,076);
    aset(010,side,017);
    for(n=060;n<0161;n++)
    (
        m=n%n;
        i=2 * 2 * 2 * 10 * 4;
        aset(0,side,n);
    )
    aset(010,side,0);
)

}
mreset(side) /*reset one chip */
char side;
{
    int n;

    for(n=0;n<16;n++)
        aset(n,side,0);
}

```

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GOBBLEMAN **NEW**

This is the TRS80/System 80 version of the sensational new arcade game GHOST MUNCHERS.

Suddenly you find yourself trapped in a maze. Gobblemen are chasing you from all directions and there seems to be no escaping. All of a sudden when you get to the energy dots you get the strength to gobble up the monsters. Wow, look at that score! Oh No! Your time and power is running out fast and now they are after you again.

So you've made it safely through the first chase but don't be too sure next time around - they are going to get faster and faster until there's no escape from the GOBBLEMAN. With great sound effects and a self running mode that plays as well as you can! Available for TRS80/System 80 16K Tape . . . \$19.50.

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A Janitor lobs a hand grenade through the window of your locked room. What you do next could mean survival and escape! Or permanent residence in the home for Deathmaze survivors! To leave you will have to deal with guards, fellow survivors, doctors, the infamous Crazy Carpenter and much, much more. So don't expect to get out soon!

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COMA

- The Real Price of The Processor

THE WIDESPREAD use of microcomputers may soon force many drug pushers out of business. The simple reason is micros themselves are becoming the addictive commodity throughout the country.

The new breed of addicts is suffering from a condition known as COMA (short for computer addiction) which describes the state of mind of those afflicted. Anyone who owns, or has access to, a microcomputer is a likely candidate for COMA.

It has become the trendy illness of the eighties, though as yet the health funds have not included the cost of its treatment in their BASIC cover — or private or multi-cover for that matter.

Nor is there any truth in the rumour that Sydney's Wayside Chapel is setting up a special treatment and withdrawal clinic or COMA victims. This Kings Cross institution reckons it has enough troubles caring for junkies and hosting fashionable weddings anyway.

Of course, now the erstwhile Festival of Light star, Rev Fred Nile, has moved his pulpit into the NSW Upper House, he may add COMA to his list of no no's. Indeed, he may well make an eloquent plea for the return of mental arithmetic and the abolition of computer games in favour of tidlywinks and noughts and crosses.

Perhaps, though, he will rest easy in the hallowed halls of Macquarie Street when he realises (after reading this learned paper) that while your ordinary run-of-the-

With the information explosion have come many benefits. But there are drawbacks also, and hidden costs in human terms. As roving reporter FRED SYMES has discovered, some people are simply unable to operate without a daily "fix", taken whilst seated in front of a micro terminal.

mill drug addiction has a somewhat lowly image, COMA has a degree of class about it, even though it is relatively inexpensive.

More important, though, from the point of view of the addicts, is that no matter how badly hooked an addict may become, there is no fear of police harassment. Nor will the COMA addict have to frequent seedy bars to get a fix. No sir, COMA is highly respectable. And it's legal. (Thank goodness something is.)

COMA addicts can be found almost anywhere — in the office or at home. We've even got a couple here at the *Your Computer* office, and you'd think we'd know better.

Now I don't like to divulge secrets, but to help substantiate this story I should tell you about our beloved publisher, Matt Whelan. He's been hooked for ages, but it is not a well known fact it was his idea to launch *Your Computer* so he could justify his addiction, and enjoy a ready source of micro fixes.

How else do you think I could get this rubbish past him?

What happens is that Matt works away at his Apple until 9 or 10 pm. Then he convinces himself he needs a little relaxation, and what better way than to play a game or two.

But his 'game or two' becomes a veritable orgy of mapping and cursing that goes on and on and on, until one of two things happen. Either the non-addicted staff arrive and bring him to an embarrassed stop, or he falls asleep at his desk and has to be kicked awake. As he's the publisher we don't kick him too hard, mind you.

Badly Afflicted

Then there's the well-known Sydney micro retailer who admits to being a hopeless COMA case. Won't mention his name, or he might cancel his advertising.

He is so badly afflicted that he and his wife no longer go shopping together. A simple shopping list became a program-like exercise in logic. No longer was there the pleasure of random browsing through the stores. Each item required was listed, the shops where each could be bought were noted, bulk and weight of the parcels was calculated and the best place to park the family car, having regard to all other factors, was decided.

With all this information a logical sequence of purchasing was programmed. It was even refined to the state where minimum and maximum time schedules were calculated to complete the chore.

Nothing was allowed to stand in the way of the successful running of the programme.

"Even if I met an old friend between stores, I would not stop to chat because I could not allow my program to be disrupted," the retailer told me.

He also told me that his wife now refuses to let him help her with the shopping. They have fewer dinner parties, too, because he can't abide the thought of not planning the occasion to the nth degree.

Those Who Wait

And then we have Don Cox, sub-editor on *Your Computer*, and dabbler in our motoring titles. Don isn't a computer addict, but he still suffers from a bad case of COMA. Not that he has contracted the disease himself — his lovely wife has.

She works with computers — works, works and works with them, and loves it as only a dedicated COMA addict can. She



PUBLISHER WHELAN SHOWING PHYSICAL SIGNS OF ADVANCED COMPUTER ADDICTION...

quite often works late into the night, which means that Don is becoming quite a good cook. Well, it's either that or starve.

And now, if you'll excuse me, I'll be off. I must find what will happen if I pick up the lantern and the knife that the terrible Zork has offered me on that damned screen. □

• • •

Hollywood Interface

At MCA's Universal Studios in California, there is a stock control system that would outrage many people. Briefly, it records the physical attributes of various "extras", so requests of "talent requisitions" can be filled.

A typical requisition could read, "Wanted a shapely, 1.7 metres tall, size eight blonde with long hair, aged between 21 and 24, to act as a stand-in double on a television show".

Every day the IBM computer at Universal finds 200 to 300 extras for 12 to 14 television shows. The system is used to provide casting directors with the names of actors and actresses who meet particular requirements. The computer in use is an IBM 3031, and the office that operates it in this stock control mode is responsible

for casting non speaking roles, the so-called extras.

Apart from the mere names and addresses, there is a record of some 150 different attributes of each of the 2200 extras listed in the programme.

It seems the 150 attributes recorded for each member of the Screen Actors' Guild are divided into three categories: physical description, physical talents, and possessions.

Physical description includes such data as height, weight, size and colouring. Physical talents includes athletic abilities, belly-dancing, baton twirling, card dealing, and playing a particular musical instrument such as a mandolin. Possessions could mean the ownership of military or police uniforms, sports apparel, golf clubs, sailboats and vehicles.

When a talent requisition arrives, the manager or one of his staff uses a VDT to enter the physical characteristics needed to fill a day's casting orders. The computer then lists people who match, or most nearly match, the requirements.

Casting orders arrive at the office each day before 11.00 am. At about 1.00 pm,

extras begin calling and asking for work. On any given day at least half the 2200 extras on the books call between four and ten times each, looking for assignments.

Special requests are often more specific. One recently required the casting office to find 20 men between 2.0 and 2.2 metres tall. The computer system listed the information that there were only two men on the file who met the requirement, and so extras had to be sought elsewhere.

Exactly where would seem to be rather a problem. Aside from names, the computer lists persons with beautiful body parts. For example the demand for men with beautiful legs might be small, but when one is required, the computer system is ready.

As the manager said: "Actors and actresses rarely are filmed close up with their own body parts. Not all actors and actresses are perfect in every respect." □

—Linton Simpkins

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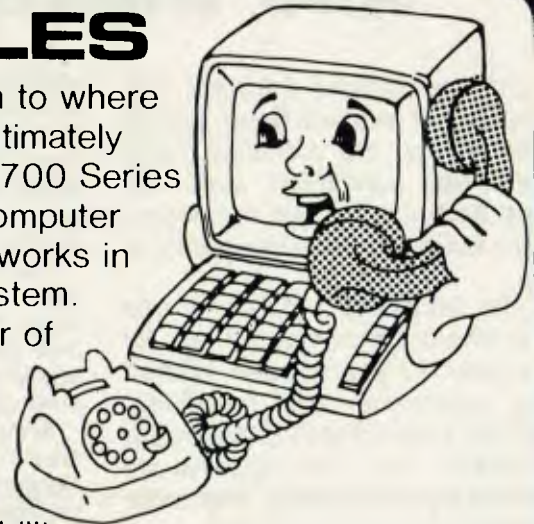
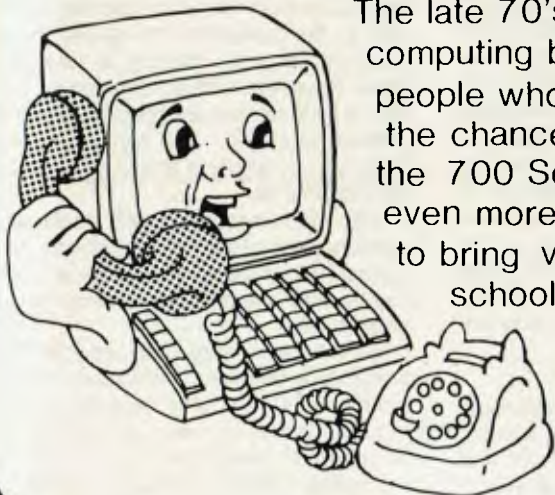
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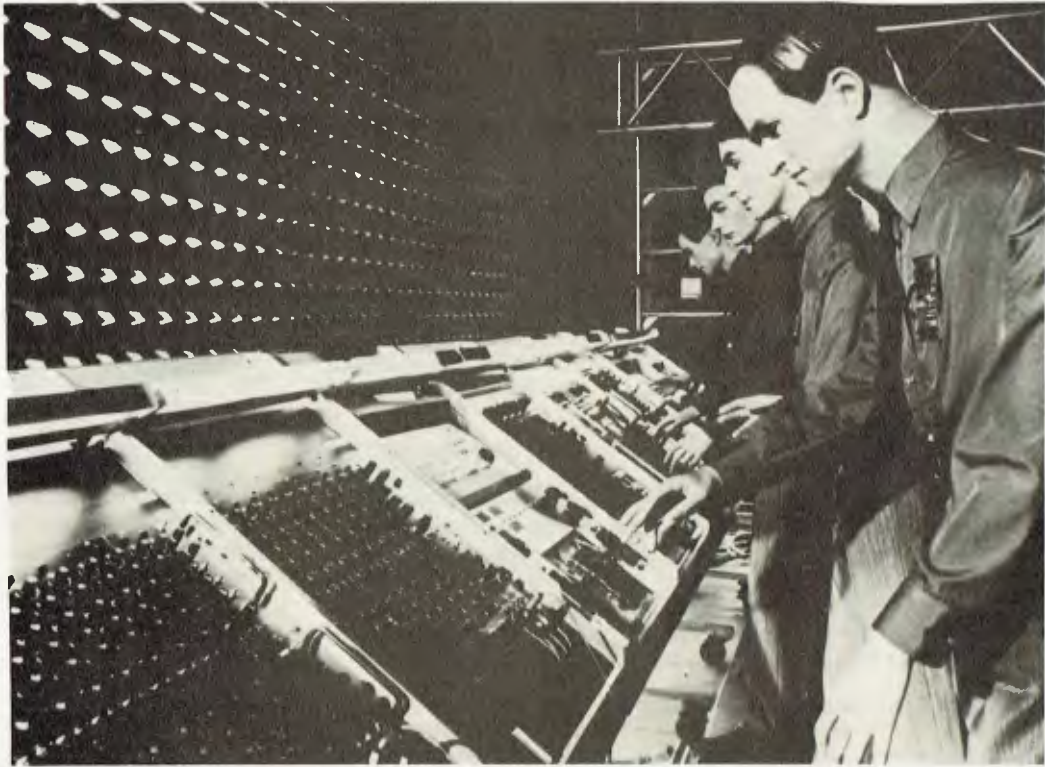
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COMPUTER MUSIC And Digital-Recorded Music

Computers have intruded into all areas of modern living, and in most cases the job they have done has convinced even the most ardent purist that computers are a tool to improve the quality of life.

The recording industry is one area where the computer has, for the past 30 years, been infiltrating, improving and modifying. MADELEINE d HAEYE, the record reviewer for The Sun-Herald newspaper in Sydney, has taken a look at this quiet invasion.

MOST OF US have seen and heard those half-toy pocket calculators with musical tones. Simple calculations can produce simple tunes ... $3+3+5+5+3+4+4$ equals 'Three Blind Mice,' 'God Save The Queen,' or a tinny version of Brahms Lullaby.

In a way, it could be called computer music — if one accepts the definition of a pocket calculator as a computer. It certainly results in a form of music more

noted for its novelty than for its quality.

Almost on the same level is the memory function within some of those expensive home organs. At the push of the appropriate button the player is supplied with, say, a bossa nova beat, over which he can lay, say, a rock melody (yuk).

Further up the scale of "computer music" you'll find groups like the German-based Kraftwerk — four rock exponents who play around with synthetic sound, and who brought along six tonnes of electronic gear for their recent Australian visit.

At the highbrow peak, there's an album titled "Computer Music," an American Nonsuch label import. This features compositions by J.K. Randall, a member of Princeton University's music department; New-Zealand born Barry Vercoe, author of MUSIC 360, an assembly-language program for IBM/360 computers; and Charles Dodge, a computer sound synthesis researcher.

Computer or Synthetic

If we have to tighten our definitions, then "computer music" should, ideally, mean that music which is composed and played by computer. Of the three examples I've given here, only the highbrow version would meet the definition.

And that, quite frankly, is so weird, so dissonant, so unlike the accepted form of music that its value is again reduced to that of novelty. No music lover could possibly achieve pleasure from this pure computer music.

All the rest, then, under tighter definition, becomes synthetic music.

It must be conceded that a musician or technician is, in the act of inputting a program to be translated into sound from a synthetic source, playing a keyboard. Thus, the sound effects one can produce from a synthesiser can not really be called "computer music." The synthesiser and its electronic relatives are, in reality, musical instruments.

With memories, some with incalculable combinations of sounds and effects, most capable of imitating the classical instruments they are still *instruments* by any other name.

Synthesisers were first used for their percussive qualities, particularly in rock groups. It is only fairly recently that the musical genius Vangelis, and others not far behind (Francis Monkman, formerly of Sky; Mike Oldfield, Tomita), have begun to reap the musical beauty that synthetic sound has to offer.

The Hidden Part

All this is not to say that computers do not play a part in producing music; only that they are generally a hidden part, in the back room of the recording studios, offstage.

The role of the computer is particularly valuable in producing records of superior reproductive quality. And the most practical use is to be found in discs recorded by the digital process.

More and more are coming onto the market; and with the exception of the quick-production, quick-profit rock and pop fields, it's a safe assumption that most records will be digitally-recorded within a few years.

What then sets the technique of digital recordings, apart from the normal (analog) releases?

The most obvious virtue is practicality. Some of the other 'breakthroughs' in recording in recent times demand extra, specialised and costly equipment.

Digital recordings need only a standard, average-to-good stereo sound systems — your set at home ... Although obviously the better the equipment, the better the reproduction. You'll find that the greatest listening benefit is in the greatly expanded dynamic range (the gap between loud and soft).

Non-digital recordings are made by recording the sound onto a magnetic tape. After editing and enhancing, a master tape is used to produce a metal die, from which vinyl records are moulded.

Bad Non-Digital Habits

The process can be weakened by distortions. Ever heard of "wow" and "flutter"? They're descriptions for the way in which tape speed can vary. Also sent to plague engineers are nasty little habits like the signal leaking between the stereo channels, and the signal leaking between adjacent layers, in much the same way as heavy print on a newspaper advertisement can spoil a good photograph on the backing page.

The other important factor in analog recording is the range of the recording equipment, particularly, as mentioned, the range covering the dynamics of the sound. Good-quality recording equipment can reach up to 60 or 65dB, more or less adequate for some types of music — like early Frank Sinatra, with smooth, low backing.

But the problem is really felt when trying to record a full symphony orchestra. The orchestra's dynamic range may be 10 to 20 times greater than the equipment can handle!

The engineer is forced to compress the dynamics. The recording gain level is turned down during loud passages, and up during the soft bits. So the ultimate sound has been compromised.

You can turn your speakers up to their full limit, but you'll never get a true imitation of Judas Priest at their loudest best (or worst, depending on your taste).

In the digital process, the sound is fed through a digital recorder. Instead of recording the sound in one continuous electrical signal, the digital recorder reads the sound wave at high speed (up to about 50,000 times per second).

It then assigns a binary number (one of about 65,000 possible) to each reading. Because the symphony orchestra has been reduced to a series of numbers, the strengths and the softnesses are more faithfully reproduced when converted back for the mastering process.

Goodbye, Wow & Flutter!

And, as the digital recorder is controlled by an extremely accurate quartz clock, mechanical variations are more-or-less eliminated. Goodbye, "wow" and "flutter."

Only the noise heard from the orchestra (and the coughing from the audience if it's a "live" performance) is passed into the

digital recorder. All the other nasty electronic gremlins are wiped, so to speak.

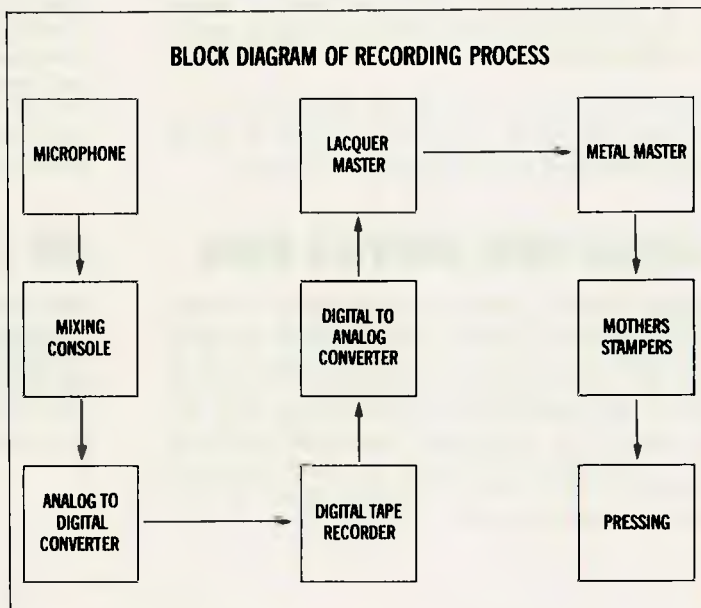
The two diagrams below have been provided by CBS, which has been doing wonderful things with its Mastersound series. The first diagram shows the process, and the second lists the performance differences between analog and digital processes.

The proof, however, is in the listening. Out of the current crop of digital releases, I'd recommend any of the albums presently being put out on the Deutsche Grammophon label by the Berlin Philharmonic and Herbert von Karajan — particularly the Tchaikovsky Piano Concerto with Emil Gillels.

For the solo instrument, there's an exceptional release of Scott Joplin's music, played by the classically-trained Joshua Rifkin, being distributed by EMI.

Computer music?

You can keep your 4+4+4+4+5+5+5 = Twinkle, Twinkle Little Star. I prefer the full strength of von Karajans mob or the ragtime grace of Rifkin's grand piano in my living room. □



DIGITAL RECORDER SPECIFICATIONS COMPARISON CHART

PERFORMANCE FEATURES	DIGITAL MASTER TAPE	ANALOG MASTER TAPE
Frequency Response	20-20,000 Hz (± 0.5 dB)	30-15,000 Hz (± 1 dB)
Signal-To-Noise Ratio	>90 dB	64 dB
Total Harmonic Distortion (THD)	.03%	0.5%
Wow and Flutter	Unmeasurably small	.035%

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SYSTEMS ANALYSIS IN SMALL BUSINESS

Many small businesses are now facing a momentous decision. As prices of small computers have fallen, they must now decide whether or not to computerise. But which applications to computerise, and what kind of computer to buy, are decisions fraught with danger for the unwary. LES BELL tells how to avoid some of the traps. . .

MANY BUSINESSMEN observing the falling price of small computers and reading articles in the weekly newsmagazines, are now contemplating the introduction of a micro-computer into their business in some way. Deciding whether to jump or not, and which computer to buy (with which software package), is a difficult decision for the untrained or inexperienced.

The situation is further compounded by the cost of a micro-computer being low in comparison to the fee charged by a consultant for analysing the decision and recommending a computer. On the other hand, the headache is eased by the low cost of a micro making possible the gradual introduction of the system into a business. Thus the computers initial impact is

reduced, and it can initially be operated in non-critical areas, where manual back-up is possible, if necessary.

In this article, I shall try to set out some guidelines which will be of use to the small businessman who is contemplating the purchase and installation of a small (under \$10,000) computer system, and who is prepared to involve himself in the

introduction of the system. That pretty well describes most *Your Computer* readers in business.

I shall try to avoid dogma as much as possible, and present a set of decision-making criteria which the reader can use when investigating possibilities for his own business. At the same time, I cannot resist a certain amount of iconoclasm!

The system analysis procedure for a small business is iterative. That is, the analyst will probably have to repeat the process several times, until his decreasing expectations meet increasing system capabilities and cost.

Initially, inexperienced people tend to have unrealistic expectations. "I want to keep order processing and inventory in-

formation for 10,000 product lines, with an average of 700 orders per day, and I want to do it on a ZX-80. Of course, I realise I'll need the extra 16K RAM pack".

The Analysis Loop

The next time around the loop, the problem definition might be "I want to keep inventory information for one department with 1,000 products, only 50 orders per day, and I'll use a TRS-80 with one disk drive."

Successive iterations will finally produce a workable compromise. And compromise is the name of the game with small computers.

What's in the system analysis loop?

Define system requirements. Be realistic; if you haven't much experience with micros, find out the kind of jobs they are currently doing. Don't push beyond what is currently possible.

Contact other small business users of micro-computers, and find out what they are doing with their machines. Read the case histories in *Your Computer*.

Be specific in your definition, and don't leave room for errors. When you write your definition, test each statement for validity and sensibility.

Is it really sensible to process 500 orders per day, on a system with one screen and printer? In a seven-hour day, that's 50 seconds per transaction, before you've allowed time for production of reports, printing and other jobs.

Can you fit inventory information on 10,000 items onto the disk space on your prospective computer? What information is required, what is useful, what is nice to have, and what is just plain useless?

Try, if possible, to base your system on current procedures. Very rarely does a company buy a computer without having been in business for some time, and

therefore having existing ways of doing things. If you change your procedures to fit the computer, and let's be honest, you will probably have to, what will be the impact of that change?

Analyse your current forms and reports. What information are you collecting that is not being used? What information are you not getting in reports that would be useful?

Determine your exact business needs. Examine your personal motivation, too. If you really are fascinated by computers and like the ideal of playing around with one, then be honest and buy it for that purpose — it's perfectly legitimate and healthy!

Don't saddle your business with an executive toy.

Hardware and Software

The hardware and software of a computer system are irretrievably interlinked and intertwined, and cannot be considered totally separately. Some people would have you believe the software is all; that it is the only consideration, and that the machine itself is unimportant.

I tend towards this view, but cannot wholeheartedly support it. It sometimes happens that the software you want is only offered in conjunction with a machine insufficiently robust for the job, or not capable of expansion to meet your future needs. In that case caveat emptor...

Formulate your software approach. Will you use off-the-shelf software, will you have a package modified to meet your requirements, or will you go the whole hog, and have a package specially written for you?

I would suggest the latter option removes much of the incentive for buying a micro-computer in the first place. Software is more expensive than hardware.

In a typical commercial environment, the software on a system costs more to produce than the hardware did. But it doesn't take long to design and assemble a micro-computer; writing a good piece of software is a much bigger task. For this reason, I have restricted my comments to the purchase, and possible modification of, a standard package.

Modification of software is only possible when it is purchased from the original designers/vendors. It is possible to modify other peoples' software, but it is time-consuming and expensive. In many cases, source code is not available.

Canned Software

That really leaves the local purchaser of a micro with no alternative but to use 'canned' software. The rules are: Obtain the documentation for the package. Read it and try to understand

it. Is it orientated towards the technical user or the untrained operator? Which are you?

Ask the vendor to put you in touch with other users of the product, and ask their opinions. Don't waste their time, but you should find most people will appreciate the possibility they will want this kind of advice themselves some day.

Observe the product in action on a computer system similar to your choice. Most packages will run much faster on a hard disk system than on 20cm (eight inch) floppies, for example. Is it capable of the throughput required? Does it cater for any special cases you may have?

Thoroughly investigate all the alternatives. Try to weigh up the pros and cons of each one, and make an objective decision about which fits your needs best.

The standing of the supplier doesn't matter that much with micro-computer software. It is unlikely such software will ever require maintenance in the way that big system software does; that is revision to run under new operating systems, or with new peripherals.

Finally, for those who aren't faint-hearted, there is one further alternative — roll your own software. For small and unusual applications (where packages aren't available) it is perfectly feasible for the owner/user to write his own software. This is only suitable for those non-critical areas, where you've cruised along by manual methods, but a computer would allow much more sophisticated analyses and reports, for example.

A marketing manager could write his own programs to do moving averages of sales figures, or even progress to exponential smoothing and linear regression





In the world of personal computers there is just one that is known as the best: the PET

**NOW
16K RAM
AT 8K PRICE
\$999**

The Commodore PET has become the standard for the Personal Computer Industry.

The Pet is completely integrated, with the processor, memory, keyboard and visual display unit contained within a robust housing, allowing easy transportation with no interconnecting cables necessary. In order to retrieve and save your data and programs, a storage device is used which operates like a cassette recorder, with your information recorded reliably on standard cassettes. The PET has 16k bytes of RAM. Optional equipment permits expansion to 32k. Also, it has 14k bytes of ROM.

The Pet communicates in BASIC—the easiest computer language. Easy to learn and easy to use, BASIC has now become the standard for personal computers, with literally thousands of programmes available. The PET is also programmable in machine language, allowing more efficient use of the system.

The full-size keyboard is capable of producing letters, numbers and graphic symbols. Upper and lower case is standard. Characters appear

on the screen in a pleasant green colour designed to reduce eye fatigue and may be displayed in normal or reverse print.

PET's IEEE-488 Bus—just like H.P.'s mini and full size computers—permits direct connection to over 200 pieces of compatible equipment such as counters, timers, spectrum analysers, digital voltmeters and printer plotters from H.P., Philips, Fluke, Tectronix and others.

The full range of Commodore Disk Drives and Printers are plug-compatible with the PET and a comprehensive range of cassette and disk based programmes are available through the extensive network of Commodore Dealers.

APPLICATIONS

The Commodore PET is a creature of many faces. Its applications are limited only by the user's imagination.

The future of the PET is virtually unlimited; its present capabilities are already many and impressive. As a personal computer, the PET can teach languages and mathematics; play games; create graphic designs; store meal recipes and change

number of portions; maintain budgets, personal records and checkbooks; operate appliances and temperature controls.

As a management tool, it delivers the information the executive needs, in the form he can use, and available to him alone. Trend analyses charts and graphs can be almost instantly available.

The professional may use the PET for maintaining appointment schedules, recording income and expenditures and filing all the specialized information and forms he may need to make his work more efficient—from medical records for a doctor to income tax computations for an accountant.

The engineer, mathematician, physicist, has a tool far superior to the very best programmable calculators yet developed... at a cost that is comparable... and with almost infinitely greater versatility.

And the businessman has a computer that can maintain inventories, keep payroll records, operate accounts payable and receivables, issue cheques and handle correspondence.

Commodore PET 4016 Computer Technical Specifications.

Computer/Memory

Read/Write Memory (RAM) 16K bytes available to the user.

Read Only Memory (ROM) 14K bytes in total, divided into:

8K BASIC interpreter available immediately you turn on your PET,
5K Operating System
1K Test Routine

The 6502 micro-processor chip makes the PET one of the fastest and most flexible BASIC systems. Significant features of Commodore BASIC are:

- 960 simple variables
- 960 integers
- 960 string variables
- 960 multi-dimensional array fields for the above 3 types of variables
- Up to 80 characters per program line with several statements per line
- Upper/Lower case characters and graphics capability
- Built in clock
- 9-digit floating point binary arithmetic
- True random number generator
- Supports multiple languages; machine language accessibility

Keyboard

74-Key professional keyboard.
Separate calculator/numeric pad.

Upper-case alphabetical characters with shift key to give 64 graphics characters.

Can be set for lower case and shifted upper case characters.

Screen

40 characters wide by 25 lines (1000 characters in 8 × 8 dot matrix).

23 cm screen phosphor screen.
Brightness control.

64 ASCII plus 64 graphics characters.

Blinking cursor with full cursor control, including programmable control.

Screen editing capabilities

Full cursor control (up, down, left, right).

Character insert and delete.

Reverse character field.

Overstriking.

Return key sends the entire line to the CPU regardless of cursor position.

Input/Output

8 bit parallel input/output port.

IEEE-488 Bus (HP-IB and IEC Bus) allows up to 12 other peripherals to be connected.

Two cassette ports.

Video signals for additional displays.

Serial output port.

Technical Data

Dimensions: Height 355 mm (14"), Width 419 mm (16.5"), Depth 185 mm (18.5").

Shipping Weight 20.9 kg (46 lbs).

Power requirements 240V ± 10%, Frequency 50 Hz. Power 100 Watts.

Commodore BASIC

APPEND	GOSUB..RETURN	STOP	SPC
BACKUP	IF..THEN	SYS	LEFT\$
CLOSE	INPUT	VERIFY	RIGHT\$
CLR	INPUT *	WAIT	MID\$
CMD	LET		CHR\$
COLLECT	LIST	SGN	ASC
CONCAT	LOAD	INT	LEN
CONT	NEW	ABS	VAL
COPY	ON..GOSUB	SQR	STR\$
DATA	OPEN	SIN	TI
	POKE	COS	TB
DEF/FN	PRWT	TAN	ST
DIM	READ	ATN	DS
DIRECTORY	RECORD	LOG	DS\$
DLOAD	REM	EXP	+
DOPEN	RENAME	AND	-
DSAVE	RESTORE	OR	*
END	RUN	NOT	/
FOR/NEXT	SAVE	TAB	↑
GET	SCRATCH	POS	π

Commodore microcomputers

programs. But I'd still recommend leaving general ledger programs to the experts.

For roll-your-own software attempts, the major decisions are the selection of the language and the operating system. These are rather more technical considerations, so I don't propose to cover them in depth here.

Hardware Requirement

Formulate your hardware requirements. The processor in a system is not vitally important, but it must support the software of your choice.

You must allow sufficient memory to accommodate the operating system, language processor (such as BASIC in-

terpreter) and program. Even more memory is required when large amounts of data must be kept, such as when sorting or using large arrays.

When examining the choice of mass storage devices, such as 13cm (5.25 inch) mini-floppies, 20cm floppies, or hard disks (or even cassettes, if appropriate) use arithmetic, not guesswork to work out your requirements. Work out the length of a record of information to be stored:

name	30 characters
address line 1	40 characters
address line 2	40 characters
address line 3	30 characters
postcode	4 characters
type of purchase	4 characters

This gives a record length of 148 bytes.

Many systems would force the user to make this record 256 bytes long.

If details on 1500 customers are to be maintained, what size disk should be used? Well, 1500 x 148 is 222 Kbytes, which will just fit on a single-density 20cm disk. With a two-drive system, this might be acceptable.

If you're cutting costs and only have one drive, it must be double-density to allow space for the operating system, utilities, language processor, and of course, your program.

Examine your peripherals requirements carefully. Can one VDU handle the workload?

If you need multiple screens, this will influence your software possibilities enormously. What speed of printer will be required, and what quality of type?

Examine the documentation carefully. Enquire about support services and maintenance. Unlike software, it pays to have your hardware supplier still in business when your computer breaks down.

Allow for future expansion. Can you add more memory, a hard disk drive? Can you attach more screens and make the system multi-user?

Bell's Handy Hints!

Each application has its own special requirements, which have not been covered here. Avoid applications which will involve custom hardware; these can prove expensive. Let someone else take the risk first.

I have a few other words of advice which can be classified as dogma, and consequently the discerning reader may choose to ignore them. They are based on experience, both good and bad (some real horror stories!), but may not apply to your particular situation.

Avoid 13cm (5.25inch) minifloppies! If you only want to store that much information, you may as well memorise it, and run the business in your head. Mini-floppies are really okay in their place, which is beside a thumping great hard disk.

Stick with industry standards in software, such as CP/M. This way you have access to the largest software base, with more chance of finding the right package for your needs.

Beware of the advice of people (even/ especially consultants) who have ingrained mainframe modes of thinking, which necessitate a minimum of one Mbyte of RAM and 10 Mbyte of disk, just to run a short BASIC program.

And don't believe everything you read. □



ASK THE VENDOR TO
PUT YOU IN TOUCH WITH
OTHER USERS OF THE
PRODUCT...

CASE HISTORY



So You Want a Computer-Controlled Rooster

Will Clara Cackle win the heart of Reuben the Rooster, or will he fall for the charms of her lovely sister Chikita?

These are questions which cannot be answered until some enterprising, imaginative TV executive gives the girls (and Reuben) the chance to play out a wonderful fantasy on their station. FRED SYMES, for one, would like to know the answer, and hopes that somewhere out there in televisionland is a person with enough nouse to pick up the challenge.

IF YOU'RE a friend of a writer, poet or artist, you will, in all probability, meet some pretty unusual people; you know, bohemians, eccentrics and other assorted weirdos. Let's face it, to be a friend of one of the aforementioned creative types, you're probably a bit of a weirdo yourself.

But if you want to meet some real characters straight out of fantasyland types, then you have to get alongside Dennis White, managing director of Createk, in Sydney.

Be warned, however, if you are at all conventional, conservative, or dare I say unimaginative, give Dennis a miss. Otherwise you might find yourself filling the wallet of a head-shrinker. (Yes, I know this is supposed to be a story about how micro-computers are being used in small business. Eventually it will be, but first let me tell you about Dennis and his wonderful dreamland of creativity.)

Virtually single-handed, he has been trying to out-Disney Disney. And he's getting very close to achieving his ambition despite years of frustration and even ridicule, from some quarters.

A superb artist, animator and sculptor, with an acute sense of the ridiculous, he has created countless special effects, costumes and sets for TV commercials. He's produced, animated entertainments for children and adults, and an incredible inter-galactic adventure set, which achieved a remarkably realistic sense of "being there" for the viewer.

Excellent as these have been, Dennis has never been entirely satisfied. An idealist and a perfectionist, he has been disappointed that the Australian fantasy market has not been prepared, or able, to pay the price of perfection.

Dennis realises, of course, that in a small market such as we have in Australia, cost is a debilitating factor in the attainment of his goals. What really has annoyed him though is the general attitude that in the area of creative fantasy, American is best!

Australian Technology

"That was true until a couple of years ago," Dennis agrees, "But Australian technology and creativity is now certainly equal to the American product."

As Australian companies have looked to America for ideas and products, Dennis has an exciting collection of characters he has designed over the years, but has not been able to sell, because no-one believed Australians had the know-how to bring them to "life".

For at least ten years he has been dreaming of a television show built around animated barnyard characters. When first he mentioned it to likely sponsors, the response was incredulous looks. Some couldn't even grasp the concept of the idea, others just didn't believe this young Australian could produce such an ambitious show.



While continuing to produce far less ambitious works, to keep the company going and to buy the groceries, Dennis White has maintained his belief that he and his small band of like-minded technical supporters could produce the goods.

Probably his biggest break came when a New Zealand tourist company wishing to develop theme parks in Australia bought his company (then known as Animads) to utilize the creative skills of Dennis and his team. The Kiwis had seen what Dennis had already done, and knew of his dreams for much more sophisticated amusement products.

With the financial backing of the New Zealanders, Dennis set to work on the production of two major works he'd had in mind, other than the barnyard show. These were "Movie Monsters" and the intergalactic space show. To assist with the technology, particularly of animation, a top Disney man was imported. This was when it became obvious that Australians knew at least as much, if not more, than the American expert.

CASE HISTORY

American Advice

I can vouch for this personally, because as part of my rather chequered career (excuse the cliches), I had at the time been appointed by the New Zealand owners as manager of Dennis' operation.

The American advised on the type of motors required to supply the animation to the models in the "Movie Monster" set. Australian engineer Jim Linich, the man who has provided the motive power for all Dennis animated characters, tended to disagree with the advice.

Well, we all went along with advice of the US expert, only to find at a critical stage in production — like two weeks before "Movie Monsters" was due to premiere at the Sydney Royal Easter Show — that Jim was right. The motors, specially imported from the States, just didn't do the job, so there was a frantic search round Australia to find the motors that would.

Shortly after, the New Zealand tourist company was itself taken over, and one of the first actions of the new owner was to sell off Animads. Dennis bought it back, and changed the name to Createk.

He then got back into creating special effects to rebuild his finances. In this he was successful enough to start work "on spec" on his barnyard fantasy. Part of it anyway. He chose to create the main character, Reuben the Rooster.

The basic concept of the barnyard show is that Reuben is a country and western singing star, supported by a number of other animated characters, such as Mr. Big (the pig) Clyde (the horse), and Chikita and Clara, two young chicks vying for the romantic favours of Reuben.

Reuben has been completed at a cost of \$80,000. He is able to perform a four-

minute chat and song show, put together just to indicate what he can do.

Reuben In Nashville

Though little interest has been shown by likely Australian sponsors so far, there was an excellent response in New York and Nashville, where Dennis recently ran a film clip of Reuben for television executives.

I watched Reuben perform "live" the other day, and was staggered by the personality that has been built into this singing rooster. He is unbelievably realistic.

Supplying the animation to Reuben are 11 motors, which activate 11 parts of his anatomy. He turns his head, moves his mouth in perfect synch with the audio tape, taps his feets, strums his banjo, leans forward and backward and moves his eyes, brows and lids.

Jim Linich provided the servo motors. With typical Australian ingenuity, modified motors from Bosch windscreen wipers do the job. Each motor is activated by a program run on an old Sol-20, one of the first micros to come on the market.

Using the same synchronisation method as for animated film, Reuben's animation was charted, then recorded on the clock track of a reel-to-reel audio tape. The synch chart was also transferred onto the Sol-20.

Each motor can be activated at intervals of one-tenth second. In theory, each animated part of Reuben can move 600 times per minute, for a total of 6600 movements per minute. Naturally, this rate of animation is not required, but it does reveal the high state of technology the Dennis White team has achieved.

Tape Activated

The pulse on the clock track of the tape activates the computer program, which in turn activates the motor, or motors, required to come into play at that time.

To check what Reuben should be doing at any given time during his show, Dennis keys in the time, say 2m 21.3s, and the relevant information comes up on the monitor. It will show which motors are being brought into action at that precise moment, and what parts of Reuben's anatomy are being activated.

It is possible to alter the program to eliminate a movement, speed it up, slow it down, or add a new bit of animation.

Apart from Jim Linich, Dennis' helpers have been Robert Smart, who did the interfacing, and David Tilbrook, who was responsible for several modifications to the hardware. The software was put together by a guy who wishes at this stage to remain anonymous, for the reason that his employer might not appreciate his moonlighting on Reuben.

Almost any night on television you can see some of Dennis White's bread-and-butter work. Telecom's owl, Mortein's cockroaches, Minolta Camera's mermaid suit, and the Comet Transport set. Years ago Dennis created the original dragon suit for Sydney's St George Building Society.

Through his Brisbane office, he has been commissioned to produce Matilda for the 1982 Commonwealth Games; remember Mishka at the Moscow Olympics?



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YC NOV 81



LINTON-SIMPKINS

THE LONG DISTANCE RUNNERS ARE NO LONGER LONELY!

EVERY DAY one more bastion of male supremacy, real or imaginary, falls to the forces of fair play and reasonableness.

This sad fact was forcibly brought home to me recently as I watched Sydney's City to Surf race on television, and even more when I heard of a marathon race for consenting adults of any sex.

For nearly two millenia, marathon running was the unchallenged preserve of men, but of a kind of man of a rather exceptional breed, one that I have no wish to emulate.

Now women are dogging the tracks of these sweating, tortured men and, to their chagrin, gaining on them.

All this is really rather odd, because I have always thought women were far too practical a race to take part in anything like a 40 km run.

Over in our sister gerontomatriachy, the USA, in the city justly famed for not going soft on hardcore pornography, Boston, there is an annual marathon race for men and women.

The results of the race are tabulated by a computer. Here's to dear old Boston, the home of the bean and the cod; where the Lowells have no-one to talk to, because Cabots speak Cobol, by God, supplied by Honeywell.

These results are closely studied by many citizens. I feel that this scrutiny is not unconnected with the same sort of gathering-around that one sees at car crashes.

It isn't really too sadomasochistic, but merely interest and a feeling of relief that

one has escaped the accident one's self. Also, there may just be an element of delight in seeing how other humans can be made to suffer. A feeling I entertain each year on the Sunday of the City to Surf event.

I am not alone in this freehand gloat, otherwise why would so many people flock to see the Rugby matches, punk rock concerts, visit trendy inner city pubs and such...?

There is even a dash of the aphrodisiac about a little suffering, as the ancient poet Ovid and the modern poet Robbins have realized to their mutual benefit. Ovid even recommended the predatory male to take his target to the games or gladiatorial contest in order to make his aim more certain (or to turn his doughty lady into a certainty, but then Ovid was the first of the dirty old men).

But back to the Bostonian suffering this year, and the computer mentioned above has given out a few interesting pieces of information. In 1981 the men competing were on the average shorter, older and showed less stamina than last year. In contrast the women competitors were generally faster than their sisters of 1979.

Since I have observed that women at parties generally seek to escape from short old men, it seems to me that the above two pieces of information may not be unconnected, and that the girls were running with the added incentive of trying to escape from your average older, shorter and lighter man.

Come to think of it, it is just and reasonable that women might want to escape from short, scrawny old men and may even

be prepared to run 40-odd km to do it. Naturally the incentive would vary inversely with the age of the women and directly with the age of the men.

So this year the average women was three minutes faster and this was perhaps why she was rather more likely not to finish — 51.7 per cent finished, compared to 56.8 per cent last year. I hope the poor finishing of the ladies this year had nothing to do with the aging, scrawny latter-day Milanions, dropping golden apples.

In the ill-omened words of the computer supplier, Honeywell, the male-breakdown looked like this. In 1980, men as a group finished the course in three hours and 28 seconds. This year 2112 men under 40 ran the course in an average time of 2hr 50m 10s. The ones over 40 are called "masters" by the diplomats who organise the race, and the 1315 of these averaged 3hr 12m 34s for a combined average time of 3hr 1m 50s for all males.

Being more diplomatic still, the organisers didn't have a "master" class for women. Perhaps it was that, or the title "mistresses" was too much for Boston.

Such diplomacy is not unknown in other sports. The lady rowers, who correspond to the male category of heavyweights, are referred to in Australia as "elite".

What with women in marathon running, and at West Point, if they manage to develop a parthenogenesis on a regular basis (thank God, it has only happened once in 2000 years, and then only with outside help), we males are finished. □



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Has all the things that other word processing programs should have Easy to use, written all in machine code / It permits the inserting and deleting by characters, words, sentences, and paragraphs / Page scrolling up and down / Search ahead of the cursor or behind the cursor for any character / The cursor can be moved up, down, left and right / You can seek top of file and bottom of file / Block move of text, block delete of text / Search and replace or search delete / Unlimited insert (to the limit of your machines memory) / Permits use with lower case /

Has things that other programs should have, but don't. Upper and lower case output to your printer (if your printer accepts lower case) without having your computer modified. ON UPPER CASE ONLY MACHINES: This program marks the capital letters so you can see which letters are CAPITALS and which are not. / Will change all upper characters text to lower case or all lower case to upper. A SINGLE COMMAND / Will capitalize the first letter of all sentences and all proper noun 's. WITH A SINGLE COMMAND / LOADS ANY ELECTRIC PENCIL / FILE, ASCII SAVED FILES, EDTASM FILES or BASIC PROGRAMS SAVED ASCII / Permits installing special control characters in your text for your printers special features, like double wide or condensed print / Definable screen length and definable print length to 255 characters wide / Screen editing that is not final till your command. This means that you can edit your file on the screen and if you don't like how it reads you can cancel and leave it the way it was / You can append files (which means that you can put one file to the end of another file) / No lost characters at the end of the line, even for the fastest typist / A directory of all your files is available to the user without leaving the program / Saving programs to disk easy enough for the non-computer user / To save memory, not all the program modules are in memory at one time but are called from the disk as needed / You can set tab positions like on a typewriter / 10 CUSTOM COMMAND KEYS for the experienced user (there is a command file that permits many special functions that are all user defined (not enough space for better explanation in ad, send for complete overview) / Program has HELP file that is a short review of the commands that are available /

Standard Printer Module. This printer module is provided for the user as a standard feature. Optional special printer routines for custom printer will be available in the near future. In this original release, it has the following printer drivers and will support the following printing devices: RS232, TRS232 and PARALLEL printer ports. You have the following format commands: Justifies Text, Centers Text, Centers Title, Line Spacing, Line Length from 3-255

characters and Set Margins / Also send any ASCII code to any printer from the text / Save formatted text to the disk for spooling later / Information for customer to load his own special printer driver / Printing can be stopped and started by the user at any time and then restarted where you left off / You can print entire file or just print to bottom of the page /

Communication Package. RS232 COMMUNICATION TERMINAL PROGRAM permits you to communicate with other computers. Transfer files from one machine to another. Permits dumping memory across the phone lines. Receive files from other TRS-80's and "Shake Hands" with larger computers. This is the complete system called LAZY WRITER. There is no package written for the TRS-80* that is as comprehensive. This package is available for the TRS-80* MOD I, 32K or larger with at least a single disk drive. List price is from

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The system permits embedding ASCII commands into the text of the program. NOW you can do SUPERSCRIP and SUBSCRIP (if your printer can handle it). Underlining and boldface, printing of a single word in a paragraph, is now possible, at no extra cost.

A key that remembers the cursor position.

User definable special character. For use with printers that have printable characters that the TRS-80 keyboard does not normally support.

Margin control from within text. This means that you can change the margins of your printed text without stopping the printer routine and changing it.

Page offset with odd/even headers and footers. This means that you can print one page offset to the left of centre and the next page offset to the right. This is very nice when you are writing a book.

Printing changing feature. This permits having more than one file on disk and create one printed letter, contract, or book without having to reset the printer commands.

Mandatory space command. This is necessary when you are writing letters or papers that have certain words that are not to be broken-up, eg. John P. And-houser. This name can be made to be unbreakable to justify routines in the program.

Disk catalog. Now you can load your disk directory into memory and create a file of this information.

Reverse Indents or known as Hanging Indents.

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Binary for Beginners

Puzzling over the difference between a bit and a byte? Has- sled by hexadecimal? In the belief that no-one could be less inter- ested in computers than a bird- watcher, Your Computer editor LES BELL has set out to make all clear...

NEWCOMERS to computers generally are blessed with the ability to count. What often disturbs newcomers, however, is at its fundamental level, the computer seems to count in a different way to people.

In dealing with computers, there's just one magic number to remember, which will always get you out of trouble. Every- thing in computers revolves around the number two.

Why is this?

In all digital computers, and certainly all micro-computers, all the processing and memory circuitry is digital in nature. That is, the inputs and outputs of each circuit can be in only one of two states at any time.

This is how it works. In a micro- computer, the circuit elements run off a power supply of five volts. The other con- nection to the circuit is nominally earth, or zero volts. These connections form the power supply circuit.

Digital circuits are logical in operation. Inputs and outputs have only two values, logical zero or logical one; or expressed differently, true or false.

In computer circuitry, inputs and out- puts are either near zero volts or near five volts. It doesn't matter whether an output is 4.85 volts or 3.9 volts — we say that's 5 volts. And we equate that with logical one, or true. Similarly, voltages around zero volts we call zero, or false.

Thus, these circuits have only two states, and we say they are binary in nature. They can represent true or false, on or off, black or white, or any other two- valued system of expression.

Down For The Count

The next question is, how then can these circuits count?

If you have a circuit with an output, it can only represent 0 or 1, and that's a bit limit- ing. Think about what happens with our normal system of counting in tens. We run out of symbols, or outputs at nine (9). But that hasn't stopped us counting to millions and beyond.

What we do, when we run out of sym- bols, is to stick an extra symbol to the left of the old one, and start the first column one back at zero again. So when we get to nine, we do this:

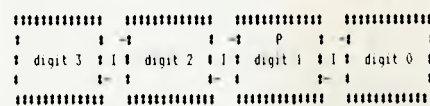
8
9
10
11

And when we get to 19, we perform a similar trick:

18
19
20
21

We can do something similar with bi- nary circuits. We simply add a new circuit to the left of the first. Whenever we run out of values on the right-hand circuit, we just bump up the next circuit to the left. And when it overflows, we just bump up the circuit to it's left.

So we get a scheme like this:



As each digit overflows, it cranks up the digit next to it. Counting up from 0 (0000) to 15 (1111) in such a scheme happens like this:

digit 3	digit 2	digit 1	digit 0	decimal
0	0	0	0	0
0	0	0	1	1
0	0	1	0	2
0	0	1	1	3
0	1	0	0	4
0	1	0	1	5
0	1	1	0	6
0	1	1	1	7

1	0	0	0	8
1	0	0	1	9
1	0	1	0	10
1	0	1	1	11
1	1	0	0	12
1	1	0	1	13
1	1	1	0	14
1	1	1	1	15

Notice how, each time a digit goes from 1 to 0, it causes the next digit to change state. And if it changes from 1 to 0, so the next digit along is 'nudged', too. Look at the change from 7 to 8. It's like the change between 999 and 1000.

You can see that four binary digits (commonly called bits) allow us to count from 0 to 15. By adding more bits, we can count as high as we like. Adding an extra bit almost doubles the highest number we can count to. So five bits will let us count to 31. Six bits lets us go to 63.

Can you see a pattern beginning to emerge?

If we have n bits, we can count as high as $(2^n) - 1$. So an eight-bit computer will let us count as high as 255. A 16-bit computer will go as high as 65535. Instead of counting sheep as you try to sleep, you might try working out the series 2, 4, 8, 16, 32, 64 in your head.

Each of these numbers is one more than the limit we can count to with a given number of bits. They're handy numbers to remember when you're trying to do arith- metic around computers, too.

To convert binary numbers to decimals is easy. Look at the way a decimal number is organised:

ten-
thousands thousands 100s 10s units

2 7 4 9 5

Binary numbers are organised in a simi- lar way:

thirty
-twos 16s 8s 4s 2s units

0 1 0 1 1 0

In this case, the value of the binary number, expressed in decimal, is $0 \times 32 + 1 \times 16 + 0 \times 8 + 1 \times 4 + 1 \times 2 + 0 \times 1$, which equals 22.

There's an easy way to convert binary to decimal without keeping track of which digit is which power of two.

Algorithm 1

1. Set your total equal to zero.
2. Read the next digit, if there is one and if there is, double your total; otherwise you are done, and the total is the answer.
3. Add the digit to your total.
4. Go to step 2.

Here's a short C program that does this:

