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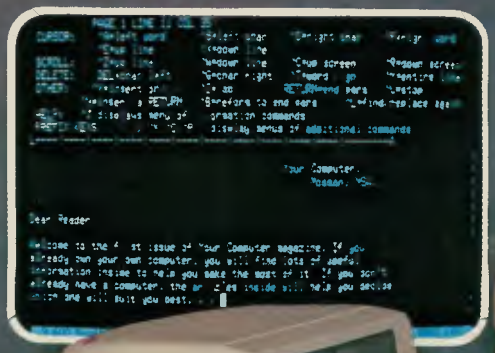
May/June 1981 $2



Microcomputing for Fun or Profit

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inside your computer

MAY/JUNE 1981

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editorial

PEEKING to see what we have to say for ourselves, eh? We won't keep it a secret. We're insufferably smug and proud of the concept of *Your Computer*.

Our editorial team includes journalists who had never seen a computer before joining the magazine as well as those whose expertise in the field is above reproach (and in some cases above comprehension, according to our newcomers).

This office expert-office idiot approach to *Your Computer* is intentional: our stories reflect the different groups that make up computing. While an expert might have trouble putting a story for novices in simple English, a beginner is streets ahead; the same works in reverse — a story aimed at the skilled enthusiast must be written by someone of equal knowledge.

We hope you enjoy our first issue, and those in the future. Every effort is being made to ensure it develops into the best computing magazine you'll ever read.

We're not perfect, but read through to page 104 and you'll agree we're not ripping you off. And perfection is our aim.

Regardless of our plans for the magazine, you will be its final judge — so we'll stop trying to justify its existence, and forget the usual platitudes about this being *your* magazine. We'll just make a few observations about the way we hope the magazine is going to grow.

Initially, at least, *Your Computer* might seem a little schizophrenic. This is simply because people are buying computers for different reasons, with several large groups immediately identifiable. Catering for all these people in one magazine could be a problem, but we think we've found the answer.

Here are some of the major groups, and how we see them:

● **The Small-Business Owner:** A doctor, architect, shopkeeper, importer — you name it — the small business has a world of computers designed for it. A person involved in this high-risk, hard-work area might have seen computers on TV, and thought that perhaps a computer could help run the business; might have even thought of programming or even writing extra programs to make the business and its computer more effective.

● **The Hobbyist:** Alias the computer hacker, alias the amateur computer scientist. Computer science is one of the few remaining fields where the amateur, armed with meagre resources, can still make small discoveries, and sometimes major ones. For them the thrill of learning never dies. The distilled essence of accumulated knowledge is particularly potent. But even more toxic is the ability to make things happen. People who have re-invented the Shellsort algorithm on a Monday at 2 am will know precisely the feeling we're on about.

● **The Beginner:** Where can you go if you know nothing about the subject but all the advertisements for microcomputers have lit the brain's 100-watt lightbulb with the thought, "Wonder what that's all about?" We can help the beginner, and make no apologies for being biased in favour of this little-helped group. As the magazine grows, matures and gains more knowledge, so will the beginner who comes on the ride with us.

● **The Professional Programmer:** Don't laugh if you are one. There is a strong demand for people to write programs for these fast breeding microcomputers. Many of these experienced programmers, who should be churning out software, just can't adjust their thinking to take advantage of these flea-powered machines. Maybe that's why they're itching...

● **The Teacher:** Children are making remarkable discoveries through using computers, not only about the computer but other things as well. Computers present a challenge to teachers, and for one very important reason — children will need to know about computers in order to succeed in the job market as adults. That aside, computers also make effective teaching machines. Because using them is much like play to a child, the chance to combine play and learning should be irresistable to teachers.

● **The Engineer:** This character needs to know as much as possible about the next generation of chips in order to design a new bathroom scale. Sound funny? It's not. Engineers are discovering that microchip technology is playing an ever-increasing (and vitally important) role in their profession. If they don't understand the technology and can't adapt it into their designs, then those designs are going to be quite useless.

Everybody has a different use for a computer. Not everyone shares a common temperament or can be motivated the same way. But what is it that all computer users can have in common?

That's easy. The hobbyist has it right, and sometimes is even honest about it. The key is programming. A satisfying, consumately pleasing activity, programming is about techniques that let you tackle bigger and bigger tasks with your computer as you progress in learning and experience. *Your Computer* is about programming, too. It's about structured program design. It's about computer graphics. How do you translate programs designed for one type of computer so they will run on another type? It's about operating systems and languages that make using your computer more productive (and easier).

It's about putting your computer to work, with you up front as boss.

However, if you find you hate programming and simply could't be bothered with it, don't worry. There are enough commercial programs for sale to keep you and your computer occupied for several lifetimes. Beginners especially may be frightened off to meet a wall of programming descriptions in their first association with computers. For them, commercial programs may be the answer for good, and they may never want to program. That's fine.

What we'd really like to get across to you is that *Your Computer* is for everyone. In between the covers there's a story for just about every computing taste.

We hope you'll stick with us in the months and years ahead. We don't think you'll be disappointed.

—Les Bell

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YOUR COMPUTER is published monthly by White House Publishing Group Pty Ltd, under licence from MotorWord Pty Ltd. Printed by The Litho Centre, Waterloo, NSW. Distributed nationally by Gordon and Gotch. Typeset by Hughes Phototype, Artarmon, NSW. Registered for posting as a publication — Category B. OFFICES: Editorial and Advertising, 706 Military Road, Mosman, NSW. Phone: (02) 969 7000. Postal Address: PO Box 216, Spit Junction 2088. See Page 102 for information on copyright, contributions, reader services and advertisers' index. SUBSCRIPTIONS: Normal subscription price for 12 issues is $24, including postage. Further details Page 102.

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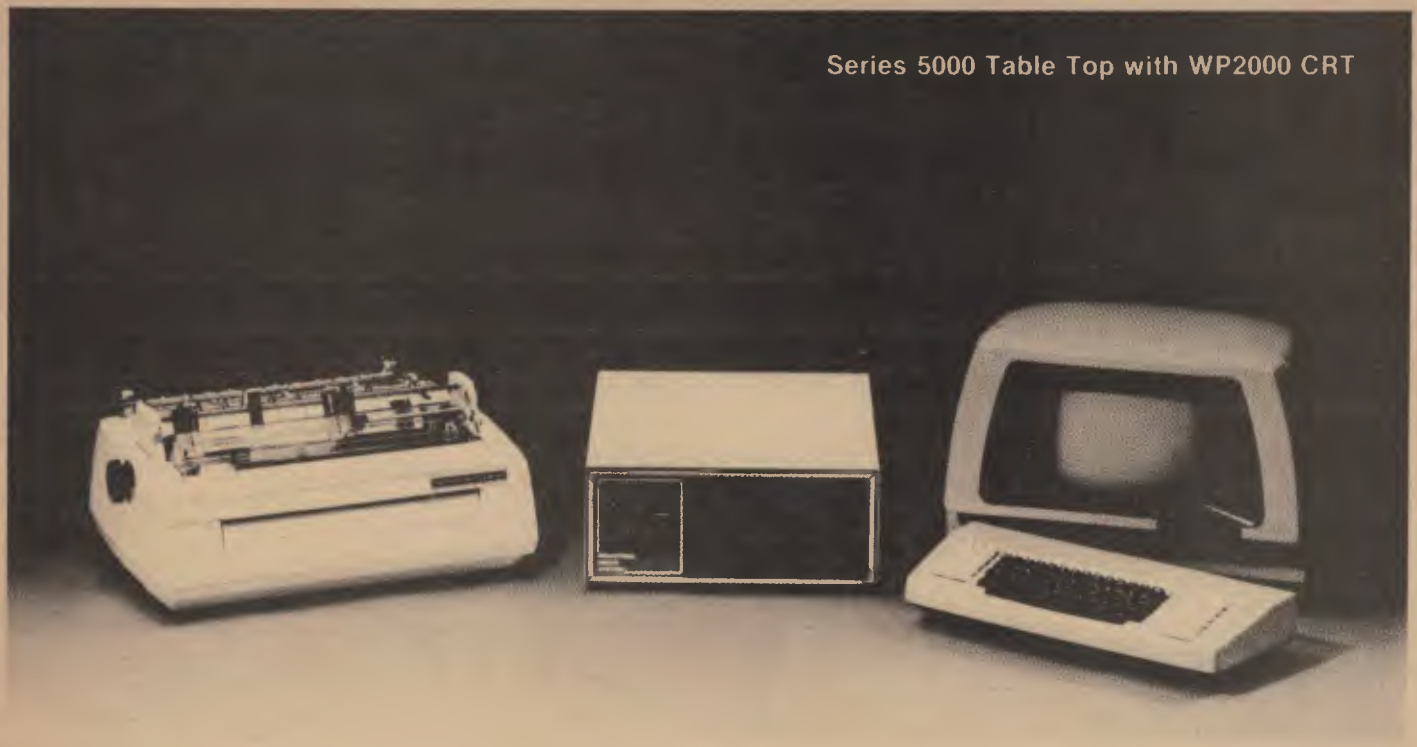

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your computer news

ACORN ECONET

ACORN Computer's Econet system, which will allow the connection of up to 255 remote stations to a central file manager, has been launched in Australia. The system revolves around an Acorn System 3 or 4 (or an Atom with disk) which manages all disk files for the network, and will also queue files submitted for printing.

The Econet system uses an inexpensive four-core cable, up to 1 km long, to link the stations, and can transfer data at up to 250 kbaud. The hardware required fits inside the Atom, or is available in Eurocard format for the larger systems, while the software is a 4K ROM which fits on the Atom board.

All stations have equal status, and unless specifically prohibited, any station can communicate with any other without recourse to an intermediary. The only unique station is the one that generates the network clock.

The Econet is fault-tolerant; a fault on one station will not affect others. Each station runs programs at full speed, and adding stations will not slow the system down.

Files may be either public or private; public stations may be accessed by all stations, whereas private files are only available to the station that created them, or to a priviledged station. A station may only create and delete its own files, but may also load and catalogue public files.

The print spooler program may be on the same system as file manager, or on a separate machine.

The Econet has several features which make it particularly useful for schools and other educational organisations: for example, it is possible for priviledged stations to read the screen of any other station. Messages can be sent between stations, and one sation can even assume control of another.

Systems like the Econet offer significant cost benefits to schools and other users who have only intermittent need for disk or printer access, and thus can afford to share the system's resources. In addition, the ability of the teacher to monitor the activity of the various stations is very useful.

Further details of Econet can be obtained from Sinclair Equipment in Melbourne.

New for Commodore

B.S. Microcomp, micro computer systems designers, is now Australian distributor for a wide range of Commodore computer products.

Mr Bill Saunders of B.S. Microcomp told *Your Computer* the company was now selling a powerful data management system for all disk-based Commodore systems, high resolution graphics hardware and software for 40 and 80 column machines, a programmer's toolkit and an RS232 test set, a compact unit for all RS232 interface configurations.

Mr Saunders said he visited the sixth West Coast Computer Fair in San Francisco and had talks with Commodore executives at the Santa Clara base, in the heart of Silicon Valley.

He confirmed Commodore is manufacturing the VIC microcomputer as well as a single disk drive, an IBM format 8-inch disk drive and a 64K expansion board for the 8032 Super Pet.

Memorite 111

MEMORITE 111, a new word processing system developed by Vector Graphic of California, gives the company's computer features similar to dedicated word processors without compromising its data processing capabilities.

The Memorite 111 system does not need a printed quick-reference manual — if you forget an aspect of the system while using it, ask for help and get the answer immediately. An entire instruction book can be requested. The spelling of 30,000 words is stored by Memorite so that any that are mispelled can be indicated on the screen.

An advanced list-processing capability incorporated in Memorite manages lists of several thousand members, with plenty of extra space for specialized information besides name, address, and phone number.

It can sort a list quickly on the basis of any data item, and create a new list by specifying categories of list members. Memorite will merge list information into a standard letter and will print the mailing labels.

Vector's automatic sheet feeder can be used to print multiple letters on letterhead conveniently.

Memorite documents can be sent to, or received from, any other Vector system, or any other communicating word processor using industry-standard protocols.

Memorite holds about 17 pages in memory allowing sections of text to be moved from one page to another without tedious disk access, and can automatically search and replace through a long document in less than a second. Vector systems have memory mapped video which allows revision of the screen image instantaneously.

Each user may use an individual password which causes typed material to be scrambled so that no one else can view or change it. Extensive information is stored on each document on the directory. Each document has a title and a short description of its contents, the author and the date.

Memorite may be used on any Vector system ranging from 5¼ inch floppy disk drives to higher-speed higher-capacity 8 inch drives, and up to hard disks that offer almost instantaneous access to all typed material without inserting diskettes. Memorite is the same regardless of disk type, and systems can be upgraded one to the next.
Further details from *Dicker Data Projects at 31 Cawarra Road, Caringbah NSW. Phone 525 4707.*

IF THAT'S NOT ENOUGH. . .?

NOW YOU know how to pack enormous programs into your ZX80's limited memory, you don't have to bother — the 16K RAM expansion modules have arrived in Australia (did we hear someone say "at last!"?).

The expansion modules, complemented by a new 8K ROM, could turn the tiny ZX80 into a worthy competitor for machines 10 times its (physical) size.

The RAM pack simply plugs into the existing expansion port at the back of the ZX80, with no wiring, soldering or fiddling required (although we're not sure how it might affect the hooking up of a new printer we're told will soon be available for the mite).

Considering the sort of software that's already appearing for the 1K version, it can't be too long before ZX80 users will be offered 'advanced' TRS 80-style program tapes.

We were planning on testing the new add-ons with the ZX80 in this issue, but could't get hold of them at the same time as the machine — thanks to another of our interminable shipping delays.

Meanwhile, if you want to get hold of one of the new modules, or uncover some more details, contact Sinclair Australia in Melbourne or your local dealer.

WF Spinwriting. . .

WARBURTON FRANKI has added the internationally respected Spinwriter to its already impressive list of computer peripherals.

The Spinwriter, which has enjoyed enormous success in Japan and overseas, is a high quality character printer using a unique 'thimble' print element. Claiming to be faster than the golf-ball with better quality than the daisy-wheel, the 'thimble' is a durable, specially reinforced plastic element providing up to 128 characters per thimble. The last character can be seen without moving the thimble.

Aimed at applications such as word processing, graphing/plotting and communications, the Spinwriter comes in RO and KSR versions with several popular interfaces. All currently available models will be supplied and fully supported by Warburton Franki in ever State.

Future releases from NEC will include an APL version of Spinwriter.

HAM 'N' EGGS COOKING. . .ZAP!

ZILOG AUSTRALIA (probably better known as Zap Systems) has been taken over by Hanimex Corporation.

Hanimex was Australian distributor of Commodore systems before the American company decided to end the franchise and do the distributing itself.

The Hanimex takeover of Zap puts it back in the computer marketplace where it believes there is a great deal of potential.

Ohio Puts the Byte On (Ouch!)

THE FEDERAL Office of the Australian Dental Association has installed an Ohio computer system to facilitate membership administration throughout Australia.

The installation consists of an Ohio C3 CPU with 23 megabyte disk drive and is networked into four C2-OEM's with four MIME 2A screens. A separate ADM 3A VDU works on a file maintenance program.

Prime job of the system is to provide maintenance of a membership file consisting of 5500 members of the association in Australia.

A spokesman for the ADA said a subsidiary application consisted of a sub-file for subscriptions to the Association's national journal, by individual subscribers and agencies, with automatic invoicing provisions.

The system was sold and installed by TCG, importer and distributor of the Ohio Scientific range in Australia.

The system will also maintain records including bookkeeping for the ADA's related world body, the International Dental Federation.

Mike Barraclough, a director of TCG said the system offered a second group of applications in the word processing area.

A Zilog Sanders Media 12/7 printer attached to the system provides repetitive document production, drug guides and presentation of association minutes taken during meetings.

Future applications envisaged for the sysem include processing of statistical surveys, production of a directory for members, document retrieval and automatic bookkeeping with normal provisions to trial balance level.

"These should be fully online within 18 months," the ADA spokesman said. "The Ohio system has proven extremely useful to us in the day-to-day operations of a large national professional association. It provides a highly cost-efficient, flexible solution to our needs," he added.

. . . And Disposing

JUST LIKE the baby's nappy, the print head in Epson's MX-80 matrix printer is disposable. Conservatively rated at 50 to 100 million characters, service is as simple as changing a ribbon cartridge. "In fact", says a spokesman for Australian distributor Warburton Franki, "you just snap the head out, throw it away and snap in a new one. It's as easy as that — the only tool you need is at the end of your arm."

The MX-80 provides features normally found in printers costing a lot more. The choice of 40, 80, 66 or 132 columns of printing is available in as many as four distinct printing density modes, a total of 12 different combinations which can accommodate nearly any printing requirement. More than half of these utilise multi-strike and/or multi-pass techniques.

Other atractive features of the MX-80 are true lower-case descenders, bi-directional printing, logical seeking of shortest lines, 80 characters per second, 64 graphics characters, forms handling and more. At around $900 the MX-80 is a fully loaded printer at a 'bare bones' price.

Commodore Off and Running

THE AUSTRALIAN subsidiary of Commodore International has made a profit in its first three months' operation.

Mr Nigel Shepherd, managing director of the Commodore Information Centre, said at his Artarmon headquarters, Sydney, that the profit was after writing off all setting-up costs in Australia.

This is Commodore's first comment on progress since it opened for business here in September 1980.

Meanwhile Commodore International expects a turnover in excess of $200 million for this year.

Reporting from Norristown, Pennsylvania, Commodore president Jack Tramiel said net sales for the first quarter were $US 35,212,000 — a 42.3 percent increase on the same period last year. Earnings before tax were $1.31 per share, almost double the 70¢ earning in the first quarter of last year.

Mr Shepherd said the Australian company's growth was comparable. Its dealer network was now 60-strong. Figures for December and January showed sales of 300 Commodore PET microcomputers alone.

Seahorse Moves

SEAHORSE COMPUTERS has moved to new premises in Camden, a short drive down the Hume Highway from Sydney (even if Les claims there's no such thing as a short drive on the Hume Highway).

Keith Stewart of Seahorse has a 'mazing range of hard–, soft– and firm-ware for the popular machines, including Dan Paymar lower case adapters for the Apple, special chips to increase the editing power of PETs, hi-res graphics add-ons for the TRS-80, fantasy games, and programming utilities from Microproducts, Southwestern Data Systems, and Sys-tech, Germany.

For information and catalogues, contact Seahorse Computers, PO Box 47, Camden NSW 2570. Or telephone (046) 66 6406. Or if you can't catch him any other way, leave a message on The Source (his mailbox number is CL 2111).

CAN'T SEE THE TREES FOR DEFOREST

DEFOREST SOFTWARE is opening a branch store in Perth on May 25.

Managing director Peter DeForest says the store will be primarily for small business computer systems, but it will sell the full range of DeForest products.

"The big deal the store will offer will be the Tandy model three," he says.

The new DeForest outlet is at 854 Canning Highway, Applecross, 6153. Phone (09) 364 7385.

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Once loaded, this program gives Sorcerer ROM PAC Basic more than 15 extra program development commands, some of which you would not have thought possible. If you purchase this piece of software and are not 100% satisfied that it is all we say it is, we will gladly refund your money in full!
The following commands are just a sample:
EDIT xx[,yy]
This allows you to edit your program just as if you were using the Wordprocessor Pac. All the same numeric keypad commands are used. You may even have Basic program lines over 500 characters long.
AUTO [xx[,yy]]
While entering program lines, each new line number is typed for you! All the EDIT commands are available in this mode, which greatly speeds program writing.
REN [nn[,b[,c[,d]]]]
You may renumber all or a section of your program with one simple command.
TRACE [xx[,anything]]
This command runs your program and prints each line number on the screen after it is executed. You may optionally print values of numeric or string variables after each line number.
HELP xx
How many times have you got a SN ERROR IN LINE xx message but could not see the error? This command prints the program line in EDIT mode and places the cursor over what System 3 thinks is the error! This command is especially useful with your now very long program lines.
FIND(") anything
Find and list all program lines containing 'anything'. An optional wildcard character may be included.
DEF x
You may define function keys with this sophisticated routine which even includes an input feature.
VAR
List all variables and their values. This is often used after a
LIST [xx[,yy]]
List all program lines from xx to yy.
DEL [xx[,yy]]
Delete all program lines from xx to yy.
CLOSE
Erase all spaces in your program excepting those within quote marks and in REM statements.
OLD
Recover a lost program after NEW, CLOAD or RESET.
CLOAD?
Verify a program on tape without the possibility of contaminating memory in the case of a TAPE ERROR.
MERGE
Merge the incomming BASIC program off tape to the end of the Basic program in memory.
Other features.
System 3 has stacks of other features including a printer driver that can be accessed with control P as well as healing a host of bugs in the Standard Basic Rom Pac. It leads with a simple LOG command and relocates itself to the top of RAM. Even odd memory configurations are possible. You will find System 3 simple to use, fast, efficient and reliable. It comes on cassette at both 1200 and 300 baud, and runs in 3K of RAM.
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Integer Basic Card	$ 190.00	$ 218.50
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RF Modulator	$ 35.00	$ 39.95
Sanyo Green Screen Monitor	$ 312.00	$ 345.00

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COMMODORE

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The Commodore C2N cassette is available for this system at $128.00.
The normal list price for a 16K PET is over $1600!
This offer is for a limited period only so make sure of yours today.

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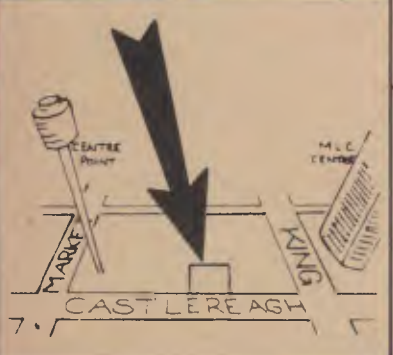

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ZX80 INVADERS!

IT HAD to happen. Just when you were convinced the standard 1K ZX80 was too small to do anything complicated with, the mystery programmers came out of the woodwork with their usual bagful of 'impossible' tricks.

There were hints of things to come when programs providing flicker-free graphics started appearing (the ZX80 normally switches its screen display off while it stops to 'think'), but few people expected to see this put to good use on the basic 1K machine.

Software development and distribution specialist Melbourne House thinks differently, however. It stunned most observers in Australia, the United States and Britain recently with its simultaneous international launch of Super ZX80 Invasion, a cassette-based Space Invaders program for the basic version of Mr Sinclair's mighty mite.

The moving graphics machine language program gives a totally flicker-free game with three skill levels.

Each Super Invasion cassette comes with a 2K version of the game as well, so if you upgrade your ZX80 you can enjoy a more highly developed version straight away.

Super ZX80 Invasion is available from distributor Compshop Australia or through your local Sinclair dealer.

ZX80, And Counting...

YOU MIGHT have heard Clive Sinclair's ZX80 has become a ZX81.

Julian Barson of Sinclair Equipment Australia says the ZX81 is not yet being produced. The earliest he can see it coming here is at the end of the year, but more likely in 1982.

The rumoured British market price of around $140 won't come with it; it's $200. Rumours of ZX81 kit being sold for less than $100 are untrue, Mr Barson says.

The only information to filter through on the ZX81 is that it will be in a different case, include an 8K ROM and a printer will become available for it and the ZX80.

The rumours are yet another example of Clive Sinclair's bent for generating a bit of pre-release publicity...

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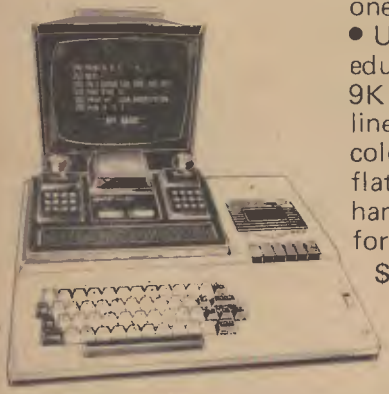

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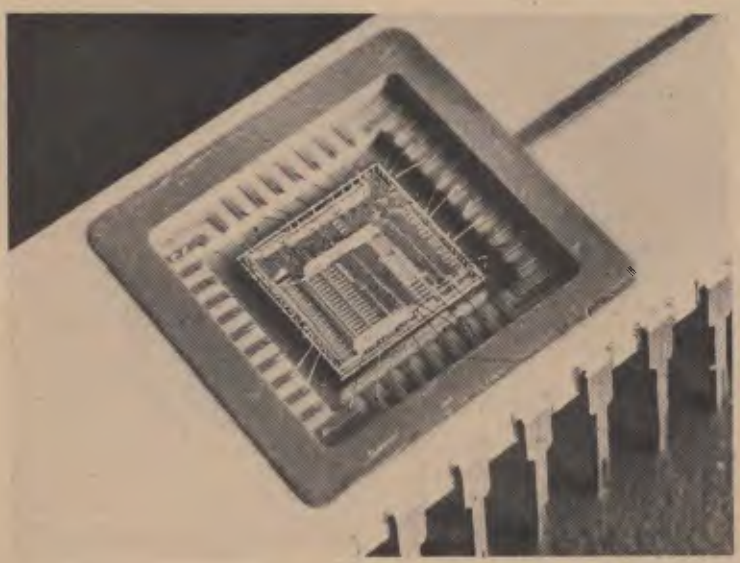


The intricacies of the microchip are really not to be worried about; they work, and make computers oh so simple to use...

This is a guide to microcomputers written for the faint of heart.
Your Computer *editor Les Bell takes you further than the magazine or radio ads which might have caused you to raise an eyebrow in interest — do you know what computers are around, how they work, or, most importantly, what they can do for you? for such a complex subject, there is really less to it than meets the eye.*

It Won't Byte You....

"There Is Less To This Than Meets The Eye" Tululla Bankhead

THERE'S A pleasant feeling in the air around the microcomputer fraternity. Much like the feeling in early days of radio, I should imagine. There's a lot of similarity between the beginnings of radio and computers. Initially, the technology was expensive, only worked in the laboratory, was not widely understood and was inexplicable except in mathematical terms.

In the second decade of the century, though, radio amateurs began building their own sets and radio came out of the laboratory. But it was still seen as a two-way communications medium and it was not until the 1920s that broadcasting began and radio really came to the people.

It's happened the same way with computers. Until the '70s computers were huge, expensive and *extremely* complex room-fulls of equipment tended by a high priesthood of operators, programmers and analysts. The weight of this cultural heritage makes it difficult to imagine computer people as wearing anything other than white lab coats and living on an altogether higher plane than us mere mortals. Fortunately the appearance of minicomputers in the late 60s began to change this.

But then came the event that shook the computer world — the invention of the microprocessor. At that time I was at university and one of the courses I did was in computer architecture. I received a preliminary data sheet for one of these devices, and it looked to my (unsophisticated) eyes uncommonly like the central processing unit of the much larger computers we were studying. So I went to my lecturer and asked him, "Is it possible to build a computer around one of these?"

His answer reveals the attitude that dominated the data processing community and still holds sway among a few diehards.

"No, my boy," he said, "they're fine for poker machines and vending machines, but they'll never be serious general purpose machines."

At that moment, across the Atlantic in the US, quite a few amateur experimenters (analogous to the earlier radio hams) were trying to build microprocessors into general purpose computers, and succeeding. In 1975 the Altair 8800 appeared, the first machine to incorporate a microprocessor that actually looked and behaved like a minicomputer. But still, computing was an activity for the dedicated enthusiast. There was no soft-

ware available to speak of, and much time was spent "re-inventing the wheel" and writing programs that already existed for larger computers.

But now we've entered the "broadcast age" of computing. Now you can have a computer in your home, and use it to solve your problems without even having to write a program. I hope you will, though, as programming is really a fun activity. There's a lot to learn, but you can take it at your own pace, and every step *is* fun. It can be frustrating and it can be infuriating. But when your first program actually works, you feel, and have every right to feel, like Einstein.

What Will it do For Me?

There are a lot of things you can use a home computer for.

I use mine for writing as a word processor (which is how I'm writing this article now, and it can churn out articles, letters, documents, all perfectly formatted and word-perfect. There's even a program available for it to check my spelling!) I've written programs to do things like count the number of words in an article, which turned out to be a fairly easy task for the computer. It saved me from a deadly chore.

The word processor is also handy for sending out identical letters to a list of people. It can automatically type letters, inserting the names and addresses (and any other details required) in the right places. This is a great help to overworked secretaries.

One thing I often have to do is refer to articles previously published in books and magazines, just to check that I've got my facts straight. To help with that I've begun keeping indexes on the computer. To locate an article, all I have to do is key in a keyword, and the computer finds all the references to it in my library.

The same technique could be used, for example, to keep details of a record collection, or of a collection of beermats, or anything. Computers are great for manipulating lists and extracting information from them.

My computer also has a stereo sound generator built in, and I've been experimenting a bit with computer music. Nothing really very interesting has come out of it; in fact, it sounds flaming atrocious at the moment. But one day...

Another side-effect of the sound board has been some graphics games with sound effects added (stereo space invaders yet!), and this has turned out to be good fun.

Mostly, I use my computer just to write programs, purely for the enjoyment of writing programs and getting them to work. I'm not alone in that; most people discover that programming is a very enjoyable (in fact, addictive) pastime.

Other uses for the home computer: it can be used to control external devices. I've seen computers controlling set-ups from model-railways to pipe organs. There's a fascinating recording of a computer-controlled pipe organ playing the Flight of the Bumble Bee at *amazing* speed! Use it to turn your coffee pot on in the morning, and off again after breakfast. It can act as a burglar alarm.

Use the computer to experiment with graphics. Computer-generated art can sometimes be interesting, and sometimes awful.

Use the computer to keep track of your personal finances. If you're hopeless with money as I am, a personal computer could be just what you need to get back on track. Using the computer, it's easy to compare different saving and investment schemes to see which is best for you. Once you are saving regularly or getting income from an investment, use the computer to make projections. How soon will you be able to afford the boat-Porsche-new house-new computer?

How are your shares performing? Dial up an information service; get the information loaded into the computer, and receive an instant analysis.

The day is not far away in Australia (it's already come in the US) when you will be able to instantly send electronic mail to any of your friends who have a computer. The receiver doesn't have to be there for the computer to answer the phone and take the message (which you have previously edited, using your word processor).

I guess you can keep recipes on your computer, but the idea of flour and eggs getting into the keyboard, or worse, the floppy disk drives horrifies me.

And, of course, you can always play games. From simple little tic-tac-toe games up to Adventure and Galaxy Invaders. They all have something to offer. By the way, does anybody know what to do with the giant clam in Adv ture? It's been driving me nuts for we now!

Other applications I've seen:a wine kept for a home wine-maker, teach kids arithmetic and spelling, teach speed-reading, timing eggs, analys historical information for an amat historical society, keeping lists members for another club and even c ing horoscopes.

What Is This Thing Called Computer?

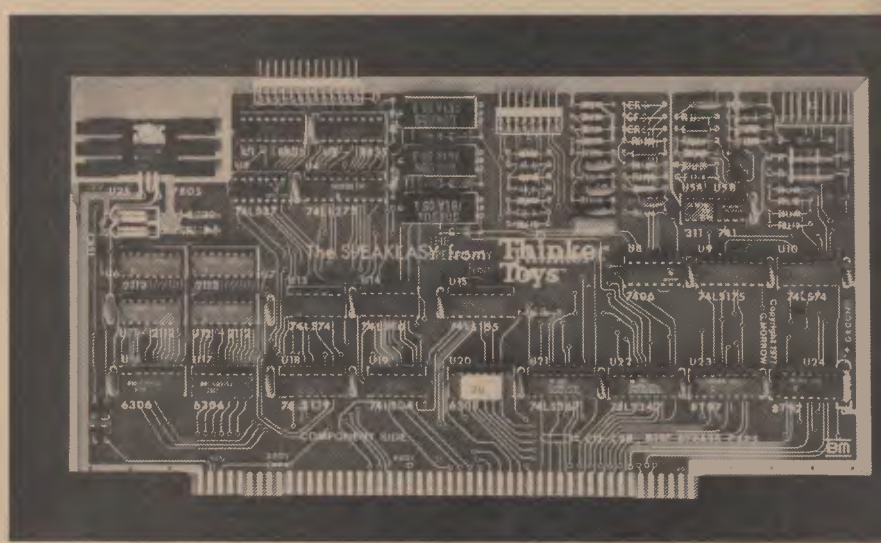
You've probably heard all the us stuff about how computers count binary, and so on. Forget that for a s It's true, but you don't really need to kn about it, and it will just confuse the issu

Most personal computers are shaped with a keyboard at the front, ar separate video monitor (often just a which sits on top or to the side. The k board is your way of getting informa and instructions into the computer, the video monitor is the primary way getting data out.

Inside the computer is a mess of e tronics, and it's impossible to tell looking at it just what it does. There really three sections to any computer.

First, there's the central processing (CPU). The CPU is the comput "brain", and is the bit that really does m of the work. In most personal computer is a single microchip called a mi processor, and most microcomputers one of a small range that have becc popular.

The next section of the computer is memory. The CPU gets all its instructi and the data to operate on out of memory and will store all its intermed results. Memory actually comes in major types: read-write memory, sh ened (for historical reasons) to R (actually Random Access Memory),



Close enough to a picture of the impenetrable for you?

read-only memory, sensibly abbreviated to ROM. The CPU can store into RAM, and the contents of RAM disappear when the power is switched off, but ROM retains its contents for ever and can't be changed by the CPU. ROM is pre-programmed by the manufacturer with the all-important software like the BASIC language interpreter.

The CPU must also have some way of communicating with the outside world. It does this through circuitry called input-output ports (I/O ports). There's an input port connecting the CPU to the keyboard, for example, and an output port enables the CPU to print on the printer. The video display on most personal computers is not actually connected through an output port, in fact it's part of the memory, but it's classed as I/O circuitry nonetheless.

Remembering that the contents of the computer's RAM are lost when it is switched off, there has to be some way of storing information permanently. Most computers allow you to plug in a cassette recorder and store programs and data on tape for later reloading.

The computer is usually supplied with a basic complement of these parts, and often will have a connector at the back somewhere to allow the connection of more memory or I/O ports. Such a connector is called a bus, and there are several common buses, each with a number of plug-in add-ons. Alternatively, it may be possible to expand the computer's memory, internally, by plug-in cards.

Software

One very important part of any computer system, in fact probably **the most important,** is the software. That's the programs the manufacturer supplies stored inside the computer's ROM, or on cassette or other storage. It makes the computer a smart machine.

Most personal computers have a program stored in ROM which lets them speak the BASIC computer language. BASIC stands for Beginner's All-purpose Symbolic Instruction Code and it's actually simpler than its name suggests. Just about everybody who has a personal computer has learnt to program in BASIC to some degree (at least enough to do what they want). It's not difficult at all.

And of course, most computers come with a few games and demonstration programs, just to get you going and show you what can be done. Usually these programs are fairly simple, because if they were really useful they would be a saleable item in their own right. However, they show off the graphics capability of the computer, and perhaps some sound effects and other special features.

Most of the popular personal computers are also supported by other sources of software. The manufacturer will supply a range of programs, and these will be generally of fairly good quality. Other software authors and dealers will also offer programs. Some of these will be real gems, and some will be dogs. Generally, unless the software is sufficiently cheap that you can afford to do you dough, it is better to seek an opinion from a friend or a magazine review before buying. At the very least, try to obtain a quick demonstration at the shop if possible.

Onward and Upward

What I have described are the bare bones of a computer system. There's a lot more available to the user than that. Take, for example, the Tandy (Radio Shack) TRS 80 Model 1. This machine, in its simplest (level 1) form, is very simple indeed. The main hardware is enclosed within the keyboard (fancy computer jargon for box). There's a Z80 microprocessor, four Kbytes (4096 characters) of RAM, and a simple version of BASIC stored in four Kbytes of ROM. There's a keyboard, a 64 character by 16 line video display, and a cassette interface. The video display is also capable of "chunky" graphics.

To get you going, there's an introductory manual which teaches you BASIC, and there's a demonstration tape. That's it. The Level 1 TRS 80 is limited in what it can do by several factors:

- The simplicity of its version of BASIC.
- The limited storage available.
- The small video screen (though not a serious problem)
- No lower case characters on the screen.
- Low speed and inconvenience of the cassette interface.
- Difficulty of interfacing to other devices.

The way around most of these problems is simple. The first problem is overcome by upgrading the computer to Level 2, which means replacing the 4K BASIC with a 12K version which is much more powerful. At the same time, the RAM is usually increased to !6 Kbytes, which is long enough for quite large programs.

Further expansion is possible through the use of the TRS 80 Expansion Interface, a box which sits behind the TRS 80, under the video monitor. It provides power and support circuitry for another 32 Kbytes of RAM, and also includes an interface for floppy disks and a printer. The floppy disks are magnetic disks which can hold up to 200 Kbytes of programs and data, and save or load programs a lot faster than the cassette interface.

Expanded to this level, the TRS 80 is quite a sophisticated and powerful computer. It is suitable for virtually all home computer uses, and more than a few business applications. But it doesn't stop there.

Listed in Tandy's latest computer catalogue are a number of add-ons for the TRS 80. They include several printers, disk drives, desks, a voice synthesizer and a voice recognition unit. With units like these, the computer can be greatly expanded.

But the hardware is only part of the story. Software is equally important. Tandy offers a lot of software for its machine, from the disk operating system, through business software, word processing programs, programming aids, personal financial programs, educational material and, of course, games. All of this software helps to make the computer of more value to the owner or user.

What we've mentioned so far is only the standard gear available from Tandy. There is a lot of support from other manufacturers for the machine, both hardware (disk drives, high-resolution graphics, I/O ports), and software. In fact, the range of software available for the Tandy is amazing.

Other Machines

The Tandy is not the only machine on the market, not by a long shot.

There are many other computers which may be more appropriate for your needs — this is why deciding which computer to buy can be such a difficult decision.

Computers come in all shapes and sizes. There's the totally integrated machines which put the keyboard and video display circuitry all into the one box, like the Apple II, the TRs 80 and the Sorceror. Then there's a few that take it even further and integrate the screen into the box, like the Commodore and the Superbrain.

Some, like the North Star Horizon, don't put the keyboard and VDU circuitry in the box at all. They instead use a separate terminal (or terminals, for multi-user setups). Some manufacturers produce both kinds of machines; Vector Graphic, for example.

A few machines use a circuit convention called the S-100 bus to ensure (well, almost) that the various interfaces and memory cards plugged into them will all work together. An S-100 machine may be built up from cards from several different manufacturers, and often is. Owners of S-100 machines generally are more involved with hardware and with the inner workings of their machines. Some of them have to be!

In *Your Computer* we'll be reviewing all the popular machines, and some of the not-so-popular, most of the new ones and certainly as many of the interesting ones as we can find room for. We hope these reviews will help you choose your computer. □

Even the Office Idiot Understands....

FIRST THE cat sharpened its bloody claws on one of my prized poster-sized photographs. Then my old back trouble flared up while bending over the remains of my prized picture. Finally I was given notice by a bloody computer that in the battle between man and technology, I was losing. . .

All up, it was the kind of day where driving my car into a brick wall for the glass and metal-destroying pleasure of it was only just pipped on the post by the thought of tossing something heavy at anyone who so much as looked sideways at me.

It all began as an innocent, quiet day: I was loaded with a Sinclair ZX80 microcomputer (small enough to fit in my coat pocket) and a small book described as the operating manual for said computer: with a song in my heart proclaiming high hopes of instant success in my first attempt at programming, I wandered off blissfully unaware of the dire things that were about to happen.

I wouldn't describe this virgin foray as a failure; it was more an unqualified disaster. Even the old standby, "When all else fails, read the instructions," couldn't instill in the ZX80 some sympathy for the well-meaning idiot who ended up plotting its total, complete and spectacular destruction.

I did everything by the book. The book said the ZX80 "consists" of two units. Damn right it does, and it didn't take me long to work out which was the power supply and which was the computer. I'm smart like that.

"DON'T PLUG IN TO THE MAINS SUPPLY YET" the book warned ominously. I didn't, I didn't! The book said that at the back of the computer were four sockets marked MIC, EAR, POWER and a fourth for the video socket. There was nothing marked on the back of the computer, it's actually behind *and* underneath. But this book had helpful diagrams.

With the feverish patience of a sex maniac, I plugged the power unit to 240 volts and the lead (all of nine volts) to the computer. No sparks or smoke, so I hadn't put it in the wrong socket. The TV was hooked up, the cassette recorder plugged in (I had foolish visions of making a copy of my first program) and with twitching hands let the electricity fly and my hopes soar.

Nothing happened. The TV screen looked like a line of dirty washing in a gale. I tried tuning the teev , tried different channels, but only succeeded in getting a fuzzy grey screen with a blob (that was supposed to be a letter K) in the bottom left-hand corner.

Twiddle, twitch, fumble, rumble, mumble and blast! I gave up my first attempt at programming.

I had been lent a ZX80 games' programme, so I tried to load that into the computer's memory. And I tried and tried and tried. And failed.

That was at home, alone; I gave up completely, and in complete disgust. The ZX80 was unplugged, the TV put back to a more sensible function and I sat back fuming into a cup of tea (drop of milk, no sugar, fairly strong) and looked daggers at the bit of plastic and metal that had soaked up three hours of my precious time and not done a bloody thing in return.

Naturally, I gave up computers there and then. My lady, who works by day with monstrous IBMs, agreed with me that it was a waste of time — mine for trying to get the damn thing to do something, hers for having to put up with my temper tantrums.

