Buying your first computer

Many thousands of people have bought computers for the home and perhaps many more would if they knew what they were all about. If you think you'd like a personal computer but are unsure which way to go, read on.

by PETER VERNON

Buying a computer is not a decision to be taken lightly. At the very least a small computer will set you back about $200 and that's without any of the essential accessories, programs and books that go with the hobby. A personal computer can quickly become an open invitation to spend money. How can you be sure this money is well spent?

The first step is *not* to rush out to a dealer or computer store. Instead, do some work with pencil and paper to define your own requirements. What do you want a computer to do? The expected applications of a computer define what is required by way of memory size, screen display format, keyboard and accessories.

Personal computer applications

By far the most popular use of a computer in the home is to play games, with educational applications a close second. Word processing, home management, control of household appliances and communications are other uses. With the increasing number of computer clubs, owning a computer can also be an introduction to a large circle of friendly, like-minded people.

There are some things, however, which buying a computer will not do. It will not make you into an expert programmer — no more than buying a piano will make you a musician. Long hours of learning and practice are required to master anything but the simplest programming.

Nor will owning a personal computer guarantee you a job, although it can help. Some people have graduated from a computer club to working with a computer manufacturer or distributor of computers or software, but the competition is fierce and opportunities are scarce. Familiarity with computers can have indirect benefits at work, or may impress a prospective employer!
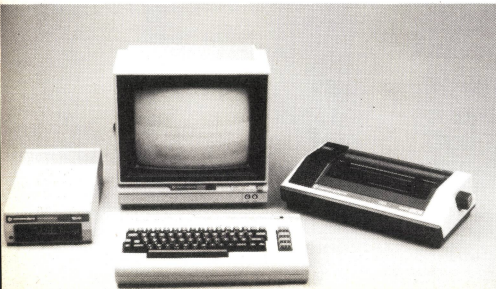
What to look for

Having decided what a computer can and cannot do for you the next step is to start looking around. Read reviews, advertisements and the brochures produced by manufacturers and retailers. Talk with other computer users but remember that they are the last place to go for unbiased advice. To most users, the best microcomputer is the one they own!

If your primary interest is games, look at the capabilities for colour graphics, sound effects, joystick facilities and available software. Although games programs are sold for computers which do not have a colour display capability, they are intended as adjuncts to other applications. Colour adds immeasurably to the impact of computer games, so if this will be the main use of your computer there is little point in going for a monochrome display.

The features required for educational uses of a computer are similar to those required for a games machine. The best educational software uses colour graphics, sound effects and interaction to maintain the student's interest. Old style "drill and practice" programs are rarely worth buying.

For word processing and information management, colour is not an essential requirement. The ability to display both upper and lower case letters and a reasonably sized text display are much more important.

The Commodore 64 is one of the largest-selling computers in the home market. Features include 16 colour graphics, sound effects and plug-in software cartridges for games and home management applications. While it is a system with a lot of potential considerable programming effort is required to bring out the best in the machine because of the limited Basic language supplied. See EA June, 1983 for an in-depth review.

The VZ-200 from Dick Smith Electronics is one of the lowest-cost systems on the market. It offers low resolution graphics in eight colours and limited sound effects but is a good starter system at around $200. The Tandy MC-10 is comparable. The July, 1983 issue of EA contains a review of the VZ-200.

The standard screen format for business word processing is 25 lines of 80 characters each. Home TV sets, even those converted for direct video entry, just do not have the bandwidth required for a legible display of this line length. It is for this reason that most low cost computers display 32 or 40 characters per line. Longer lines exclude the use of colour.

If colour is not required, a monochrome monitor or converted black and white television receiver can be used. The legibility of the display will depend on the bandwidth of the monitor. Television receivers converted for direct video entry can be used to display 64 character lines, but for a crisp 80-column display a higher priced video monitor will be required.

A video monitor is just one of the "hidden costs" of a personal computer. Prices range from around $200 to over $700 for a 34cm (diagonal) colour unit, although the experienced electronics enthusiast can save some of the cost by converting a surplus television set, as described in the August, 1983 issue of EA. As well as allowing full time use of a computer, a video monitor generally provides a sharper picture and is less prone to interference than a television set driven by an RF modulator.

Note however that some computers limit the choice of methods. Some, like the VZ-200 and Commodore 64, provide both modulated RF video and direct video output, while others such as the TRS-80 Color Computer provide only a modulated RF output, and cannot be used with a monitor unless the case is opened (voiding the warranty) and additional connections made. Others, such as the VIC-20 and TI-99/4A require an RF modulator in the form of an external box, usually supplied with the computer.