```
main()
{
    int total;
    char c;

    total = 0;

    while (isdigit(c = getchar())) {
        total = total * 2;
    }
    if (c == '1')
        total = total + 1;
    printf(" binary = %d decimal\n",total);
}
```

The reverse process is almost as simple. To convert decimal to binary, use this algorithm:

Algorithm 2

1. If the number is odd, write down a one, otherwise, write down a zero.
2. Divide the number by two, ignoring the remainder. If the result is zero, then go to step 3. Otherwise go to step 1.

Reverse the order of the digits you have written down, and that is the result.

Here's another short C program to do this. It uses recursion (in other words, it calls itself), in order to output the digits in the right order; that is backwards.

Golden Memories

Talking about remembering numbers, how do you remember numbers in binary? On my computer, for instance, the start of the cassette load routine is:
1100000101011111

That's the pattern of bits sent out on the address signal lines, when the computer starts executing that program. How could anyone remember a number like that? But if I forgot, how could I get a tape loaded into my computer?

The answer is that you don't remember binary numbers. You only have to remember how they work. Instead, we convert them into some other number system; there are three common ones.

Decimal is just our conventional counting, based on tens. Octal is similar, but based on eights, while hexadecimal is based on sixteens (but you won't need 16 fingers).

Let's start with octal. Octal is rather unpopular these days, which is a pity, as it's easy to use and has a special advantage if you're programming 8080 or Z-80 micro-processors. It works like this. Take your binary number, and break it into groups of three bits, from the right.

0 1 / 0 1 1 / 1 1 1

Now take each group of three and convert them into a decimal number:

0 1 / 0 1 1 / 1 1 1

1 3 7

The answer, in this example, is 137.

To convert octal into decimal is a simple extension of the algorithm we used earlier. Here it is:

```
main()
{
    int total;
    char c;

    total = 0;

    while (isdigit(c = getchar())) {
        total = total * 8;
        total = total + (c - '0');
    }
    printf(" octal = %d decimal\n",total);
}
```

The same applies to decimal to octal conversion:

```
main()
{
    int d;

    printf("input number: ");
    scanf("%d",&d);
    dtoc(d);
    printf("\n");
}

dtoc(n)
int n;
{
    char c;

    if(n != 0) {
        c = n % 8 + '0';
        dtoc(n/8);
        putchar(c);
    }
}
```

Hexadecimal is rather different. In this case, we want our number system to represent every possible combination of four bits.

Remember they can vary from 0 to 15, but decimal runs out of steam at 9! So we'll have to invent six new digits. The conversion from binary to hex looks like this:

0000	0
0001	1
0010	2
0011	3
0100	4
0101	5
0110	6
0111	7
1000	8
1001	9
1010	A
1011	B
1100	C
1101	D
1110	E
1111	F

We break up the binary number into groups of four bits, then convert each group into hex. So what happens is:

0 1 0 1 / 1 1 1 1
5 F

Converting hex into decimal is fairly easy. Here's a BASIC program to do it:

```
100 REM ** HEX -> DECIMAL CONVERTER **
110 REM WRITTEN IN MBASIC 4.4
120 REM 27/9/81
130 :
140 REM INITIALISE
150 T = 0
160 :
170 INPUT "HEX NUMBER TO CONVERT"; N$
180 :
190 FOR I = 1 TO LEN(N$)
200 REM BREAK UP STRING
210 C = ASC(MID$(N$,I,1))
220 REM REMOVE ASCII OFFSET
230 IF C >= ASC("A") THEN C = C - ASC("A")
    + 10 ELSE C = C - ASC("0")
240 T = T * 16 + C
250 NEXT I
260 :
270 PRINT T;" DECIMAL"
280 END
```

Converting Hexadecimal

Converting decimal to hex isn't very tricky either. We can use a modification of the same technique we used for binary and octal conversion. Of course, in BASIC, subroutines can't call themselves, so we can't use the recursive technique

directly. Instead, we can store the digits in an array, and then print the array backwards.