Sinclair's bit of useless electronics went back to the *Your Computer* office. As I dumped it on the boss's desk, all the time swearing and cursing him for everything I could think of, a gentle hand led me to a television set.

To my acute embarrassment, it took the whiz about 10 seconds to plug the ZX80 in, tune the picture to a fairly crisp and readable standard and say, "Righto dimwit, what's your problem?"

The ZX80 manual, A Course in BASIC Programming, was shoved under my nose (my cries of "I've read it, I've read th bloody thing!" ignored) and I was ordere to learn how to program, or there'd b trouble.

You know what? I did. I actually learne how to program some simple function Nothing stunning, mind you, just b ginner's stuff like getting the computer add, subtract, multiply and divide. Ther were accompanying books, like 30 Bas Programs for the ZX80 which I peere into, and miracle of miracles, I actua programmed the computer to play son simple games.

I'm a long way from giving IBM a call tell the heavies I'm available for a he fee, but I'm getting there.

As if that little success story was enough, one of Dick Smith's System computers then lodged in my loungeroo for a weekend.

Guess what happened? You guesse That's right, the bloody thing didn't wo This time I wasn't programming, just tryi to get a program or two loaded into it failed. I again gave up computers. T whiz again took me by the hand a showed me what an idiot I was.

I can load a System 80 with a progra quite well now, thank you.

Just recently I had a run-in with an AP Imagination Machine. a nice, tidy lit computer, it didn't get the better of m First time, it ran perfectly. Second tim still perfect. Third time, just as good.

I may not have won the war yet, but fo novice I'm not doing too badly in tucki the odd won battle under my belt.

The Solution Machine.

Meet Commodore.

The business computer that's providing solutions for more than 100,000 businesses around the world. Built by one of the pioneers in office machines. With a reputation that can come only from vertical integration of the total manufacturing process. Commodore is a builder, not just an assembler.

Compare Commodore's word and data processing capabilities with computers costing twice or even three times as much. You'll see why so many small businessmen are turning to Commodore for solutions to problems as varied as these:

□A busy pharmacist and his staff were spending far too much time handling an avalanche of paperwork and stocktaking and not nearly enough time talking to and advising customers.

Solution? A Commodore 3000 microcomputer with software created specially for the pharmacy profession.

Result? A dramatically reduced workload, increased custom, total efficiency and greater profits. All for a quickly recovered outlay of around $12,500. Nearly 100 Australian pharmacists now enjoy this Commodore system, more enquire every day.

□A Sydney radio station needed a system that could take over the complicated functions of conducting a popular music survey, analyse the findings and then provide a full catologuing system for its music library. Other requirements: It had to be easy to use and not cost the earth.

Solution? A turn-key system based on the Commodore PET 2000 microcomputer, again with specially written software. The Commodore was an instant hit—other stations are now looking to Commodore for similar microcomputers.

□Scientists at Australia's Mawson base in Antarctica needed a computer. With the nearest repairman the end of winter away, the computer had to be reliable and easy to maintain and service. Besides, the scientists got bored sometimes.

Solution? A Commodore 8000 microcomputer and printer to log all data, perform calculations and print reports—without needing a repairman! The big range of Commodore entertainment programmes also solved the boredom bit.

□ Production planning, stock estimating, and profit calculating were just some of the individual applications which a big Australian company needed to compute.

Solution? A Commodore 3000 microcomputer and the Commodore Visicalc programme. Visicalc is a software package which combines the versatile, easy-to-use features of a pocket calculator with the 3000's powerful memory and screen editing capabilities.

In applications like these, and many more, Commodore solves the problems that stand in the way of increased profitability. Commodore can provide the solution in your business, too.

For literature and the name of your nearest Commodore Dealer, call or write to:
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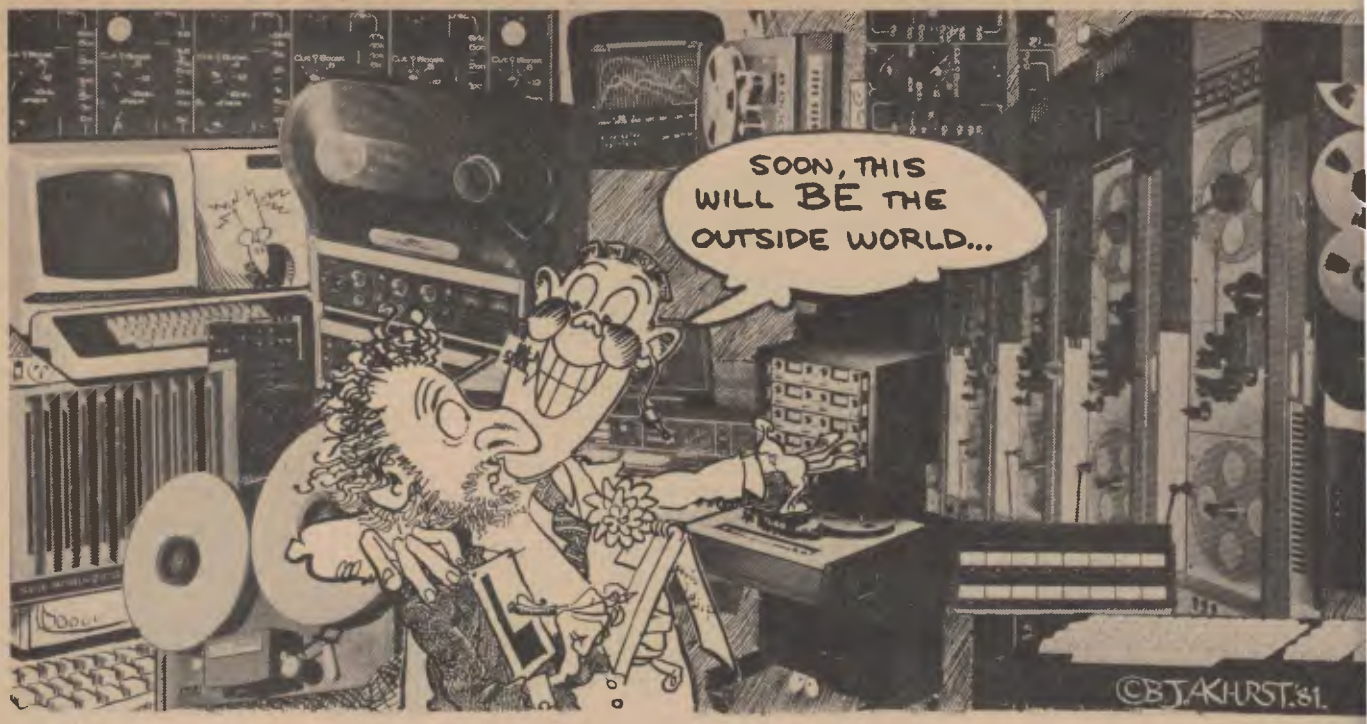
Commodore microcomputers

MIvT 446



The Soft Sell...

IT'S SCARY OUT there in the world of computers. Lots of jargon, different systems, different computers. Information whizz-bangs past your ears like a mortar attack. I'm not a one-week wonder, an instant expert. I played it cool in my information collecting. I learned that there is more to this game than meets the bubble memory (slight pun there, very slight), but if you have the time and the inclination, you'd be able to amass enough knowledge to dazzle Dick Smith.

There are thousands, tens of thousands of programs available. Under the loose heading of software you can buy a program to tell you how much you are going to be in debt for, and for how long, or you can buy educational packages to help the kids read, write, THINK! That's the important bit, computers make you use your brain. Most of the time, making you do it is fun.

Places to buy programs from are breeding like rabbits. A program, or piece of software, won't work on every computer. You probably know that, but I didn't, until recently. The program, or instructions for the computer, come in cassette form, or in a disk form. I'm told the cassette is fairly slow, the disk rapid. But to be able to use a disk, you need a disk drive for your computer. Cassette recorders are cheaper; many home computers have them built in.

For small businesses, programs to look after book-keeping, accounts and general administration abound. They don't cost much, but you might have to modify your business's operation. The trick to programs is that they're written to suit *most* applications, such as in business. They don't cost very much because they're mass-produced. If you want a program made especially for you (for a small business, as an example) then it's go to cost a small fortune. Writing a progr can be extraordinarily complicated a time consuming.

These things I know. I asked.

Apparently, one of the best things y can do with your home computer is w your own programs. There are over-t counter programs to help you write on have to be honest, for the home compu enthusiast, who doesn't own a sm business and hasn't the mortgages a debts to warrant a program to keep ta on them, commercial programs are a thin on the ground, except for gam thousands of them. If you have childr things are a bit different, educatio programs are freely available. Most good — well, those that I saw were go There are speed-reading courses enjoyed that one. I can now get throu Ethel the Aardvark Goes Quantity S veying in rapid time.

You don't have to be a genius to sort out what's going on where in the world of computer programs. We know, because we sent computing novice MARK CAMM out to investigate. We picked a beginner to write the story so that he could produce a comprehensible rundown for newcomers: surprisingly, he succeeded.

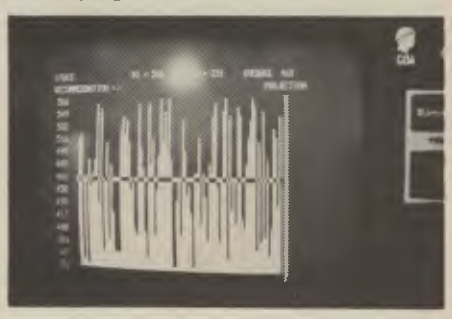
"What! Me write about computer programs?" he yelled at us in disbelief. But a week later he trudged back with the story, proving once and for all that even the most timid beginner can find out quickly, and in a language approaching the Queen's English, what can be bought to make a home computer do for you whatever your heart desires.

Applecations

Apple Computer is a name well know the land of microchips. The software av able for it is vast, more than 2800 piec But, as the honest manager of Compu Land in Sydney, retailer of the Ap pointed out, most of them are rubb That still leaves a hell of a lot that aren

Six 'S' Business Advisory Pty Ltd Geelong, produce a heap of software the Apple under the heading V

ABOVE: Dick Smith according to the microchip.
BELOW: Eric Ackroyd of CISA gave *Your Computer* a demonstration of the Stock Exchange program he had nearly finished developing when we visited.



Business Signs. These are programs for business and include:

- Creditors and General Ledger. A program for you to keep an eye, and a brain, on cash flow, profits, who owes what — with this baby you can ask the computer what's happening to the business, and it'll tell you.
- Insurance Brokers. A program for the brokers among you (and who isn't broke?) to keep records of your customers, renewals, policy records, premiums, the whole schamozzle.
- General Payroll. Whatever paymasters do, this program does it for them. Find out where your company's income is going. . .
- Debtors and Inventory. Account selection, customer master record, sales territories and transaction entries.

Interestingly, these programs are written in a computer language called Pascal, and so will run on any machine that understands Pascal.

ComputerLand has a Real Estate program which looks after cash flow, taxes, capital gains — everything you wanted to know about real estate, but didn't have a computer to ask.

The one I was impressed with was the E-Z Video Marquee and Slide Marker. Apple computers use colour monitors, and this program lets you write a sales message on the screen so that customers walking into your fruit shop, for example, get an attractive display telling them that apples are on special, or whatever. Pictures of the product can be drawn into the program, and it can also double as a cash register. It seems cheap for the price when its benefits are added up.

For musicians there is a hardware and software package that springs into the light of day as the alphaSyntauri.

It's a synthesiser and can reproduce up to 16 sounds at one time. You can have the well-known instrument sounds,or you can make your own up. Write your own music on the screen, and away it'll play. Lots of goodies come with this system, and it's not cheap. But having heard a demonstration of it (the Pink Panther theme) I'd say it was a ripper.

Apple also has the ALF Music Synthesiser, which isn't in the same league as the alphaSyntauri, but it's a damn sight cheaper.

Some more Apple software:

The Cashier. The small business owner can work to increase productivity and efficiency with this little bit of technical wonderment because it keeps a $-eye on customer and vendor files, it can process and monitor sales, order and receive stock, check profits, inventory and cash, and generate management reports, invoices and quotes — like, would you believe, "You're bankrupt?"

Livestock Selection. Ranking animals in order of merit. One software salesman told me the story of a racehorse breeder who spent $10,000 having a program written to look after his bloodstock records, or whatever it is that stud managers keep a record of. There's also a stud book program, more than compatible with the Livestock Selection program.

With a little bit of adaptation to his operation (the salesman told me) a livestock selection and stud book program such as the one for the Apple could have been his at a fraction of the cost of his original, expensive program, if you see what I mean.

Supertalker. Give your mother-in-law some competition; the supertalker allows you to add the dimension of human speech in your computer programs.

The system is a little extra programming and hardware for the Apple, but the cunning thing is that it's adaptable enough to be used as a verbal educator for the kids, or a prompter for the computer operator at work to do this, that or the other.

Medical Accounting. I know a lot is written about doctors being more interested in income than medicine, but it makes sense for MDs in large practices to keep an eye on income, and with Australia's horribly complicated medical health plans, a program such as this for the doctor might give him a chance to break away from the ledger and practice his calling.

Apple's range of software is huge. There are more management programs

than you can poke a stick at, word processing packages galore, mailing lists, educational programs in plague proportions, but they're by no means the only people on the block. The descriptions of Apple software are a good guide to what's available elsewhere.

The 80s

Dick Smith, that effervescent gnome-like character with the adventure disease in his blood, can be accredited with getting the electronics-for-the-layman industry going in Australia. More than anything else, it was his enthusiasm and showmanship that proved anyone with an IQ above that of a retarded rock could succeed in and have fun with electronics.

The Dick Smith System 80 microcomputer, a close cousin of Tandy's TRS 80, has many programs for it. Probably because of Dick's personality, the emphasis is on learning and enjoyment.

His educational programs include a typing tutor, and if you're going to use a home computer, being able to type on a qwerty keyboard would be of immense use: you just never know when you might branch out into a word processor.

There's an educational program called "Learning Fun 1 — Scurve Invaders." It combines practice in maths with Space Invaders. Then there is the"Learning Fun 2: Hangman and Concentration", for developing word skills.

There are more. In the general category, programs for the computer enthusiast abound, mainly to teach programming, but also to get you used to exploiting your computer's potential.

On the business side Dick has SCAP, not a disease, but a stock control and pricing system program.

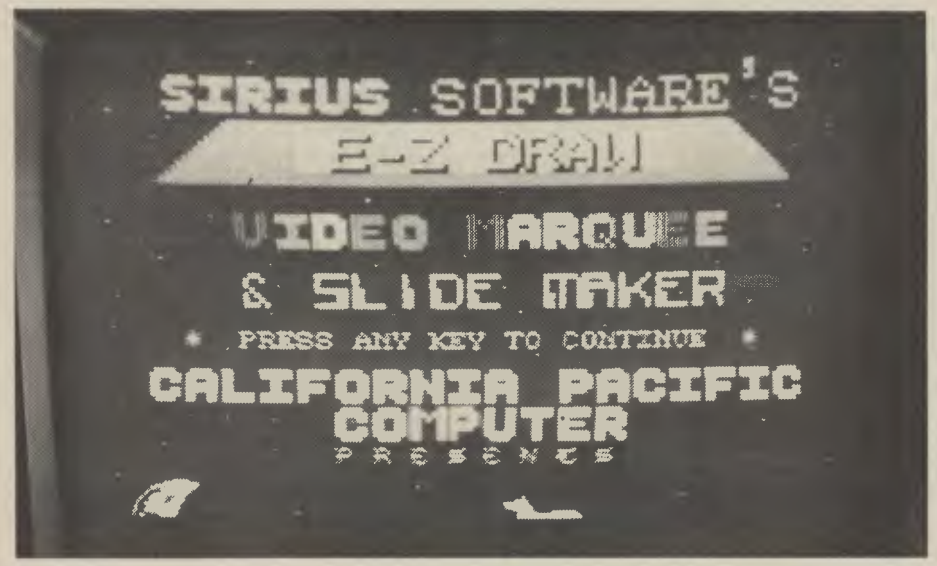
ComputerLand Melbourne gave me a huge pile of pamphlets on the software it had available. Much of it is for the Apple, with the programs coming from Six 'S' Business Advisory Pty Ld. However, it also handles Archives Incorporated which supplies, so I'm told, excellent software for property management.

Tandy's TRS 80 is, apparently, a popular bit of hardware (that's computer-speak for things like computers, monitors and ashtrays for chain smokers).

Buying programs for it is no problem and, interestingly enough, I'm told that most programs for TRS 80 computers will go nicely in Dick Smith's System 80 — don't you just love the technical talk?

Eric Ackroyd, of CISA Microcomputing Pty Ltd in Sydney, gave me a list as long as your arm of what software for the TRS 80 he had available, or could get in 48 hours.

The System 80, far more versatile than you might think with programs available to make it a success at business and at home.



For the small-business owner, this piece of Apple-supplied software allows you to key in a sales message that is displayed on the screen, as well as a picture of the product you want to sell. Also doubles as a cash-register program.

At the moment Eric is building programs for all you budding dabbler the Stock Exchange. One program wi to chat to the computer at the St Exchange (if you're lucky enough to permission to hook in) and the other advise you when to buy and sell graphic form let you know what sto have done in 100 days trading and g you some idea of how much money are making, or losing.

Eventually, says Eric, you will be abl buy the two programs as one. It won't b cheap bit of programming, but if yo heavily into share trading, it is, at moment, probably the only program o type for Australia's Stock Excha system.

One strong warning that came from visit to CISA (and I'm really proud myself because I did it on the Ides March) is that, as in most retailing fie you should be wary of the unident seller.

You could be buying some ter rubbish (both hardware and software dealing with people who trade *only* w telephone number or a post office bo it's alright dealing via the phone Australia Post, as long as you know company's address and can visit it if want to.

Copyrights on programs are ea breached, and if you buy something doesn't work from a Fly-By-Nighter, can kiss your money goodbye. Bac service; consider it strongly when bu anything for your computer.

IMS Computer Systems Melbourne (it does have an address) company specialising in packages fo business world. Its programs w suggest that medium-size compa would benefit most, mainly because programs are specific. Examples: Ord entry invoicing system, integrated d mail system, word manager, de system with invoicing, creditors, ledg payrolls and so on. I hate putting the in someone's head, but the ra complexity and understanding programs is an area so great that could write a magazine about it.

Personal Enrichment

Texas Instruments is one of you American HUGE multi-national corp tions. It's no surprise then that education programs are describe Personal Enrichment Programs. Bu all of that, it does offer programs in E Learning Fun, Beginning Gram numbers, graphs, chess, getting making music, losing weight, teac yourself to program and even how to Bridge.

Its business programs are, in the m aimed at you at home: controlling income, keeping to the household bud keeping personal records, mailing keeping the bank account under co

The tip of the iceberg. Some of the thousands of programs and books on computers to keep you wondering what you'd done before microprocessors were invented.

under one or more programs all of these are at your fingertips.

The TI machine, like the TRS 80, the System 80 and other popular computers, has a devastating range of software available. some of it is direct from them to you, other times it's farmed out to agents. Texas Instruments, for example, sells through Canberra Television.

There are the businesses that have less software, or are more specialised, but are no less important if you're in the market for computer gear.

A good example of the small, specialised company is Dicker Data Projects of Sydney. Operating solely on the Vectorgraphic Vector 3 computer and terminal, the company is oriented toward businessmen, but does have a Western Australian Government contract to supply programs for that State's education department. Dicker also has a defence contract in Canberra training kids to program.

Its main business package is called Execuplan, for financial and sales reporting product by product. Built-in formulas allow you to manipulate figures to keep records horribly accurate.

There's also a word processor, Memorite 3. It's sophisticated, the program alone costing about $500.

For Enthusiasts

Applied Technology of Sydney is another exclusive mob, taken one step further: all hardware and software is designed and produced in Australia using Z80 microprocessors. I still get completely bamboozled by computer technospeak, but Z80, like 8085, is the name given to the microchip on which this or that computer might be based.

Fear not if you're out in the world searching for the right place to go while trying to figure out if any of it makes sense. None of it does to begin with, but there are any number of helpful people to talk to.

Applied Technology caters for the enthusiast, amateur to expert, and most of its software reflects this. It's still a good place to visit.

Customised Technology, also from Sydney, is another company that specialises in Z80 microprocessors. It has Sorcerer software, for games and serious applications, and one of the main business programs is CADAS, a general-purpose data base. It's meant mainly for mailing lists, but can be adapted.

One of the company's prides is software for Micropolis and Vista.

Warburton Franki, again of Sydney (look! I did talk to people other than those in Sydney, so there.) uses yet another microprocessor system; CP/M, or control program for microprocessors. It's called the industry standard.

This company's little specialty is the Word Magic word processing system. A piece of CP/M software, it edits, corrects, moves paragraphs around, does everything you'd expect of an urbane word processor (except write the story for you).

Anderson Digital Equipment, Melbourne, has for itself the Northstar microcomputer. Programs available for it come under the name of Sweet Software Programs. Isn't that lovely? It's apparently a complete business package, looking after things such as the payroll and accounts payable.

DeForest Software, from that unrivaled place Nunawading, near Melbourne, uses a Zenith Z80 computer; one of the most popular programs from this crowd is the Magic Wand word processor, although Peter DeForest stocks a huge range of programs for a number of machines.

I suppose I'd better tell you, in case you hadn't worked it out, that to have a word processor, the program helps, but so does a printer so you can actually put the whole thing to some use. Amazing things, word processors, or the programs. Ask anyone that has used one. . .

What You Need To Know

In my search through the software currently available, it was made crystal clear to me that the more you learn, the more you need to know.

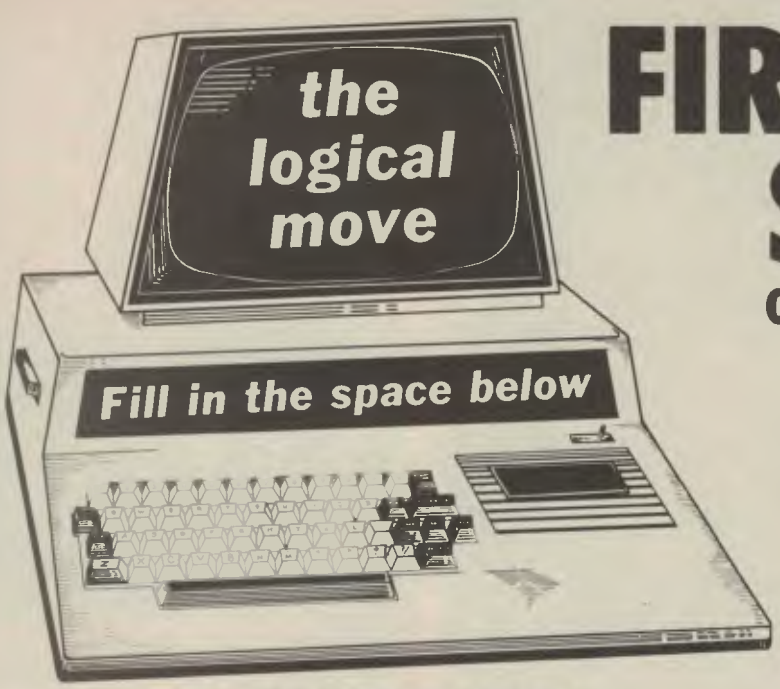
All I discovered, really, was that the novice to microcomputers could get horribly confused and easily jaded by the range of software available, and the fact that not all software will "run" on all computers is just one more problem sent out to baffle you.

I walked out thinking a program was like an LP record and could be played on anything. Wrong.

But I had some fun looking at various programs. The games were interesting (story coming up, keep flicking over the pages) but the serious programs proved to be an education. There are books on how to write your own program, programs for business, home and pleasure. The kids can get a buzz from them, you can save some money using them, in fact,if you're thinking of buying a home computer, I'll make this promise:

Life will not be the same any more.

Now go out and buy a program for that! □



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...and the Games people play

THEY CAN BE stupid, frustrating, exciting and perhaps juvenile, but if ever there was an opiate for the electronic masses, home computer games is it.

As you get older you take on a cynicism which tells you that if the kids enjoy something, and become enthusiastic or persistent, then as an adult you have a duty to ignore it, disown it or ban it.

Have you watched kids play computer games in pin-ball parlours? Or spent some time there yourself? That kind of electronic wizardry is now available in your own home, dirt cheap.

You might have been one of those parents that abhorred Kiss. You're likely to react the same way at the mention of bringing Space Invaders into your home.

But you won't after a game or two, or 20 or 50. It's no joke, home computer games **can be compulsive.**

Games in the *Space Invaders* mould proliferate; so do games that play poker, chess, backgammon, cribbage, dice, this game, that game, almost any game you can mention.

If you think it's tough playing poker with people, try playing it with a computer.

A program called **Poker Pete,** for the Tandy TRS 80 and Dick Smith's System 80, come to you with three levels of difficulty.

You sit down to the computer keyboard and monitor, asking yourself, "What the hell am I doing playing poker with a microchip?"

You then discover; the computer is not easy to beat. In fact, it's good. It predicts beautifully, outplays you cunningly, and if you do beat it, if you do take the pot, you feel good. There's also a good chance an hour has past since you sat down to this "**silly,** childish game."

The same goes for **Rescue at Rigel,** a science-fiction adventure game where you wander through an alien complex trying to rescue hostages while preserving energy, saving ammunition and fighting off the baddies like the Great Tollah.

Again you think it's juvenile, but it's no good thinking that; the game has you by the short and curlies.

Things are now so sophisticated, and getting more so by the week, that full sound effects, full colour and three-dimensions can come blasting off the computer's monitor screen with blood-racing excitement. There's no hyperbole meant, once you're hooked, you're hooked.

A demonstration program that came with a System 80 home computer I had a quick fiddle with had on it a **Star Trek game. It wasn't the action-fast game I**

expected; it was one that made me plot, think, plan.

I'd be 98 not out before I could finish playing with all the games available for all the systems in Australia. The only sensible thing I could do was walk my feet off around the computer shops and see what was for sale.

Much of what I saw was for the TRS 80 and System 80, but it's a good guide to what is available generally.

Punters' Dream. For racing fanatics, and the not so fanatical, this game gives you an electronic race track. You can study form, bet and probably lose your shirt.

Bandito. A one-armed bandit game; you tell the computer how much money you want to spend, and it feeds it to the fruit machine. As the advertising brochure says: "Thrill as you hit the jackpot."

Airmail Pilot. It's the early days of flying and you're in a cloth-covered biplane trying to get through storms and whatever without running out of fuel or crashing. This has, apparently, very good graphics.

Interlude. You wear yourself out playing this one. It's a sexual encounter program. The computer asks you questions, either alone or with a good friend, and then directs you to an interlude in the accompanying manual or one that's hidden in the program.

Simutek Package One. A collection of five programs in the Space Invaders mould. It includes **Star Wars** and **Graphic Trek 2000.**

Death Trap. Using hand-eye co-ordination, you have to control a constantly moving point on the screen that's in danger of colliding with randomly floating "mines". Comes with sound effects.

Asteroid Nova. Compshop Australia in Melbourne can supply this one for the Apple, TRS 80 or the System 80. Your spaceship is travelling in the middle of a shower of asteroids. Get out alive.

Galaxy Invasion. Again available for the Big Three, from Compshop, this one involves aliens invading Earth. You're the only defender. Buck Rogers, eat you heart out.

Adventure. These games are so popular and so difficult it could take you months to work out what's going on. It's meant to be like that, testing your powers of reasoning, logic and initiative to the limit. These games come in many forms, like **Adventureland** and **Pirate's Adventure.** If you like a challenge, here's one being handed to you in a program. There's also a book available to help you play Adventure.

Attack Force. Available for the TRS 80, the screen looks like a maze. There's eight alien ships heading for you. The more you destroy, the harder it gets.

Meteor Mission II. Stray asteroids and meteors. Steer a course that keeps you going.

Sargon II. *The* computer chess championship program. The computer thinks, and if you think you're a fair to middling chess player, prepare to be humiliated by a microchip. On high levels, it's almost unbeatable.

Air Traffic Controller. A very realistic game where you control 27 aircraft. Absorbing and a challenge — and, even if that's what the advertising says, it's true.

Sorcerer Asteroids. For the Sorcerer computer system, this game is one where you have to watch out for big boulders, and even if you do blast them, the little boulders can still do a lot of damage.

Customised Technology in Sydr carries Sorcerer software; I mention t because I had trouble finding retail outl for this product.

Texas Instruments brings out a num of games for its hardware. Included **Tournament Brickbat.** Rapid, needin good level of skill. You against computer.

Wall Street Challenge. The st exchange, this game lets you speculat stock buying and selling. Try this ga before mortgaging your home to beco a real stock broker.

Santa Paravia and Fiumaccio. In t game you and up to five other play struggle to form a kingdom in medie times.

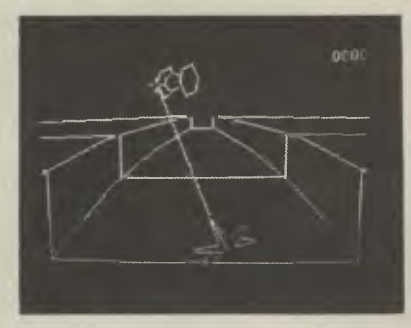
Golf. Well, golf is golf. Play 18 ho without leaving your chair. Great people who hate getting wet, but live the sport.

Wildcatting. This one gets you lurk around possible oil fields. You use geological survey map, the program te you how much your test drills are costi Wait until you strike oil!

Texas Instruments has a number mind-bending and stretching games: 3D Star Trek program is wild.

Apple, naturally enough, has a range of games. In a display case ComputerLand in Sydney is a **Heuristi Robot Car** that interfaces (ask an exp what it means) with the Apple 11. In oth words, you tell the computer what y want this mock sports-touring car to d and it'll radio the car and tell it where to g It's beaut for people like me who have grown up.

B-1 Nuclear Bomber. If you hate yello cake, you'll hate this game. Then aga you might love it because the game p



ABOVE: This Star Wars game from Apple comes in colour, with full sound effects and a nice, illusory 3-D effect. The new generation of computer games.

LEFT: Computer chess games, one of the many different types of games a home computer offers to the family. Many of these games are tough, ruthless and keep you awake half the night trying to beat them.

RIGHT: Okay, who killed him? It's all part of the adventure-style series of games.

you in control of a nuclear bomber, and it's up to you to get the bomb to its target. Try the White House or the Kremlin for starters.

Midway Campaign. for the military purists, a must. This program is an exact replica of the World War 11 Battle of Midway. You control the American fleet, the computer looks after the Japanese fleet.

The Northstar computer doesn't miss out with games. Anderson Digital Equipment of Melbourne carries games software like **Space Invaders, Othello, Star Trek** and other parlour-type games.

DeForest Software in Nunawading, Victoria, has a great game for the TRS 80, called **Olympic Decathlon.** A faithful reproduction of the rules of this strenuous and tough series of Olympic trials, you compete in ten events from the 100 metre dash to the javelin. Pete DeForest reports that he's completely hooked on the game, but getting no fitter or thinner.

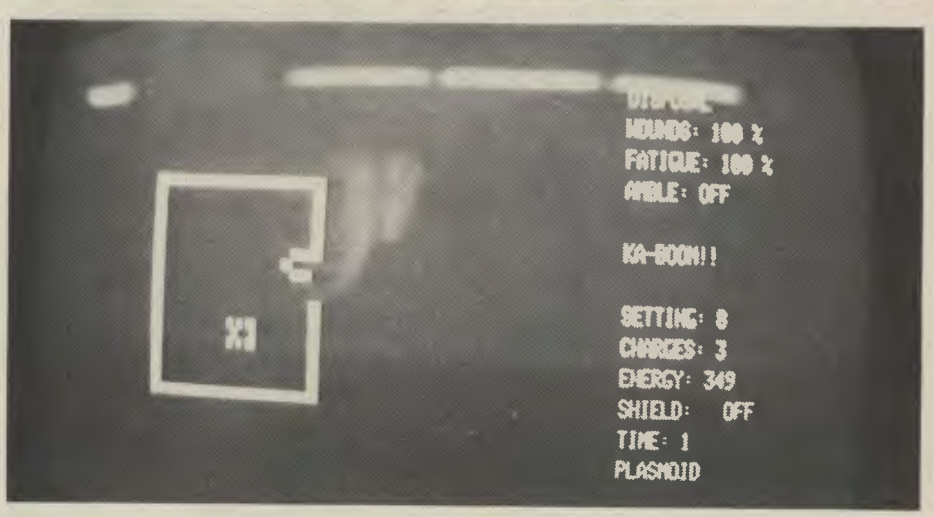
Although most of the games appear to be Space Invaders-like, don't be put off from looking around. Many games share their category with educational programs.

The stunning thing about home computer games is their ability to shove television out of the minds of children.

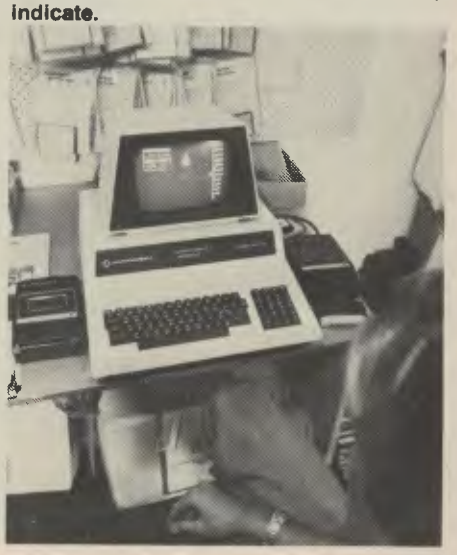
A friend of mine has had a home computer for several months and two children for several years. He reports that by combining computer games with educational programs and some heavy sessions where the kids do some programming of their own, the colour television could be tossed out the door and nobody would miss it. Least of all the kids.

I know one thing playing with computer games isn't mucking around. □

Just look at that concentration! The hand-eye co-ordination is amazing, as is this boy's complete lack of fear in getting the most out of the Commodore PET computer.



ABOVE: Rescue at Rigel on the System 80 (there are more graphic versions available). A science fiction game where you have 10 hostages to rescue with only so much time; it's far more exciting and involved than this static shot would indicate.



A few of the Apple games available, plus a bit of its more "practical" software.

Although microcomputers can perform many useful and joy-filled tasks at home, it is at the office, in and around the factory that they can make their greatest impact. Business uses for microcomuters are wide-ranging, and not as limited as you might think.

GETTING DOWN TO BUSINESS

Getting Down to Business

COMPUTERS ARE at their best when manipulating large amounts of data; all the better if that data is numerical in character. Although many companies have pursued the idea of the home computer, most people do not have a need for that kind of information processing at home. In business, though. . .

Many of the usually available home computers can be used to tackle quite complex business tasks. But the commercial user has different requirements from the home user. Speed of operation and reliability are important — closing the store just because the computer has hiccups and swallowed a diskful of data is no way to run a business. The business needs storage capacity for a large amount of data, sophisticated programming which closely matches its needs, the right price, and it all has to be available.

The microcomputer story is one of tails wagging dogs — and nowhere is this more evident than in the business area. The microcomputer itself is dirt cheap, under $300 is the current record, and it will be even less before too long. A decent peice of commercial software to run on the computer costs about 10 times that. The printer costs about $1000, maybe more. But before we get into the politics of programming and other sordid facts, let's look at the way it can be, if you're careful.

Management Information

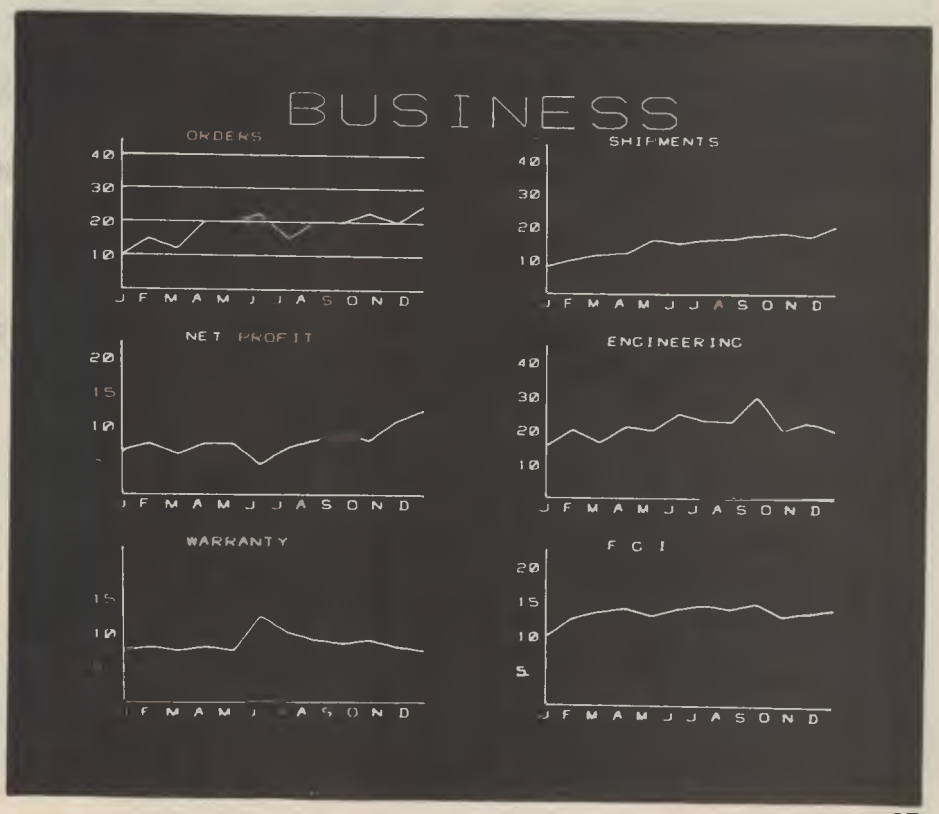
The most prevalent management information tool which our microchip technology has brought to us is the humble pocket calculator. It's not a computer, but it's not that far off in some cases.

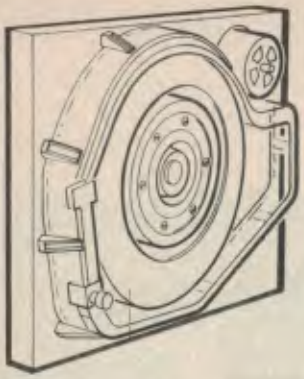
Pocket calculators like the Texas Instruments Master Business Analyst and Hewlett-Packard's financial models are able to carry out sophisticated analyses and tell the manager just what he should be doing with his money. Although these machines began by solving simple time-and-interest problems, they are now able to handle more complex situations like calculating the net present value of a projected cash flow. By just re-keying a few values, the manager can recalculate for a different situation. What if interest rates should rise? What if we liquidated this investment earlier? What if?

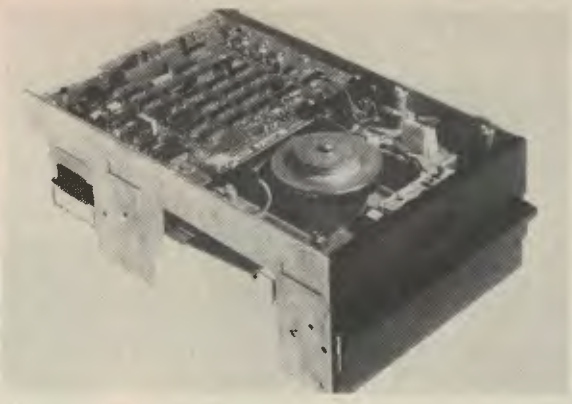
That's what these dinky machines have become — decision-making tools. Where proviously a manager went on gut feeling, today he has no excuse for not knowing exactly what an increase in interest rates would do to him.

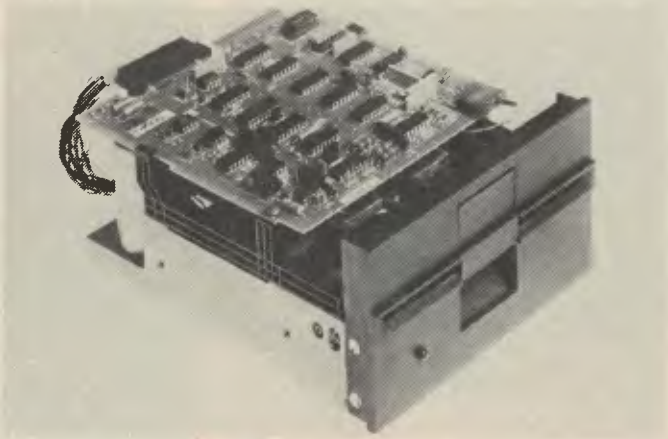
The pocket programmable calculator takes this capability one step further. Instead of being restricted to the standard financial calculations such as internal rate of return and discounted cash flow the manager can now develop his own models of situations and analyse production costs for different runs. Of course, the PPC can solve the same problems as the pre-programmed machine; standard packs of programs are available to do that. It is in the repetitive solution of unique

Business applications for microcomputers are endless — from aircraft design, chemical analysis and projections to controlling business operations.

