Dick Smith's

Getting to know PERSONAL COMPUTERS

*$6.95

THIS BOOK TAKES THE MYSTERY OUT OF COMPUTERS AND EXPLAINS HOW THE AVERAGE PERSON, WITH NO TECHNICAL KNOWLEDGE, CAN USE AND ENJOY THEM

Dick Smith's Getting to know PERSONAL COMPUTERS

HORWITZ GRAHAME

Unlike other labour-saving machines which are built to do one job only, the computer is designed to do many jobs. It is a teacher one moment, an accountant the next and, when it's time for games, a fascinating and absorbing family entertainment centre. In less than one minute, everybody, including children, can use a computer with ready made programs.

- **WHAT IS A PERSONAL COMPUTER AND HOW DOES IT WORK?**
- **WHAT CAN A PERSONAL COMPUTER DO FOR YOU?**
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  - *Education*
  - *Research*
  - *Household Management*
  - *Domestic Monitor*
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  - *Computing: The Hobby*
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- **GETTING STARTED IN COMPUTING AND CHOOSING THE HARDWARE**
- **A CLOSE-UP LOOK AT TWO TYPICAL PERSONAL COMPUTERS**
- **THE RANGE OF READY MADE PROGRAMS**
- **EXPANDING THE SYSTEM**
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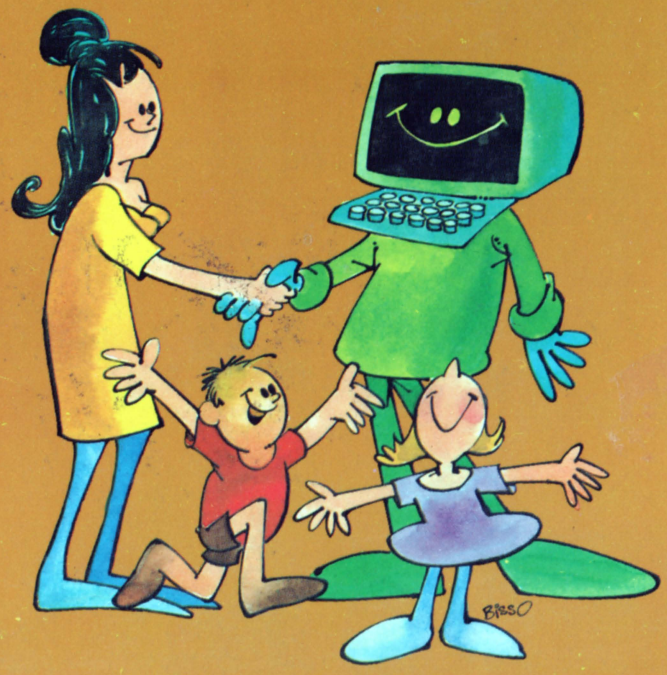

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DOROTHY DEGER

HORWITZ
GRAHAME

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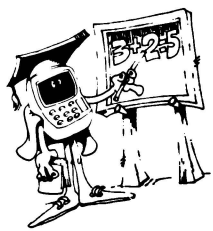

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INTRODUCTION

Despite the growing stack of books, magazines and newspaper supplements devoted to computers, even I'm getting confused.

There is so much material (data, if you like) available about computers but it is mostly too technical or confusing for the average person to understand. And that, of course, is the whole point about personal computers: *they are for the use and enjoyment of the average person with very little technical knowledge, let alone a degree in science or mathematics.*

It seems to me that computers (and very often the people who work with them) have been almost deliberately shrouded in mystery and unnecessary mystique. One of the aims of this book is to take computers out of the closet and explain exactly what they are all about — and what you can do with them — in simple, everyday language.

Perhaps the fact that the development and introduction to the marketplace of low cost personal computers has been so rapid (on sale in USA since 1975, Australia/New Zealand since 1978, with literally millions sold) has a great deal to do with the public's confusion about computers.

In other words, only yesterday a computer was solely for the use of multi-million dollar big business and government but today it is an affordable multi-purpose machine available to the average person.

I also believe there is a basic misconception in most people's minds about personal computers. It's easy (but wrong!) to conjure up a vision of a space age housewife pressing a few keys on her computer to magically clean the house and prepare dinner for ten. Technically, that *is* possible — but it would cost a fortune!

In my opinion a personal computer should be used essentially as a source of enjoyment, education and as a practical tool to organise various aspects of everyday life or business. Really, there's not very much difference between the reason you'd buy a hi-fi system or a video recorder and the reason you would buy a personal computer. Incredibly, the price tag is much the same, but the hi-fi and the video recorder are limited to one type of use only while the computer is capable of numerous different functions.

This book explains all these functions and tells you how you can get the most pleasure and practical use out of your personal computer.

Strictly speaking, the word 'personal' is probably a misnomer — as soon as you get the computer home you'll find that the rest of the family will be clamouring to get their hands on it!

From my experience young children adapt to computers particularly readily and are eager to learn the new 'buzz words' that are part of computer literacy. Yes, there's a whole new language out there — it's fun to learn and everybody will be speaking it soon. Let me give you a few examples ...

... 'Hardware' is not remotely related to hammers and nails ... the 'menu' won't be served at your favourite restaurant ... and a 'brownout' has nothing to do with a day at the beach.

Crazy? Confusing? It won't be after you've read this book and discovered the amazing and fascinating world of computers.

Dick Smith

Chapter

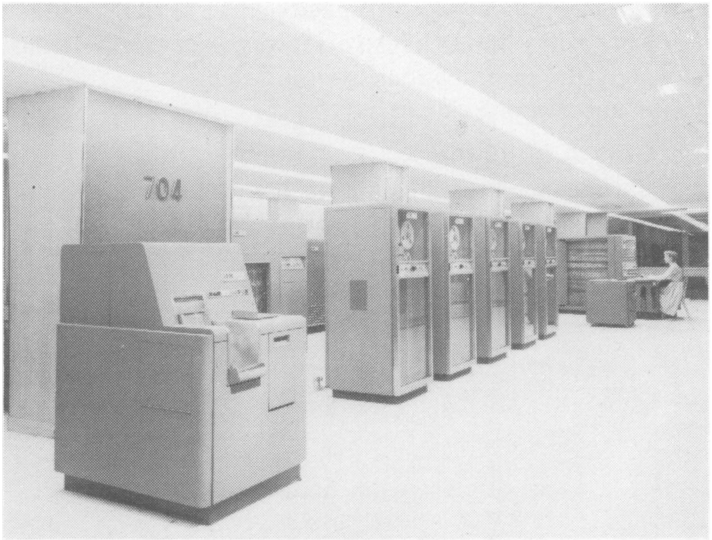
What Is A Computer And How Does It Work?

WHAT IS A COMPUTER AND HOW DOES IT WORK?

Simply defined, a personal computer is a small electronic machine, sold over the counter in retail stores, that can be used for many activities in the home or small business. Unlike other labour-saving machines which are designed to do one job only, the computer is designed to do many jobs.

It is an accountant one moment, a teacher the next and, if it's time for games, a built-in amusement parlour in your own family room. A very versatile appliance indeed! It can even instruct you in the basics of flying (no, I'm not kidding!), help sort out your income tax return and organise a business. (I'll go into much greater detail in later chapters but this should whet your appetite for now.)

A typical modern personal computer. It looks similar to a typewriter and is a million times more streamlined than ...



... this 1954 IBM machine occupying a whole room!

The First Computer

It seems hard to believe but the first 'modern' computer was built only about thirty years ago — a massive contraption, now a museum piece, that occupied an entire room. Because of their size and cost (millions of dollars!) early computers were limited to use by governments and big business.

Today a personal home computer sits comfortably on a desk or table and the price is within the reach of the man in the street. (In my opinion, it is inevitable that the personal computer will become as much an essential part of the home as a refrigerator.)

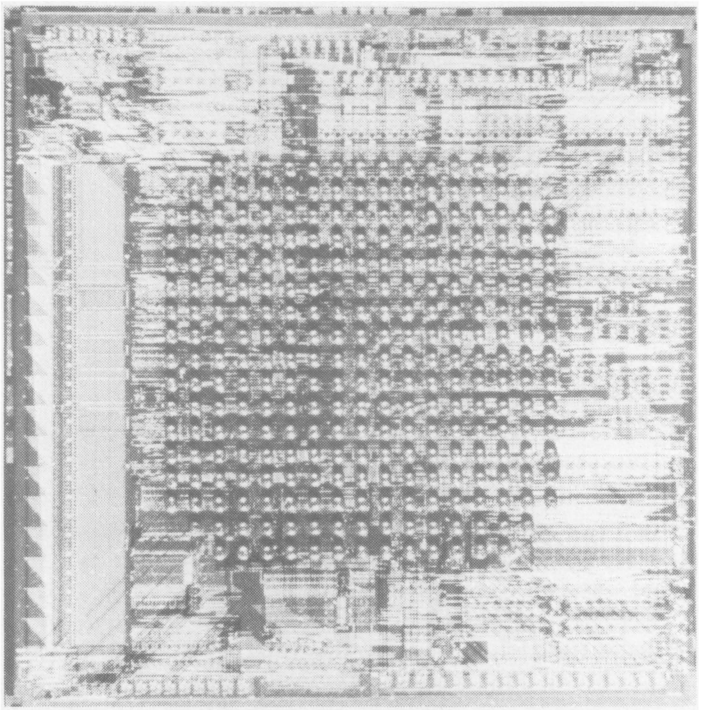
The rapid development of computers to their present stage has been nothing short of a miracle. It has been said that if the car industry had accomplished what the computer has in the last twenty years, a Rolls Royce would cost $20 and do over 100 000 kilometres per litre.

The change in the state of computer art is very comparable to that of the calculator, now a familiar object in

most households. It was only a few years ago that calculators were bulky and expensive — today every schoolchild considers the slim, inexpensive unit an essential tool for maths and science classes.

It's Only A Machine

What has been responsible for the rapid development of the computer? Probably the biggest single factor has



The very latest in silicon chips from IBM. All this complex and sophisticated circuitry is contained in an area approximately 7mm square.

been the technology of the silicon chip (a tiny integrated circuit) which has simplified and miniaturised computer construction. It is not the intention here to explain that dazzling technology in any detail — the purpose of this book is to explain how to use the machine (remember, that's all a computer is!) not how to make it.

Debunking The Myths

Up till fairly recently the very word 'computer' was enough to make most of us recoil. 'I don't want to know about it'... 'It's too complicated for me'... 'I don't have the brains for this kind of thing' would be typical responses.

Unfortunately, computers (perhaps because of their complex beginnings) were put on a pedestal as objects far too high and mighty for the average person to understand And there is still something of a 'holier than thou' syndrome about them. One of the purposes of this book is to debunk all the myths about computers — get them off their pedestals and into the living room, or small business office, where they belong.

One reason why people are frightened of computers is because of the awesome reputation as mathematical genii who can solve long equations in a single electronic beep. Back in the early days computers *were* largely used mathematically. For example, scientists operated them as giant calculators to solve problems in aeronautical design and the like. But a calculator can only deal with numbers. A computer, on the other hand, can handle much more than just numbers — it can deal with all types of information in the form of words, music, patterns and sounds, just to name a few.

The increasing use of computers in everyday situations — making a theatre booking or buying an airline ticket — is going a long way towards familiarising the public with computers. And the time is not far off when we'll be doing our grocery shopping by computer. (I'm proud to be the first person in Australia selling electronic gear by computer shopping!)

Anybody Can Operate A Personal Computer

Admittedly, in the early stages of computers only experts could operate them, but today's personal computer is so sophisticated and, at the same time, so simple that *anybody can operate it.* Certainly, there are quite a few points to learn (that is another reason for this book)

but in less than one minute (yes, you read it correctly — *one minute*) the average person, including children of a reasonable age, can operate a computer using ready made programs. It will take a little longer to learn to write your own programs, but even that's not as difficult as you might imagine either.

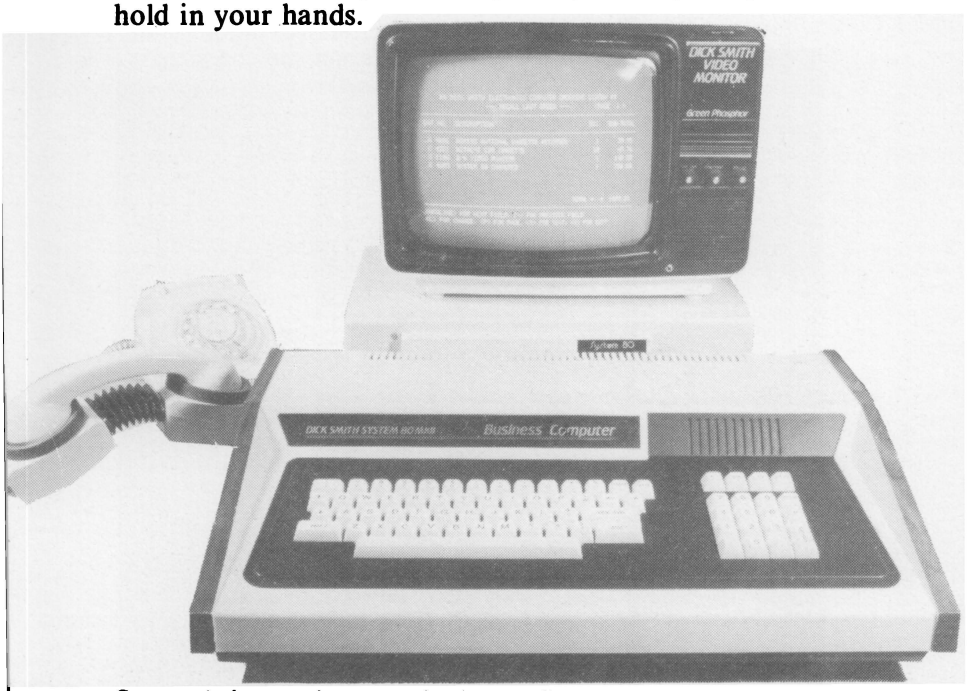
You'll be amazed how quickly young children adapt to computers. Unlike many adults they have no inbuilt resistance to the electronic age.

Three Simple Words You Need To Know

Before going any further it is important to explain three simple 'computer literacy' words. It is impossible to discuss computers without understanding these words. Their meaning may be unfamiliar to you now but they are rapidly becoming part of everyone's vocabulary.

Hardware

Hardware is a general term to describe the physical computer itself plus all the bits and pieces built into it or attached to it. In other words, the hardware consists of the parts of the computer set-up that you can pick up and hold in your hands.



***Some typical** personal computer hardware - all very portable.*

Software

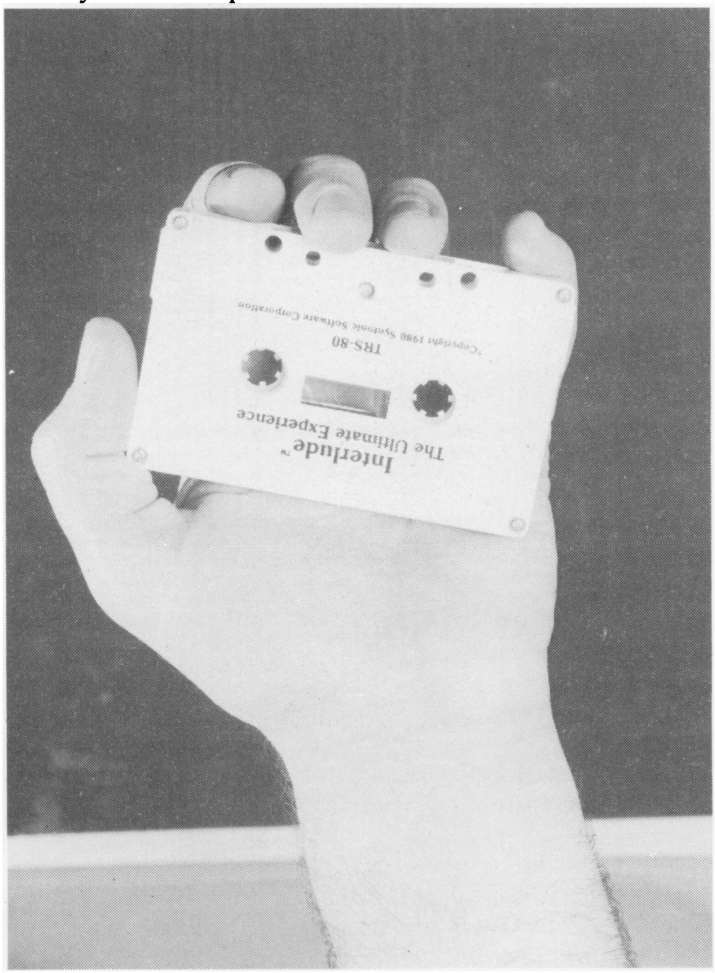
Software is a collective term to describe the various types of programs that are fed into the computer.

Program

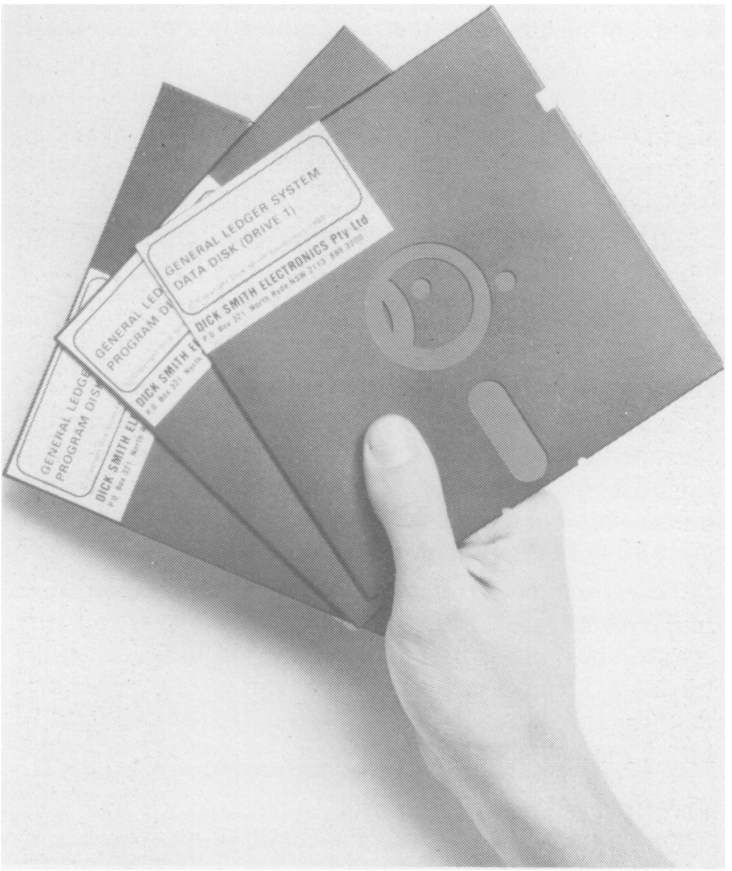
This word is doubtless familiar to you — you probably didn't baulk at it when it was used several times in the preceding paragraphs — but what is its exact meaning in terms of computing?

A program is simply a set of instructions for the computer to obey.

To understand the concept of a program think of a computer as being like a pianola. A pianola is capable of playing a huge variety of tunes but can only perform when you 'load' a pianola roll to tell the instrument what



A computer program in the form of a cassette. It is identical in appearance and size to a conventional music cassette.



Computer programs in the form of floppy disks. These are not unlike small 45 rpm records in appearance.

to do. Similarly, a computer can only perform when you 'load' a program, the set of instructions telling the machine what to do.

Programs can be bought ready made in the form of a cassette (looks just like the one you put in your tape recorder), a disk (not unlike a small 45rpm record) or as

instructions written out on paper ready for you to follow by pressing keys on a keyboard (very much like an ordinary typewriter). Or, you can write your own programs. Most enthusiasts use their computer in both of these ways.

By using programs written by somebody else you can start to use your computer instantly — it's as simple as buying a cassette to put in your tape recorder or a record to play on your hi fi set.

Most machines are built to perform just one function. e.g. a vacuum cleaner is built, i.e. 'programmed', to suck in dirt or blow out air. But because a computer is 'programmable' it turns into a multi-function machine.

Hardware/Software Compatability

It is important to understand right from the beginning that the hardware and software must be compatible with each other. In other words, Type X hardware (the computer) will not understand Type Y software (the program) unless they speak the same 'computer language'.

Therefore, before you buy your hardware you must make certain that there is an extensive range of software that can be used with it. Otherwise it would be rather like buying a 22rpm record player put out by some eccentric manufacturer and then finding it extremely difficult to buy 22rpm records!

Are Computers Intelligent?

Don't be fooled — computers can't think. There is no such animal as an intelligent computer — in fact they have been called 'high-speed morons'! The machine is only as good as the person who is operating it, or who wrote its program. How often have you had a mistake in your department store bill described as a 'computer error'? The chances are it's not a *computer* error at all — it's a computer *programmer* error. The programmer, of course, is human — the man or woman who prepares orders or instructions to the computer.

Obviously the computer system can malfunction, but it is a rare occurrence since computers are considerably less prone to making mistakes than humans. A well designed computer has a program built into it to recognise many common mistakes. The machine stops and refuses to continue until the human operating it feeds in the correct information.

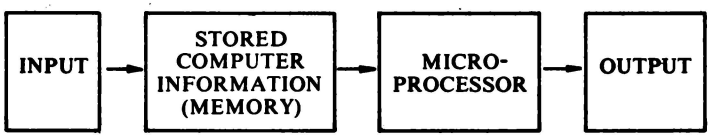
The General Principles

Having established some elementary facts let's look at how a computer works. The following explanation is deliberately simplified to give the reader an instant grasp of computer principles. Each function of the computer will be dealt with in much greater detail in Chapter Five.