```

100 REM ** DECIMAL -> HEX CONVERTER **
110 REM WRITTEN IN MBASIC 4.4
120 REM 30/9/81
130 :
140 INPUT "DECIMAL NUMBER";D
150 I = 0
160 IF D = 0 THEN 220
170 I = I + 1
180 H(I) = D - 16 * INT(D/16)
190 D = INT(D/16)
200 GOTO 160
210 REM PRINT RESULT
220 PRINT "EQUALS HEX ";
230 FOR N = I TO 1 STEP -1
240 REM PRINT, ALLOWING OFFSET
FOR LETTERS
250 IF H(N) > 9 THEN PRINT CHR$(H(N)
+ ASC("A") - 10); ELSE PRINT
CHR$(H(N) + ASC("0"));
260 NEXT N
270 END

```

It's a little bit contrived in places, particularly line 250, which prints either a digit if H(N) is less than 10 or a letter if it is 10 or greater. The reason this is so awkward is the digits are not immediately fol-

lowed by the letters in the ASCII code, which computers use.

It is left as an exercise for the reader to convert these programs to operate in binary and octal. I deliberately gave those examples in C, because it's easier to do those conversions by hand and because C expresses the algorithms more clearly.

However, if you don't have a C compiler (and most of us don't) it will make an interesting and useful exercise to rewrite these algorithms in C.

In my experience, there's no better way to learn than by doing. So at this stage, you would be well advised to sit down by your computer and try a few examples.

Your Turn!

Exercises for the diligent reader!
(You'll go far, stick with it).

- A. Convert these binary numbers into decimal:
 1. 01001011
 2. 11010010
 3. 10011001
 4. 10110100
- B. Convert these decimal numbers into binary:
 1. 93
 2. 45
 3. 174
 4. 255

- C. Convert the numbers in A (above) into octal.
- D. Convert the numbers in B (above) into octal.
- E. Convert these hex numbers into decimal:
 1. C3
 2. 35
 3. 67
 4. FF
- F. Convert these numbers into hex (don't panic!):
 1. 177 octal
 2. 193 decimal
 3. 10111100
 4. 65535

Answers:

A:	1) 75	2) 210	3) 153	4) 180
B:	1) 01011101B	2) 00101101B	3) 10101110B	4) 11111111B
C:	1) 1139	2) 3220	3) 2310	4) 2640
D:	1) 1350	2) 0550	3) 2560	4) 3770
E:	1) 195	2) 53	3) 103	4) 255
F:	1) 7FH	2) 0C1H	3) 0BAH	4) 0FFFFH

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CP/M Without Tears

-A Story With BIOS

Okay, your micro-computer is percolating along, with a CP/M operating system; but you're a little concerned about the unusual characteristics of the peripherals you're dangling... Maybe it's just that you would like to have both upper and lower case capability, or perhaps, the ability to standardise your command codes for your particular terminal.

With CP/M life isn't all tough, you can enlist the aid of BIOS — Basic Input/Output System. For some answers to the three possibilities posed above, we sent JEFF RICHARDS forth into CP/M land, with the faithful BIOS at his side. Here's his report:

ONE SIGNIFICANT advantage in a micro-computer which uses the CP/M operating system is the availability to the user of the Basic Input/Output System — BIOS.

This means once the system is up and running, the user can begin to modify his BIOS, so it does exactly what he wants it to do. Such a feature is of enormous value in specialised applications, and when using peripherals with unusual characteristics.

To give you some examples of how the routines in the BIOS can be enhanced, I have examined three simple interfacing problems, and provided a solution for each.

The first problem involves keyboards with only one case, either upper or lower. Many such keyboards are around, either in older equipment, or as part of the cheaper serial terminals. The problem is also relevant to those keyboards with upper and lower case, but without the "Upper Case Lock" feature.

The routine presented here (Listing 1) is designed to fit in your BIOS, immediately after the routine that takes the keyboard input character from the I/O port, and before any processing is done.

It works by looking for a special "change case" character (labelled CASE), which can be set to any convenient character your keyboard can generate, but which would not normally be keyed in. ASCII zero (NULL) is a good choice. But if this is not possible, don't forget CP/M and most word processing

routines expect to receive certain control characters from the keyboard, so try to avoid these.

Upon receipt of the "change case" character, the current state of the shift flag (labelled LOCK), is toggled by adding 1 to it (line 000F). This flag is used in the second part of the routine, to determine if the case of received characters should be inverted or not.

Inverting the received character is done by simply exclusive or'ing it with 20Hex (00100000Binary). This turns bit 5 on if it is off, and off if it is on. (Try it with pencil and paper to demonstrate that the correct codes are generated).

The RETurn at line 13 is optional.

It should be excluded if you want the input routine to pass your "change case" character through to CP/M as an ordinary character. If you do not want the character passed to CP/M, then leave the RETurn in.

Useful Feature

Keyboards that have upper and lower case can still benefit from a similar routine. A useful feature missing from many keyboards is an "Alpha Lock" key. This key forces all alphabetic (A to Z) characters to upper case, while leaving the shift key operable for numerals and punctuation characters.

Listing 2 shows a substitute IGNORE routine which performs this task. The control character is still the "change case" code of Listing 1; but this time, instead of just inverting the case of any character, it forces lower case alpha ("a" to "z") to upper case.

Operation is the same in both cases; simply type the "change case" character once to turn the feature on, and type it again to turn it off.

The second problem involves the compatibility of different terminals. Most terminals support a similar set of functions, such as home cursor, clear to end of screen, clear to end of line and scroll.

Unfortunately there is not a lot of standardisation on what codes will initiate these actions; so it is valuable to be able to insert a code conversion routine in the BIOS procedure, which will convert codes from those the program sends to those to which the terminal can respond.

Such a routine is presented in Listing 3. This is designed to fit into the BIOS right at the console output entry point (invariably called CONOUT).

It works by defining a table of 32 codes. If a control code is detected, then, instead

of passing the control code through, it passes the code from the table which occupies the position pointed to by the control code.

Charging Commands

For example, suppose you have a word processor set up to communicate with a Lear Seigler ADM-3A; the code to clear the screen is 1AH (26D). But your terminal clears the screen on receipt of 05H (5D).

In this case, you would put the value 5 in the 26th position of TABLE, so any time the word processor sent a clear screen command, the "26" would become a "5" and the screen would clear.

Alternatively, you may want to disable functions.

Some terminals fall into what is called "monitor mode" on receipt of 1FH (31D), in which all control codes are displayed, instead of being acted upon. This is a nuisance if you are occasionally dumping garbage to the screen, or if you have some programs which think a "31" should perform some other function.

In this case you could put a zero (or some other non-implemented control code) into position 31, so any time a 31 comes down the line it will be ignored.

Finally, there is a routine to deal with some unusual characteristics of printers. Note that the routine of Listing 3 could as easily be extended to printers; say for a device that has a non-standard form feed command.

The problem to be detailed here, however, is involved with the difference between line and character printers.

A character printer prints a character when it is sent from the output port. The character might actually print, or it might be a command to return the print-head to the left margin (carriage return), or to space the paper to one line (line feed).

A line printer on the other hand does not print anything until a certain print command is received, then the whole line is printed at once. The reason for this is usually in the mechanism that does the printing. Once it starts on the line it is all or nothing.

Driving this type of printer is not more complex than character-printers, because the print command is usually the carriage return character. Since you have to send one of these at the end of each line, it serves as a good instruction to the printer that the line is complete and can be printed.

The problem is, some printer manufacturers (notably Centronics) have taken

advantage of this convenience and have added a feature of their own. What they've said in effect is: we may as well use it to signal a new line as well.

So if your system sends a carriage return/line feed combination to this type of printer, you will get automatic double spacing — one line for the carriage return and one line for the line feed.

On some printers this "feature" can be disabled. But this is not always convenient, and there may be some software designed to take advantage of it. A better solution is to modify your BIOS so a carriage return/line feed combination and a single carriage return both space one line only.

Intelligent Printers?

But doing this turns up a new problem with this type of printer. Sending a single carriage return will do nothing!

"Intelligence" (at least that is what the manufacturer calls it) in the printer detects that there is nothing to print, so it ignores the carriage return and does nothing. The solution is to replace the carriage return/line feed combination with a space/carriage return combination.

This is what the routine in Listing 4 does.

One additional feature is included in this listing.

Printers are much slower than processors, so most printers include a signal which tells the CPU they are ready to accept a new character. Therefore the CPU can test this signal and not send any characters until the printer is ready.

However, many printers have a SELECT/DESELECT state which can be controlled by a code sent from the CPU. This is useful, as the printer is usually deselected when turned on, and the CPU can select it when it is ready to print. When the CPU has finished printing, it can deselect the printer, and the operator can note that output is complete.

Also, many printers cannot do operator initiated form-feeds unless deselected. If the CPU cannot select the printer after the operator has deselected it, to extract the last printed page, then the CPU could spend a long time waiting for the operator to realize what is wrong.

When to Send

The solution, of course, is to send the select code at the beginning of each output program. However, if it is sent as an ordinary character, the output routine will test the status of the printer before sending it, and will discover that the printer is not ready. As a result the CPU won't send the code to select the printer and make it ready!

The listing shows how to insert a simple test, which causes the output routine to jump around the status test if the character it is sending is the select character.

The routines presented here are only a few of many that could be devised to make your system deal with its peripherals more effectively. Other examples are a line-count, to do software form feeds on a printer that does not have hardware form feeds; or a routine to do cursor addressing, using home, line-feed and tab on a screen that does not have hardware cursor addressing.

Note, however, that modifying your BIOS is virtually impossible unless you have the source code. And steer away from any machine advertised as using CP/M, but does not give you access to the BIOS sources.

Also, be wary of indiscriminately increasing the size of BIOS. The space available to store it on the system area of the disk is fixed, and you may simply run out of room.

However, increasing your BIOS up to the maximum will not consume any more memory, as the space is already allocated to it. So it is worth spending a little time to get as many tasks as possible out of your programs and into the BIOS.

Continued on page 77.

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What's happening at Apple?

THE AUSTRALIAN computer industry is alive with rumours about foreign companies gearing up for a major push on the local market.

The atmosphere is something like the situation in the parliamentary press gallery in Canberra. But as yet the computer industry hasn't produced a Don Chipp, or a Tamie Fraser, to fire broadsides at the rumour-mongers.

The focus of most of the current rumours has been on Apple, and the suggestion of the US parent company being about to buy out the Australian distributors and go it alone.

There have also been suggestions of several million dollars changing hands in the deal to let Apple into Australia.

What really happened is Electronic Concepts (ELCON) has made a clean sweep in the Apple stakes, taking over as master distributor and edging out the competition.

According to ELCON managing director, Mr Rudi Hoess, Apple has re-affirmed his company as the master distributor, at the same time terminating Delta's right as a major Apple dealer.

A Telex from Apple International Sales Manager, Mr Steve Shank, sent to ELCON, said Apple continued to believe in integrated sales and distribution in Australia, and to that end ELCON would be supported in preference to other groups.

This announcement follows a visit to Australia by Steve Shank, and a return visit to the US by Mr Hoess, in which the negotiations for the deal were concluded.

A brief history of the on-going battle begins with Apple appointing a Hong Kong company to distribute its products in Australia, with the Australian distributorship on a non-exclusive basis.

The Hong Kong company did not exercise its Australian rights until early this year, when it appointed CGF Electronics, in Melbourne, as its master distributor.

This move followed Apple's appointment of Sydney-based Electronic Concepts as its official Australian distributor.

The plot then thickened. The two companies battled it out for supremacy. At the

time CGF Electronics managing director Mr Paul Marks said: "We're now involved in a two-man race that will keep both of us on our toes. It can only be good for the industry."

The new situation is perhaps not entirely unexpected, as the wrangling of the past few months had to be resolved in the favour of one of the two parties.

Immediate Strategy

According to Rudi Hoess, the victor, his strategy for the coming 12 months will be to upgrade the advertising and information campaign, and to heavily promote the new Apple equipment.

He says he already has 70 dealers on his books, and he will be looking to increase that number in the next few months.

As to the rumour of Apple US moving into Australia to oversee, first-hand, the marketing, of its products; Mr Hoess says this could happen in about 12 months time.

He agrees Apple have realised the marketing potential of Australia, and will focus much of their new product activity here.

"Computers in most people's minds are accounting machines. We are trying to change that image," Mr Hoess said.

Not Just Accounting

"But the heyday of excitement, in integrating the new technology in everyday life is over. From here on in, the less sensational technological change will take over.

"The awareness of large corporations as well as small business of computers as a tool to productivity, rather than just an accounting machine, is of the greatest importance.

"What these people are now realising is the machine becomes a terminal to the mainframe, as well as a computer in its own right.

"I predict there will be a boom in the industry in the very near future, of much greater proportions than we have seen in the past. The rate of increase in new technology is becoming more rapid."

Mr Hoess believes the overseas manufacturers have realised the potential of the Australian market, and it is on the cards for several large Japanese based concerns to make an effort to gain a greater share of the local trade.

No doubt this will be a boon to Australian users, who will have a field day shopping around. It could also mean another price cutting war, bringing down prices still further.

Whatever the result, it's all good news to all sectors of the computer industry in this country.

Mr Hoess believes the future of the computer industry in Australia is in the add-ons area.

"In the real sense, we don't have a computer industry. We are just bringing in technology and putting it together," he says.

Where We Excel

"Where we excel is in specific interface environments, where we can produce for our own needs. Australian software is among the best in the world, because here you have to perform just that little bit better to survive.

Mr Hoess points out there is already an established market in the US for Australian software. Items such as word processors and the 80-column card for the Apple are already being used there.

Mr Hoess said Apple would be pushing the Apple III early next year.

The equipment, which initially had several technical problems, is now, according to Mr Hoess, operating properly. The complaints about the lack of programs from people who bought the system when it was first released, has also been answered. Apple has been churning out compatible systems for the computer.

"Apple is upgrading the Apple III, and merging it with a five megabyte hard disk, for use with the IBM when it comes out. The Apple III is really a development system, not an operating system.

"When Apple III begins making its existence known, it won't be as a hobby machine, it will be as a business orientated system," said Mr Hoess. □

SORCERER COMPETITION

SYSTEM SOFTWARE

1 KENT STREET, BICTON
WESTERN AUSTRALIA 6157
TELEPHONE: ISD (619) STD (09) 339 3842
Sunday through to Friday.
Ask for Richard Swannell for personal service.

SUPER ASTEROIDS by Apollo 'A new era in real time graphic arcade games'.

Never has there been such a captivating and superbly written arcade game for the Sorcerer. Styled after the well known and very popular ASTEROID DELUXE arcade game, SUPER ASTEROIDS is destined to become the most popular piece of demonstration software used by dealers and users alike. Perhaps it is the outstanding use of fine line graphics or the silky smooth movement. Maybe it is the breathtaking speed, dazzling explosions, gripping sound effects or simply the challenge of avoiding those fire balls from that persistent flying saucer that insidiously follows you across the screen. Whatever it is, we warn you NOT to purchase this game for fear that you may join the ranks of hundreds of other ASTEROID Addicts who, square and bleary eyed at 3 am, just MUST have DNE more go at trying to beat that High Score.

The object is to guide a small space ship across the screen avoiding but shooting asteroids as they glide past. When an asteroid is hit, it will break up into many smaller pieces. By repeatedly hitting the pieces they will soon disintegrate and disappear. If you crash your ship into an asteroid it will break into pieces and splinter across the screen in a shower of sparks! However, if you manage to stay in one piece, chances are you'll soon be pursued by a flying saucer that shoots balls of fire! Best that you treat him with care, else you may make his friends VERY aggressive.

Apollo has used a novel but ingenious method of continually reprogramming graphics characters and has obtained stunning results! All movement is done pixel by pixel but without speed loss. Numbers of asteroids, directions, speeds and such like are all totally unpredictable. If you can show us a piece of software that has finer, smoother and faster graphics than SUPER ASTEROIDS, we guarantee to refund your money in full!

Cassette \$29.95

COMPETITION

We are running a programming competition and encourage anyone with time and enthusiasm to enter. Prizes will total over \$2,500.00! One prize of \$500.00 will be awarded to each winning entry in all 5 sections with the chance of more than one winning entry per section if the standard is particularly high.

SECTION 1: Games — Any type of game will be accepted although we recommend the arcade styles such as Asteroids or Adventure games.

SECTION 2: Utilities — Here a wide range of options is available including Graphics, Plotting, Assemblers, Mini Compilers, Printer Drivers and Disk Utilities.

SECTION 3: Educational — Anything from child education in Maths and Spelling to computing such as the Machine Code tutorials.

SECTION 4: Serious Applications — This may include Data Base programs, Accounting Systems (both cassette and disk based), Maths and Scientific packages, Astronomy and other special purpose applications.

SECTION 5: Miscellaneous — Anything not covered above such as Novelty Programs, Hardware/Software combinations, Sound Generation and Wordprocessor programs would come under this section.

CONDITIONS OF ENTRY

All applications must be lodged at System Software on or before the 31st December, 1981.

Entries should be submitted on cassette at both 1200 and 300 baud twice each. If the software is to be run on disk, instructions should be included on uploading.

No entry will be returned unless specifically requested and return postage forwarded.

Entries will be judged according to: (1) Programming technique. (2) Reliability. (3) Usefulness. (4) Creativity. (5) Originality. (6) Marketability and (7) Documentation.

At least one (1) winning entry will be taken from each section.

The Judges' decisions will be final and no correspondence will be entered into.

A prize of \$500.00 will be awarded to each winning entry.

Only winning entries will become the property of System Software.

The names of all programmers submitting winning entries will be published in a subsequent catalogue unless otherwise requested.

ZAP80 'Secret Code Disassembler' by Ian Robinson

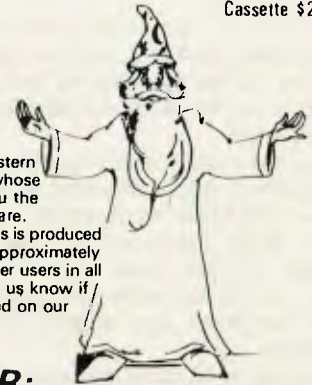
This is far from your average run-of-the-mill disassembler! Other than being a mere 4K long, able to disassemble at the speed of light and packed with options, ZAP80 will display before your very eyes all those unknown instructions ZILOG never talk about! Ian has been doing extensive research into the actions of the Z80 processor when confronted with the 700 or so undocumented (and so called 'illegal') code sequences. Over 100 of these are VERY useful! Did you know you have extra 8 bit registers and a complete set of instructions to manipulate them? Did you know about extra rotate instructions?

ZAP80 will disassemble ANY code sequence. Nothing is illegal! It will allow you to program with codes that no other disassembler can decipher! Think about that

ZAP80 comes with documentation and explanation of all new mnemonics used. Three versions are supplied that reside in low, mid and high memory. Options include ASCII output, screen pause and customised printer control.

Whether you are a serious programmer, a beginner or simply curious, ZAP80 is a piece of software you must have. Come and play a REAL adventure game!

Cassette \$24.95



We are a dynamic Western Australian enterprise whose sole aim is to bring you the best in Sorcerer software. A catalogue such as this is produced regularly and sent to approximately 2000 interested Sorcerer users in all parts of the world. Let us know if you wish to be included on our mailing list.

HOW TO ORDER:

ALL PRICES ARE IN AUSTRALIAN DOLLARS.

One Australian dollar equals 1.16 American and 1.4 Canadian.

All programs come standard on cassette but some may be requested on either Micropolis II Quad density or VISTA 5 1/4" diskettes for an additional cost of \$5.00 per diskette. Note that more than one program will fit on a diskette. Programs available or diskette include CIRCUS, GALAXIANS, GROTRNIK WARS and ZAP80.

\$2 discount if this form is used. (Photostat will suffice).

PROGRAM	PRICE
Postage within Australia is \$1 for initial item and 50c for each additional. Outside Australia is \$2 and 50c.	
Less \$2 Discount	\$2.00
TOTAL	

I enclose,

(a) Cheque or money order for the above amount, or

(b) My credit card, expiry date
(Master Charge, Visa, Bankcard, American Express, Diners Club)

No.

My name and address:

NAME:

STREET:

TOWN/CITY:

POSTCODE: COUNTRY:

Micro-computers are getting pretty small these days, as we've seen with the Sinclair ZX80. But this must set some sort of a record. It weighs just 170g, and is small enough to fit comfortably in your hand — if you know what LES BELL means.



Sharp PC1211 Pocket Computer

your computer REVIEW

AS POCKET calculators have grown more powerful and sophisticated, and computers have become smaller and cheaper, it was inevitable that the two types of machine should finally meet in the middle.

The Sharp PC-1211 is a pocket-sized computer which is fully programmable in BASIC, with optional facilities to save programs and data on cassette tape, and to print results and listings on an alphanumeric printer.

The Sharp looks very like any other small Japanese pocket calculator, with a satin chrome finish and LCD display. But most of its keyboard is laid out like a standard QWERTY typewriter keyboard.

On the right half of the keyboard is a numeric keypad and a few function keys, though there is no divide key and no 'x' for multiplication either. These are replaced by the standard computer functions of / and * respectively.

Using the pocket computer as a calculator is a bit different from the standard calculator. The expression to be evaluated is keyed in, and is displayed character by character across the LCD display. The equals key is not used. Instead, the ENTER key is pressed, and the result appears in the display.

If you realise you have made an error in entering your formula, press the <-- --> keys and the expression will reappear on the display. It can now be edited and re-evaluated.

This makes the calculator extremely easy to use, although I suspect it may make adding up columns of figures rather

difficult, as the 80-character buffer could easily be overflowed.

However, most users wouldn't bother using the Sharp as a calculator — its keyboard isn't laid out for it. Instead, they would stick to what the PC-1211 does best, and use it as a personal, pocket-sized, computer.

The PC-1211 uses an honest-to-goodness superset of ANSI BASIC. It includes all the functions and statements required for a conventional implementation of BASIC, and adds a few of its own, which are designed to support its calculator-like design.

Full Cursor Editing

The PC-1211 is surprisingly easy to program. In fact, once it is put into program mode, it's just like using any other personal computer. There's no video display, of course, but it does offer full cursor editing.

Up-and down-arrow keys allow the user to select the line to be edited, and the cursor left and right movement keys allow the line to be edited, using the insert and delete functions.

Lines can be typed in without regard for spacing, as the PC-1211 immediately tokenizes the input. On hitting 'enter', the lines will be re-displayed with correct spacing and a colon after the line number.

Incidentally, the PC-1211 allows multiple statements per line. These become a necessary technique for programming, due to the line-number overhead, which is eliminated — an important point for a memory-limited machine.

REMs are allowed, but not often used, for similar reasons.

The PC-1211 has 26 memories, rather than variables, and these are named A — Z. Each memory can hold up to seven characters of string data.

Arrays are possible, but tricky. For example A(1) is A itself, A(2) is B, A(3) is C, and so on. Memory extends beyond Z, but it then must be referred to indirectly, as A(27), A(28), etc. Indirection is possible through this facility.

The BASIC is very comprehensive (for such a small machine). Functions provided include all standard trig functions: LN, LOG, EXP, DMS (degrees, minutes, seconds conversion), DEG (the reverse), INT, ABS, and SGN. Trig functions can be set to work in degrees, radians or grads.

The complement of statements is equally complete. LET can be implied, and the other common BASIC statements are all there: INPUT, PRINT, IF, THEN, GOTO, GOSUB, RETURN and so on. A few statements are obviously tailored to the machine's calculator style PAUSE, for example, works like PRINT, but places its argument in the display for almost a second before continuing. PRINT, on the other hand, halts execution.

Scientific Notation

There are some statements one just wouldn't expect to see on a computer this size. There's a reasonably complete implementation of PRINT USING, for instance. This allows the user to specify the number of digits to be printed before and after the decimal point, and to force the computer into scientific notation.

The AREAD (automatic READ) statement will read data into variables/memories at the start of a program's execution. To use this facility, a program must be 'defined' that is, it must start with an alpha label, and the computer must be in 'DEF' mode.

An alphanumeric label (one of the two bottom rows of keys) can be placed at the beginning of a line (after the line number) simply by enclosing it in quotes. Once this is done, a program segment labelled in this way can be immediately executed, by pressing the shift key, followed by the

label key. For example.

```
10:"F":AREAD A
20:F=1
30:FOR X=1 TO A
40:F=F*X
50:NEXT X
60:PRINT A;"FACT. = ";FX
```

will read the value of A from the display, and then proceed to calculate the factorial of A, just by pressing the 'shift' and F keys.

The ability to dedicate a key to a program extends to functions also. In the 'reverse' mode, the reservable keys can be used to provide two key-stroke access to functions. This can save quite a bit of typing when entering programs. Many of the functions, statements and commands can be abbreviated, but this will not save memory, as the input is tokenized in any case.

Precision of calculations is to ten decimal digits, which is more than most computers in single-precision mode. Accuracy seems quite good, when compared against other ten-digit calculators. However, users should be aware of potential problems when using, say, the trig functions, and watch for instability (this, of course, applies to all floating-point computer calculations).

The Sharp's keyboard is small, but logically organised and easy to use. The keys don't have any 'feedback' in their feel, and several times I made entry errors. But with cursor editing, this is hardly a major problem.

Easy, But Tedious

Entering programs is easy, if somewhat tedious. Programs are just the same as if they were written for a computer, save for changing PRINTs to PAUSEs. In fact, where trig functions are concerned, the convenience of having a degrees mode is

a major advantage over most computer BASICs, which are limited to calculating in radians.

One annoying feature, which I found lacking, is the ability to display results with a selectable number of digits after the decimal point, and to force scientific or engineering notation. In programs, the PRINT USING statement will perform this function, but I couldn't get it to work in calculator mode. Engineering notation just isn't available on the Sharp.

I was interested in just how fast the PC-1211 was in comparison with other computers and programmable calculators.

Interface Age's prime number generation benchmark is written in BASIC, and would run directly on the PC-1211. But how to get it onto a calculator?

Eventually, to make for a reasonably fair comparison, I compiled the BASIC into Reverse Polish Notation by hand to run on an HP-41C. (An interesting exercise — a BASIC cross-compiler for the HP-41C might be possible!). This code is not optimal by a long shot — it merely translates the BASIC code in a fairly dumb way.

The results showed the HP-41C to be running at about twice the PC-1211's speed. I couldn't wait for the machines to complete their run — they're simply not as fast as a full-blown computer. But after 50 minutes, the HP-41C was up to 271, and the PC-1211 didn't reach that point until 100 minutes.

However, I doubt that many people would have programs taking as long to execute as this one. And speed is not high on their list of criteria for selecting a pocket calculator or computer.

...And The Printer

Along with the PC-1211, we also obtained the matching printer and cassette interface. This forms a cradle in which the PC-1211 sits, attached by a connector at one end. The CE-122 is powered by rechargeable ni-cad batteries, so it is completely portable.

The printer, interestingly, is an impact, not a thermal type. It will print up to 16 characters across the paper, both for results, and for listings. In program development, the availability of listings can make life much easier.

The printer is noisy in comparison with thermal types, but then, its use will only be intermittent. It prints a row of dots at a time, with quite acceptable quality. Although the 16-character width is a limitation, it formats listings so continuation lines are indented, making reading easier.

The built-in cassette interface allows the reading and writing of named program files. The PC-1211 can search for named files on a cassette, skipping over others. The BASIC even has a CHAIN instruction,



allowing long programs to be made up from multiple cassette files!

Data can also be stored on tape, using the PRINT# and INPUT# statements. The system stores a complete block of memories immediately on the tape, but this system will allow some quite sophisticated programming.

Turning Japanese

The documentation for the PC-1211 and the CE-122 is written in that curious form of Japanese English which keeps you reading for the unintentional funnies.

At times it can be obscure, even mystifying, but the information is there. A little experimenting will usually reveal what the manual means.

There are three books for the PC-1211: a User's Manual for the machine (which is a concise introduction for the owner who already knows BASIC); an introductory BASIC textbook for the novice; and a library of applications programs taken from various fields, including a few games.

The PC-1211 is not supported with a vast array of Application Packs, as are HP and TI calculators. But it seems likely the

majority of owners write their own programs anyway.

Overall, then, my impressions of the Sharp PC-1211 are favourable. It is a well-thought-out package, capable of far more than its appearance would suggest. Although it is not as powerful as the more expensive HP-41C, there is a large difference in price.

For the professional who needs an advanced calculator for repetitive problem-solving, it merits serious consideration. □

Specifications and Report Card

Unit:	Sharp PC-1211 Pocket Computer
Made By:	Sharp Corporation
Processor:	Dual CMOS 4-bit processors
Clock Speed:	Not applicable
RAM:	Approx 1.9Kbytes
ROM:	Not applicable
I/O:	LCD display, keyboard
Languages:	BASIC
Keyboard:	Calculator-style, soft action
Display:	5 x 7 dot matrix LCD
Graphics:	Are you kidding?
Peripherals:	Printer/cassette interface
Expansion:	Through port in side
Best Points:	Small size
Worst Points:	Speed, display formatting

Ratings:	excellent	good	well, maybe	poor
Documentation			✓	
Ease of Use		✓		
Functionality		✓		
Support		✓		
Value-for-money	✓			
Extras included:	Hard plastic case			
Options:	Cassette interface, printer/cassette i/f			
Price:	\$215			
Review unit from:	Metropolitan Business Machines			