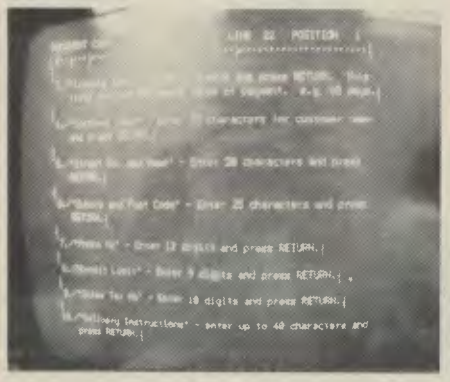


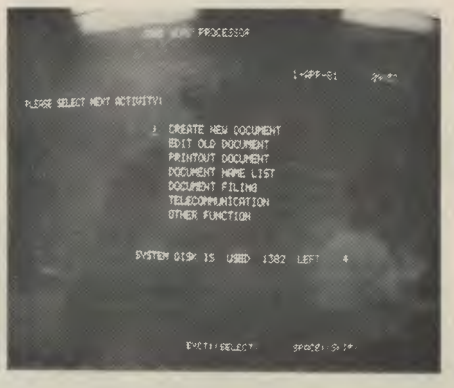






The innards of two disk drives and word processors in use. Pic below shows a mailing system in use.





problems that the programmable ma
stands out.

The best feature of the calculator
it is an instant-access machine.

Computers

The same advantage may also ap
the microcomputer. It's not alwa
"personal" computer; several people
have to share it. It might be used to
accounts in the morning, and then
word processing in the afternoon s
the only time the manager gets his h
on it is after everyone else goes h
Noblesse oblige. . .

But still, the microcomputer is use
a management information tool,
cision machine, a "what-if" device. T
one area where the executive or ma
who can program or at least is precis
logical in his thinking will really score
his non-automated counterparts.
small and inexpensive computers
as the Apple II or TRS 80) can be us
this way. There's no need for expe
peripherals like disk drives or pri
though they do make life easier.

One particularly popular "what-if
is a piece of software called Visicalc
is now available for the Apple II, the
80, the Commodore and the He
Packard HP-85, and there are quite
"look-alike" programs appearing for
machines.

Visicalc is a tabular calculator. It le
user define the rows and columns
giant table, and the relationships bet
them. Once this has been done, the
can fill in some of the rows and colu
and Visicalc will then fill in the row
columns which are dependent on
For example, the entries in one row
be monthly sales revenue for a yea
row underneath that would be tot
penses per month, and the row belo
(to be filled in by Visicalc) wou
monthly profit. The thirteenth co
would be the totals of the correspo
monthly figures.

Visicalc allows the user to alter a
the variables in the row-column
and then recalculate the dependen
ables. If that's not a "what-if" mach
don't know what is!

This is the door through which
microcomputers sneak their way
small companies. They're inexpe
and they don't have to do much wor
simplify the writing of quotes, or wha
In no time at all, they're producing
fully, and now a disk drive and printe
be justified. Next they're doing
accounts as well. That's when th
starts.

Micros in Business

There are a number of jobs that n
can do around the office, as oppos
jobs for one "personal" user. F
there's accounting, the traditional do

of the office computer. Several different packages of software are available in Australia.

Most accounting systems consist of a number of modules which run independently. the core is the General Ledger, which knits together the ledgers produced by the other programs to produce the statement of profit and loss. This is the bottom line. In addition there is a Debtors Package (sometimes combined with order entry, and also known as Accounts Receivable), a Creditors Package (Accounts Payable), an Invoicing program (may be integrated with Debtors), and an Inventory package, which monitors stock levels.

The simplest programs don't really do much work for the user — all they do is provide a printed record of transactions.

Two major systems are available in Australia; one from IMS Computer Systems in Melbourne and the other from Six 'S' Business Advisory in Geelong.

The IMS system is based around a General Ledger package which has quite a comprehensive range of facilities for generating trial balances, monthly or yearly Profit and Loss with budgets. There is also a creditors system which keeps track of all invoices received to keep track of how much you owe and for how long. It will print cheques, and you can enquire at any time about your position with a creditor. It even prints the labels for the envelopes.

The debtors system performs a similar task for all the people who owe you money. Every month, it will "age" the debtors, and it will chase "delinquents" by producing reminder letters automatically. This program integrates with the general ledger package as well as the inventory system.

IMS also has a payroll program which fits the Australian tax system, unlike imports. It will cope with up to 800 employees on a double density floppy disk, or more on multiple disks or a hard disk. It produces payslips automatically and can print group certificates at the end of the year.

To take care of business communications, IMS offer a Word Management System, including word processing and automatic cataloguing of disks used, and an Integrated Direct Mail system.

To run the IMS software, you will need a computer capable of running the CP/M operating system, and a lot of memory (say 56K minimum).

The software from Six 'S' Business Advisory is unusual, in that it is written in Pascal, rather than a more conventional business language like BASIC or COBOL.

Hardware Requirements

Business applications depend very strongly upon the hardware being able to carry them. A totally integrated business system, for example, spends a lot of its time updating disk files; in fact, most of the processor's time is spent waiting for the disk to find the right record of a random access file. On eight inch floppy disk systems this is bad enough, but on systems with 5¼ inch floppies, it becomes a real problem. A hard disk is definitely the way to go; but hard disks haven't been around that long in the microcomputer world, certainly not for some of the integrated home computer systems.

Some individuals (particularly salesmen) don't seem to be able to grasp this problem, and so we shall doubtless continue to hear horror stories of systems intended to maintain mailing lists on 5¼ inch floppies, but which require the disks to be changed every twenty minutes while the system spends a few hours doing a simple select out of the list. There is a definite need for the purchaser to arm himself with some rudimentary knowledge to avoid this kind of blunder. Unfortunately, unlike the mini and mainframe computer business, consultants are of limited value, as they cannot be completely up to date.

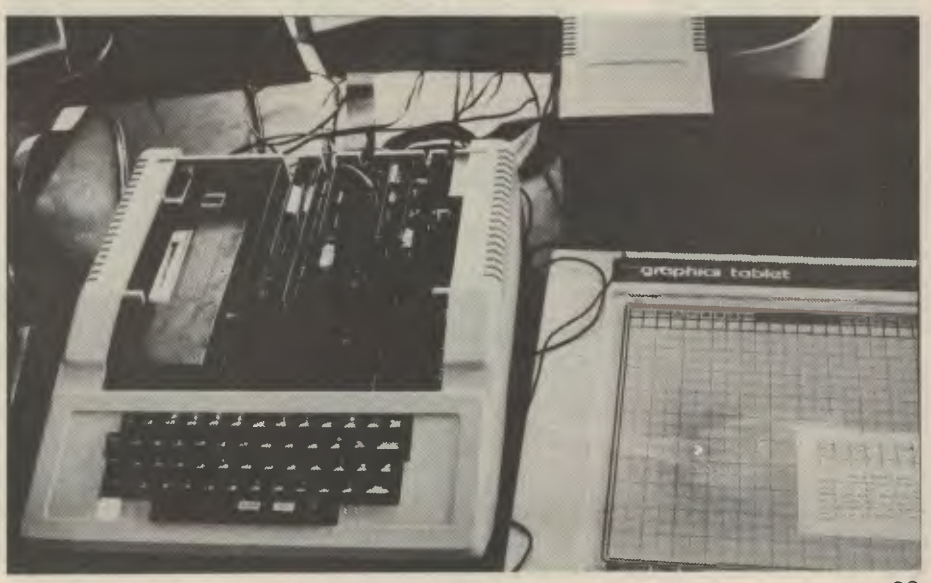
Word Processing

Another function that can be performed by the small business system is word processing. Many businesses require the repetitive typing of similar letters to clients, customers and suppliers. A word processing system can automate a lot of that work and make it fast and error-free.

Secrets of Success

The companies that seem to have had most success with microcomputers are the ones that introduced them to perform a specific function, such as simplify quoting, and where the manager responsible for the introduction was personally interested and experienced enough to do his own simple programming. Companies which decided to introduce a computer in the grand manner (to do *everything)* but didn't spend enough money to buy a minicomputer, generally have wound up with egg on their corporate faces. A microcomputer won't do everything, except for very small companies, nor is it a substitute for a fully-fledged minicomputer, with the kind of full-blown business software which is still only available on minicomputers. □

LEFT. The Apple II shows off its graphics ability. BELOW. An Apple graphics pad... plot your own charts.



WORD FACTORIES

THE PAPERLESS, wholly el-tronic office is rising rapidly on horizon. Adding a word p cessor to your office compu should be seriously consider- You don't want to be left in dark.

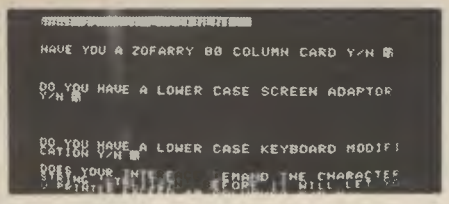
An office computer can turned into a word processo the push of a button. It's effe can be as revolutionary as the f time adding machines beca an essential part of business lif

```
FILE COMMAND? CATALOG

DISK VOLUME 254
*A       HELLO
         PRINT TEST
         CLUB LETTER
         SCHL
         SCHW
         ROAD TEST
         ROAD TEST 2
         PRINTER TYPEFACES AND COMMANDS
A TO H TO SELECT, SPACE TO CONTINUE.
```

WORD PROCESSORS have b around for some years now, but the not thought as exotic as they once w The new exotics are the small c microcomputers which sit in the co and calculate budgets on dem Fashions, fads and facilities cha rapidly in the business world.

The microcomputer can deal documents, other text and numb without a flicker of worry and an incre ing number of programs are appearing the market to help them do this. It began a few years ago with Mic Shrayer's Electric Pencil, and has



minated in systems that do everything, including checking your spelling!

There are two parts to any word processor: an *editor* which you use to enter the text and correct it, and a *print formatter* which puts it into shape for printing. The two jobs are not completely separate, as part of the formatting can be done at editing time, and that is where the differences lie.

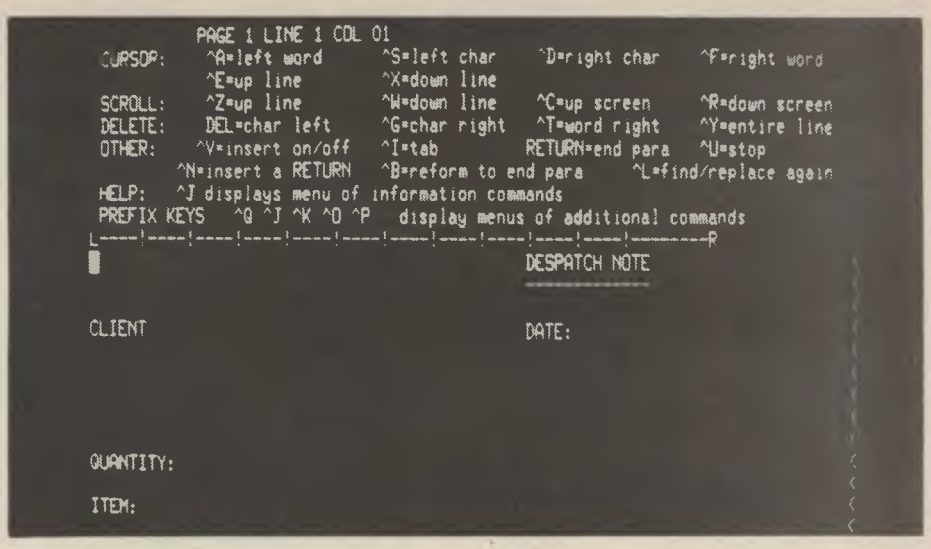
Word processors basically come in two flavours: formatting oriented or editing oriented. They're almost inevitably a compromise in one of those areas. Some word processors put a lot of effort into making the display as near as possible to an exact copy of what will finally be printed. Some word processing systems just don't make the effort at that stage, but keep the text in the format in which you type it in, to make editing easier and less surprising.

All word processors have a screen, on which there is a cursor (often a flashing underline or square blob). The cursor can be moved all over the screen and all through the document. Wherever the cursor is, that's where text will be entered, to either over-write text or push it down, depending on the mode the word processor is in.

As well as entering text a word processor should have functions to delete words, pargraphs or blocks of words. The delete key may delete the character to the left of (behind) the cursor, while a delete-right key would delete a character under the cursor. There should also be controls to allow the deletion of a word, the line to the left or right of the cursor, and of a marked block of text.

A common problem in entering text, particularly if you are writing as you go, is finding a block of copy in the wrong place; in other words, to have things out of sequence. A good word processor allows you to mark the beginning and end of a block of copy, then move the cursor, and, on command, move the copy to the new location of the cursor. It should also be possible to copy a marked block of text, rather than just move it.

A further enhancement of the block idea is the ability to save and reload blocks of copy on disk. This is particularly handy if you don't like the look of a block of copy, but don't want to kill it completely in case you decide to later restore it. Writing it to another file on the disk will enable you to reload it later, if need be. It's also a handy facility to have when editing programs (if



Word Processing Software

ELECTRIC PENCIL: Cost $150. Justifies; serial or parallel printer; any line width; underlines; word search and replace; character oriented. **TRS 80**

CISA LETTER FORM & MAIL LIST: Cost $75. For mailing circularised letters, one or several. Usual editing facilities. **(Tandy)**

WORD MASTER: Cost $250. General editing facilities; inserting words, phrases etc; easy-to-use control keys; excellent manual. **Apple II**

WORDSTAR: Cost $500; One of the most powerful programs; complete sophisticated editing facilities. **CP/M**

MEMORITE 3: Cost $500. Spelling check; 30,000 word dictionary; full editing, proportional space printing; phrase storer; security facility; maths package; mailing list. **Vectorgraphic (CP/M)**

NORTHWORD: Cost $395. Complete package for office use; menu; can be merged with Mail Manager $315); auto search and replace. **Northstar**

WARP 1: Cost $59 to $79. Auto text formating; flashing cursor, word deleting and insertion; justifies; full editing facilities. **System 80**

MAGIC WAND: Cost $350 (plus tax). Full editing facilities; standard format controls for page lines; powerful moves. **Heath (or most CP/M)**

WORD MANAGER: Cost $500. strong on-screen editing; ability to merge several files into one; Mail Merge option. **SPC (CP/M)**

SANDY'S: Cost $250. Mailer and labeller included; true windowing; full insert/delete; word search/replace; large file handling. **Apple**

*** Prices are as quoted from one source and may vary**

your word processor allows program editing).

Tabs are essential for setting up tables, and tables are one of the best reasons for having a word processor; so what use would one be without tabs? They should be completely variable. If your word processor allows the setting of decimal tabs, to line up the decimal points in a column of figures, so much the better. A good system will allow the operator to save the tab settings along with a document so that they do not have to be manually set up when next editing the document. They should also be displayed on the screen, as this makes layout much easier.

A word processor should automatically load sections of the document off disc as and when required, and store it again, rather than having the operator consciously load and store parts of the document. This automatic disk buffering can save an operator's sanity.

Ideally, the editing commands should be on clearly-labelled keys. This is not possible on most general-purpose microcomputers, however. Generally, control keys are used instead. In this case, a menu of the principal commands should be available on the screen.

Print Formatting

Print formatting commands allow the operator to control the appearance of the document on the printed page, as opposed to its apearance on the screen. Using these commands, an experienced operator can lay out pages in the most amazing ways!

On most microcomputer systems, the print formatting commands are embedded into the text of the document. Usually, they take the form of a full stop or "dot" in the first position of a line, followed by a mnemonic for the command, optionally followed by parameters. On many systems, the command .PA will cause the printer to advance to the top of the next page.

The commands are not printed. They control the operation of the printer and the layout of the document.

If you're out looking for a word processing package, take the following checklist along with you:

- Is the word processor editing or formating-oriented? Consider carefully what you want to do with your word processing system.
- Will it drive the kind of printer you have available? If you have a genuine need for a word processor, you may wish to buy a high-quality printer like the Diablo, NEC or Qume. Make sure your word processor program can drive such a printer to get the best out of its features. On the other hand, if you're just adding word processor to a personal computer to handle light correspondence and quality of type isn't that important, you might be happy with a rough and ready dot-matrix printer. Make sure your word processor program can drive that printer too.
- Will it run on your computer?
- Are the screen and keyboard of your computer up to scratch for the job? A × 24 screen is much better than 64 especially when the word proces displays a menu on half the screen. your keyboard have a "tab" key. (^ do as a substitute if you haven't)?
- How easy is the system to use? Is it to set tabs and margins?
- Does it have convenience features as automatic page numbering, heade footers? How about underlining, bold double-strike, overstrike, strike-thro block move?
- Will the program allow you to edi such as source files which will late input to other programs such as comp and assemblers? Some don't. That be really frustrating.
- Can you use the word processor in junction with a mailing list to pro "form letters"?

SECTION 2. AN OVERVIEW OF WordStar

WordStar is a CP/M compatible, screen oriented word processing system with integrated printing. Both initial entry of text and alteration of previously entered text are performed directly on screen. Most formatting functions take place immediately, resulting in the display of a true print image; additional enhancements are performed during printout.

WordStar's EDIT FUNCTION is used to create and alter documents stored on diskette. Features of the edit function include the following:

Video Editing: a portion of the document being entered or corrected is always shown on the CRT screen; additions and corrections are immediately displayed. Text entry is accomplished merely by typing the desired text; commands and functions such as cursor motion or deletion of text are quickly accomplished with visual feedback.

Automatic Disk Buffering: the size of a document is not limited by the amount of RAM memory in your computer, but by disk capacity. Text is brought into RAM as required, with no operator intervention or concern.

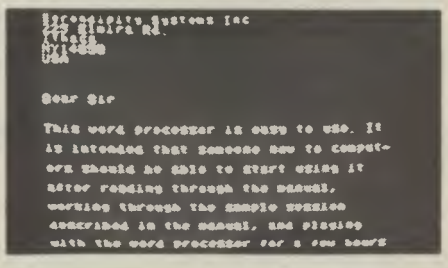
On-screen Text Formatting: text is displayed on the screen as it will appear when printed, thereby facilitating review and correction of printed copy appearance before actually printing. On-screen text formatting is accomplished with the aid of the following three features:

Word Wrap: paragraphs may be entered at high speed without striking Carriage Return; when a word you type exceeds the right margin you've set, WordStar automatically moves the word being entered to the next line and justifies and redisplays the line just completed. The RETURN key is used only to indicate the end of a paragraph, blank line, or other point where a permanent line break is desired. Thus, the typist need not break rhythm due to concern for the end of the line, nor feel the necessity of looking up from the material being transcribed.

Automatic Margination, Justification, Line Spacing, Centering: with word wrap in effect, each completed line is automatically adjusted to fit user-settable left and right margins, justified (right-aligned) unless the user has selected ragged-right format, and, optionally, double-spaced or triple spaced. A line of text can be centered between the current left and right margins with a keystroke command.

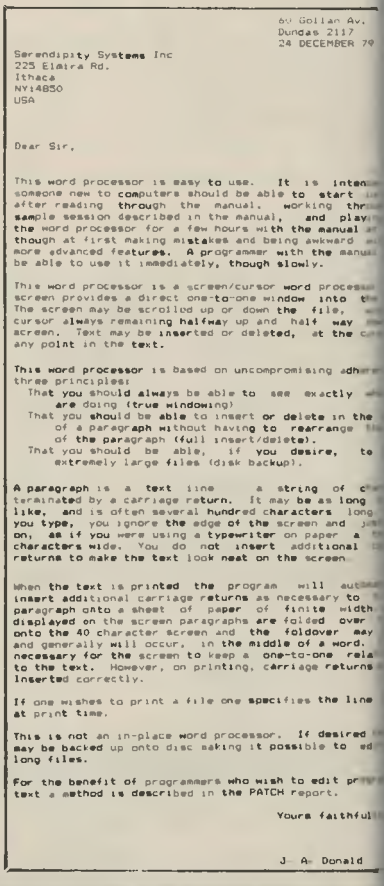
Reform Paragraph Command: text from the cursor position to the end of the paragraph may be "reformed" on command to change the margins or line spacing, to change from ragged right to justified or vice versa, or to clean up after alterations.

Powerful Editing Commands: in addition to the basic functions - cursor motion, scrolling, text deletion by character, word, or line, and selection of insertion or overtyping - WordStar's editing commands include set/clear variable tab stop, block move, block copy, block delete, find, replace, write to and read from additional files, and set/return to place markers.


Serendipity Systems Inc
225 Elaira Rd.
Ithaca
NY14850
USA

Dear Sir

This word processor is easy to use. It is intended that someone new to computers should be able to start using it after reading through the manual, working through the sample session described in the manual, and playing with the word processor for a few hours with the manual at hand, though at first making mistakes and being awkward and inefficient. More advanced features. A programmer with the manual should be able to use it immediately, though slowly.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This word processor is a screen/cursor word processor. The screen provides a direct one-to-one window into the file. The screen may be scrolled up or down the file, with the cursor always remaining halfway up and half way down the screen. Text may be inserted or deleted, at the cursor, at any point in the text.

This word processor is based on uncompromising adherence to three principles:

That you should always be able to see exactly what you are doing (true windowing).

That you should be able to insert or delete in the middle of a paragraph without having to rearrange the rest of the paragraph (full insert/delete).

That you should be able, if you desire, to edit extremely large files (disk backup).

A paragraph is a text line a string of characters terminated by a carriage return. It may be as long or as short as you like, and is often several hundred characters long. As you type, you ignore the edge of the screen and just go on, as if you were using a typewriter on paper a few hundred characters wide. You do not insert additional carriage returns to make the text look neat on the screen.

When the text is printed the program will automatically insert additional carriage returns as necessary to fit the paragraph onto a sheet of paper of finite width. The text displayed on the screen paragraphs are folded over and continued onto the 40 character screen and the foldover may occur anywhere and generally will occur, in the middle of a word. It is necessary for the screen to keep a one-to-one relationship to the text. However, on printing, carriage returns will be inserted correctly.

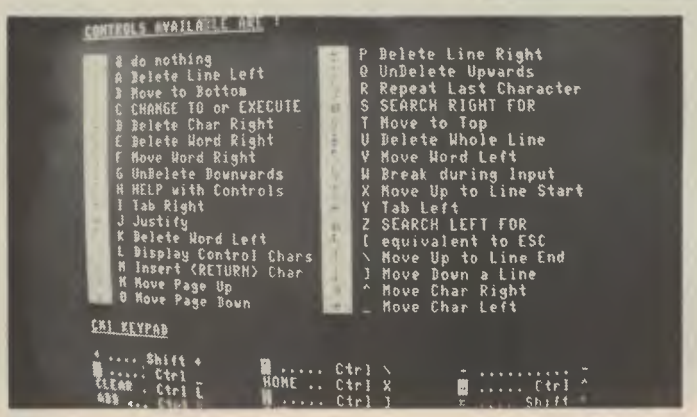
If one wishes to print a file one specifies the line length at print time.

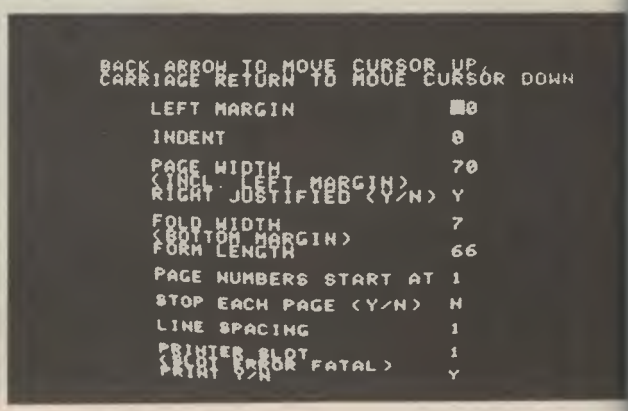
This is not an in-place word processor. If desired the file may be backed up onto disc making it possible to edit very long files.

For the benefit of programmers who wish to edit program text a method is described in the PATCH report.

Yours faithfully

J. A. Donald





WE MAKE EVERY BYTE COUNT!

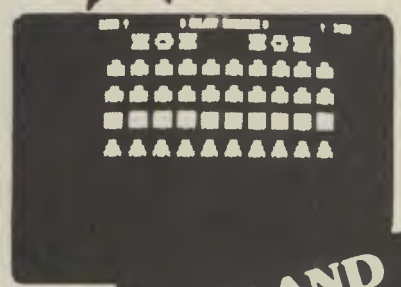
SUPER GRAPHICS

ASTEROID NOVA

If you liked 'Invaders', you will love **ASTEROID NOVA.** Finally **ASTEROIDS** come to micros. Your spaceship is travelling in the middle of a shower of asteroids. Your laser is your only defense against the asteroids. Blast them but beware — big asteroids fragment into small asteroids and you are surrounded! From time to time you will encounter an alien spaceship whose mission is to destroy you, so you'd better destroy it first! High resolution graphics.

SYSTEM 80 16K TAPE $19.50
APPLE II 24K TAPE $19.50
TRS80 Level II 16K tape $19.50

WRITE FOR FREE CATALOGUE



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The newest and most exciting Invaders type game yet! Turn your **TRS80** into a video game arcade. **GALAXY INVASION** is based on **MOON ALIEN** — a phalanx of space invaders above the earth: you are the sole defender. As you fire your laser at the invaders, they swoop down and bomb you, but there are no bases to hide behind!

Incredibly smooth graphics and great sound.

Highly recommended

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ADVENTURE

ADVENTURE by Scott Adams is like no other program you have ever seen. "Out of 50 programs reviewed, ADVENTURE was rated No 1 . . . highly recommended." — 80 Software Critique. Defeat exotic wild animals to get treasures or work out how to get out of a quicksand bog.

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With thousands of stars whizzing by you your space destroyer ship comes out of hyperspace directly under a convoy of aliens. Almost effortlessly, you skilfully destroy every last one, but before you can congratulate yourself, another set appears. These seem to be slightly more intelligent than the first set. Quickly you eliminate all of them too. But your fuel supply is rapidly diminishing. You must still destroy two more sets before you can dock with your space station. All right, the space station is now on your scanners! Oh no! The intruders have overtaken the station! You must skilfully fire your neutron lasers to eliminate the intruders from the station before your engines run out of fuel and explode.

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ZX80

SINCLAIR SOFTWARE

'30 PROGRAMS FOR THE SINCLAIR ZX-80: 1K' is a unique 112 page book which contains 30 programs all designed to fit into your basic 1K version of the **SINCLAIR ZX-80.** In programs which go far beyond anything that has been published the authors show the unique capabilities of the Sinclair ZX-80. The ZX-80 is more powerful than you ever thought!

As well as the programs, the book illustrates programming techniques you can use in your own programs — space compression, PEEKs and POKEs, USRs and so on. Offering pro gram value of well over $40, the book is available for $12.50.

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AUSTRALIA'S OWN

THE FIRST time you see a word processor operating, you'll be impressed – whether the processor is good or bad. The variety of software systems available is huge, ranging from brilliant to hopeless, yet even the low-grade ones look good to the newcomer.

The *Your Computer* staff is used to the best (WordStar), so anything else we try is likely to pale by comparison.

We were pleased to note that Sandy's Word Processor, the only significant Australian system so far, survived the comparison quite well. It has its limitations, certainly, but in the areas it is aimed at it seems excellent value.

Firstly, Sandy's is designed for the Apple II. To run WordStar on an Apple means buying a Z80 softcard as well, so all-up it is likely to cost close to $1000. At $250, Sandy's *must* look good to the Apple owner.

Our office staff's first introduction to word processing was with Sandy's, and they loved it, finding it simple to learn, and easy to use. So far, not a complaint has been made.

Sandy says the ideal word processor – one that has both full editing and full formatting capabilities – is yet to be written.

"Everything done so far has been a compromise, as is mine; it's been biased to editing facility," he told *Your Computer.*

"There are some people who want a screen display which shows exactly what they'll get off their printer; mine sacrifices that for extra editing power."

The value of Sandy's philosophy depends on the tasks your word processor will have to perform, or the people using it. We prefer the editing facilities, because it's easy to judge how formatting commands (inserted to a menu before printing) will affect the finished product. A test print command, which shows the final format on the screen, allows you to check before printing.

Major Features

The writers in our office certainly prefer being able to type flat out, inserting carriage returns only at the end of paragraphs, and leaving the formatting to the word processor.

The sytem's major feature is its ease of use. While Sandy says his documentation is only "adequate", we tested it by giving it to a secretary with no computer experience, sitting her at the Apple, and leaving the room.

It took her from switch-on through to printing a typed-in and edited document without problem.

The mailer program, and a new labeller program, come on the word processor disk. While the word processor is cleverly protected against copying, these two programs can be duplicated on your mailing list files to save switching between disks or drives.

The word processor has four modes, edit (there is no need for switching between insert, delete and so on), files command, exchange and test print.

When you compare Sandy's to a system with an incredible range of features like WordStar you could call it lacking in capabilities.

While many of those features are extras you'll rarely if ever use, there are a few we'd like to see included.

The underlining capability, for example, is printer-dependent; it should be available regardless. So should changing typefaces for bold emphasis on words.

As an example, if we run the printer we use for program listings and so on (the Epson MX80) with Sandy's can't take advantage of the underli nor can we use its several typ variations in the middle of nc text.

The bold, condensed, empha or enlarged faces can be used on a of their own, but not for single w or phrases within a line.

Another fault we've found using Sandy's to edit documen the "grab" function, which we to move paragraphs around to rearr stories; it won't handle long-en strings for our purposes.

Everything we've mentionec Sandy so far about missing fea he has said he can add, but has ir ionally limited the standard capabi to keep it simple and preserve me space for the documents themse

He has set the system up common configuration that suits applications, removing little-used ures as he goes along and adding in popular ones.

In the sense of producing a sir to-use, sophisticated, word proc with wide appeal, he has achi his aims.

And as for the perfect word pr sing program he says is yet to be wr ...he's working on it.

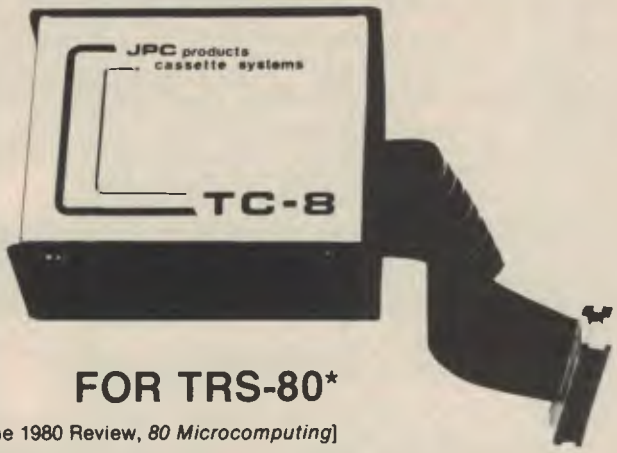
Continued on page 39

Naturally Sandy uses the system himself.

DEFOREST SOFTWARE

HIGH SPEED CASSETTE SYSTEM

Poor Man's Floppy



FOR TRS-80*

Now the widely acclaimed JPC Cassette System is available for your TRS-80* computer.
The price is only $120.00

TC-8 Cassette System
Kit: $120
Assembled: $150

[Reprint of June 1980 Review, *80 Microcomputing*]

by **Carl A. Kollar**

I guess I don't have to tell any TRS-80 owners how frustrating the cassette system that comes with the computer can be. Even with the factory mod that's available, the annoyance of loading and checking programs becomes just barely tolerable.

If you're like me, after you've just plunked down a chunk of money for a Level II 16K machine, "you ain't got nuttin left" for even one disk drive at 500 bucks apiece. So you suffer.

A reasonable alternative is the Exatron Stringy Floppy (ESF). This will cost you about 350 bucks and totally eliminates your loading and saving problems, automatically and fast. I've had one of these for about six months and love it!

But, if the price is still too steep, have I got a device for you!

The Device

The February 1980 issue of *Microcomputing* had an ad that intrigued the hell out of me. It was a high-speed cassette system by JPC Products acclaimed as a "poor man's floppy." It made all sorts of seemingly ridiculous claims such as "loads five times faster," "stores 50,000 bytes on a 10-minute cassette," "less than one bad load in a million bytes with the volume control anywhere between one and eight."

All this for a measly 120 bucks? How could this be? A call to Albuquerque answered a few questions: Yes, it had its own power supply, and, it stored programs five times faster because it utilized higher density data. The computer outputs the information at a higher rate out of the rear keyboard connector.

The ad had even claimed anyone could build it even if you have never soldered before. JPC would make it work, if you couldn't—for free. I was sold. I placed my order, and it arrived about two months later (parts shortage).

I work in electronics, so I found the unit exceptionally easy to build. It took about an hour. The manual is superb. (That's better than great.) It was clear, concise and exact with no ambiguities. Important parts placements are stressed (polarity markings on electrolytics, bands on diodes, etc.).

JPC was right! With these instructions, you couldn't go wrong. The board quality is excellent. It is double-sided and parts locations are clearly marked on the component side of the board. There are no jumper wires to install. JPC utilizes PC traces and plated-through holes for connections to traces on the other side of the board.

Also, there are absolutely no adjustments or settings to bother with.

The documentation is a sheaf of 8½ × 11 papers stapled together. It is written in the nicest format I've seen in a while. Each command and/or subjects is covered on its own sheet in large type. All explanations are in easy to read English—not computerese.

Commands and Features

SAVE"filename": Saves your BASIC program on cassette.
LOAD: Reads the next BASIC program from the cassette.
LOAD"filename": Searches for and loads the specified file from cassette.
LOAD? and LOAD?"filename": Reads file from cassette, and compares contents to memory.
LOADN: Prints a list of all the programs on a cassette, until interrupted by the "break" key.
LOADN"filename": Same as above except the tape will stop at the end of the program named.
KILL: Removes the file manager program from memory so that the extra memory can be used by large programs.
RSET: Allows the operator to rewind and position the tape on tape recorders that have these functions tied to the motor control jack.
RUN"filename": TC-8 searches for a specified program and runs it immediately.
PUT"filename": Same as SAVE "filename", except it is for use with system tapes.
GET: Same as LOAD, except it is for use with system tapes.
GET"filename": Same as LOAD "filename", except it is for use with system tapes.
GET? and GET?"filename": Same as LOAD? and LOAD?"filename", except it is for use with system tapes.
GETN and GETN"filename": Same as LOADN and LOADN"filename", except it is for use with system tapes.
OPEN: Required before cassette input or output of a data file can be attempted.
CLOSE: Required to end a cassette data file.
PRINT#: Allows numerical or string data to be output to a cassette file.
INPUT#: Allows numerical or string data to be input from a cassette file.

I haven't counted them, so I don't know about the "one load in a million bytes" claim, but my son, Anthony (age 11), loaded about 30 of his programs from his Radio Shack format tape to a new TC-8 format tape. He's run them all and found no bad loads.

Unlike the standard tape system, you can position your tape anywhere before the program you want and not have to look for a blank spot between programs. The TC-8 patiently waits for the program you want and then starts loading without getting confused by the portion of the previous program you just fed it.

Try that on your regular cassette system; you'll wear out the reset button. ■

ORDER NOW

To order your TC-8 kit, send your cheque or money order for $120.00 plus $3.50 postage and handling to DEFOREST SOFTWARE, 26 Station St., Nunawading 3131. Credit card orders accepted by phone or mail. Personal cheques will delay shipment. We will otherwise immediately ship you the TC-8 kit, the cabinet, the ribbon cable, the power adapter, an instruction manual, and a cassette containing the software.

★★★★★★★★★★★

SPECIAL
"DEMO"
MODEL 1 16K
COMPUTERS
only $900

★★★★★★★★★★★

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DEFOREST SOFTWARE

TRS-80 MODEL 1

FLIGHT SIMULATIONS

AIR FLIGHT SIMULATION -Control your own aircraft, very realistic and challenging	017R	$ 10.00
AIR MAIL PILOT -can you get the mail through on time in this marvellous flying simulation	106R	$ 10.00
FLIGHT PATH -contains mountain pilot, air trafic control situation and prosision aproach radar.	171R	$ 12.50
FLIGHT SIMULATION -FS1 -Perhaps the best simulation available brilliant 3D graphics		$ 27.95
JET FIGHTER PILOT -takes you as close to real combat fighter flying as possible	159R	$ 19.95
NIGHT FLIGHT -take of fly and land a prop driven aircraft somewhere in the north atlantic.	117R	$ 12.50
THE FLYING CIRCUS -contains 7 flying games	205RD	$ 45.00

SPACE SIMULATIONS

ATTACK FORCE -dodge the crusher at convoy and destroy them before they squash you	BIG54	$ 19.95
BALL TURRETT GUNNER WITH SOUND -imagine yourself at the control of a strata blazer	051R	$ 12.50
COSMIC PATROL -warning players of this game should be prepared for a state of not before available	228R	$ 19.95
COSMIC FIGHTER -fantastic machine language game	BIG53	$ 19.95
FLYING SAUCER -level I or level II	269-1905	$ 14.95
GALACTIC EMPIRE -one of the classics, conquer other planets first part of a trilogy	010-0026	$ 19.00
GALACTIC TRADER -trade through out the universe you have conquered this is the second part of a trilogy	011-0027	$ 19.95
GALACTIC REVOLUTION -your kingdom has revolted can you save it ?	011-0029	$ 19.95
INVASION FORCE -machine language great game	269-1096	$ 24.95
PINBALL -withsound - fantastic real time game	1018A	$ 16.00
SPACE TREK II -a popular space trek simulation	002R	$ 10.00
SPACE TREK III -another entertaining space trek simulation	031R	$ 10.00
SPACE TREK IV -contains steller wars and population simulation	034R	$ 10.00
SPACE INVADERS WITH SOUND -everyone should have	1017A	$ 16.00
STAR SCOUT -extended 3D galaxy, destroy the death star on disk	012-0085	$ 25.0D
SUPA NOVA -fast pace realtime game for 2 players -machine language	BIG52	$ 19.95
ULTRA TREK -a classic	QSL005	$ 19.95

WAR GAMES

BATTLE GROUND -2 player, you are in command of an awesome array of fighting men and machines of war	141R	$ 12.50
MIDWAY CAMPAIGN - Japanase carriers spotted 150 miles north-west of Midway - ALARM -		$ 20.95
NORTH ATLANTIC CONVOY RAIDER -your battle ship suddenly emerges from the fog into the midst of the British convoy		$ 20.95
NUCLEAR BOMBER -you are a Commander of a super sonic bomber, you receive a message ATTACK this is not a drill		$ 20.95
PLANET MINERS -can you compete against a giant mining council		$ 20.95
SANTA PARAVIA -not strictly a war game, you are in command of an ancient Italian kingdom - and can be invaded	273R	$ 12.50
SKIRMISH 80	070R	$ 12.50
SLAG -a 2 to 12 player war game where each player represents a country	010-0018	$ 19.00

BOARD GAMES

CHESS MATE 80 -plays such a good game you maybe embarassed to play it in public	057R	$ 25.00
CRIBBAGE AND CHECKERS -two modern classics ready to provide you with hours of challenge	068R	$ 12.50
OTHELLO -don't flip your lid, flip disks instead, compete against a merciless computer	046R	$ 12.50
SARGON CHESS -perhaps the ultimate micro chess game		$ 37.50

HOME ENTERTAINMENT

BANDITO -your own slot machine with sound	1003A	$ 14.00
BARRICADE -machine langauge arcade game	BARRIC	$ 10.00
CHECKER KING - machine language multi level	QSL002	$ 25.00
CODE BREAKER WITH SOUND -can you solve the hidden code	1007A	$ 14.00
CAR RACE -a fun game	011R	$ 10.00
DAREDEVIL	082R	$ 12.50
FORMULA 1 RACING	269	$ 9.95
GAME PLAYER WITH BASIC 1 -matches the book	QSL007	$ 12.50
GAME PLAYER WITH BASIC 2 " "	QSL008	$ 12.50
GAME PLAYER WITH BASIC 3 " "	QSL009	$ 12.50
GAMES 25 - 25 simple games on disk	QSL010	$ 15.00
GAMMON CHALLENGER -machine language multi level	1009A	$ 19.95
GOLF AND CROSS OUT -play golf in the comfort of your home	009R	$ 10.00
INVESTERS PARADISE -contains stock trek and speculation	125R	$ 12.50
KIDS GALLERY -games		$ 12.50
LIFE -the classic life on TRS80	078R	$ 10.00
MICRO MUSIC	269-1902	$ 14.95
MICRO MOVIE	269-1903	$ 14.95
MICRO MARQUEE	269-1904	$ 9.95
MIND WARP -contains mind twist and mind bender for puzzle lovers everywhere	118R	$ 12.50
MONEY MADNESS -very entertaining	156R	$ 12.50
OIL TYCOON -drill wells - make a million	023R	$ 10.00
OLYMPIC DECATHLON -compete in the olympics, perhaps the greatest game for 1981 - fantastic graphics	1110MIC	$ 29.95
PIN BALL -sound - fantastic graphics		$ 16.00
POKER TOURNAMENT -play five card draw polker with five opponents	010-0093	$ 16.00
SILVER STREAK PINBALL -with sound - fantastic	001ADV	$ 19.95
STOCK MARKET - the stock market make a million	1004B	$ 14.00
TEN PIN BOWL	033R	$ 10.00
WINNERS DELIGHT - are you a winner	124R	$ 12.50
WHO DUNIT -can you solve the crime ?	047R	$ 12.50