Naturally, a printer is also required for word processing applications. We won't go into the relative merits of dot matrix, thermal and daisywheel printers here, other than to point out that a printer can cost much more than the computer itself. Unless word processing is going to be you main application it is not necessary to purchase a printer immediately. Wait until the need becomes evident.

More important, however, is a place to connect the printer. A surprisingly large number of personal computers are not equipped with either parallel or serial ports but require separate "printer cards" and communications interfaces as an extra cost option. Other computers can

Tandy's TRS-80 Color Computer is available with one of two versions of Basic. Extended Color Basic is require to make use of the computer's sound and high resolution graphics capabilities. Other features include plug-in cartridge software and a range of disk operating systems.

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be used only with a printer from the same manufacturer because they use a non-standard interface. Since these printers are usually more expensive than standard types, another extra cost is involved.

If your main use for a computer is to learn about hardware and design techniques, access to the circuitry of the computer is important. Adding your own devices to a computer is one of the best ways to develop an understanding of the principles of computer engineering. If this is impossible, either because the system is not readily expandable or there is no information available on the expansion facilities, the computer is not suitable for the electronics hobbyist.

Documentation is important here, however. The mere presence of an expansion port or cartridge connector is not enough unless there is sufficient information available to allow the use of the facilities. At the very least, a description of the pin-outs of the connector and the allocation of memory is required.

Graphics — what's available

Graphics capability depends on two factors; the number of different colours which can be displayed on the screen and the resolution of the display. Resolution is usually expressed as the number of dots or "pixels" which can be displayed across the screen by the number which can be displayed vertically. (Pixel stands for picture element.) The more dots
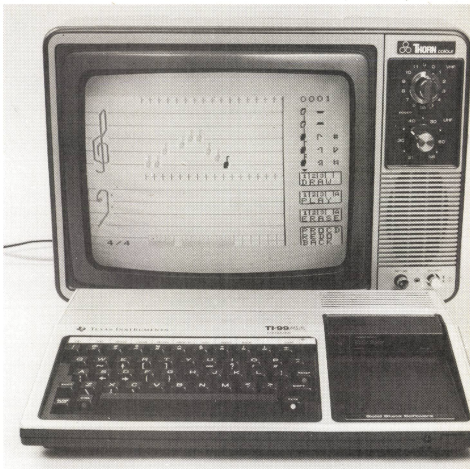
Discontinued last year by TI because of marketing problems, the Texas Instruments TI-99/4A is currently available at bargain prices. Features include excellent colour graphics (including 32 sprites) and sound effects, and a very good version of the Logo language. Some software in plug-in cartridges is still obtainable at dealers and the computer is supported by a very active users group with branches around Australia. This system was reviewed in the December, 1982 issue of EA.

horizontally and vertically, the smaller the size of each dot and the greater the detail which can be displayed.

For systems costing less than $500, 16 colours and a resolution of 256 (horizontal) by 192 (vertical) are reasonable. Like most aspects of personal computers however, graphics capabilities

can be expressed in many ways, some of them ambiguous. A reference to 16 colours, for example, always includes black and white as colours. There are also trade-offs between colour and resolution. Some computers restrict the use of colour in high resolution displays because of memory or processing limitations.

Computers such as the VZ-200, TRS-80 Color Computer and the MC-10 provide low resolution "chunky graphics" and boast eight colours. In actuality, the low resolution graphics mode only allows four colours to be displayed simultaneously, selected from one of two sets. Since the background of

The CAT computer from Dick Smith Electronics is one of the newest on the market. For $699 it offers limited Apple II compatibility and enhanced graphics and sound, while a $99 "soft emulator" is available to allow the CAT with a disk drive to run the majority of Apple II software. A detailed review of this system appeared in EA in May, 1984.

The Atari XL computer system forms a compatible range from the 600 to the 800 and up. The family is known for extensive colour graphics, ease of use and the availability of a wide range of software and peripheral equipment. The 600XL shown here comes with 16K of RAM, and is expandable to 64K.

the display must be one of these colours, actually only three colours are available from graphics displays.

The TRS-80 Color Computer has a higher resolution (256 × 192) graphics mode, but only two colours are available in this mode. Of the popular personal computers only the Atari, VIC 20, Commodore 64 and Texas Instruments TI-99/4A allow 16 or more colours with relatively high resolution.