```

01:  #LBL 'PRIME'
;100 REM INTERFACE AGE BENCHMARK
;110 REM DISCOVERS FIRST 1000 PRIME
      NUMBERS
;120 REM

;130 PRINT "Starting:"
02:  "STARTING"
03:  AVIEW

;140 FOR N=1 TO 1000
04:  1.999
05:  STO 00
06:  #LBL 00

;150 FOR K=2 TO 500
07:  2.500
08:  STO 01
09:  #LBL 01

;160 LET N=N/K
10:  RCL 00
11:  INT
;230 PRINT N;
12:  RCL 01
;30:  #LBL 03
13:  INT
;31:  RCL 00
14:  /
;32:  INT
15:  ^ENTER
;33:  VIEW X

;170 LET L=INT(M)
;240 NEXT M
16:  INT
;34:  #LBL 04
;35:  ISG 00
;36:  GTO 00

;180 IF L=0 THEN 230
;250 PRINT CHR*(7)
17:  X=0?
;37:  BEEP
18:  GTO 03
;260 PRINT "Finished,"
;38:  "FINISHED"

;190 IF L=1 THEN 220
;270 END
19:  1
;40:  END
20:  X=Y?
21:  GTO 02

;200 IF M>L THEN 220
22:  RDM
23:  X<Y?
24:  GTO 02

;210 IF M=L THEN 240
25:  X=Y?
26:  GTO 04

;220 NEXT K
27:  #LBL 02
28:  ISG 01
29:  GTO 01

```

This listing shows line by line how the Basic prime number generation program was converted into reverse Polish. for the HP41C.

Graphics Printers

SEAHORSE COMPUTERS now has stocks of the Epson range of printers with their high resolution graphics capabilities.

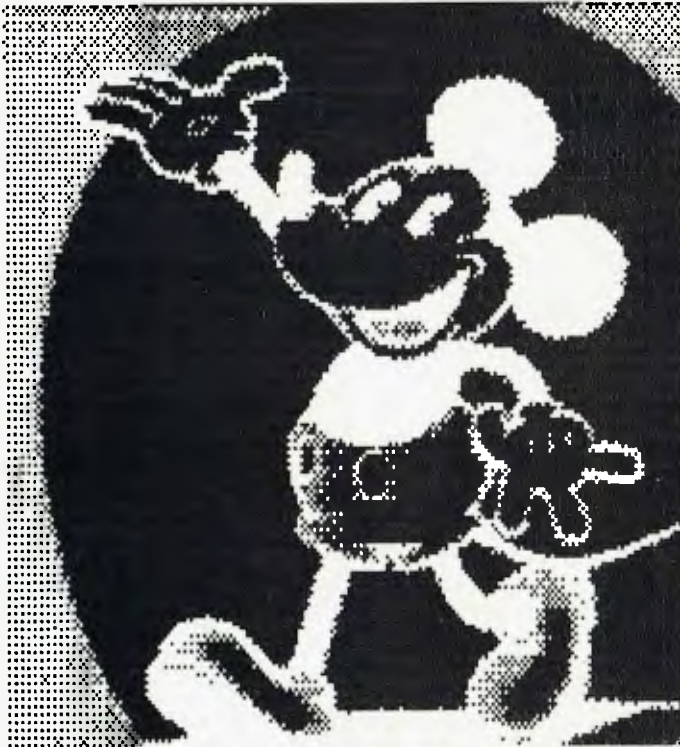
The MX80 type 2 is available for \$999 plus sales tax and the MX100 with its 38 cm (15 inch) carriage is \$1200 plus tax.

These printers can be eas-

ily interfaced to a number of computers.

Their main feature is their very high print quality, which is claimed to be better than printers costing hundreds of dollars more.

The graphics versions of the Epson produce very high quality graphics dumps. These are easy to produce, using the screen dump routines available from Seahorse Computers. □



Dollars to Schillings

AUSTRALIAN travellers who want to keep tabs on their expenses will appreciate the new 'TravelChek' Auto Currency Converter, which has a special micro-computer chip built-in, to perform instant currency conversions.

All the user has to do is to key the tiny credit card-size unit with the exchange rate, whether it is Australian dollars to French francs, Italian lira or Japanese yen, or the other way around. Any two currencies can be converted into each other, and the exchange rate stays locked in the memory (even after it is switched off) until programmed to handle a new one.

'TravelChek' saves its own batteries by shutting down automatically if it has not been used for 10 minutes, and also functions as a conventional arithmetic calculator.

'TravelChek' is distributed to the trade throughout Australia, by Contax Pty Ltd, Box 1162 GPO Sydney 2001, and is sold by gift shops and department stores for around \$29.95.

It is also available by mail order, from CPL distributors, PO Box 234, Milsons Point NSW 2061. □

Australian Dataphone

THE TCG GROUP of Crows Nest in Sydney has signed an agreement with B.R. Pascoe and Associates to sell TCG Hypercom dataphones in Hong Kong, Singapore and Malaysia.

Managing director of TCG, Peter Fritz, said his company regarded the agreement as a major breakthrough in marketing the Australian-designed and manufactured Speakeasy premium business phone and dataphones overseas.

The agreement follows displays by both TCG and Hypercom, manufacturer of the Speakeasy range, at the Hanover Fair this year. The phones attracted major

orders at the Fair from customers in Greece, Israel, Nigeria, Iceland, Sweden and Brazil.

"We also received a significant number of orders from the USA and West Germany, and are confident of making major inroads into both those domestic markets," Mr Fritz said.

The agreement with B.R. Pascoe follows negotiations by TCG with a number of firms in both Singapore and Hong Kong interested in acting as agents for the dataphone, which evolved from the Hypercom TX5000 premium business phones introduced to the Australian market last year.

The dataphones are designed to communicate with a host computer.

B.R. Pascoe and Associates was established in Hong Kong in 1979 to provide broadbased consulting and EDP training and software services. It now has 30 staff in Hong Kong and Singapore.

Through our involvement with BRP we anticipate achieving an additional 2000 dataphone users in Hong Kong and Singapore, and expect trading in the first year to reach some \$750,000," Mr Fritz said.

"We are the only telephone company in the world to provide this double-end service — the voice and the telephone — and therefore to solve the problem on both sides. Other companies rely on the customer to solve one side himself.

"Dataphones cost approximately \$300 each. Mainframe interface costs are in-line with the cost of one VDU operator. The ability to link a number of phones to the mainframe increases capabilities over those systems which place the intelligence in the phone and maintains a more cost efficient system," according to Mr Fritz. □



Novell Image

US-BASED Novell Data Systems has released a new fully programmable dot matrix printer onto the Australian market.

Distributed in Australia by the TGG Group, the micro-processor based Novell Image 800 is designed specifically for office use. It features 30 programmable functions, including six sizes of condensed and expanded print, variable line spacing, subscripting and superscripting, selection of two character sets and a programmable VFU — Vertical Format Unit.

Five operator control switches on the front panel of the printer allow the operator to put the printer in an on-line or off-line mode, set the top of form, advance paper to the next top of form setting, advance the paper for fine position adjustments, recognize a paper-out condition, override that condition, and set the printer into a self-test mode.

Interfaces are available for RS-232 or Centronics.

A stepper motor, combined with dual tractor paper feed, ensures repeatable positioning of dots to form clean characters and guarantees accuracy in underlining, subscripting, superscripting, descenders and margin alignment.

The Novell 800 sells for under \$1700 and prints 150 characters per second, bi-directional, with logic seeking intelligence. The printhead is designed for an average of 200,000,000 characters. □

Computerised Shopping!

WHILE everyone else is talking about it, Dick Smith has done it! He has introduced Australia's first "shop by computer" system.

This is a system where you use your personal computer, through your telephone, to shop from your home or business (anywhere) directly onto the Dick Smith computer.

Smith foresees the day when most of his 45,000 mail order customers will use this system. With \$3 million turnover from these customers, he wants to make it as easy as possible for them.

Until now, ordering electronic equipment by mail order had cost the consumer a lot of time and money and taken up to five days to reach its destination. By using the "shop by computer" system, the customers can place an order through their own personal computer. At the touch of a key, the order is received at Dick Smith Electronics.

The Dick Smith ordering system is simple to use, and anyone with the right equipment can take advantage of it. All that is needed is a Dick Smith System 80, or a Tandy TRS-80 computer, an expansion unit with an RS-232C port, a disk drive and an acoustic coupling modem. As an introductory offer Dick Smith is making the simple programme available at cost price.

The computer acknowledges receipt of the order, and also lets you know the

latest specials Dick Smith Electronics has to offer.

The order is given preferential despatch treatment, and would normally be on its way within four hours of it being received. It is also automatically billed via a nominated credit card account. □

Rubik Solution

GLOSTER Software has just announced the availability of a computer program, designed for the new and popular Sinclair ZX-81 home computer, able to solve the Rubik Cube.

Cube owners tell the computer what colours are on their cube, and where the various pieces are now, and the computer displays the moves in easy-to-follow steps, by reference to the colours on the cube.

It is claimed that the computer's instructions are very much easier to follow than those of the "how to do it" books. They are more explicit and relevant to the actual cube being used, and to its current state.

While to some it may seem the challenge has been taken out of the cube, the computer adds another dimension by informing the user of the time taken to order the cube (excluding the computer's thinking time).

For those who are still unable to resolve the problem, the computer has a final word of advice. Noting that there are 43,252,003,274,489,856,000 combinations, it reasons that the cube owner now possesses a uniquely ordered cube. It therefore strongly advises the use of glue before some smart Alec tries to re-arrange it. □

DAMAR MANAGEMENT SYSTEMS

FROM **HEWLETT PACKARD**

THE HP-85
A PERSONAL - PROFESSIONAL COMPUTING SYSTEM.

Hewlett-Packard's newest stroke of genius puts big computing capability into a portable computer even first time users can quickly master. The HP-85 is designed for anything from basic calculation to complex problem solving in Business, Industrial or Scientific applications.

Yet it's a totally integrated system — Keyboard, Display screen, Printer, Tape cartridge, Plus 4 ports for peripherals and additional plug in RAM and ROM modules.



DAMAR — SERIES 80 SOFTWARE LIBRARY

OVER 300 HP-85 SOFTWARE SOLUTIONS!

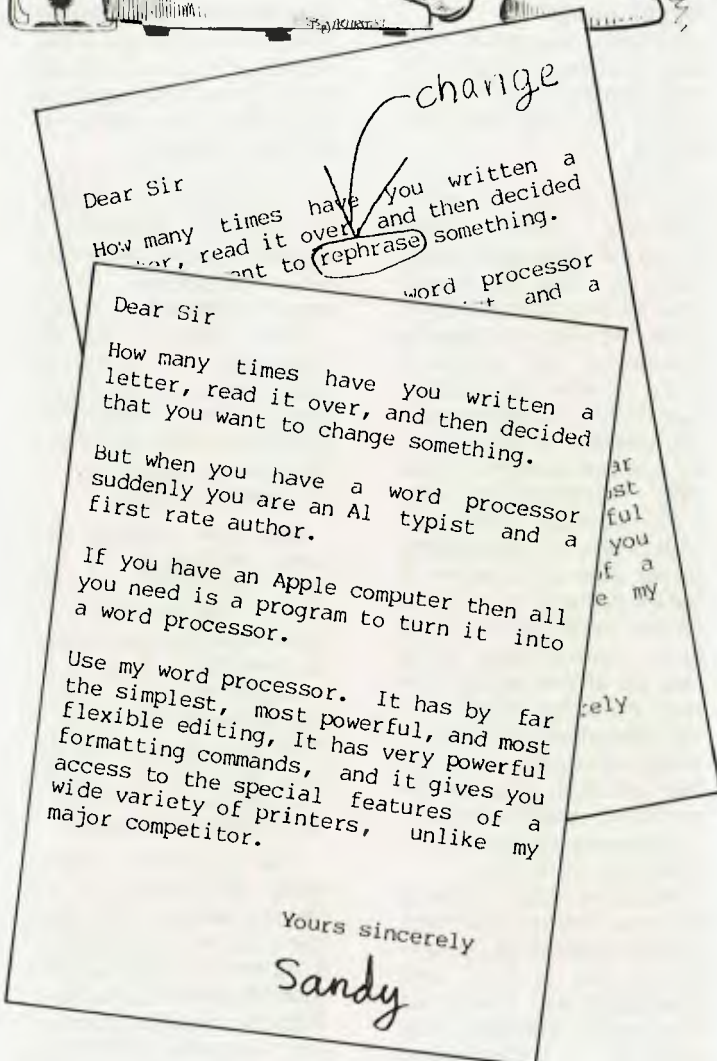
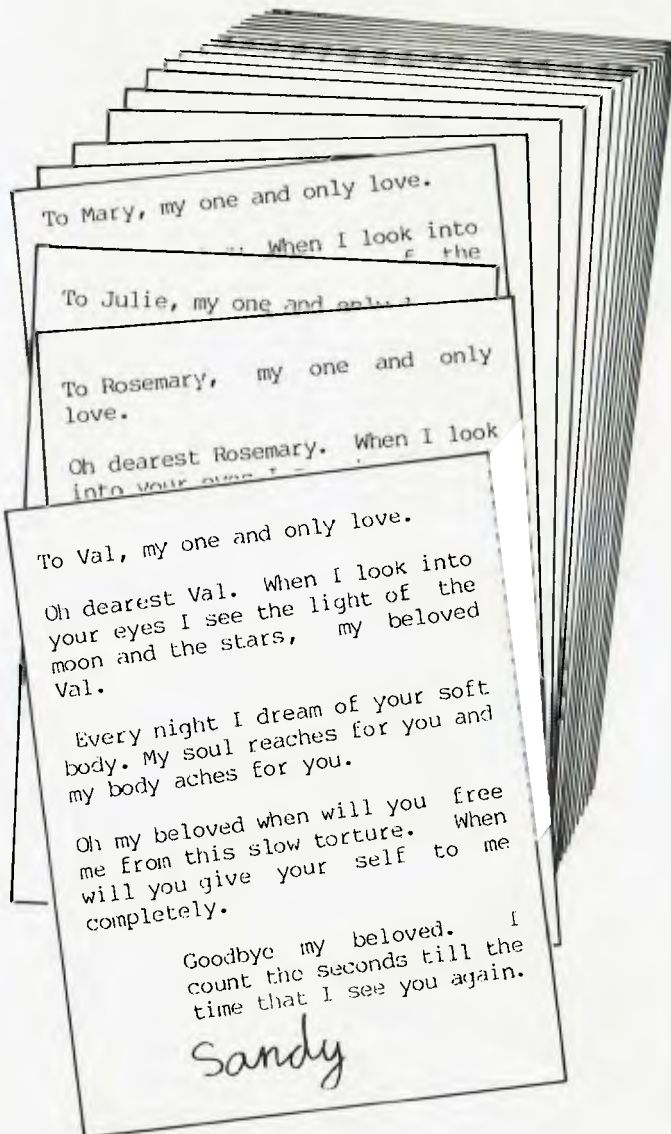
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If it is not available at your computer store ask them to get it in.

first staged in Sydney in February this year, and was considered a great success by both participants and visitors. An exhibition devoted entirely to software is quite unique, and the industry is well served by having a specialised event.

With the support of the Software Industry Committee of the Australian Computer Society, a series of seminars will be conducted, over four half-day sessions, covering topical subjects in the field.

It is anticipated over 50 companies will be participating in both exhibitions covering almost all the fields of software applications, and peripheral services.

For further information contact Peter Daniel or John Alcock, on (02) 929 8188

Parramatta Land

COMPUTERLAND AUSTRALIA has opened its third suburban Sydney store, in Parramatta.

According to the company, this reflects the growing awareness of the capabilities of small computers in Australia by people in business and education, as well as personal users.

Computerland will now have over 180 stores all over the world.

The famous Apple Computers, which have had a great deal of publicity over the past year, as well as Cromenco Systems, regarded as the "Rolls Royce of microcomputers", are among the range of hardware available from Computerland.

Parramatta's manager,

Ray Green, a chartered accountant turned computer professional, says after having been in the main-frame and mini-computer environment for the past 12 years, micro-computers offer the best and most cost effective solution to most businessmen's problems.

New Tape

PERKIN-ELMER Data Systems has announced the release of a magnetic tape system, which adds performance characteristics previously found only in the 'main-frame' computer class.

Called HPTD125, the tape system is one of a number of peripherals Perkin-Elmer sees as important in allowing users to fully utilize the capa-

bility of their 32-bit Megamini computers.

In particular, the new tape meets the demands of the section of the market which requires removable storage media, offering high data throughput and data interchange between various computer systems, say Perkin-Elmer representatives.

The tape offers data transfer at rates up to 780KB per second, and is capable of reading and generating tapes at 800 BPI, 1600 BPI and 6250 BPI — all on a single tape system.

Other technical advances include improved data integrity, using the GCR format, and gapless mode support for continuous or chained data.

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Utility ZX-81 Software

HARD ON the heels of the new 8K ROM, comes a series of software designed to further expand the capabilities of the Sinclair ZX computers, from Gloster Software.

It is now possible to re-number program lines after the program has been entered; pick-up data left behind in spare RAM by a previous program; and merge separately saved programs/routines together.

Current variables portions can be saved on tape during program execution; and portions of the current variables can be replaced by loading data directly from tape during program execution, while retaining a permanent set of variables.

In effect, the ZX-81 user now has file handling capabilities enabling an unlimited amount of data to be handled

by a single continuously operating program, without the necessity of introducing an expensive disc drive system (not yet available in any case). At least 2K RAM must be available —preferably more.

As an encouragement to those still using the previous 4K ROM system, software is also available enabling 4K ROM saved programs to be loaded directly into the ZX-81 or ZX-80/8K ROM machines.

The accompanying instructions even include full details of how to convert each program in the 30 programs for the Sinclair ZX-80 — 1K book, which has almost become a classic for ZX-80 owners. □

3M Market Boom

3M AUSTRALIA, the country's biggest supplier of computer media, is developing its

retail computer market, the computer industry's fastest growing sector.

There are now about 130 minimicro computer retailers throughout Australia, excluding Tandy and Dick Smith outlets, an increase of 120 in a year, said Mr David Clancy, data recording product manager of 3M.

Mr Clancy estimates the value of the minimicro computer market is \$4 million a year, with an annual growth of 60 per cent, making it the fastest growing sector of the computer industry.

He expected 3M's Scotch brand computer media will be stocked by up to 80 retailers by the end of October. The company also supplies diskettes, personal computing cassettes, data cartridges, C-Box storage systems, data health care products, head cleaning diskettes, multi-purpose cleaning kits, Velos-

tat anti-static mats, anti-glare film and the Data South printer.

Mr Clancy expected Scotch brand computer media would be sold from computer boutiques such as those planned by Myer and Grace Bros.

He predicted more of the big retailers would move into the minimicro computer, since they had "built-in" customer bases, excellent mailing lists, and their own credit systems. □

Uninterruptible Power

DEFOREST Software has announced a new uninterruptible power supply unit, suitable for all microcomputer systems.

The unit is Australian designed and built, and costs \$1400 plus sales tax.

An optional gel-cell battery pack is available, but user may also use standard lead-acid batteries. □

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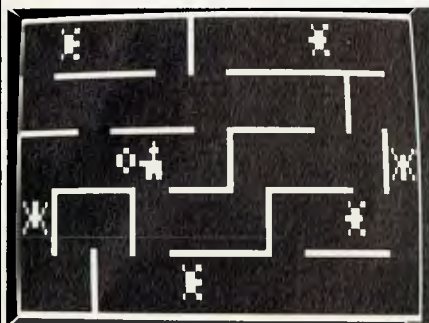
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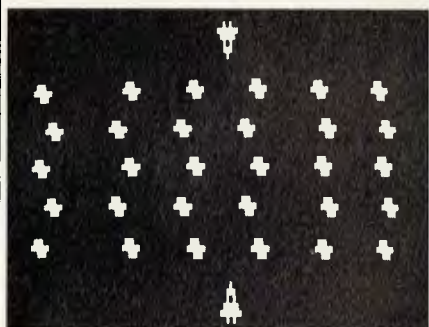
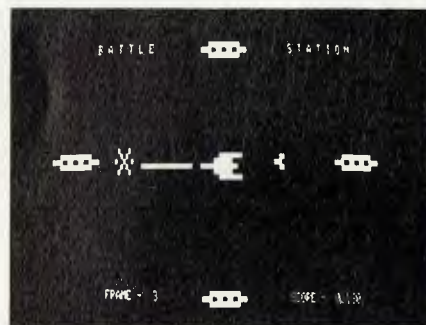


KILLER BEETLES

In this game you have to trap and bury killer beetles before they get you.
16K LI
\$19.95

BATTLE STATION

Four alien space ships have attacked your space station. Only speed and skill will fend off the attack.
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\$19.95

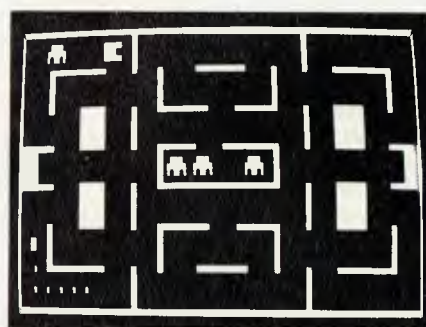


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Ph: (003) 31-8942.



Plain Sailing

INTERNATIONAL container shipping company ACTA Pty Limited has signed an order for a network of Honeywell computer systems, designed to streamline and improve customer service for exporters and importers.

The system will allow the company to drastically cut tedious paper work, and facilitate rapid release of bills of lading for exporters. Importers will benefit from specially designed software, which will allow immediate information retrieval in response to customer enquiries.

The first stage of the installation will take place when the first of three Honeywell DPS6 systems is installed in ACTA's Sydney office.

Melbourne and Brisbane will come on-line a short time later, completing the link to the Sydney head office.

A series of 60 Honeywell terminals, located in branches, depots and terminals, will provide full on-line computing facilities at these locations.

The assistant general manager (Marketing) for ACTA, John Burrows, is confident the investment will pay huge dividends in the area of customer service.

"Most of the administrative work performed at our branches is involved with mani-

fest, delivery orders, bills of lading, freight statements, and like documentations," said Mr Burrows.

"In future, all this information will be sent down the line to the DPS6 mini-computers.

"Then when a telephone rings with a customer enquiry, the staff will have the answer right in front of them on their visual display unit (VDU)," he said.

Exporters will benefit from rapid bill of lading release and minimum delays in documentation production. For the broker, whose profits are continually being re-invested in more products for export, delays in receiving a bill of lading can be costly.

"A bill of lading is really a title for the goods, normally in the form of a shipped on board bill," Mr Burrows said.

"If we can save him two, three or more days, then he can reduce his interest payments and save money."

ACTA has 12 large ships and 27,000 containers on the move at any one time. With trade lines extending to Europe, North America, the Middle East and New Zealand, keeping track of customer goods is a demanding but vital consideration. It took Honeywell one month, using ACTA's files, to design a demonstration system using the powerful Info 6 software.

ACTA management services manager, Frank Assenza, said the Honeywell equipment will allow ACTA to break new ground in the field of customer service in the container shipping industry.

The order package includes Honeywell TPS6 and Info 6 software, for ease of software generation. □

New Sanyo Machine

SANYO'S NEW MBC 3000D micro-computer has a 64K-byte RAM main memory, with a 4Kbytes of ROM for both main and local I/O memories.

The keyboard is a detachable ASCII type with 22 programmable function keys. Two by 20cm (eight-inch), double-sided, double-density disk drives with 1Mbytes per drive are built in, and up to two external drives can be connected via the floppy disk controller.

The MBC 3000D has a green 30cm (12 inch) non-glare screen with an 80 character display × 24 lines.

Standard characters are 6 × 9 dots, with 8 × 12 dots for graphic elements. Display modification offers facilities for inverse, flashing, overline, underline, highlight, secret, or any combination of these.

Expansion and communication is via RS-232C (two ports) in asynchronous mode, or optional synchronous mode. The printer interface is to Centronics parallel specifications.

The MBC 3000D is designed for CP/M, now virtually the standard operating system for micro-computers. It is claimed that there are now over 1600 public domain programmes available, and another 1500 commercially available software packages.

Roger Price, Sanyo Office Machines' Data Processing Product Manager, says: "Anyone using the MBC 3000D micro-computer now has access to suitable local

software for any application."

The range of standard software packages includes general ledger, accounts payable/receivable, stock control, financial planning and modelling, word processing, payroll, cost accounting, statistics and engineering."

The company claims the MBC 3000D has wide market appeal, finding ready applications in small business, accounting, word processing and financial modelling.

Sanyo Office Machines has taken particular care to ensure that a full range of software designed for Australian businesses is available at the same time as the release of the MBC 3000D. □

"What Next"

AS PART of a bid to penetrate the business computer market with its 32-bit Megamini system, Perkin-Elmer Data Systems is sponsoring the publication of a regular newsletter called "What Next".

Aimed at top executives, and already enjoying an enthusiastic response, "What Next" zeros in on one aspect of the Australian economy each month, with comments on the changes and challenges facing Australian business in the years ahead.

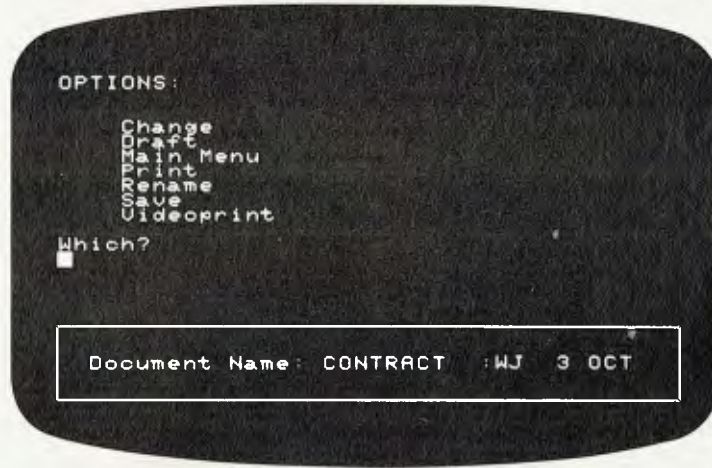
Articles are prepared by leading writers in the economic and industrial fields. The first issue, for example, was written by Peter Barrett, editor of Australian Mining.

Future editions will be just as noteworthy, assessing such important topics as the car industry and how city development will affect business in 1982 and 1983.

While "What Next" carries a nominal cover price of \$30 annual subscription, Perkin-Elmer invite top executives to apply for a complimentary one-year subscription. □



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When you buy a personal computer for your office, you don't want to take a college degree to use it. Computer Solutions has Word Processing software so good that it will make you want to buy an Apple II.

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Fast recording of your documents on inexpensive magnetic diskettes. Retrieve your documents from

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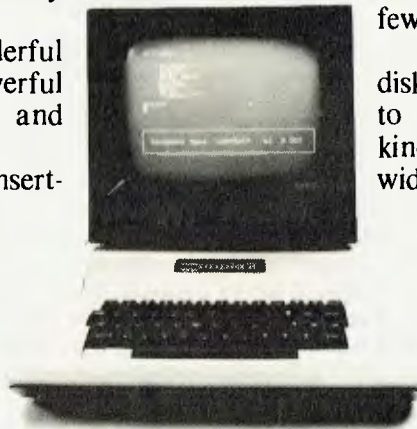
diskette so easily, make some changes, and record the altered version. Then ZARDAX will print your new improved version. Never again will you retype a whole document just because you wanted a few changes.

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If your dealer doesn't carry ZARDAX, have him mail us on The Source CL1791. Or have him call one of our distributors. In the USA, Action-Research Northwest, 11442

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requires a 48K, 16-sector disk-based Apple II Plus



Computer Solutions

Educational use of micro-computers in New Zealand schools is reaching a relatively advanced stage, due in part to the enthusiasm of distributors who see this as their most available market, because schools do not have to pay the crippling sales tax. Whilst he was in New Zealand recently, Fred Symes met several of these go getting enthusiasts. One, Mr. EYCKE ZIMMERMANN, Managing Director of Computer Store in Auckland, provided the following article which he has used to promote his products to schools.

WITH THE introduction of micro-computers into the real world there is no doubt that the computer is going to have an ever increasing effect on all our life styles.

As a result educators have, quite rightly, been investigating ways and means of introducing computers to schools. This should enable them to utilize the ability of the machine as a teaching aid while, at the same time, making students familiar with the type of equipment that they will strike in business life.

Until the advent of the microprocessor, the cost of a computer was so astronomic as to be completely out of reach of the average school. This position has now changed, and it has become important to try and standardise the available equipment while still giving the flexibility which is the hallmark of the microprocessor.

I will examine three aspects of the decision making process.

1. The areas in which computers can and should be used.
2. The available hardware.
3. The available software.

1. School Computers. Objectives

There are a number of separate areas in which computers can properly be used in schools. The emphasis given to each area affects the physical requirement of the device ultimately selected. The areas are as follows:

- A. Administration.
- B. Interactive Teaching Machines.
- C. Computer Programming.
- D. Computer Operation.

A. Administration

In order to serve the administrative needs of a school, the computer needs to have a very large data base to record such things as name and addresses of pupils, rolls, marks, attendances, etc. This can only be achieved by the use of a very expensive large disk drive. Unless the school has surplus funds it is unlikely that a teaching computer, such as envisaged, would be capable of meeting the administrative functions of a medium to large sized school.

However, if a teaching computer is capable of undertaking the sort of operation that involves a large amount of mathematics and a relatively small amount of data base, such as the compiling of a school timetable, it can also be used for working out school averages and the like and may be used after school hours for the purposes of word processing and letter writing.

A computer which can be programmed after school hours for these purposes would indeed be helpful. This additional facility need not cost anything other than the software to drive it.

B. Interactive Teaching Magazine

Most schools now have a special class where students with difficulties are given more personal attention.

It has been shown that an interactive terminal which can provide repetitive questions covering the same subject matter over and over again, retains the attention of pupils for a considerable time and greatly assists their learning skills.

A computer which has a number of terminals, each one capable of progressing at the rate most appropriate to the pupil operating it, would therefore be of great advantage. A simple program which makes use of a random number generator for varying the questions can be of great assistance in this department.

It has been shown, that a suitably programmed terminal can maintain the undivided attention of the pupil for period of 15 minutes or more.

Assuming four terminals to be available, it would mean that twelve students would be exposed to the remedial tuition offered by the computer during the normal 45 minute period.

As special classes are quite often limited in numbers to 12 or thereabouts, it means that every student in a class of this

nature would be exposed to computer aided instructions during one period.

The stumbling block at the present time is the availability of suitable software to comply with New Zealand school curricula.

C. COMPUTER PROGRAMMING

A great deal of discussions is currently taking place over the various languages available on different computer systems.

The purpose of the course, is to familiarise the students with computer programming. There is a conceptual barrier in all of us when trying to translate the command PRINT to the fact that this English-like word turns on a mechanical device such as a printer.

This word has now taken the place of the conventional off-on switch with which students are familiar. This type of conceptual understanding of what computer languages are, can be achieved with any language worthy of the name. It matters little whether it be E-Basic, M-Basic, C-Basic, V-Basic, Cobol, Fortran, Pascal, or whatever. The latest language need not necessarily represent a better solution to a problem than the older more established language. Nor do I believe that secondary schools should aim at making students fluent in a particular language. The concept is the thing that matters, not the fluency in a selected language.

Like the developments of the hardware, such as microcomputers, the development of the software is pushing ahead by leaps and bounds. There will always be a newer and brighter language developed, which will capture the imagination of the authors and supporters of that language. For this reason, the language chosen for the demonstrating of programming at school level is, in my opinion, unimportant.

In any case, most computers worthy of that name have the ability to use a variety of languages. All that is necessary is to insert the appropriate disk into a disk drive to fire up the computer in the language and/or operating system of one's choice.

For this reason the choice of language should not determine the choice of hardware.

D. COMPUTER OPERATION.

When a computer program has been written by a student, we expect him to enter this program into the computer. Depending on the means available, we either sit him in front of a home computer

and ask him to key in a program, or to mark a mark-sense card or to punch holes in a card. None of these alternatives appears to be covering the real life situation that a student is likely to find once seeking employment.

In the business world the need for a new program is discussed by management. A systems analyst is then asked to examine the problem and to come up with a recommended solution. He does this, by flow-charting a possible solution and then having it vetted. Once the solution has been approved, the analysis and flow-chart is then passed on to a programmer for him to program. The program code is then handed to a keyboard operator who will enter the program into the computer. At this stage the program is run by the computer operator. A complete listing with all error remarks is handed back to the systems analyst for correction. This is repeated until the program is debugged.

It seems to me to be a golden opportunity to involve more people in the design of a program by using say, seventh formers as systems analysts, sixth formers as programmers and students from the typing classes as computer operators and keyboard operators. It greatly increases the value that the school is receiving from the equipment and more closely simulates the real life situation.

If the terminals were available in the economics section of the school, it would then be possible to use terminals for instruction of typists and/others in simple word-processing as well as typing.

This would create an additional teaching situation without detracting in any way from the use of the equipment.

If a senior student or a staff member is engaged in a particular research project, there is no reason why he/she cannot use one of the terminals by simply walking across to the typing block and entering his/her program at that level.

2. Hardware

The actual choice of microprocessor is rather immaterial. There are any number of devices around capable of fulfilling the needs of a school situation. It seems to me futile to discuss the various merits and demerits of such devices as the 8080, 8085, Z80, 6800, 6809, 6502 etc. etc. After all, we are not discussing the electronics of a device but the ability of it to meet a specified need. Provided that the support of hardware and software is adequate, then that machine will do the job.

In a school situation other things come into consideration.

I do not consider it good practice to use a computer that is integral with the keyboard and the VDU unless, it has the ability of being multi-user, multi-tasking. For one thing, it seems a waste of money to supply one student with a complete computer and then find the breakdown of such a minor item as a keyswitch in a single unit machine can put the whole computer system out of use. I particularly refer to the keyboard switches, as these will receive a hammering in a school. Computers built for home use by hobbyists on a one to one relationship for a few hours a week, do not necessarily stand up to the use and abuse, mechanically, that such a machine will receive in a school.

Physically many of the lower priced computers have all electronics on one board. In this way, the cost of gold-plating of edge connectors and appropriate sockets on mother-boards, card-frames etc. is avoided.

For service in a school, this is not necessarily desirable. Indeed where a MAINFRAME is provided with a number of printed circuit boards plugged into it, it is possible to replace; a. defective boards rapidly and b. increase the size and capacity of the system as the needs of the school increase and permit.

Another point to consider, is that a singleboard computer is usually a proprietary design by one firm.

Many of these designs are technically excellent. They are, however, manufactured by only one firm. Should such a firm ever get into financial difficulties then future support for such a system is difficult to obtain.

In the rapidly evolving micro-computer industry this has of course, happened before. The DIGITALGROUP produced a very fine computer two years ago. Many of their units were sold. The firm has since gone into receivership and is now no longer manufacturing. They use a bus peculiar to themselves and owners of hardware of this kind are now in dire difficulty in obtaining expansion or replacement modules.

I suggest that, when considering purchase of a microcomputer, one ought to ensure that it uses one of the two standard microprocessor bus systems; either the S100 or the SS50.

The S100 bus is supported by some 350 manufacturers, worldwide, whilst the SS50 bus is supported by more than fifty

manufacturers, worldwide. This means that if the manufacturer of your particular system should default, there are a large number of manufacturers in the world who will be only too pleased to sell you expansion or replacement units which will fit your particular machine. This creates safety for your investment.

3. Software

I have already stated that I consider the choice of software to be relatively unimportant. It is the principle of giving electrical instructions in English-like commands which is the concept one must get across to the student. At the present time BASIC is the international language for microcomputers. There are several different versions of BASIC available. They start with a limited student basic, a standard Basic, an enhanced Basic etc. No two Basics are exactly alike. It should be possible to change from one Basic to another, depending on the program that one intends to run, with great ease. This seems the most practical solution. It also enables the loading of other languages, such as Pilot or Pascal.

I suggest that the selection of a particular computer according to the availability of one or another computer language is really necessary. Make sure that more than one language is available and that the language is reasonably powerful, to meet your needs. If the computer system is any good, no doubt additional languages for it will become available shortly in the ever-changing scene of microprocessors.

Typical Operation

Rather than compromising and letting senior students waste time in coding and entering programs into a computer, it is suggested that the real life situation of a systems analyst instructing a programmer who passes the program to a keyboard operator for entering and subsequent running by a computer operator, should be adopted. This means that you get four times the value of each program. It is further suggested that the machine that you purchase should be capable of multi-terminal operation, even if this restricts the memory available to each terminal. It is unlikely that a student writing his first or second program will require large amounts of memory. Accordingly, a multi-user, multi-terminal operating system within a microcomputer is a great boon to all involved.

your computer pocket programs

Renumber Utility for TRS-80/ System 80

by Andrew Koch

ALL OF us, at one time or another, have been developing programs and added in line after line until, in certain areas of the code, the line numbers are sequentially contiguous.

You then find yourself in the unenviable position of having to manually "shuffle" the lines by retyping them in to make room for new ones.

Proud owners of NEWDOS have their own renumber facility, but the vast majority of users either do not have disc systems or are running TRSDOS, in which case they must pay about \$30 for a renumber utility from software shops.

The renumber presented here is superior to most in that it uses a revolutionary new algorithm developed by the author which does not require a line number table.

Renumbering is a very complex procedure since all references to line numbers on the right hand side of the program must be adjusted to the left hand side of the program.

The usual technique is to build a table of the current numbers and match this with the new line numbers to allow for both forward and backward references. A second pass is then performed substituting the new values into the code.

The size of this table may be quite significant for large programs and is thus quite a burden.

Figure one shows the algorithm for this new type of renumber written in a derivative of psuedo code.

As shown, the program operates by a series of comparisons and additions for each line number found, and thus requires absolutely no table space. The disadvantage is that execution time can be quite long for large programs, but it must be remembered that on micros, memory space is the critical factor as computer time is free. It really doesn't matter if renumbering a huge program takes a couple of hours since renumbering will not be performed more than a couple of times in the development of any one program.

For really large monsters, all you need do is set it going, turn off the screen and go away. Renumbering only requires use of 74



the CPU and memory — and these do not wear out through usage!!

Figure two is the assembler listing for those of you with editor assemblers, and may be moved to suit whatever memory size you've got.

Figure three is the same program put into BASIC data statements for 16K machines. All you need to do is set a memory size of 32280, CLOAD in the program of figure three and run it so that the machine code gets poked into the machine.

Then CLOAD the program you want to renumber and type SYSTEM followed by /32280 and the renumberer will run. It asks for two pieces of information.

1. The first new line number
2. The increment for the new line numbers

These may be any value you like, except don't specify an increment of zero and don't let the new numbers ever exceed 65535.

Once the program has been renumbered, you can then CSAVE it back to tape.

To test the program to ensure you have typed it correctly, try a series of small programs.

Figure four shows the routine going through its paces, and it is a good test.

To illustrate the technique, we present a step-by-step conversion below:

Original Program