ADVENTURE AND INTERACTIVE GAMES

ADVENTURE 1 - ADVENTURELAND -if you have never tried an adventure before try this one	$ 16.00
ADVENTURE 2 - PIRATE ADVENTURE -built in helps	$ 16.00
ADVENTURE 3 - MISSION IMPOSSIBLE -battle against the clock	$ 16.00
ADVENTURE 4 - VOODOO CASTLE -save the Count of Mont Cristo	$ 16.00
ADVENTURE 5 - THE COUNT -can you escape Count Dracular	$ 16.00
ADVENTURE 6 - STRANGE ODYSSEY -a space adventure	$ 16.00
ADVENTURE 7 - MYSTERY FUN HOUSE -unusuall	$ 16.00
ADVENTURE 8 - PYRAMID OF DOOM -beware the mummy	$ 16.00
ADVENTURE 9 - GHOST TOWN - weird	$ 16.00
ADVENTURE 10 -SAVAGE ISLAND -part 1 of a [illegible] adventure	$ 16.00
SINGLE ADVENTURE ON DISK	$ 24.95
ANY THREE ADVENTURES ON DISK	$ 39.95
INTER ACTIVE FICTION -six micro stories -disk 012-0021	$ 29.95
INTER ACTIVE FICTION TWO HEADS OF THE COIN MYSTERY disk 012-0022	$ 29.95
KID VENTURE -little red riding hood with sound -disk 011-0055	$ 19.95
STONE OF SISYPHUS -disk/you create a character, choose your weapon and enter land of enchantment, illusions monsters 012-0100	$ 39.95
STRIP POKER AND CONCENTRATION DICE -warning !! explicit sexual language may offend 010-0097	$ 19.95
THE ORIGINAL ADVENTURE -the grand daddy of them all on disk 1203MIC	$ 35.95

ULTILITIES

ASSEMBLY LANGUAGE DEVELOPMENT SYSTEM -suports Macro by Microsoft - disk	1206MIC	$119.95
BASIC COMPILER -new from Microsoft this one really works -disk	1207MIC	$219.95
BASIC PROGRAMMING ASSISTANT -helps you code and de-bug basic programs	203R	$ 19.95
DLDIS -disk labelling disambler	231RD	$ 24.95
DISK ASSEMBLER -single pass disasembler	232R	$ 19.95
DISK INDEX MANAGER	011-0052	$ 19.95
DISK MASTER -written in Australia keeps track of all your disks, applies only one drive -extra fast sort -a must	QSL001	$ 25.00
DISK SCOPE -need to check out a disk query .if you use a disk query system you need disk scope	139RD	$ 25.00
DYNAMIC DEVICE DRIVERS -re configure your system.	228R	$ 25.00
EDITOR ASSEMBLER PLUS -by Microsoft -fantastic	1104MIC	$ 39.95
ENHANCED BASIC -enhance the power of your TRS80	077R	$ 29.95
IRV -turns your keyboard into a super board	250R	$ 29.95
LEVEL 111 BASIC -more powerful than disk basic in a lot of respects - incredible graphics		$ 59.95
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SYSTEM SAVERS -disk to tape or tape to disk	1001B	$ 19.95
STRUCTURED BASIC TRANSLATOR -write basic in a structured manner on disk		$ 35.95
T-BUG -old faithfull	269-2001	$ 24.95
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UTILITY 1 -contains renum and tape duplication program	081R	$ 10.00
UTILITY 2 -can merge, display file names and combine sub-routines	076R	$ 10.00
ULTRAMON -marvelous monitor program	5003R	$ 32.00

EDUCATION

ALGEBRA 1 LEVEL 1	269-1702	$ 36.95
ARCHIMEDES' APPRENTICE - a tutorial package teaches formular for volumes of any object	092R	$ 12.50
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BODDY BUDDY -get to know the inner you, calorie requirements flexy diet, anatomy quiz	109R	$ 12.50
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LEVEL 11 BASIC COURSE PART 1	269-2005	$ 24.95
LEVEL 11 BASIC COURSE PART 11	269-2006	$ 29.95
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MATH 1 LEVEL 1-	269-1701	$ 36.95
OMNI CALCULATOR -contains surveyors apprentice, Archimedes apprentice Omniconverter a unit conversion program	211RD	$ 25.00
STRUCTURED BASIC TRANSLATOR	1015A	$ 35.95
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TEACHERS AIDE -up to 8000 characters per lesson -disk	214RD	$ 49.95
TEACHERS AIDE 2	269-1713	$ 59.95
TYPING TEACHER SIMPLIFIED	099R	$ 10.00
TYPING TUTOR -by Microsoft	1102MIC	$ 19.95
VIDEO SPEED READING TRAINER	100R	$ 12.50
WELCOME USA -geographical	011-0056	$ 12.50
WORD WATCH	111R	$ 10.00

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ATERM -powerful terminal program	1001A	$ 29.95
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ELECTRONIC DESIGN CALCULATOR	204R	$ 12.50
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LM1381 pre amp designs	008R	$ 10.00
PECA ELECTRONICS -passive electronic circuit design	011-0051	$ 25.00
QSL MANAGER -log your contacts instant search -disk	151RD	$ 25.00
TERMINAL 80 -communicate with the world through your RS232 interface	130R	$ 49.95

OPERATING SYSTEMS

CPM -1.5 -cpm for the model 1 disk trs80	CPM1S	$150.00
NEWDOS 35 -marvelous basic system	012NDOS35	$ 45.00
NEWDOS +35 -as above but with utilities	012NDOS35+	$ 99.00
NEWDOS +40 -40 track	012NDOS40+	$109.00
NEWDOS 40	012NDOS40	$ 55.00
NEWDOS +77-77 track	012NDOS77+	$109.00
NEWDOS 80 -new superior operating system - Apparat 01	[illegible]	$149.00
VTOS 4 -brand new	012-[illegible]	$109.00

LANGUAGES

BASIC 1.5 -[illegible] use with CPM trs80 disk system	CBA[illegible]	$120.00
FORTRAN TRS80 DISK -		$139.00
[illegible] BY MICROSOFT	1026[illegible]	$[illegible]
[illegible] IC -very powerful cassette based basic	1101[illegible]	[illegible]
-trs80 disk system with assembler	UCSI[illegible]	$2[illegible]
[illegible] -trs80 disk system -very powerful	UCSI[illegible]	$

[illegible]AT.ONS

[illegible] MANAGEMENT -on disk	269-1[illegible]	$ [illegible]
[illegible] ACCOUNTANT -balance your budget	069R	$ [illegible]
[illegible] MANAGER -extremely powerful data base	012-[illegible]	$ [illegible]
[illegible] -on disk	269-[illegible]	$ [illegible]
[illegible] disk	269-[illegible]	$ [illegible]
[illegible] on disk	269-[illegible]	$ [illegible]

DEFOREST SOFTWARE

BUSINESS

ACCOUNTS PAYABLE -interacts with above		$100.00
ACCOUNTS RECEIVABLE -interacts with above	QSL013	$100.00
ACCOUNTS RECEIVABLE PAYABLE -from Instant Software -uses 3 drives	064R	$202.00
ADVANCED STATISTICAL ANALYSIS	269-1705	$ 16.95
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DOUBLE PRECISION SUB ROUTINES	269-1704	$ 14.95
FINANCIAL ASSISTANT -appreciation financingamortization.072R		$ 10.00
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MAILFILE -very powerful from Galatic Software	5000RD	$125.00
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REAL ESTATE 2	269-1572	$ 59.95
REAL ESTATE 3	269-1573	$ 59.95
REAL ESTATE 4	269-1574	$ 59.95
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SCRIPSIT -powerful Word Processor	269-1563	$136.95
STATISTICAL ANALYSIS -level 1	269-1703	$ 59.95
SUPERSCRIPT -converts scripsit to a far more powerful processor	012-8041	$ 35.00
SURVEYORS APPRENTICE -	127R	$ 12.50
THE WORD SLINGER -economical word processor -disk	129R	$ 36.00

MISCELLANEOUS

COMPUTER CAROLS -marvellous sound affects for your TRS80	036R	$ 12.50
IQ TEST -test your IQ on your TRS80	157R	$ 12.50
OPERA THEATRE -have your TRS80 play marvellous music	1008B	$ 14.00
PERSONAL BILL PAYING -keep track of your accounts on your TRS80	103R	$ 10.00

TRS80 MODEL II BUSINESS SYSTEM

BASIC COMPILER MODEL 11	BAS002	$350.00
CREDITORS SYSTEM -includes purchase analysis intergrates with General Ledger prints detailed Remittence Advice		$500.00
DEBTORS SYSTEM WITH INVOICING -a sophisticated invoicing system which can operate stand alone or fully intergrated with stock control -requires CPM and C BASIC		$700.00
GENERAL LEDGER -allows cash payments recipts and journal entries plus sophisticated auto control		$500.00
INTERGRATED DIRECT MAIL SYSTEM -user define key elements and label or report format forms letter facilities		$700.00
MAGIC WAND -a truly superior word processing system, all the features commonly found on word processors costing many thousands of dollars. Print commands are exceptionally powerful. combine this system with a Diablo printer and Model II Computer and you will have the most cost effective word processing system available today.	QSL011	$450.00
ORDER ENTRY INVOICING -automatically deducts from stock analyse sales and profitability low stock warning and back order intergrates with Debtors system -2 Disk		$700.00
PAYROLL SYSTEM -keeps track of 800 employees with allowances or deductions provided for 10 rates of pay -2 Disks		$700.00
WORD MANAGER SYSTEM -user friendly very kind to operator errors password protection, merging, global search		$500.00

GAMES INTERACTIVE

ADVENTURE 1 TO 9 -on disk	022-0013	$120.00

UTILITIES

AIDS3 -DATA MANAGER	MTC001	$125.00
CALCS3 -calculator	MTC004	$ 46.00
CPM2 -operating system FMG	CPM2	$220.00
DEVERGE COMPARE PROGRAMS	MTC007	$ 35.00
REBUILD, RENUMBER ETC.	MTC003	$ 35.00
SUPERSEDE -utility	MTC005	$ 35.00
SIFTER 12 -sorts	MTC006	$ 35.00
TABLE DRIVEN ACCESS	MTC002	$ 35.00

LANGUAGES

CBASIC		$129.00
COBOL	269-4705	$349.95
FORTRAN	269-4701	$349.95
PASCAL -FMG	PAS02	$250.00

APPLE

ACCOUNTING ASSISTANT		$ 10.00
ASTOLOGY -disk	242AD	$ 25.00
AIR FLIGHT SIMULATION -Apple 2 -your flying blind can you land against the odds, without crashing	148A	$ 10.00
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introduces
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for your TRS-80 *
Model 1.

Apparat Inc announces the most powerful Disk Operating System for the TRS-80* It has been designed for the sophisticated user and professional programmer who demands the ultimate in disk operating systems

NEWDOS 80 is not meant to replace the present version of NEWDOS 2 1 which satisfies most users But is a carefully planned upward enhancement which significantly extends NEWDOS 2 1's capabilities This new member to the Apparat NEWDOS family is upward compatible with present NEWDOS 2 1 and is supplied on Diskette complete with enhanced NEWDOS + utility programs and documentation Some of the NEWDOS 80 features are

- New BASIC commands that supports files with variable record engths up to 4095 bytes long
- Mix or match disk drives Supports any track count from 18 to 80 Use 35 40 or 77 track 5 mini disks drives or 8 disk drives or any combination
- A security boot-up for BASIC or machine code application programs User never sees DOS READY or READY and is unable to BREAK clear screen or issue any direct BASIC statement including LIST
- New editing commands that allow program lines to be deleted from one location and moved to another or to allow the duplication of a program line with the deletion of the original
- Enhanced and improved RENUMBER that allows relocation of subroutines
- Powerful chaining commands
- Print Spooler
- DFG function simultaneous striking of the D F and G keys will allow the user to enter a mini-DOS to perform some DOS commands without disturbing the resident program (e g dir while in scripsit)
- Upward compatible with NEWDOS 2 1 and TRSDOS 2 3
- Includes machine language Superzap 80 and all Apparat 2 1 utilities
- Enter debug any time by pressing 123 keys Also allows disk I O
- Diskette Purge command
- Specifiable system options (limited sysgen type commands)
- Increased directory capacity
- Copy by file commands

NEWDOS 80 with all of the NEWDOS + utility programs many of which have been enhanced is priced at just $149 00 and is available at most TRS 80 dealers

As with 2 1 NEWDOS 80 relies on the TRSDOS and Disk Basic Reference Manual published by Radio Shack NEWDOS 80 documentation supports its enhancements and upgrades only

only $149

Adapter for TRS-80* computer eliminates disk read errors

De Forest Software is marketing a simple plug-in adaptor for TRS-80* computers that corrects a design deficiency in the disk controller circuit.

The problem, which causes disk read errors, has been traced to Tandy's reliance on a circuit internal to the FD1771 controller IC to perform the function of separating clock and data pulses.

As explained in the *Background* , use of the internal chip circuit for reliable data clock separation is a design shortcut which the manufacturer of the controller IC warns against.

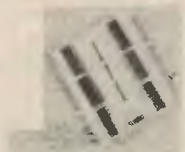
The De Forest solution, a PC card adaptor called the DATA SEPARATOR, eliminates the problem by substituting an explicit data separator circuit — one which has been used reliably in disk controllers since 1977 — for the internal IC separator circuit.

The DATA SEPARATOR is installed without modifying the host system. The user merely removes the FD1771 IC from the host controller, installs the IC in the DIP socket on the SEPARATOR card and plugs the adaptor into the vacated socket of the host controller and then joins two wires.

We caution that opening the Expansion Interface of the TRS-80* computer which is required to install the SEPARATOR may void the computer's limited 90 day warranty.

The SEPARATOR which sells for $79 95, may be purchased from De Forest dealers or ordered direct from De Forest Software.

Payment for mail orders may be made by cheque or money order or charged to a BANKCARD account.



Adaptor fixes TRS 80 computer disk controller*

CRC ERROR! TRACK LOCKED OUT!

Technical Staff
Percom Data Company

This problem started while we were studying an annoying problem with the TRS-80* computer. Disk drives sold by Percom are realigned and tested before shipment. We noticed, however, that some disk drives would pass the Percom inspection but just would not work reliably on the inner tracks with a TRS-80* computer. These drives were within the manufacturer's specifications, and would function perfectly on other disk systems. Percom manufactures "perfectly" here meaning more than 50 million bytes read without error.

The disk read data separation arrangement in the TRS-80* computer Expansion Interface uses an internal data separator of the FD1771 disk formatter/ controller IC. Use of the FD1771 internal data separator is not recommended by Western Digital, the IC manufacturer. The following note appears on page 17 of the FD1771 data sheet:

Internal data separation may work for some applications. However for applications requiring high data recovery reliability, WDC recommends external data separation be used.

We suspected the data separator because the problem was most severe on disk inner tracks where storage density is highest and data separation is most critical.

To prove our point, a technician breadboarded a standard Percom data separator circuit and configured it to plug directly into the FD1771 IC socket of the TRS-80* computer controller.

When connected to the TRS-80* computer, a troublesome drive functioned perfectly. We ran a BACKUP utility many times and never got a track lockout. Before we added the external data separator circuit to the computer, this same drive would always lock out tracks, and would have difficulty reading from the inner (higher number) tracks.

The data separator circuit fixes the mini-disk controller of the TRS-80* computer. The type of drives being used is irrelevant; the circuit eliminates disk read errors resulting from the inability of the Tandy controller design to reliably separate clock and data signals when reading high density inner tracks.

This Australian Unit has been designed and produced for deForest Software **ONLY $29.95**

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SUPER 80 is a unique Australian invented and manufactured hardware/software package which will integrate high speed high resolution graphics into any level II TRS-80 system. The installation of **SUPER 80** will not affect normal operation of the TRS-80. A fully buffered expansion and edge connector is provided so that other peripherals may be used. Fully protected against over voltage.

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Epson.

The type you get out of most printers you wouldn't send to your maiden aunt, much less use for your *important* correspondence. And up to now, in order to get a dot matrix hardcopy you could really call correspondence quality, you had to spend on the high side of a thousand bucks.

Not any more.

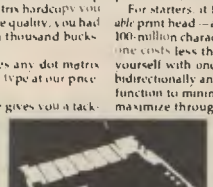
The Epson MX-80 challenges any dot matrix printer anywhere to match our type at our price. Or even come close.

Our emphasized print mode gives you a tack-sharp, clean, easy-to-read face with true descenders – at a fraction of the price of daisy wheel printers. We give you a user-defined choice of twelve different weights and sizes of letters in 40, 80, 66 or 132 columns. We give you adjustable tractors so you can do anything from labels to memos to manuscripts. Fast and clean.

But if you think print quality is the only thing we have to sell, you're wrong. The MX-80 may be the most revolutionary printer to come out in the past ten years.

For starters, it features the world's first *disposable* print head — after it's printed between 50 and 100-million characters, just throw it away. A new one costs less than $40 and you can change it yourself with one hand. Plus, the MX-80 prints bidirectionally and 80 CPS with a logical seeking function to minimize print head travel time and maximize throughput. Finally — and this is the best part — you can buy an MX-80 right now for less than $950.

And that's what we call a lot of fine print for the money.



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VTOS 4.0

VTOS 4.0
Operating System
Diskette with
Operation's manual
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1) Large (8") Drive Support.

2) Double sided Drive Support plus 35, 40 & 80 track drive support.

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NOTE: all above drives may be mixed on any one system and can be configured at Sysgen time during or any Backup.

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7) Supports double-speed processor clock modifications (Archbold for example).

8) FASTER! Improved Overlay structure using ISAM accessing techniques, improves loading time by up to 1400%.

9) General purpose output spoolers of a true, symbiont design provide simultaneous output and program execution without any user intervention.

10) Keyboard Type Ahead feature permits you to enter keystrokes before your program needs them.

11) User definable keys all 126 letters.

12) Built in Graphic String Packer lets you enter graphic symbols into a BASIC program from the keyboard through the use of the (Clear) key (a simply hold down (just like the (Shift) keys during other keystrokes and voila GRAPHICS.

13) Dated files - all files are accompanied by the date of their last modification (creation of write).

14) Marked files. All files are accompanied by a 'mark' as they have been modified since they were last backed up. This permits the BACKUP utility to copy only those files which have actually been updated since a previous backup.

15) File transfer by class. Allows transferring of all files of a similar directory classification such as CMD,/BAS,/PLC, etc.

16) Built in SYSTEM command contains lower case display driver, screen print, Break key disable, Blinkcursor, disk drive stepping rate and motor on delay modifications, and more.

17) Users may SYSGEN a custom VTOS system configuration containing special I/O drivers, device LINKing and ROUTEing, SPOOLing and DEBUGging the BOOT process without requiring a more lengthe AUTO and CHAIN parameters.

18) Non BREAKable AUTO and CHAIN Commands.

19) Wild Card DIRectory. Permits you to locate all files of a certain classification such as '/BAS'. Uniformly file size in K (1024 bytes) regardless of drive type. DIR D' would give you all of your files that start with D.

20) Dynamic file name defaults in APPEND, COPY, and RENAME commands allow you to specify only minimal information about file names.

21) COPY and APPEND commands execute up to 300% faster.

22) ALLOCate command for pre-allocation and non-releasibiate of file space. File will never shrink if this option is used.

23) MEMORY command to directly set upper memory limit.

24) Variable length file support is incorporated which automatically blocks short user data records both within a sector and across sector boundaries thereby taking maximum advantage of disk file space.

25) No security disk needed to make backups or to run the system.

26) Though many O/S bear the design code, VTOS 4.0 is the ONLY FULLY APPROVED OPERATING SYSTEM by Randy Cook! And it's FANTASTIC!

27) Endorsed by SCOTT ADAMS & LANCE MICKLUS.

Continued from page 34

WORDSTAR.RVW

One of the most complex functions a computer can carry out (but is often the simplest to use) is word processing. **Les Bell** *has been using a package called WordStar, and here's his evaluation. . .*

ALMOST EVERYTHING I write for *Your Computer* is processed electronically by the WordStar word processing package. This article is held in a file named WORDSTAR on the same disk as ZX80.RVW, DJ2D.RVW, BYTEYOU.-DOC and others in my computer.

I've been using WordStar for about a year. I dread to think how many documents and files I've edited using it. I don't use any other editor on my system, even for program editing; I can't be bothered learning two sets of edit commands. WordStar's were bad enough.

Many of the editing commands are two-letter sequences. To end an edit session, one types ^K D (^K is the control and K keys hit at the same time). I don't mind the complexity of the command sequences — there are so many commands that I can't think of an easy way round it. Besides, WordStar makes it easy for the user.

At Help Level 3, the top half of the screen is taken up by a menu which shows the main editing and cursor control keys; this menu is helpful when you first begin using the system, but after a short while you automatically memorise the common commands. I haven't used that menu for nine months or more, and the system now comes up automatically in Help Level 2, which suppresses that menu and leaves almost the entire screen free for editing.

In Help Level 2, whenever you press a prefix key if you don't complete the rest of the sequence within a second or so, the system automatically prompts you with another menu appropriate to that prefix key. Thus you are never stuck for the right key. If you need any more help, the ^J prefix lists all the help commands which explain the complete operation of WordStar.

Installing WordStar

WordStar is a big program. It requires a 48 K CP/M system to run properly, and the distribution disk carries four files: WSU.COM, INSTALL.COM, WSMSGS.OVR and WSOVLYI.OVR The last two files are overlays on the main program; WSMSGS.OVR is the file containing all the messages and menus for the screen.

WSU.COM is the uninstalled version of WordStar. Attempts to run it simply result in an error message. INSTALL, the WordStar installation program, must be run first. INSTALL asks the user a series of questions about the kind of terminal and printer he is using, then goes on to quiz him about how he is driving the printer and its communmication protocol. Finally, it offers the user the opportunity to patch the various locations itemised in the owners manual. The patcher uses symbolic names to refer to the patchable locations, so that the listing given in the manual need not be up to date. After finally checking the user's choice of set-up, the INSTALL program generates a workable WS.COM file and places it on the disk. The whole process is very quick (particularly if you are using a standard terminal and printer), and is easy to follow.

I installed WordStar originally for a DG640 VDU, with no problems, and subsequently re-INSTALLed it for a SSM VB3 80 character VDU. I haven't debugged the VB3 version, but it's useable (I'm using it right now) and it says a lot for WordStar that it's smart enough to adapt to these VDUs without requiring any technical knowledge on the part of the user.

In Use

WordStar is a delight to use. There's no need to remember to save documents after editing, they are automatically updated. The program is screen oriented, and the display shows how text will print, rather than leaving all formatting till print-time. Text can be justified or left "ragged right" — WordStar automatically shuffles text around on the screen to fit.

All the usual editing functions are there; full cursor and scroll controls; block move, copy, delete and write to disk; global search and replace; variable tabs; delete character, word or line; set and clear variable tabs.

Another nice feature is the ability to set decimal tabs for lining up the decimal points in columns of figures — fantastic for doing reports.

Text is entered without any carriage returns except at the end of paragraphs. WordStar automatically breaks it up into lines. Subsequently, paragraphs may be 'reformed'; that is, re-displayed with new margin or indentation settings, using the ^B command. While reforming paragraphs, WordStar has a feature called Hyphen-Help — it will break words that are too long for the current line, finding an appropriate place to put the hyphen, and ask the user whether he wants to hyphenate at that point. The user then has the option of accepting that hyphenation (it's usually right), moving the hyphen left or right, or over-riding Hyphen-Help altogether.

The Hyphen-Help feature is certainly more powerful than the equivalent feature on the IBM Electronic Composer, units often found in small typesetting businesses. It's about comparable to that found on much larger minicomputer-based phototypesetters.

WordStar indicates where page breaks will fall by putting a line (not part of the text) across the display. This enables the operator to judge when widow lines would appear, and avoid them by putting conditional page breaks into the text.

Print Formatting

Print formatting is versatile. WordStar supports underlining, double-strike printing, **bold-face,** strike-through and bi-directional printing. On daisy-wheel printers, superscripts and subscripts, variable character pitch, variable line height, and most importantly microspace justification are also supported.

The top and bottom margins are over-rideable and the user can define text to go in headings and footings. Pages can be automatically numbered, and the heading/footing printed at the outer edge of opposite pages.

WordStar allows concurrent printing and editing. That is, you can print one document while you are editing another. This speeds work up considerably.

Documentation

The manual supplied with WordStar is excellent. It is several hundred pages long (at a guess) and is written in clear, non-technical language. It covers the operation of every command in detail. It is not often needed, thanks to the excellent Help menu system.

Mail-Merge

Mail-Merge is an optional add-on to WordStar to accomplish the merging of mailing list data into letter texts. It does some fancy tricks as well.

The mailing list merge function is excellent. It allows the naming of variables (no more confusing $1, $2, or ^1, ^2), and also allows the printing of prompts on the operator's console. It comes with some excellent demonstration files. □

When computers were first introduced there were no languages available; you had to communicate with the machine on its terms. Today, you can choose from many different tongues to suit the task at hand. . .

WHICH LANGUAGE FOR YOU?

WE'VE COME a long way from the dark old days of 1976, when BASIC first became available for the 8080. Now you can choose from more languages than processors, and it's tempting to try some against the old standby, BASIC.

In his excellent book, Programming Proverbs, Henry Ledgard lists, as number 25, 'Consider another language'. That's true, but it doesn't really go far enough. Which language should you consider for the job you're contemplating? For microcomputers there are now so many languages on the market, each with its own following, that a new one seems to appear every week: BASIC, FORTRAN, Pascal, COBOL, C, APL, PL/1,FORTH, PILOT, ALGOL and so on.

Although the processor inside the computer is actually programmed in binary patterns, very few programmers ever work at that level. Some, working on applications that are speed- or size-sensitive, use a language called assembler, but the majority use high-level languages.

Assembler corresponds to the actual codes used internally by the microprocessor. Each instruction is fairly crude, and it takes a lot of instructions to do even quite simple things. An example of an assembly language program is shown in Fig. 1. This program just adds two numbers together in memory. Since the average programmer generates only 10 lines of *debugged and documented* code per day, regardless of the language used, it is obvious that a high-level language increases productivity dramatically.

HOW DOES a high-level language work? Well, there are two ways of getting a sophisticated language to make sense to the byte-crunching microprocessor. In each case, we get the computer to do most of the work itself.

Fig. 2a shows the operation of a program called a compiler. The input to the compiler is a *source file* written in the high-level language, probably using a text editor. The compiler reads through the source file, and using various grammatical rules is able to construct a machine code program that performs the required function. This output from the compiler is then loaded back into the computer and run.

The way that most microcomputers work, though, is with a program called an interpreter. The operation of an interpreter is illustrated in Fig. 2b. Here, the source program is loaded into memory along with the interpreter. Like the compiler, the interpreter reads the source line by line, but instead of generating machine code to do the job the source code specifies, the interpreter just goes ahead and does it there and then.

There are advantages and disadvantages to each method of running a high-level language program. With a compiler, there is an extra stage of preparation before arriving at a running program, and the program has to be re-compiled each time a change is made. On the other hand, the machine code program produced by a compiler typically runs ten or more times faster than the equivalent program running under an interpreter.

An interpreter scans and 'decodes' the source code line by line, including each time it goes around a loop. The compiler, though, only compiles the loop or avoiding all that overhead.

Bear in mind that all languages can either compiled or interpreted (or both), that the speed difference between co piled and interpreted code is no function of the language.

Here's a quick guide to some of various languages available for mic computers, and some notes on the p and cons of each:

BASIC IS, of course, the lingua franca the microcomputer world. Just ab every microcomputer has a BASIC in preter available for it, and in many cas BASIC comes as standard. Most of common home computers, for exam have BASIC in ROM (Read Only Memo so that it is available on switch-on. W has BASIC got going for it?

For a start, as its name sugges BASIC is simple. It is easy to learn, a there are plenty of simple examples in magazines to help you learn.

The language itself will help too; m microcomputers use a BASIC interpre which means that the program that's n ning is exactly what you typed in, numbers and all. This means that w the BASIC interpreter comes across error, it can print out an error messa complete with the line number where occurred. And, of course, the origi code is still in the computer so you c quickly edit the error out and contin testing your program.

The fact that BASIC is usually int preted counts against it in the spe stakes, where it loses against compi languages, particularly for busine applications. On the other hand Micros

Given the values of ==
begin;
1 NO DO
while x<n do;
(inword == NO)
Here are C1= ";C1;
415+T *64
10 DO I,N
DO
INKEY$
FOR
It can't be done. == '\n'
char
DIM P(21,2)
float
C
WORDS
if (c == '\n')
loopnumber
seed: =random;
set
for(x=0;x<n;x+t)
long
type
1+R2/(Q*X2) 2*3.14159*F
int
APL
X2=R2/SQR(R2/R1 *(Q^2+1)-1)
FOR N=0 TO N STEP 1
fopen(argv[1], buf))
%s\n",argv[1]);
PRINT
(getc(buf) & MASK)) != EOF)
Algol
PICTURE
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PIE NEAR

has released a compiler for its BASIC, so that a program can be developed using the interpreter, and compiled to give a speed improvement when fully debugged. The fact that most commercially available software is written in BASIC is a powerful influence, too. The problem is, though, that when I say 'written in BASIC', I really mean 'written in a BASIC', since there are several different BASICs available. A lot of business software is written in CBASIC (Commercial BASIC), which doesn't require line numbers for every line, and is partly compiled and partly interpreted (see Pascal).

Most BASIC-in-ROM computers, though, use Microsoft BASIC, and translation between the two can be a pain.

Likewise, the different extensions to the language, particularly in graphics, make it difficult to transport BASIC programs from machine to machine.

Pascal

THE MAJOR competitor for BASIC's position as *the* microcomputer language is Pascal. Originally written by Niklaus Wirth as an educational language, it is quite different from BASIC. While BASIC probably has its roots in FORTRAN, Pascal is a descendant of Algol, and has similar control structures and a similar flavour.

Pascal's proponents point to the way it not only supports, but virtually *forces* structured programming. Programs are block structured, and the flow of control is easy to follow.

In addition, in Pascal, all variables are declared before use. Functions can declare their own variables, which are local to that function only, and do not affect other functions with variables of the same name. A lot of BASIC programs come to grief because the variable I is used to count two loops at the same time – a problem which does not arise with the same frequency in Pascal.

The best-known implementation of Pascal for microcomputers is UCSD (University of California, San Diego) Pascal, which will run on a number of different computers. The UCSD system compiles Pascal, not into machine code, but into code for a hypothetical machine, called the P-machine. This P-code is then run under an interpreter. Since almost the entire system (compiler, editor, file manager, etc) consists of P-code, the only part that has to be re-written to move it to a different machine is the P-code interpreter, which is not very big.

This semi-compiled, semi-interpreted code is not blindingly fast, but it is fast enough for many applications. (CBASIC suffers from the same speed problem).

Pascal supports variables of types other than the standard BASIC types (string, array, integer and so on. For example, it is possible to have variables of type *month,* with values Jan, Feb, and so on. This helps to make programs much more readable and logical.

Counting against Pascal are its poor string and file handling, although recent implementations have all had extensions to improve this. In fact, Pascal is starting to suffer from the same problem as BASIC, with a sudden explosion of versions, all with different extensions and incompatibilities.

C

THE C language was developed at Bell Labs and, like Pascal, displays the cohesion of design and purpose that comes from a small design team. Described by some as 'Pascal that's not afraid to get its hands dirty', there are certainly similarities between the two languages, but there are greater differences.

C is a systems implementation language, unlike BASIC and Pascal which are designed for writing applications software. C is intended for writing operating systems and utilities, and in fact, the widely acclaimed UNIX operating system is written almost entirely in C.

C has similar expressive power to Pascal and Algol, and so we will sometimes use it in this magazine to write and demonstrate algorithms. Like Pascal, it supports structured programming,making extensive use of 'while' and 'for' loops and eschewing the vulgar 'go to'. It has a wide selection of operators; for example, the expression

```
X = i++;
```

sets X equal to i and then automatically increments i, while

```
X = ++i;
```

increments i *before* setting X equal to the new value of i.

The C programmer lives close to the hardware features of the machine he is programming; for example, variables can be declared to be of class *register,* and the compiler will keep such variables in the processor registers wherever possible (unfortunately, this feature is not much use on register-deprived microprocessors). The compiled code is fast, as C performs no error checking at run-time; the compiler has to pick up all the errors. A program called *lint,* available at some UNIX sites, is designed to pick the 'fluff' from one's programs and point out non-portable, tricky, or stupid programming.

String manipulation is not just poorly supported in C, it's non-existent; fortunately it's easy in C to whip up your own equivalents to BASIC's set of string functions. C provides *pointer variables,* which can be used to index through strings or arrays using the auto pre- and post-increment features mentioned above. The same techniques are used to manipulate buffer space for disk I/O and so on.

C programs are made up of pre-compiled modules which are linked together, so one tends to acquire a lit of functions which can be used to qu knock up a program without too r effort in debugging.

FORTRAN

THE OLD faithful lives on; in fact there several FORTRAN compilers avai for the larger micros. FORTRAN has of faults compared with the newer l uages, but it may yet outlive them a dint of the sheer volume of scientific statistical software that is available written in FORTRAN. It's compiled, runs fast, but is non-interactive. BASIC, FORTRAN has been accuse encouraging unstructured programm but attempts such as RATFOR (Rat FORTRAN) to structure it have met only mixed success.

Fortunately, its lack of bells whistles means that FORTRAN is well standardised, and there is alwa good chance that a FORTRAN proc from one shop can be run in another.

Small computer owners who are ested in scientific applications sh seriously consider FORTRAN.

FORTH

THERE HAS been an upsurge of inte recently in FORTH, a language whic well suited to extremely small syste The creation of an astronomer, Cha Moore, FORTH is basically a collectio 140 *words* which the system un stands. The programmer can define own words in terms of existing words. store the definitions in a *diction* Although the basic FORTH syste fairly primitive, as the dictionary fills u the language takes on a new, and hig level, character.

Interestingly, as each word is defi the definition is compiled and sc resulting program is fast. The tric aspect of FORTH for the novice is its of a stack to communicate values variables between words. Another r difficulty is the casual disregard FO programmers display for documentir even commenting their programs. spite having a version of FORTH, ca STOIC, running on my system, I maintain it is basically incomprehensi

FORTH systems are available number of microcomputers, notably TRS-80. Despite the lack of publis software, there are several very a users groups. I don't know what FO users use it *for,* but it does have s attractive features, notably the abili treat disk memory as though it was co trick mini and mainframers term *v memory.*

COBOL

LIKE FORTRAN, COBOL is, to s degree, a software dinosaur whose b hasn't yet got the message that its bra

dead. COBOL (Commercial and Business Oriented Language) has for a long time been the primary language for commercial installations. There is a lot of business software written in COBOL, but not much of it is suitable for micros. There are at least three COBOL compilers available for 8080/CP/M computers, but their only buyers must be established COBOL software houses trying to break into the microcomputer boom.

COBOL is virtually the opposite of FORTH, in that it is extremely verbose, to the point that it is almost self-documenting. For example:

Thanks to its verbosity, COBOL is easy to read. This is particularly important in commercial installations, where, on average 10 different programmers work on a program at different times of its life.

Another advantage of COBOL is its excellent file handling. On the whole, though, COBOL does not seem to be setting the microcomputer world on fire, as BASIC can do anything that it can, and quite a lot more.

APL

KEN IVERSON'S brainchild, A Programming Language, is said to be the language of choice for many professionals at IBM. APL is possibly the most powerful programming language ever designed, with a rich set of instructions, particularly for dealing with arrays.

Two things count heavily against it; it uses special symbols for its functions, symbols not commonly available on terminals; and its devotees, even more than FORTH followers (if such a thing is possible), delight in not documenting their programs. To make things even worse, the lines of an APL program read from right to left.

APL programmers delight in writing one-line APL programs that do the same as 500-line Pascal programs. No matter that no-one else can understand them.

LISP

LISP IS another comparatively incomprehensible language, characterised by the use of lots of brackets. LISP is commonly believed to stand for Lots of Insane, Stupid Parentheses. In fact, LISP is a list processing language, mainly used at MIT for artificial intelligence research, although it now has its devotees in the microcomputer community, with LISP interpreters available for the 8080 and 6800 microprocessors.

One of its most significant abilities is the innate ability to write self-modifying programs; this is ordinarily considered a dirty trick in other languages, but is one of LISP's strengths.

Fig 1.

```
                ;Example program to add two bytes together
                ;Both bytes in RAM
0100                    ORG     0100H   ;Start program at address 0100 hex

0100 211001     ADDER:  LXI     H,BYTE1 ;Set the HL register to point to BYTE1
0103 7E                 MOV     A,M     ;Load the contents of BYTE1 into the
                                        ;accumulator
0104 23                 INX     H       ;Set HL pointing at BYTE2
0105 86                 ADD     M       ;Add BYTE2 into the accumulator
0106 23                 INX     H       ;Set HL pointing to RESULT
0107 77                 MOV     M,A     ;Store the accumulator there
0108 DA0C01             JC      OFLO    ;If there's a carry, then jump to OFLO
010B C9                 RET             ;Otherwise, return to the calling
                                        ;program
010C 23         OFLO:   INX     H       ;If there is a carry, increment HL again
010D 3601               MVI     M,1     ;Store 1 in that location
010F C9                 RET             ;Return
0110 04         BYTE1:  DB      4       ;First value to be added
0111 07                 DB      7       ;Second value
0112 00                 DB      0       ;Place the answer here
0113                    END             ;The end. . .
```

PILOT

COMPUTER-AIDED instruction is a significant application of computers in education. PILOT (Programmed Inquiry, Learning and Teaching) is a special language for use in the preparation of CAI texts. It is particularly good at pattern matching of students' responses, yet is extremely simple and easy to use, with most keywords being in fact a single letter.

SUMMING UP

THIS ARTICLE has only covered a few of the most popular languages, and not in any depth. We have not mentioned, for example, PL/1 (a rising star in microcomputer languages), nor PL/M, the original microcomputer high-level language, nor more obscure tongues like MUMPS, SMAL or TRAC.

The choice of the appropriate language depends on several factors:

- What's available
- The programmer's knowledge
- The time available for development
- The interactive or batch requirements of the application
- Floating point or integer arithmetic
- String handling
- Screen formatting
- The size of the target system

and countless other variables.

Basically, interpreters speed program development, but compiled programs run faster. Structured programming techniques also reduce development time, but produce larger, slower programs. □

Fig 2A. The compiler

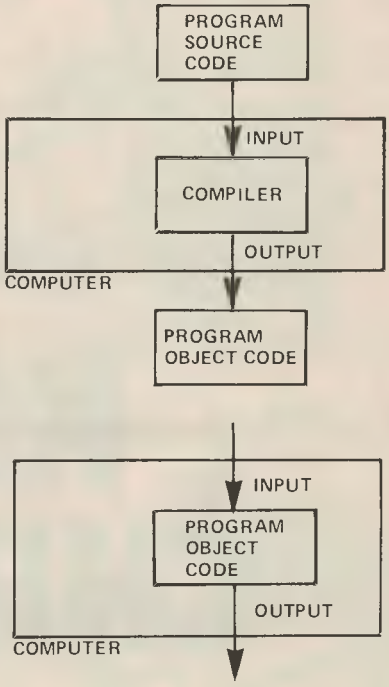
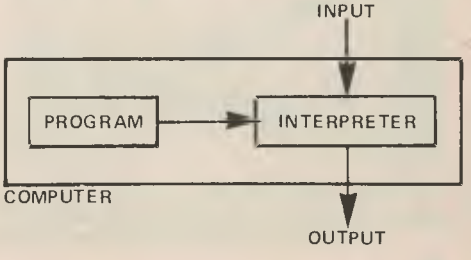
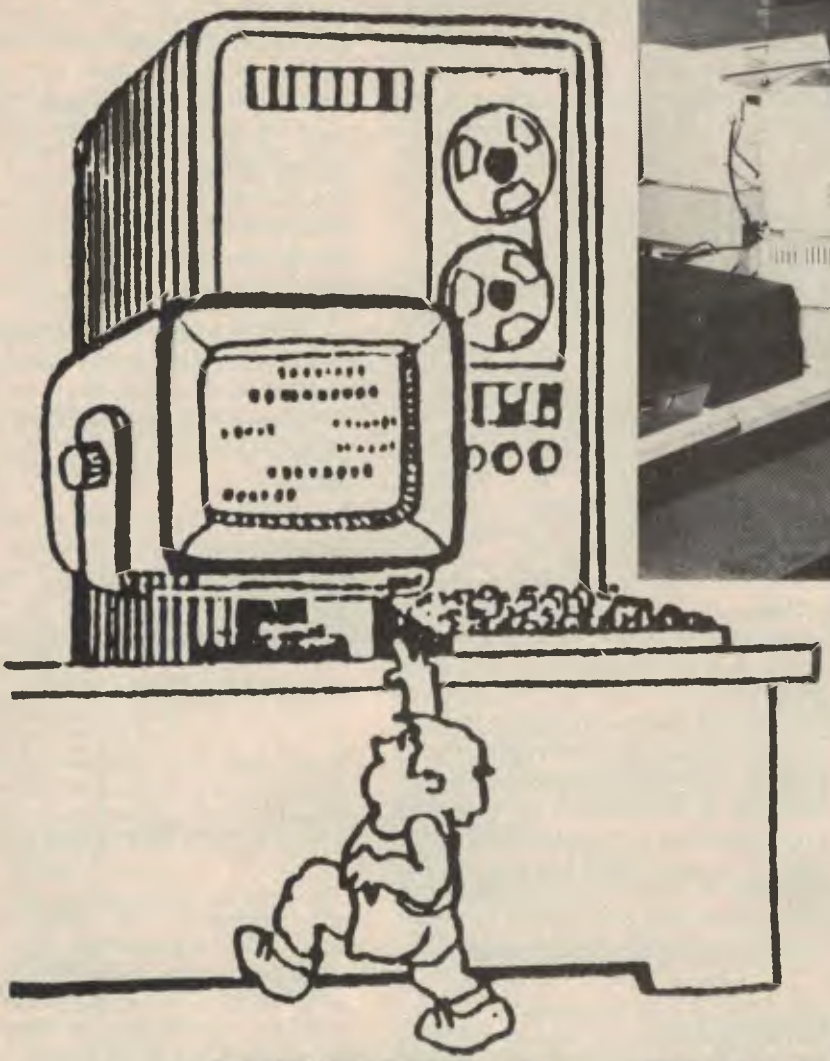


Fig 2B. The interpreter



A Computerworks Project success story — this schoolboy migh using the Apple computer just to play games on, but his ge knowledge of computers far outstrips that of most adults.