You're probably familiar with the word 'process' as associated with computers. Look at it this way: just as a washing machine 'processes' laundry from dirty clothes to clean, so a computer 'processes' information or data to produce an answer or result. The operator gives information to the computer (i.e. programs it) by inserting a cassette or disk or pressing keys marked with letters, numbers and symbols. This is known as *Input.*

The computer then processes this data using information either permanently or temporarily stored in its memory and replies with an answer or question (there is often a dialogue between operator and computer before a result can be established) that is either displayed on a monitor screen or printed out on paper. This is known as *Output.*

Diagrammatically, the operation looks like this:



Although the general principles of computing can be shown in such a simple form, it has taken hundreds of years and the genius of countless scientists to develop the computer to its present stage. It's an intriguing story ...

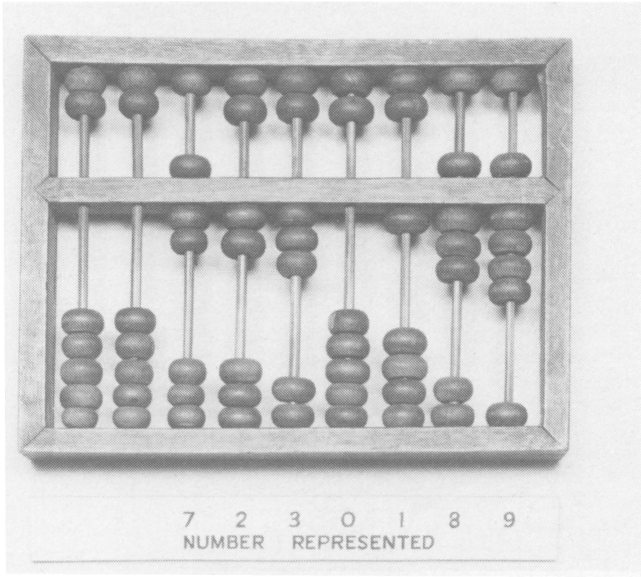
Chapter 2

The Computer Miracle

THE COMPUTER MIRACLE

Today's computer has only been in existence for a mere blink of history's eye, but humans have been calculating data since the beginning of time. Prehistoric man probably scratched marks on a rock to tally up the count of animals killed for food, while another series of marks would calculate the additional number of kills necessary to feed the primitive community.

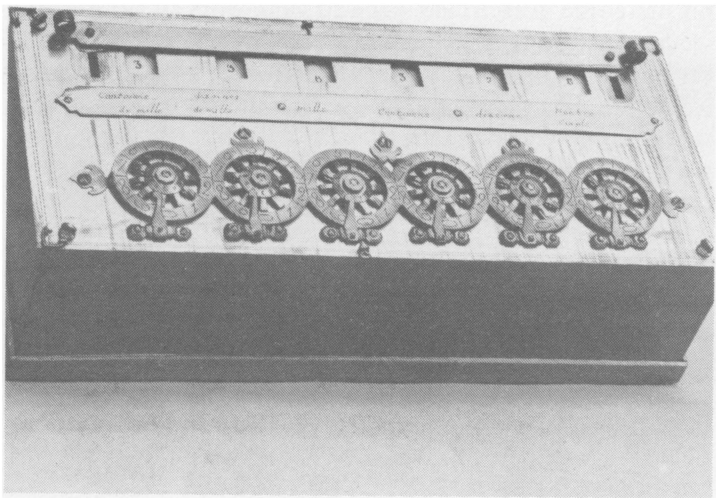
Not quite so ancient, but still dating back over thousands of years, is the abacus. Old as it is, this quite sophisticated means of calculation remains very much in use today in the East.



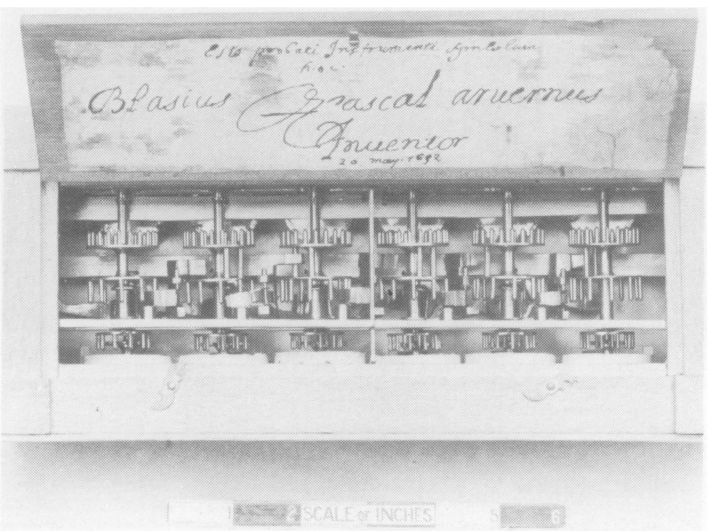
A Chinese abacus. (Crown copyright. Science Museum, London)

A Primitive 'Number Cruncher'

The honour of inventing the first Western mechanical calculator must go to the Frenchman, Blaise Pascal, a philosopher and mathematical genius of the mid seven-



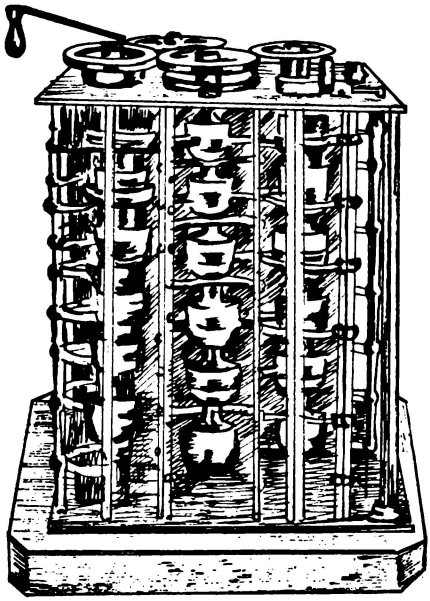
A replica of Pascal's calculating machine. Exterior. (Crown copyright. Science Museum, London)



The interior of Pascal's machine. (Crown copyright. Science Museum, London)

teenth century. Today his collection of cogs, wheels, nuts and bolts would seem primitive in the extreme. Although his machine was much praised and worked admirably well as a 'number cruncher' there were not too many buyers. The machine was not cheap and even then there was employee resistance not unlike the current situation where some workers fear that the computer will do away with their jobs. Pascal is well remembered in modern computing since one of the major computer languages is named after him.

Following Pascal a number of eminent European mathematicians pursued the perfection of the mechanical calculator. Perhaps the early nineteenth century Englishman, Charles Babbage, was the most successful. A wealthy man in his own right, Babbage used his personal fortune, as well as twisting the government's arm to

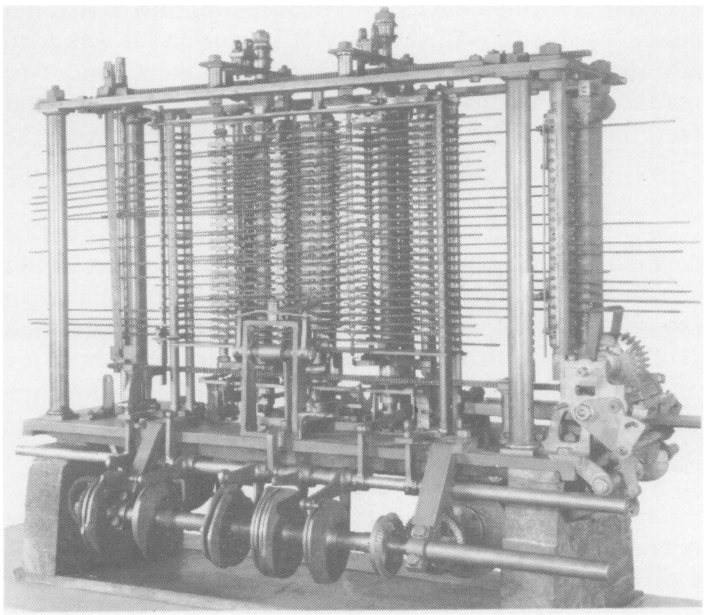


An artist's impression of a model of the Difference Engine.

provide even more funds, to build a machine known as the Difference Engine — a wonder of yet more wheels, cogs, sprockets and levers.

The Analytical Engine

His work was viewed with great respect by the Royal Astronomical Society, but Babbage was not satisfied. He had his heart set on building a new and much improved machine based on a very ingenious theory. From the concept of this machine Babbage must be credited with inventing the basic principles of a computer, i.e. a machine that has no fixed function but can be 'programmed' to do a variety of different things. The machine — that was destined never to be completed — even had a 'memory' where numbers could be stored awaiting their turn to be summoned by the controller to perform the



A front view of portion of Babbage's Analytical Engine. (Crown copyright. Science Museum, London)

next function. Babbage named his dream machine the Analytical Engine.

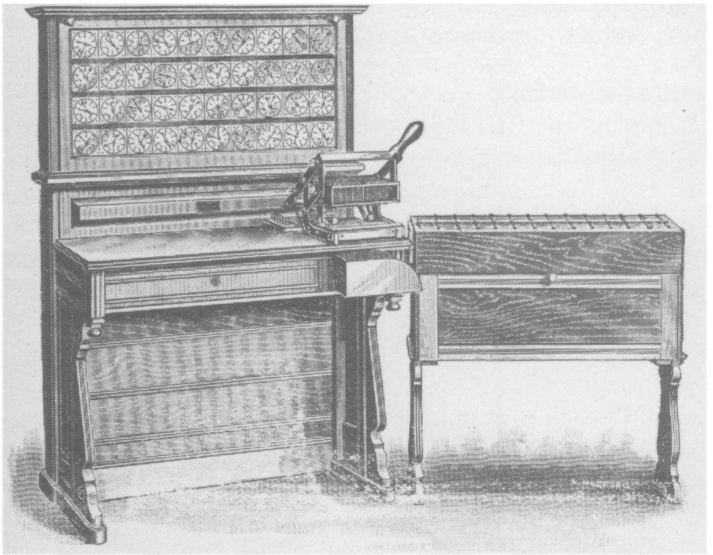
Unfortunately, it was not long before Babbage's dream turned into the government's nightmare. A disgruntled Treasury closed its fist, and Babbage was left without a financial backer. Benjamin Disraeli, the Prime Minister of the day, was moved to remark that the only use he could see for Babbage's machine was to calculate the enormous amount of money that the government had poured into a worthless project. Babbage died a disappointed man, judged by his contemporaries as a genius, but misguided.

The 'Amazing Tabulating Machine'

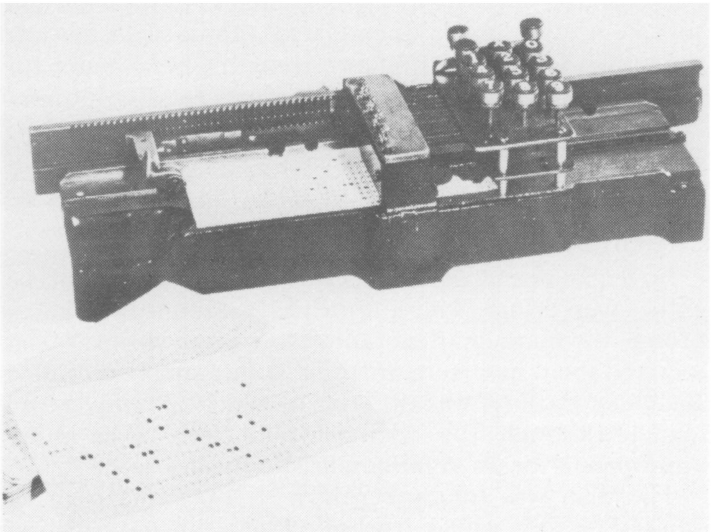
The next computer breakthrough came from across the Atlantic in the United States. A predicament had arisen there which once again proved the truth of that old adage 'Necessity is the Mother of Invention'. It was 1880 and the Eleventh Census had just been taken. But it was readily apparent to those whose task it was to count and record the results that this would take years and the census would be completely out of date before the results were published.

So, with typical Yankee ingenuity, the powers that be decided to run a competition for an invention that would enable the results of the next census to be collated in record time. The winner of the contest was a Dr Herman Hollerith who had invented 'an amazing tabulating machine'. Although the device was mechanical in principle, Hollerith had an advantage over his predecessors in being able to take advantage of that new-fangled power source — electricity.

The 1890 census was duly held and the statistics were released in the unheard time of six weeks after census day. Dr Hollerith went on to form the Tabulating Machine Company which rapidly expanded in size and profit. When he died at age 99 Hollerith was still acting as a consultant to the company he had founded — but the



An engraving of Dr Hollerith's sorting, counting machine of 1890. (Photo: Science Museum, London)



One of IBMs first computing products — a 1901 hand-operated punch.

company name had been changed to International Business Machine Corporation (IBM).

Hitler's Mistake

During the first half of the twentieth century scientists on both sides of the Atlantic were gradually developing ideas to make computing machines faster and more efficient. In the 1930s two Germans, Konrad Zuse and Helmut Shreyer, were very much in the forefront of the development of 'high speed' computers using valves instead of electro-magnetic relays. In fact, shortly after the outbreak of World War II, they suggested to the Nazi authorities that they should build a computer which would break the enemy codes and effect a quick German victory. When asked by the authorities how long such a machine would take the build, the two inventors answered, 'Over a year'. The Nazi authorities laughed. This did not fit in with Hitler's timetable for World War II — it would be well and truly finished by then. So the idea was scrapped.

Ironically, the British, with their backs to the wall, had to take a much more open ended approach to the war timetable. The British military strength was no match for Germany's; the island population was totally outnumbered and out-weaponed. So, with nothing to lose, the Brits decided that one way to win the war (or, at least, not be defeated so quickly) was to crack the German codes.

The Brits Triumph

So began one of the strangest recruitment drives of the entire war effort. The authorities gathered together a group of mathematical and electronic wizards and secreted them in a Hertfordshire country mansion called Bletchley Park. It was the stuff of which spy movies are made, although the setting would have been more appropriate for an Agatha Christie thriller.

The plan was totally eccentric — but, amazingly, it worked. Using valves, the select few created the first electronic computer and broke the German codes. Many

historians believe that this achievement won the war for the Allies. It is important to remember though that this computer series (known as Colossus) was only a *special purpose* computer.

The first *all-purpose* general electronic computer was an American achievement. Cumbersomely known as Electronic Numerical Instigator and Calculator (affectionately known as ENIAC), it was the world's first 'modern' computer. First operated in 1944 — it was massive, costly and with severe limitations.

The Stored Program

The most obvious limitation was the fact that to change from one program to another, part of the computer had to be rewired! Enter the American mathematician Jon van Neuman. More than any other individual this man was responsible for the next vital step in the development of the computer — the *stored program.* This is the technique of feeding the complete program into the computer's memory and keeping it there permanently in its entirety.

This explanation of a stored program is more easily understood if a computer is again compared to a pianola. A pianola can only 'run' its program (the roll) *once* without it being physically reinserted into the pianola to 'run' again in strict consecutive order. The situation was much the same with early computers and programs. However, the development of the stored program presented two distinct advantages.

Firstly, the program could be repeatedly used without having to be fed back into the computer each time. Secondly, the computer had become a 'decision maker' since it could refer to any part of the program instantly and at will without having to go back to the beginning of the program and run it consecutively (like the pianola roll) until a wanted piece of information was located.

The stored program was a great breakthrough in practical computing but the cost of building such a machine still remained astronomical. The valves (at $10 a time)

were a crippling expense. Then, almost out of nowhere, Bell Telephone announced the invention of the transistor. Cost: 10 cents. And computers were on the move again ... the electronic revolution was gathering momentum.

But, marvel as it was, the transistor was to be only a short-lived miracle. A replacement was just around the corner. It was discovered as a by-product of the 1960s Space Race to put a man on the moon. The staggering amounts of US government money injected into research during this period produced many scientific discoveries — not the least of which was enormously complex electronic circuitry contained in a very tiny space. This was the birth of the silicon 'chip' or integrated circuit — and so microelectronics had replaced the transistor.

The Silicon Chip

The silicon chip, smaller than your little finger nail and costing only a few dollars, is today's equivalent of a half million dollar computer occupying a large room in 1959, the year before Kennedy announced the man on the moon program.

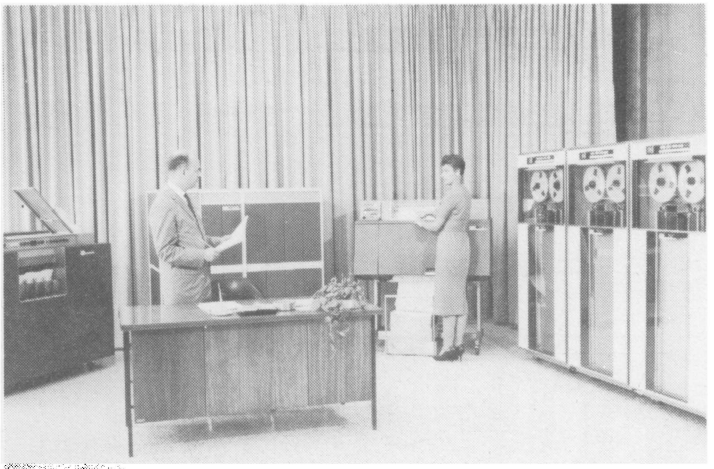
Not only did the development of the silicon chip contribute to previously undreamed of technology, but it also sent prices and sizes plummetting downwards.

The arithmetic goes like this. Valves (the basis of the First Generation Computers) costing $10 were replaced by transistors (Second Generation Computers) costing 10 cents. Then came the silicon chip (Third Generation Computers) costing a few dollars but the equivalent of 100 000 transistors.

According to one calculation: 'If the dollar had inflated at the same rate at which electronic costs have deflated, a sandwich that cost you a dollar in 1950 would cost you $20 000 today.' (*Running Wild,* Adam Osborne.)

And The Future?

The electronic revolution is changing the face of the earth. That is Fact One. Computers, the central core of the revolution, will affect the lives of every person on this



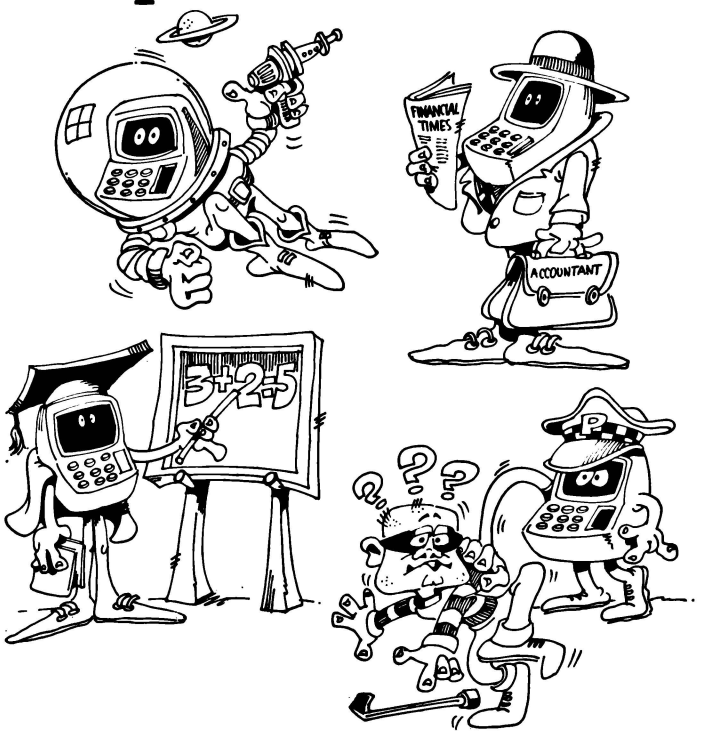
Back in 1959 all these components were needed to make up a miraculous new data processing computer from IBM.

This 1960 IBM STRETCH computer (the real thing near completion and the model proudly displayed in foreground) was marketed at prices upward of $10 million.

planet, and beyond. That is Fact Two. Fact Three? Well, there'll always be Death and Taxes, but I sincerely believe that there are undreamed of benefits to be reaped by everybody who has the privilege of living in a computerised world controlled by humans.

Chapter 3

What Can A Personal Computer Do For You?



WHAT CAN A PERSONAL COMPUTER DO FOR YOU?

Even if this book were to expand to encyclopaedic proportions there is absolutely no way it could describe *everything* a personal computer can do for you. *The uses are infinite* — limited only by your imagination. (I know a gynaecologist who has worked out a way to use a personal computer to calculate the weight of an unborn baby — don't ask me how, but that's where his imagination led him!)

Perhaps the best way to give you some practical ideas about a computer's potential capabilities is to separate them into different categories. The categories are not listed in order of importance — it is entirely up to you to decide what area (or areas) of computer use appeal to you as being the most interesting or valuable. The categories are not totally separate either, of necessity they overlap.

- Entertainment
- Education
- Research
- Household Management (accounts, etc.)
- Domestic Monitoring
- Hobby Organization
- Computing: The Hobby
- Small Business Management

ENTERTAINMENT

The moment you carry a personal computer inside your front door, you have created an instant home family entertainment centre. There are literally hundreds and hundreds of absorbing games you can play simply by turning on the power and loading a cassette tape or a disk programmed as a game. There you have it — the screen lights up with *Galaxy Invasion* or a challenging game of chess!

A small selection of the vast range of cassette programs available for personal computers.

Huge Variety Of Games

There is an enormous variety and range of games available, and your only problem will be to choose from such a tempting selection. (See Chapter 6 for a rundown on just a few of the games you can select from.)