```
1 IF A>4 THEN 50
9 PRINT
10 GOSUB 9
50 END
```

We wish to renumber this starting at 10 with increments of 10. The first line number is 1, and thus requires 9 added to it to make it correct. If we add 9 to all the line numbers then the right-hand side references will also be correct.

```
10 IF A>4 THEN 59
18 PRINT
19 GOSUB 18
59 END
```

Now consider the second line number which is 18. We want this one to be 20 so we must add 2, but only to the numbers equal to or greater than 18, since everything below it (i.e. 10) is now completely correct.

```
10 IF A>4 THEN 61
20 PRINT
21 GOSUB 20
61 END
```

Now the first two lines are correct and the references to the other lines are still valid. The third line, 21, needs 9 added to it to make it equal to 30, so we add 9 to all numbers greater than or equal to 21.

```
10 IF A>4 THEN 70
20 PRINT
30 GOSUB 20
70 END
```

Now, the last line should be 40, and thus all numbers greater than or equal to 70 must have 30 subtracted from them, producing:

```
10 IF A>4 THEN 40
20 PRINT
30 GOSUB 20
40 END
```

The program won't change other numbers appearing in your code because it searches for keywords, similarly, it will handle statements of the form:

```
IF (900<X^2) OR (B=250) THEN 250
ELSE IF Z<B THEN GOSUB 900 ELSE
ON X GOTO 40, 30, 20
```

So there it is, I hope you have every success with renumbering your programs so that they now appear fit to send into *Your Computer*. □

```

00100 1          RE NUMBER
00110 1          *****
00120
00130          AN IN-CORE BASIC PROGRAM RENUMBER UTILIT;
00140 1          BY: ANDREW KOCH.
00150
7E18          ORG          32280
7E18 31147E 00180 RENUM LD      SP,RENUM-4
7E18 1600    00190 LD      D,0
7E18 21947F 00200 LD      HL,INTRO
7E20 CD0A2F 00210 CALL   2FOAH ; PRINT INTRO
7E22 22787F 00220 LD      (ROCHPT),HL
7E26 CD619E 00230 CALL   0361H ; INPUT
7E29 CD5B1E 00240 CALL   1E5BH ; LINE NUMBER
7E2C ED537A7F 00250 LD      (START),DE
7E30 2A787F 00260 LD      HL,(ROCHPT)
7E33 1600    00270 LD      D,0
7E35 23      00280 INC     HL
7E36 CD0A2F 00290 CALL   2FOAH ; MESSAGE
7E39 CD619E 00300 CALL   0361H ; MORE INPUT
7E3C CD5B1E 00310 CALL   1E5BH ; SECOND LINE #
7E3F 7A      00320 LD      A,D
7E40 B3      00330 OR      E
7E41 C2537E 00340 JP      NZ,INCDK
7E44 21D07F 00350 LD      HL,ERRMES
7E47 010000 00360 LD      BC,0000H
7E4A CD0A2F 00370 CALL   2FOAH
7E4D 110000 00386 LD      DE,0000H
7E50 C3187E 00370 JP      RENUM
7E53 ED53767F 00390 INCDK LD      (RINC),DE ; SET INCR
7E57 2A7A7F 00400 LD      HL,(START)
7E5A 22747F 00410 LD      (TARGET),HL ; SET START
7E5D 2A4440 00420 LD      HL,(40A4H) ; SET TO TOP OF PROG
00430
7E60 7E      00440 OUTRLP LD      A,(HL) ; CHECK PNTR
7E61 23      00450 INC     HL
7E62 B6      00460 OR      (HL)
7E63 CABE7F 00470 JP      Z,RNFIN ; FINISH IF END
7E66 23      00480 INC     HL ; ADVANCE TO LINE
7E67 ED58747F 00490 LD      DE,(TARGET) ; NEW VALUE
7E68 4E      00500 LD      C,(HL) ; COPY LINE #
7E6C 23      00510 INC     HL ; SAME FOR OTHER BYTE
7E6D 46      00520 LD      B,(HL)
7E6E 22807F 00525 LD      (OUTPT),HL
7E71 E5      00530 PUSH   HL ; SAVE OUTER PRINTER
7E72 C5      00540 PUSH   BC
7E73 D5      00550 PUSH   DE
7E74 D5      00560 PUSH   DE
7E75 1600    00570 LD      D,0
7E77 21E17F 00580 LD      HL,RENMES
7E7A CD0A2F 00590 CALL   2FOAH
7E7D D1      00600 POP    DE
7E7E EB      00610 EX     DE,HL
7E7F CDADF0F 00620 CALL   0FAFH
7E82 D1      00630 POP    DE
7E83 C1      00640 POP    BC
7E84 C5      00650 PUSH   BC
7E85 2A767F 00660 LD      HL,(RINC)
7E88 78      00661 LD      A,E
7E89 85      00662 ADD    A,L
7E8A 6F      00663 LD      L,A
7E8B 7A      00665 LD      D,A
7E8C BC      00666 ADD    A,H
7E8D 67      00667 LD      H,A
7E8E 22747F 00680 LD      (TARGET),HL
7E91 EB      00690 EX     DE,HL ; HL = OLD TARGET
7E92 AF      00700 XOR    A ; CLEAR CY
7E93 ED42    00710 SBC   HL,BC ; DIFF FOR NEXT PASS
7E95 EB      00720 EX     DE,HL
00730
7E96 2AA440 00740 LD      HL,(40A4H) ; SET INNER
7E99 2B      00750 DEC    HL
7E9A 23      00760 INC     HL
7E9B 7E      00770 LD      A,(HL)
7E9C 23      00780 INC     HL
7E9D B6      00790 OR      (HL) ; CHECK NEXT LINE
7E9E CAB27F 00800 JP      Z,ENDINR ; IF E.O.P
7EA1 23      00810 INC     HL
7EA2 4E      00820 LD      C,(HL)
7EA3 23      00830 INC     HL
7EA4 46      00840 LD      B,(HL)
7EA5 E3      00850 EX     (SP),HL
7EA6 78      00860 LD      A,B
7EA7 BC      00870 CF    H
7EA8 DAC57E 00880 JP      C,DONTLS
7EAB C2B37E 00890 JP      NZ,DOCHLS
7EAE 79      00900 LD      A,C
7EAF BD      00910 CF    L
7EB0 DAC57E 00920 JP      C,DONTLS
7EB3 E5      00930 DOCHLS PUSH  HL ; OLD LHS
7EB4 60      00940 LD      H,B
7EB5 69      00950 LD      L,C ; HL=LHS #
7EB6 19      00960 ADD    HL,DE
7EB7 44      00970 LD      B,H
7EB8 AD      00980 LD      C,L ; BC=NEW LHS #
7EB9 DDE1    00990 POP    IX ; OLD LHS
7EBB E1      01000 POP    HL ; SOURCE PNTR
7EBC DDE5    01010
7EBE 70      01020 PUSH  IX
7EBF 2B      01030 LD      (HL),B
7EC0 71      01040 DEC    HL
7EC1 23      01050 LD      (HL),C
7EC2 C3C67E 01060 INC    HL
7EC5 E3      01070 SKPSM JP      (SP),HL
7EC6 23      01080 DONTLS INC  HL ; POINTS AT LINE
7EC7 7E      01090 SKPSM LD  A,(HL) ; GET CURRENT CHAR
7EC8 A7      01100 AND    A
7EC9 CA9A7E 01110 JP      Z,INNRLP ; IF EOLN
7ECC E5      01120 PUSH  HL
7ECD FE8D    01130 CP    08DH
7ECF CAE57E 01131 JP      Z,FOUND1
7ED2 FE91    01132 CP    091H
7ED4 CAE57E 01133 JP      Z,FOUND1
7ED7 FECA    01134 CP    0CAH
7ED9 CAE57E 01135 JP      Z,FOUND1
7EDC FE95    01136 CP    095H
7EDE CAE57E 01137 JP      Z,FOUND1
7EE1 E1      01138 POP    HL
7EE2 C3C67E 01148 JP      SKPSM
7EE5 E1      01160 FOUND1 POP  HL
7EE6 C3EC7E 01165 JP      RCTU4
7EE9 C2C67E 01170 RNABN JP      NZ,SKPSM ; ELSE NUMBER EXPECTED
7EEC D7      01180 RCTU4 RST  ICH ; SKIP
7EED C1      01190 POP    BC ; COPY LAST
7EEE C5      01200 PUSH  BC ; AND REPLACE
7EEF 227C7F 01201 LD      (SPACE),HL
7EF2 E5      01210 PUSH  HL ; SAVE START
7EF3 D5      01220 PUSH  DE ; AND DIFF
7EF4 CD5A1E 01230 CALL  1E5AH ; READ NUMBER
7EF7 7A      01240 LD      A,D
7EF8 B8      01250 CP    B ; COMPARE LINES
7EF9 DA6D7F 01260 JP      C,RNSKIP
7EFC C2047F 01270 JP      NZ,RNDOIT
7EFF 7E      01280 LD      A,E
7F00 B9      01290 CP    C
7F01 DA6D7F 01300 JP      C,RNSKIP
7F04 D5      01310 RNDOIT PUSH DE ; SAVE NUMBER
7F05 54      01320 LD      D,H
7F06 5D      01330 LD      E,L
7F07 2AF940 01340 LD      HL,(40F9H) ; E.O.P POINTER
7F0A E5      01350 PUSH  HL ; MAKE ROOM
7F0B C1      01360 POP    BC
7F0C 03      01370 INC    BC
7F0D 03      01380 INC    BC
7F0E 03      01390 INC    BC
7F0F 03      01400 INC    BC
7F10 ED43F940 01410 LD      (40F9H),BC
7F14 7E      01420 SHIFLP LD      A,(HL)
7F15 02      01430 LD      (BC),A
7F16 DF      01440 LD      1BH ; CHECK FOR END
7F17 2B      01450 DEC    HL
7F18 0B      01460 DEC    BC
7F19 C2147F 01470 JP      NZ,SHIFLP
7F1C 03      01480 INC    BC
7F1D E1      01490 POP    HL ; RECDVER
7F1E D1      01500 POP    DE ; AND DIFF
7F1F D5      01510 PUSH  DE
7F20 ED437C7F 01511 LD      (SPACE),BC
7F24 C5      01520 PUSH  BC ; SAVE END SPACE
7F25 19      01530 ADD    HL,DE ; MAKE NEW
7F26 CD9A0A 01540 CALL  0A9AH
7F29 3E00    01550 LD      A,0
7F2B 3D8040 01551 LD      (40DBH),A
7F2E 213041 01552 LD      HL,4130H
7F31 3620    01553 LD      (HL),20H
7F33 B6      01570 OR      (HL)
7F34 CDD90F 01580 CALL  0FD9H ; WRITE NUMBER
7F37 23      01590 JNC    HL ; SKIP
01600
7F38 DDE1    01610 POP    IX ; END OF SPACE
7F3A C1      01620 POP    BC ; DIFF
7F3B D1      01630 POP    DE ; START OF OLD #
7F3C C5      01640 PUSH  BC
7F3D DDE5    01650 PUSH  IX
7F3F EDA0    01660 RNNOLP LDI  A ; TRANSFER
7F41 7E      01670 LD      A,(HL)
7F42 A7      01680 AND    A ; TEST NEXT CHAR
7F43 C2377F 01690 JP      NZ,RNNOLP ; UNTIL END
7F46 2A7C7F 01691 LD      HL,(SPACE)
7F49 42      01700 LD      B,D
7F4A 4B      01710 LD      C,E
7F4B D1      01720 POP    DE
7F4C 0B      01730 DEC    BC
7F4D C5      01740 PUSH  BC ; NEW INNER SOURCE PNTR
7F4E 03      01750 INC    BC
7F4F 2AF940 01751 LD      HL,(40F9H)
7F52 1A      01752 SHLP13 LD  A,(DE)
7F53 02      01753 LD      (BC),A
7F54 03      01754 INC    BC
7F55 13      01755 INC    DE
7F56 DF      01756 RST  1BH
7F57 C2527F 01757 JP      NZ,SHLP13
7F5A E1      01770 POP    HL
7F5B 23      01780 INC    HL
7F5C 7E      01790 LD      A,(HL)
7F5D 2B      01800 DEC    HL
7F5E A7      01810 AND    A
7F5F CA637F 01820 JP      Z,NXSKP

```

```

7F62 D7      01830      RST      10H      ; GET NEXT CHAR
7F63 D1      01840 NXSKEP POP      DE      ; RESTORE DIFF
7F64 ED537E7F 01841      LD      (LAST),DE
7F6B FE2C    01850      CP      2CH      ; CHECK FOR LIST
7F6A C3E97E  01860      JP      RNAGN
              01870
7F6D D1      01880 RNSKIP POP      DE      ; RESTORE DIFF
7F6E F1      01890      POP     AF      ; CLEAR STACK
7F6F 2B      01900      DEC     HL
7F70 2B      01910      DEC     HL
7F71 C3C67E  01920      JP      SKPSM
              01930
7F74 0000    01990 TARGET DEFW    0
7F76 0000    02000 RINC  DEFW    0
7F78 0000    02001 KOCHPT DEFW    0
7F7A 0000    02002 START DEFW    0
7F7C 0000    02003 SPACE DEFW    0
7F7E 0000    02004 LAST  DEFW    0
7F80 0000    02005 DUTPT DEFW    0
              02010
7F82 E1      02020 ENDINR POP     HL      ; CLEAR STACK
7F83 E1      02030      POP     HL      ; RECOVER OUTER POINTER
7F84 23      02040      INC     HL      ; SKIP LINE NUMBER
7F85 7E      02050 SKIPLP LD      A,(HL) ; SKIP TO EOLN
7F86 A7      02060      AND     A
7F87 23      02070      INC     HL      ; SELECT NEXT
7F88 C2857F  02080      JP      NZ,SKIPLP
7F8B C3607E  02090      JP      OUTRLP ; FDR NEXT LINE
              02100
7F8E CDF81A  02110 RNFIN  CALL    1AFB8 ; FIX LINE POINTERS
7F91 C3CC06  02120      JP      06CCH ; BACK TO BASIC
              02130
              02140
7F94 42      02150 INTRO  DEFW    'BASIC RENUMBER -- VERSION 8.4'
7FB2 0A0A    02160      DEFW    0A0AH
7FB4 53      02170      DEFW    'START NUMBER ? '
7FC3 00      02180      DEFB    0
7FC4 49      02190      DEFW    'INCREMENT ? '
7FCF 00      02200      DEFB    0
              02210
7FD0 0A0A    02220 ERRMES DEFW    0A0AH
7FD2 2A      02230      DEFW    '** BAD VALUE.'
7FDF 0A00    02240      DEFW    000AH
              02250
7FE1 180D    02260 RENMES DEFW    0D1BH
7FE3 52      02270      DEFW    'RENUMBERING AS '
7FF3 00      02280      DEFB    0
              02290
0000      02300      END
00000 TOTAL ERRORS

```

```

1 INPUT A
2 IF A>=14.5 THEN GOTO 1
3 PRINT"HERE WE GO AGAIN"
20 GOTO 1
400 PRINT "NEGATIVE NOT ALLOWED"
5000 IF A<1 THEN 400 ELSE ON A
      GOTO 8000, 7000, 6000
6000 PRINT "HAPPY NEWYEAR": GOTO 3
7000 PRINT "MERRY XMAS": GOTO 3
8000 PRINT "HAPPY BIRTHDAY": GOTO 3

```

```

100 INPUT A
110 IF A>=14.5 THEN GOTO 100
120 PRINT "HERE WE GO AGAIN"
130 GOTO 100
140 PRINT "NEGATIVE NOT ALLOWED"
150 IF A<1 THEN 140 ELSE ON A
      GOTO 180, 170, 160
160 PRINT "HAPPY NEWYEAR": GOTO 120
170 PRINT "MERRY XMAS": GOTO 120
180 PRINT "HAPPY BIRTHDAY": GOTO 120

```

```

17302 INPUT A
17800 IF A>=14.5 THEN GOTO 17302
18298 PRINT "HERE WE GO AGAIN"
18796 GOTO 17302
19294 PRINT "NEGATIVE NOT ALLOWED"
19792 IF A<1 THEN 19294 ELSE ON A
      GOTO 21286, 20788, 20290
20290 PRINT "HAPPY NEWYEAR": GOTO 18298
20788 PRINT "MERRY XMAS": GOTO 18298
21286 PRINT "HAPPY BIRTHDAY": GOTO 18298

```

```

100 A=32280
110 N=0
120 READ D
130 IF D<0 THEN 180
140 POKE A,D
150 A=A+1
160 N=N+1
170 GOTO 120
180 PRINT N; " BYTES LOADED - USE SYSTEM/32280"
190 PRINT
200 DATA49,20,126,22,0,33,148,127,205,10,47,34,120,127,205,97,3,205,91,30,237,83
,122,127,42,120,127,22,0,35,205,10,47,205,97,3,205,91,30,122,179,194,83,126,33,2
08,127,1,0,0,205,10,47,17,0,0
210 DATA195,24,126,237,83,118,127,42,122,127,34,116,127,42,164,64,126,35,182,202
,142,127,35,237,91,116,127,78,35,70,34,128,127,229,197,213,213,22,0,33,225,127,2
05,10,47,209,235,205,175,15,209,193,197,42,118,127
220 DATA123,133,111,122,140,103,34,116,127,235,175,237,66,235,42,164,64,43,35,12
6,35,182,202,130,127,35,78,35,70,227,120,188,218,197,126,194,179,126,121,189,218
,197,126,229,96,105,25,68,77,221,225,225,221,229,112,43
230 DATA113,35,195,198,126,227,35,126,167,202,154,126,229,254,141,202,229,126,25
4,145,202,229,126,254,202,202,229,126,254,149,202,229,126,225,195,198,126,225,19
5,236,126,194,198,126,215,193,197,34,124,127,229,213,205,90,30,122
240 DATA184,218,109,127,194,4,127,123,185,218,109,127,213,84,93,42,249,64,229,19
3,3,3,3,3,237,67,249,64,126,2,223,43,11,194,20,127,3,225,209,213,237,67,124,127,
197,25,205,154,10,62,0,50,216,64,33,48
250 DATA65,54,32,182,205,217,15,35,221,225,193,209,197,221,229,237,160,126,167,1
94,63,127,42,124,127,66,75,209,11,197,3,42,249,64,26,2,3,19,223,194,82,127,225,3
5,126,43,167,202,99,127,215,209,237,83,126,127
260 DATA254,44,195,233,126,209,241,43,43,195,198,126,0,0,0,0,0,0,0,0,0,0,0,0,0
,225,225,35,126,167,35,194,133,127,195,96,126,205,248,26,195,204,6,66,65,83,73,6
7,32,82,69,78,85,77,66
270 DATA69,82,32,32,45,32,32,86,69,82,83,73,79,78,32,56,46,52,10,10,83,84,65,82,
84,32,78,85,77,66,69,82,32,63,32,0,73,78,67,82,69,77,69,78,84,32,63,0,10,10,42,4
2,32,66,65,68
280 DATA32,86,65,76,85,69,46,10,0,27,13,82,69,78,85,77,66,69,82,73,78,71,32,65,8
3,32,32,0,69,32,82,79,79,77,32,80,5,7,9,80,-1
290 END

```

CP/M Without Tears

continued from page 58.