KIDS ON CHIP ROW

Although in the throes of exhausting the last of its government grant to bring computers closer to the community, Computerworks Project in Sydney is an educational haven for school children. Ian Webster, the Project's creator, put up with Your Computer's *MARK CAMM coming for a visit. We discovered kids today understand computers far better than adults; computer sense, Ian Webster calls it.*

I DEFINITELY didn't feel welcome atmosphere was right, but I felt some wrong. A young schoolboy was tryi fly a rocket over a mountain range safe landing site on the other side.

I was too boring, I could tell; how have you worked computers, I had a him. About 20 minutes, he had answe He had meant to say "many months" as I had nothing to do with the roc was unimportant.

There were no lights on in the room the reflected glow of video monitors.

The blue-walled room's lights we and in walked Ian Webster, the pro creator. I shook hands with him, pe his hand and all, then he went to an the telephone.

The Computerworks Project cou described as unique. It's unlikely anywhere else in Australia is a s where anyone can walk in off the s and immediately begin using the puters. It happens in Ian Web domain. He made it happen.

In 1979 he approached the Schools Commission and asked $20,000. The commission gave it t Four Apple II computers, a 10 meg hard disk and associated equip came out of the grant, premises in C Nest, Sydney, rented, and on line ca project where kids landing rockets v visitors.

The kids are good. Brilliant. Abou week visit the Project, write the programs, play games, learn (i Webster's words) computer sense

No one is told what to do. A question, it's answered. Basically yourself. Learn about it yourse structured discipline.

Not much to show for a $20,000 government grant? It may not be the prettiest computer centre you've seen, but for Sydney school children, it was the only one.

No, not the brochure, but a graphic display on the screen from the programming skills of one of the visiting school kids.

Says Ian Webster: "It's a program applied to kids at school." But more than that: "The idea of teachers leading a class through a course on computers seemed ludicrous. I'm after community computer literacy — get them to use the computer, not force them to understand it."

And while he lets the kids go to town on the 1000 or so programs available, or write their own, he spends more than enough time showing businessmen and potential but adult enthusiasts the joys of computing.

"I suppose we do attract the kids who have one computer at school and get 20 minutes on it a week," Ian says.

Some of the kids will become programmers, some systems analysts, most will do whatever they were going to do, but the important thing is that they will understand computers.

At the moment some of the kids have keys to the building; they come and go as they please. Ian's not there all day — he works for Imagineering, developing programs. Some kids have been known to spend all night, while Ian sleeps, using the computers. All with Ian's blessing.

I'd like to say "visit the project", but I can't. It's closing down. The $20,000 grant is finished, the one-year experiment over, the computers readying themselves for return to the Federal Government, which owns them.

Ian has plans to open up another project, but doesn't know where, or when.

"Funding was extended until Easter," he says, "but the project has to wind down, I have to submit a report to the commission, and a decision has to be made about what happens next, if anything."

The Apples have been in the blue room a long time, but for a taste of the outside world they've often been taken to local libraries, shopping centres, anywhere an audience can be interested in Ian Webster's desire for community computer literacy.

He (at 29, married, with children) does it all because he likes computers, and he likes kids. He's an historian by training and trade, and hard to talk to unless you breathe computertalk.

His project is of the utmost importance to him. The recognition of computers affecting everybody sooner or later (and probably sooner) is everything to him. If you're not computer literate, you're not going to be in the race — except for the dole queue.

Ian Webster decided to push for the computer project after realising there were oly two ways for kids to have access to computers: an enthusiastic teacher and a computer in the school, or for someone in the NSW Education Department to decide on supporting heavily the thrusting of technology into the hands of children.

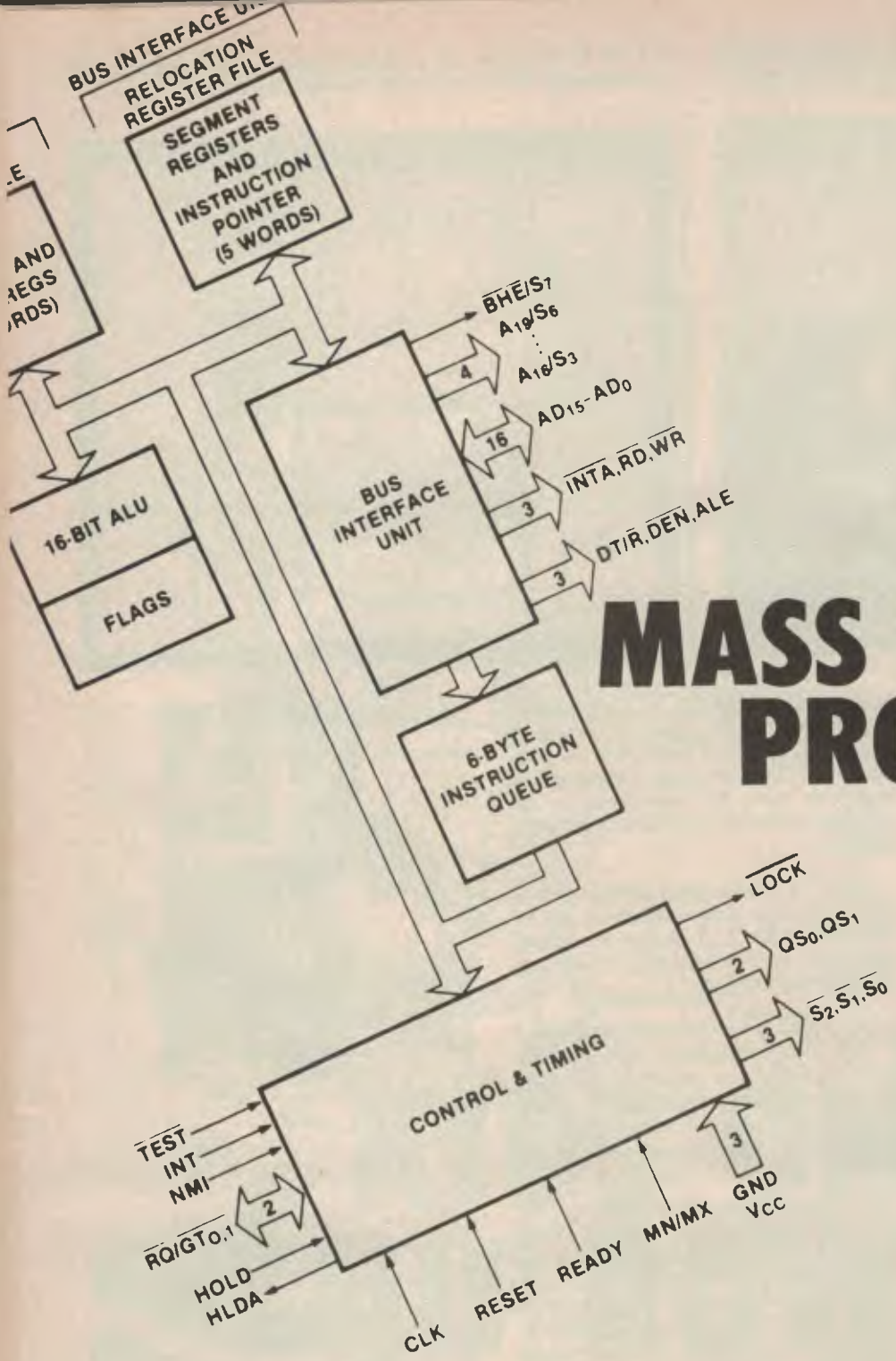
"There hasn't been such a person within the department," says Ian.

He is after interaction between computers and people, especially children.

I was just the journalist who came along to ask him what he was doing. I couldn't get into the "club" because I wasn't there to ask if I could join in.

Had I, then I might never have got back to the office to write the story. □

Ian Webster, the creative computer worker who took his belief in "community computer literacy" away from an idea to a reality.



Just about all of the popu microcomputers currently availa are based on eight-bit microp cessors. But the chip manufactur have begun to come up with n designs which handle a 16-bit wo length; what's likely to happ and what will the effects be the micro computer market? LES BELL reports:

MASS TRANSIT PROCESSIN

Mass Transit Processing

MOST PERSONAL computers are ba on one of two microprocessor chips A-80 and the 6502, although you'll come across the good old 8080, the 8 the 6800, the 6809, the 2650 and occasional SC/MP and 1802.

One factor links all these machine they manipulate a byte at a time. It do matter if the computer is doing dou precision floating-point arithmetic, chip is still fetching single bytes ou memory and doing arithmetic on a byt at most two, at a time.

Most of these chips have instructio add two 16-bit quantities, and they ca add two eight-bit values. And that, la and gentlemen, is as smart as your c puter really is.

But the times are changing, and latest chips from the semicond manufacturers are so much more po ful than their predecessors it's har know where to start in describing differences.

The best way to view the differenc through a general examination of ma architectures, starting at the beginnin

Single Address Machines

Most minicomputers and m computers are of this type. Each ins tion contains, or is associated wi single address. For example, the M ola 6800 microprocessor has instruc such as 'Add with Carry into Accumu A Extended' (ADCA address) in whic

rst byte is the instruction itself and the llowing two bytes contain the address of ne byte which is to be loaded into the ccumulator. So, for example, the instruc-on ADCA $8017 (B9 80 17) is a three yte instruction which adds the contents f location 8017 (hex) into the accumu-ator, along with the carry. the location 8017 is the source of the data, and the estination, in this case the accumulator, s implicit in the instruction. alternatively, n a sorte Accumulator instruction, the estination address would be given, while ne source (the accumulator) is again mplicit.

Double Address Machines

Compare this with a hypothetical nachine offering double addressing, the bility to specify both source and destina-on addresses in an instruction. This ould make possible instructions like:

ADD (destination address) (source address)

One instruction covers the three equired on a single address machine:

LDA (destination address)
ADD (source address)
STA (destination)

Those familiar with the 6800 and the 080 and their derivatives will realise that ese microprocessors do have a limited rm of double addressing. For example. e 6800 has two accumulators, A and B, ther of which could have been the des-nation in the example given above. Thus, e instruction ADCA $8017 could have en ADCB $8017 (F9 80 17). Notice that e opcode changes from B9 to F9 — if u write this out in binary it can be seen s is only a change of bit 6 of the opcode m 0 (referring to A) to 1 (referring to B). Analysing other opcodes which can er to either accumulator in this way ows this bit always indicates which cumulator is being referred to, and uld be called an 'accumulator indicator

Further examination of the 6800 codes reveals that bits 4 and 5 often icate the addressing mode — 00 icates the immediate addressing de, 01 direct, 10 indexed and 11 ended addressing.

The 8080 takes this a step further in its ister-to-register move instructions. s is only obvious when the opcode is ressed in octal format. Each of the cessor's internal registers is allocated de, such as the accumulator being 7, B 0, and C 1, and the move instructions take the format

MOV destination, source = 1 (destination code) (source code). Thus MOV A,B becomes 170.

This is not strictly double-address architecture, as it does not address memory, but it is a powerful feature of many microprocessors.

Three Address Architecture

Some very advanced processors offer the ability to specify two source addresses and one destination address — words can be loaded from two memory locations, added together and the result stored in a third location.

Instruction Set Orthogonality

The scheme whereby the 6800 allows various instructions to operate with one of several addressing modes is extremely elegant; it allows the programmer to learn one basic add instruction with various options. For example, the basic add instruction ADDA will also operate on the B accumulator (ADDB) or can add in a carry bit (ADDA or ADCB). Each of these instructions can also operate in the immediate, direct, indexed or extended addressing modes, giving 16 permutations on the basic instruction. Little effort is needed to learn them. The compare, exclusive OR and other instructions also operate the same way, on either accumulator, in any addressing mode.

This feature of a computer's instruction set is called orthogonality, and it accounts for many a programmer's preference for a particular processor. Fanciers of the Motorola 6800 will point to its consistent use of addressing modes as an advantage over the 8080 and 8080 users will point to the orthogonality of its MOV instructions, and the way it can CALL, JUMP, or RETURN on any of eight conditions (again an example of orthogonality).

Orthogonality is difficult to design into an 8-bit processor. It is wasteful of opcodes an an 8-bit word only allows 256 separate opcodes — the 8080 allows redundant instructions like MOV A,A, MOV C, C, which are effectively no-ops.

The potential for instruction set orthogonality is much greater with 16-bit processors. Up to 65,536 discrete opcodes are possible. Until recently, minicomputers have used the 16 bits of an opcode as several fields, each indicating a particular operation. This is the way the new 16-bit micros work.

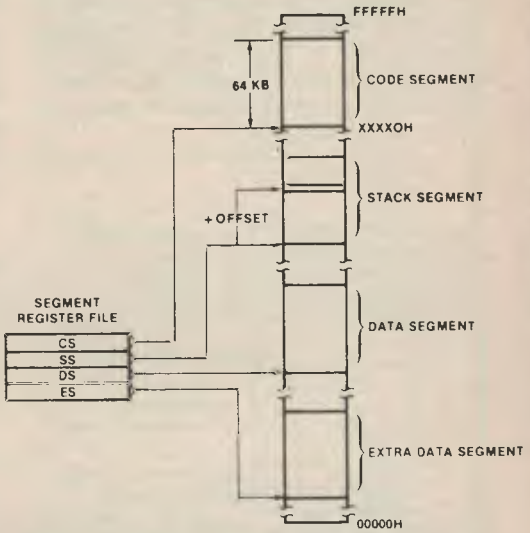


FIG 1. The 8086 uses four segment registers to point to four 64 Kbyte segments of memory.

Power to the Processor

The first thing most people notice about the 16-bit processor is its new arithmetic instructions, such as multiply and divide. Previously, 8-bit processors used quite long sub-routines to perform multiplication and division. While memory is cheap, processor time isn't, and the hardware math's instructions speed the process up considerably.

The new processors sport the ability to multiply two 16-bit quantities, giving a 32-bit result, or divide 32 bits by 16 bits, giving a 16-bit result. There are also utility instructions to allow conversion to and from ASCII.

Intel's 8086 (renamed iAPX86) family takes arithmetic to the ultimate, employing a specialised co-processor, the 8087, which runs in parallel with the 8086. It performs fixed or floating-point arithmetic in a mode transparent to the user.

The big area where the new machines shine is in memory management. Intel's 8086 can address up to 1 Megabyte of memory, while the Zilog A-8000 can address up to a theoretical maximum of 96 Mbytes. No more running out of space after 64K segments; the New Motorola 68000 can directly address up to 16 Mbytes. It does this effectively because it has a 32-bit architecture internally. But memory management goes beyond just having a large address space. The space

must be managed effectively, particularly in cases where the processor is running several users independently. For this reason, the Z-8000 operates in two modes: a user mode, which is the way the user's programs usually run, and a supervisory mode, used by the operating system. The supervisory mode allows priviledged operation of certain instructions. For example, the I/O instructions and memory management instructions cannot be executed by a user. This means that all I/O is done by the operating system (good design practice anyway), and reduces the likelihood of one user crashing the system.

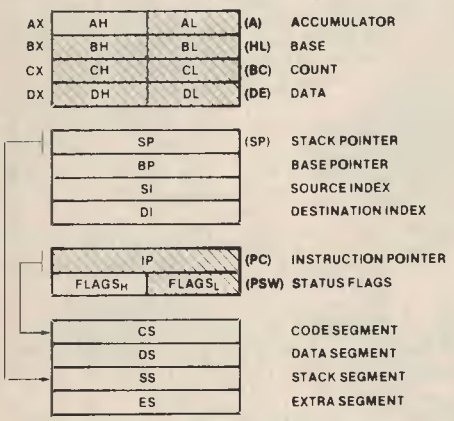
An external memory management unit breaks the Z-8000's address space into relocatable segments. It translates the logical memory addresses output by the CPU into physical addresses, so that the program the CPU is running does not have to be where the CPU actually thinks it is. Intel has taken a slightly different approach, and put its memory management unit on the CPU chip, while the Motorola chip's memory management is even more sophisticated, using traps to catch improper references to memory, and being able to nominate certain areas of memory as execute-only, read-only, and so on.

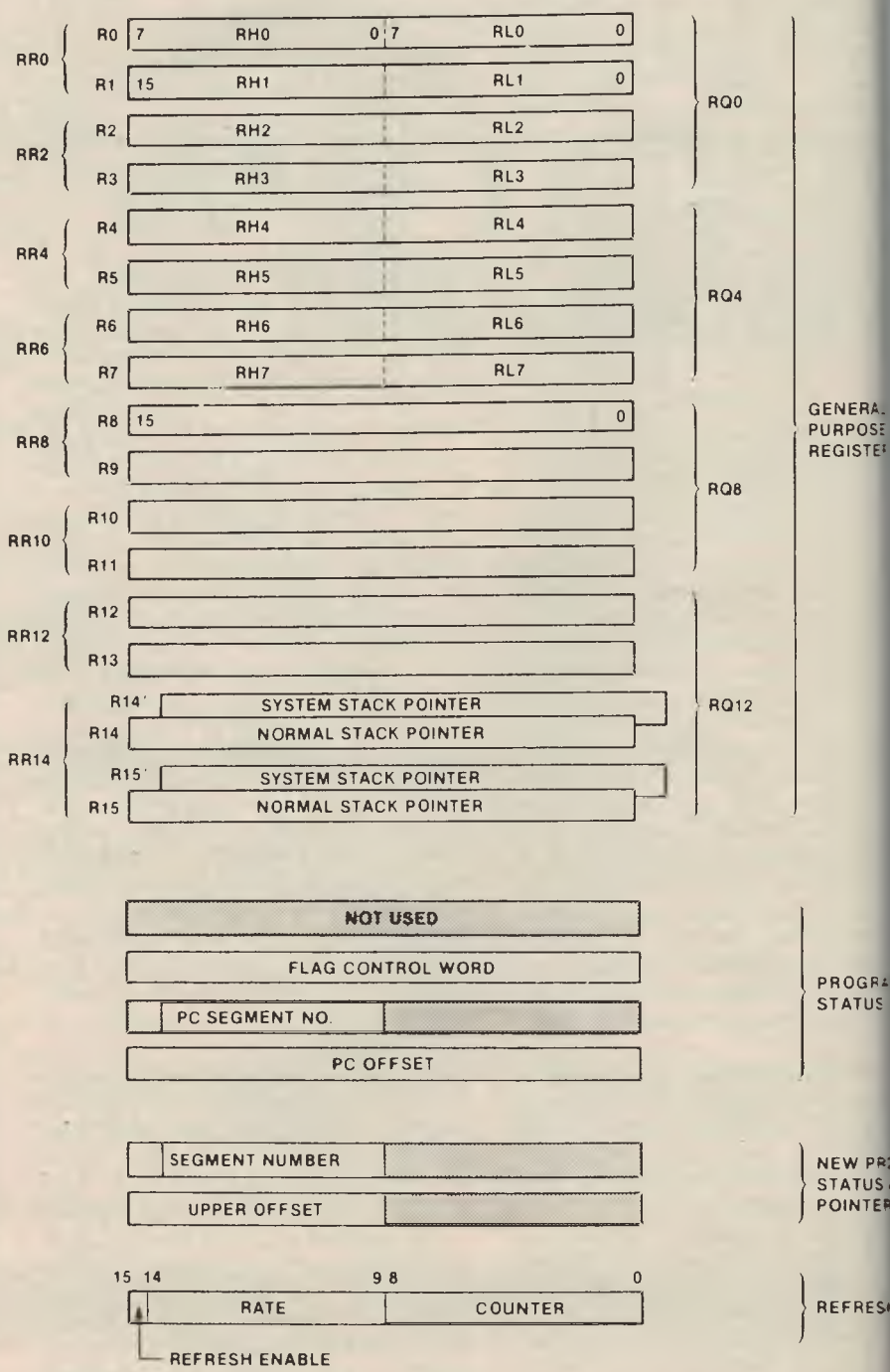
Intel is known to be working on a c which allows the use of virtual me though this will not be available for than a year.

The 16-bit processors are much in operation than the old 8-bit types clock speeds up to 10MHz, and the now on a performance par with computers in many applications.

Fly in the ointment

These chips have been availabl some time now; why haven't we





Register sets of the 8086 (iAPX86) (above) and the Z-8000 (right). Notice that the 8086 dedicates the registers to specific functions when used with certain instructions, while the Z-8000 is much more generalised.

The 8086 registers include a subset (shaded) which corresponds to those of the old 8080; this makes it easy to convert programs to run on the new processor.

The Z-8000 can hold bytes (RH0-RH7, RL0-RL7), 16-bit words (R0-R15), 32 bit long words (RR0-RR14) and even 64-bit quad words (RQ0 to RQ12). Notice the stack pointers both have extra registers to allow segmentation in a similar way to the 8086.

There is considerable debate as to which arrangement is best. Intel's approach is to optimise the CPU's ability to operate on objects (data structures) in memory, while Zilog have designed a processor which has plenty of registers to minimise memory accesses.

The Intel approach uses much less microcode and should run faster; in addition, compilers for the processor are simpler. A very sophisticated compiler would be required to take full advantage of the Z-8000 register capabilities, but an assembly language programmer with a good macro-assembler would probably find it more powerful.

CUSTOMIZED TECHNOLOGY

(A MEMBER OF THE GLOBAL SOFTWARE NETWORK)

SORCERER SOFTWARE
Games and Simulations

SORCERER ASTEROIDS: You rotate your ship around and fire the laser at the moving rocks – when one is hit it breaks into smaller pieces. You must keep a lookout from flying saucers who fire at you and also beware of the asteroids. (includes sound effects). **$21.95**

ACTION BOWLING: An arcade and reflex game simulating the real thing and for one or two players. Has features and not found in the parlours e.g. bowlers are given the opportunity to select the skill level at which they wish to bowl and as the skill level is increased, the probability of getting a strike decreases. Note the comments the computer gives after ever ball. **$21.95**

JAIL-BREAK: The challenge is to break out of a wall by destroying the bricks with the ball. The ball is kept in play by hitting it with the bat. Various levels of skill available. Can be used with joysticks or with interactive keyboard control. (Includes sound effects). **$11.95**

SPACE TREK: Based on the main-frame "Star Trek"s. Three fancy displays appear on the VDU as they may appear on Spock's screen. Each mission not only vaires in the amount of enemy spacecraft to destroy but as well as Klingons you have Romulons to devastate – watch the ships blow-up! (Includes sound effects). **$15.95**

PUNT: A horse racing game with graphhics and musical sound effects. Provision exists for the avid punter to have fun watching the all time greats run over 1 to 3 laps. **$11.95**

UTILITIES, BUSINESS, MUSIC AND MISCELLANEOUS

4 VOICE MUSIC: The software enables you to easily write music as it displays both the treble and bass staffs on which one moves the cursor up and down to place the desired notes for each four-part chord. Features include: *hearin *hearing a note before it is selected * transposing * copying refrains * tempo control * full editing to insert and delete notes in the music file * key signature selection * graphical notes and musical symbols. Includes sample music file, hardware which connects to your stereo and thorough documentation. The music generation machine code easily interfaces with your programs. **$54.95.**

CADAS V.1.1: A general purpose cassette data base system for handling alphanumeric data. Written in Z-80 machine language and suitable for use on 16K, 32K and 48K microcomputers. Commands available are: ADD, CALCULATE TOTAL, CREATE, DELETE, EDIT, LIST, LOAD, MERGE, PRINTER SELECT, QUERY SPACE, REPORT, SORT, TAB SET and WRITE. Allowance is made for up to 500 records which may consist of 1 to 9 fields. Each field is given a name by the user when creating the database and this is used as an aid when manipulating the file. The space available for record storage is approximately 8K less than the available RAM.A field may contain up to 56 characters and numeric fields may be summed. The records to be processed maybe controlled by specifying a range of records or comparison with a string **Price $35.95.**

CASSETTE FILES: A machine language program usable with your BASIC software that allows you to solve the CLOAD* problem. Some of the features:

*OPEN file
*CLOSE file
* WRITE string into buffer. When the buffer is full it is automatically written to tape.
* READ next string from buffer. A file is read from tape when the buffer is emptied.
* Output to Centronics type printer or 300/1200 serial printer.
* You can use the Monitor)FI command to list the files saved on tape.

$15.95

SUPER-X: Designed as a screen editor/renumberer utility for use with the Sorcerer's BASIC Rom Pac. It features full screen editing facility including insert, delete, overwrite, truncate and cursor control with TAB functions. Further features are selective listing, auto screen numbering and powerful search facilities. A sophisticated renumberer utility allows user to renumber program partly or wholly, compact program with options and safely append programs all performed with full protection and control. SUPER-X will fully recover programs after typing 'NEW', 'CLOAD' or pressing 'RESET'. **$35.95**

MACHINE CODE TUTORIAL: A set of 8 programes designed to show the BASIC programmer what to do after typing BYE. Learn Z-80 code with these easy to understand and lightly written tutorials. Everything you ever wanted to know about your Exidy micro – but didn't know where to look! What more could you ask for? **$24.95**

CROSS REFERENCE: Prints a complete variable and line number cross reference for BASIC programs. Also references GOTO, GOSUB, THEN, RESTORE, ON-GOTTO, ON-GOSUB' FNxx() statements. **$12.95**

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BIO-CHART: Has been called the best biorhythm program for a microcomputer. Allows you to determine quickly in which months you'll have those super days when everything goes right and those days when you should have stayed in bed. The metabolic curves are plotted along with the average of these and can be printed out. **$10.95**

Most software we carry is also available on Vista Disk – ask for details.

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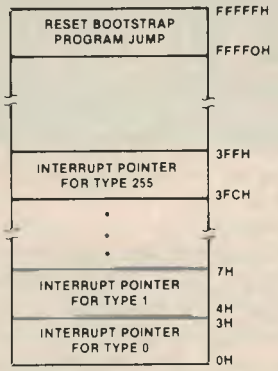

Reserved Memory Locations

FIG 2: 16-bit processors are better at dealing with interrupts — the 8086, for example, reserves the bottom 1K of memory for 256 interrupt vectors.

them on the market? In particular, the 8086 has been available for almost four years — why the delay?

Initially the problem was the way Zilog and Motorola "pre-announced" their products. No-one is willing to be committed to using a particular chip if a better one is just around the corner. Even so, Intel proved to be two years ahead of its closest competitor.

All this has meant that software vendors waited and tried to hedge their bets. In the end, Microsoft released its BASIC for the 8086, but only to run on Intel systems — which are not really in the commercial league. Then Seattle Computer Products and a few other hardware manufacturers began to produce S-100 boards for the 8086, and Seattle made available BASIC—86 for its system, in conj with a DOS.

Now Digital Research has rele version of CP/M for the 8086, and M is available. Digital Research release MP/M—86, a multi-user ing system, and PL/1-86, the popu programming language.

The main reason for all this ac not the 8086, it's Intel's 8-bit equ the 8088. This chip contains the CPU, but the memory manageme translates 16-bit words into by communicate with the outside worl the system gives 16-bit performanc 8-bit hardware, and this is provin ular, particularly with owners of systems wishing to upgrade. more, the 8087 arithmetic co-proc and the 8089 I/O processor will als with the 8088.

For the Z-8000, software has bee in coming. Microsoft is working version of the Unix operating s called Xenix, and this is due sho release.

The 68000 is still too new for us any software released on the other than that from the manufactu

That's the current state of play 16-bit market. It's anyone's guess whether a particular processor ty dominate the market in the same w the 8080 and its descendants led t in 8 bits. Let's hope we get it so before the 32-bit processor appearing.

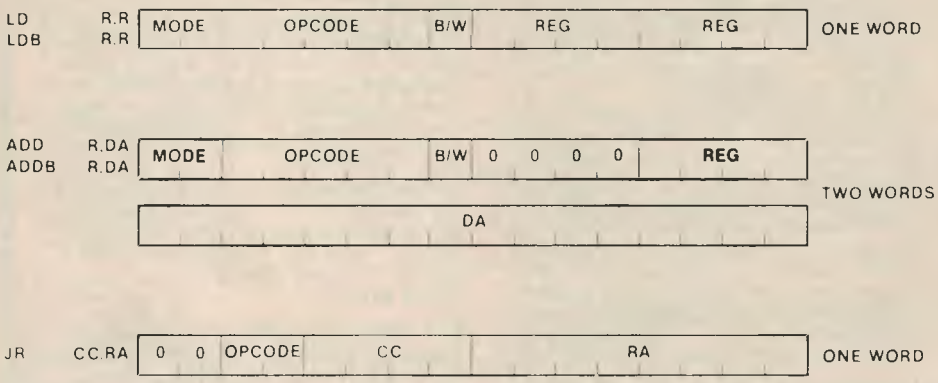

FIG 3: These Z-8000 instructions show the way an instruction word is split up into fields. The load instruction, for example, can operate on a byte or a word (B/W) and specifies both a destination register and a source register (or memory).

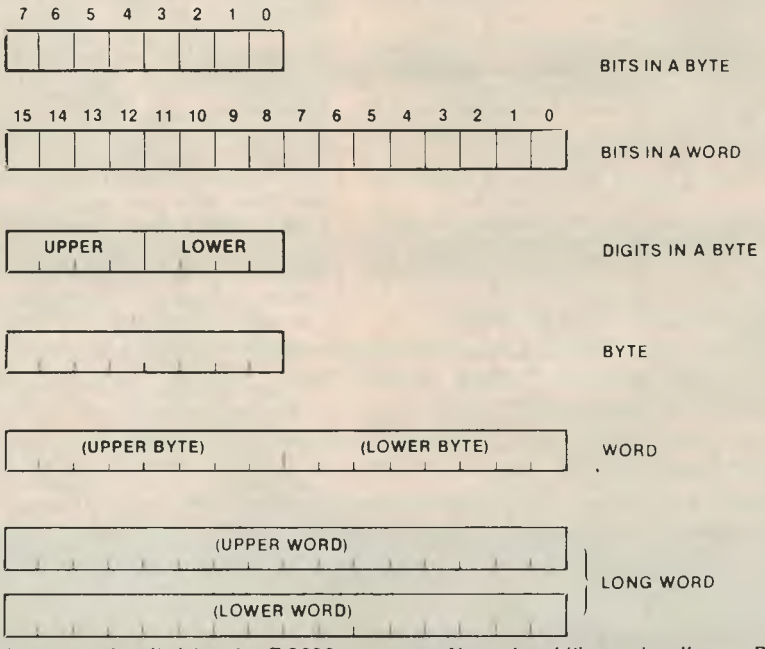

FIG 4: The data types handled by the Z-8000 processor. Note the ability to handle two BCD digits in a byte, and two words as a 32-bit long word.

AN INSTANT EXPLANATIO

Discussing a computer's cessor is a complex tec field; for the beginner wh ready to delve that deeply, a simple summary of the sto

A PROCESSOR controls the com memory. Increase the processor's and you've increased the com ability to use its memory.

Most microcomputers have 8-b cessors, but coming on to the mar 16-bit processor — it can handle tw much data at the one time as its ha brother.

Its impact on computer designs be enormous, changing the face o puting as we now know it.

An 8-bit processor can hand operating codes, the 16-bit proces many as 65,536 — that's one hal jump in capacity.

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WIN AN APF HOME COMPUTER!

"YOUR LIFE will never be the same"; that's APF's promotional promise with the Imagination Machine, and it could prove prophetically accurate for at least one *Your Computer* reader.

It will be the case if the reader who wins APF's unique home computer is a newcomer to the incredible world of computing.

The Imagination Machine has a lot to offer for everyone: by virtue of its clever concept and design, it's almost the ideal home computer for the man in the street, yet it also offers the features and capabilities he'll want and need when he becomes an enthusiast.

The "uninitiated" can, if they prefer, treat the APF unit as an uncomplicated push-button machine.

The more expert the user, the more the machine can do; including playing music, running normal or high-resolution colour graphics, plotting shapes and charts, and developing complex games or educational programs.

The basic machine can be expanded relatively cheaply to add on twin disk drives and a printer.

Your prize is actually worth a total of $1265; it includes almost $200 worth of ready-to-run software in the form of APF plug-in memory cartridges and prepared program cassettes.

A major feature is the inclusion of APF's excellent Basic Tutor package, worth around $75 — even the beginner can be programming for himself in no time.

This issue of *Your Computer* makes no apologies for being biased towards the beginner — while we want to provide plenty of meat for the enthusiast, we recognise the newcomer to computing needs all the help he can get if this industry is going to realise its potential.

The competition is open to all, and AVAILABLE to all. Whether you know more than the IBM brain trust, or have never heard of a microprocessor, you can win the Imagination Machine. Either way, you should learn from it as well as enjoy it.

Good luck! □

Want to Know More?

IF YOU want to know more about the prize in Your Computer's *great inaugural competition, you can check it out in this month's equipment test/review section. Turn to page 74.*

If you would like to see one in action, call in on one of the co-sponsors — dealers who have joined with us to establish the competition:

- **Calculator Supermarket,** *435 Bourke Street, Melbourne. Ph. (03) 67 6412.*
- **Radio Parts Group,** *562 Spencer Street, West Melbourne. Ph (03) 329 7888.*
- **Kalextronics,** *101 Burgundy Street, Heidelberg. Ph (03) 458 2976. Shop 11, Melton Shopping Centre, Ph (03) 743 1011.*

Of course, if it means catching a plane to get there, forget it — try one of the interstate dealers listed by the importer on page 11 instead.

The Rules

1. The official entry forms will be published in the May and July issues of *Your Computer.*

2: There is no limit on the number of entries by each person, and several entries may be delivered in the same envelope, but all entries must be made on the official coupon (plus attachments where necessary). Photocopies or other facsimiles of the entry coupon will not be accepted.

3: Employees (and their families) of White House Publishing Group, Calculator Supermarket, Radio Parts Group, and Kalextronics (plus any company, group or individuals associated with the printing, distribution or sale of this magazine or with the running of the competition) are not eligible to enter.

4: The closing date of entries is 5pm on July 31, 1981. Mailed entries received within five days of this date, but date stamped on or before the closing date by Australia Post will be accepted.

5: The winner will be notified by telegram, and the result will be published in the September issue of *Your Computer.*

6: The winner will be determined after examination of all answers to question 1 on the entry coupon. Question 2 answers will be considered in the event of a tie, as will the date of receipt of entries.

7: *Your Computer*'s decision will be final, and no correspondence will be entered into.

Official Entry Form

SEND TO:
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1: **Take the letters used in "APF Imagination Machine" and make up new words using all or as many of the letters as possible.** No letter should be used more than once (i.e. there are four 'A's and four 'I's – you can use each four times only), and no word should be repeated. Nor should your entry include the words or initials of the title, or proper nouns:

....

....

....

2: Answer the following question in 50 words or less:
"What do you want to do with a home computer?"
(If you've picked up *Your Computer* because you're a beginner trying to unravel the mysteries of computing, this issue should have already given you hundreds of ideas. Simply discuss your favourite):

.....

.....

.....

.....

.....

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I have read and understand the rules, and agree to abide by them.

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WHEN WILL YOU VIEWDATA?

About 10 years' ago the British Post Office pioneered viewdata, the world's first electronic information publishing system. The latest variation is called Prestel, and it seems ready to tackle Australia. But what is it and what can it do for you?

REMEMBER THE debacle of quadraphonic sound? The rival systems that managed to compete themselves out of the market?

We're witnessing a similar event in Australia now, with something far more sophisticated; and its implications are far more wide-ranging.

The wrangle is called viewdata; specifically, the Prestel and Teledon implementations of it.

As many home computer users know, the biggest problem with computers is their insatiable appetite for information. Computers might be able to produce a lot, but their demand for input is extraordinary.

Computers are classic seekers of information. Would it not be remarkable if there was a computer already loaded with all the information you could possibly want, and all you had to do to gain access to this vast pool was press a few keys?

Well, that's viewdata.

The British Post Office invented viewdata almost 10 years ago. Developed from an earlier system called teletext, which used the blank lines at the top of a TV screen to carry the pages of a 200-page magazine, viewdata soon overhauled it in sophistication and ability.

Teletext is transmitted during the blank period at the top of each picture frame. If you roll down the picture on your TV you can probably see a row of flickering yellow dots — that's the teletext magazine, in undecoded form. If you had a teletext decoder attached to your TV, you would be able to see the decoded pages, each of 24 lines of 40 characters. Sixteen colours are available, and the system has crude, chunky graphics; good enough for drawing rough weather maps and the like.

The information transmitted on teletext is generally news, sports results, weather and travel information. It is being transmitted by several TV stations in the cities, although there is some scepticism as to how the system will pay for itself.

Viewdata is an extension of this concept. It uses the same display electronics, except that instead of obtaining the information from a TV picture, the display is gathered from specific information transmitted down the phone line.

The computer at the other end of the phone has a data base of information — in the case of the British Post Office's Prestel system, getting on for a million pages. Each page is placed on the system by an information Provider — an organisation which has information available, either for sale or free distribution.

When you first switch to the system, your Prestel decoder, inside the TV set, will dial up the central computer and establish contact. At first, the system provides you with information on the current state of your account, so that you know the size of the bill you're running up.

Then you come to the main index. This lists by category the subjects Prestel has information on. This is presented in the form of a menu — each category is opposite a number, and by keying this number into your remote control keypad, the next menu page is displayed. For example, if you keyed 3 for entertainment, the next menu would list cinemas, restaurants, theatre, concerts, and so on, and by successively selecting from the menus, you can get to the information you want.

The range of information on the system is enormous. Under C, for example, there's:

Calculators
Calories
Cameras
Cameroon
Camping Equipment

and so on.

Each page on the viewdata system is charged for in three different ways. First, there's the cost of your telephone call to get onto the computer. Then there's a charge for the time that you're actually connected to the computer (this goes to administer the system and pay for the hardware), then there may be a charge for the page you're accessing — typically, one new pence (2c).

Prestel has begun to take off in Britain. It's not the overnight success the optimists hoped it would be, but it is steadily growing — and, of course, the British economy isn't all that healthy at the moment. People can't afford to splash out on innovations like Prestel.

But it's not the only system of its kind. The French have a similar system, more suited to their language with its accents over letters, and they have an ambitious scheme to put a terminal in every home, to replace the enormous cost of printing and distributing telephone directories.

The Canadians have a system called Teledon, which boasts much improved high-resolution graphics. But this system is more expensive than Prestel, and not as tried and tested.

At the moment Telecom is ready and willing to install a system but seems to be experiencing political problems with the Minister for Telecommunications, Mr Ian Sinclair. Telecom is strongly in favour of the Prestel system; it believes it is more appropriate for Australia's needs, and is more practical.

Mr Sinclair, however, apparently favours Teledon. The situation at present seems to be a stalemate; Telecom has placed a provisional order for a Prestel system, but cannot proceed any further than that.

If Telecom gets the go-ahead, the computers are due to be installed in October this year, with commercial services beginning in March of next year.

Despite ministerial concern with meeting the needs of the education system, the biggest users in Britain have proven to be the travel industry, which has instant access to bookings' information and stand-by status. Some of the pages on Prestel are provided by the tourist bodies of different countries, including Australia. It is possible, on the system, to investigate the facilities at several hotels and then make a reservation, book your flight, and even pay for it through your credit card — all using a Prestel terminal.

The next biggest user is business; financial data on all the major public companies is available on the system. There is also information on imports and exports. It's magnificent for the businessman. Stock exchange information is updated twice a day.

You can play games with the system, you can leave messages on it, you can find answers to silly questions. In Britain, there are even coin-operated terminals in pubs, chalking up a roaring trade in arbitrating arguments.

Prestel seems set to come to Australia. Look for it at your local TV store soon. □

Continued from page 16

OKAY, BUT WHAT WILL IT DO FOR ME?

A computer can be fun for a whi but is it really of any use in the lo term? What can you do with after you've finished playi games? If our survey of comm cial software hasn't already giv you the answer, perhaps this b commentary will. KEITH STEWA of Seahorse Computers, was a 7 pilot until he caught the comput bug - here he relates how family's computer has beco more useful by the month, and p for itself several times over.

THIS MANUSCRIPT is being typ corrected, and rewritten three times fas than it could be produced if a typewr was being used.

Spelling mistakes are being insta corrected.

Whole paragraphs can be grabbed placed elsewhere in the article, and completed text can be stored on a magnetic disk which will hold about pages of information. When finished, article will be transferred from computer to the printer standing alo side. A neatly typed copy will appear seconds.

Only two hours ago I used this sam keyboard to communicate with a ma computer in the United States.

At home, the family has used an App for more than two years. From the da came home, it paid its way. Our childr prefer using a computer to watch television because they can take part and control, what is to them a very n and natural part of their world.

More and more people now ha access to a computer either at home or school.

Our children are lucky to have computer at home. But what can t children do who do not have access? Ho can they catch up with the revolut which has already taken place?