Computer games are an economical form of amusement too. The average price of the software (the game program) is about $20.00 (some are cheaper, some are more expensive) — and that's a once-only cost. Your computer doesn't eat 20 cent pieces and your children are not wasting their pocket money in some sleazy amusement parlour. The only expense in playing computer games as many times as you like (beware — they're addictive!) is the electrical power used — which is minimal. (A switched on computer and video display screen consume about the same amount of power as a modern TV set.)

Hand/Eye Co-ordination

An interesting and beneficial side-effect of playing computer games is the way in which they develop

hand/eye co-ordination skills, particularly in young children.

Some of the games also have an educational aspect included as part of the fun. For instance, in several of the space invader type games the player will have to solve a simple arithmetical problem before the computer will allow the space craft to land and proceed with the next part of the game. Children respond very well to this, working out the arithmetic quickly and accurately with an enthusiasm that is often lacking in a conventional learning situation.

Many of the game programs are computerised versions of popular games such as poker, chess or bridge. The difference here is that you are pitting your skills and wits against a computer. (Don't worry, the computer is far from infallible — I've called its bluff in poker many a time. To add reality to the game, the person who wrote the game program has allowed for the human factors of bluff, gamble and greed.)

Good Old-Fashioned Fun

Although there can be some educational value in these computer games, it is stressed that their main purpose is for entertainment and enjoyment. There's certainly nothing wrong with good, old-fashioned fun for its own sake.

One final point which the seventeenth century Pascal would never have imagined in his wildest dreams — computer games are a definite deterrent to parental insanity on rainy days during the school holidays!

Remember, to play these games, you don't have to know anything at all about computers — it's simply a question of plugging in the power and loading the cassette.

Is Dad worried that he won't score as high as Junior in the Meteor Mission game? Computer games develop a high level of hand/eye co-ordination at an early age.

EDUCATION

Have you ever wanted to learn to type, but never had the time to attend classes? There is a ready made program — called Typing Tutor — which will teach you as effectively and perhaps more quickly than attending formal lessons in a classroom. After each lesson your performance is evaluated, i.e. the computer displays your degree of accuracy and number of words per minute typed. If you are satisfied with your own performance you can proceed with the next lesson or, if you prefer, you

can repeat the lesson as many times as you like. The computer is your devoted slave-teacher.

Want To Be A Pilot?

Learning to type is just one of hundreds of ready made teaching programs for all age groups. The children (or you!) can learn to spell, practise maths, study a foreign language, develop speed reading skills, learn the basis of flight, study music ... the list goes on and on.

A Computer Has Infinite Patience

A computer has infinite patience when used as a teaching aid. It never becomes cross or bored — and it never has favourites.

If you don't do well in a test the machine does not become annoyed. It simply suggests that you might like to try the test again, perhaps at a lower level of proficiency, until you have mastered it. The computer always offers its pupils a choice.

The computer is not impersonal either. It asks your name and the lesson is directed at you personally, with your name appearing on the screen. The results of all lessons are graded by the computer, which always marks fairly and accurately. There are very few children (or adults for that matter) who won't feel a sense of pride when a flashing box appears on the screen with the words 'CONGRATULATIONS DICK, YOUR SCORE IS 100%'.

RESEARCH

You've probably heard of data banks that store information on all sorts of subjects ranging from medical research to the latest stock exchange prices. But did you realise that your computer can give you instant easy access to the thousands and thousands of documents stored in data banks all over the world?

This might sound like a glimpse into the distant future but it is actually happening now!

All this is made possible by a neat little unit called an acoustic coupler modem, a communications network

called MIDAS and your ordinary telephone: Full details are given in Chapter 7.

HOUSEHOLD MANAGEMENT

Unless you run a mansion the size of Buckingham Palace with a commensurate number of staff, there is absolutely no need to call in IBM to design a special computer to manage your household. Your personal computer will do just fine.

Balancing The Budget

Balancing the household budget is something that comes more naturally to computers than it does to most humans. Not everyone has the innate mathematical ability to control accounts, which is probably why some of us mismanage the family budget — or don't have one at all.

The computer can competently take charge of your household accounts and general budgeting. There are ready-made programs available for these purposes but if you find you have an aptitude for programming you may want to develop your own program, specifically tailored to your particular household.

Your Bank Balance

There are very few people who have not had the experience of being at odds with the bank over the exact sum of money in the account. (Infuriatingly, the bank's computer is nearly always right!) So, as the old saying goes, if you can't beat 'em, join 'em.

To find out your bank balance with precision accuracy all you have to do is feed into the computer the deposits made, cheques written, plus any bank charges or periodical payments. Then, at the press of a button, the computer will display your current bank balance.

Sure, you can do all this by hand, but the computer is quicker with a built-in mathematical ability.

Can the computer make a mistake in calculating your bank balance? No, the computer cannot make a mistake, but if *you* feed in an incorrect piece of information (for

example, you tell it you wrote a cheque for $20 when the amount was actually $200) it is quite obviously going to give you the wrong balance. The mistake is yours, not the computer's. ('Garbage in, garbage out' is a proven computer adage.)

Preparing Your Income Tax Return

This is an excellent use for your personal computer. It is very easy to make an error in calculation when preparing your tax return by hand. This holds up your return and increases the time taken to process it. Not only does the computer fill in a return more efficiently and methodically than you, it does the job considerably faster ... which means you get your refund cheque sooner!

There is an excellent income tax program available written especially for Australian conditions.

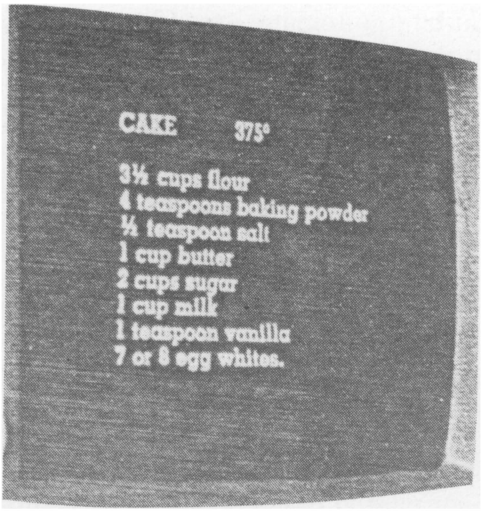
Other Aspects Of Household Management

Depending on how much time you have at your disposal there is practically no limit to the amount of household organisation you could program a computer to control. Some people make an inventory of their pantry cupboard and use the computer for grocery stock control. (Personally, I reckon this is probably more trouble than it's worth ... unless you have an exceptionally large and hungry family!)

You could also use your computer to catalogue all your favourite recipes. Then, at the press of a few keys, the screen would display a selection of recipes all featuring the mince meat you've decided to prepare for dinner. (Again, I'm not so sure that this is of any real benefit, but I daresay it would be of interest to some people.)

You could even use your computer to organise your Christmas card mailing list ... inventory the household records ... or catalogue your cassette or butterfly collection ...

The possibilities are endless. Once again, it's your imagination, time and skill that count.



The recipe book of the future?

DOMESTIC MONITORING

The use of computers in controlling domestic appliances is quite advanced. In fact, there is no real limitation to the computer's ability — the only limitations are in your ability to program the computer to do what you want, the engineer's ability to produce the hardware to attach to it and, very important, the cost involved.

The principle behind computer control of a household appliance is very simple. Take your oven, for example, A small electrical device called a relay can be attached to the normal on/off switch to start or stop the oven at a predetermined time or temperature. This relay may be activated by an infra red light that is controlled by the program you have fed into your computer. *There need be no physical connection whatsoever between the computer and the oven.*

This example is meant only to illustrate the principle of computer control. In reality, it would be a complete waste of time, effort and money to computerise your oven — the manufacturers have already done it for you by supp-

lying an in-built automatic on/off timer and control in most modern ovens.

Using the same relay principle a computer can be programmed to turn lights on and off at regular (or irregular) times when you are away from home. Once again, if you only want a few lights controlled, it's hardly worth the expense of a computer system when you can buy a ready made light off/on system for far less than a computer set up would cost.

However, if you wanted to go all the way and be able to turn on/off lights, radios, TVs, video recorders, electric blankets and even the air conditioning in the dog's kennel, you could purchase a control device (it has about 16 channels and uses normal radio frequency) which, when linked with your programmed computer, will control all these appliances and more. (Maybe that's going a bit far — but I guess it depends on what turns you on and how much money you have to spare.)

Home Security

One domestic computer application which is of real benefit is in the area of home security. If you install a conventional noisy ringing burglar alarm, the problem is that nobody takes very much notice of it. How often have *you* heard an alarm ringing and done nothing about it? Even neighbours are often loathe to interfere or call the police. In any event, noise pollution laws only allow the alarm to ring for a fairly short period of time.

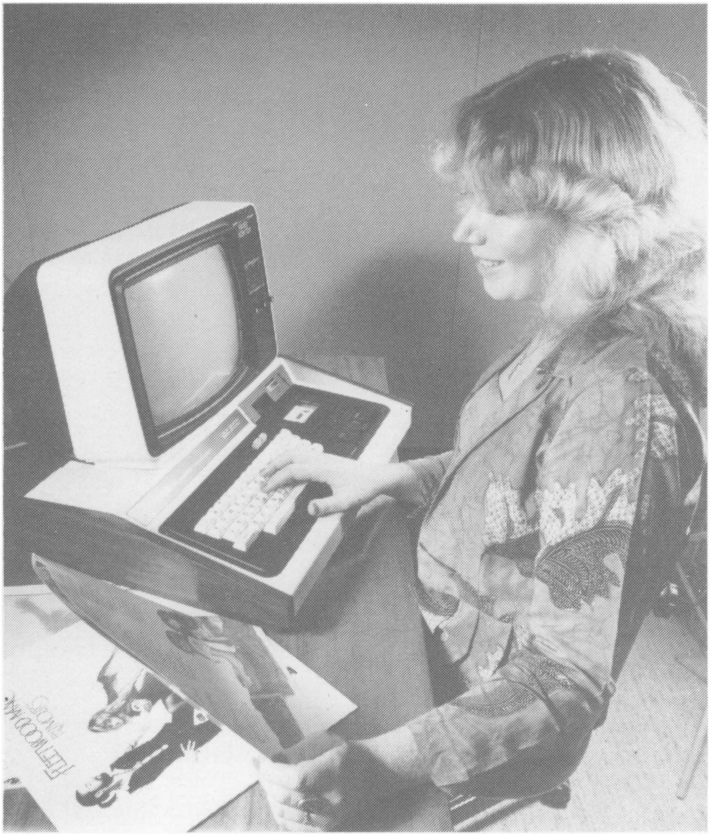
It is now a proven crime statistic that a burglar is not unduly worried by the sound of an alarm going off. He is fairly confident that apathy will prevail and the law is not likely to arrive in a hurry... so he continues looting. But if your alarm is linked to your programmed computer... that's a different story.

A soundless light sensor detects the burglar and alerts the computer which automatically dials the police, issuing a pre-recorded message that a burglary is taking place at your address. The police can arrive swiftly and catch the thief in the act without him being aware that any

alarm has been sounded at all. This silent, computerised alarm is an exceedingly valuable security aid.

HOBBY CATALOGUING

A personal computer is the ideal way to organise and catalogue just about any type of hobby collection. Stamps, coins, records, tapes, photographs, butterflies ... all manner of collections can be put in order with the help of a computer.



A computerised record catalogue? Why not? You'll never lose track of your favourite album.

Although there are some pre-written programs to get you started, you would need to acquire some programming skills yourself in order to take advantage of all the computer has to offer.

COMPUTING: THE HOBBY

Learning to program a computer is an absolutely fascinating hobby in its own right. It's a very creative activity to which you can rapidly become addicted... in the best sense of the word! This book does not attempt to teach you programming, but try the super simple program written out on page 65. This is just a totally elementary bit of fun — but it would spark your interest and stimulate a desire to learn more.

As the computing hobby gains more and more devotees, computer clubs are springing up all round the country. (See page 143 for Club Directory — maybe there's one close to where you live.)

Financially Rewarding Hobby

Programming can also be a very financially rewarding hobby. Because most of the programs sold in Australia have been written in the United States, often for situations and conditions which do not apply here, there is a strong demand by software retailers for first class programs written for local conditions. (We've even purchased programs devised by talented fourteen year olds.)

You really need a certain type of analytical mind to become a good programmer. But you'll never know if you have what it takes until you get your 'hands on' a computer and a good instruction book.

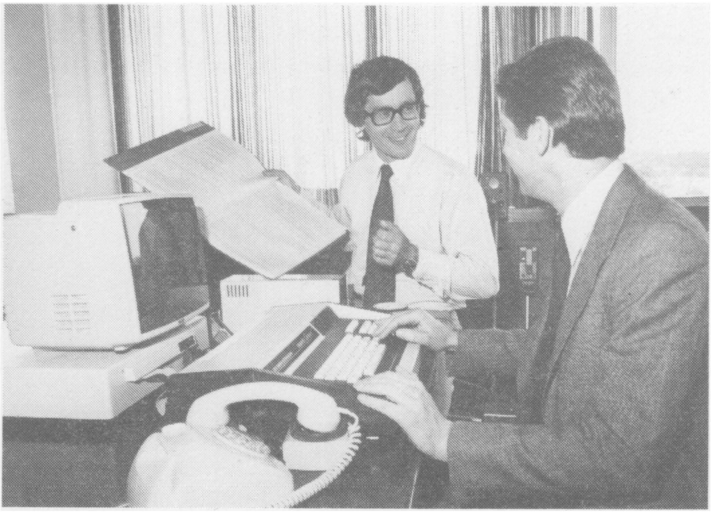
SMALL BUSINESS MANAGEMENT

The use of a computer in a small business deserves a separate chapter of its own. It will suffice to say here that there are ready made software programs to take over

such aspects of a small business as:

- Accounts
- General Ledger
- Inventory
- Stock Take
- Payroll
- Word Processing

Some fundamentals of business management can be entrusted to the computer and hours of manual labour saved.



One of the advantages of using a computer in a small business is that you can tell at a glance just how the profit (or loss!) is shaping up.

CONCLUSION

The contents of this chapter are really only a general guide to what a small computer can do for you. Just reading the ideas and suggestions given here has probably prompted your own thoughts on how you and the computer could get together to benefit your particular lifestyle or business.

Remember, the average personal computer costs about the same as a good stereo system and has an infinitely greater capacity for being enjoyed and used in thousands of practical ways.

Chapter 4

Getting Started In Computing And Choosing The Hardware

GETTING STARTED IN COMPUTING AND CHOOSING THE HARDWARE

You've already taken the first step in getting started in computing — *you are computer conscious.* The fact that you are reading this book proves it. You've become aware of the increasing use of computers at work, at school or simply in the course of everyday life.

(The other day my wife asked me to check that our family health insurance was up to date, so I phoned the company and was immediately asked for my insurance number. When I gave it I could hear the electronic sounds made by the girl as she keyed my number into her computer. Within seconds she replied: 'You're Dick Smith from North Ryde and your insurance is fully paid up till the first of next month.' A simple experience like this really underlines the fact that we are in the computer age.)

A 'Hands-On' Demonstration

A good way to have your first close encounter with a computer is to visit a shop where computers are sold and there are demonstration models on view. Most sales people (particularly in specialised electronic shops) are knowledgeable about computers and are only too pleased to explain the product, demonstrate it, and let you get your 'hands on' it.

Computer Shows

Spend some time at a computer show. These are being held in the major cities with increasing regularity. All types and brands of computers are on display and this

gives you an opportunity to compare the capability and prices of the various brands. (I happen to believe that my computers are the best — but others sell for more money. My advice: compare all the different brands and see exactly what you get for your dollars.)

Visit A Computer Club

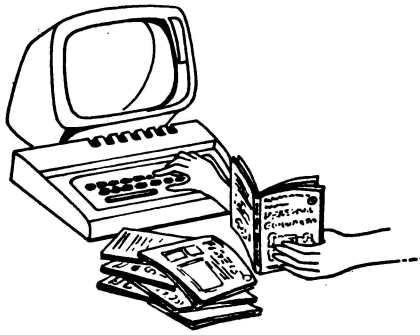
Check around and see if there is a computer club in the area where you live or work. You'll sometimes find these clubs advertising in the local papers. Ask if you could attend a meeting to see what goes on. Don't be shy just because you don't know much about computing yet — you'll find that most computer enthusiasts are very keen to spread the word about the hobby and will enthusiastically give a newcomer many valuable tips.

Start A Club At School

If you're still at school there's bound to be a teacher with a feeling for computers. Suggest to him/her that a computer club should be started at school. Maybe the P & C could be persuaded to donate some of their funds towards the purchase of a computer.

Magazines And Books

Read all you can about computers. There are at least two locally produced magazines devoted to personal computing now appearing on newsagents' shelves. Other American and English magazines and books can be bought at specialised shops.

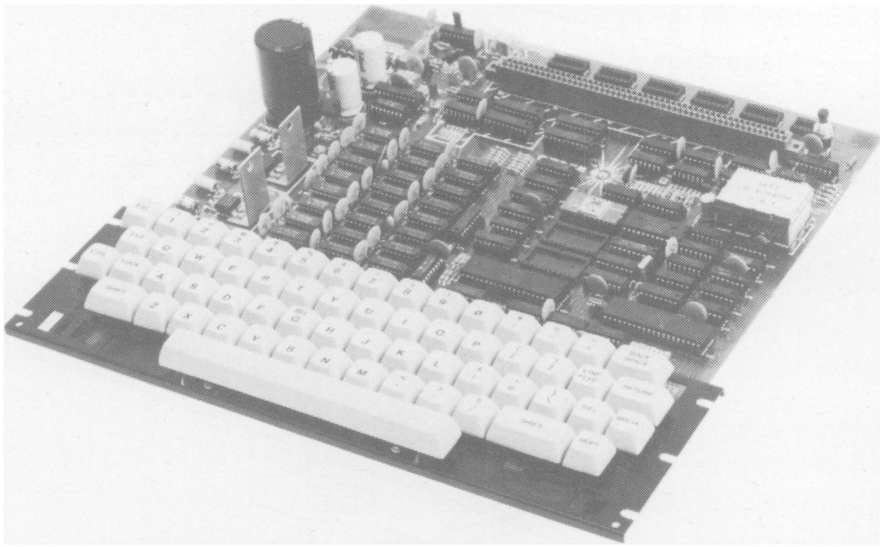


Build Your Own

If you're an electronic hobbyist but know very little about computers, why not buy a kit and build your own computer! It's nowhere near as difficult as you might think, and you'll save a considerable amount of money.

Most computers sold in Australia are manufactured in the USA where extremely high labour rates prevail — and you pay for this on built-up units. With a computer kit, *you* provide the labour and therefore reduce the cost very substantially.

Anyone who has a reasonably good knowledge of electronics and can solder neatly should have no difficulty in construction. This is because of a unique double-sided circuit board design which means there is virtually no other wiring. The board is covered with a professional 'solder mask' which makes soldering much easier and eliminates the problems of bridges etc. Once the components are soldered onto the board in their marked position over 98% of the construction is completed.



An assembled computer kit.

Building a computer from a kit will teach you the technical side of construction, how a computer works and, soon, you'll learn to program. Conversely, if you already know how to program but don't know much about the inside of a computer ... there couldn't be a better way to learn than by building a kit. All of which gives you an excellent background for an exciting career in computers, one of the growth employment areas of the future.

Modular Computer Systems

Rather than have all the computer equipment inside a single case, it is usually a wise decision to buy a modular system. In this way you can add to the system as your interest (and budget) increases. If you cannot add to the system as you wish your initial purchase outlay is really wasted money.

With some computers it can be a real headache to add to the system later. What you want might not fit in the unit — or if it does, you have to send your whole computer back to the factory for modifications. This is costly, and you're without your computer.

If you want to add to your modular system all you have to do is buy the new unit and plug it directly into the back of your existing computer or expansion unit.

With many machines you're locked into the expansion facilities provided by the manufacturer — or lack of them. Therefore, you would be wise to select a modular computer that can accept expansion boards made by a multitude of different manufacturers to cover almost every conceivable type of computer application.

Service is another good reason for choosing a modular system. Suppose a disk drive has a 'bug'. With a onebox system, it's back to the factory again. Although the repair might be simple, you'll be days without your computer. With the modular system, all you do is unplug the drive and send *it* back for repair. In the meantime you've still got the rest of your computer operating normally.

Buy From An Established Dealer

Buying a computer is quite a sizeable investment so it is extremely important to buy from a reputable shop that has been in business for some time. The shop has its good reputation to protect so you can be assured of good aftersales back up service.

Although they are remarkably sturdy and tough, computers *do* break down and you will want to be satisfied that the firm that sold you the computer can carry out warranty work and service the unit promptly.

Chapter 5

A Close-Up Look At Two Typical Personal Computers

A CLOSE-UP LOOK AT TWO TYPICAL PERSONAL COMPUTERS

When you lift your new computer out of its box for the first time you'll probably be surprised how light it is. (Silicon chips don't weigh much!) As you can see from the photograph below it looks very similar to the familiar typewriter.

SYSTEM 80

Now let's run through the various components of one typical personal computer, the System 80.

This unit, together with a display screen (either your household TV screen or a video monitor) comprises a basic personal computer set-up.

A green phosphor video monitor.

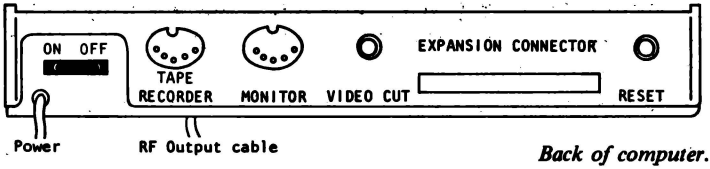
TV Screen Or Monitor?