```
1: ; listing 1 - keyboard case invert
2: ;
3: ;
4: lock:    db        00h        ;any suitable character
5: case:    ds        1          ;current case flag
6: conin:   ani        7fh        ;clear hi bit for cp/m
7:         mov        b,a        ;save input char
8:         lda        lock       ;get case switch char
9:         cmp        b          ;is this it?
10:        jnz        ignore     ;skip if not
11:        lda        case       ;get current case
12:        inr        a          ;toggle lo bit
13:        sta        case       ;put it back
14:        ret                ;(optional)
15: ignore: rrc                ;lo bit into carry
16:        mov        a,b        ;retrieve input char
17:        jnc        shout      ;skip if not set
18:        cpi        40h        ;check if alpha
19:        jc         shout      ;skip if not
20:        xri        20h        ;invert case
21: shout:   ;insert usual input code here
22: end
23: ; listing 2 - keyboard alpha lock
24: ;
25: ;
26: ignore: rrc                ;lo bit into carry
27:        mov        a,b        ;retrieve input char
28:        jnc        shout      ;skip if not set
29:        cpi        61h        ;check lo limit "a"
30:        jc         shout      ;skip if less
31:        cpi        7bh        ;check hi limit "{"
32:        jnc        shout      ;skip if not less
33:        xri        20h        ;make upper case
34: shout:   ;insert input processing routine here
35: ; listing 3 - screen code conversion
36: ;
37: ;
38: table:   db        0,1,2,3,4,5,6,7,8,9,10,11,12,13,14,15
39:         db        16,17,18,19,20,21,22,23,24,25,26,27
40:         db        28,29,30,31
41: ; table position = code you are sending
42: ; table entry   = code vdu needs
43: ; nb. - the above table produces no conversion
44: ;
45: ;cp/m enters here with character to send in reg c.
46: conout:  cpi        20h        ;control character?
47:         jnc        cont        ;skip if not
48:         lxi        h,table     ;base of lookup table
49:         mvi        b,0         ;clear b
50:         dad        b          ;hl=hl+bc
```

```

51:      mov     c,m      ;get char from table
52: cont:      ;and continue with console output
53:      ; listing 4 -- printer output
54:      ;                - strip line feeds
55:      ;                - add a space
56:      ;                - force select char
57:      ;
58:      ;
59: select: equ   11h     ;centronics select code
60: list:  mov   a,c      ;get output char
61:      cpi   select    ;is it printer select?
62:      jr    force     ;yes - skip status test
63:      cpi   0ah       ;is it a linefeed
64:      rz      ;ignore if is
65:      cpi   0dh       ;is it a carriage return
66:      jnz   listc     ;no send it
67:      mvi   c,20h     ;else insert space
68:      call  listc     ;and send that
69:      mvi   c,0dh     ;then replace c/r
70: listc: call  listst   ;get device status
71:      cpi   0         ;zero = not ready
72:      jz    listc     ;loop till ready
73: force: mov   a,c      ;retrieve output char
74:      ;insert output routine here
75: listst: equ   $      ;list device status test
76:      ; goes here

```

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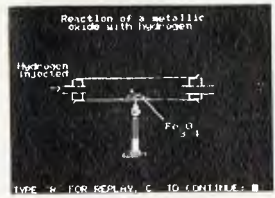
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<p><u>The Real Number System.</u> Rational and irrational number surds, inequalities, absolute values etc.</p> <p><u>Quadratic and Parabola.</u> Quadratic polynomials, roots of equations, tangents and normals etc.</p> <p><u>Statistics.</u> Mode, Mean, Median, Histograms.</p>	<p><u>Phrases and Clauses.</u> Classification of phrases and clauses, adverbial, adjectival, usage, parts of speech.</p> <p><u>Poetry.</u> Simple poetic forms including limericks, cinquain, acrostic, classification and comparison of poems.</p>	<p><u>The Heart.</u> Blood flow from structure, circulation, chambers identification, detailed colour graphics, heart attack causes.</p> <p><u>The Digestive System.</u> Digestive system processing, structure, absorption, by products, hires colour graphics.</p>
CHEMISTRY	GEOGRAPHY	LANGUAGES
<p><u>Gas Laws.</u> Boyle's Law, Charles Law, the Ideal Gas Law, piston experiments, animated hires experiments.</p>	<p><u>Introduction to Weather Charts</u> Introduction to weather charts, air masses, pressure zones, synoptic charts, detailed graphics.</p>	<p><u>German – The Definite Article.</u> The definite article, classification, analysis, grammar.</p>
-TEACHERS-		
<p>If the lessons listed do not meet to your specific requirements, then the ZES AUTHORIZING SYSTEM is for you.</p> <p>ENABLES NON PROGRAMMERS TO CREATE COURSES TAPERED TO YOUR OWN STUDENTS NEEDS . . .</p>		



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INTRODUCTION

INFORMATION ON DEMAND (IOD) THROUGH THE SOURCE, PROVIDES A FULL RANGE OF INFORMATION GATHERING AND ORGANIZING SERVICES TO A BROAD SPECTRUM OF CLIENTS. IOD LOCATES AND RETRIEVES THE SPECIFIC INFORMATION YOU NEED QUICKLY AND ECONOMICALLY. SOURCES INCLUDE OVER 150 COMPUTER DATA BASES, TRADE ASSOCIATIONS, GOVERNMENT AGENCIES AND RECOGNIZED EXPERTS. THE STAFF INCLUDES PROFESSIONAL INFORMATION RESEARCHERS IN KEY CITIES THROUGHOUT THE U.S., EUROPE, JAPAN, AUSTRALIA AND SOUTH AMERICA.

EXAMPLES OF TYPES OF INFORMATION SECURED BY IOD ARE:

- THE RELATIONSHIP BETWEEN VIRAL MENINGITIS AND DRAIN MOTH FLIES.
- SAFETY REGULATIONS AND PLANT PROCEDURES FOR CHEMICAL WORKERS WHO WEAR CONTACT LENSES.
- FLOOR PLANS OF CZECHOSLOVAKIAN HOSPITALS.
- INTERNATIONAL TRADE STATISTICS FOR DIAMONDS AND OTHER

Technology Wedding: A Marriage of Convenience OR FUTURE CHIPS

THE FRENCH, in their inimitable way, have coined a word for The Future: *Tele-matique*, the combination of computation and communications. The Americans, in their inimitable way, came up with the portmanteau word *Compunications*.

The future for the personal computer, the home computer, the kind of small system we are becoming familiar with lies in communications, in the ability to transfer lots of information between machines. A good example is the use of The Source.

The Source is what is called an Information Utility. This is in the American sense of a power utility, a water utility, the gas utility — a service which provides a ready supply of a commodity, on demand.

The Source is such a service. It pipes information into your home. It actually consists of a giant system of computer programs, running on a huge network of computers, mainly concentrated in the State of Virginia in the USA. It's owned, mainly, by the Reader's Digest company.

The computer age is well and truly here, but how many people realise its full implications. What does The Source do, for example? How will it improve the quality of our lives? LES BELL looks at the marriage of Computers and Communications, tracing the development so far and making some predictions on the outcome of the honeymoon

To access The Source, you must have a computer terminal, usually a home or personal computer, and an acoustic coupler. You must also have an account on The Source, so you can be billed for the services you use. You didn't think it would be free, did you?

In Australia, you must also have an account on OTC's MIDAS communications

network, to enable you to gain access to the computer network in the US without the hassles and expense of a trans-Pacific phone call.

To establish communications, you dial a Sydney number (it's toll free from anywhere in Australia), and place the phone handset into the acoustic coupler. The MIDAS network will then ask you to log in, by giving your user identifier and password. You are then connected to the Tele-net computer network in the US, and you go through the same procedure to log into The Source.

Electronic Postman

You can use the system to send electronic mail. This can be to other users you know. For example, the publisher of *Your Computer*, Matt Whelan, and I manage to keep up a torrent of abuse and short notes to each other.

All the other users have at least one thing in common; that is, an interest in computers, so there's plenty to converse

about. We have running 'pen-pal' relationships going with potential contributors and authors in the US, so if a new computer is released over there, we find out about it very quickly.

You can also maintain a list of people with whom you communicate regularly, and this can be held in a file on the system. Special commands will let you 'broadcast' messages to all these people.

You can also 'chat' to other users. This is a direct, on-line connection, between your two terminals, so you can communicate directly. Obviously, both users must be on-line at the same time, so there is a command 'ONLINE' listing the users currently on-line.

If someone wants to chat to you, a message will appear on your screen, and you are able to interrupt what you are doing while you hold a conversation. Of course, you can exclude chat calls if you want — like leaving your phone off the hook!

The system also provides news. The Source is permanently connected to the New York Times editorial computer, so as soon as a journalist files a news story, it is available to be read on The Source. The front page of the 'electronic' New York Times is available for scanning, and then you can select the stories you want to read in depth.

You can even search through the stories looking for key words. If for example, you are interested in industrial relations, you can tell the computer to search for those stories which include the key-word 'union'.

Feature stores and syndicated features are available on the system too. There aren't any photographs, unfortunately.

United Press International (UPI) has a similar arrangement with The Source, so it is not restricted only to American news.

Inside Information

If you need up-to-date financial information, and you're not a stockbroker with special requirements, then you'll find it on The Source. A service called UNISTOX lists all share prices on US exchanges, updated hourly. Commodity prices are also provided. This service only covers US listings, unfortunately, but if you want to keep tabs on gold. . .

The Source has information on demand for people who have very unusual requirements. Their professional researchers claim, for example, to have recently secured such information as: the relationship between viral meningitis and drain moth flies; safety regulations and plant procedures for chemical workers who wear contact lenses; floor plans of Czechoslovakian hospitals; and international trade statistics for diamonds and other precious gems.

It is also possible to book flight reservations through The Source, and even pay for your flight, using a credit card. Prog-

rams on The Source will test your knowledge of foreign languages, while the bulletin board services on The Source are among its best features. Bulletin boards are like public mailboxes, which anyone can read through. If you've got a problem with your computer, just put a letter on a bulletin board and check back in a few days. Someone will probably have suggested an answer.

There's even a kind of electronic 'personal column' which seems to be a digital equivalent to CB radio; I came across quite a few 'ads' referring to 'foxy ladies'! And there are lots of games programs on The Source. The computer will even teach you how to perform card tricks!

Home Computer

Turning to home computers, I'm afraid I don't see a terribly bright future for them, at least, not with our current level of technology. Texas Instruments tried to launch a home computer, and discovered that what the market wants (at the moment at least) is a machine which acts like a real computer.

The present home or hobby computer enthusiast would not be happy with some of the easy-to-use, sophisticated units now under development at labs like Xerox's XPARC. They want something as complex as possible, I'm sure of it. In fact, if someone can figure out a way to provide all the horrors of IBM's Job Control Language on a \$500 computer, he would make a killing!

Apart from the information/communications application, I see the place of the real home computer as being virtually hidden from the user. Probably the first impact of micro-computers will be in areas such as environment control (the

American term for air conditioning and heating).

A recent article in Byte magazine described how the author used a micro-computer to control a wood-burning stove coupled into his main oil-fired central heating system, which is now hardly used. Computers will also appear in solar-energy systems, security systems, automatic lighting systems and other areas.

Before long, information utilities like The Source will be quite common. They are already starting to appear in large corporate offices, but they will now start to invade the home. I certainly wouldn't like to be an encyclopedia salesman in this day and age!

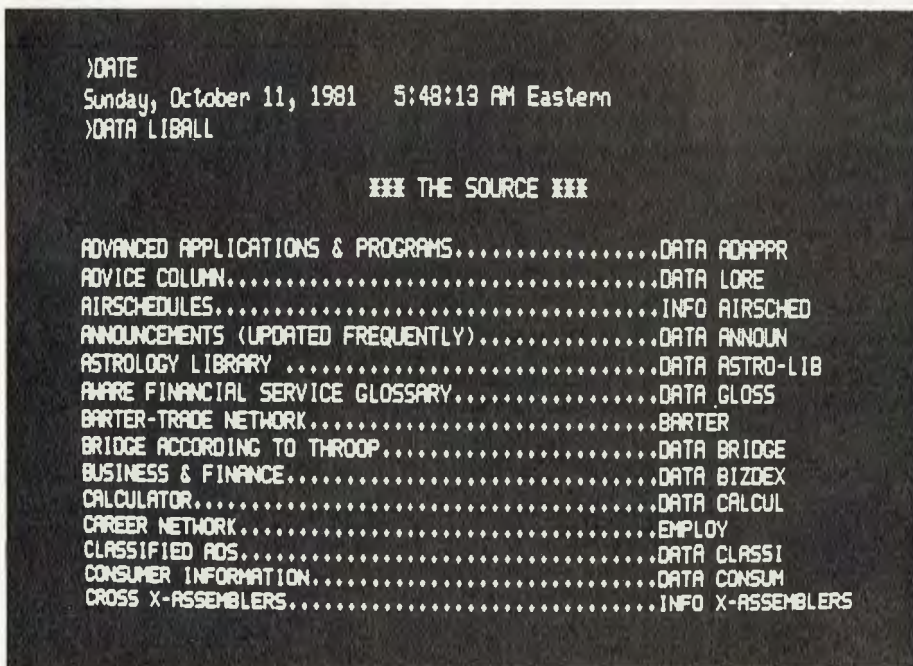
As people have traditionally traded in goods, now we are starting to see the beginnings of a new trade. Information is money, and information is power. We can expect to see the emergence of a new profession of 'information consultants' and 'information brokers': people whose special skill is obtaining and selling information.

This shouldn't seem strange; already, in the US, less than half the population is concerned with production of goods. The rest are all manipulating information.

It is possible we shall see the emergence also of specialists whose job is to produce or 'manufacture' information as required. The details of their jobs can only be a matter for speculation at the moment.

Cable Television

The Australian Domestic Satellite will make a tremendous difference to what's available on television. It seems inevitable that government control will be required to ensure that the satellite does not encourage the major networks to totally dominate our viewing.



The Domsat is tentatively scheduled for late 1985. Yet in the late sixties, a group of radio amateurs at the Royal Melbourne Institute of Technology built the world's first amateur radio communications satellite, which set new records for reliability. Chalk one up to private enterprise.

Video tapes and video disks are starting a trend away from mass distribution of our entertainment, and allowing the individual to view what he wants whenever he wants. This means, too, a freedom from advertising. The availability of so many new media means we will see the emergence of much more 'personalised' media.

However, we will see a trend away from 'passive' television viewing to new forms of recreation. For example, in the US, a growing number of people are engaged in a long-running economic simulation/war game, which is actually run on a batch processing system, and in which each move takes a month. The decisions which have to be made are extremely complex, involving many evenings' work, either alone or in family-based teams. The action in this extension of the ICL management game, with which some of you will be familiar, takes place in a fantasy universe, but involves the same basic principles of economics, marketing and strategic warfare.

The Interactive Box

Cable television will make possible interactive television, along the lines of Warner Communications' experimental Qube system in Columbus, Ohio. This super-advanced system brought us such new techno-cultural extravaganzas as the Cindy's Tan-line Contest in which would-be Miss Americas are invited to reveal part of their tan line (at the hip, shoulder or wherever). The viewers at home are able to vote their preferences through a small box, which is connected (via the cable) to a computer at the studio.

Seriously, Qube has provided an lead in the area of referenda about local government issues, interactive chat shows, viewer participation in talent quests and so on. It has provided the opportunity to try new forms of advertising, and even market research. Perhaps its major benefit, according to one viewer, is it relieves the frustration and feeling of non-involvement he feels when viewing non-interactive channels.

Information utilities can also be piped in through the television set, along the lines of Teletext, Telidon and Viewdata. These systems offer colour displays and ease of use for the non-technical person, at the expense of the high degree of user interaction evident in computer systems like The Source.

On The Source, everyone can be an Information Provider. And I think that's what makes these systems especially important for the new society that's starting to emerge around us. We can all contribute, as individuals, without having to belong to any special-interest groups.

New Babble

An area I regard as very promising is the development of new languages, in particular, the 'Actor' family of languages, which are now starting to emerge from the research laboratories. Originally designed to introduce your children (5-6 years) to the concepts of programming, these languages have now been expanded to provide possibly greater power than present day languages such as BASIC and Pascal, or even Algol-68 and APL.

The Smalltalk language was developed at Xerox's Palo Alto Research Centre, and is very different from those most of us are used to. Whereas languages like BASIC are strictly sequential in nature, and deal with very simple data structures. Smalltalk is based on 'activities' which represent either data or procedures, and

which exhibit behaviour when sent an appropriate message. There are no nouns or verbs in such a language, only a system of activities, all sending and receiving messages.

Families of message can be constructed, all of which have the ability to recognise and reply to message sent to them, and to perform some activity, such as drawing pictures, making sounds, or adding numbers.

Intelligent Associate!

J. Thomas Markley, president of Raytheon Data Systems in Massachusetts, believes the new marriage of communications and computation will provide us with what he calls the intelligent associate. This Markley defines as a device which will take information processing outside the glass-enclosed computer centres now shared by only a small portion of society.

An associate in this sense of the word is someone who seeks out and reports information and recommends action. Markley's intelligent associate will be a terminal-like device, hooking into data bases at home or at work, and solving virtually any information-handling problem.

It will be characterised, he feels, by eight principal attributes:

A display-based terminal any user can link to a network

Having broad functional capabilities: data entry, inquiry response, program development and electronic mail.

Come from a single compatible family, which can be upgraded from one to a dozen stations.

Be supported by easily-upgradable families of peripheral devices.

Be capable of many networking modes, so the user can select the best mode for the situation.

Be rich in software, that is, it will possess all the operating systems and executive software for any application.

Its availability under many labels, from different manufacturers.

Will become reality only when its potential users are ready for it.

Alvin Toffler in his book *The Third Wave*, postulates what he calls The Electronic Cottage. In this home of the future, the inhabitants will not have to leave to go to work. Instead, they can do their work at a computer terminal.

The electronic cottage throws up a number of interesting possibilities. For example, how about shared jobs? A couple could share a job, working in shifts or even at the same time. Transport costs would obviously be down, with no need to travel. People could work flexitime to suit themselves.

Toffler sees the changes as being even more fundamental. He even predicts the end of the conventional nuclear family. I recommend his book as stimulating read-

```
Subject: WANTED "CALIFORNIA GIRLS") CORRESPONDENCE
From: CL2158          Posted: Tue 28-July-81 0:14 Sys 12
--More--
```

```
HI,
COAST TO COAST FROM THE BIG APPLE.
BORN IN LATE NOV, 1950. BROUGHT UP ON BEACH BOY MUSIC.
NOW I WOULD LIKE TO HEAR FROM SOME OF THOSE CALIFORNIA GIRLS.
SEND MAIL SEND EX CL2158
HOPE TO HEAR FROM YOU. ***PETE
```

```
Subject: COMMUNICATIONS
From: TCX127          Posted: Mon 27-July-81 18:00 Sys 12
--More--
```