Schools are the key to this problem access to computers. In most cases child's best chance is if the school has least one computer. Then he or she w hopefully, be able to get an hour or two 'hands-on experience' before leavi school.

Computers will only be accepted in o schools when we realise that the powerful teaching aids can not only fr the teacher from the more boring a repetitive aspects of the profession, b will enable pupils to use terminals as pa of their school experience. Life will easier for those pupils who come to us one of the thousands of similar termina in offices, shops, warehouses a factories throughout Australia.

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placing our telephone handset into an acoustic coupler, our home computer is able to communicate with tens of thousands of other large and small computers around the world. We have spoken to computer operators in Maine. The words they type into their keyboard appears less than half a second later on our screen in Australia.

The signal has to bounce off a satellite on its way across the Pacific.

It takes only seconds to compare the New York and London gold prices. We can look at the New York Times news service before relaxing by playing one or two of the computer games which are stored in a computer in Virginia. We can look at house prices and a listing of houses for sale in various parts of the US. there is no reason why houses could not be bought or sold in this way in Australia. e could have sent a letter to any one of thousands of home or office computer users in the US in seconds, or looked at 'today's chicken recipe.'

It takes less than 30 seconds to connect our personal computer to the overseas networks through OTC's MIDAS service.

Children quite naturally create anc use simulations as they grow up. These form a very real part of every child's world; Doctors and Nurses, or Answer Dad back and see what happens. These are challenges and simulations which teach the developing young adult the limits and inter-relationships which he or she will soon have to apply in real life.

Most people have seen TV games machines which are connected to a domestic television set. Your personal computer not only plays all these games, but enables the user to take part in, and control fantastic simulations. You can play chess at any level from rank beginner to that of grand master. Other programs allow you to be the commander of the spaceship USS Enterprise controlling the on-board computers before leaving the mother ship to attack the dreaded Klingons and hopefully save the universe.

These may be lightly dismissed as mere games, but similar "games" enable pilots to sit in a Boeing 747 simulator in Sydney, and 'fly' the patterns around Frankfurt airport in a European winter on two engines with ice on the wings, a double hydraulic systems failure, and with the maximum cross-wind. If the pilot makes major mistakes while learning a new routine, he does not risk crashing a $50 million aeroplane with 400 passengers on board.

The instructor can replay the last few minutes' action, pointing out what should have been done at various stages. The pilot repeats the exercise. Then he can make his first live approach into Frankfurt with the knowledge that he has done it all before.

Similar games and simulations on other types of computers enable users to try various approaches to a problem using a realistic simulation without the attendant real-life hazards.

Computers and microchip technology are already in everyday use. A microcomputer chip and a simplified keyboard controls most modern washing machines.

You don't have to know anything about computers to be able to make your modern washing-machine work, just as it is not necessary to know about the intricacies of the internal combustion engine to be able to drive a car.

High quality software programs are now becoming available. Many of these programs are being written in Australia. Other are written overseas and modified for Australian needs.

Our $1500 home computer has paid for itself many times over, and has been expanded stage by stage into a full system with dual disk drives.

Each month, thousands of hobby, personal and small business computers are finding their way into factories, offices and homes around Australia.

We must catch up in our schools. □

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- Each station is independent of every other; a fault on one station does not affect the others.
- The Econet is far more flexible than a time sharing system since extra facilities can be added as self contained units without affecting the remainder of the system.

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HEARD ON THE BUS

A COLLECTION of truths, totally unsubstantiated rumours and crosstalk about how things are, are going to be or should be if only 'they' did things right. By Leon Yendor (Australia's answer to Zoso).

STANDARDS: In the best of all possible worlds. . . For the newcomer to computing a totally confusing jumble of letters and numbers identified amongst the other buzzwords by the word 'standard' as a suffix. Standards? Well some of 'em are and some of 'em ain't. So which are real and who says so? Why are there people out there telling you that Standard Number X is no good? I'll try to help but if you want detailed technical articles on any of them please tell the Editor.

Standards are really all about interfacing. Any kind of connection between two parts of a system presupposes that a set of rules has been laid down for how the two will communicate. A printer won't connect to your computer if one uses RS232 and the other is current loop. A program will have to be massively rewritten if it calls a monitor entry you don't have and you will surely not be able to easily use the latest mass memory device to arrive (at some dramatic new low price) if you don't have some sort of standard bus or expansion device.

The naive amongst us may have supposed that standards are laid down as soon as (if not before) a new device is widely used. In reality they come about mostly as a result of user frustration or the formalisation of a really well-designed piece of gear.

Many of the well-known names in the big computer world have never done anything towards hardware standards although in the manner of Kodak with Super-8 film and Philips with the audio cassette some of their media techniques just take over the market.

So what about standards as they apply to your computer? When you're new to the game it's easy for a salesman to tell you that his company's product is so well supported that it doesn't need to comply with anyone else's rules. That may have been true for the mainframe and mini makers but even some of those have left orphans. In the micro world things are happening at lightning speed and whilst some manufacturers are now well established it is not unknown for some to suddenly disappear or to change their product so dramatically that buyers have been left with the baby.

I've also heard standards invented on the spot. A couple of years ago, after giving a sales pitch in which I stressed the benefit of a widely supported bus (which was used by the brand I was selling) I heard the opposition salesman tell the same audience that his machine had the A44 standard bus at a time when there might have been one other source for some limited add-on peripheral device. A very big name in the office equipment world recently told a buyer that their machine was S-100 standard and boy is he peeved now that 16k of add-in memory is going to cost him five times the price of an S-100 board.

After the horror stories you had better have some ammunition before you go out in the jungle. Here are some widely used bus names and formal standard numbers together with comments (of a strictly opinionated nature, so check me out too!).

S-100: the most widely supported bus in the world, and now to be called IEEE 696 as it is being formalised by the Institute of Electrical and Electronics Engineers. Last time I counted you could get eleven different CPU chips for it and there were 35 system manufacturers using it as well as about 200 brands of add-in boards.

MULTIBUS: Intel's registered name for the bus in its development systems. It is now under consideration for IEEE standardisation and as such will be IEEE 796. I believe there will be a number of changes in the draft standard.

STD: Boy, was that ever an attempt at using a name to imply something. This one is the result of an attempt by two manufacturers to set up a small bus standard mostly suited to industrial use. Last I heard was there were differences between signal definitions used at each factory. Any updates would be appreciated but the add-in builders aren't rushing in either.

Exorciser: Motorola's trademarked development system bus. There are a few add-in suppliers here but I think Motorola will have to come up with a new design some time. The number of address lines and provision for added bus masters is too limited for my future. It has made provision for up to 16 data lines.

SS-50: This is the way that most users of Motorola devices have gone in the hobbyist side of thing. For those who don't want to be in with the big crowd and who will accept much less support it is a reasonably well supported way to have a Motorola based system.

Eurocard: This isn't a bus standard at all but part of a design standard referring to printed circuit board sizes and connector styles. The reason I mention it at all is just to warn anyone who is offered a machine using this 'standard' that I have seen a number of totally different ways of laying out the signals with destructive effects being certain if the wrong mixture was put together.

Others: A few machines have unique busses or none at all. This doesn't mean you can't add anything to them but you may be limited. There is really nothing like letting designers get at all the 'hooks' to ensure a wide range of add-ons.

IEEE 896: One for the future, it will be the first bus standard laid down *before* any device has been made to use it. This is for 32-bit machines with up to 64 bus masters and you won't find too many of these in hobby rooms or corner stores for a long time. You just don't need that power to do most of the work that is around for micros.

BUS BUZZES: An American report says IBM has shown an S-100-based machine in Europe. If this is true how do the detractors justify their knocking or is that just their knees?

I'll deal with media standards next issue but to explain the next rumour you need to know that at present there are no real standards for formatting mini-floppies. This should change this year as my well-informed Californian sources tell me IBM is about to market a machine using them. This could have the same kind of effect as the introduction of 8 mm had on 9.5 mm in the home movie market. I wonder who, if anyone, has guessed right ahead of the giant.

A widely accepted standard for mini-floppy disks together with a 130 mm winchester type hard disk could make a neat enough package to sway even this die-hard 8" floppy lover change tracks. A 5-Megabyte micro-winchester is available right now and you will see 10 and 20-Megabyte units in the next few months. All we really need to go with that combination is a realistically priced fast back-up method and I don't think all the implication of the needs for that have been properly explained yet. □

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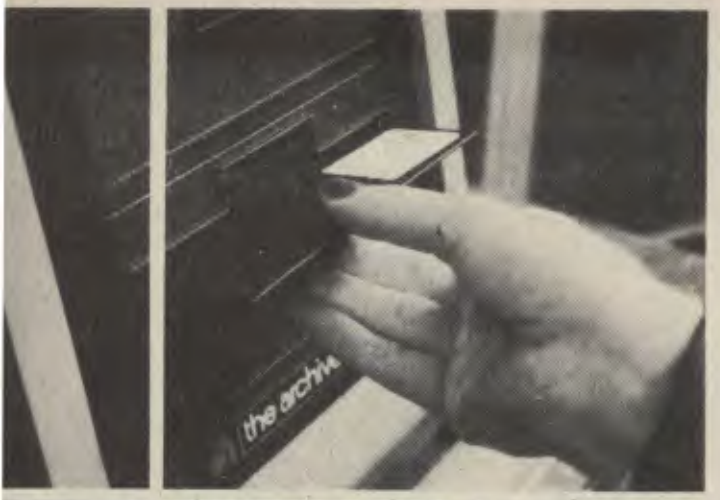

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System Operations

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SOFTWARE

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- CP/M™ Operating System

Optional

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- Payroll
- CPA Client Accounting
- Property Management
- Inventory Management
- Work in Process Inventory
- Legal Billing
- Mailing List
- Data Base Management
- Microsoft™ Basic
- CBASIC 2 ™
- Microsoft™ Fortran
- Microsoft™ Cobol

SOFTWARE

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HARDWARE

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Display	• 12" Green phosphor Monitor • 25 lines x 80 Characters • 240 x 100 Graphics format • Memory mapped video • Screen attributes including inverse, video blink and underline in any of 8 intensities • non-glare filtered screen
Keyboard	• Detachable microprocessor keyboard • 104 Keys • Lefthand function keycluster • Righthand numeric keycluster • 23 relegendable function keys
I/O	• Both serial and parallel
Options	• Direct wire modem • HZ Emulator

Physical Characteristics

Main Unit	13.5"H x 17"D x 22"W
Keyboard	2.8"H x 8.6"D x 20.6"W
Weight	59 pounds
Electrical	110/220V 50/60 HZ

Hardware

Now that you know the advantages of The Archives, you should also know that The Archives is designed and built by experience and expertise—two factors that are making Archives Incorporated famous throughout the world.

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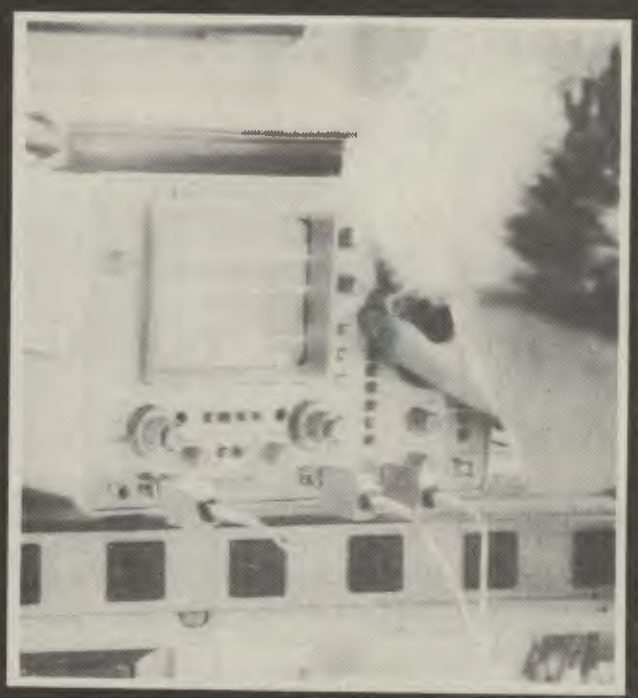

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Archives Incorporated views the management of information as the dominant aspect of a computer's function. Our engineers designed The Archives based on that concept. In order to effectively manage information using a computer—the computer must be capable of being managed. Built to the scale of a human being, not a corporation, The Archives is a system easy to use, easy to understand and easy to maintain. It's a computer a person can operate without being a computer expert.

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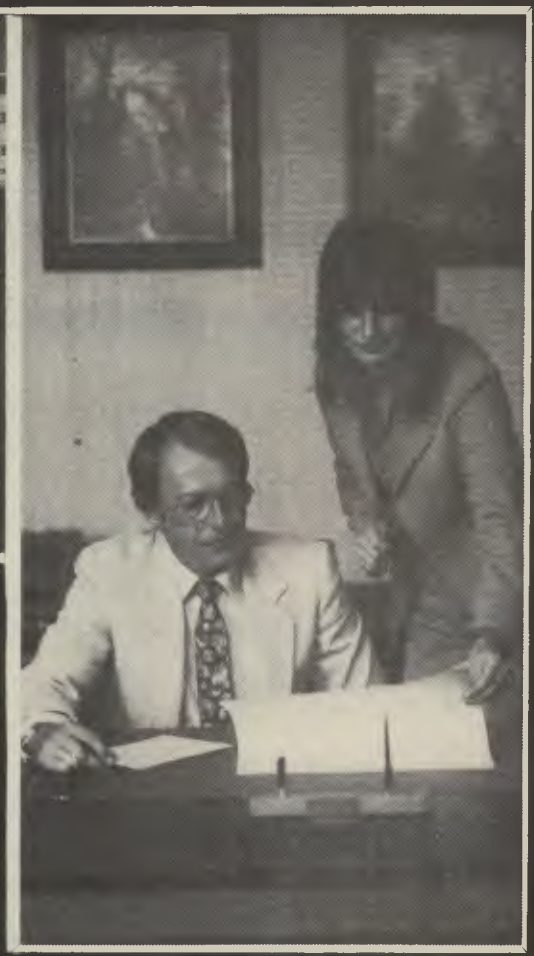

ere is no question that the major area restricting your business wth is in the office. This is one place where employee efficiency still in the dark ages—requiring the handling of paper, forms d files. What you really need is not the physical presence of obete forms and letters but the information and data they con-n. You need The Archives Business Computer.

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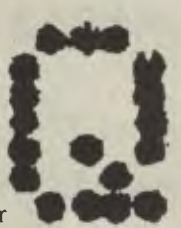

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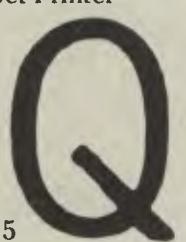

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Is it a toy, or is it really a computer? Fascinated by the idea of a $300 computer the Your Computer *editorial team set out to investigate. Like a certain brand of fish paste, we found that with the ZX80, a little bit goes a long way. . .*

SILENT MITE

LIVE SINCLAIR has, over the years, cquired something of a reputation. He's ıe British equivalent of our own Dick ;mith, except that his forte is manufactur-ıg, not retailing (I wonder what would appen if the two met?).

Throughout his career, he's chalked up ome notable successes (a revolutionary lass D amplifier, his domination of the IK calculator market, The first pocket-ized TV) and his fair share of failures (the lass D amplifier that interfered with very TV for miles, his withdrawal from the K calculator market, the first pocket-zed TV).

Sinclair has long had an interest in gital calculating devices — first, the inclair programmable calculators, and ter, the Science of Cambridge Mk 14, a mple educational microcomputer. The

your computer REVIEW

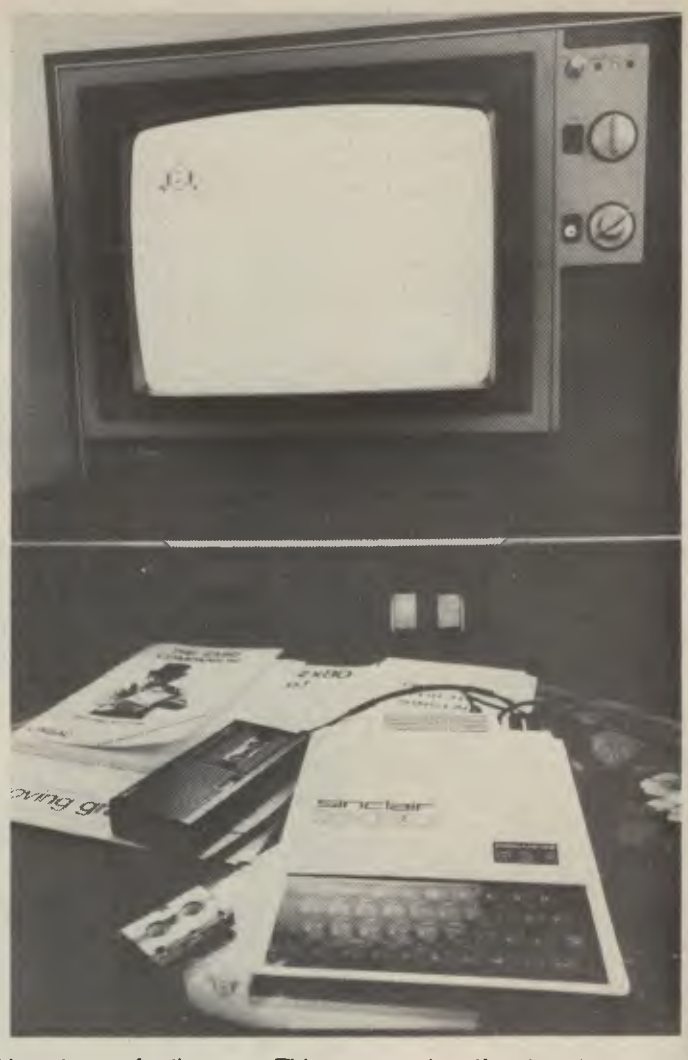
latest racehorse from the Sinclair stable is the ZX80, the first computer to sell in Australia for under $300. In most things, it tends to happen that you get what you pay for; how much do you get for your $300 in this case?

The first thing that strikes you about the ZX80 is its size, or rather, lack of it. It doesn't exactly dominate the table it's sitting on; in fact, it would just about disappear into one of the disk drive slots on a bigger system.

The construction is very similar to one of Sinclair's earlier calculators: a printed circuit board is sandwiched between a plastic base and a plastic cover. The base is flat, apart from two strips of non-slip foam to stop it skating away from you as you exhale. The cover is hollow, concave to a depth of about 2 centimetres to clear the integrated circuits on the pcb, and there's a power bulge at the back to clear the larger metal can of the TV VHF modulator.

It's not exactly built like a battle ship, but it'll do.

The keyboard is interesting. To reduce cost, there are no moving parts or key-switches or anything fancy like that. Instead, the keyboard is an elastomeric type; it consists of a set of contacts on the pcb and another set on an elastic film above, which is the underside of the key-board cover itself. Another film between the two only allows contact between areas directly under the keypads marked on top,



and then only under pressure. It's cheap, fairly reliable, spill-proof to some degree, and an absolute bastard to type on.

The power supply is a separate adapter like the rechargers you get with some brands of calculators and TV games. It's supplied locally for Australia, and does the job reasonably well. This is an area where some manufacturers have been known to skimp badly, and one I'm always very critical of.

Under the Lid

Inside the beast there's not much to see. Despite being made in England, it doesn't work by cogs and gears. There's a few chips, all fairly standard, and that's about it. Nothing to adjust, no wire links to set, no dip switches to puzzle over, in fact, to the experienced eye, it's difficult to believe that it can work at all. It takes a conscious act of will to suspend disbelief and understand that it really does work, and work well.

The processor chip itself is a Japanese second source of the almost ubiquitous Z80 chip (what else!), the Nippon Electric Company 780-1. Random Access Memory is a pair of 2114 chips giving 1 Kbyte (1024 characters). This is used for all RAM requirements — program storage, variable storage, working storage for the BASIC interpreter, and the video screen contents; there is not a great deal of room to spare. Help is on the way, though; there is a 16 Kbyte RAM module coming (it should be available now) from Sinclair and memory boards are appearing from independent manufacturers.

Similarly, for the read-only memory, there is only 4K of ROM in the basic machine. That contains the monitor program, the BASIC interpreter and the character generator for the video display. The guy who wrote it must hold the patent on some kind of digital shoehorn to have crammed it all in.

Afficionados of electonic circuitry will doubtless have noticed that there's something funny about having the character generator memory in the same ROM as the monitor program. You're darn right, but there's something even funnier: the ZX80 doesn't have any conventional video circuitry at all. Instead, the memory refresh counter on the Z80 chip is used to count TV lines. There is a routine in the monitor which checks to see if a key has been pressed. If one has, then the key code is calculated, otherwise the routine goes on to refresh the TV display.

This means that if a key has been pressed, then the video display drops out momentarily, producing a blinking display. This isn't so bad; in fact, it makes up for the negative feel of the keyboard by providing the user with feedback to indicate key contact.

Of course, while the processor is executing a program, the display blanks out. This is not so convenient. Fortunately, some ingenious programmers have got around the problem, and software is now available to display even moving graphics on the ZX80.

Class Marks

Plugging in the power supply and switching on provides the first revelation: the display is of black characters on a white background, rather than the more conventional white on black.

The display format is 24 lines of 32 characters. Picture quality is not bad — I've seen a lot worse from VDU boards that cost almost as much as the entire ZX80. Upper case only, of course — do I hear any complaints? No, I thought not.

Mind you, I've also seen a lot better. The display was a bit streaky, probably due to the VHF modulator; (or even our TV set); direct video entry would have pro-

vided a much better display. It also proved difficult to get a good display of the inverse video characters, no matter how we adjusted the brightness and contrast controls. Once again the problem may have been in the VHF modulator.

Having examined the innards of the machine at length, we now pause to examine the keys (later on we'll actually read the manual — but only after we've tried everything and been forced to admit defeat. We're not going to let a *machine* beat us). The keys are arranged in a standard QWERTY keyboard layout — others have dared to disagree, and failed miserably.

Above each key is a BASIC keyword — FOR, GOSUB, and the like. There is no *shift* key to access them; so how do you do it? One of the features of the BASIC language is that after each line number it always expects to find a keyword, because the keyword will dictate how the interpreter should process the rest of the line.

Consequently, after a line number, the ZX80 always expects a keyword, and automatically shifts the keyboard to keyword mode. At other times the keyboard behaves conventionally: the keys call for ordinary letters and numbers.

On the display, the cursor helps the user to keep track of what's going on and how the keyboard is going to behave (or misbehave, if you're not watching). While the computer is ready to accept ordinary letters, the cursor is an inverse (white on black) *L (for either literal of letter). When a keyword is expected, it changes to an inverse K (you guessed it — keyword).*

Because BASIC is such a simple language (give it time, it will be), and because computers are such simple machines (simple-minded, I mean), the BASIC language has a lot of redundancy built in, and more than a few rules. The ZX80 knows the rules (or at least, its own interpretation of them), and it can detect when you break them. At such times, the cursor changes to an inverse *S* (for syntax error), and when you hit the NEWLINE key, the computer refuses to accept the line, but stays in edit mode. A major point in favour of ZX80 BASIC.

This can, on occasion, be a little confusing; for example, while entering a PRINT statement, the cursor changes to the inverse S after the first quote mark ", and stays that way until the terminating " is entered. If you don't know what the computer is doing (detecting unbalanced quotes), this can be a bit misleading.

The ZX80 BASIC is quite reasonable, and is very respectable, given the space restriction. It includes virtually all the standard BASIC keywords, notable exceptions being DATA statements and the ON GOTO statement. ZX80 BASIC provides ways around this, however, so it's not too severe a handicap. For example, the GOTO statement can GOTO a destination specified by an expression, such as GOTO N * 100. This really is a computed GOTO.

Despite the small amount of memory, it is possible to cram quite long programs into the ZX80. This is largely made possible by the way the ZX80 stores each keyword as only one byte internally, instead of the number of characters you see on the screen.

The output of a program is slightly restricted in format by the fact that the screen disappears while the program is running, but within the limitations, it is possible, and not difficult, to write quite useful programs.

Due to the small size of the BASIC interpreter, it can only deal with whole numbers, integers. This makes financial calculations a bit of a problem, although they are possible. The BASIC is reminiscent of the Tiny BASICs found in early copies of Doctor Dobb's Journal, but the similarity is probably only superficial.

One particularly nice feature of the ZX80 is its editor program. As one enters text, the cursor moves across the bottom part of the screen; when the NEWLINE key is pressed, the line takes its place on the listing at the top of the screen. To edit a line already in the listing, the cursor is moved up or down until it is on the right line, and then the EDIT key is pressed. That line is then made the current line, and may be edited in the usual way.

Graphics are possible on the ZX80, in a similar manner to the TRS 80, using chunky graphic characters. These are also shown on the keyboard, to make life easy.

Internally, the ZX80 doesn't use the ASCII code, so interfacing it to a printer or other peripherals would prove difficult (though I'll bet somebody's done it by now). It also means that there are a few unfamiliar string functions, particularly CODE and TL$, which supply the numerical value of the first character in a string and a string minus its first character, respectively. The string functions are versatile, and not a significant limitation on the machine.

The new BASIC 8K ROM will add floating point arithmetic, with logarithmic and trigonometric functions, as well as the DATA statement and a number of convenience functions. The difference will be astounding.

Documentation

The manual supplied with the ZX80 is up to the usual Sinclair standard. Of course, it's mainly an introduction to the BASIC language, rather than an introduction to the ZX80.

The manual is spiral bound, thank goodness, so it will lie flat while you type. It tells in a reasonable amount of detail how to plug the machine together and switch on, and provides a fairly comprehensive introduction to the ins and outs of small (very small) computer systems.

The part of the system that is likely to give the beginner most trouble, the cassette interface, is described in detail.

Of course, the documentation supplied with the machine is not the end of the documentation available, and there are some excellent books to helo you get more out of the ZX80.

For the beginner, 30 BASIC programs for the ZX80 will help to get the machine to

ZX80

Processor	Z-80 equivalent
ROM	4K, including BASIC, monitor and character generator
RAM:	1K, including video RAM. Expandable.
I/O:	Cassette only. Rear bus connector for expansion.
Display:	Black on white, medium quality.
Keyboard:	Pressure-sensitive type, slow.
BASIC:	Comprehensive. Limitations: fixed point arithmetic,
Limitations:	No data statement, no ON-GOTO.
Peripherals:	Poor so far.
Documentation	Adequate for beginners, with background material.
Ease of use:	Good for beginners with no typing experience, disturbing for good typists.

do something quickly, while The ZX80 Companion from LINSAC will help the more experienced user by explaining a lot about the internal operation of the machine.

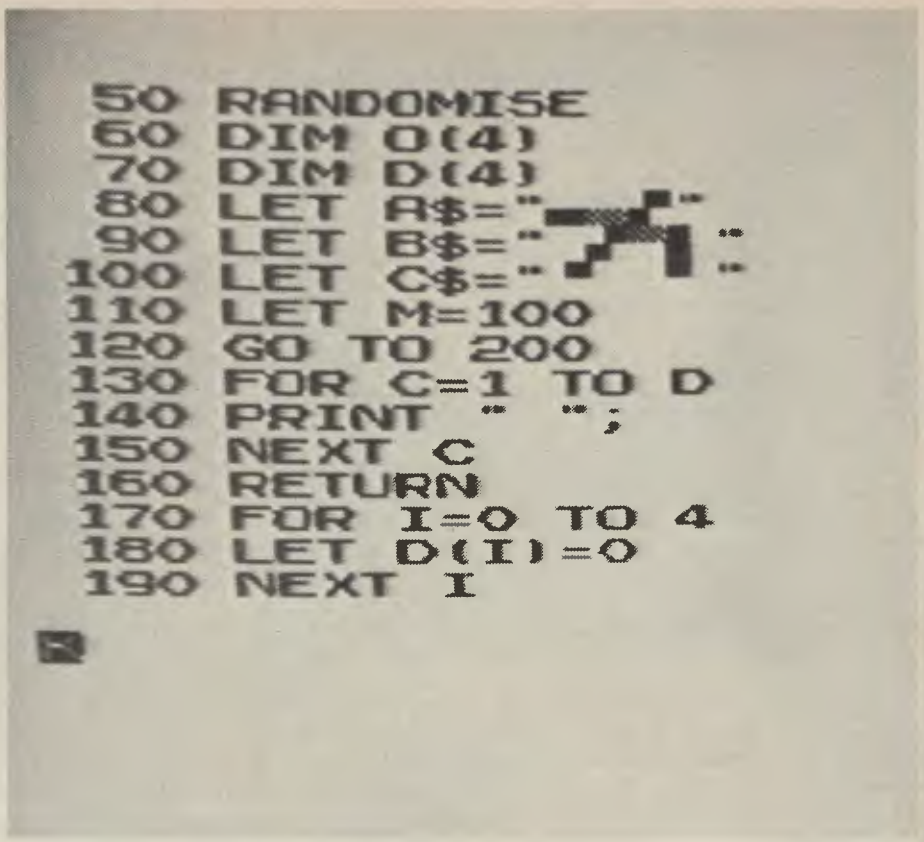
Incidentally, Sinclair has been reasonably free in releasing information about the inside of the machine, unlike some manufacturers who can barely bring themselves to reveal what microprocessor they use.

The level of the software support available for the machine is increasing rapidly. The buyer of a ZX80 need not fear that he is all on his own; on the contrary, the low price of the machine ensures that there are lots of other users, many of them producing innovative software which will be published or otherwise made available.

Summary

It seems that $300 buys quite a lot of computer these days. At the present stage of its development, the ZX80 is not really a serious computer, but it does have considerable value as an educational tool. Don't be put off if you buy a ZX80 and it won't do what you'd originally planned.

Most personal computers are more powerful, but the learning experience of a ZX80 is worthwhile. □



A Beginner's Dream?

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IT'S VERY small. It could almost be a toy, or a model of a real computer. But a real computer it is, practical, efficient and surprisingly versatile.

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There is only one kilobyte of memory in the ZX80 — that means it's so small it couldn't store the words of this story in it. By comparison, a full-blown computer could store the whole of this magazine and the complete Oxford Dictionary and still have room to spare. Despite this shortfall, the ZX80 can squeeze an astounding amount of information into its memory.

To drastically reduce cost, the conventional moving-part keyboard was replaced by a touch keyboard — perhaps not as effecive or positive, but in its own slow, ponderous way just as good.

The ZX80's true benefit will be to the beginner. the operating manual supplied with it is excellent. What confusion arises in usually the beginner's own lack of familiarity with computer technology and descriptive language. Some patience and a literal following of the instructions is all that's needed for success.

The computer talks to itself in a computer language called BASIC. Actually a high-level language, the ZX80's built-in command codes and operating sequences take most of the complication out of understanding it.

In a very short time even the most novice of novices can be instructing the computer to run simple programs.

Worth the money?

More than worth it. If you're curious about computers, but shy away from spending too much on something you might discover is not for you, then the ZX80 is your ideal. It does most things the larger computers do.

Its limited capacity might, after a while, be a burden. It'll be then you might decide to move upmarket, but because of the excellent grounding the ZX80 will have given you, you'll do so with an excellent knowledge and grasp of programming techniques. And because of the cheap purchase price, you could throw away the ZX80 if you do decide you don't like computing.

ZX80 clubs are springing up all over Australia, and there is an increasing amount of over-the-counter software being made available.

There are several books available with programs in them so all you have to do is type the instructions into the computer's memory.

The ZX80 is a complex piece of electronics that is easily understood. Just because it's small, it doesn't mean it's of no use. □

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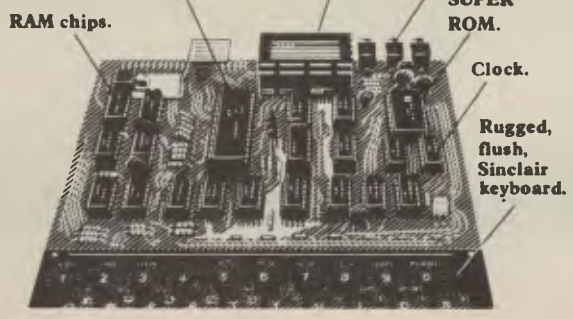

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IMAGINATION -and Thereby Hangs a Tale...

Some microcomputers look and are known to scare off beginners. But make a computer look friendly to all eyes and some dyed-in-the-wool enthusiasts have an immediate knee-jerk reaction — they don't like them looking easy.

APF took its heart in its mouth and produced the APF Imagination Machine. It hoped a machine that looked friendly and easy to use would help newcomers overcome computer-shock syndrome while not alienating the enthusiast.

What APF has produced is a computer instantly useable by everybody while ensuring that the depth of the plumbing can take enthusiasts over the limit and beginners by the hand.

By Chris Carolan

your computer REVIEW

THE APF Imagination Machine is a true home computer. It's very simple to use, but far from simple in its abilities. With none of the high technical trauma you might expect from a computer it's simply a matter of taking it out of its cardboard box, plugging it in and it's ready to go.

Don't be put off by the name — operating this computer needs no guessing at all. It's not one of the more complex variety used to produce monthly bank balances or navigating space flights. APF has managed to combine all the ingredients to give first-time users and the more experienced a readily useable product. The amount of technical knowledge needed to operate the APF or learn along with it is kept to a minimum, not only for putting it all together, but also when it comes to making use of its "brain".

Your own imagination is the machine's only severe limitation.

As with most microcomputers now available, the main programming language used is BASIC. If you don't know what BASIC is, don't worry — the machine will teach you how to use it. If, on the other hand, you do know what it is, then there is nothing to stop you getting straight down to writing programs as soon as you have put it together.

The thought of setting up computer equipment might seem daunting to many people, but APF has managed to significantly reduce the anxiety of their new customers in this respect.

The imagination machine is really four units — a power supply, an American colour TV, the MP1000 console with two hand controllers, and the computer console with keyboard and built-in cassette recorder. The set-up procedure is explained in booklets, and is so simple that it could be explained in one sentence: Sit the MP1000 on the computer console, join them with the supplied J-clip, plug in the screen and power cables, plug in the power supply, insert the required program cartridge and turn the power on.

When all else fails, read the instructions — the computer is not a toy. Problems that occur with computers are usually caused by human error. Don't call the machine an idiot unless you are sure you're not the idiot who hasn't done the right thing.

Once it's all together, you can immediately begin to learn. The BASIC language book provides a simple-to-follow procedure which allows the machine to take over the instructing. There is no need to read the whole book from cover to cover before touching the machine — it's a frustration to be avoided at all costs. Once the first part of the book has been read you should know enough to load the lessons from the BASIC course, and to start your hands-on training. The course contains 22 lessons, each of which introduces you to two or three new BASIC commands, and show you how to use them by supplying a small program which demonstrates their function. Each lesson offers you the

portunity to skip the typing necessary to nter the program — but if you haven't ad any contact with a computer before, it probably advisable to use this opportunity so that you begin to understand that OU are in control and not the machine.

The imagination machine, like a lot of her micros, will help you to the best of its ility, and unless you do something ich is totally beyond its comprehension, will offer all the assistance it can to ake your life easy.

While you go through the lessons on e computer, the instruction book plains each lesson, the commands ed, and what each command makes e machine do. Since the course begins th the most common commands, you ay find later that you want a simple planation of a previously used mmand. A quick look at the reference ide and you should have your answer.

As the voice on the tape says when u've finished the course: "You should ve gained a basic understanding of mputer programming". Because of the y in which the course is structured, you n go through each lesson at your own ce. There is no pressure to begin at the ginning or go through every lesson hout a break. This not only gives you ne to digest the new information which s been presented, but also to discover other facets of your new equipment ich allow you to have a bit of enjoyment ween studying. For this purpose, APF has made available a selection of video games where all the programming work has been done for you. No doubt, as you begin to understand the programming side, the methods in which the games work will become apparent, and this should start off the process of thinking in what other ways you can utilise the abilities of your computer. However, it is good to be able to make use of the equipment without first having to devote much, if any, time to the learning process.

So, change the BASIC cartridge for one of the games, and pick up the hand controllers. They are supplied with enough cable so you can sit back — but you might find relaxation difficult! A session with noisy battles and colourful games is an experience kids in pinball parlours know full well.

For the more experienced user, the imagination machine will provide a useful working basis on which to build up to a larger system. A few minor disadvantages become apparent when the reference books are used to look up language details. In order to make it easy for the first-time user, all references are oriented towards the BASIC course supplied by APF — to look up machine-dependent features means that you really have to have an understanding of the course. However, once this familiarity is there, it becomes a simple matter to find the information you need. Similarly, if you look up a certain command in the BASIC-language book, there is a reference to a certain lesson rather than a page number. I think that even users who have gone through the lessons might find that it is a bit difficult to locate a required statement in the book without skipping through the chapters, especially after having left the course for some time and returned for a refresher.

Apart from these points, the documentation which accompanies all of the programs and games is very good. There is nothing quite as annoying as having to guess how a function or program is working. If the instructions are clear enough, as they are here, then this can be avoided. This should be remembered for your own programs too as coming back to one of your own is as difficult as trying to work out somebody elses.

As far as the language itself is concerned, there are two levels of BASIC available. Level I provides all the necessary commands for normal programming, while Level II includes extra commands for certain scientific functions. Most users will find the Level I set adequate. For those who really want to get down to the nitty-gritty, there is also an assembler available. Assembler (or Assembly) language varies according to the hardware being used, and while they may be similar to each other for similar types of machines, they are more complex to use because each instruction (command) has a one-to-one relationship

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The MX-80 is the first of a revolutionary series of Epson MX Printers. These employ the most advanced automatic assembly and machining techniques in existence to produce a printer that is incredibly versatile, remarkably reliable and extraordinarily inexpensive. It's a printer that could only come from the world's largest manufacturer of print mechanisms: Epson.

If it sounds like we're proud of the MX-80, we are. Not only does it do things some of the world's most expensive printers can't do, it'll do them for you for much less. And if that isn't revolutionary, we don't know what is.

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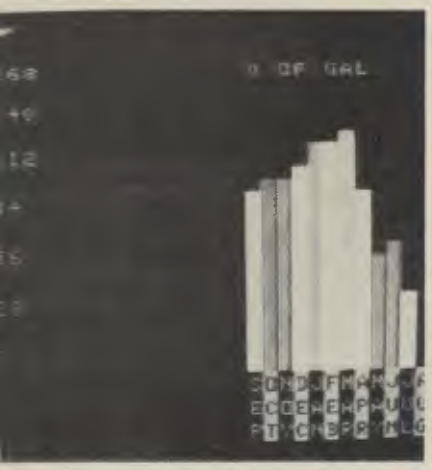
vith the function the hardware is perform-ng. For the general user, the knowledge equired at this level is not needed when using a higher level language such as BASIC.

Expanding the system can be as simple as adding the expansion interface which nen allows you to add more memory, a printer, and a disk drive. Holes to plug this n have already been made at the rear of he computer console. There is obviously extra cost involved once you reach the add-on stage, and it should be pointed out hat these are not necessary unless you nave a purpose in mind. Recognise the act that they can be obtained as and when your need arises; the development pace of the industry is such that not only are new products becoming available continually, but also the older ones are being upgraded.

The major advantage of the imagination machine over many of its competitors is the simplicity of its operation, without sacrificing flexibility. A certain person (who shall be nameless), came in contact with the APF when the whole computer business was beyond his comprehension. It was the first time he had been able to make a computer work!

We found that this really does get close to the ideal of a machine for the home computer user. The market it is aimed at is every house — a prospect which would bring joy to any advertising executive. However, rather than capitalise on this, the Australian distributors made every effort to keep the price down.

Consequently, there are few micros which can offer for the price the range of facilities of the imagination machine. Anybody considering buying a micro should definitely put this one on their list. Step-by-step instructions make everything extremely clear, the BASIC course provides a good grounding for people who have little or no previous computer experience, and for the more experienced user there is room for expansion. The video games provide not only enjoyment but also an investment to the rest of the family. Just make sure you can lock it up, or you may never be able to get to use it yourself. □



APF Imagination Machine

Processor:	6800
Clock speed	895 kHz.
RAM:	8K (expandable to 16K).
ROM:	12K (cartridge) plus 2K (games unit).
Display:	32 × 16 line colour display. Medium to good quality, limited by US-system television.
Graphics:	Mode 1, 128 × 192; 8 colours
Resolution:	Mode 2, 256 × 192; 4 colours.
Keyboard:	Standard Qwerty layout with single keystroke entry for most BASIC commands.
I/O:	Inbuilt cassette only. Expansion bus available for extra memory, disk drives, printer and so on.
BASIC:	Reasonably comprehensive; machine language monitor.
Documentation:	Very good start-up manuals for beginners, plus a detailed techincal manual.
Ease of use:	Excellent

... And if You're Serious

THE IMAGINATION MACHINE is interesting from the marketing point of view: in he US, it's probably intended to get purchasers of APF's TV game to trade up. Over here, the TV game was never available by itself, and the system is sold as a complete and integrated unit.

It's based on the Motorola 6800 processor, surrounded by the standard family of parts; a 6821 PIA to interface the games paddles and a 6847 video display generator chip, coupled with an MC1372 colour modulator. This last piece of circuitry is impractical to convert to Australian standards, which is why the set-up includes a US-standard colour monitor.

The unit seems fairly well put together, if slightly inelegant in design. The use of one track of the tape system to carry audio which plays as you load is a nice touch, although those smooth American accents do tend to grate after a while. Of course you can just turn the volume right down to solve that problem. And you can use the facility to include comments on your own program tapes.