Using a TV screen for the display saves a little cash on your initial outlay but, in a family situation, can lead to arguments when Mum's favourite serial clashes with your galactic battle. So you might want to buy a video monitor as well, save fights ...

Video monitors have either white or green print on a black background. The green-print type is slightly more expensive but it is considered to be kinder to the eyes and ideal for use over an extended period.

Connecting Up

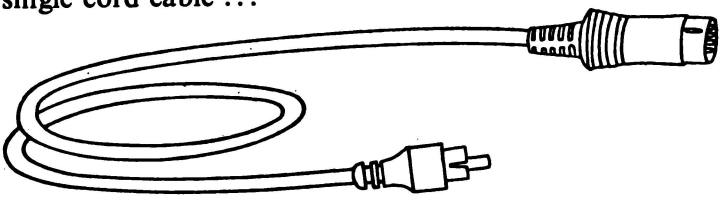
The best place to begin the close-up look is at the back of the computer because this is where the various cords that come in the box with it have to be connected.



Back of computer.

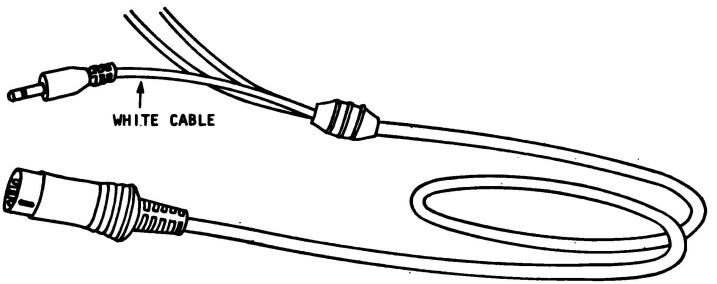
If you are going to use your TV as the monitor screen take the RF output cable which is permanently connected to the back of the computer and plug it into the aerial socket of your TV, selecting Channel 1.

If you have a video monitor, plug the fat end of the single cord cable ...



... into the hole marked MONITOR on the back of the computer; plug the thin end of this cable into the only hole at the back of the monitor.

If you are going to use a program that has electronic sound effects, take the second cable that comes with the computer and insert the fat end in the hole marked TAPE RECORDER in the back of the computer and the plug on the thin white cord in the hole low down on the right hand side in front of the monitor.



Before you plug in to the household power here is a brief explanation of the other switches and buttons on the back of the keyboard.

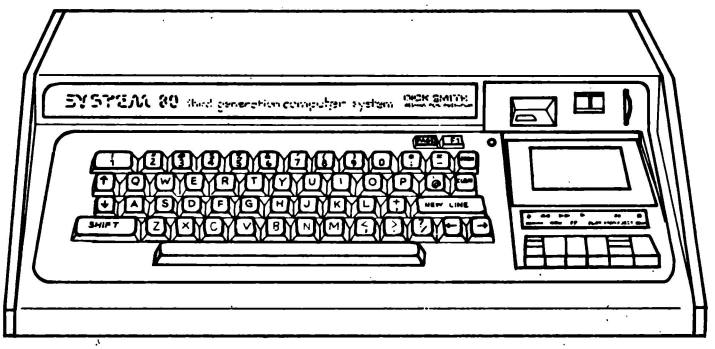
ON/OFF: Obviously, the on/off switch for the computer itself.

VIDEO CUT: This button should normally be left out, but press it in if you want to double the size of the letters appearing on your monitor screen.

EXPANSION CONNECTOR: The outlet through which attachments to the computer are connected (see Chapter 7).

RESET: Pressing this button 'rubs the slate clean'. Any program already stored in the computer's memory is immediately erased.

Now that the computer is connected to the display unit, plug both units into the household power and let's take a look at the front of the computer.



The Keyboard

This is set out almost exactly like a typewriter with keys for letters, numbers, symbols and a space bar. The position of some symbols and computer command keys (such as NEW LINE, also called RETURN or ENTER on some computers) vary from computer to computer as is the case with different brands of typewriters. One differ-

ence between a typewriter keyboard and a computer is that the numeral zero is always printed with a slash through it, ∅. This is because the computer's ultra logical 'mind' could not otherwise tell the difference between a zero and the letter O.

The keyboard is used like a typewriter to 'input' information into the computer. The words you type (input) on the keyboard display (output) on the video monitor.

Special Function Keys

PAGE: The PAGE button is activated when the Video Cut button at the back of the keyboard is pushed in. When the button is up, the screen shows the left half of the display; when the button is down, the right half of the 'page' is shown.

F1: When it is pressed down, this button turns on the manual control keys for the built-in cassette player.

Built-In Cassette Player

The built-in cassette player, located on the right hand side of the keyboard, is also an input device. It looks exactly like a regular music cassette player and operates in exactly the same way. The tapes you load in the cassette player are re-written computer programs. (See Chapter 6 for a guide to the type and variety of programs available.)

The Central Processing Unit (CPU)

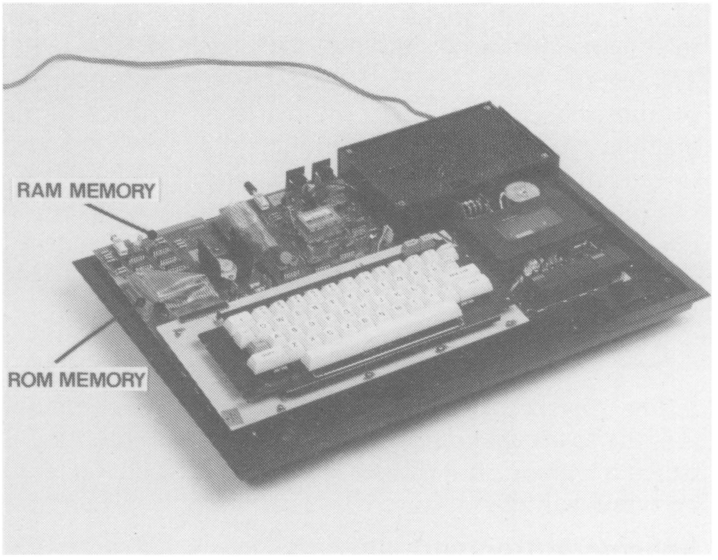
This is located inside the keyboard unit and is the 'heart' of your computer containing its memory.

A computer has two different types of memory —

Read Only Memory (ROM): a fixed and permanent memory which is built into the computer during manufacturing and used to store the operating system programs which process data input to the computer, run your programs, and process output.

Random Access Memory (RAM): a reusable and temporary (if desired) memory which is used to load, write and store both programs and data.

The size of the computer's memory (either type) is expressed in terms of 'kilobytes' or, more commonly, just the symbol K is used.



This photograph of the 'guts' of System 80 pinpoints the location of both ROM and RAM memory. The black perforated box on the upper right side is an inbuilt power supply. Below this is the inbuilt cassette.

The System 80 has a 12K ROM (read only memory) which gives you the full range of commands and functions necessary for serious programming.

The same computer has 16K of RAM (random access memory) which is more than ample for most people. Less than 16K can be very limiting since the computer will simply not have a sufficiently large memory to cope with all the programs you want to use or write. If you become really serious about computing, even 16K could be limiting. However, it is generally a simple matter to expand the computer's memory (see Chapter 7). For additional explanatory information about memory see *Appendix.*

Your First Program

Okay, let's get started on your first program.

First switch on the video monitor (use the left hand knob marked on/off — the other two knobs are for contrast and brightness). If you are using a TV set you may have to adjust the brightness/contrast controls or the horizontal/vertical holds to get a clear display on the TV screen. Next, you're finally ready to turn on the computer itself by pressing the switch at the back of the machine. A small red indicator light above the keyboard to the left will signal that the computer is on.

The word READY? will immediately appear in the top left hand corner of the screen. Next press the key marked NEW LINE and READY will drop vertically down to the bottom left hand corner displaying like this

```
READY
>_
```

The > is the 'prompt' sign indicating that the computer is ready to accept your instructions. The short line dash is called a 'cursor'. It indicates where the next character to be typed will go.

Loading A Program

Now, assuming that you do not know (yet, at least) how to program a computer yourself, it is simply a question of loading a program that someone else has written. Most personal computers come with a demonstration cassette which you can run as your first program.

Step-by-Step

1. Take your cassette tape (I've chosen a game called Poker Pete) and place it in the player in the normal way.
2. Press the button marked F1 on the keyboard to activate the cassette player.
3. Press the rewind button.
4. When the tape is rewound, press the counter button so that it reads 000. Also press the F1 button again, so that it goes to its 'up' position.

Now you are ready to inform the computer that you

As you can see, a computer cassette program is placed in the player in exactly the same way as a conventional music cassette.

want it to load a cassette. There are several alternative words used for this command — CLOAD (Cassette **Load**) and SYSTEM being two of the most common. The correct word to use is printed either on the package containing the cassette tape or on the loading instruction sheet that comes with it.

5. Type the word — say CLOAD — on the keyboard, then press the NEW LINE key.

6. Press the Play button on the cassette. Within a few seconds an asterisk will appear in the top right hand corner of the screen. After a few more seconds the volume meter above the cassette will activate — i.e. move from zero to the right.

7. Adjust the volume so that the needle is between 2 and 3. Some tapes require a slightly higher level of volume — you just have to experiment to get the correct level. A second asterisk, flashing intermittently, appears almost instantaneously. This tells you that the program is being 'loaded', or stored into the computer's memory (the RAM memory). The length of time taken for this proce-

dure depends on each individual tape — 6 to 8 minutes would be average.

8. When the program is finished loading in, a READY appears on the screen.

9. Now it's time to type in the command word that activates the taped program now stored in the computer's memory. The most common command word is RUN — but check the instruction sheet that comes with the cassette. Type in RUN, press NEW LINE ...

Now it's you v. the computer in a high stakes poker game! Poker Pete will ask you your name, explain the rules, shuffle the cards, deal the hands ... and the game's on. The computer keeps track of who's winning the money and, from time to time, presents a moving display across the screen which reads THE LEADER IN THE POKER TOURNAMENT IS ... POKER PETE! (occasionally it says my name!) Poker Pete gives you the option to fold if you have a bad hand and when you do he responds sarcastically with NO GUTS HUH? or a series of symbolised expletives.

My flush beats Pete's straight any day. But I'm not always that lucky!

(I haven't chosen Poker Pete to illustrate a game because I think it is one of the best. It's just that it's simple — and fun at the same time. There are many more challenging games — both mentally and physically.)

There are hundreds and hundreds of programs available in cassette form. See Chapter 6 for a list of just some of the programs that are available. Remember, always make certain when you buy software (i.e., a program) that it is compatible with the hardware (i.e., your computer).

Writing Your Own Programs

As has already been explained it is not the purpose of this book to teach you how to program, but if you've come this far the least I can do is show you a very simple program. Actually, I'm going to make it so simple that you probably wouldn't recognise it as a computer program ... but it is. And all types of computer programs (including the complex scientific programs written to guide Mariner to the edges of the planet Saturn) stem from this process of basic logic.

Here we go:

1. To erase Poker Pete from the computer's memory, press the BREAK key, type in NEW and hit NEWLINE. The word READY will appear in the top left hand corner, followed by >–, and the computer is now ready to receive your first program.
2. Type in

   10 PRINT 'DICK SMITH!'
3. Press NEW LINE
4. Type in

   20 GOTO 10
5. Press NEW LINE
6. Type in

   30 END
7. Press NEW LINE

This, what you see on the screen, is your program. It consists of three instructions to the computer. Now type

the command RUN, press NEW LINE — and this is what you'll see.

The reason why the whole screen is flashing with DICK SMITHs is because of your second instruction, 2Ø GOTO 1Ø, and the fact that the computer takes everything you say literally and logically. GOTO is a computer command word that means exactly what it says. The computer has been told to GOTO line 1Ø, i.e. carry out the line 1Ø instruction again, so it must continue to obey the instruction and print DICK SMITH *ad infinitum.* (Maybe *ad nauseam* is a more appropriate phrase!) The computer *cannot* obey your instruction in line 3Ø to END because the GOTO instruction in line 2Ø is self-perpetuating. The computer does everything in strict numerical order.

The number in front of each instruction is to identify and separate each individual line of the program. The reason for leaving a large numerical gap between line numbers is to allow you the flexibility to add other

instructions which the computer will list and carry out in numerical order. (See Chapter 8 for more detailed information on programming.)

So much for my ego trip. Now, how about stopping the program (use the 'BREAK' key), and typing in your name instead of mine. The program will work exactly the same way — the computer has no favourites!

A Typing Error In Your Program?

What happens if you make a typing error? Say, for example, you've typed PLINT instead of PRINT. The computer's memory is programmed to understand the word PRINT but the word PLINT is totally meaningless to it. So, in response to your error, the screen will display.

?SN ERROR IN 1Ø

(SN is short for SYNTAX)

Therefore you must type the whole line again correctly. The computer will then automatically accept the new correct line 1Ø and delete the incorrect line 1Ø from its memory.

If you see that you've made a typing error before you have moved on to the next line, simply press the backspace key (←) to delete the incorrect letter(s) and retype in the correct letter(s).

Recording Your Own Program

You can record your own programs on blank cassettes (or on disk, see Chapter 7). A blank tape (it can be an ordinary audio tape of reasonable quality) is placed in the built in cassette unit and a program can be recorded using exactly the same magnetic principle as in taping music or speech.

A Display Of Garbage

Whenever you turn the computer off, wait at least 10 seconds before turning it back on otherwise your monitor will display a load of 'garbage' — the whole screen is filled with meaningless mumbo jumbo and strange symbols.

Don't worry, you haven't broken the computer (that's amazingly difficult to do). Just turn it off and wait before

turning it on again, and the READY will display normally.

In fact it is bad computer practice to turn the machine on and off unnecessarily. Never do this when you want to change from one program to another. Instead, press the BREAK key (or the RESET button) and type in NEW to erase the existing program from memory.

VIC 20

The second personal computer you're going to take a look at is less sophisticated and versatile than System 80 but *sells for less than half the price.* The VIC 20 is really a combination super game player/ baby computer. It has enormous appeal to the many people who want more than just an ordinary game machine as well as the facility to practise computer operations which don't require extensive memory and other very advanced features found on more expensive computers.

The Vic 20 ready to go!

What Is The Difference Between A Game Machine And A True Computer?

A computer always has a fullsize typewriter keyboard, not just a small calculator-type pad which can be difficult to use. A computer can always use floppy disks (see Chapter 7) as well as cassettes, whereas many game machines can only operate cassettes. The machine language is always built into a computer in the manufacturing process so there is no need to pay extra for an 'extended' computing language as is the case with some game machines.

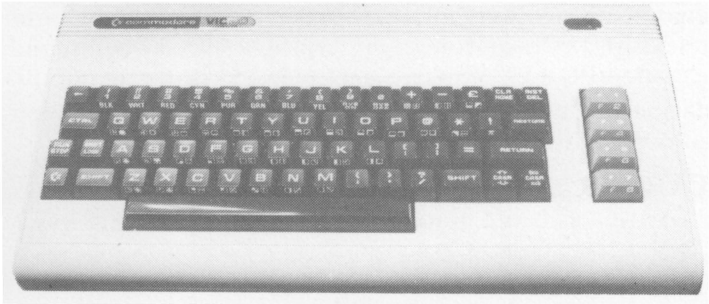
The most obvious difference between the two types of machines is that you can use your computer in all of the fascinating ways described in Chapter 3, and not just as a game machine.

A Colour Machine

This particular computer displays in colour either on a video monitor or on the screen of a standard colour TV set.

The same basic operating procedures that have already been explained for System 80 also apply to VIC. This computer does not have an in-built cassette player but it is just a simple matter of plugging an external one directly into the back of the computer which can be connected either to a TV set or a video monitor. It also has sufficient built-in expansion features to let the system 'grow' with the user as his or her knowledge and requirements become more demanding.

The Keyboard



Apart from the standard letters and numbers the VIC keyboard is different from System 80.

A quick run through the uses of the various keys will also give you a good idea of the machine's capabilities.

Graphics And The Commodore Key

When you turn on the computer you are automatically in 'graphics' mode which means you can type upper case letters and the more than 60 graphics you see on the keys. There are two graphics on each key. To get the graphic on the right side, simply hold down the SHIFT key and type the graphic you want. To get the graphics on the left side, hold down the COMMODORE key (the little flag). In this way, you can type upper case letters and the full graphics set at the same time.

Upper/Lower Case And Graphics

To get into the 'text' mode you simply press the SHIFT AND COMMODORE keys together. This lets you use the computer like an ordinary typewriter, with full upper and lower case letters, plus all the graphics on the left side of the keys. These are the graphics that are most suited for charts, graphs and business forms.

Colour

You can change the colours of the characters you type by pressing the CTRL key and one of the 8 colour/number keys. The colours are black, white, red, cyan, purple, green blue and yellow. You can set — and change — colours inside or outside a computer program. In addition to the eight character colours you can also change the colours of the border and screen on your television or monitor set by typing a special command called a 'POKE'. You can get up to 255 different combinations of screen and border colours, including 16 screen colours and 8 border colours.

CTRL

As well as being used to set character colours this key is

also used to execute special commands in certain programs such as wordprocessing.

SHIFT

If there are two symbols, numbers or words on a single key, pressing the SHIFT key at the same time as that key will display or perform the function of the top symbol, number or word.

The keyboard has two SHIFT keys and a SHIFT LOCK key, just like a typewriter, for typing long strings of upper case letters or graphics.

RUN/STOP

As its name implies, this is to start or stop a program running. If you stop a program and want to resume it where you left off, you can type CONT and the program will 'continue'.

RVS ON and RVS OFF

These two keys let you type reverse characters on the screen. For instance, white on black instead of black on white.

CLR/HOME

This key moves the cursor to the 'home' position at the top lefthand corner of the screen. If you press SHIFT and CLR/HOME you 'clear' the screen of all the characters that were present.

INST/DEL

An editing key which lets you insert or delete characters.

RESTORE

This is a 'reset' key. If you type the RUN/STOP key and the RESTORE key together, you completely reset the computer as if you just turned it on... with the benefit that any programs you had in the memory are retained and can be listed or run from the start.

CURSOR KEYS

These move the screen cursor up, down and sideways.

RETURN

This key serves the same purpose as NEW LINE in System 80.

PROGRAMMABLE FUNCTION KEYS

The 'function' keys are in a vertical row on the far right side of the keyboard. There are four keys and (if you shift them) a total of eight functions. When a program is running in the computer, it can 'look' to see if one of these keys is being pressed — and do special things if one *is* pressed.

This chapter has been designed as an outline guide to the fundamentals of personal computers. The system can be considerably expanded as you'll find out in Chapter 7. No, it doesn't get more complicated — it just becomes more flexible and allows you more options.

Chapter 6

The Range Of Ready Made Programs

THE RANGE OF READY MADE PROGRAMS

The programs listed and summarized in this chapter are just the tip of the software iceberg. There are hundreds and hundreds more available, with new ones becoming available daily. The purpose of this general listing is simply to give you an eye-opening indication of the great variety of software in many different areas of interest.

Remember, software and hardware must be compatible — in other words, they have to be able to communicate with each other in the same language. So, before you buy a program, always check that it will suit your particular personal computer.

The software listed here is all suitable for use on System 80 computers. A similar range of software is available for the VIC 20.

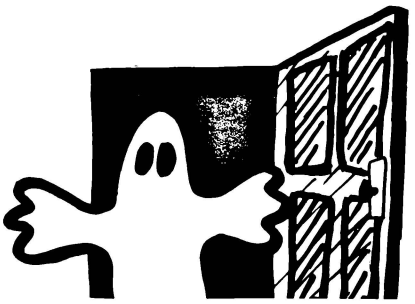
GAMES

Computer games have varying degrees of difficulty ranging from fairly simple hand/eye co-ordination movements to complex decision making/role playing games which really tax your brainpower and your manipulative skills.

Some individual games have various skill levels built into the program. You are offered a choice of novice, average or advanced levels, and asked whether you'd like to play fast or slow.