```
COMMUNICATIONS DAILY, news service for professionals in all aspects of voice,
data and image communications, is soon to be available on The Source. We are
happy to work with all prospective users o
```

ing, even if you don't totally agree with it.

Office Without Paper

Although technology has affected us in many ways through all the facets of our lives, it seems ironic that the office has seen less innovation than any other, especially since many of us spend so much time there. Typewriters, filing systems and the like have changed very little over the years.

But now, the introduction of word processors has started to change this. The latest word processors can talk to each other and can even send electronic mail. They are, in short, the first electronic workstations.

But now electronic filing is possible, using a combination of computer storage and microfiche, Micronet, Inc, a Washington consulting firm, set up a paperless office in May 1979. Incoming documents are either microfiched or scanned by an optical character recognition device, and the original paper disposed of. All data can then be edited, indexed, sorted, retrieved, and converted back into paper form, if necessary, for communication with the outside world.

Even dictating machines have followed this trend to automation.

Industry experts predict both IBM and Olivetti will have a speech-recognition typewriter on the market by 1985 — a revolution will change office employment patterns drastically.

Automation

A word on everyone's lips today is automation. What will it mean, in real terms? How will it affect our lives?

Michael L. Dertouzos, Director of the Laboratory for Computer Science at the Massachusetts Institute of Technology, believes the linking of automation with information capability will mean changes for the better.

"It's my contention that it will reverse some of the impersonal and dehumanising consequences of the Industrial Revolution," he says.

At the moment we already have automatic machines which can manufacture individual parts, by following the instructions of a programmable controller. The next major breakthrough lies with the integration of intelligent robots to perform assembly work.

In the next ten to fifteen years, machines will gain the ability to 'see' meanings, through the use of multiple microprocessors. That is, machines will be able to perceive shapes and patterns. To make use of that information, however, will require intelligent programs, only now beginning to be devised.

"The general-purpose programmable robot and the micro-computer based controller are two components essential to the future development of automation," writes Dertouzos.

"A third is the distributed system or network, which is made up of a number of

interconnected robots, programmable controllers, and computer systems".

Dertouzos describes a fascinating scenario of the not-too-distant future; the automated shoe-shop. The consumer of the future will buy a new pair of shoes at a centre which will accurately measure his (or her) feet, using an instrument which will simultaneously use the information to code an order card.

Samples of shoes can be inspected, but the bulk of the selections will be looked over on a computer-driven colour display. The consumer will pick a shoe model, order alterations to suit personal taste, and have the order card processed, along with a credit card.

The order card will program the equipment in the back shop to cut the leather to size and include the requested alterations. After processing by other special-purpose machines, the shoes will finally be assembled by a robot. The whole procedure will take about 11 minutes, and its product will be tailored to the individual, not to a standardised mass market.

And so we see how the technology now being introduced is tailored to the individual. Mass production will generally decline, as we develop machinery which is more efficient, but produces individual items.

People will have more leisure time, spent in active pursuits, which will reinforce their self-identity, their individuality. □

Australian Source

IT IS SAID Australia usually catches on to American ideas about ten years after they are introduced over there.

Well, this time we have well and truly jumped the gun, and have a marvel of US technology only four years after its American launch.

What we speak of is The Source — a data base with a difference. An enterprising Melbourne businessman has set up The Australian Source, to give Australian micro users access to an information utility which is more relevant to their needs.

While the US Source is a worthwhile service, much of the information relates directly to the US, and has little application here. The Australian system will have local news and services at a user's finger tips, and at a greatly reduced cost.

The service is being provided by Tergo Quen Pty Ltd, which will be operating first in Melbourne, then expanding Australia-wide within the next six months.

According to Gary Wayne Alpert, managing director and chairman of Tergo Quen, the Australian system should have at least 15,000 members within 12 months.

He says the Australian system will give direct access to financial reports, sports and hopefully news, through a major national newspaper. It will also give communication nationwide with other Australian Source users providing an electronic mail system.

"We are hopeful of having 800 programs for the Apple alone," Mr Alpert says. "The American Source is very good, but the average overseas line is not good enough to load in programs. With the

Australian Source this problem should be overcome.

"Initially our system will operate out of Melbourne and anyone outside that city will have to make an STD call into the Source. But in February we will have a duplicate system in Sydney, and within six months we will be Australia wide," he said.

As the system is Melbourne based, and for a few months at least will provide some difficulties in access for interstate subscribers, Mr. Alpert said discounts on membership fees will be made.

The costs involved are: A one-time joining fee of \$100; an hourly user charge of \$10 an hour between 8am and 6pm; and \$4.50 an hour between 6pm and 8am.

Mr Alpert said there would be substantial discounts in membership fees for schools and other daytime users.

There will also be an introductory offer of membership fees of \$60 for users who join before February 1, 1982.

According to Mr. Alpert: "The launching of The Australian Source micro-computer network in Australia is probably the most singularly important event yet to take place in the micro-computer industry in this country."

"This is the beginning of a new era for home computers, where a huge data bank, previously only available to big business and government, will now be provided to the home users."

To become a member of The Australian Source micro-network, an applicant will have to have one of the approved hardware systems. These include the Apple, TRS-80, System-80, Commodore, Casio, Atari and numerous S-100 systems. □

market directory

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your computer clinic

Hot Source

I WOULD be most appreciative if you could tell me how much a hook-up to The Source costs. I already possess a 48K Apple and disk-drive, and I would like to know the expense involved in the additional hardware, as well as the costs of the hook-up and running charges (per minute on line).

SHERMAN YOUNG
Sandy Bay, Tas.

To hook up to The Source costs initially \$120. Most local computer stores now sell The Source information. The extra hardware you would need includes an Apple or CCS (California Computer System) communications card, the extra software needed would be a program to turn your computer into a smart terminal. The ASCII express is one of the best for this and you would be facing costs of about \$75.

The on-line charges for The Source vary from \$4.25 per hour to \$15 per hour, depending on the time of day; and there's Midas charges of \$12 an hour and 60 cents per 1000 characters.

And Source Again

WILL YOU please tell me how to contact data base services in Australia and the US. How much will it cost, and what sort of information can be obtained?

D. RAY
Moruya, NSW

Contact OTC in Martin Place, Sydney, for the information about the Midas Computer. For the costs, see the letter above. For information about what The Source provides, see the article in this issue "Communications and Information".

TV or not TV?

I AM interested in buying a home computer. The model I have in mind is the TRS-80 Model I, 16K RAM, Level II.

But I need some advice on one point, concerning the green monitor. I had decided to save money and not buy one. Rather, I would simply use my television screen. The Tandy agent advised me against this, saying a green monitor provided much better definition than a television screen. I would like your opinion on whether he is correct, particularly as it will only be a part-time hobby to begin with.

DENNIS MURRAY
Armidale, NSW

The salesman is right. The green monitor would provide better definition. But I'm not sure how much that would matter to you as a part-time hobby user. My advice is to stick with your television screen as a monitor for the time being, at least until you get to a level of expertise necessary for better screen use. I know of many people who have been using computers for years and have never bought a monitor. As for part-time, see our COMA story.

Data Bank

I READ with interest the article by Keith Stewart, in the July issue, about The Source — the American information network.

I would appreciate more information about this, especially a relevant contact in the US.

P.J. GEEVES,
Launceston, TAS.

There's no need to go to the US to find out about The Source. Your local computer store should be able to hook you up to The Source. Otherwise, contact Seahorse Computer Services, PO Box 47, Camden, NSW 2570.

What's a Winchester?

COULD YOU help me with some information about the Winchester? Such as what it is, and what does it do?

R.T.
Mt. Isa, Qld.

A Winchester is a type of hard disk drive. Previously, disk packs were open, so the read/write heads could get at the magnetic surface. This allowed contamination and dust particles into the pack. In a Winchester disk, however, the heads are part of the disk pack, and the whole unit is sealed to keep dust out. Most Winchester disks are fixed into the disk drive, and cannot be removed.

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your computer text file

Games Crazy?

GIDDAY! Reading the article on the "Adventure" series of software and other games in the August issue of *Your Computer* was nearly as thrilling as actually playing one. (Slight exaggeration to attract attention).

Naturally, I was thrilled by the chance to win an Adventure, but unfortunately I have access only to an Apple with disks. Fortunately for myself the will to have fun, being suppressed by good sense, was freed by my incurable sense of humour.

Here are my answers to your questions:

1. Who writes the adventure series?

No one knows for sure, but reports have it that it is a three-footed, greenish-pink midget with bad breath, yellow teeth, an eye-patch, and insomnia, who lives in a shallow depression at the base of the third mountain on the left as you enter Tibet from the top.

Informed sources also lead me to believe that it could be the KGB, planning to send the world's greatest minds mad.

2. Are the Adventures run in BASIC or Machine Language?

Neither. Obviously a trick question, but not clever enough for me. The series is written in Swahili. It is a dead giveaway, because my computer, which is multi-lingual except for Swahili, refuses to give me any sort of help.

3. How many adventures are there in the series?

What a stupid question. (I bet the fool on your left made it up!) Without accurate sales figures (so one couldn't possibly tell in any event), piracy would raise the number in the series (if you disregard disks chased by frustrated Adventurers).

4. If you can't find your way around an Adventure problem, what should you do?

I shall be comprehensive. Depending upon the time, your state of mental health and physical health, the level of your frustration, and nobody watching you can;

- Go to bed
- Throw fits
- Turn the computer off
- Start again
- Get a stiff drink
- Swear
- Use a crow bar

Take up smoking

Lose some hair

Throw the cat around

Keep going (dangerous)

Or write a letter to *Your Computer*.

ANDREW SINCLAIR (frustrated)
Ipswich, Qld.

Let there be light

I MUST say although I am excited about the Computer Age, I find I am completely ignorant of the operations of the computer. I was pleasantly surprised, however, when the shades were lifted from my eyes after reading your July issue.

My subscription can be counted as a vote of confidence

RAY J. SCHEID
PINNAROO, SA.

Insurance Broker System

I READ a recent edition of your magazine and noticed an enquiry from an insurance broker.

So any future enquiries of this type may be satisfied, I would be pleased if you would store the following information in your 'memory banks'.

Huntersoft is the author and copyright owner of the Huntersoft IBS. This system is now installed in 26 sites throughout NSW and Victoria. To our knowledge, no other system has approached that number of sites.

The system caters for the complete accounting and record keeping needs of a broker, at the same time producing information for the broker which would either be impossible or impracticable to gather using manual methods.

It is a complete hardware/software support package, with hardware available in several configurations to suit the size and requirements of the user.

I would be grateful if you would pass on this information to your reader who made the enquiry.

GRAHAME TRICKER
Huntersoft, Hamilton, NSW.

Thanks Digger

I WAS so overwhelmed by the outstanding quality of *Your Computer*, I felt obligated to write a complimentary letter.

Congratulations for a great mag. My name will soon be appearing in your subscribers file.

BRUCE RONNING
Lyneham, ACT.

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- THE DEFINITIVE REFERENCE WORK FOR SOFTWARE:
for 8080/280/6502 Systems
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P.A.

HEARD ON THE BUS

By LEON YENDOR

Tariffs and Ripoffs

BACK IN the August issue were two references to the duty being charged on pre-recorded floppy disks.

As a result of these articles, I have been contacted by a number of people concerned with the consequences of this ridiculous impost. Among the printable solutions have been a couple which may be worth trying.

The main problem is that the national religion of this country is apathy. These solutions wouldn't be needed if at least a hundred of you in each state took the action suggested in the editorial published in August.

Maybe some slightly more outlandish methods will appeal to some of you sufficiently for you to tear yourselves away from whatever hypnotic game you are currently hooked on. Just remember, when this one wears off you'll be paying the higher price for the next disk if you don't help now.

The first suggestion is a variation of a standard way of avoiding high import duty on items not manufactured in this country, and is called by-law entry.

It works like this: Let's assume someone in Australia decides to manufacture the mythical gringle. His marketing people tell him the most popular one is the pink platinum model, and his production people advise that their entire capacity would be flat out just producing the number of these used in the domestic market, without taking on the green-gold one, which only takes one percent of sales.

Having set up production of PPGs, our hero applies for import protection and of course gets it, with the result that ALL imported gringles are now subject to duty.

The users of GG gringles now find that although they cannot buy a locally made one, they are hit to leg to help the PPG company (or is it really a sneaky way to balance the budget?). As it happens, there is a provision left in the system to obtain relief in these circumstances — the by-law.

To obtain by-law entry duty free (which means two percent!), you have to write to all the gringle makers in Australia (or three, whichever is the less), enquiring as to whether they are prepared to deliver a GG gringle of local origin. When they all refuse to supply, you take their refusals to the Customs Department and generally obtain permission to import duty free (paying two percent).

Seeing there are limited numbers of floppy disk manufacturers in this country (and they knew whose arm to twist for protection to be granted), you can be sure



that either you will get your duty free entry via a by-law, or these folk will get so tired of answering your letters they will plead to have the regulation changed, so only blank disks are protected.

For those dealing in some volume with imported disks, another method has some appeal. Obtain a box of imported disks and send them off to your supplier, to have the programs placed on them.

Before sending them out of the country, however, you must notify the Customs Department that you wish to export and re-import them, and get all the necessary paperwork. Make sure your supplier knows he must return the SAME disks, which you will have numbered or in some other way marked for the benefit of Customs.

You could have used locally made disks, of course, and I don't want you to think me unpatriotic, but there are three considerations colouring my opinion on this particular point. One is that it was the local manufacturers who got us into this mess anyway. The second is I don't think we benefit too much from the local assembly of floppies anyway, as it is hardly a massive locally-funded, labour-intensive industry. And third, you'll go through more hassles trying to re-import your own locally made disks than doing it in the suggested way.

I'm afraid the whole protection racket is starting to give me a pain anyway. It seems tariffs are looked on by some local manufacturers as a simple way to raise their prices.

In the computer hardware field we can see people who were doing quite nicely, thank you, with some even making hand-

some export deals, and a whole bunch of them have jumped on the protection wagon. It may be necessary to protect labour-intensive industries; but a small, efficient industry which is competitive on world markets when it wants to be can certainly do without the tariff drug. Next thing we know we won't be able to live without it, and the result to the consumer is nothing but over-priced mediocrity.

If you can't stand the heat...

Pipe Dreams?

THE BIGGEST non-event so far in the computing hardware development race must be bubble memories. A number of big companies, which were pushing this technology very hard as a floppy disk replacement, have now dropped development of these devices. I'm sure there are great advantages in some applications like, TI's portable terminal and programmable pocket calculators, but until the price of a bubble cartridge approaches that of a similar capacity floppy, we won't see a mass market.

Another need is for a standard cartridge format, to ensure interchangeability.

Meanwhile, those who are continuing development in this area are trying to find a way to stop their research engineers singing the old song 'I'm forever blowing bubbles'.

Stop Playing Games, Kids.

I'VE HAD about five phone calls in the last month, asking if I knew where the caller could find a young micro-computer enthusiast to take on a well paid job in service and support areas.

It seems computing as a hobby is failing to produce in its devotees the kind of desire for an intimate knowledge of the machines involved; unlike other hobbies like ham radio or model planes.

My advice to those who see themselves getting a job in micros is to get a balanced insight into both the software and hardware aspects of a popular chip. In my days with one of the mainframe companies, it was possible to be a programmer with virtually no hardware experience. Most engineers couldn't write more than a trivial machine language program, but this won't do in the micro scene.

If I were employing anybody, I'd want a solid electronics background, with digital experience and enough assembler lingo to write a few test routines at least.

I'm not starting an employment agency, but if you have these skills, then you're not doing much to advertise them. Try writing to a number of sales and manufacturing firms using micros, and let them know what you can do. A good resume could do wonders.

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The APPLE II is Australia's most popular and versatile computer. And nowhere will you find it better supported than at City Personal Computers. We have all the Software and accessories, for business and pleasure, to ensure that your APPLE system is a success from day 1. And the experience of our Apple-trained staff will keep you one step ahead. So before you buy your Apple System, call in at C.P.C. and see what a difference there is.

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That shows the true value of the Apple II. The system shown above, with 48K APPLE II PLUS, DISK DRIVE, SANYO HI-RES MONITOR and the fantastic EPSON MX 80 printer, is less than \$4000 from C.P.C. And that includes sales tax (Less than \$3600 excl. tax).

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And this is just one example configuration. We have APPLE II Systems from around \$1500 to suit every need, so come in and see what we can do for you.



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CASS.		
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DISK DRIVE	730.00	799.00



Invitation to Programming 1	\$29.95
Music Composer	\$79.95
Statistics 1	\$39.95
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Stock Charting (24K disk)	\$39.95
Stock Analysis (24K disk)	\$39.95
Tetlink	\$49.95
Video Easel	\$49.95
Bond Analysis (24K disk)	\$39.95
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Conversational Spanish	\$84.50
Conversational German	\$84.50
European Countries & Capitals	\$29.95
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Mailing List (24K)	\$29.95
Mortgage & Loan Analysis	\$29.95

QUALITY SOFTWARE:	
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Fastgermon	\$21.95
Tari Trek (requires 24K)	\$21.95
Sterbase Hyperion (24K)	\$24.95
Tank Trap	\$21.95

IMAGE SOFTWARE:	
Wall Street Challenge	\$19.95
Dungeon Campaign	\$29.95
Strategy Pack 1	
Roman checkers, Frame Up	\$24.95
Strategy Pack 2	
Target Chase, Tunnels,	
Survival, Snake Hunt	\$24.95
Mind Master	\$24.95
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Number Hunt, Bingo Duel	\$24.95

ADVENTURE INTERNATIONAL:
Please note that all Adventure International Programs require 24K RAM.

1 Adventurland	\$25.50
2 Pirate Adventure	\$24.50
3 Mission Impossible	\$24.50
4 Voodoo Castle	\$24.50
5 The Count Adventure	\$24.50
6 Strange Odyssey	\$24.50
7 Mystery Fun House	\$24.50
8 Pyramid of Doom	\$24.50
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<input type="radio"/>	EPSON MX80 TYPE II (with bit graphics)	\$1095.00	<input type="radio"/>
<input type="radio"/>	EPSON MX80 F/T (friction + tractor feed)	\$1095.00	<input type="radio"/>
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<input type="radio"/>	Note: All prices tax inclusive.		<input type="radio"/>



As Authorised Commodore dealers we can supply all your CBM requirements, from the new large-screen PET to the 803 business system.

Also - check with us on the availability of the new Commodore Vic Colour Computer.

your PET computer

I HAVE just returned from the United States after four great weeks of holiday.

But I was disappointed to find Commodore had not yet released its single disk drive; I believe the Australian release has been delayed as well.

There is one bright aspect though — an independent company has been able to achieve what Commodore has not. PEDISK II is a single disk drive for the PET and, I have been told by Commodore dealers in the US, will be compatible with current PET drives.

I'm told PEDISK II can support either 5-inch or 8-inch drives. As a single drive it has 143 Kbytes. The price in the US was \$595.00 for the controller, disk and DOS. For the controller, cables and DOS the price is \$339.

Maybe some enterprising Commodore dealer may start importing these drives directly. I would estimate the retail cost of these in Australia, if imported by an independent, would be \$A700.

Commodore Colour Computer

No, this is not a rehash of my article on the VIC 20. This is a genuine big Commodore colour computer — in fact, it is based on the 8032.

The information I got was sketchy, as those I spoke to had not seen it themselves, but it would appear that it's the same as the 8032, without the monitor built in. A colour monitor is placed on the top of the Commodore. It has the same 8 colours as the VIC.

I will try to provide more details as I get them.

VIC 20

The release of the VIC in Australia has been delayed; hopefully it will be out by the time this is published. The interest up to now indicates that it will be a popular machine.

Some concerns I have about the VIC are:

1. Commodore does not yet have a disk drive for the VIC.
 2. The price for the peripherals may be high.
 3. There were very few independent software programs at each of five computer stores I visited in the US. This was verified by the owners of two of the stores.
- One of these had a large range of software for other computers. This would indicate that the major source of VIC software will be from Europe rather than the US.

Commodore Books

One of the things I found of great interest in my travels, was the increase in

the number of Computer books of relevance to the Commodore.

Here's a rundown on some of these, now available in Australia:

Mostly Basic: Applications for your PET is published by SAMS, written by Howard Berenbon. It has 28 programs, divided into six sections. I will give a brief outline of each, and then an overall summary.

Section One — real time applications. These are of interest if you are electronically inclined. The telephone dialer suits US telephones and from my understanding will need to be modified to suit Telecom equipment. The next is a combination lock program designed with circuit diagram to have your Pet activate your lights (and safe if you can afford it!).

The third program is a digital stopwatch which brings out one of the major criticisms of the book. With this program Berenbon shows that he is not a PET owner but has adapted his programs to suit. Any Pet owner knows (don't you?) that the PET has a built-in timer by using either TI\$ or TI. Berenbon has therefore, spent some time writing a program to do what Commodore has neatly provided in its machine at great cost!

Section Two, has programs of educational interest. Dungeons of Htam is a fantasy simulation game. It does not use graphics and is fairly long. I did not key it in so I cannot tell how many bytes it uses. I expect you may need more than 8K, although it seems possible, from my examination of the program, to reduce the amount of memory it uses considerably.

The other programs in this section include a memory game, spelling test and a reading pacer.

Section Three, has a house buying guide, amortisation schedule and a depreciation schedule. Section Four, has six programs for home applications, these include a message taker, medical expense record and a basic diet program.

The final two sections have utility programs and a tarot card reader. The latter requires 16K of memory.

Berenbon has provided the PET user with a variety of programs, some of which, are available in a better format commercially. However, through his listings you can get a better understanding of how these programs work. There is nothing stopping you from modifying and improving these programs, or using them for development of other programs.

There are two other books which provide the same programs for the APPLE and the 80's for which I feel the author

originally wrote the programs, as the PET version does not use any of the PET graphics and is poorly laid out. Cost is \$14.75.

Pet Games and Recreations. As the title infers this book has a variety of games for the PET. Unlike Berenbon's books, this one has programs which use the PET graphics extremely well. In the book there are 26 games ranging from Tic Tac Toe, which uses the full screen and the PET graphics, to games of deductive reasoning like The Code Game and Doctor Factor.

To give an indication of the quality of the programs and the thought behind the design, it is worth mentioning that the staff and editor of Compute Magazine gave a lot of help with the program listings as did Jim Butterfield. The cost of this book is \$13.50.

Pet Basic — training your Pet computer is published by the same people who put out the previous one. However, for some unknown reason this one carries the "officially approved by Commodore" logo, something I would have thought the other book should also have had.

In some ways, this book is overshadowed by the PET/CBM Personal Computer Guide, which goes into more detail. PET BASIC is a book which would appeal more to the first time PET user than to one who has had experience with the PET. The cost of this book is \$17.50.

Pet Interfacing. This book gives you a better idea of how specialised interfaces can be built and used with the PET computer. It is a book for those who wish to expand their system and who have the technical ability to do so.

It is written in easy to understand language and is well set out. It gives you a guide of how to construct circuits, and is far easier to understand than Nick Hamshires's book *Pet Revealed*. Cost is \$22.95.

All these books are currently available in some Sydney Computer Stores.

Using WAIT

Try this: Wait 6502...

Also try using the Wait key to stop your program until a key is pressed. This is done by entering the line XX WAIT 158,1 (original ROMS WAIT 525,1). (To simplify the old problem of which ROM is what, I propose to use in this column the same system of description that Jim Butterfield has suggested in Compute Magazine. Jim suggests "ORIGINAL" "UPGRADE" and "BASIC 4.0").

your APPLE computer

SINCE LAST Month's review on the Vision-80 card from Zofarry Enterprises, news has come of the release of a new onboard ROM, which will greatly extend the versatility of the card, especially in the communications area.

As outlined in the article, the Vision-80 card will allow the Apple to communicate with another Apple or host computer. One of the main enhancements is the facility to execute DOS commands on a remote Apple (if that Apple has a Vision-80 card also). This, with the ability to send and receive files of information alone, improves the Apple's flexibility to a phenomenal degree.

Imagine the possibilities! An unattended Apple sitting on its ten megabyte disk drive, connected to an auto answer modem; Joe Bloggs phones up and connects his Apple, via an acoustic coupler, to our idle machine. Joe can then execute some data available for public access), and transmit it back to himself.

Use a little imagination and some Sun-white rice, and you have the nucleus of a simple electronic mail or public data base system. And all that without a program loaded in either machine!

The Cream Too

Not content with just baking the cake, Zofarry have added some cream and icing. Incoming data can now be loaded directly into a 35,800 character buffer, with an alarm that will sound when it is 256 characters from full. If some garbage you don't want starts coming down the line, you can momentarily turn the buffer off, without jeopardising the data already in the buffer. The previous problem of conflicting control characters has now been overcome, by additional use of the Shift key when entering control commands to the Vision-80 card.

Speaking of the Shift key, there is now a one-wire shift mod that requires no soldering, and will connect to pin 4 in the Game I/O port. This will mean those who already have a ZEV-80 or Vision-80 cards can take their game paddles out of moth-balls, because the new plug-in modification will not effect normal paddle operation.

There is now a procedure for creating macro 'logon' instructions, so logging on to Host computers, such as The Source, can be done without difficulty.

The Vision-80 card will support transmission rates up to 1800 baud, in any of eight data formats. Output can be echoed to a printer, as well as being displayed on

the screen, and preserved in the buffer for later storage on disk.

Apart from the improvements in the communications area, you can list basic programs or data on the screen, with all control characters (that are not normally shown) highlighted with true character underlining. This facility can also be used to create some imaginative text displays. The documentation has been improved substantially, with a large quantity of information provided for Pascal, CP/M and Assembler users of the card.

The cost of the new ROMs is expected to be about \$30, with the exchange of your old ROM (\$40 if you keep it). All new Vision-80 cards will have the upgraded ROMs installed. If you are in the market for an 80 column card, I suggest this could be the best (certainly the most flexible) one around. For further details contact your local Apple dealer, or Zofarry Enterprises, Burwood, Sydney.

* * *

Programming Tips

Below are a few programming tips supplied by Steven Zanker.

Steve suggests if you want to protect an Applesoft program from being modified, just enter the following onto the front of your program:

```
0 POKE 2075,255: POKE 2076,255
```

Later in the program insert a line to delete line 0

Now save the program.

For those who wish to find the diskette volume number in use, you will find it at: (hex) \$B7F6, (dec) 47094

Location 28 holds the current Hi-Res colour byte. To change the colour, just POKE 28 with the appropriate colour number.

```
POKE 28, 0 — Black 1
          42 — Green
          85 — Purple
          127 — White 1
          170 — Red
          213 — Blue
          255 — White 2
```

One way to fill an area on the Hi-Res screen quickly with red or green is to HLOT vertical lines in the odd numbered grids, or for blue or purple HLOT in the even numbered grids:

```
100 HGR2 : POKEW 28,170: FOR
LOOP = 1 TO 279 STEP 1: HLOT
```

```
LOOP,0 TO LOOP, 191: NEXT
```

If you have any routines or programming techniques you have found whilst learning to program (in any Apple language), please send them in to me (via *Your Computer*) as Steve has done, so all may benefit.

Command Handler

Below are a list of addresses for the DOS command handler routines for DOS 3.3:

COMMAND	HEX ADDRESS	DECIMAL ADDRESS
APPEND	\$A298	41624
BLOAD	A35D	41821
BRUN	\$A38E	41870
BSAVE	\$A331	41777
CATALOG	\$A56E	42350
CHAIN	\$A4F0	42224
CLOSE	\$A2EA	41706
DELETE	A263	41571
EXEC	\$A5C6	42438
FP	\$A57A	42364
IN#	\$A22E	41518
INIT	\$A54F	42319
INT	\$A59E	42398
LOAD	\$A413	42003
LOCK	\$A271	41585
MAXFILES	\$A251	41553
MON	\$A233	41523
NOMON	\$A23D	41533
OPEN	\$A2A3	41635
POSITION	\$A5DD	42461
PR#	\$A229	41513
READ	\$A51B	42267
RENAME	\$A281	41601
RUN	\$A4D1	42193
SAVE	A397	41879
UNLOCK	\$A275	41589
VERIFY	\$A27D	41597
WRITE	A\$510	42256

These addresses can be made to work for us if, for example, we wish to de-activate certain commands from DOS. For example, if we wish to prevent someone doing a CATALOG, we need to enter a line like this in our program:

```
09 POKE 42350,96
1 DEL 0,1
```

When the line is executed, it will insert a Return From Sub-routine command at the beginning of the 'CATALOG' command-handling sub-routine.

—Greg Stringer

your computer club news

THE CLUB news-letters keep rolling in, thank you, and here is some of the good news. . .

The Micro User Club is now putting out an informative newsletter called *Micro User News*, produced by the Adelaide club members.

The newsletter is a monthly, aimed at micro users who have a particular interest in Tandy compatible hardware and software. This includes the TRS-80 and System-80 based equipment.

The October issue of *Micro User News* includes a lot of information about the use of disks and disk drives, and helpful hints on how to make the equipment function better. It also has several beginners pieces, aimed at the new user, providing programming advice.

The newsletter is edited by Richard Newcombe, who is drawing on the talents of club members like Allan Dent, John Ross and Keith Neighbour, to provide the technical input.

Anyone who has a Tandy compatible system would do well to contact club secretary, Rod Stevenson, on (08) 337 6682. The club's postal address is 36 Sturt Street, Adelaide 5000. □

The Western Australian Compucolor/Intecolor User Group is now producing its own newsletter — a five-page news and review handout to club members.

The newsletter called *CUWEST*, gives information such as printer modifications, consumer advice, new equipment reviews and games information. It is a monthly publication, giving the agenda of the group's monthly meetings, which are usually held at The Logic Shop, 454 William Street, Perth.

Lately the group members have been discussing voice input on Compucolor II, the operation of Colorcalc and Colorgraph on ISC 3651, and the operation of the Epsom Programmer. □

TAS-MICRO is aimed at all micro users and owners in Tasmania. It holds training courses and seminars, which are designed to teach basic programming and to help improve the quality of programming. Club members also provide an information service to people considering buying a computer.

In the Northern Territory, The Micro-Computer Association of the NT holds monthly meetings, talking with owners and users of TRS-80s, Apples, Ohio Scientific, and other well known brands. □

AUSTRALIAN CAPITAL TERRITORY

Australian ZX80 Users' Group (AZUG); David Brudenall, 19 Godfrey St, Campbell, ACT 2601.

OMEGA (Ohio Scientific Microcomputer Enthusiasts Group Australia); Geoff Cohen, 72 Spofforth St. Holt, ACT 2165.

MICSIG; Registrar, PO Box 446, Canberra 2601

NEW SOUTH WALES

Australasian ZX 80 Users Newsletter; 87 Murphys Avenue, Keiraville, NSW 2500

Commodore Users Group; John Guidice, GPO Box 4721, Sydney 2001.

Compucolor Users Group; Andrew MacIntosh, 91 Regent St. Chippendale, Sydney 2008.

80-AT; The Australian 8080-Z80 Users Group; PO Box 165, Lakemba 2195.

Macarthur Computer Users Association; R.G. Friend, C/- 109 Campbellfield Ave, Campbelltown, 2560. Phone (046) 25 2752 (A.H.) or (046) 76 0541 extn 325 (Work).

MEGS; (Microcomputer Enthusiasts Group); John Whitlock, PO Box 3, St. Leonards 2065.

Newcastle Microcomputer Club; Gordon Johnson, Electron Microscope Unit, University of Newcastle. Phone (049) 68 5045 (Work).

NSW Apple Users Group; John Smith, 1a Wallaroy Road, Double Bay 2028, Phone (02) 36 5696.

NSW 6800 User Group; 27 Georgina Avenue, Keiraville, NSW 2500.

Sorcerers Users Group; PO Box E162, St. James 2001. Ian King, 15 Forest Avenue, Wahroonga 2076. Phone (02) 48 6072.

TI-99/4 Home Computer Users' Group of Sydney; S. Andersen, PO Box 101, Kings Cross, 2011. Phone (02) 358 6662.

QUEENSLAND

Brisbane Youth Computer Group; A. Harrison, PO Box 396, Sunnybank 4109.

Iree Microcomputer Interest Group; N. Wilson, PO Box 811, Albion 4010.

Superboard Users Group; Ed Richardson, 146 York Street, Nundah, Qld 4012.

SOUTH AUSTRALIA

Adelaide Micro User Group (TRS-80 and

System 80 Users); R.G. Stevenson, 36 Sturt St, Adelaide 5000.

South Australian Microprocessor Group Inc (SAMG); The Secretary, PO Box 113, Plymton, 5038. Phone (08) 278 7288.

TASMANIA

Tasmanian OSI Users Group; David Tasker, 11 Bass Highway, Westbury, TAS 7303.

VICTORIA

Apple Users Society of Melbourne; G. Halprin, Phone (03) 859 5835.

BUG 80; Burwood Users Group, PO Box 46, Blackburn South 3130.

Compucolor Users Group; L. Ferguson, 12 Morphet Avenue, Ascot, Melbourne 3342.

Geelong Computer Club; Peter McKeon, PO Box 93, Geelong 3220.

KAOS (Ohio Scientific); David Anear, 49 Mil-lewa Crescent, Dallas, Victoria 3047.

National ZX80 Users Club; 24 Peel St. Col-lingwood, Victoria 3066

Northern and Western Suburbs Computer Users' Group; contact CP/M Data Systems, 284 Union Rd, Moonee Ponds, 3039. Phone John King (Secretary) (03) 338 9304

SMUG; SCORD M100 users, Robin Miller, 60 Winnalee Drive, Glen Waverley 3150.

Sorcerer Computer Users (Australia); Sec-retary, PO Box 144, Doncaster 3108.

WESTERN AUSTRALIA

Sorcerer Computer Users of Australia; The Secretary, 90 King St, South Perth 6151. Phone (09) 367 6351.

NEW ZEALAND

Wellington Microcomputer Society Inc; Lindsay Williams, 2 Pope Street, Plimmerton, New Zealand.

New Groups:

The MicroComputer Association of the Northern Territory; Andy Smith, Darwin Community College, Casuarina, NT.

Sorcerer Computer Users of Australia (ACT Branch); Mr G. T. Dick, 31 Creswell St, Campbell, ACT 2601.

TAS-MICRO; Peter Deckert, Unit 1/456 West Tamar Road, Riverside, Launceston 7250.

CUWEST (WA Compucolor/Intecolor User Group); John Newman, 8 Hillcrest Drive, Darlington, WA 6070.

CBASIC Developments

DIGITAL RESEARCH has bought Compiler Systems Incorporated. Gordon Eubanks, the author of EBASIC and CBASIC, will become a Digital Research Vice President with responsibility for language systems.

Just before the announcement by DR, I received the latest advertising flyers from both DR and CSI. I commented at the time that they looked as if they had been done by the same advertising agency!

Only weeks earlier, CSI had announced the pending release of the long awaited "native code" CBASIC compiler. I first heard of this product about two years ago. Details of the specification for the new compiler are a little further on in this column, but the major aspect was the dramatic increase in speed, which was benchmarked faster than the DR PL/I-80 compiler.

Until now PL/I-80 has been just about the fastest CP/M compiler around when it comes to execution speed.

Eubanks Story

Drs Gordon Eubanks and Garry Kildall have collaborated previously. Kildall was a lecturer at the US Naval Post-Graduate School, while Eubanks was a student working on EBASIC as part of his thesis. So it is no coincidence EBASIC was written in PL/M (authored by Kildall), to run under CP/M (also authored by Kildall).

EBASIC is in the public domain and the PL/M source code is available on the CP/M Users Group disks.

After finishing his studies, Eubanks went on to develop CBASIC 1 and later CBASIC 2 as fully developed business BASIC packages. CBASIC 2 is currently up to its eighth release version.

EBASIC and CBASIC compile to an "intermediate" (or P code), rather than to the native code of any real microprocessor. The P machine is a theoretical machine. A run-time interpreter translates the intermediate code to the native code of the host microprocessor for execution. This type of compiler is popular — UCSD Pascal uses identical techniques — and could



Gordon Eubanks

be perhaps more aptly described as a compiler-interpreter.

It is easier to write a compiler using these techniques, and it is also much easier to transport the compiler-interpreter to new processors, as only the run-time interpreter has to be re-written for a new host. This is why UCSD Pascal is available for so many machines. The disadvantages are generally slower execution speed than native code compilers and generally larger programs.

CBASIC has become the major programming language for commercial programmers in CP/M environments. It features 14-digit precision, which is important for money calculations where odd fractions of a dollar have a nasty habit of catching up with you at the most embarrassing time. It has a civilised file handling technique and good string manipulation capabilities, as well as long variable names.

Over-riding Feature

While these features are important, there is one over-riding feature which has led to its wide spread use; as a compiler it protects the source code of the distributed programs. Most commercial CBASIC

programs are distributed in intermediate code form. The end user simply runs the programs with the run-time interpreter.

This also solves another problem quite neatly. To run a CBASIC intermediate code file, you need to buy a copy of CBASIC. Therefore CSI makes a sale to the program writers for development, and then makes a sale to the program purchasers to run it. This means a big market for the product, and thus a moderate selling price for CBASIC and no hassling over end-user licence fees for the compiler.

It is highly likely that the majority of owners of CBASIC have not written one line of code in the language, only using the run-time interpreter to run off-the-shelf programs.

C BASIC As BASEC

CBASIC has moved away considerably from the traditional "Dartmouth" model BASIC. Apart from being a compiler, while most BASICs are interpreters, it only requires line numbers on lines which are the targets for GOTO, GOSUB or similar statements.

There are some grounds for saying CBASIC is not really a true BASIC at all. Rather it is a semi-structured language which has a lot of BASIC like features, and is easily learnt by BASIC programmers.

I think it is fair to say we would still only have Microsoft BASIC version 4.51 if it wasn't for the competition it has had from CBASIC. Microsofts answer to that competition was BASIC-80 version 5, in interpreter and compiler versions. The Microsoft compiler has not taken off commercially as yet, due to restrictive licencing agreements, but there is likely to be more news on this front.

CSI had obviously been aware of a strong consumer demand for a native code compiler version of CBASIC, and it has now developed CB80.

There are over 30 different improvements from CBASIC to CB80. The major ones are:

- Compiles to Microsoft REL format

- Strings can now be up to 32K bytes long (previously 255 bytes)
- Nested IF statements
- Multiple line functions can contain local variables
- Type of variable can be called to override defaults
- CALL statements can pass parameters to multi-line functions
- Multi-line functions can be EXTERNAL or PUBLIC as well as local
- ON ERROR statement traps execution errors, ERR function returns error code
- INKEY function reads characters from keyboard without echo
- ALPHA-NUMERIC labels as well as NUMERIC labels
- FOR loops execute 0 or more times rather than 1 or more times
- LOCK and UNLOCK features provide record lockout for MP/M
- Automatic program overlays during execution

Speed increases as strings are eight times faster, integer arithmetic is 100 times faster, looping is 100 times faster, and real arithmetic is two times faster

- Enhanced file manipulation features
- Of course all this doesn't come cheaply. Projected selling price is around the \$500 mark, with an introductory offer for existing CBASIC licence holders of around \$400. (See your favourite dealer).

For commercial programmers, a single annual licence fee purported to be \$2000 will cover ALL licencing requirements for distributed compiled code containing CB80 library functions. I think that is an excellent deal.

CB80 should be available by the time you read this. Sixteen-bit versions are under development.

BASIC-80

AS I mentioned before, the Microsoft BASIC-80 compiler hasn't exactly set the world on fire, as Microsoft wanted the proverbial arm and a leg as licencing fees for using the function library in distributed compiled code.

After a lot of industry pressure the latest release of the BASIC-80 compiler has

introduced a new approach by Microsoft to the licencing problem. Version 5.3 has the majority of the run-time functions split off into a program file called BRUN.

BRUN is not linked in at link-time, but is expected to be on the disk the compiled program executes on, and is loaded by compiled programs at run-time. This means compiled code can be marketed freely without licencing hassles (for Microsoft that is). The end user has to own a BRUN file to be able to execute the program.

For users, an advantage of this approach is larger programs can be linked together with the rather primitive Microsoft linker (which can only link in memory). Version 5.3 finally implements the long promised CHAIN with COMMON, and even has double precision trig functions officially supported.

Microsoft may be happy with this solution to it's licencing problems; but it really looks a very lame approach when compared with the CB80 licencing scheme. The need for another file besides the one which is actually executing is a nuisance. I can see a number of hassles arising here.

Most of the commercial programmers I have spoken with have voiced a strong preference for the CB80 licencing deal.

Another Big Name

HARDLY a month goes by without another "big" name announcing a new CP/M machines.

The current name of the month is WANG. It has announced a sort of super word processing system which will have CP/M as its supplier-supported operating system.

Await breathlessly the announcement by a major European computer manufacturer of a new small 16-bit machine, with CP/M-86.

New North Star

NORTH STAR has recently announced a new computer called the Advantage.

The main claim to fame of this machine is its graphics capabilities. The Advantage is a stand-alone system, with everything in the one terminal-shaped case.

The 30cm (12 inch) P31 phosphor tube has bit-mapped graphics hardware attached with a resolution of 640 by 240. The unit is Z80 based, with an 8035 to handle the 86 keys on the keyboard, and the two minifloppy drives. (Yes, folks, NS has changed the disk controller).

The approach is somewhat like the Apple (with a big motherboard which includes all the basic electronics, and six bus slots for expansion and adding all the usual NS extra cards).

The advertising scrupulously avoids mentioning IEEE-696, so I guess it is still not truly compatible.

Graphics software will be available in GDOS and GBASIC (NS's own operating system and BASIC) as well as in a CP/M package. The US pricing is very attractive at \$US3999, so it could shake up the graphics market.

Further details and a full *Your Computer* review are in train.

The Slow 80AT

DOUBTLESS some of you have been wondering what is happening to 80AT. The simple answer is nothing!

The convenors have decided that all currently paid up members will get six issues of the newsletter. How long it takes to get out six issues depends on the contributions from members.

At the current rate of contributions, it is going to take a very long time!

Feedback

SEND YOUR questions about CP/M to Bill Bolton, CP/M Column, *Your Computer*, PO Box 216, Spit Junction, Mosman 2088.

No guarantees that your question will get answered in the column, but I will try. Source users can contact me at TCY396. (I don't read Source mail unless there is a clear subject heading).

—Bill Bolton

your computer glossary

Absolute: Located at a fixed address in memory.

Access: To read or write from a location in memory, or a file, or disk.

Accumulator: The major register of a CPU, in which arithmetic and logical functions are performed. Some computers have several registers which can function as accumulators; in others some registers can perform a subset of the full set of operations.

Address: A memory location which can contain data or an instruction.

Algol: Algorithmic Language, an early computer programming language for mathematical applications. Widely used in Europe, embodied early structured programming concepts and was a precursor of Pascal.

Algorithm: A set of instructions which define a method of obtaining some result (usually mathematical). A cooking recipe is an algorithm, as is a knitting pattern.

Alphanumeric: Composed of either letters or numbers or both.

Analogue (Analog): Representation of a value by a voltage or some other measurable datum, rather than a binary or other representation based on counting.

Apple: The Apple 11 computer is a computer based on the 6502 microprocessor with an integrated keyboard. Noted for its colour graphics capabilities, which make it popular with schools.

Application: What you do with your computer.

Array: A set of values under a common variable name, which are accessed through a subscript. For example A[1] is the first item in array A, A[2] is the second, etc. A[N] is the Nth item.

ASM: Assembler. also a suffix added to assembly language file names to distinguish them from other files with the same name.

Assembler: A program which converts assembly language into its corresponding machine (or object) code, which can be executed by the computer.

Assembly Language: A language in which each machine code instruction is represented by a short mnemonic which is much more comprehensible to the programmer. For example, the 8080 machine code

[10010110]
in binary, is
[SUB L]

(subtract L from accumulator) in assembly language. Each line of assembly language becomes one machine instruction.

Assign: To make one thing equal to another, e.g. [A = B] assigns the value of B to A.

Atom: An indivisible component of a data structure.

Attribute: A property possessed by some object, such as a file. Often attributes take the form of restrictions, such as a file being read-only.

Backup: An extra copy of a disk, tape or file taken as a precaution against damage of the original.

Backus Normal form: A special language (a metalanguage) used to describe precisely the grammatical rules of another language.

Base: The lowest number inexpressible in a given number system.

BASIC: Beginners All-purpose Symbolic Instruction Code. Invented in 1970 at Dartmouth College by Kemeny and Kurtz as a teaching language, it has since been enhanced in its more exotic forms into one of the most sophisticated yet easy-to-use languages available on personal computers. Its major rival is Pascal, which has the added virtue of stressing structured program design.

BDOS: Basic Disk Operating System. The major functional component of the CP/M DOS.

Binary: The system of counting in 1s and 0s used by all digital computers.

Binary Search: A method of searching for an entry in a table by successively halving the table until all that's left is the desired entry.

Binary Tree: A form of data structure in which entries are tagged on at the end of the appropriate branches.

BIOS: Basic Input/Output System. The part of the CP/M operating system which is different for each machine and provides any special I/O routines for disks, terminal, printer, etc.

Bit: Binary Digit. Either 1 or 0.

Boot: To load the operating system into the computer from a disk or tape, either initially or subsequently after running a program.

Bootstrap: To use one short program to load a longer loader program which then loads the operating system.

Branch Instruction: A program instruction which causes the computer to jump to another instruction, usually fairly close by.

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. Makes programmers itch.

Bus: A set of wires over which, data, addresses, or control signals are transferred between the central processor and memory or I/O devices.

Byte: A computer word eight bits wide. A byte in memory can hold a character or a binary number between zero and 255 (or — 128 and 127), or a computer instruction.

C: A programming language, developed at Bell Labs, which is particularly convenient for writing system utility programs.

Case Statement: An instruction found in some high level languages which allows control to pass to one of several subroutines depending on the value of a variable. For example, the BASIC statement

ON X GOSUB 100, 200, 300

will jump to line 100 if X = 1, 200 if X = 2, 300 if X = 3.

Call: A jump to a subroutine which leaves the return address on the microprocessor stack, so that when the subroutine is finished executing, control returns to where it left off.

CBASIC: A commercial version of the BASIC language, running under the CP/M operating system. Doesn't use line numbers on every line, and is compiled, rather than interpreted like Microsoft BASIC.

CCP: Console Command Processor. The part of the CP/M operating system that reads a command line and sorts out what it means.

Chain: To automatically run one program after another.

Character: A letter or number, or in some circumstances, a control code such as "carriage return".

Checksum: A running total of the characters in a file, recorded or transmitted with the file so that errors can be detected.

Code:

Absolute: Machine instructions which are intended to be loaded and executed in a particular area of memory.

Object: Machine instructions, as distinct from the source code from which it was generated.

Reentrant: Code which can be used by several users at once, keeping separate variables for each.

Relocatable: Code which can be loaded and run anywhere in the computer's memory.

Source code: A program written in assembler, or a high level language such as BASIC, which must then be assembled or compiled to produce the object code which can actually be executed.

Cold Boot: To start up a system from scratch, loading the operating system from disk or tape.

Cold Start: See Cold Boot.

COM file: In CP/M parlance a command file, that is, a machine code program that can actually be run.

Command: An instruction from the console for the system to do something.

Comment: A note added into a program to help the reader (or programmer) to understand its operation. Does not affect the program's execution in any way.

Compiler: A program which accepts as input a source file written in a high level language, and produces as output an object file containing the machine instructions which are actually executed.

Computer: Are you serious?

Concatenate: To join two strings together, one after the other.

Conditional: A test; for example, is X greater than Y: IF X is greater than Y
THEN GOSUB 500 (BASIC)

- or, if the carry flag is set, jump to location NEXDIG:
JC NEXDIG (Assembler)
- Conditionals are one of the most powerful features of any computer language.
- Console:** The keyboard and screen from which the operator controls the computer.
- Control characters:** Codes which perform functions like acknowledging correct receipt of a message or requesting retransmission of an erroneous message. Control characters are defined as part of the ASCII and similar codes.
- Copy:** To duplicate, usually for backup safety.
- CP/M:** A disk operating system for 8080 and Z80 based microcomputers. Allows the user to store information and programs in named files, as well as managing disk storage and input/output functions. Other disk operating systems include TRSDOS (on TRS-80) and DOS 3.3 (for Apple).
- CRT:** Cathode Ray Tube. Usually refers to the screen of a video terminal or the terminal itself.
- Data:** Information to be processed by, or output from, a program.
- DDT:** Dynamic Debug Tool. A program that assists the user to find errors in machine code programs.
- Debug:** To locate and fix errors.
- Decimal:** Based on ten.
- Delete:** To erase.
- Device:** A piece of equipment such as a printer or tape drive which the computer uses.
- Directory:** A list of the programs on a disk (or occasionally tape) together with necessary information, such as length and location.
- Disc:** A flat, circular magnetic surface on which the computer can store and retrieve data and programs. Is fast compared with tape, particularly when access is not one item after another.
- Disk drive:** The mechanical assembly which rotates the disk and positions the read/write head.
- Disk Operating System:** A program which operates one or more disk drives automatically and manages the system.
- Display:** The computer's output device at the console, usually a TV-like display of letters and numbers; sometimes the computer can draw on the display.
- Double Density:** A method of recording twice as much information on a floppy disk.
- Dump:** To list out the contents of memory or a disk.
- Echo:** When the computer inputs a character from the keyboard, it then sends it back to the display so that you can see it was received correctly.
- ED:** An editor program; part of CP/M.
- Editor:** A program which lets you alter and correct source files and other documents.
- Erase:** See delete.
- Error Message:** Tells you something went wrong, and sometimes what.
- Execute:** To run a program; to follow its instructions.
- FIFO:** First in, first out.
- File:** A continuous collection of characters (or bytes) saved on a disk or tape for later reloading.
- Fixed Point:** Counting in integers only. Usually limited to small values, and restricted in accuracy, giving rise to ridiculous answers such as $9/5 = 1$.
- Flag:** A variable, sometimes a single bit, which can have only two values, used to indicate some condition.
- Floating point:** The kind of arithmetic used in scientific calculators.
- Floppy disk:** A disk, made of thin flexible mylar, and enclosed in a card jacket, which can be used for magnetic storage. There are two varieties; eight inch and $5\frac{1}{4}$ inch. These can typically store somewhere between 140,000 and 3 million bytes (characters).
- Focal:** Formula Calculator. A simple language, rather like a small BASIC, found on some mini and microcomputers.
- FORTRAN:** Formula Translation. One of the first computer languages, and beginning to show it.
- Function:** A sub-program that processes variables in some well-defined way.
- Garbage Collection:** The process of going through memory or disk space, reclaiming all the unused space.
- Global:** A variable which is known to all the parts of a program. See local.
- Grammar:** The formal rules of a language.
- Hard Disk:** A disk made of hard material, larger, faster and more fragile than a floppy disk, and capable of storing 70 million bytes or more.
- Hard Copy:** Printout.
- Hardware:** The bits of a computer you can kick, as opposed to the programs you can only swear at.
- Hashing:** A method of reducing the size of a table which otherwise would have mostly empty entries.
- Hexadecimal:** The method of counting to the base sixteen. Or the method of splitting binary digits into groups of four, which is the same thing. In hex, you count: 0 1 2 3 4 5 6 7 8 9 A B C D E F 10 11 12 13 14 15 16 17 18 19 1A 1B 1C 1D 1E 1F 20 21 22. . .
- Identifier:** A label, or the name of a variable.
- Iff:** If and only if.
- Index:** A variable which usually points to an entry in a table or list.
- Index Register:** A processor register which is used to access tables and lists in memory.
- Indirect Addressing:** Referring to a variable which actually contains the address of another variable.
- Input:** To get data into the computer.
- Instruction:** A step the computer can perform.
- Integer:** A whole number.
- Intermediate Code:** A special kind of object code which cannot be run directly on the computer, but must be interpreted.
- Interpreter:** A program which examines source code a line at a time, decides what it means, and then does it. Compare with compiler.
- Interrupt:** To electronically drag the computer away from what it is doing in order to respond to some time-critical situation.
- I/O:** Input/Output.
- Jump Instruction:** Normally, control proceeds from one instruction to the next, one after the other. A jump instruction passes control, not to the following instruction, but to some other. Jumps can be conditional.
- Kilo-:** Prefix meaning one thousand.
- Kilobyte:** 1024 bytes (Kbyte).
- Kilobaud:** 1000 baud (kbaud).
- Label:** A word which identifies the destination of a call or jump instruction, or simply identifies some location in memory.
- Language:** The set of instructions, and rules for stringing them together, which you use to instruct the computer what to do.
- Library:** A set of programs, or sub-programs.
- Line Number:** A number at the beginning of a line, which identifies it in a similar way to a label.
- Line Printer:** A high-speed printer for computer output.
- Link:** Part of a data item in a list, which tells the computer the location of the next data item.
- LISP:** A list processing language, much favoured by the artificial intelligence community.
- List:** A sequence of consecutive data items.
- Load:** To transfer some data or program into the computer memory.
- Locate:** To "fix" a relocatable code so that it will only run if loaded in a particular location.
- Logical Device:** A device as the computer "sees" it: what the computer regards as the "list device" may be one of several "physical devices", such as a line printer or teletype.
- Loop:** To repeatedly execute a sequence of instructions; part of a computer program that is so executed.
- Machine Language:** The binary codes the machine actually executes.
- Macro:** A user-defined sequence of instructions which can be inserted anywhere in a program.
- Macroassembler:** An assembler which can utilise macros.
- MBASIC:** Microsoft BASIC; the BASIC used in the TRS-80, PET, Apple 11 and so on.
- Memory:** Where the computer stores data and programs internally for fast access.
- Menu:** A display which offers the operator a choice of several alternatives.
- Microcomputer:** A small computer based on a microprocessor.

glossary

- Microprocessor:** The central processing unit of a computer, built into a single silicon chip.
- Mini-diskette:** A 5¼ inch floppy disk.
- MP/M:** A multi-user version of CP/M.
- NAD:** A name and address file maintenance program.
- Numerical analysis:** The art and science of number crunching.
- Object Code:** Machine code.
- Object File:** A file containing object code.
- Object Module:** An object file containing part of a program, ready to be linked to others.
- Octal:** the system of counting to base eight, or grouping bits in threes.
- Offset:** To load an object file somewhere it will not run, in order to edit or modify it.
- Open:** To give the operating system the characteristics of a file so that it can subsequently read or write it.
- Operand:** The number an operator (+, -, etc) operates on.
- all work. See Disk Operating System.
- Operator:** An arithmetic function or some other function which alters variables.
- Optimization:** Making a program work better (or faster, or using less memory).
- Output:** What the systems produces.
- Packed Data:** Data which shares the same address, and has to be unpacked before use.
- Page:** A length of memory, typically 256 bytes.
- Parameter:** A constant which sometimes has to be varied.
- Parity:** An extra bit on the end of a character or byte for error detection.
- Pascal:** A modern structured language which may eventually rival BASIC in popularity.
- Password:** A secret word the system may demand of you before allowing you access to certain (or all) programs or data.
- Patch:** A temporary (ha,ha) fix on a bug.
- Peripheral:** A piece of equipment the computer uses, like a printer, disk drive, or modem.
- Peripheral Driver:** A program which outputs data to a peripheral and controls it.
- Physical Device:** See Logical Device.
- PIP:** Peripheral Interchange Program. A CP/M utility for copying files between devices.
- PL-1:** Programming Language /1. A good general purpose commercial language.
- Pointer:** A variable used for indirect addressing.
- Polish Notation:** A method of separating operators and operands; e.g. + 5 4 is Polish Notation for 4 + 5.
- Poll:** To ask a peripheral if it requires service.
- Postfix Notation:** Also known as Reverse Polish Notation, this is similar to Polish; 4 5 means 4 + 5.
- Preprocessor:** A program which does part of a job to make life easier for the program which follows; e.g. a macro processor before an assembler.
- Printer:** Gets computer output down onto paper.
- Priority:** The resolution of which interrupt is serviced first if two should arrive at the same time.
- Process:** A program.
- Program:** A sequence of instructions which can be understood, and ultimately followed, by a computer.
- Prompt:** A message asking the operator to supply information.
- Queue:** A list in which entries are made at one end, and removed from the other.
- R/O:** Read Only; cannot be overwritten.
- RAM:** Random Access Memory.
- Random Access Memory:** The computer's internal memory which is used to hold running programs and data. The computer can both write and read RAM.
- Read Only Memory:** Memory used to store programs, which can not be erased or overwritten.
- Reader:** Paper tape input device.
- Read/Write Head:** The small coil which reads and writes on the surface of a disk.
- Reconfigure:** To reorganise the I/O or other aspects of a system.
- Record:** A set of related data items. For example, an employee's name, address, payroll number and pay rate would form a record.
- Recursion:** The ability of functions in some languages to call themselves.
- Redundant:** Not needed or taken for granted.
- Reentrant Code:** Code which can be used by several programs simultaneously, keeping separate data for each.
- Register:** A location in the processor capable of performing logical or arithmetic functions on the contents.
- Relocatable:** Capable of being moved in memory.
- Relocatable Object Module:** Part of a larger program consisting of many such modules, all linked together and located.
- Resident:** Permanently in the system.
- Reverse Polish Notation:** See Postfix.
- RPN:** See Reverse Polish Notation.
- Run:** To execute a program.
- Save:** To store a program on disk or cassette (particularly BASIC).
- Schedule:** To decide at what stage a process should run (of an operating system).
- Screen:** See CRT.
- Sector:** A section of data on a disk.
- Simulation:** Making one system behave like another.
- Software:** Programs.
- Source Code:** The original text form of a program.
- Source File:** A file of source code.
- Source Language:** The language the source code is written in, e.g. BASIC, Assembler, C.
- Sort:** To arrange items of data in order.
- Spool:** To output a file to a peripheral, usually either a printer or tape.
- Stack:** A list in which both entries and removals are made at the same end. A micro-processor usually has a hardware stack which is used to save subroutine return addresses, temporary storage of data, and to pass variables between subroutines.
- String:** A sequence of characters.
- Submit:** To put the system under control of a file of system commands.
- Subroutine:** Part of a program which can be accessed from several points within the program.
- Symbol:** The name of a variable or a location in memory.
- Symbol Table:** A table constructed by an assembler or compiler to give the addresses of all variables and labels in a program.
- Symbolic Name:** A label.
- System:** A collection of hardware and software, possessed of the property that the whole is greater than the sum of the parts.
- System disk:** A disk carrying the operating system.
- Teletype:** An electromechanical printer/-keyboard.
- Timeshare:** Running several programs on a system simultaneously.
- Track:** The area under the read/write head during one rotation of a disk.
- Transfer:** To move data.
- Transient:** A program that is only in memory for a short time before being overwritten. Often, the only program that is not a transient is the operating system.
- Tree:** A list in which each data item may refer to several others.
- TTY:** See Teletype.
- Unix:** A multi-user, multi-tasking, multi-programming operating system, expected to appear on microcomputers before long.
- User:** One of the people connected to the computer.
- Utility:** A program of use to most users.
- Variable:** Named quantity that can take on different values.
- Verify:** To check that data written on a disk or tape can be read again correctly.
- Warm boot:** To reload the operating system a second or subsequent time.
- Word:** The amount of data fetched from one memory location. Typically one byte, but can be two on recent processors.
- Word Processor:** A system for manipulating, editing, printing and formatting texts files.
- WordStar:** A proprietary word processing program.
- Write Protect:** To remove the cover from the notch in a floppy disk so that it cannot be written on.
- Zilog:** Manufacturer of the Z-80 and Z8000 microprocessors.
- Z80:** A popular 8-bit microprocessor.

8 + 16 BIT

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EDITORIAL CONTRIBUTIONS: Contributions to *Your Computer* are welcomed and will be given every consideration*. Please read these notes carefully to get an idea of the style and format we prefer.

All Contributions: should include your name, address, and home and office phone numbers (in case we need to check details).

Contributions on disk: Contributions can be accepted on eight-inch disks if prepared using WordStar under CP/M, or on 5¼ inch disks prepared on an Apple using Sandy's Word Processor. Please pack them extremely carefully if posting.

Style: All items should be typed (or printed on a quality printer) and double-spaced on white paper. Include your name, address, telephone number, and the date on the first page of your manuscript (all manuscript pages should also have your surname and page number in the top right-hand corner). Be clear and concise, and keep jargon and adjectives to a minimum.

Listings: Unless it is absolutely impossible, we want listings produced on the computer. This reduces the risk of error — if the computer typed it, the computer probably accepted it. Print listings with a dark ribbon on white paper. Please provide an account of what the program does, how it works and so on. Any comments on the program should refer to the address, line number or label rather than to a page number. Any comments on modifying the program to work on other machines will be appreciated. Try to include a printout of at least part of a sample run if possible.

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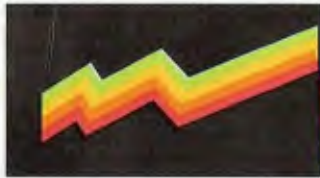
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