The cassette interface is interesting from anothe point of view. It first loads the contents of the screen, so that the screen is nicely set up as the remainder of the tape loads. But it also saves and loads the whole of the user RAM each time — no matter how much you've actually used. This makes loads and saves slower than necessary — particularly if the RAM is expanded. Maybe it's a ploy to drive you to buy a disk!

The documentation is very good. We particularly liked the Technical Reference Manual which, although not too brilliant in presentation, contains a lot of gems, including sections on machine code programming (the 6800 is nice for this), hi-res graphics, descriptions of machine code subroutines in the ROMs, and some nice programming examples.

All this is useful, as the Imagination Machine doesn't have all its hardware features fully integrated with its BASIC language software. Instead a lot of work is done by PEEKing and POKEing locations in memory. This isn't necessarily a bad thing; it doesn't stop the user from doing anything, and encourages him to understand what is actually happening, so that he can go on to use the hardware in less conventional ways.

All in all, we liked the Imagination Machine. The editor says he wouldn't have one himself (what on earth would he do with another computer?), but for the beginner it makes good sense. It all goes together nicely, it plays some fun games, it's well supported with beginner's software, and best of all it's excellent value for money. □

FREE READERS' CLASSIFIEDS*

READERS: New shipment of books for the enthusiast. Latest titles include: But It Was Only A Syntax Error and the new blockbuster from England, How To Turn Your Computer On. Visit us at our showrooms, 15 Interface Road, Bucket SW1.

ARE: An unusual acronym that stands for Arcane Research Enthusiasts. We are a small but growing band of believers with proof that Darwin was wrong and life does not evolve — we know it comes from a 16-bit processor. See us on any street corner for further details.

For Sale: Due to pressure of work and absence of husband at bowls club each night, one 8080 based S100 system and Discus, several very pretty hand-embroidered 8-inch disks, a selection of recipes from Margaret [illegible] and complete [illegible] back-

FREE: Write a program for us and we will supply *free* to you photostat copies of Maximillion Dollar's latest address. Contact the Ripoff Quick Programs Bought Company, Department Y, PO Box 1, Senegal.

FANTASTIC: Hi there, my name is Roxanne. I would like discrete meetings with businessmen or computer enthusiasts. Bankcard welcome. Box †3*24, YC.

For Sale: Handy selection of little-used calculators, one failry old Chinese abacus, one very old adding machine, box of crayons, bits of paper [illegible] portable typewriter. [illegible] inets, six [illegible]

CLASSIFIEDS: We hear there's a lot of people out there with quirks. Well, just remember, we are the original quirk servicers. Only $5 for a quick touch-up, or $25 for a complete semi-conductor lube oil change. Max's Garage. No credit.

Wanted Known: Whereabouts of wife last seen in loungeroom, watching me with my new computer. Mary, I don't understand why you left, but I chatted with the marriage guidance counsellor and I'm sure everything will work out. John.

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NEXT ISSUE

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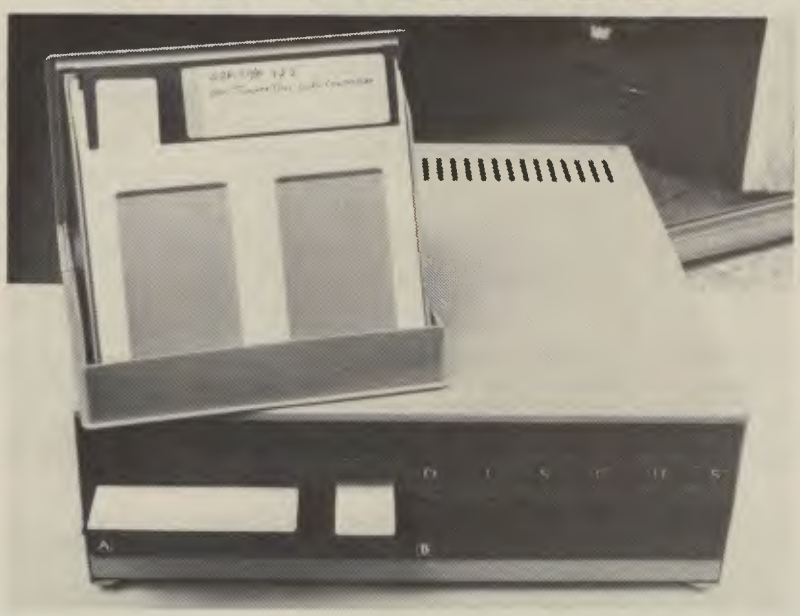
MARKET DIRECTORY

The addition of disk drives to your system marks its coming of age. For S-100 computer owners, the range of controllers is big.

Here, LES BELL tells his own tale of happiness with one of the popular systems, the Discus 2D.

THERE'S A LOT TO DISCUS



THE best part of two years (or was it — it certainly feels like it), I toiled with a home-brewed S-100 system, only a cassette interface for mass age. It wasn't so bad; I had BASIC, a assembler and text editor, all kinds oftware I'd concocted, but, frankly, ng four (count them, four) minutes for BASIC tape to reload after I'd crashed gan to strain my patience to the limit. his wasn't helped by those advertise- ts for Lifeboat Associates that were nning to appear at that time, listing es of fantastic software — all of it gned to run on a disk system under M. the time had come, as the walrus and after some pleading with the k manager, I looked around at what available.

ost of my system at that time was ed on thinker Toys (aka Morrow gns) boards, and my experiences with d all been fairly favourable. George row is a genius digital designer, and

your computer REVIEW

the CPU, dynamic-memory cards and cassette interface in my system were all full of cunning tricks to get maximum performance out of minimum hardware.

After looking around for a while, I decided on "better the devil you know" and ordered a Discus system, by Morrow.

Originally, bearing my budget in mind, I'd intended to buy a single drive system; but when I thought of the hassles of duplicating disks on only one drive, I decided to go the whole hog with a dual disk system. As I'll explain later, the single drive system doesn't really pose as big a problem as I'd thought, so single drive buyers needn't feel discouraged.

In due course it arrived, and late on a Friday afternoon I picked it up and headed homewards to set it up. Tech classes held me up until after 9 pm and then I made record time home to set it all up.

Controller Board

The controller board is a double-sided board (obviously), and is based on the Western Digital WD1791 controller chip. As well as the disk controller circuitry, the board also carries a serial port, and the software supplied is set up to run through it. Quality of construction is excellent, and the board is well laid out, with all chips socketed, a *must* when fault-finding.

The controller circuitry is memory-mapped, at location E000 hex, and occupies 1 Kbyte of the computer's memory map. The reason that it's so big is that there's a 2708 EPROM on the board, which contains much of the driving software for the controller chip, as well as the console I/O routines for the serial port. For this reason, much of the disk operating system's BIOS (Basic Input/Output System) consists of calls to routines in this EPROM.

These utility routines are available to the intrepid programmer who wants to write his own operating system or to access the disk directly. The routines can be used to set the track and sector to be accessed, the DMA transfer address, the drive selected, the density, and other parameters, as well as performing the actual read or write operation.

Despite the 1K of firmware on the board, the BIOS for the Disk Jockey controller is still fairly large. This is because the controller can write either standard 128 byte sectors in single density, or in double density, sectors of either 256, 512 or 1024 bytes in length. It does this automatically; it detects the formatting of a disk on either a cold or warm boot, and sets itself in the appropriate mode before reading or writing.

The disk capacity is dependent upon the density and sector length. In single density a single-sided disk will hold 243 Kbytes; in double density, with 256 byte sectors, the capacity is 486 Kbytes, while with 1 Kbyte sectors, it increases to 600 Kbytes. The use of longer sectors also improves the speed of the system.

The board also carries 1 Kbyte of RAM for workspace and a disk buffer. Although this means that it occupies a total of 2K of the system's memory, if it gets in the way, it can be switched out through the use of bank selection circuitry. For systems without a front panel or monitor program, there is a jump-start circuit on the board.

The Drives

The floppy disk drives are mounted in a strong, steel cabinet, side by side. The drives in my system are Shugarts, but I understand that Morrow may have changed to a different supplier by now. The sky-blue cabinet (biege optional) is low-profile and matches the computer nicely.

Mounted behind the disk drives is an ample power supply for the drives and circuitry; which brings me back to the original narrative.

Late on that Friday I arrived home, ripped the carton open, plugged everything in and switched on. Nothing. Not even smoke, thank goodness. But not a whirr from the motors.

Screwdriver in hand, I took off the cover and the problem was immediately obvious. The power supply connectors were not plugged into the drives. Since these export models have a 240V power supply, the factory disconnects it while testing the drives on an external US 110V power supply. Someone at the factory had simply forgotten to reconnect the internal power supply.

A few minutes later everything was in place again, and I powered up. Whirr, clunk! And the system signed on perfectly on the serial terminal I had borrowed.

Software

The Discus is supplied with a disk operating system called DISKATE. This standard combines an operating system, text editor and assembler in one package, and is an extremely powerful piece of software. It's too complex to go into here; suffice to say that using DISKATE is an acquired taste and skill. It's nothing like CP/M, and has some very unusual features. For example, you can load and execute programs anywhere in memory (except over DISKATE itself). It also provides a sophisticated macroprogramming mode, including automatic execution of multiple files on power-up (very useful for customising your system). DISKATE can even call itself recursively (very useful, on occasions), and a program running under DISKATE can call DISKATE to execute a command line anywhere in memory.

Along with DISKATE, the system boasts an unusual BASIC called BASIC-V. This is a BASIC with virtual memory management; it uses the disk as its main memory. This allows the execution of programs much bigger than memory, and the use of many more variables and arrays than memory could possibly hold.

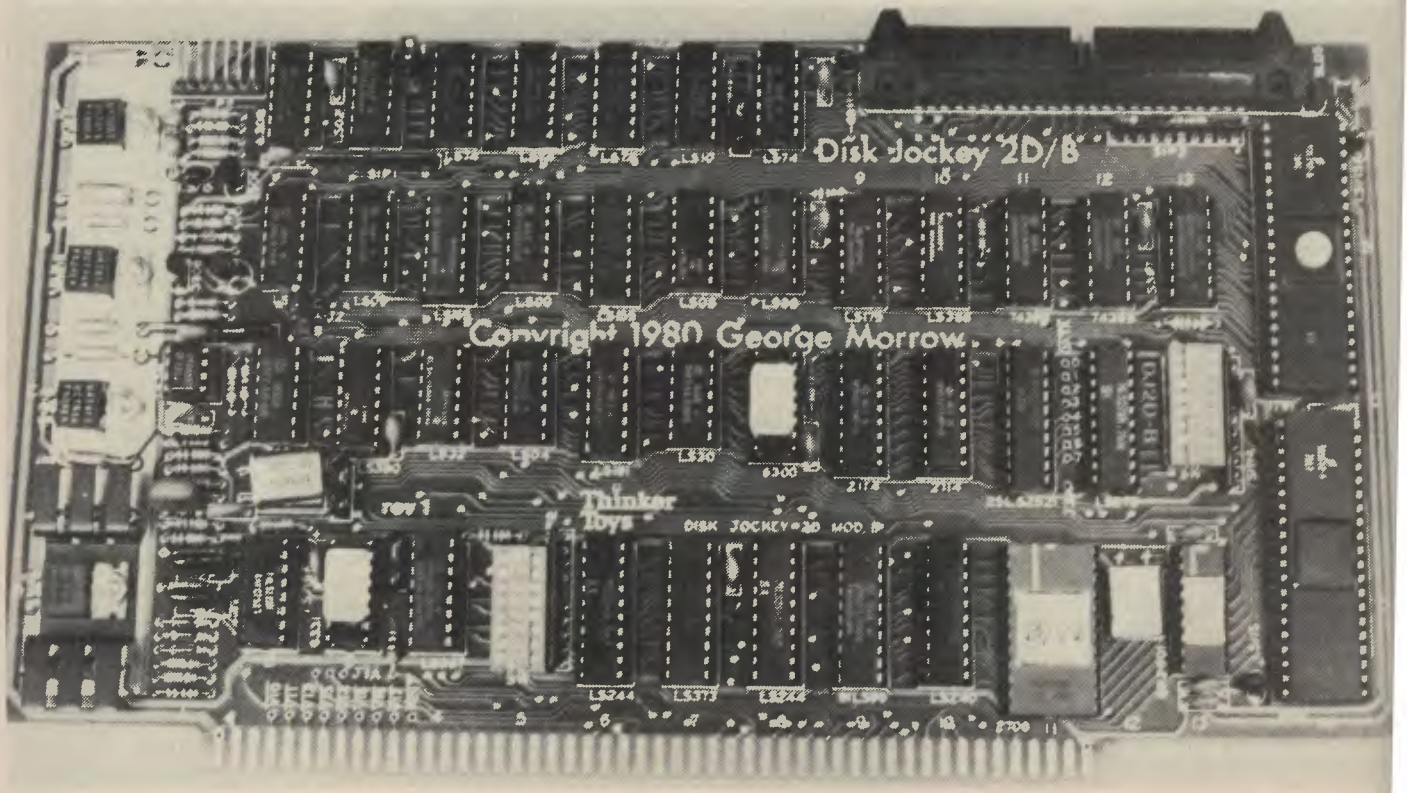
BASIC -V acts as though you have 8 Megabytes of RAM in your system.

There are no file-handling commands; as far as the programmer is concerned all data structures co-reside in main memory. Even the operating manual for BASIC-V is on the master disk, as the value of the string variable MANUAL$.

BASIC-V has a few restrictions; no exponentiation or transcendental functions, for example; and it has a totally different flavour from more conventional BASICs. I've never seriously used it, and so can't provide an in-depth report, but I've an artificial intelligence project getting under way currently, modelling some aspects of human behaviour, and this will require the use of large arrays and perhaps some of BASIC-V's other unusual features.

The CP/M package for the Discus

The Discus controller board.



stem is excellent. It includes, of course, usual CP/M utilities (ASM, DDT, ED, BMIT and so on), but it also has a few ks of its own. Principal amongst these the provision of a special CBIOS stomised BIOS) for the Exidy Sorceror ich (along with some sneaky tricks in rdware) allows the system to be used the Sorceror without glitching that stem's dynamic RAM. Source code is pplied for the CBIOS's so modifying the stem software is a matter of editing and ssembling, then using the CP/M utils MOVCPM, DDT and SYSGEN to put new system onto disk.

To help with modifying the system, re is also a program called VEUSER, which writes the modified OS on disk after patches have been de to the machine code. But the nicest ity of all is a program called SINGLE, ich makes a single drive look like a dual stem. It does this by patching itself into /M and fooling CP/M into thinking that re are really two drives on-line. Just out anything a two-drive system can do, n be done with a single drive using this gram. It just takes a lot more patience you insert and remove disks.

ocumentation

The manuals supplied with the system ver the hardware design in detail and also provide examples of the use of the on-board firmware. Two other manuals cover the use of DISKATE and BASIC-V, while CP/M is covered by the digital Research documentation. The hardware documentation is not intended for the novice, but the remaining manuals are fairly easily comprehensible.

I found the Discus system made a tremendous difference to what I could do with my computer. In no time I was running several versions of BASIC, C, WordStar and other good software.

It all ran straight away, with no problems. The extended features of the BIOS make it a pleasure to use, and I've experienced none of the horror stories you sometimes hear from other disk users.

In a year of heavy use, I've had no problems with the system at all. It's been moved about a lot, and been subjected to abuse from my hairy software crashing and filling memory with garbage. Yet it's never (yet) destroyed a disk content. It's reliable, and has no problems reading single density disks written on other systems. Best of all, all of the Lifeboat software is available to me.

The Discus 2D system costs around $2000 assembled and tested (excluding sales tax). I got mine from Planet Three Systems, 47 Birch Street, Bankstown, NSW. □

Discus 2D disk system

sk size:	8-inch.
pacity:	243K (single density). 600K (double density).
ock Speed:	Will work with 2 MHz, 4 MHz, and 5 MHz.
wer-on jump:	To any 2K boundary.
dressing:	Memory-mapped.
M:	1K, bootstrap and disk primitives.
M:	1K, disk buffer.
erface type:	S-100.
rial interface:	RS232C and 20 mA current loop.
ndard software:	DISK/ATE assembler, text editor, monitor and operating system, BASIC-V virtual memory BASIC interpreter.
tional software	CP/M, Microsoft BASIC, Microsoft FORTRAN.
cumentation:	Adequate; requires digging into at first.

How Much? For What? Oh...

S THE business person who will benefit st from Discus.

Trying to find ways of economically reasing your office computer's data se or getting the computer to digest ts with a bit more snap in its step can be resome problem.

The Discus is an 8-inch twin-drive disk tem for S100 based computers, ing the Exidy Sorcerer.

Discus disks are double density and cause it runs CP/M is compatible with adaptable to a lot of business software. your business computer is running inch disks, the Discus could provide nstant answer if the current data base is too small (or too slow). It's probably cheaper than trying to get the same capacity on 5¼ disks.

The disk is your computer's library; if it's not getting the information it needs fast enough, or has problems finding somewhere to put its discoveries, it's not going to be efficient — and neither is your business.

The enthusiast with an S100 system hankering for a bit more capacity will enjoy the Discus's flexibility and friendly attitude to bungles. It's been built tough and can take more punishment than anyone would sensibly give it. □

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For further information, call Dave Masters on 597-2459 or write to .

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POCKET PROGRAMS

TRS-80 WUMPUS

HERE'S A version of Gregory Yob's game that will provide all the fun of a big adventure-type game without the expense — either money or memory space. After seeing the original description of the game in *Creative Computing*, I decided to write my own version, and here it is.

How do you play Wumpus? Easy. After loading the program, typing RUN will allow you to climb into the caves. A little time for the WUMPUS to hide, then when you reach the bottom, the computer will tell you where you may move to. In this version there are 22 caverns. The computer will then give you clues about the adjacent caverns:

I feel a draft	—	pit nearby
I hear squeaking	—	bats
I smell a Wumpus	—	WUMPUS

Pits are bottomless and will finish you off. Bats are just a nuisance and will pick you up and dump you anywhere — even to more bats, a pit or onto the Wumpus' dinner plate. If you smell a Wumpus you may shoot at him, but beware — if you walk into his cavern he will eat you.

The easiest way to learn this game is to play it. So type it in and go.

The current version runs on a 16K level 11 TRS-80 with about 12 K left (with a little shoe-horning it'll run on a 4K system). Have fun and get them Wumpuses (Wumpi?) but watch out for protesters — they're an endangered species!

Jonathan Masters

```
10 POKE 16553,255
20 CLS
30 RANDOM
40 PRINT TAB(10)"WUMPUS  J. MASTERS
   SUMMER 1980"
50 AR=6:EX=0
60 RESTORE
70 PRINT:PRINT "YOU ARE GOING DOWN
   INTO THE POTHOLE...."
75 PRINT "....THE WUMPUS IS SCUTTLING
   TO HIDE"
80 DIM C(22,5)
90 FOR D=1 TO 22
100 R=RND(22)
110 FOR E=1 TO D
120 IF C(E,1)=R THEN 100
130 NEXT E
140 C(D,1)=R:C(R,0)=D:C(D,5)=RND(15)
150 NEXT D
160 FOR L=1 TO 22
170 READ L1,L2,L3
180 C(L,2)=C(L1,1)
190 C(L,3)=C(L2,1)
200 C(L,4)=C(L3,1)
210 NEXT L
229 W=RND(22)
230 IF W=1 OR C(W,5)<3 THEN 229
240 DATA 2,3,5,1,3,5,1,2,4,3,5,6,1,2,
    4,4,7,9,6,8,11
250 DATA 7,9,10,6,8,14,8,12,13,7,15,
    16,10,13,17,10,12,17,9,18,19
260 DATA 11,16,22,11,15,22,12,13,21,
    20,19,14,20,18,14,18,19,21
270 DATA 20,17,22,15,16,21
280 PRINT
290 PRINT
310 CN=RND(22):IF C(CN,5)<3 OR CN=W
    THEN 310
320 B=C(CN,2):C=C(CN,3):D=C(CN,4):
    E=C(CN,5):A=C(CN,1)
340 PRINT "YOU ARE IN CHAMBER
    NUMBER ";A
350 GN=GN+1:PRINT "THIS CHAMBER
    JOINS";B;", ";C;", ";D
360 IF A=W THEN PRINT "CHOMP CHOMP...
    (YOU'VE BEEN EATEN BY A
    WUMPUS)":GOTO 570
370 F=0:IF B=W OR C=W OR D=W THEN
    PRINT "I SMELL A WUMPUS":F=1
380 PV=1:PV$="I HEAR SQUEAKING":GOSUB
    10000
390 PV=2:PV$="I FEEL A DRAFT":GOSUB
    10000
395 PRINT
400 IF E=1 THEN PRINT "WOOPS TOO LATE
    THE SUPER BATS GOT
    YOU":CN=RND(22):GOTO 320
410 IF E=2 THEN PRINT"UH-OH...I THINK
    YOU'RE FALLING DOWN A PIT":GOTO
    570
420 PRINT "YOU HAVE ";AR;" ARROWS
    LEFT":IF AR=0 THEN PRINT
    "UH-OH":GOTO 570
430 IF F=0 THEN 460
440 INPUT "DO YOU WANT TO SHOOT?";S$
450 IF S$="Y" THEN 630 ELSE IF S$<>N
    THEN PRINT "HEY ":GOTO 440
460 INPUT "WHICH CAVERN DO YOU WISH
    TO MOVE TO";AA
470 IF AA=B THEN FF=B:GOTO 520
480 IF AA=C THEN FF=C:GOTO 520
490 IF AA=D THEN FF=D:GOTO 520
500 PRINT "HOW!"
510 GOTO 460
520 CN=C(FF,0)
550 PRINT:PRINT:GOTO 320
560 PRINT "YOU LOSE"
565 PRINT "SCORE = ";-(AR/GN)*100
570 PRINT "HERE IS A WUMPUS MAP..":
    GOSUB 740
580 PRINT "WELL, THAT'S THAT. NOW BE
    A GOOD"
590 INPUT "OLD CHAP AND PLAY SOME
    MORE?";S$
600 IF S$="N" THEN PRINT
    "CHICKEN!":END
610 CLEAR
615 GOTO 50
620 PRINT "HUH! BE A GOOD ";:GOTO 590
630 INPUT "TO WHICH CAVERN DO YOU
    WISH TO SHOOT?";GG
635 AR=AR-1
640 IF GG<>B AND GG<>C AND GG<>D THEN
    PRINT "HOW!":GOTO 630
650 IF GG=W THEN 680
660 PRINT "TWING, TWANG...CLUNK YOU
    MISSED":GOTO 460
670 AR=AR-1:GOTO 460
680 CH=RND(100)
690 IF CH>75 THEN PRINT "HA HA, HE
    MOVED" ELSE 720
700 W=RND(22)
710 GOTO 460
720 PRINT "AAAAEEEEIIIIOOOOUUUU, DEAD
    WUMPUS"
725 PRINT "SCORE = ";AR/GN*100
730 GOTO 570
740 FOR L=1 TO 22
750 FOR M=1 TO 4:PRINT USING "##";
    C(L,M);:PRINT "  ";:NEXT M
755 IF C(L,5)=1 THEN A$="B":GOTO 758
756 IF C(L,5)=2 THEN A$="P":GOTO 758
757 A$="I"
758 IF C(L,1)=W THEN A$=A$+"W"
759 PRINT A$;STRING$(10," ");:IF
    LEN(A$)=1 THEN PRINT " ";
760 IF L/2=INT(L/2) THEN PRINT
765 NEXT L
770 RETURN
10000 BB=C(B,0)
```

```
0010 CC=C(C,0)
0020 DD=C(D,0)
0030 IF C(BB,5)=PV THEN PRINT PV$;
0040 IF C(CC,5)=PV THEN PRINT PV$;
0050 IF C(DD,5)=PV THEN PRINT PV$;
0060 RETURN
```

TRS-80 SOFTWARE TIMER

WAS bitten by the micro bug two and a half ears ago and decided I wanted a ready-built ome' computer. I looked around, talked to nowledgeable friends, I read the magazines nd, finally, I talked to the salesman.

He, it seemed, had the panacea for all my ome organisational problems: I could balance ny cheque book, store all my wife's recipes nd call them up any time she needed them, I ould help my daughter improve her mathematics by setting her to work 'interactively' ith the machine. The number of household roblems I could solve seemed infinite.

So I bought this wondermachine and found as, I suspect, have many others) that the ome computer has the opposite effect.

It turns you into a fanatic, you create rograms of little practical use (at least for the ome); you find you have insufficient memory, ie cassette recorder is too slow and you must ave a printer — and it turns out that all the oney you thought you would save with omputer budgeting is spent tenfold on the arious vital extras.

Unless you are extremely fortunate it can be a quicker way to marital problems than having your mother-in-law living with you.

I did all these things; I bought more memory, the printer and the extra bits and pieces. And I did balance my cheque book (what was left to balance), as well as improving my mathematics.

But it wasn't the cure-all I thought it would be.

This worried me, so over Christmas I gave some thought to finding a really useful program. I wanted something interesting and useful, and the program listed below satisfied me! It's a software timer for the kitchen, in an older format. The idea incubated and hatched over a breakfast egg on Boxing Day.

The program it creates is an "hour-glass" egg timer, and allows you to vary the rate of flow of sand through the neck. It is written in Level 2 BASIC for the TRS80, so a few comments might help anyone else wishing to modify it for other machines.

- Lines 5 and 7 initialise the system
- Lines 15 – 17 set up the sand flow rate
- Lines 20 – 79 create the egg timer shape
- Lines 80 – 150 fill it with sand
- Lines 155 – 255 trickle sand through
- Lines 230 – 340 refill the top section
- Lines 1000 – 1040 are a subroutine that actually removes sand from the top section and places it in the bottom.

The program has been found to produce reasonable quality eggs, either soft or hard boiled. We are at present working on an audible alarm and controller for the stove!

Anyhow, use your imagination and if you think there are more uses or better ways of doing it let me know. Good Cooking!

—Dave Masters

```
2  REM:PROGRAMMABLE TIMER
5  DIM P(21,2),V(7,2),Q(29,5)
7  A$="*"
10 CLS
15 I=1:INPUT "TIME REQUIRED IN
    SECONDS (MUST BE > 30) ";T
17 TK=(T-27)*30/70
20 FOR Y=0 TO 180 STEP 3
30 X=15*COS(Y*0.0174533)
35 X=INT(X):Y1=Y/9+5:Y2=(Y+4)/9+5
40 SET(X+80,Y1):SET (127-(X+81),Y1)
45 SET (X+80,50-Y1):SET
    (127-(X+81),50-Y1)
50 IF FIX(Y1)=FIX(Y2) THEN 70
55 IF I>21 THEN 70
60 P(I,1)=X+80:P(I,2)=127-(X+80):I=I+1
70 NEXT Y
75 FOR X=29 TO 97
76 SET (X,4):SET(X,46)
77 NEXT X
78 M=1:FOR L=3 TO 47:IF M=-1 THEN Q=1
    ELSE Q=0
79 SET (30+Q,L):SET (95+Q,L):M=M*-1:
    NEXT L
80 FOR L=3 TO 21 STEP 3
90 V(L/3,1)=INT((P(L,1)+3)/2):
    V(L/3,2)=INT((P(L,2)-3)/2)
100 NEXT L
110 FOR X=64 TO 320 STEP 64
115 R=X/64
```


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POCKET PROGRAMS

```
120 FOR Y=V(X/64+1,2) TO
    V(X/64+1,1)-1
125 C=Y-(V(2,2))+1
130 PRINT @ X+Y+64,A$;
135 Q(C,R)=X+Y+64
140 NEXT Y
150 NEXT X
152 PRINT@896,"IT'S SET NOW";
153 PRINT@960,"PRESS SPACE";
154 IF INKEY$<>"" THEN 155 ELSE 152
155 W=9
160 FOR N=1 TO 5
165 FOR P=0 TO 14
170 O1=Q(15+P,N):O2=Q(15-P,N)
172 IF O1=0 THEN 220
173 IF O1=O2 THEN 176
175 O=O1:GOSUB 180
176 O=O2:GOSUB 180
177 NEXT P:GOTO 220
180 PRINT @ O," ";
190 GOSUB 1000
200 PRINT @ 1022-O+64,A$
210 RETURN
220 NEXT N
225 PRINT CHR$(28);:PRINT"  ";:PRINT
    CHR$(28);
230 PRINT "DO YOU WISH TO RETIME, Y
    OR N";
235 Q$=INKEY$:IF Q$="" THEN 235
240 IF Q$="Y" THEN 300
250 IF Q$="N" THEN END
260 GOTO 235
300 FOR L=1 TO 29
310 FOR M=1 TO 5
315 IF Q(L,M)=0 THEN 330
320 PRINT @ 1022-Q(L,M)+64," ";
325 PRINT @ Q(L,M),A$;
330 NEXT M
340 NEXT L
999 GOTO 152
1000 FOR T=1 TO 7
1010 PRINT @ 415+T*64,A$;
1020 FOR TM=1 TO TK:NEXT TM
1025 IF N=9-T THEN RETURN
1030 PRINT @ 415+T*64," ";
1040 NEXT T:W=W-1:RETURN
```

C what I mean?

DG640 GRAPHICS DRIVER

WRITTEN IN C and easily adaptable to other VDUs, these routines can be used as they stand, or used as a guide for assembly language programming.

These routines came about as the result of a few idle hours one evening. Having seen C promoted as a good systems programming language, for writing operating system utilities, etc, it seemed like a good opportunity to try it out, improve my backward C programming and get graphics onto my old 640, thereby killing three birds with one stone.

C, and in particular BD Software's C compiler, will be the subject of a separate review, so I don't propose to go into too much detail here, but a few notes will aid comprehension for the uninitiated.

Function grf(c):

This function sets or resets the graphics mode. Calling this function with a value of 1 (grf (1)) sets the graphics bit in the 640's memory: calling it with a value of 0 resets the graphics bit. The variable n is a pointer to a location in memory, the variable *n is the location being pointed to. This function would be easy to rewrite in machine code, and quite a bit faster.

Function clrscr(c):

This function clears the screen in either mode. If it is called with a value of 'g' it fills the screen with a value of 0, turning off all graphics bits. If the function is called with a value of 'a' (or any other character) then it fills the screen with hex 20's (spaces).

Function set(x,y):

The screen is split up into 128 horizontal × 64 vertical pixels, with the top left hand one having coordinates (0,0) and the bottom right (128,64). The set function first works out in which byte of screen memory the pixel to be set is stored, and then masks it out using an OR function. Unusual symbols here:

| means OR

<< means
shift the left value to the right a number of bits given by the value on the right.

% means
give the remainder when the left value is divided by the right value.

Function reset(x,y):

The reverse of set(x,y). Two more functions you never see in BASIC:

~ means 1's complement (NOT)

& means AND

Function test(x,y):

I've thrown this one in for what it's worth, which is not much, as it is UNTRIED and UNTESTED. It should work though (tell me if it doesn't, I might try to use it some day!).

Function flip(x,y):

Inverts a bit on the screen, making white black and vice versa.

The – function is exclusive OR, by the way.

Function circle(x,y,r):

Draws a circle at x,y with radius r. This is a first attempt which worked first time except for one minor bug which I haven't had time to fix — it leaves gaps here and there, because it doesn't work out all the possible y values for each x. Similar functions could be written for other shapes, either calculating them, as here, or drawing them from tables of values. The sqrt function called here is NOT part of the C language; I had to write it myself because BDS C is not, in any manner of speaking, a mathematical language. So here it is.

Function sqrt(n,k):

This is the most embarrassingly bad square root function I've ever seen. It's slow, and it only returns an integer value, but I'm quite pleased with it. It is based on the Newton-Raphson method of calculating a square root from an initial guess, and is called with n as the value to be square rooted and k as the number of iterations to be performed (thus giving the calling program the option of trading off accuracy against speed and lower memory requirements).

The routine is recursive, that is, it calls itself repeatedly, decreasing k by 1 each time, until k = 0, when it guesses that sqrt(n) is approximately n/2, and then returns to itself repeatedly, improving its accuracy as it goes. It's slow, and probably eats memory; about all it's got going for it is that it's short and works!

```
#define VDUBASE 0xf000
#define SCRWID 64

grf(c) /* set grafix mode */
int c;
{
        c = 2 * c;
        setmem(VDUBASE + 0x400, 0x400, c

/*      char *n;
        for(n = 0xf400; n < 0xf800; n++)
                *n = 2 * c;
*/
}
```

```
clrscr(c) /* clear screen */
char c;
{
        char *n;
        if(c == 'g')
        {
                for(n=VDUBASE; n<0xf400; n++)
                        *n = 0;
        }
        else for(n=VDUBASE; n<0xf400; n++)
                *n = 0x20;
}

set(x,y) /* set pixel at coords x,y */
int x,y;
{
        char *n, mask;
        n=VDUBASE + x / 2 + y / 4 * SCRWID;
        *n = *n | 1 << (2 * ( y % 4 ) + ( x % 2 ));
}

reset(x,y) /* clear pixel at x,y */
int x,y;
{
        char *n, mask;
        n = VDUBASE + x / 2 + y / 4 * SCRWID;
        *n = *n & ~(1 << (2 * ( y % 4 ) + (x % 2)));
}

int test(x,y) /* test pixel at x,y. Returns 1 if set,else 0. */
int x,y;
{
        char *n, mask;
        n = VDUBASE + x / 2 + y / 4 * SCRWID;
        mask = 1 << (2 * ( y % 4 ) + ( x % 2 ));
        mask = mask & *n;
        if(mask != 0)
                return 1;
        else return 0;
}

flip(x,y) /* invert pixel at x,y */
int x,y;
{
        char *n;
        n = VDUBASE + x / 2 + y / 4 * SCRWID;
        *n = *n ^ 1 << (2 * ( y % 4 ) + ( x % 2 ));
}
```

```
circle(x,y,r)   /* draw circle at x, y, radius r */
int x, y, r;
{
        int i, px, py, py1, i2, r2;

        r2 = r * r;

        for(i = -r; i <= r; i++)
        {
                i2 = i * i;
                px = x + i;
                py = y + sqrt(r2 - i2, 5);
                py1 = y - sqrt(r2 - i2, 5);

                set(px, py);
                set(px, py1);
        }
}

sqrt(n,k) /* recursive Newton-Raphson sqrt */
int n,k;
{
        if(k == 0)
                return(n/2);
        else return((sqrt(n,k-1) + n/sqrt(n,k-1))/2);
}

line(x1, y1, x2, y2) /* plot line */
int x1, y1, x2, y2;
{
        int n, m, c;

        m = (y2 - y1) / (x2 - x1);
        c = y1 - m * x1;

        for(n = x1; n <= x2; n++)
                set(n, m * n + c);
        for(n = y1; n <= y2; n++)
                set((n-c) / m, n);
}
```

COMPUTERS IN THE CLASSROOM

Computers and education; it's so obvious, you wonder why they didn't think of it when they invented schools (perhaps they simply should have invented computers instead). The computer's role in the classroom is growing daily, and bringing with it its own problems. Your Computer's *regular education features plan to look at those problems, and the benefits of computers; hopefully we'll be able to help ease the growing pains as well as passing on ideas and developments in the field. For our first issue, editor LES BELL has a look at the current scene.*

THE LOW COST of microcomputers makes them extremely attractive to teachers for classroom use, but they seem to be even more attractive to kids (of all ages). The computer has the ultimate fascination of the pinball machine — it's complex, but behaves in a reasonably predictable manner, and there's a certain amount of satisfaction in being able to master the beast.

There are a number of ways in which computers can be used in the classroom. The computer certainly has its advantages but just as certainly it will bring its own problems. With the educational system as subject to public scrutiny as it presently is, more than a few teachers would probably be glad to see the end of computers so they can concentrate on more fundamental problems.

But the computer is here to stay. It won't go away. And teachers and educators will have to face the problems.

The first, of course, is the lack of training for teachers as part of their formal education. A Dip. Ed. is a qualification in teaching, not computers, and now teachers are faced with complex machines which they will have to learn about, and quickly. The level of proficiency required will, of course, depend upon what they want to do with the computer — in some cases, reading the manual will be enough, certainly to run pre-written Computer Aided Instruction (CAI) scripts.

But if some programming is included (in a computer literacy course, for example) a higher degree of knowledge is required. Traditionally the teaching of programming has been the responsibility of the maths teacher. This has led to a strong emphasis on the mathematical aspects of programming; a great pity, as many of the modern applications of computers do not involve maths at all (like word processing, graphics, computer music, computer art, computer games). The tide is turning now, however, and teachers with many and diverse backgrounds are becoming involved with computers.

Let's look at some of the ways in which computers can be, and are, used in schools.

Computer Literacy

Given that computers are so cheap that schools can buy them, it follows that they are cheap enough to appear in other sections of the community: offices, shops, banks, you name it. It is important that kids grow up without the inhibitions that characterise the average adult's first contact with a computer.

I've manned stands at computer shows, and seen adults refuse point blank to touch the keyboard of a computer. There are two reasons for this; people are embarrassed that they'll make fools of themselves by not being able to make the computer do something, or they're afraid they might damage it some way (although, as Apple Computer points out, the only way you can damage a computer this way is by typing with a hammer).

Children on the other hand, generally plunge straight in (although the older ones show signs of those adult inhibitions).

That's why we need courses in computer literacy. Everyone should have the opportunity to run a few programs, play games, maybe even write programs, and learn what a computer can and cannot do. Just enough to take away that fear. The topics covered in such a course can be simple: what the computer is, the keyboard, the screen; mass storage, cassettes and disks; running short programs; playing games; using the computer as a calculator; writing short programs.

Computer Programming

Some students, particularly those in the sciences, will be interested in learning the rudiments of computer programming. Most of them will be fairly proficient in maths in any case, so such a course can fairly contain a certain amount of mathematical orientation. In general, though, it is better to make a programming course independent of maths.

The course will usually fall within the domain of the maths department, as it did at my old school (where, believe it or not, we wrote Algol programs which were sent to a computer centre 180 km away, by mail! Data communications were crude in those days).

The pitfall in this case is dwelling on the mathematical aspects rather than the programming ones. For example, take a program which calculates the prime numbers between one and 1000. It is tempting to muse on Eratosthene's Sieve, and some of the properties of prime numbers, rather than the problem at hand: which is the flow of control, the program structure. In a first programming course, the accent is on the implementation of algorithms, not their selection or design. That can come later (but not much later).

For this reason, quite simple algorithms can provide meat for some challenging programming — draw a square, draw a triangle, make a sound. As pupils get more advanced, and they do so rapidly, the problems can become more real-worldly: sort this sequence of numbers; change the program to sort words instead; how would you move this series of characters from here to here inside this block of text?

These problems require no mathematical expertise for their solution, yet if the teacher desires, the algorithms can be given a mathematical treatment for those pupils who would benefit from it. More to the point, the student can learn a lot by counting how many times the program goes through a particular loop, and counting how many instructions there are in the loop.

Computer-Aided Instructions

Computer-Aided Instruction describes the use of computers as an actual teaching device. In other words, the computer actually delivers a lesson on *any* topic, and may even administer a test at the end of the lesson.

This grew out of the self-administered programmed learning texts which appeared many years ago with some success. Basically, the books would offer information 'one bite at a time', then ask a question and direct the reader to the next frame which depended upon his answer. If correct, this would lead to the next unit of information; if wrong, it usually explained the mistake and repeated the question.

These books suffered from two limitations: they could only cope with multiple choice answers, they were usually easy to cheat on.

Computers suffer from neither drawback. Given that there is only one or at most a few correct answers to a question, the computer can reject all others (although its explanation of why a response is wrong will necessarily be limited in that case). Furthermore, it is impossible to cheat on the machine, as it will not let you peek at the following page. There is no searching to be done to get to the correct page; the computer just jumps there.

The computer can also keep score of correct and incorrect answers as it goes along, and then supply the teacher with a record of each child's score, and even point out the problem areas. Other nice features: the computer is infinitely patient, and will sit waiting for a response while the child thinks; it can give the pupil two, three, or more attempts at the correct answer, and count the attempts; and it can offer encouragement and rewards through personalised messages, or the opportunity to play a game at the end of the lesson.

Pre-recorded CAI programs are available from several sources; the Apple II computer, in particular, is well supported with CAI software. At present, the software is mainly oriented towards primary school activities such as simple arithmetic (up to long division), spelling and so on. These commercial packages are quite sophisticated, performing analyses for the teacher and so on, but their American origin leads me to suspect their value for teaching spelling (and this from a guy who spells program like that?).

In addition to buying-in software, of course, you can write your own. You can do this in BASIC, for simple jobs, or you can use the specialised language PILOT (Programmed Inquiry, Learning Or Teaching) to do the job. PILOT is a stripped-down programming language with not much more than the ability to ask questions and evaluate the responses. Some versions of PILOT, however, incorporate sophisticated pattern-matching techniques to detect near-misses due to spelling errors or typing mistakes.

One limitation of computers for this kind of work is their inability to provide graphic or pictorial information. This is particularly important with younger children whose attention span is limited and whose reading ability is not so well developed. The newer computers, though, do provide excellent colour graphics, making them ideal for use with young children.

Apple PILOT, for example, provides graphics, animations and sound effects, all of which will hold a child's attention. It also allows the creation of special character sets for foreign language teaching, and will even time students' responses.

Games and Simulations

Many of the games available for home computers are just that — games. But games do have a definite role in a child's development, and computer games (when they are not **too** fantastic) are no exception.