BATTLE STATION

The aim of the game is to defend your space station against the four attacking alien space ships. Cassette. Needs 16K of RAM. $19.95. X-3596



GHOST HUNTER

You have to find your way through a ghost-filled maze, eating dots as you go. If you're too slow the ghosts will get you — but if you've managed to eat a 'power pill' you'll get the ghosts! Cassette. Needs 16K of RAM. $19.95. X-3597

KILLER BEETLES

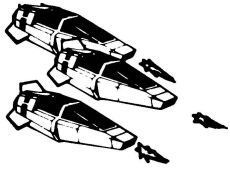
Pit your skills against the killer beetles. You have to dig traps and when a beetle falls in — you bury him. The problem is: they don't stay buried! Cassette. Needs 16K of RAM. $19.95. X-3598

SPACE SHOOT OUT

A game for two players. Your aim is to fire your missiles through the meteorite belt to destroy the other space ship. Cassette. Needs 16K of RAM. $19.95. X-3599

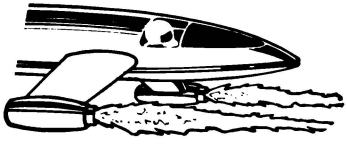
LUNAR LANDER

You are the commander of a Lunar Lander whose auto pilot has failed. It is your job to safely land the craft over difficult terrains while maintaining a watchful eye on your fuel load. Of course, once you have successfully landed, the trick is to get out again. Cassette. Needs 16K of RAM. $19.50. X-3691



GALAXY INVASION

You have to destroy the invaders and save the Earth — but beware of roving flagships! Cassette. Requires 16K of RAM. $19.50. X-3693



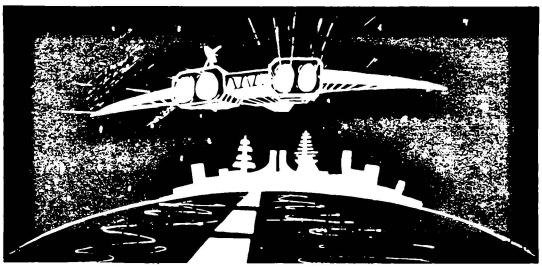
COSMIC FIGHTER

Again, your aim is to destroy the alien invaders . . . but in this version of the game once you have destroyed the aliens they all reappear . . . and you have to kill them all

over again. This time around alien destruction requires two hits. If you make it through, you then have to hit them three times for an effective kill. A Mother Ship provides refuelling and the menace of ever present flagships adds to the excitement of this hard and fast game. Cassette. Needs 16K of RAM. $19.50. X-3695

METEOR MISSION 11

Your mission is to rescue stranded astronauts from the planet below. You must manoeuvre your craft through the meteor belt to land, pick up and return the astronaut safely to the orbiting Mother Ship. To make life harder, the more astronauts you rescue, the more floating meteors appear! Cassette. Needs 16K of RAM. $19.50. X-3697



GALACTIC EMPIRE

A sophisticated game of strategy and tactics. Your object is to unify the galaxy. Cassette. Needs 16K of RAM. $19.95. X-3679

GALACTIC TRADER

The second of this now famous Galactic series. Your objective is to make a fortune trading commodities throughout the galaxy. Playing time is twenty minutes to five hours, with ten levels of difficulty. Cassette. Needs 16K of RAM. $19.95. X-3678

GALACTIC REVOLUTION

The third of the Galactic series. Diplomacy, social manipulation and Machiavellian ruthlessness must be combined to bring the major power blocks of the galaxy together to serve your ends as you lead the revolution (or suppress it!). Cassette. Needs 16K of RAM. $19.95. X-3677

TAVALA'S LAST REDOUBT

The cruel Tavala has been forced from his throne in the world of Galactica and has fled for his life to the planet of Farside where he and his band of rogues plan their last stand. Extreme solar conditions have isolated Farside from the rest of the galaxy, so it is left to Berthi, the Farside leader, to make the final assault on Tavala. Cassette. Needs 16K of RAM. $19.95. X-3676

BETA BLITZ

Put yourself in the pilot's seat as you approach a city on a high-speed bomb run. Your mission is to destroy the enemy's ground installations. Naturally, the enemy will respond with rapid fire anti-aircraft guns and fighter planes — they can mount a formidable attack! Cassette. Needs 16K of RAM. $14.95. X-3683

STAR WARRIOR

One of the popular 'Adventure' games; the scenery is set as woodland and mountain terrain. Utilising good

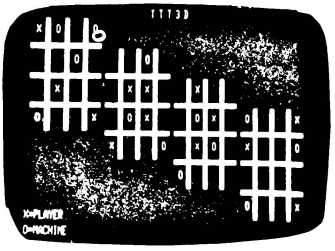
graphics and various levels of play, your aim is to hunt down the military governor of 'Fornax', and to destroy the installation in which he is found. Nineteen command options are available. Cassette. Needs 16K of RAM. $39.95. X-3643

TREK 78

The classic computer game based on the popular TV series *Star Trek*. This game provides continuous 'status' reports. Your aim is to destroy the enemy and save the galaxy. Cassette. Needs 16K of RAM. $12.95. X-3644

POKER PETE

Like to play a game of poker with Pete? He's a pretty shrewd player — hard to beat, though it can be done. This program has some quite intriguing graphics. Needs 16K of RAM. $15.95. X-3664.



3D TIC TAC TOE

The familiar 'noughts and crosses' game, expanded and made much more challenging. There are four grids on the

screen, one behind the other. You play the computer — but watch out — it's shrewd! Cassette. Needs 16K of RAM. $17.95. X-3671

SUPER MAZE

The maze game to end all maze games. It can generate mazes of up to 100 x 100 elements — and it can take you many hours to find the way out! Cassette. Needs 16K of RAM. $17.95. X-3672

FLIGHT SIMULATOR

A surprisingly good simulation of flying a small plane — has excellent real time graphics. Learn basic flight control, including take-offs and landings, then play the exciting British Ace 3D battle game. Cassette. Needs 16K of RAM. $34.90. X-3684

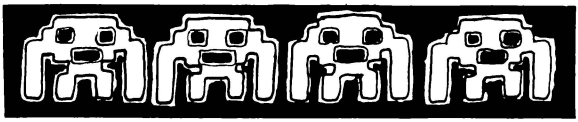
SIMUTEK PACKAGE ONE

Five space fantasy games in one package. *Graphic-Trek 2000,* in which you try to dock the Enterprise with its giant space station while avoiding Klingon torpedoes and phasors (really good graphics). *Invasion Worg,* where your job is to stop the Worg invasion of Earth (multi-level game). *Star Wars* — where you must manoeuvre your space fighter deep into the nucleus of the Death Star, plant your bomb then escape via the only exit. *Space Target* — a real-time space battle game with impressive graphics. *Saucers* — a fast action graphics game which calls for split-second responses! Cassette. Needs 16K of RAM. $17.95. X-3685

DEATH TRAP

How's your co-ordination between eyes and hands? In this fast moving real-time graphics game you have to control the motion of a constantly moving point on the video screen, and avoid randomly-appearing 'mines' until an 'escape window' appears. You can't cross your own trail, or hit the sides of the screen either. If you escape,

you get further tries — only it gets tougher! Cassette. Needs 16K of RAM. $9.95. X-3688

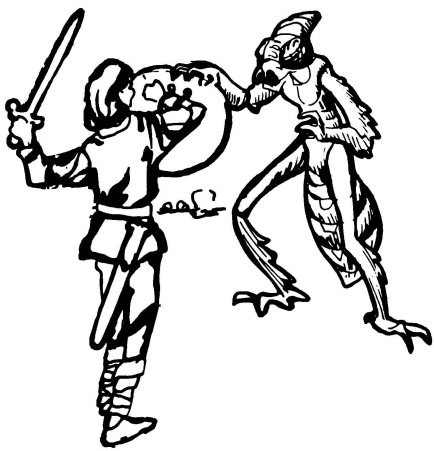


SPACE INVADERS

The ever-popular arcade game that has become a cult. Can you shoot down the aliens before they destroy you and the Earth? Cassette. Needs 16K of RAM. $9.95. X-3699

TEMPLE OF APSHAI

This is the first of the remarkable 'Dunjonquest' series and is one of the new breed of role playing games. 'Temple' offers you the chance to undertake heroic acts in a labyrinth filled with treasures, traps and monsters. You begin your adventures by bargaining with a tight-fisted innkeeper for the weapons and armoury you'll need in the Dujon. Cassette. Needs 16K of RAM. $39.95. X-3641

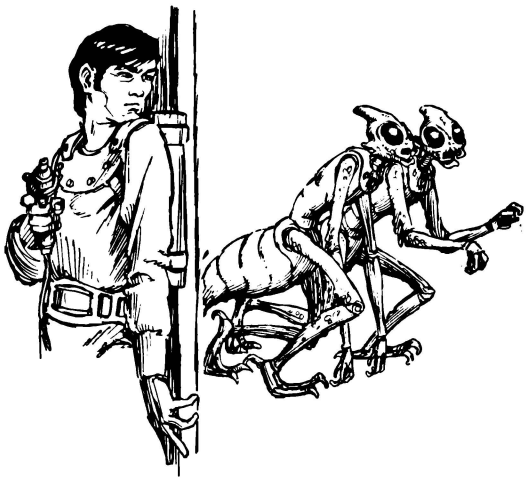


HELLFIRE WARRIOR

Another of the 'Dunjonquest' series set in mediaeval times. You commence by arming yourself with various

weapons which may be purchased (bartered for) and you are endowed with varying degrees of intelligence, ego, intuition, strength and constitution.

Various levels of play are available with the goal being to rescue the warrior maid Brynhild and return to 'the world above' with her. Beware! Forty three monsters await your every step — but some may be able to help you. Traps, secret doors and treasures await the player. Cassette. Needs 16K of RAM. $39.95. X-3642



RESCUE AT RIGEL

You're Sudden Smith, the intrepid space adventurer, and your beautiful friend Delilah Rookh has been captured by the evil High Tollah inside a secret base on the moonlet Rigel! You have to pick your way through the various levels of the base, overcome the Tollah and his cronies and escape with Delilah. The most impressive program in the 'Dujonquest' series. Cassette. Needs 16K of RAM. $22.50. X-3649

CRUSH, CRUMBLE AND CHOMP

This movie monster game gives you a chance to recreate just about any monster movie ever made. Only this time *you* write the script. *You* direct the action. And you get to be the star —the *real* star — the monster!

Choose from six different monsters and let loose the beast within you ... breathe fire, terrorize whole cities (you have a choice of New York, San Francisco, Washington DC and Tokyo) and snack on a horrified populace.

But wait! The National Guard is out to get you. Even as you read this a secret weapon is being readied against you by mad and skillful scientists. Are you truly prepared to face helicopters, tanks, artillery, and more, driven by those who are literally dying to get you? Cassette. Needs 16K of RAM. $29.95. X-3650

(This is one of my favourite games — it really tests your mental and physical skills.)

AIR TRAFFIC CONTROLLER

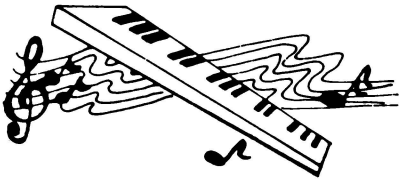
If you have ever wondered why air traffic controllers are so highly paid, this game will show you. Your task is to safely manoeuvre 26 aircraft between two airports and/or various points within your control 'area'. A time limit of 99 minutes is allowed for completion of the task. If you can plan ahead, it could lead to a new career! Cassette. Needs 16K of RAM. $12.50. X-3681

ASYLUM

This is the latest 'role-playing' game, in which you have to escape from a padded cell in the asylum. Many items to help you can be found along the way, and the use of ordinary English commands will determine your ability to survive — but you'll need plenty of patience! Cassette. Needs 16K of RAM. $19.50. X-3687

EDUCATIONAL

The computer is quickly becoming recognised as a valuable educational tool for both adults and children.



MUSICAL COMPUTER

Written by an experienced music teacher, this program helps the beginner learn to read music and find notes on the piano keyboard — quickly and easily. Cassette. Needs 16K of RAM. $34.95. X-3640

SPEED READING COURSE

A set of programs on two cassettes to help readers of all ages improve their reading skills. Written by a NSW primary school teacher, the programs have been developed from the West Australian Reading Development Scheme. The four programs correspond to the first four levels of the WARDS course, but can be set for reading speeds as high as 0.1 seconds per line. Needs 16K of RAM. $19.95. X-3692

TYPING TUTOR

A program that teaches you to touch-type. Claimed to teach typing skills faster and more efficiently than any other method, and has been widely acclaimed by business colleges. The program monitors your typing skill continuously, by checking the speed of response, and adjusts your progress to suit. Cassette. Needs 16K of RAM. $19.95. X-3682.

LEARNING FUN 1 — SCURVE INVADERS

A unique program that combines basic maths drill with the ever-popular 'Space Invaders' game — practising maths has never been so much fun! Before being able to take each shot with the laser gun at one of the dreaded Scurves, the player has to feed in the 'correct data' to the spaceship's computer. Tremendous fun, yet at the same time very effective in developing proficiency in maths. Sound effects, three levels of difficulty. Cassette. Needs 16K of RAM. $9.95. X-3694

LEARNING FUN 2 — HANGMAN/CONCENTRATION

Two programs which are not only great fun to play but also help to increase familiarity with words. *Hangman* is the computer version of the well-known word guessing game — complete with an animated graphics 'man' getting hanged. The words can be chosen by either the program, or a second player.

Concentration is the computer version of the well known TV quiz game. Two players or teams have to match prizes behind numbers on the screens, then guess the mystery food word. Cassette. Needs 16K of RAM. $9.95. X-3696

LEARNING FUN 3 — ALPHABET COUNTDOWN/RHYME TIME

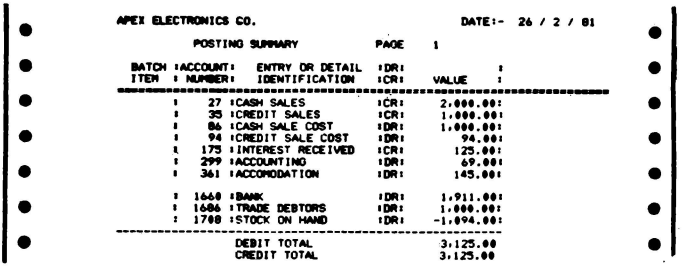
Alphabet Countdown is a real time graphics game in which sets of words taken at random from a large group must be placed in alphabetic order, in the shortest possible time. It has three levels of difficulty.

Rhyme Time displays a series of unfinished rhymes, and the player has to type in the missing word from the clues given in the rhyme itself. There is no timing factor, but after each rhyme the player's current percentage correct is displayed. Cassette. Needs 16K of RAM. $9.95. X-3698

BUSINESS

These programs have either been adapted to or written specifically for Australian business conditions.

GENERAL LEDGER SYSTEM



APEX ELECTRONICS CO. DATE:- 26 / 2 / 81

POSTING SUMMARY PAGE 1

BATCH ITEM	ACCOUNT NUMBER	ENTRY OR DETAIL IDENTIFICATION	DR CR	VALUE
	27	CASH SALES	CR	2,000.00
	35	CREDIT SALES	CR	1,000.00
	86	CASH SALE COST	DR	1,000.00
	94	CREDIT SALE COST	DR	94.00
	175	INTEREST RECEIVED	CR	125.00
	299	ACCOUNTING	DR	69.00
	361	ACCOMODATION	DR	145.00
	1660	BANK	DR	1,911.00
	1686	TRADE DEBTORS	DR	1,000.00
	1700	STOCK ON HAND	DR	-1,094.00
		DEBIT TOTAL		3,125.00
		CREDIT TOTAL		3,125.00

Designed to overcome time consuming manual entry, calculation and reporting methods. The package will let you know exactly how your business is running, and provide the necessary information to make 'business decisions', based on accurate reports, as to your company's status.

Comes with a comprehensive manual. Disk. Needs 32K of RAM, two disk drives and an eighty column printer. $299.00. X-3752

STOCK CONTROL & PRICING SYSTEM

Handles up to 1200 stock lines and offers many features like Australian Sales Tax option, fast machine language sorting, the ability to produce up-to-date price lists at any time, a facility to print out stock count sheets and compare counts with 'on-hand' figures. Disk. Needs 32K of RAM and 2 disk drives. $275.00. X-3750

ACCOUNTS RECEIVABLE

This package gives you the vital information concerning the 'heart' of your business, i.e. cash flow. At a glance

you can tell who owes you what, how much and for how long, thus allowing you to make important decisions affecting your business.

Information that can take days to produce is available to you in minutes. Your company's financial status is at your fingertips, with reports such as the Trial Balance, Debtors Ledger and Posting summaries. Disk. Needs 32K of RAM, two disk drives and an eighty column printer. $299.00. X-3756

WORP-1 WORD PROCESSOR

A low cost, easy to use basic word processor. Handles 1300 words/9000 characters at a time, features automatic text wrap-around, character-orientated insert and delete edition, optional justified printing. Needs 16K of memory. Cassette. $59.50. X-3758

WORP-9 PROFESSIONAL WORD PROCESSOR

A powerful professional word processor system which is very easy to use. Written in Australia it provides unlimited text insertion, the ability to print mailing labels and to merge a name and address file with a standard form letter. Disk. Needs 32K of RAM and at least one disk drive. $299.00. X-3761

INVOICING

An invoicing program for the small business, making it much easier and faster to produce invoices from mail or telephone orders. Calculates tax if required, also handles credit notes. Can be used either by itself, or with the Stock Control and Pricing System (which lets it automatically update stock levels as goods are sold). Disk. Needs 32K of RAM, 2 disk drives and a printer. $199.00 X-3751

DATA FILE MANAGER (DATFILE)

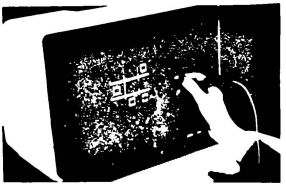
A program which lets you computerise virtually any data file currently on cards, etc. Membership and mailing

lists, client and customer details, product information — you name it. Datfile lets you call them up on the screen, add new entries, make changes, sort all entries, select by category, print out and so on. Disk. Needs 32K of RAM and at least one drive. $99.00. X-3760

GENERAL

LIGHT PEN DEMO CASSETTE

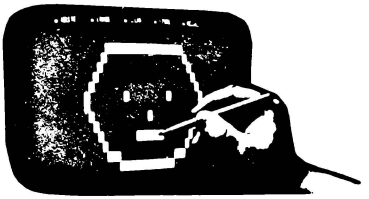
Provides two demonstration programs to get you started with a low cost Light Pen. One side has a Noughts



and Crosses game (also known as Tic-Tac-Toe), the other has a simple 'Menu' program to show how you can use the Light Pen with your own programs. Suits both 4K and 16K machines. $11.95. X-3647

SKETCH-80

Use your Light Pen to 'draw' on the screen of your computer. This machine language program lets you make a drawing, modify it, store it away in memory, recall it — even save it on cassette or disk. Fascinating and educational. Cassette. Requires 16K of RAM. $17.95. X-3646



SOUND-OFF

This package provides all you need to enter the exciting world of computer sound effects and music synthesis. There is a demonstration sound effect program plus a program to let you add sounds to your own programs. Cassette. Needs 16K of RAM. $14.50. X-3648

SHAREMARKET ANALYSIS

A very useful program for anyone who invests in the sharemarket. It lets you store the selling price variations for up to 45 shares (or indices), and produce either a 'normal' or 'three point reversal' point and figure chart for any share or index whenever you wish. Much faster than manual charting, and more flexible because you can chart using any desired sensitivity! Disk. Needs 32K of RAM, 1 disk drive. $49.50. X-3765

COMMUNICATIONS TERMINAL PROGRAM

This program lets you turn the computer into a communications terminal, so that you can use it to obtain all sorts of valuable information from the big 'data base' computers via your telephone. To use it your computer must have an 'RS-232C Communication Port' card, and an Acoustic Coupler Modem to connect to the telephone. Cassette. Needs 16K of RAM. $9.95. X-3766

AUSTAX 82

A unique Australian-designed program written in association with the Australian Taxation Department and with the assistance of qualified tax specialists. It will guide you through the complete tax form (Form S), making sure that you don't miss anything, and checking your figures so that they don't exceed allowable amounts etc. Then it performs a complete calculation of your tax, and gives you a summary so that you can transfer it to your return. If you have a printer, it will print out the summary so that you can attach it to your return as well. Cassette. Needs 16K of RAM. $29.95. X-3762

ELECTRONIC SHOPPING

An exciting new program which lets you use your computer to access the Electronic Shopping computer at Dick Smith's head office, in Sydney, using your telephone from anywhere in Australia (or even overseas). Lets you call up our computer, and either send in an order, or call up any of the many 'pages' of useful information which are available. Be one of the first to enter the exciting era of electronic shopping! Disk. Needs 32K of RAM. $5.00. X-3764

EDITOR/ASSEMBLER PLUS

A complete package for developing assembly/machine language programs. Has a text editor for preparing source code, a powerful macro assembler for translating the source into machine or 'object' code, and a very flexible debug program to allow troubleshooting and analysis of programs in memory. The debug program can be used alone if desired. Cassette. Needs 16K of RAM. $39.95. X-3680

Z-80 DISASSEMBLER

A program which produces an assembly language listing from Z80 machine code stored in memory. Very handy when you are trying to analyse machine language or programs, to find out how they work (or why they don't!). This one is actually written in BASIC, and provides an ASCII decoding function as well as the mnemonics — so you can spot stored messages, etc. Cassette. Needs 16K of RAM. $17.95. X-3690

OS/80 (MICRODOS)

A low-cost disk operating system for systems which are running from 1 to 4 disk drives (either 35 or 40 track). A really easy to use DOS, designed especially for business and professional use. It communicates with the user and with user programs entirely by BASIC commands.

It has five utility programs on the disk (disk file number, utility for formatting/ backup, etc. disk diagnostic program, 'patch' program for updating the DOS itself, and a simple data file program). Needs at least 16K of RAM and one disk drive. $35.00. X-3555

NEWDOS/80 VERSION 2.0

A very powerful disk operating system for the more advanced programmer. It provides virtually every function and facility which could be needed by even professional software development engineers. Comes complete with a very comprehensive user manual, which is updated by the publisher if you register as a user. Disk. Needs at least 32K of RAM and one disk drive. $199.00. X-3565

TINY PASCAL

Write and run your own programs in Tiny PASCAL which has most of the basic statements and procedures of full PASCAL — supports recursive procedure/ functions, global and local variables, if-then-else-then, peak and poke, while, for, repeat/ until and graphics. Cassette. Needs 16K of RAM. $49.50. X-3670

PASCAL COMPILER VERSION 3.0

This program provides the computer with a full-scale version of the popular PASCAL programming language, featuring syntax error checking, access to the computer's normal graphics and random number generator. And because it compiles your PASCAL programs directly into computer language, they run very much faster than BASIC programs. Disk. Needs 32K of RAM, at least one disk drive, and NEWDOS/80. $239.00. X-3669

OS-80 MACHINE LANGUAGE UTILITY

A utility which is used to adapt OS/80 (MICRODOS) so that it can save and load machine-language programs on disk. $39.50. X-3560

Z-BASIC COMPILER

Lets you compile your BASIC programs, so that they run up to twenty times faster than with the ROM interpreter. Disk version, but comes on cassette so you can use it with the DOS of your choice. Needs 16K, but can handle larger programs if you have 32 or 48K. $99.00. X-3570

SOME COMMON BASIC PROGRAMS

Saves keying in the programs by hand. All sorts of handy programs in BASIC: investment, statistics, tax calculations, costing etc. Use the programs as they stand, or adapt them to do what you want. $19.50. X-3665

MMS FORTH V-20

A really well written implementation of the new FORTH programming language. You can customise and expand FORTH into virtually any language you need — yet it runs from 10 to 20 times faster than ROM BASIC. Disk, with its own DOS (written in FORTH). Minimum 16K of RAM and one disk drive. $85.00. X-3668

MEMORY AND DISK DIAGNOSTIC

A very handy program which lets you run basic troubleshooting tests on your System-80 computer's internal memory, and its disk drives and controller. Lets you check them out yourself if you suspect a hardware fault. It can save you a lot of time and money, stopping you from sending the equipment back for service when it isn't really to blame! Easy to use, it runs a comprehensive set of tests on both of these important parts of the machine. Disk. Needs at least 16K of RAM. $15.95. X-3763

BASIC PROGRAM SERIAL LOADER

A program written especially to help schools, colleges and others to transfer BASIC programs directly from other computers (like the Apple II) into the System-80

computer, via the RS-232C serial interface. It therefore saves all the effort of re-keying the programs into the System-80, although the user still has to make any changes to syntax that may be required before the program will run correctly. Cassette, comes in three versions: for 16K, 32K or 48K of RAM. Requires the RS-232C serial interface option. $19.50. X-3689

For Adults Only
INTERLUDE

A game for adults only. How's your love life — getting a little dull? When the kids have gone to bed, run this program on your broad-minded computer and it will come up with some imaginative ideas for the rest of the evening ... Warning: not a program for those who are offended by explicit descriptions of sexual behaviour. Cassette. Needs 16K of RAM. $22.50. X-3675

Chapter

Expanding The System

EXPANDING THE SYSTEM

In order to expand your basic computer system you need peripherals. A peripheral (the 'ph' is pronounced 'f' as in photo) is simply an 'attachment'.

If you are buying a food processor the manufacturers offer you a choice of attachments which you can add to your basic machine so that it can perform additional functions. The situation is exactly the same when you are buying a computer — but instead of calling the extra gadgets by the simple term 'attachments', computer jargon uses the fancy word 'peripherals'.

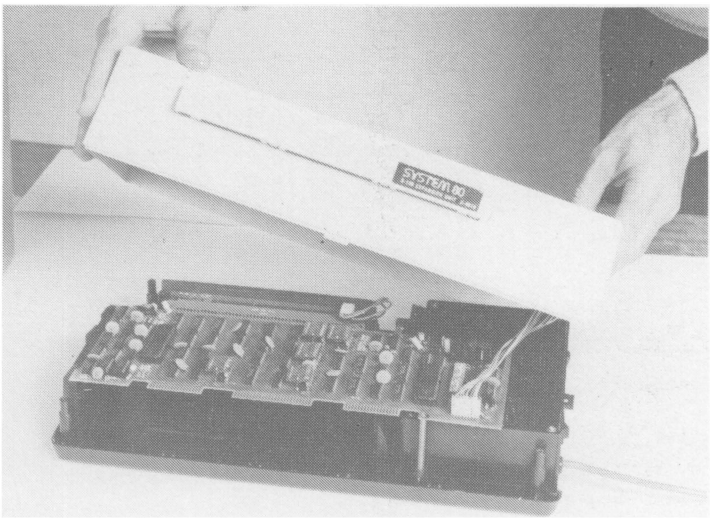
Taking the same analogy into the world of motor cars ... they are sold as the basic model or come with 'extras', that is, attachments or peripherals. (Somehow I don't think that word will ever catch on down the Parramatta Road.)

Therefore, any part of your computer set up which is outside the all-in-one keyboard/memory/processing unit is a peripheral. Strictly speaking even a built-in cassette player is a peripheral since it is not part of the computer itself. The video monitor or normal TV screen also falls into peripheral category. But let's take a look at some more interesting (if less basic) peripherals.

A System 80 set up with quite a few peripherals including an expansion unit, two disk drives and a dot matrix printer ... all discussed and explained in this chapter.

EXPANSION UNIT

This is a rectangular box-shaped device that is plugged in to the rear of the keyboard and sits neatly behind it on a desk or table. The unit has various sockets through which other peripherals can be connected to the computer. The System 80 expansion unit has the widely accepted industry standard S-100 connection system, allowing you to expand in almost any way you wish using compatible products available from hundreds of manufacturers around the world.



Lifting the lid off an expansion unit. Inside are all the components which connect to various peripherals to expand the capabilities of your computer.

A SECOND CASSETTE

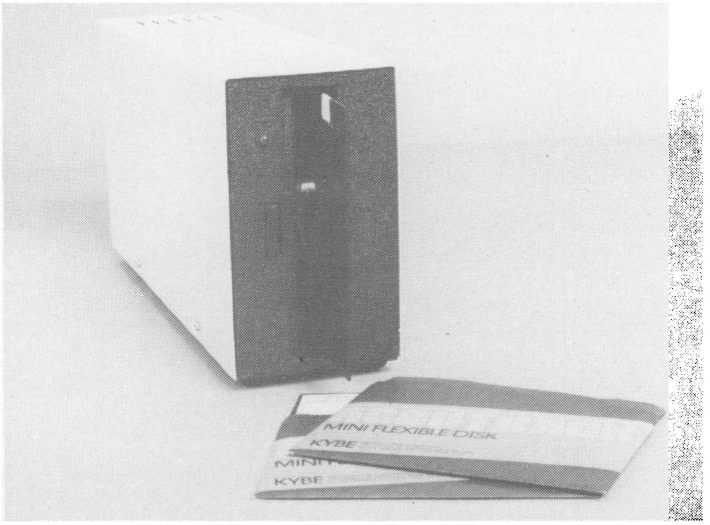
A second cassette player, in addition to the one built into the computer, can be interfaced (connected) to the main unit via the expansion unit.

DISK DRIVES

The only method of running and storing programs that has been discussed in detail so far is the use of magnetic

tapes activated in a cassette player. Now it is time to introduce the magnetic floppy disk — a small, flexible disk which looks very much like a 45 rpm record inside a cardboard sleeve. A floppy disk is revolved in a unit called a disk drive which, to continue the music analogy, is the approximate equivalent of a turntable.

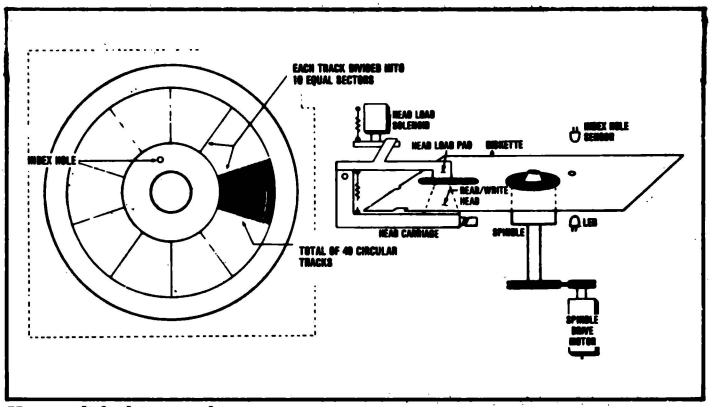
The disk drive itself is a neat rectangular unit with a vertical or horizontal slot (rather like a letter box) into which the disk is inserted. On insertion the disk engages and is revolved in the disk drive at about 300 rpm. As with tapes, information is magnetically written on, stored on or read from the disk.



A disk drive with floppy disks.

A disk drive works a little like a record player. The *read-write head* moves across the disk tracks and picks up or stores information. There is, however, a basic difference between a disk drive and a record player. The tracks on a disk are concentric circles, each one separate from the others. They don't spiral towards the centre like the grooves on a record. Each track is divided into 10 sectors

so that the computer can find the data required by locating the track and sector numbers of its storage place. (Another difference between a computer disk and a regular record is that the floppy disk stays in its sleeve & rotates *inside it* — so don't try to get it out!)



How a disk drive works.

A disk drive is faster and more efficient to use than a cassette player. It is also more expensive — understandably. The computer's read-write head (an electromagnetic head which reads or writes on disk or tape) finds the desired segment on a disk far more quickly than on a tape which has to be mechanically rewound before the desired section can be located. A typical program taking a good few minutes to load via tape will load in a matter of seconds via disk.

Disk drives are recommended for serious business use or by the keen enthusiast.

READING/WRITING

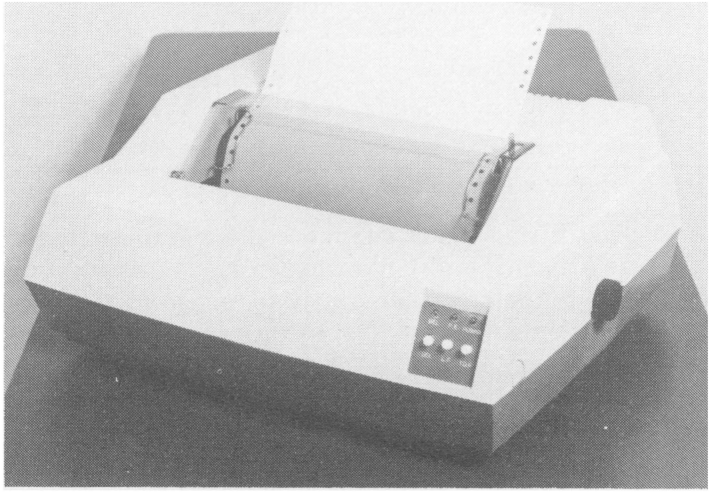
When a disk drive or cassette recorder is transferring data to the central processing unit (CPU) it is *reading* the data. When it is transferring it out of the CPU, it is *writing* the data.

PRINTERS

These are the output devices that print out the results of the computer's work on paper. A printout of a file is called a *hard copy* of that file. There are two main types of printers.

Dot Matrix Printer

This type of printer uses a series of dots to create the characters you see on the page. It is fast but generally has limited print quality.



A dot matrix printer. It prints on standard fan-fold sprocketted paper up to 240 mm wide at 125 characters per second.

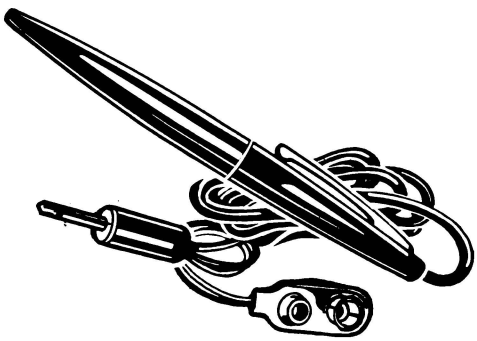
Daisy Wheel Printer

This uses a variety of interchangeable daisy wheels (which work like the golf balls in an electric typewriter) to type the characters on the page. A daisy wheel printer is often slower than the dot matrix printer but produces a much more attractive result and is recommended for word processing work.

A daisy wheel printer which produces sharp, clean copy suitable for word processing.

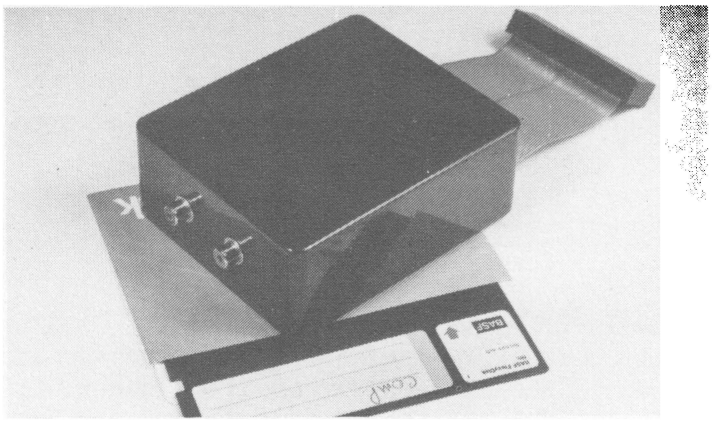
LIGHT PEN

This is a very inexpensive peripheral which can add another dimension to your computer entertainment or serious use. The pen actually 'sees' darkness and light. When it is touched to the screen the display can be altered or erased. The pen can also be used to make sketches or produce graphics on the screen.



MUSIC SYNTHESISER UNIT

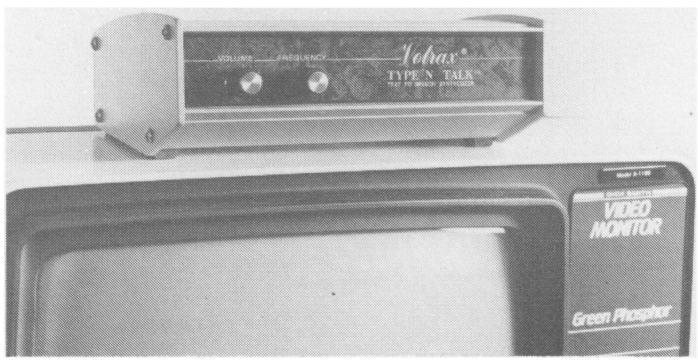
This gadget opens the door to the uniquely different and special world of computer sound. The unit itself is a small box about 10 cm square that plugs into the back of the keyboard unit enabling the computer operator to generate music via a normal amplifier. In effect, you can become a composer using both single notes and chords, even if you can't play an instrument!



A music synthesiser. The sockets, at left, are hooked up to a normal stereo amplifier.

SPEECH SYNTHESISER UNIT

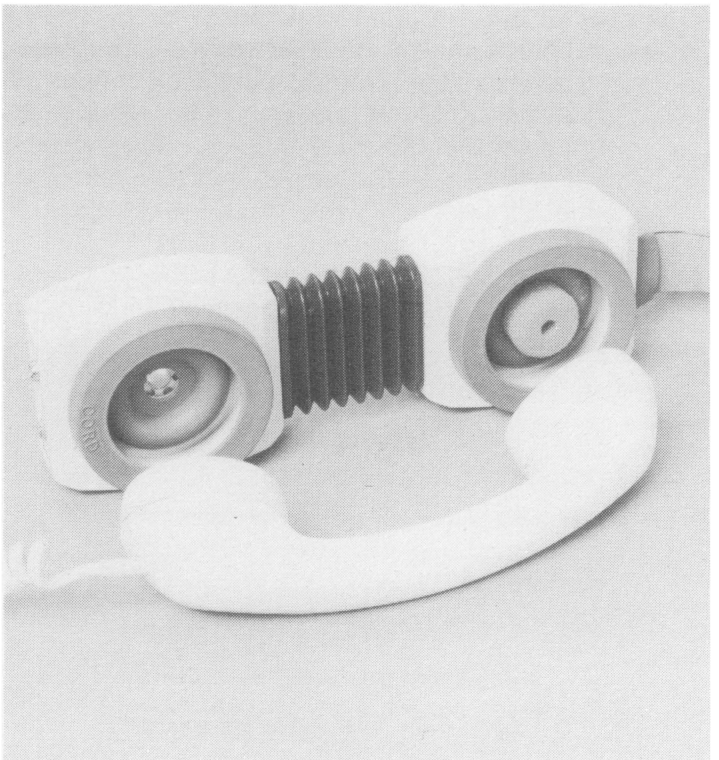
This remarkable device has really beneficial applications for handicapped people — the blind, the deaf and



the physically disabled. Letters or words can be typed on the computer's keyboard and they are then spoken aloud via the synthesiser unit.

ACOUSTIC COUPLER MODEM

A unit which enables you to connect your business computer to your normal household telephone. *In this way you can communicate with any other computer anywhere in the world using the regular Telecom phone system.*



Within the time span of a few seconds, without leaving your own home, you can...

- Search the files of leading overseas newspapers
- Call up the very latest stock exchange, interest and currency exchange rates from overseas
- Scan extracts of the latest research reports in any of hundreds of fields including science, medicine and engineering
- Communicate via the latest electronic mail techniques
- Link up with overseas data banks

Over the last few years huge data bank services have been established in the USA and other countries. Hundreds of different data banks have been set up by research bodies, universities, newspapers, hospitals, stock exchanges and all kinds of public institutions.

All of this stored information is available (for a fee — see over) to anyone with a low cost personal or business computer. MIDAS (Multimode International Data Acquisition Service) offers this service to people anywhere in Australia — providing they have access to a telephone. And the cost is the same whether you live in Sydney, Perth or Alice Springs.

This small business computer has direct access to worldwide data banks via the acoustic coupler modem attached to a normal telephone. Unfortunately, this businessman is not using the coupler correctly. Can you spot the error? *See page 108 for clues.*

In order to link a System 80 personal computer with MIDAS you require a communications terminal program. The business version of the same computer already has this program built into it.

What Is MIDAS?

MIDAS is an international data communications link operated by OTC (Overseas Telecommunications Commission) which allows Australians to connect into the big overseas data base networks and enjoy the facilities available to users in the USA and Canada, and shortly in the UK and Europe as well. You connect to MIDAS by dialling a special telephone number in Sydney. Calls to this number are toll-free from anywhere in Australia, due to a special agreement between OTC and Telecom Australia. As a MIDAS subscriber you pay only for the time you spend hooked up on the data link itself, regardless of whether you live in Sydney or on the other side of the continent.

How Much Does It Cost?

Because OTC is using specially developed equipment which lets many users 'share' the satellite link at the same time, the cost is shared out too. You pay only around 20 cents per minute, plus 60 cents for each 1000 characters of information obtained. This is generally less than you'd pay for an overseas telex, cable or telephone call.

Of course MIDAS itself only provides the link overseas — you still have to pay for the use of the various data banks themselves. Like MIDAS, these generally charge at quite modest rates. Typical rates vary from 60 cents to $1.50 per minute.

Security

Could someone use your computer when you're not there and run up a huge bill on your account? Not unless you let them. When you register as a MIDAS user, you are given details of the special MIDAS telephone number together with your own special security password and user code number. Without having these, no unautho-

rised person can use either your computer or their own to run up a bill on your account.

Is It Difficult To Use?

No — all you have to do is remember your password and user number. Of course you also have to know how to use the data bases you want to search, but you get details on how to do this when you register with them.

How To Get Started

The first thing you need to do is contact the Customer Systems Manager, Marketing Branch, OTC, at GPO Box 7000, Sydney NSW 2001, or telephone (02) 230 5000, and ask for a MIDAS application form and information. If you let them know your occupation and the sort of information you'd like to obtain by using MIDAS, OTC may also be able to tell you which data bases are likely to be of value to you, and how to register with them. If you have a range of specialised interests, they may be able to send you a directory for one of the data base networks.

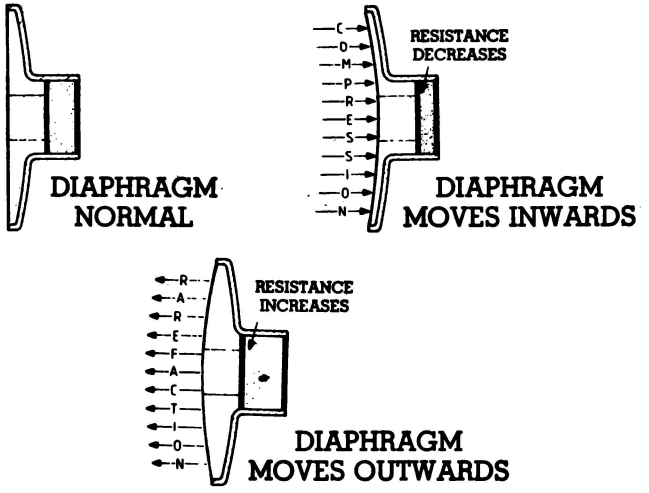
Registering with MIDAS itself will cost you nothing. This is also the case with many data bases. Although some do charge a small registration fee, in general, you're charged only for your use of the services they provide. You're not committed to any minimum time, either.

Once you're registered, using MIDAS is very easy. You simply set your business computer for communications terminal mode, dial up the MIDAS number, and join your acoustic modem up to the telephone handset as soon as you hear the tone. You then hit the 'A' key to let MIDAS know what sort of a terminal you're using. From then, MIDAS itself guides you on the screen, and within seconds you're talking to the overseas data base of your choice.

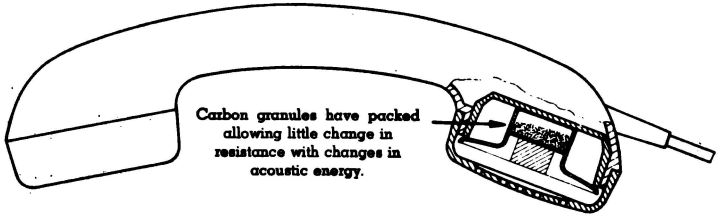
If you are operating a personal computer, load the communications terminal program, type in RUN to set it going, and then tell it that you want 'full duplex' (F), and that you *don't* want added line feeds (N). Then dial up MIDAS.