The best kinds of computer games are simulations. Much of the early work in this area was done by the DEC-sponsored Huntingdon Project in Buffalo, New York (if my memory serves me right). These games all simulate real-world situations.

Take an example:

In the game Hammurabi the student plays the part of the administrator of ancient Sumeria. Over a (simulated) ten-year period, Hammurabi has to decide each year how many acres of land to buy, how many bushels of grain to feed the people, how much seed to plant. The program then calculates the impact this will have on the city's grain stores and its starving people. Plague, harvest yields, and rats eating the grain all play their part, and it is quite difficult to survive a full term of office without being thrown out by the starving populace.

Hammurabi is really a simplified, but non-trivial, exercise in practical economic/ecology/population dynamics. The value of the model lies in the way it brings home the complex relationships between a few variables — things just aren't quite as simple as intuition leads you to believe.

Other simulations can be constructed for lessons in economics, physics, chemistry, commercial studies, geography, history, ecology, biology (like foxes and rabbits on an island) and other subjects.

The best way (though the most difficult) to use a model is to build it up as you go. There is no better way to test your understanding of a process than to try to explain it to a computer. If your simulation corresponds reasonably closely to observed real-life behaviour, then you can be reasonably sure you have a good understanding of the real world.

Computer versions of war-games and other strategy and tactics games are also good for improving kids' general reasoning power and inductive/deductive logic. If nothing else, computer versions of Space Invaders are good for improving hand/eye coordination.

Simple guessing games are good for younger children, while games like Battleships and Hunt the Hurkle improve the visuo-spatial ability that will be required later in geometry (not to mention computer graphics!).

Over To You

We hope *Your Computer* will function as a source for embattled teachers struggling with their computers. In particular, we want to hear of problems you may face in the classroom, and we hope to be able to include a regular section of information for schools and teachers. Let us know how we're doing, will you? □

THIS COLUMN WILL not just look at CP/M. I'll try to cover the broader topic of Operating Systems (OS) in general but the major focus for the time being will be CP/M, derivatives (such as CDOS) and extensions (such as MP/M and CP/NET). Even if you don't own a computer which supports CP/M now, I think that you'll find some of the broad topics that will be covered here of interest. . . for example I'll be keeping a close watch on what is happening with UNIX on microcomputers. UNIX has the potential to be to ALL microcomputer systems what CP/M has become to 8080/Z80 systems — a universal software bus.

CP/M is not without its faults as an operating system; however the most often quoted ones are usually the most trivial. There are some quietly important ones which rarely get mentioned outside the circles of programmers who have really delved into the system interface level of CP/M. (That is something for another column, later). The point is that CP/M does what it is supposed to do for most users most of the time and that is what counts. There are a lot of big computer users who dearly wish they could say the same about the operating systems they have to struggle with! In general the software available for microcomputers is significantly better than that available on most larger computer systems *except* that it is not as fast and is limited to single user installations but even these limitations are fast disappearing.

CP/M system users have the choice of several BASICs, several PASCALs, two FORTRANs, two COBOLs, three Cs, two FORTHs, two APLs, two LISPs, PL/I, ALGOL, PILOT and several other minor languages, not to mention several different assemblers, editors, debuggers and a host of applications software from a very wide range of suppliers. This is where the real utility of CP/M lies; the end user is not locked in to software from a single or small number of suppliers and, as there is plenty of competition in the marketplace, prices remain reasonable. CP/M lacks the "bells and whistles" that other operating systems, tied to a single set of hardware, can often offer (i.e. the graphics capabilities of the Apple) but this is balanced by transportability of software between hardware from a variety of manufacturers.

UNIX and CP/NET

JUST AS CP/M is reaching its "golden age" as an operating system, we are seeing the emergence of its successors. I believe these will be UNIX (definitely) and CP/NET (possibly). CP/NET is simply a networking extension of the principles evident in CP/M but the significant word is networking (if Telecom ever adopts a realistic policy towards data transmission on its communications circuits). UNIX is something altogether different from CP/M. I'll be going into UNIX in more detail at a later date, but it will suffice to say for the moment that UNIX is a brilliant software tool developed for minicomputers which is now starting to become available for some micros. It is possible to use UNIX as the supervisor for another operating system and at least one manufacturer, Morrow Designs, is providing CP/M to run as a sub-task under UNIX so that users can still utilise their existing software base while having access to the next generation of operating system for new software development or purchases.

Some of you may be wondering why I've left MP/M out of the running as a replacement for CP/M. A working CP/NET system will require at least one MP/M node somewhere so I haven't totally ignored it. However I believe that MP/M is not a realisable operating system for most CP/M users. MP/M has too many limitations as a multi user/tasking OS to make a lot of end users demand it for their hardware and it is difficult to implement successfully on most existing hardware. The successful commercial implementations of MP/M generally use hardware designed with MP/M in mind, such as Micromation's, or existing hardware with extended performance characteristics (and price to match) such as IMS's. I also feel that MP/M is not viable unless the system has a hard disk attached and that means business systems only at today's prices.

The new generation of hardware for computer systems will certainly feature extended memory addressing, memory management in hardware, floating point maths in hardware and be interrupt driven. UNIX has the inherent capabilities to best manage all the facilities and is the host operating system to the "C" programming language. Just so that you know where I stand on languages, I think that BASIC still has a lot of good mileage left in it yet, PASCAL is a toy of the academics, FORTRAN is totally under-rated by most micro users (it is probably the only truly transportable language) and that C is the only language with any hope of becoming as widely used and transportable as FORTRAN; as for PL/I subset G I'm keeping my options open.

PUBLIC DOMAIN SOFTWARE

THERE IS a whole host of public domain software available for the various 8080/Z80 operating systems. To date Australian users have had to shop around both here and in the USA to get access to all that was available. There is now a central local source for this software. An 8080/8085/Z80 users group is now active and has software from CP/M User's Group, USUS (UCSD Users Society), Proteus (SOL Users), NSSE (North Star Users), INSITE and several other smaller user group libraries. The group is called 80AT and the address is P.O. Box 80, Lakemba, NSW.

There are some restrictions on available disk formats but most users should be able to get access to this public domain software in a form they can use. Distribution of Australian public domain software is also planned and contributions of software are being solicited. With all public domain software you find useful tools and rubbish mixed together, but often the real gems are there if you take the trouble to look for them. Some of my most useful and often used pieces of software have come from public domain sources. Even if there is nothing of direct use, public domain software is often a rich source of ideas for your own programming projects. It is cheap too, generally in the $10 to $15 per disk range if you have one of the popular disk formats.

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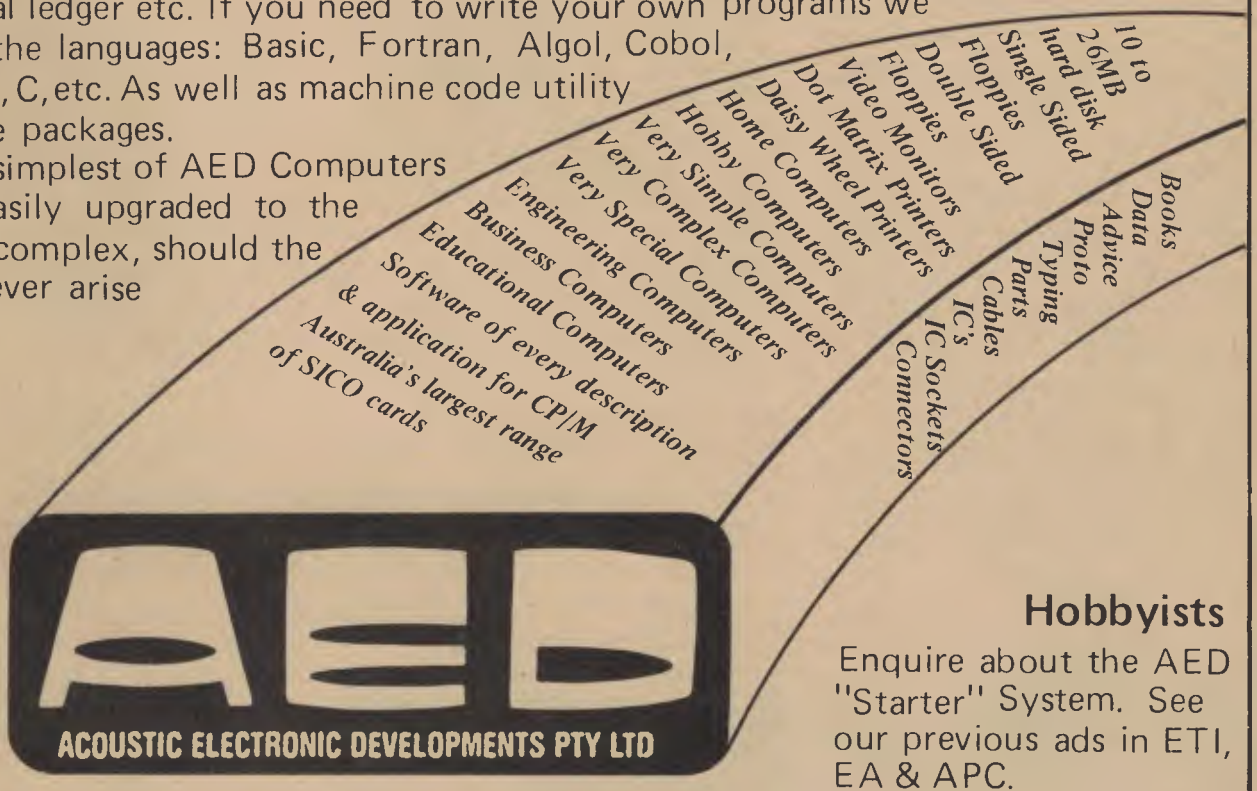

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TO START WITH, the aim of this column is to promote an understanding of the PET/CBM, for users and non users.

The PET uses a 6502 microprocessor, as does the APPLE, ACORN ATARI, OHIO, and the single-board computers SYM, AIM and KIM. The BASIC used is a variation of Microsoft BASIC. Hence any 'basic' BASIC program should run on the PET.

The main problem in translating a PET program comes when such a program uses the cursor control keys which are unique to the PET. These cursor (Curser — to the frustrated non PET user!) controls can be used in any PET program.

This is done by using the print statement, followed by the — " — symbol. For example to print a statement like HELLO SIR on the fourth line you would need to enter PRINT [Q][Q][Q] "HELLO SIR".

The reverse field Q's are the control symbols for the cursor to be moved down 1 line each time.

Another problem is the use of the programmed graphic symbols. To overcome this, you will have to use some imagination. Further to this is the ability to use reverse field characters to highlight the screen. This means that the character is printed as black on a white background. I have included in table 1 a summary of the unique PET cursor control symbols.

By now most PET owners will be aware of the two basic ROM sets, the old and upgrade. These minor changes to the operating system do not affect the ability of the PET to read Basic programs written by each machine (not like Level 1 and 11 on the TRS80). However, if written in machine language or using certain PEEK and POKE commands, the programs are not directly interchangeable.

To further complicate matters there is now a new ROM — BASIC 4.0 and if I can believe US rumours, maybe even a BASIC 5.0 which I since have heard have been available in Canada. However, before panic sets in Commodore can supply the change-over Roms for around $110 through authorised dealers. So if you find that there is a need for you to upgrade, it is possible.

To simplify things for owners, the Old ROM is Basic 1, the Upgrade is Basic 2; Basic 3 did not survive the production stage. Basic 4 is now the latest and has improved disk handling commands. The newly rumoured Basic 5 is also known as Business ROM.

Why the changes? The main enhancements of the changes in ROM were to do with, garbage collection, disk and file handling.

It is worth noting that the original 8K (Basic 1) machines cannot be readily upgraded beyond Basic 2.

How do you tell which BASIC?

Basic 1 . . . "*** Commodore Basic ***" on power up.

Basic 2 . . . "### Commodore Basic ###" (current 3000 series).

Basic 4 . . . "Commodore Basic 4.0" (current 4000 series).

At present in Australia you have the option of BASIC 4 or BASIC 2, although BASIC 2 is fast disappearing. If you want to run a disk drive and use the Commodore mainly for business, then BASIC 4 is the best choice. For home use BASIC 2 is more ideal as many of the entertainment programs like Invaders, Horobat, The Money Game, Night Drive and Car Race do not yet have BASIC 4 versions, hence will not run on the 4000 series.

A few hints on saving space in PET BASIC programs:

- To save space, you can omit the semi-colon in multiple print statements, as the PET defaults to semi-colon formatting.
- Omit the closing quotation mark at the end of a PRINT statement if there are no further items to be printed, or if it is not followed by a colon and other BASIC statements.
- When using DATA statements, quotes are only needed if there are cursor controls, graphics, commas or colons and so on. Omit them in all other cases.
- Use multiple statements per line. This saves the five bytes required for line number and other overhead per line.

The above techniques all save space — they also improve program speed as a side benefit. For out and out raw speed, another trick worth remembering is to avoid using constants in the body of program loops. This is because the BASIC interpreter has to read every character of the constant and then convert it into a floating point variable, all of which takes time. If the number is predefined as a variable, things are much more straightforward, and that's so much time saved!

The following is an example of how you can speed up a program considerably. Try it in all its formats to see how fast the program will eventually run — it's great to know how to speed up your graphics.

SLOW
```
10 FOR I=0 TO 850
20 POKE 32768+I,36
30 NEXT I
```
(where poke 32768 is the first screen location and 36 is poke value of $ sign)

FAST
```
5 Q=32768
7 A=36
10 FOR I=0 TO 850
20 POKE Q+I,A
30 NEXT
```

FASTER
```
5 Q=32768:B=65
10 FOR A=Q TO Q+850: POKE A,B: NEXT
```

Those who want to copy a program which uses RESTORE followed by a line number to the PET may like the following solution which, incidently, can be used for machines other than the PET.

1 — Find all the data statement line numbers and add up the number of items in each statement. Record these for later

2 — Find all the references to restore ine numbers in the program and record hese.

3 — You then work out the number of ines and statements to be read before the ine number(s) that have the restore, line number command.

4 — Use this following one line routine nstead:

**** restore : for X = 1 to ? : read X$: next

where **** = line number and ? = the number of data items to be read prior to those being used by the program.

It's awkward but it works and since PETS don't have restore it's the best available. If any readers have better solutions please write!, also any programming tips which could be passed on to others.

Support Your Local . . .

One way in which owners can get more out of their PET is to join one of the many user clubs around Australia. There are currently clubs formed in Sydney, Melbourne, Adelaide, and Perth. Write to GPO Box 4721, Sydney 2000 and I'm sure they will pass your address on to the right club.

An interesting point I picked up at a club meeting was how to program for sound. I have a sound unit which cost about $32 from my local Commodore dealer and installed it in about 15 minutes (10 of which was trying to work out how to use a soldering iron properly).

My only problem was trying to work out why Commodore didn't include one in the first place but then again hindsight is always an advantage.

At the same time, I found out why I had so much trouble saving programs which had sound included with them. To program sound on the PET, a signal is put out through the second cassette buffer (hence CB2). This signal is generated by using POKE commands.

POKE 59467,16 prepares CB2 for use. POKE 59466,15 establishes a symmetrical sine wave, and then POKE 59464,X, where X is any value between 0 and 255, will produce a sound.

To program a musical tune you will need to play around with different values and delays between these notes. I will include a couple of subroutines to produce some sound effects in the next issue.

Finally, before you can save a program after using sound (whether or not you have a sound unit) you need to 'normalise' things by POKE 59464,0 : POKE 59466,0: POKE 59467,0.

—PETER SANDYS

□ – CLEAR SCREEN
S – HOME
□ – UP 1 LINE
□ – DOWN 1 LINE
□ – ACROSS 1 SPACE
□ – BACK 1 SPACE
□ – REVERSE FIELD ON
■ – REVERSE FIELD OFF

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THE APPLE II has carved a niche for itself as one of the (if not *the)* most advanced personal computers available in Australia; at least in terms of easily available computing power. It's a small, friendly package, inside which lurks a combination of colour graphics and other features that has made it one of the most popular machines in the world.

Now, in its footsteps, comes the Apple III. This new machine incorporates most of the features that made the Apple II so popular, and adds more than a few of its own.

Electronic Concepts recently launched the first Apple III in Australia, and we were able to have a close look.

The Apple III is styled rather differently to the II. The keyboard is larger, and sports a numeric keypad. Otherwise, it's similar to the standard type of keyboard found on most terminals. There's an alpha lock key, to shift the letters into upper case, while leaving numerals and punctuation unaffected. There's also a pair of keys bearing apples, which shifts the machine in and out of Apple II compatibility mode.

The keyboard is interrupt-driven, which means you can type ahead, or input data while the machine is doing something else. In fact, all I/O on the system uses interrupts, which means that the system is capable of running some pretty smart multi-tasking software (if it's ever written).

Another nice feature of the keyboard is the fact the keys are redefinable, so the numeric keypad for example could be used as the function keypad of a word processor.

Immediately above the numeric pad there is a slot for the machine's integral 5¼ inch disk drive. This is the major innovative feature of the machine — the system is entirely disk-based, to the extent the character shapes for the display are loaded from disk on booting up.

Unlike other systems which have the character shapes stored in Read Only Memory, never to be altered, those in the Apple III are stored in RAM, and can be changed easily. This means italic, as an example, can be displayed on the video screen.

The system automatically boots off the disk on power-up. Apple's Sophisticated

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Operating System (SOS) is quite different to the DOS 3.3 used in Apple II. It's modelled loosely on UNIX, and is strongly user-oriented. It is composed of a collection of device drivers which can be changed by the user, and includes common graphics utilities. It will support a common file structure for BASIC, Pascal and FORTRAN, so the UCSD Pascal operating system used on the II will not be used on the III. □

Under the Bonnet

Inside, the Apple III is quite a bit different from its predecessor. The processor is still a 6502, but it's a better version; the III runs 1.7 times faster. There's a memory management circuit so that it can handle a lot more memory than the 64K limit of the processor — in fact, using 64K chips, it's possible to get 256K into the machine!

Standard machines are being supplied with 96K of RAM, although we understand this will be increased to 128K before long.

There are three video outputs — an RGB drive for a colour monitor, a composite colour output and a monochrome grey scale output. The colour graphics resolution is 192 × 280, although in grey-scale output this becomes 560 × 192. We understand all three outputs can be used concurrently, which is a nice trick indeed. A PAL version should be available by now.

The Apple III contains the interface for the Silentype Printer as standard (it's an extra on the II). In addition, other printers can be interfaced through the integral serial interface or, if necessary, any of the Apple II interface cards can be plugged into the four slots provided. Beware, however; not all cards from alternate sources will fit, and there is a size limitation.

There's also a clock/calendar circuit, and a six-bit digital-to-analogue converter feeding to a speaker and a hi-fi jack for high quality audio. There are no games paddles, but there are two A/D input channels which would serve the purpose more than adequately.

Three more disk drives can be attached to the integral controller.

The most impressive thing about the Apple III is its weight - it comes in at a very respectable 10 kg. due to its cast aluminium construction, which doubles as a heatsink for the power supply.

There's plenty to look forward to on the software side. The Apple III uses Apple Business BASIC, which is like Applesoft but with the addition of some goodies such as PRINT USING. There will also be USCD Pascal and FORTRAN 77.

Visicalc III is available already, so financial analysis and projections are a snap with the Apple III.

A word processing system will be available soon.

And as it can emulate the Apple II there's a huge bank of existing software for the new machine. The only thing it won't do is accept the Apple II language system — who needs it, anyway?

The Apple III is aimed mainly at the professional educator, manager or scientist/engineer. It will be sold as a package, complete with monitor, software (including Visicalc III) and 128K of RAM, for somewhere around $5500 to $6000. □

Which is your computer???

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An Owners viewpoint of the Exidy Sorcerer or 16 Months with a personal Whatchamacallit

I WOULD like to tell you about some of the things I've found that make the Sorcerer different; things I've used my machine for over the last 16 months (or 1.33333 years to 6 significant figures, the maximum precision of the Sorcerer).

When I purchased the Sorcerer in'79 I was a fairly typical first micro owner. An undergraduate at university, with only marginal contact with computers. I felt that I was missing out on something — what I wasn't sure. But being a fool with more disposable income than sense I purchased a micro. I didn't have any real need for a computer, only a desire to find out why these things were causing all the fuss.

I bought the Sorcerer rather than any of the other micros (which at the time boiled down to the TRS 80 and Apple) because the Sorcerer had what I thought the best word processing facility.

As an undergrad, I was required to hand in a minimum of 35,000 words a year in reports and essays.

After 16 months using the Sorcerer Word Processing ROM pac I still believe it is good value. Since it resides in ROM (when in ROM do as the ROMans do?) it doesn't take up any user RAM, so even the 16K basic (no pun intended) unit I started with was useful as a WP. I could hold about 4.5 pages of text in RAM before I had to dispose of it to the printer or record it on tape.

HINT 1

If you want to produce a document larger than your memory will allow when you have filled the available RAM: set the page length on the Y table to the size you want. Then use the verify (V) command to find where the pages will end. Then only save whole pages on tape. You can hold (cmd H) the remainder until you have killed (cmd K) the bulk of the text. Then unload (cmd U) the remainder so it becomes the top of the next section. This makes it easy to produce large documents by reading and printing groups of pages.

The only real problem I had with the WP package was that at first I had trouble with

the layout of the edit commands on the keypad. But after I had memorised the functions of each key things became very easy to use. I strongly suggest you label the editing keypad, otherwise you will be forever looking up the function of the keys in the manual, trying to find which key does what.

Aside from all the usual WP functions like auto wraparound, deletions from and insertions into existing text and a good global search and replace mode, the Sorcerer WP is good to use because of its ability to be programmed to produce some nice output formats.

HINT 2

Always use the macroprogramming mode rather than the autocommands. You can recall macroprograms and edit them like normal text, this makes macroprograms easier to debug than autocommands which are on-shot and cannot be recalled. Also you can save macroprograms on tape and recall and reuse them the next time you want the same type of format. This is good for such things as mailing lists and form letters, something to keep in mind if you are trying to make some money from your hobby.

These features put the EP ROM pac on a par with the better disk based QP programs. And the Sorcerer WP can be purchased for around $2700 if you can be satisfied with a dot matrix printer. Good value from any viewpoint.

Anyhow drifting away from the WP pac and onto the Sorcerer itself. The BASIC (ROM pac) interpreter does lack some of the features of the interpreters in other micros, most noticably an inbuilt editor. Retyping a line to correct a single typing error is bad enough but re-typing the line to correct the mistake you made while correcting the first mistake is worse.

I solved the problem by buying a tape based editing program that I load when I need it.

The interpreter has some good features; most noticeably, it is fast. I would very much like to see a comparison of the time taken for the micros to process a very large number-crunching program. I think the Sorcerer would come out the fastest. *(We're working on it —ED.)*

The other really nice thing about the Sorcerer is its graphics. I have been using two Quality Software programs, Shapemaker and Plot to use my machines graphical ability.

Breaking up the 128 user programable graphic characters into groups of 4 characters I used the shapemaker program to make 32 "frames", slightly different drawings of the same subject. By poking these frames into screen RAM in quick succession I have made some fair attempts at animation. So far the best has been a little wizard (what else?) who walks across the screen, casts a spell and flies off on a magic carpet. It is still very jerky but it shows what can be done.

Plot uses a machine language subroutine to graph the points in two arrays. If you set up several arrays, for example several sine waves slightly out of phase, and swap them into the plotting arrays one after another you can get a flowing motion; again, it is jerky, but better results must be achievable.

To sum up my opinion of the Sorcerer, I found that the machine is above all else flexible — anything it lacks in some respects can be made up using small utility programs.

And the Sorcerer has other advantages, a fast-growing software backup from several sources, for example the first FORTH program available for micros in Australia (and cassette-based at that). Also the Sorcerer has some of the best users groups around (SCUA, Sydney users group) which makes it highly likely that you will find someone who is interested in what you are doing with your micro, which can be fun. And that is what micros are all about.

If I was to buy a micro now it would still be a Sorcerer. I first learnt about computers with a Sorcerer and I am still learning new things today, which tells you something about the feasibility of the machine, or the rate at which I absorb knowledge.

—Paul Beaver

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A Piece of Dick Smith's Mind for You

Load, dammit, load!

THE TANDY TRS80 is the most successful computer in the world. If you don't believe it, take a look at the amount of software available to suit it. Owners of other computers sometimes go green with envy when reminded of some of the juicy software they can't run.

It's the availability of suitable software that is one of the most important factors to consider when choosing a personal computer. Price is another important factor.

Never one to miss a trick, electronics entrepreneur Dick Smith immediately grasped the implications of this and introduced a small computer which is software compatible with the TRS80, and it's cheaper. The System 80 can load tapes written for the TRS80, and run the programs without modifications — almost; there are a few differences.

The System 80 is a fully integrated computer in a desk-top case. It's bigger than the TRS80, a feature I like as I could balance a TV on top of rather than behind the machine. Part of the size difference can be attributed to the built-in cassette deck — Tandy's is a separate unit. The early System 80 didn't have a *volume* control, which led to a few problems in loading tapes because recording levels vary widely (even on the same tape). Recent models have both a volume control and a level meter, effectively removing the problem.

The keyboard is similar to the TRS80's, with a comfortable feel. Overall, the System 80 is solidly constructed, with a good appearance and is finished in black and off-white and simulated wood.

Inside, the beast is very like the TRS80 in electronic organisation. The CPU is our old friend the Z-80, running at 1.77MHz. There's 16K of RAM in the system, enough for large BASIC programs or sizeable machine code (system tape) programs. There's 12K of ROM, containing a Microsoft BASIC, effectively the same as the TRS80 Level II BASIC.

The VDU screen is 64 × 16, organised in the same way as the TRS80, and the BASIC provides the same PRINT and SET and RESET statements. There are a few slight differences in the character set: the System 80 corresponds more closely to the ASCII definitions.

The System 80 provides both direct video-out for a monitor, and a VHF modulated output which can be fed to a TV. The display is clear, stable and flicker-free. The cassette interface behaves just like the Tandy System, and we had no difficulty in loading tapes for the earlier machine.

We played around with the machine for a few weeks and got to know it reasonably well. Its BASIC is extremely comprehensive. It was easy to run games' programs from the pages of magazines, with no modification in most cases.

The machine was used by several people in the office, a few of whom had no prior exposure to computers. For this reason, the manuals underwent a fair bit

Displaying bar graphs is easy with one of the System 80's standard programs.

of thumbing. At this point we discovered that the manuals are the weak point of the machine. They're short, not particularly easy to find your way around in, and gave a few of our novices a bit of a hard time.

To maintain balance, Dick Smith does have a BASIC introductory course for the System 80, and sitting down with this book and the computer will provide an excellent introduction to programming. It's just that no-one had the patience to sit and read it during the short spells they were let loose on the machine.

Although the cassette interface will read TRS80 tapes, and the BASIC interpreter will run TRS80 Level II programs, the compatibility between the machines is not quite perfect.

In the TRS80, the cassette interface circuitry, the printer and serial I/O circuitry, are memory-mapped and appear to be memory locations, while in the System 80, they are actually I/O parts. This means that some programs which use the cassette interface circuitry to generate sound effects, for example, will not work on both the TRS80 and the System 80. The program may run, but the sound effects will not work. Similarly, some light pen circuits plug into the cassette interface, and they will not work without extensive modification of the circuitry.

An S100 expansion interface is now available for the System 80, making it possible to plug all kinds of goodies into the system. As well, there's a Centronics printer interface, and other interface circuits should also become available. Incidentally, the System 80 is sold in the US as the PMC-80, and in the UK as the Video Genie, so we can expect to see software and hardware appearing from independent sources.

The System 80 is an excellent choice of first computer. It's powerful enough not to frustrate the beginner or shatter their dreams, and is expandable so that it can be put to serious use. □

System 80 Tech Data

Test unit courtesy Dick Smith Electronics.

Processor:	Z-80
Clock Speed:	1.77 MHz
RAM:	16K
ROM:	12K
I/O:	Inbuilt cassette, interface TRS-80 compatible, level control included
BASIC:	TRS-80 Level II compatible, comprehensive.
Display:	16 lines × 64 characters, upper case only, chunky graphics supported Video of VHF output.
Keyboard:	Full action qwerty keyboard.

Notice the built-in cassette on the right — and, finally, the level meter.

A Cheap Starter System?

THE SYSTEM 80 microcomputer is Dick Smith's baby. You can't use it and not get occasional mental flashes of a cherubic face framed in black-rimmed glasses wishing you a bonza time.

His creation works well. Its one big drawback is the occasionally stubborn and frustrating cassette-loading of programs — a problem with most computers that get their information in this way.

The System 80 is compact, well-made and (joy of joys!) its keyboard actually works like a keyboard ought to.

Because of its similarities to the Tandy TRS 80, software (programs) made for either system are usually compatible. This gives the System 80 user a vast choice, from the simplest games to some quite complex business operations.

The instructions that come with the System 80 are good, but not brilliant. A newcomer to computing could be confused, and some of the System 80's instructions would not do a great deal to alter that state. A novice could use some advice before being launched into the world of Dick Smith.

It costs about $1000 to take this System 80 home, including the computer and a black and white monitor. Value for money is excellent.

Setting it up poses no problem whatsoever; getting programs to run does if you're a beginner. The microprocessor does not like getting hot, so if your System 80 has been sitting in the sun in the back of the car or the corner of the loungeroom, it will more than likely refuse to load and run any programs.

The office idiot took a test System 80 home one night. It had been a bright and sunny day, the computer had become heated — and so had the office idiot when, for several hours, the computer refused to behave itself.

Our test of the System 80 proved it was a worthwhile computer for the enthusiast, even though it had several niggling limitations (see main story).

Overall, though, we came to the conclusion that Dick Smith has produced a winner — especially with his flair for publicity and marketing. □

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 measureable 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 mangages 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 5¼ 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-progam 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-progams.

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 acccess.

Menu: A display which offers the operator a choice of several alternatives.

Microcomputer: A small computer based on a microprocessor.

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.

GLOSSARY

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.
Operating System: The program that makes it 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 microprocessor 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.

your computer
CLUB NEWS

Your Computer can only go so far helping micro-users to exploit every last byte — sometime, somewhere you're sure to be faced with a problem, or need some advice, that needs immediate attention.

That's where clubs or associations of micro enthusiasts come in to their own. Who else but a fellow club member would help you on a Sunday night to unravel a programming bug that had kept you awake and wondering all weekend?

Who else but a fellow club member would lend you a precious program. And who else but a fellow club member would sit down and listen with interest to your tales of computer woe?

A good example of the involvement a club can generate is the Sydney-based Microcomputers Enthusiasts Group (MEGS). According to club president John Whitlock, members include those who, until joining, had never seen a computer, to those that earn their bread and butter with them all day.

"All told, our members own just about any computer you can name," says John. "We've had some fantastic input from members."

To prove the club is for everyone, take meeting agendas: a "soft" start at 7 p.m., an hour of talk, swapping yarns and then sharp on eight, the "hard" start, the meeting proper which usually includes a guest speaker.

And then, of course, there are those Sundays when nothing works and you need to call someone for help...

There might be more of you out there. Please contact us if we have left you out so our second issue of *Your Computer* can have the definitive list...

NEW SOUTH WALES

MEGS (Microcomputer Enthusiasts Group); John Whitlock, PO Box 3, St Leonards 2065. Meets third Monday each month, Wireless Institute Australia Hall, 14 Atchinson Street, St Leonards. 7 p.m. start

NSW Apple Users Group; J. Smith, 4/15 Raine Street, Woollahra 2025. Meets second Monday of each month at ComputerLand, Cnr Market and Clarence Streets, Sydney.

Commodore Users Group; John Guidice, GPO Box 4721, Sydney 2001.

Compucolour Users Group; Andrew MacIntosh, 91 Regent Street, Chippendale, Sydney 2008.

80 AT; Planet 3 Systems, 47 Birch Street, Bankstown 2200.

Wollongong Computer Club; Paul Janson, 14 Hoyward Street, Kanahooka 2530, or 'phone (042) 61 5451.

Sorcerers Users Group; PO Box E162, St James, 2001. Ian King, 15 Forest Avenue, Wahroonga 2076, or 'phone (02) 48 6072

VICTORIA

Sorcerer Computer Users (Australia); Secretary, PO Box 144, Doncaster 3108

Compucolour Users Group; L. Ferguson, 12 Morphett Avenue, Ascot, Melbourne 3342

SMUG; SCORD M100 users, Robin Miller, 60 Winmalee Drive, Glen Waverley 3150

National ZX80 Users Club; 24 Peel Street, Collingwood, Victoria, 3066.

Apple Users Society of Melbourne; David Turk, ComputerLand, 555 Collins Street, Melbourne 3000

BUG 80; Burwood Users Group, PO Box 46, Blackburn South 3130.

Geelong Computer Club; Peter McKeon, PO Box 93, Geelong 3220.

SOUTH AUSTRALIA

TRS-80 Users Group; G Stevenson, 36 Sturt Street, Adelaide 5000.

QUEENSLAND

Brisbane Youth Computer Group; A Harrison PO Box 396, Sunnybank 4109.

Iree Microcomputer Interest Group; N. Wilson, PO Box 811, Albion 4010. Offers much for the enthusiast.

AUSTRALIAN CAPITAL TERRITORY

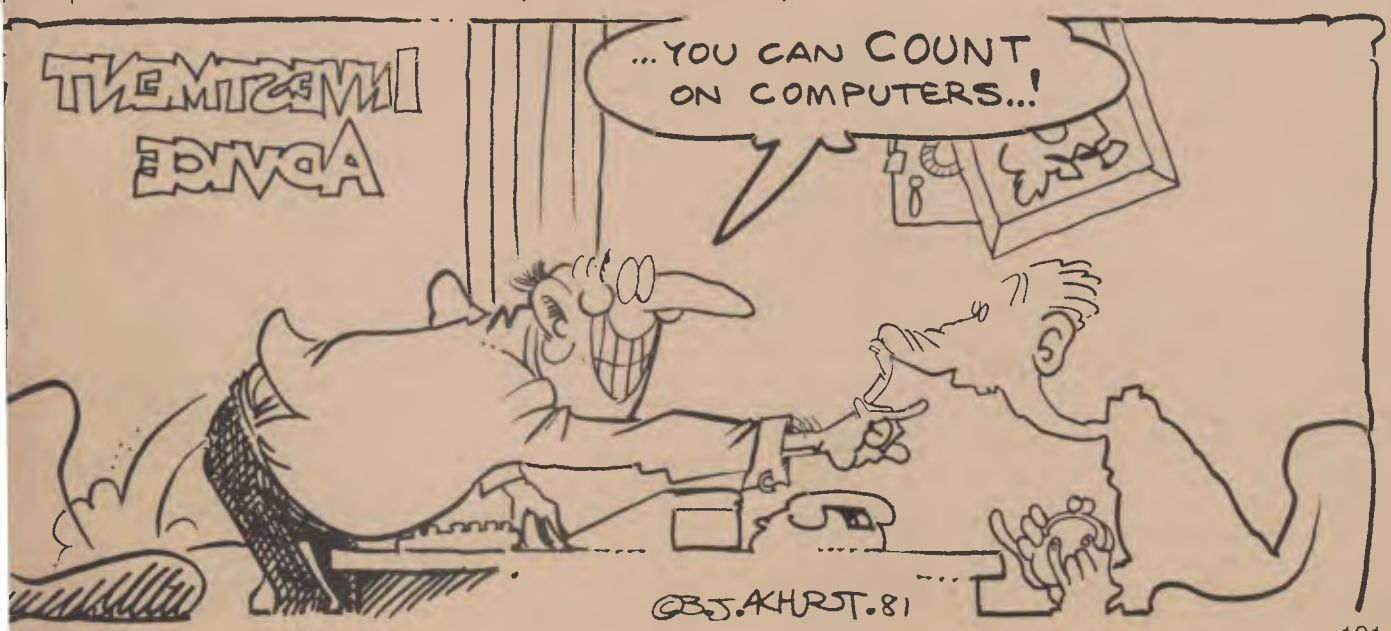
MICSIG; Registrar, PO Box 446, Canberra 2601.

TASMANIA

TEMOS; John Stephenson, 4 Melinga Place, Taroona 7006, or 'phone (002) 27 8770.

NEW ZEALAND

Wellington Microcomputer Society Inc; Lindsay Williams, 2 Pope Street, Plimmerton, New Zealand.



your computer SERVICES

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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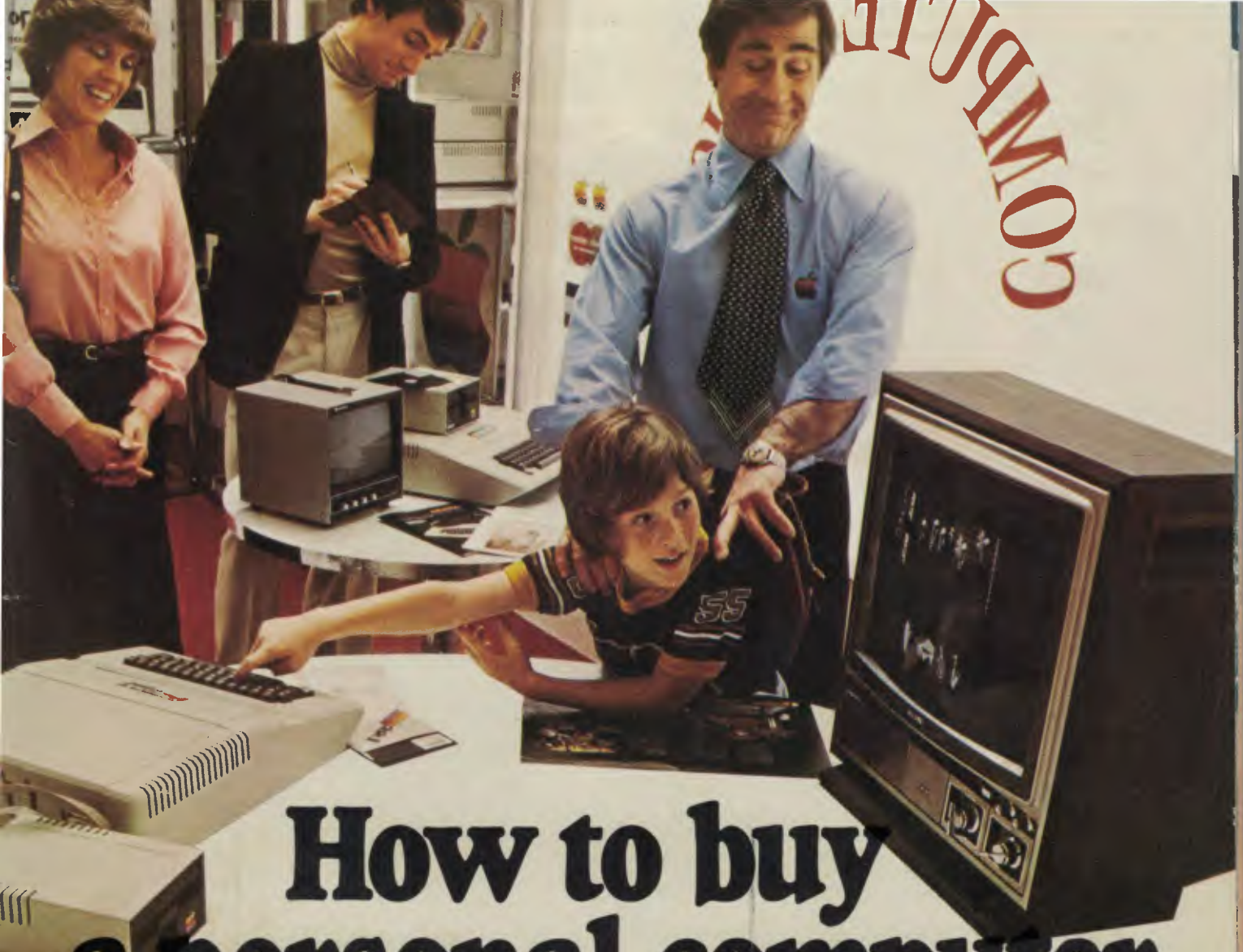

How to buy a personal computer.

In California, a store owner charts sales on his Apple Computer. On weekends though, he totes Apple home to help plan family finances with his wife. And for the kids to explore the new world of personal computers.

A hobbyist in Michigan starts a local Apple Computer Club, to challenge other members to computer games of skill and to trade programs.

Innovative folks everywhere have discovered that the era of the personal computer has already begun—with Apple.

Educators and students use Apple in the classroom. Businessmen trust Apple with the books. Parents are making Apple the newest family pastime. And kids of all ages are finding how much fun computers can be, and have no time for TV once they've discovered Apple.

Visit your local computer store

The excitement starts in your local computer store. It's a friendly place, owned by one of your neighbors. He'll show you exactly what you can use a personal computer for.

What to look for

Your local computer store has several different brands to show you. So the salesman can recommend the one that best meets your needs. Chances are, it will be an Apple Computer. Apple is the one you can program yourself. So there's no limit to the things you can do. Most important, Apple's the one with more expansion capability. That means a lot. Because the more you use your Apple, the more uses you'll discover. So your best bet is a personal computer that can grow with you as your skill and involvement grow. Apple's the one.

It's your move

Grab a piece of the future for yourself. Visit your local computer store. We'll give you the address of the Apple dealer nearest you when you call our toll-free number. Then drop by and sink your teeth into an Apple.

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