MIDAS User Information

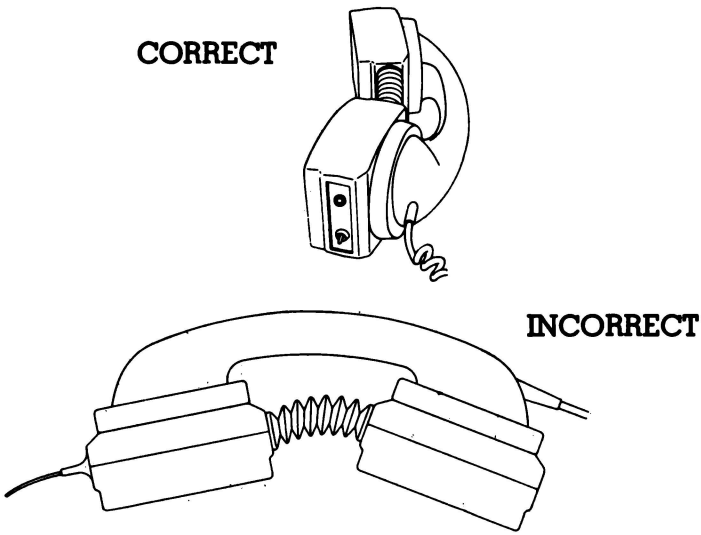
For best results when using your coupler with telephone handsets containing carbon granule microphones please consider the following:—



Most telephone handsets are fitted with carbon granular transmitters like those depicted above. When you speak into the mouthpiece the sound waves strike a diaphragm causing it to compress and release a chamber filled with carbon granules. The change in density of the granules causes a change in circuit resistance resulting in a change from acoustic energy to electrical energy.



When the telephone handset is placed in the acoustic coupler and used in the normal rest position of the handset then after a short period of time the carbon granules begin to 'pack' and reliability decreases dramatically. As the granules pack the change in resistance decreases until ultimately this resistance does not accurately convey the change in acoustic energy.



For best results the coupler should be used on its side thus orientating the telephone transmitter in the correct plane and thus preventing carbon granule packing.

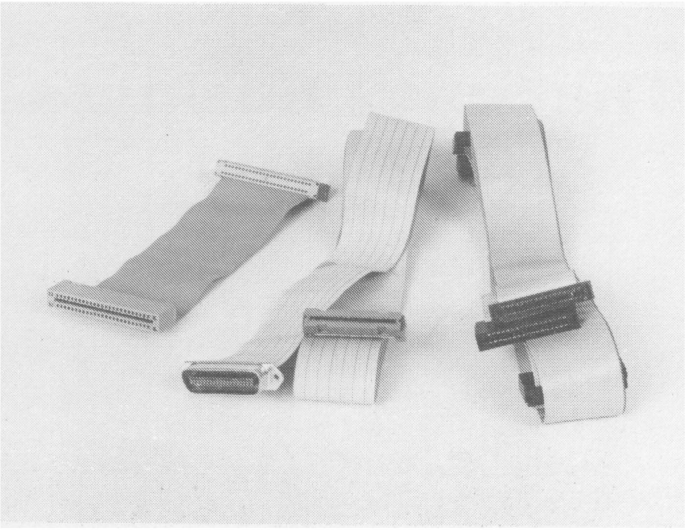
These comments are valid — you can demonstrate to yourself when next you are using the telephone by tilting your head to one side so that the telephone microphone has its axis vertical. Within a matter of moments your opposite number will be asking you to repeat what you have said. From this graphic demonstration you can easily imagine why the preceding comments are important.

REMEMBER if there is any doubt as to whether your telephone has a carbon microphone or not, do not risk

difficulties — use the coupler correctly as illustrated, ON ITS SIDE.

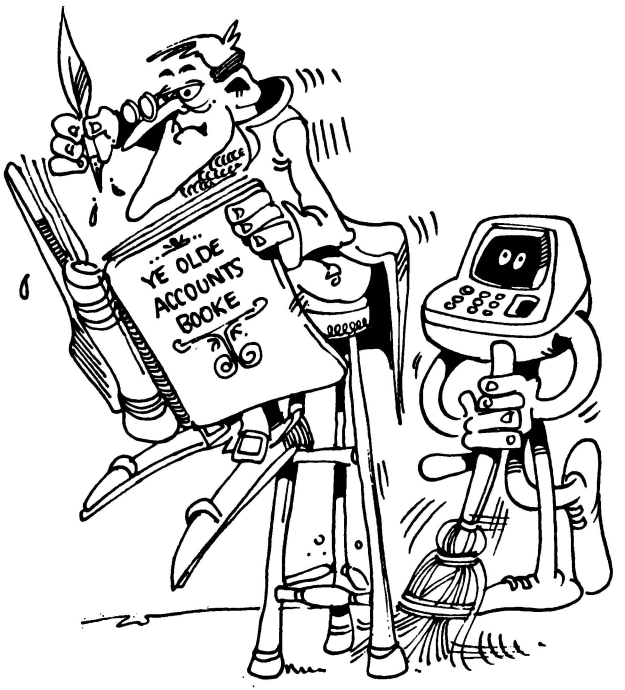
RIBBON CABLES

Ribbon cables, as illustrated here, are used to connect the various units of the computer together — e.g. the expansion unit to the computer, the printer to the expansion unit, and so on.



Chapter 8

The Small Business Computer



THE SMALL BUSINESS COMPUTER

This book does not deal with computer systems that sell for more than $10 000. (And most small computer set ups are considerably cheaper than that!) If a small businessman* has reached the stage in the development of his business where he feels that it would be more efficient, cost and time effective to have a computer handle such matters as the general ledger, payroll or inventory rather than using conventional books and clerks, he has two options.

The Options

1. Call in IBM, Hewlett Packard or some similar specialist firm. They will design a system to fit the particular business' needs — and they will usually do a superb job. The snag? It will cost you an arm and a leg and the end result, when measured against the cost of computer installation, may not in fact save any money at all. (Having a highly trained salesman come out and hold your hand does not come cheap!)

2. Buy a personal or small business computer over the counter. This will cost thousands and thousands of dollars less than the specially designed system and will probably do just as good a job. The snag? You have to be interested in learning how to make the computer and the available software work for you. You'll be teaching yourself as you adapt the system to fit in with your particular business.

(Don't misunderstand me, you don't have to write your own programs — at least not at first or unless you want to — because there are all sorts of business procedure programs already written and available over the counter for a few hundred dollars.) If yours is a small business, set up on a fairly conventional basis, some of these programs

*Women's Libbers, please note: of course I mean 'businesswomen' too, but it would be very pedantic to repeat this continuously. So please take it as read.

Business is looking good!

will have equally as good an application to your business as if they had been specially written for you.

20 Or Less Employees

Small business computers are becoming increasingly popular in firms who have around 20 or less employees. A company of this size would find it totally uneconomic to buy a traditional computer — even if they could afford the up front price.

However, take the case of a large firm of accountants. Assuming that none of the partners were knowledgeable about computing, the firm would definitely be better off approaching one of the large computer companies and spending around $20 000 to $30 000 for a system. They would need to pay that amount to get the back-up knowledge and service that would be required.

If you buy equipment from one of the large computer companies, part of the price of the unit is a certain

amount of free programming time. However, there is no such 'luxury' as free programming if you buy a small business computer — that just doesn't fit into the low cost structure of an over-the-counter model.

Experience has shown that most small businessmen who purchase a computer over the counter are practical people, aware that the computer age is here, and interested in creating and adapting programs to dovetail in with their own specialised business. This type of businessman prefers to organise his own computer set-up and get the machine going himself, rather than pay someone else to do it.

Lack Of Confidence?

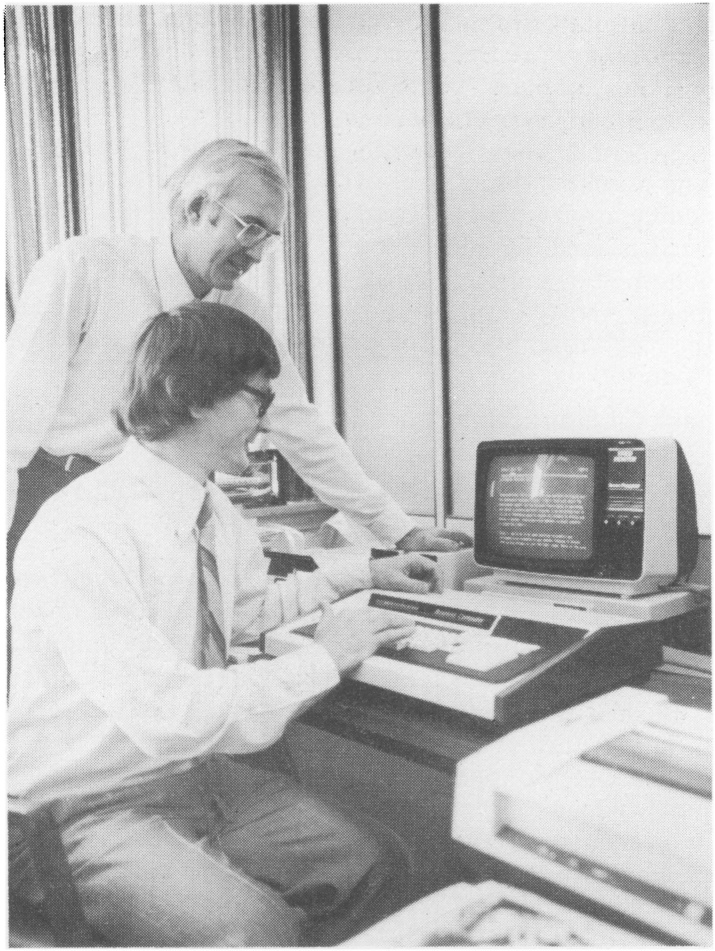
What about the person who can recognise the potential of computers in business, but has absolutely no confidence in his or her own ability to get to grips with a computer?

In order to overcome this difficulty some over-the-counter computer specialist companies (including mine) have organised an inexpensive service where computer purchasers can be helped to relax and become familiar with their new business tool.

This is how it works in my company. For the very reasonable price of $100 (at the time of going to press) an independent computer consultant will give five hours of assistance (spread over a short period) to anyone who has purchased a computer. During that time the consultant basically 'hand-holds' the new purchaser, showing him how to make the most of the computer either by altering, if necessary, ready written programs to suit his business, or explaining how to input data specifically related to his individual requirements. Usually it is a combination of both situations.

Business Software

There is a large variety of programs available (see Chapter 6) although, as explained, they sometimes have to be adapted to some degree in order to be ideally



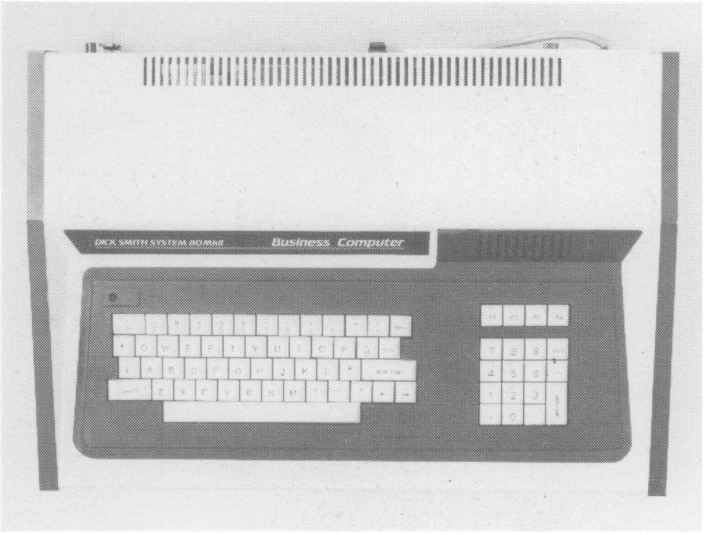
If a small businessman lacks confidence in dealing with his computer an independent consultant will give assistance for a very reasonable fee.

suitable. After a little bit of programming experience such matters as wording, headings and layouts can easily be changed so that the program is individualised.

Naturally, it helps the adaptation process if the programs have originated in Australia or have at least been changed to cope with Australian conditions. For exam-

ple, American written programs don't include a sales tax component because, in the USA, that tax is paid by the consumer in the store. The same principle applies to dates. Americans write 3rd November, 1981 as 11/3/81, which would be very confusing in an Australian business environment.

A Typical Business Computer



The System 80 Mark 11 computer provides virtually all the features of the basic personal computer together with many extra ones designed to make it more suitable for serious business use — for example, the numeric key pad is an easy and efficient way to enter numbers.

Profit and growth are the aims of most businesses, therefore it is logical to choose a computer that doesn't cost a fortune in the beginning but can be expanded as your business expands and your profit grows. For example, the basic computer illustrated above can be expanded into virtually three machines in one: an increased memory capacity computer, a word processor and a data communications terminal.

Appendix

APPENDIX

(Although I promised way back in Chapter One that I wouldn't dazzle you with technology I don't think this book would be complete without a little more clarification of the technical/theoretical side of things. Skip it for now, if you like — you're probably too busy teaching yourself to type or pitting your wits against monsters!)

The information here is still very fundamental but it will add to your understanding of computers and perhaps give you a good grounding on which to build your knowledge of programming and operating an expanded computer system.

THE COMPUTER NUMBER SYSTEM

Although it is very adept with numbers a computer does not 'think' about them in the same way as the human brain. We use the decimal number system with digits from 0 to 9. The computer uses the binary number system, with only two digits: 0 and 1.

This is not the place to explain the binary number system, it is sufficient to say that various combinations of these two numbers make up the 'machine language' in which the computer responds to instructions.

Programming Languages

This machine language is very tedious and difficult for human beings to use so computers have a permanently inbuilt 'interpreter' program. When a programmer enters instructions in a human-type language (such as BASIC — the language used to program most personal computers) the interpreter program translates these instructions to machine language.

. Because English (or Swahili, if it comes to that) is not a very precise language, programmers enter their instructions in one of a variety of specifically developed programming languages. Broadly speaking there are two main types of programming languages:

High Level Languages

These are quite closely related to English. BASIC, for example, is a high level language (see page 123). Other high level languages are COBOL, FORTRAN, PASCAL and FORTH. Languages like these are comparatively easy for the programmer to use. Sometimes, however, they are not close enough to the machine language to allow detailed or complicated instructions to be entered.

Low Level Languages

These are much closer to machine language. They are more difficult for the programmer to use but they give more flexibility and precision when writing complex programs. Assembly language is a low level language.

MORE ABOUT MEMORY

As you will remember that the computer has two totally different types of memory:

RAM (Random Access Memory) — a temporary memory used to store data and programs. RAM can be erased easily. (Very easily — a mere flick of the off switch will do it!) See, *Back Up.*

ROM (Read Only Memory) — a permanent memory built into the computer. This memory contains both the interpreter program to translate input instructions into machine language as well as the computer operating system program.

The Operating System Program

This includes:

- Sets of instructions to pass data from the input devices to the Central Processing Unit (CPU) and to pass them out again to the output devices.
- Additional sets of instructions for finding information on tapes of disk sectors.
- Detailed orders to the CPU to respond in a particular way to each key on the keyboard.

It is by means of all the parts of the inbuilt ROM that the CPU is able to accept instructions, perform arith-

metic and logic calculations, as well as organise and control the other components of the computer system.

Disk Operating System (DOS)

This is a special part of the operating system that, unlike the rest of the system, resides in RAM memory.

This is a program of routine instructions to control the storage and retrieval of information from disks. These routines include allocating addresses to files (specifying the track and sector in which they are stored), passing information to and from the disk and listing the disk directory for you. DOS typically uses about 7 kilobytes of memory space.

Bits, Bytes & Kilobytes

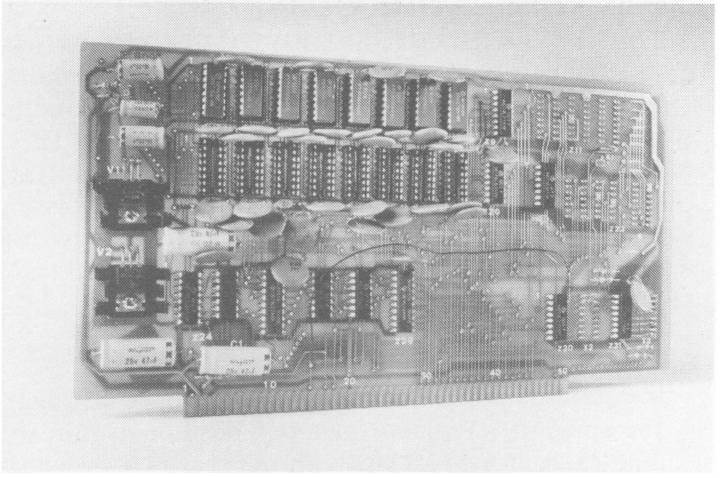
In computer jargon the word *bit* (short for *bi*nary digi*t*) is the smallest individual memory position within the computer. A group of 8 bits is known as a 'byte', which is the usual amount of data that a personal computer can process at one time. (There's also the word *nibble* — meaning four bits or half a byte — coined by some computing nut with a logical sense of humour!)

A byte is roughly the equivalent of a character, i.e. a letter, number, symbol or even the space left between words.

There are 1024 bytes to one kilobyte (K) — a term which has been mentioned several times earlier in the book in connection with the computer's memory. It has been explained that the computer's memory capacity (both RAM and ROM) is usually expressed in terms of K. (Don't confuse this symbol K with the metric symbol k (kilo) meaning 1000.)

Most personal computers have between 4K and 16K of RAM and can be extended up to either 32K or 48K by the addition of memory cards. A 48K memory, then, can hold up to approximately 48 000 characters. This storage space can be further increased by the use of external storage on disk or tapes, thus leaving extra space in the RAM. The computer can retrieve this data whenever it is

needed. This effectively increases the size of the internal RAM many times over.



A plug-in memory card which adds an extra 16 or 32 K of RAM to an existing computer.

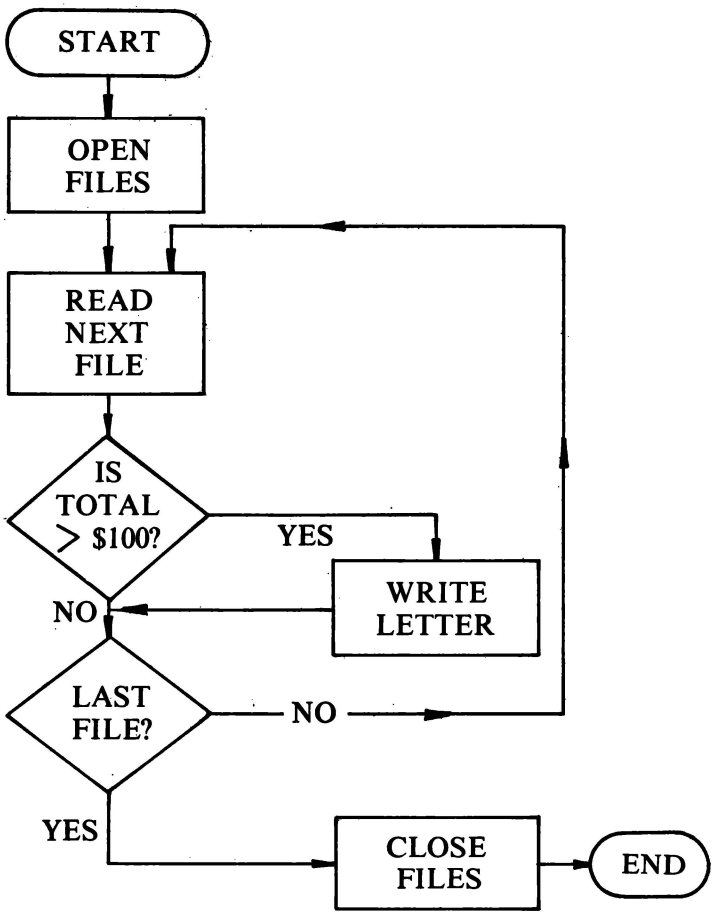
MORE ABOUT PROGRAMMING

As you'll remember from Chapter One, a program is nothing more than a set of instructions for the computer. Often a program is very detailed and contains thousands of instructions, even though you can buy it on a single small disk or cassette.

In developing a set of instructions the programmer must work out every possible event that may occur during the execution of the program and tell the computer precisely what to do if that event happens. (Never forget: the computer has *absolutely no initiative.*)

Preparing a program can involve a large number of alternative actions for each step in the program, and a large number of alternatives for each alternative, and so on. It is very easy to leave something out or even to put an instruction in the wrong place in the list. To avoid such catastrophes the computer programmer uses a planning aid called a flowchart.

Below is a sample flowchart covering just the major steps in going through a customer list and sending a reminder letter to all customers who owe more than $100.



Note that the chart goes through a *loop*. That is, when a customer has been dealt with (the computer has looked at the file and decided whether or not to send the letter), the computer returns to the next customer and repeats the process.

Different types of functions are depicted in differently shaped symbols. As you can see the diamond shape is used for 'decision making' instructions which could yield two or more possible results; and the rectangle for any operation involving the use of an input or output device.

This is an easy flowchart which can be developed into a simple program. Before it is ready for use a program must be rigorously tested to make sure that all possible events are allowed for. This is a lot harder to do than it seems.

Mistakes in a program are called 'bugs' and the process of correcting these mistakes is 'debugging'. The more complex the program, the more complex and difficult this can become.

Back Up

After you've gone to all the trouble to work out a successful program don't spoil it by being lazy. Make a 'back up' copy of it on another tape or disk so, if the program is accidently erased, you always have it available. Never forget how easy it is to lose a program ... if someone trips over the power cord, if you turn off the computer in error, if there's a blackout ... there are countless ways it could happen. A good backup system is commonsense computing practice.

Systems

A set of programs is called a system. A debtors' system, for example, is a series of programs — one tells the computer how to keep a name and address file for customers, another tells it how to print out statements for each customer, another keeps track of the transactions carried out each month and so on.

Designing a system involves several steps.

1. The initial ideas stage. You identify the problem that you want the computer to be able to solve.

2. The assessment of the size and scope of the system needed to solve the problem. In this stage you set the objectives that you want the computer to meet.

3. The analysis phase where the programmer works out the general specifications of the system.

4. The design phase where the programmer plans the system in detail.

5. The construction phase involves writing the program, testing it and debugging it.

The finished system is copied onto disk or tapes and the instruction manuals are written. The end result of all this effort is a set of completed programs which are simple and easy to use. When you buy a good program you will never see the complexity of effort and design that has gone into its production.

THE BASIC LANGUAGE

The most common language in personal computing is BASIC. It is not difficult to learn since it approximates English very closely. An easy way to explain the principles of the BASIC language is to run through the features of the System 80 'Level II' BASIC.

Firstly, this BASIC can be divided into nine sections.

1. ACTIVE COMMANDS
2. TEXT EDITING
3. BASIC STATEMENTS
4. ARRAYS
5. STRINGS
6. ARITHMETIC FUNCTIONS
7. GRAPHICS
8. SPECIAL FEATURES
9. ERROR CODES

There are four different operating levels:

- *Active Command Level*

In this level, the computer responds to commands as soon as they are entered (by pressing the NEW LINE key). Whenever the >_ signs are on the display, the user is in the active command level.

- *The Program Execution Level*

This level is entered by typing RUN, causing any BASIC program in the memory to be executed.

• *Text Editing Level*

This level allows the user to modify, add or delete characters and lines of the BASIC Program source resident in the memory. The most significant feature of this level is that the user can change any portion of a line without having to re-type the entire line.

• *Monitor Level*

This level permits the user to load machine-language programs into the memory. This may be a machine language, executable programs or even data files.

1. Active Commands

1	AUTO	Automatic line numbering
2	CLEAR	Sets aside a specified amount of work space for a program
3	CLOAD	Loads a program of specified filename from a tape
4	CLOAD?	Verifies that the loaded program is correct
5	CONT	Continue execution after stopping
6	CSAVE	Saves BASIC program to tape
7	DELETE	Deletes line or lines specified from program
8	EDIT	Activates EDIT mode to correct part of a line
9	LIST	Lists the program lines specified
10	NEW	Clears the current program from memory
11	RUN	Starts program execution
12	SYSTEM	Activates Monitor mode
13	TROFF	Turns off the trace diagnostic
14	TRON	Turns on the trace diagnostic
15	LPRINT	Prints a file to the printer
16	LLIST	Lists the program to the printer

2. Text Editing

By typing in EDIT 100, for example, the computer will

prepare to edit line 100. You can:

1. Insert text
2. Delete from end of line
3. Delete from cursor to end of line and insert text
4. Add to end of line
5. List line
6. Quit and restart edit
7. Change characters

3. Basic Statements

1. PRINT
2. PRINT @
3. PRINT USING
4. INPUT
5. DATA
6. READ
7. RESTORE
8. PRINT #
9. INPUT #
10. DEFINT
11. DEFSNG
12. DEFDBL
13. DEFSTR
14. CLEAR
15. DIM
16. LET
17. END
18. STOP
19. GOTO
20. GOSUB
21. RETURN
22. ON GOTO
23. ON GOSUB
24. FOR TO STEP
25. NEXT
26. RUN
27. ON ERROR GOTO
28. ERROR
29. RESUME
30. REM
31. IF
32. THEN
33. ELSE
34. INKEY$

4. Arrays

The computer is capable of accepting both numeric and string arrays. An array is simply a list or table of data which is set out in the memory of the computer for easy access to programs. The dimension of an array is simply the number of ways it is expanded from a single value. Thus a table of data with eight columns and eight rows is a two dimensional array containing sixty-four separate variables. In the computer these are represented with subscripts; e.g. A(1,1), A(1,2), A(1,3) ... A(8,8). These

arrays are set up in the computer using the DIM statement.

5. Strings

The computer uses two kinds of strings:

1. Constants — these are always represented within quotes inside the program; e.g. 'yes'.
2. Variables — e.g. A$

As you can see, a string is simply a 'string of characters'; they can, of course, be letters, numbers, or special punctuation and mathematical characters. The computer can add, divide, compare and create strings as you desire. The functions it uses are:

1. ASC
2. CHR$
3. LEFT$
4. RIGHT$
5. LEN
6. MID$
7. STR$
8. STRING$
9. VAL

6. Arithmetic Functions

The computer has sixteen built-in arithmetic functions:

1. ABS
2. ATN
3. CDBL
4. CINT
5. COS
6. SDNG
7. EXP
8. FIX
9. INT
10. LOG
11. RANDOM
12. RND
13. SGN
14. SIN
15. SQR
16. TAN

7. Graphics

The graphics of the computer are arranged as 48 lines of 128 columns. The graphics commands available are as follows:

1. SET — 'turns on' a point
2. RESET — 'turns off' a point
3. CLS — 'rubs out' the complete screen

4. POINT lets the computer find out whether a particular point on the screen is 'on' or 'off'.

8. Special Features

The following special features are implemented in the computer:

1. INP This command will input the 8-bit byte from the port specified.
2. OUT This command outputs a byte to the port specified.
3. PEEK This command returns the decimal value of the memory location specified.
4. POKE This command lets you insert a value into the specified location in memory.
5. POS This command returns a number from ϕ to 63 indicating the current cursor position on the display line.
6. MEM This command returns the number of unused and unprotected bytes in memory.
7. USR This command calls a machine language subroutine (or sub-program), and lets the main program 'pass' a number to the subroutine.
8. VARPTR This command lets a program find out where a particular 'variable' number is stored in the computer's memory.

9. Error Codes

To assist in trapping errors in your programs, the computer has twenty two error codes:

ERROR CODE	ABBREV	ERROR
1	NF	NEXT without FOR
2	SN	Syntax error
3	RG	RETURN without GOSUB
4	OD	Out of date
5	FC	Illegal function call

6	OV	Overflow
7	OM	Out of memory
8	UL	Undefined line
9	BS	Subscript out of range
10	DD	Redimensioned array
11	/0	Division by 0
12	ID	Illegal direct command
13	TM	Type mismatch
14	OS	Out of string space
15	LS	String too long
16	ST	String formula too complex
17	CN	Can't continue
18	NR	No resume
19	RW	RESUME without error
20	UE	Unprintable error
21	MO	Missing operand
22	FD	Bad file data

Variables

A 'variable' is a number which can have different values, so it is given a 'name'. The computer accepts variable names which can be longer than two characters. However, only the first two characters will be recognised as the variable name by the computer. Variable names must start with a letter and the second character may be a letter or a digit. Therefore variable names may be from AA to ZZ and A0 to Z9. Please note however that when using long variable names you must ensure that they do not contain 'reserved words'. These reserved words are ones like 'GOTO', 'PRINT', 'RUN', etc.

Operators

The following 'operators' or mathematical operation signs, are used by the computer:

+	Addition
–	Subtraction
*	Multiplication
/	Division

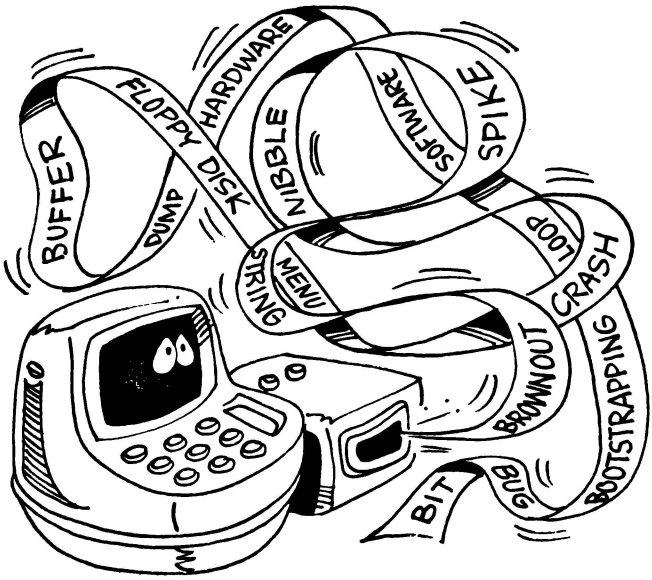
ESC Exponentiation (raising to a power)
< Less than
> Greater than
<> Not equal
<= Less than or equal to
>= Greater than or equal to
= Equal to

In addition the computer recognises three logical operators:

AND, OR, NOT

and string operators for comparing the precedence of strings.

Glossary


BUFFER
FLOPPY DISK
HARDWARE
NIBBLE
SOFTWARE
SPIKE
DUMP
STRING
MENU
LOOP
CRASH
BROWNOUT
BIT
BUG
BOOTSTRAPPING

GLOSSARY

ACCESS: To retrieve information from the computer. (The noun access has become the verb 'to access' in computer terminology.)

ADDRESS: Location of a specific storage 'cell' in memory.

ALPHANUMERIC CHARACTERS: The characters on the keyboard or screen which are either letters or numbers.

ANALYST: A computer expert who studies the operations of a business company in order to design a computer system that will enable the business to operate at maximum efficiency.

BACK-UP: A spare copy of programs, results etc. in case the original tape or disk is lost, damaged or erased in error from computer memory.

BASIC: A high level computer language. (Beginners All Purpose Symbolic Instruction Code) BASIC is the most commonly used language for personal and small business computers. The language of the instructional words is closely related to plain English, and therefore easily learnt.

BINARY: A number system where each digit has one of two number values — Ø and 1. A counting system using only the numbers 1 and Ø, it is common to all digital computers.

BIT: The smallest individual memory position within the computer. Bit is derived from *bi*nary digi*t*. (See *BYTE, KILOBYTE, NIBBLE.*)

BOOTING or BOOTSTRAPPING: The act of loading the first program into a computer after turning it on.

BROWNOUT: A drop in the voltage supply going to the computer through the mains.

BUFFER: A temporary storage area for memory.

BUG: An error in the program.

BYTE: This is the term for the usual amount of data that a personal computer can process at one time. Each byte is a group of 8 bits. (Larger computers can process two or more bytes.) (See *BIT, KILOBYTE.*)

CPU: Central Processing Unit. The central 'nerve cell' of the computer which performs the actual processing of data arithmetically and logically. (See also *ROM* and *RAM.*)

CARD: A printed circuit board which can be inserted or plugged into the expansion unit of the computer to increase memory capacity.

CASSETTE TAPE: A common material on which to record and store (or retrieve) programs or data for personal computers. It is identical in appearance to the conventional cassette tape that produces sound and uses the same magnetic tape principle for recording and playing. It operates on a normal cassette player.

CHARACTER: A letter, digit or symbol (e.g. $) on the computer keyboard that displays on the screen when the key is pressed.

CHIP: A tiny piece of silicon with an integrated circuit on it. Thousands of electronic components are fitted onto a very thin sliver of silicon about a

few millimetres square. Each memory chip contains a fixed number of bits. (See *BIT.*)

COBOL: (Common Business Orientated Language) A computer language often used for commercial and business programs.

COMMAND: An instruction given to the computer when a program is running. The instruction to print a file, for example, is a command.

CONFIGURATION: The arrangement and electrical link-up of the hardware that comprises the computer system. (See *HARDWARE.*)

CONTROLLER: A dedicated 'slave' computer that takes over the detailed housekeeping for the disk drives in response to broad commands from the disk operating system (DOS) in the main computer. (See *DISK DRIVE* and *DOS.*)

CRASH: The program fails ... dies ... bombs ... goes away.

CURSOR: A small blinking signal (usually a short line or rectangle) that lights up on the display screen indicating where the next character pressed on the keyboard will display.

DAISY CHAIN CABLE: A cable which links a series of identical peripheral units. For example, a daisy chain cable is used to link the disk drives to the expansion unit. (See *PERIPHERALS.*)

DAISY WHEEL or PRINT WHEEL: This is a device inside a printer which prints out characters and operates in the same way as the golf ball on a typewriter.

DATA: Information given to or received from the computer.

DATA DISK: When two disk drives are being used to run a program on the computer, one of the disks is normally used for storing the program and is called the System Disk. This disk generally has no new material written on it. The other disk is normally used to store the data that will be entered (be it records of daily transactions or additions to your inventory list). This is called the Data Disk.

DATA PROCESSING: The processing of information by a computer. The term generally refers to business systems (e.g. payroll or inventory) as distinct from scientific or other use.

DEDICATED COMPUTER: A small processor designed to run on one program and carry out a particular function. If you compare a computer to a pianola, capable of using many different rolls (or programs), the dedicated computer is more like a music box, playing only one tune.

DEBUG: To get rid of an error (or errors) in the program.

DIGITAL: Electronic circuits which operate by a series of On-Off switchings, rather than by varying a continuous voltage or current.

DIP SWITCHES: A tiny bank of switches that plugs into a circuit board like an integrated circuit or 'chip'.

DIRECTORY: A list of the files stored on a given disk.

DISK: This is a circular disk, similar in appearance to a 45rpm record. Like cassette tape information is recorded on its surface magnetically. It is used for storing and reading data or programs. (See *DISK DRIVE, FLOPPY DISK, HARD DISK.*)

DISK DRIVE: A mechanical unit of the total computer set-up that records (writes), retrieves (reads) or

stores information on the disk. The disk drive has a moving head that can record or read from any part of the disk. Because the disk rotates very fast (300rpm is normal) the head has almost immediate access to any point on the disk. This is a much faster way to retrieve information than having to run through a cassette.

DISPLAY: A visual showing of the computer's workings or results. It is usually in the form of letters and numbers lit up on a screen or printed out on paper.

DOS or DISK OPERATING SYSTEM: A control program that enables the computer operator to transfer other programs and data to or from a disk.

DUMP: To move data from one place to another e.g. from memory to disk, from screen to printer, from memory to printer.

EDIT: The most usual meaning is to correct the text displayed on the screen by means of back spacing over incorrect words, letters or numbers and re-typing (i.e. entering) the correct data.

ENTER: To input or 'feed' information into the computer.

EXECUTE: To 'run' a program on the computer, i.e. to tell the computer to perform a series of instructions.

FIELD: One of the units of information in a complete record system, e.g. name field, address field, etc.

FIRMWARE: A computer program stored permanently in the computer, that cannot be erased or changed. (See also *ROM*.)

FLOPPY DISK: A circular piece of flexible (floppy) plastic, magnetised like recording tape, on which programs for the computer are written, read or stored. In appearance it is similar to a 45rpm record. A floppy disk is permanently enclosed in a card sleeve, even when in use. It is inserted into the disk drive unit in order to perform its functions. (See *DISK DRIVE, HARD DISK.*)

FLOWCHART: The graphical expression (usually drawn and written with pencil and paper) of the logical sequences in a computer program.

FORTRAN: A computer language. (Formula Translation.) This language is used in scientific and mathematical programs.

GARBAGE: Meaningless data supplied by the computer in response to meaningless data, or no data, fed into it. ('Garbage in — garbage out.')

GRAPHICS: The display of diagrams or drawings on the video unit.

HALF BYTE: A group of four bits.

HARD COPY: Information from the computer in the form of words or diagrams printed permanently on paper, as distinct from being temporarily displayed on the video unit.

HARD DISK: A disk similar to a floppy disk but made of hard, non-flexible material and capable of storing far greater amounts of data. It is faster but much more expensive than a floppy disk. (See *FLOPPY DISK.*)

HARDWARE: The physical components which make up the computer itself together with any units

that can be attached to the computer (see *PERIPHERALS*), as distinct from its programs (see *SOFTWARE*).

HOME: The cursor's starting point on the display screen.

INPUT: Information given to the computer. On personal computers this is usually done by keying (typing) it onto the keyboard or using magnetic cassette tapes or disks.

INTERFACE: The connection of two or more electronic units related to the computer set-up, e.g. connecting a normal domestic TV set to the computer so that the TV screen becomes the video display unit on which information from the computer is displayed. (When used as a verb, 'to interface' means 'to connect'.)

INTEGRATED CIRCUIT: A complete electrical circuit on an individual silicon chip.

KILOBYTE (K): The term or symbol used to express the memory capacity of a computer. K = 1024 Bytes. Thus, for example, 4K = 4096 bytes (4 × 1024). The average personal computer has 16K of RAM memory, but additional memory cards and the use of peripherals can increase the computer's total RAM memory capacity. (See *RAM* and *PERIPHERALS*.)

KEYBOARD: Similar in appearance to a typewriter keyboard. This is standard on all personal computers on which keys showing letters, numbers or symbols are pressed to give ('feed' or 'input') information to the computer.

LANGUAGE: There are many different computer languages which are broadly divided into two

levels — high and low. Obviously the software (the program) must speak the same language as the hardware (the computer). BASIC is the most common (high-level) language for personal computers.

LIGHT PEN: A pen-like instrument that is sensitive to light and can be used to alter graphics, diagrams or even words displayed on the video screen.

LOOP: A sequence of instructions which the computer executes continuously and repeatedly until ordered to stop.

MAGNETIC DISK: Used for the writing, storage or retrieval of information. (See *FLOPPY DISK* and *HARD DISK.*)

MAGNETIC TAPE: A thin plastic ribbon coated on one side with iron oxide, so that it can be used for magnetic recording and replay.

MAINFRAME: A very large computer.

MEGABYTE: One million bytes.

MENU: A list of choices offered by the computer and displayed on the video monitor. The computer operator chooses one of these.

MEMORY: A computer has two different types of memory — fixed and permanent (see *ROM — READ ONLY MEMORY*) and flexible and temporary if desired (see *RAM —RANDOM ACCESS MEMORY.*) The memory capacity of a computer is expressed in bytes or kilobytes (K = 1024 bytes). (See *KILOBYTE.*)

MODE: An aspect or kind of operation. EDIT mode, when used in word processing for example, allows you to change text in a file.

MODEM: A piece of equipment for sending binary codes (computer machine language) over telephone lines, thus allowing computers to send and receive information on the telephone. The name stands for MODulator/DEModulator. The modulator translates the binary code into whistles which can be transmitted over the phone and the demodulator translates the whistles back into binary code.

MICROCOMPUTER: A small computer such as a personal computer used at home or in a small business.

MICROPROCESSOR: The complete Central Processing Unit (CPU) of the computer.

NIBBLE or NYBBLE: Half a byte or four bits.

OFF-LINE: Computer equipment which is not directly a part of the computer, e.g. a printer which produces printed hard copy from tape or disk.

ON-LINE: Computer equipment directly and permanently connected to the computer and under the control of the central processing unit.

OPTICAL SCANNING: Reading printed characters and numbers by a light scanning device.

OPERATING SYSTEM: A series of programs fixed in the computer which instruct it on how to carry out its day to day operations. For example, the procedure for transferring data from memory to the video screen or printer is programmed into the operating system.

OUTPUT: The visual display (usually on a screen or printed paper) of either instructions given to the computer, or answers supplied by the computer.

OVERWRITE: The act of recording over (and therefore replacing) information on a disk or tape.

PASCAL: A computer language (named after the famous mathematician) that is growing in popularity.

PERIPHERALS: Units of hardware (see *HARDWARE*) that attach to the main unit of the central processor (see *CPU*) via an expansion unit, such as disk drives, cassette players, printers and video display units.

PORT: See INTERFACE.

PRINTER: A computer peripheral (attachment) that prints information from the computer onto paper. A serial printer prints one character at a time; a line printer, one line at a time.

PROGRAM: A set of instructions for the computer to obey. A program can be in the form of a cassette tape, a disk, or instructions written on paper to be typed into the computer's keyboard.

PROGRAMMER: A person who writes a set of instructions for the computer.

RAM (RANDOM ACCESS MEMORY): Computer memory which is used to store and retrieve both the data fed in by the computer operator and the results calculated from the data. This memory can be erased or altered at any time. (See also *ROM — READ ONLY MEMORY.*)

RANDOM ACCESS: The ability to access (either read or write into) any byte of a memory system at will without having to run through all the preceding bytes. Semiconductor 'drip' memories are random access devices. (See also *SERIAL ACCESS.*)

ROM (READ ONLY MEMORY): Permanent memory information built-in to the computer during the manufacturing process — for example, the BASIC operating instructions and language. ROM programs are sometimes known as FIRMWARE.

READ: Retrieving data in programs from the computers memory or from disk or tape.

READ/WRITE HEAD: An electromagnetic head which reads or writes on magnetic disk or tape to retrieve or record information.

RF CONVERTOR: A unit that converts radio frequency signals. For example, an RF convertor is used to convert signals from the computer into signals like those from a TV station, so that a domestic TV screen can be used to display information from the computer.

RUN: To execute a program.

SOFTWARE: The program (in the form of a cassette tape or disk) that is fed into the computer. Programs are written to perform specific tasks, e.g. catalogue your stamp collection or prepare your income tax return. Programs can be bought ready made or they can be written by the user.

SERIAL ACCESS: Where the access to each byte of memory storage is sequential and cannot be selected at will. Cassette tapes are serial access devices — the tape must be run through until the desired place is reached (as in playing a music cassette on a tape recorder). (See *RANDOM ACCESS.*)

'SLAVE' COMPUTER: A dedicated computer which is

part of a larger system and quite often controlled by a general purpose computer.

SPIKE: A surge of extra voltage to the computer through the electrical mains.

STRING: A set of characters in a particular, significant order. A word, for example, is a string.

TAPE: See *CASSETTE TAPE.*

TERMINAL: The device which enables information to be entered into the computer and then shown to the operator. Personal computers have a typewriter-like keyboard to enter information and a video screen (or print out) for display.

WORD: The amount of data fed into or retrieved from one memory location. In personal computers this is usually one byte.

WRITE: Recording data or programs in the computer's memory or on to a disk or tape.

WRITE PROTECT NOTCH or SENSING NOTCH: A small notch on a disk which, when covered with a 'Write Protect Tab', will prevent the computer from recording or writing over data already on the disk.

CLUB DIRECTORY

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South Australian Apple Users Club; The Secretary, SAAUC, c/- The Bookshelf, 169 Pirie Street, Adelaide, 5000.

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(Information, courtesy: ***Your Computer)***