Another factor contributing to ease of programming for games is the availability of "sprites"; blocks of graphics which can be defined and moved independently of the remainder of the display. Because sprites ease the task of creating animated displays they can allow "arcade quality" video games programs to be written, even in a slow language such as Basic. Used with assembly language, they allow effects which frequently surpass dedicated video games machines.

Music and sound effects

Sound effects add considerably to the impact of computer games, quite apart from the opportunities provided for learning music theory. Computer circuits for producing sound can be divided into two types — so-called "single bit" sound and those that use a separate sound generator chip.

Single bit sound, as the name implies, uses one line of an output port to drive a transistor amplifier and speaker. Some
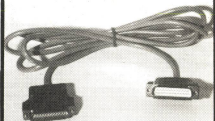
systems use more than one line, however, driving and rudimentary digital to analog converter. The significant point is that the frequency and duration of the sound is controlled by the microprocessor, so all other operations come to a stand-still while sound is produced. Simultaneous sound and movement, for instance, can only be programmed with difficulty.

Computers using dedicated sound generator chips, such as the Commodore 64's "Sound Interface Device" (SID), provide a wider range of sounds, including white noise, and produce sounds simultaneously with video displays and other processing. Often the volume of the sound can also be controlled by software, unlike the single bit approach.

The other factor to be considered is the means of sound output. Methods range from incorporating an internal speaker (as in the Apple II and lookalikes) to modulating the sound onto the RF video carrier (as with the Tandy Color Computer and Commodore machines). When computers which use this method are connected to a video monitor the sound is lost unless the monitor includes a speaker and provision is made for a separate audio connection.

Few direct entry video monitors include an audio input (one exception is the Dick Smith monitor, actually a converted portable television set). For
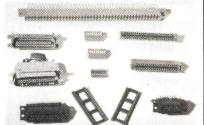
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this reason, computers such as the VIC 20 and Commodore 64 have a separate audio output which can be connected to an external amplifier.

Keyboards

The type of keyboard available on a personal computer also affects its usefulness for a variety of roles. Generally keyboards are of three types; flat plastic membrane switches, such as those of the Sinclair ZX81, rubber or plastic buttons (so called "chiclet" style, because of the resemblance to pellets of bubblegum), and full-stroke "typewriter" keyboards.

Flat plastic membrane keyboards are difficult to use for long periods becaus of the lack of tactile feedback. One user described the sensation as "like typing on a block of wood". In an attempt to overcome this, most such systems provide an audible "beep" to indicate that a keystroke has been registered.

Half-way between flat keyboards and full typewriter style are "pushbutton" keyboards, as used by the TRS-80 Color Computer and the IBM PCjr. This type of keyboard is easier to use than the flat

The MPF-III provides Apple II compatibility in a compact, low profile design with detachable keyboard. Features include an 80-column display, 64K RAM, printer and cassette ports and an Apple compatible hardware expansion slot. As yet however, no colour graphics are available. The February 1984 issue of Electronics Australia has a review of the system.

type and is more suitable for applications around the home.

Apart from the style of a keyboard there are very few guidelines which can be laid down. Separate numeric keypads, while convenient on office computers used for large scale data processing, are of little use on a personal computer. Far better is a cluster of cursor control keys and special function keys which can be re-defined by the user.

As long as a keyboard is comfortable there is very little to choose between alternative offerings. Any keyboard used for more than a month tends to become a natural arrangement, and one quickly becomes familiar with various quirks and foibles.

Software

The availability and method of loading software is one of the most important aspects of a computer to be used in the home. By far the best method is the solid-state ROM cartridge, which avoids the problems and delays caused by loading a program from disk or cassette.

Most of the popular low cost computers for home use are designed to accept program cartridges, but cartridges

The Australian-made MicroBee computer has attracted a lot of attention from home and educational users. This is one of the few low cost machines to offer text displays of more than 40 characters per line (almost essential for word processing) and is supplied with a range of software. The photograph shows the start-up menu of WordBee, the MicroBee's built-in word processor. The MicroBee IC model was reviewed in EA in November 1983.

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intended for one type of machine are not transferable to another. The range of programs available in this form may also be limited, so it is best to assess the variety and cost of program cartridges available for a particular computer before committing yourself to a purchase.

Other programs may be distributed on disk or cassette, and in any case you'll need some form of "mass storage" to permanently retain copies of your own programs and data. The lowest cost method is to use a standard cassette recorder. Disk drives are faster, but more expensive, and are better left until you have some experience with the computer and come to feel the need for faster response time and greater storage capacity.

Be aware that some computers cannot use an ordinary cassette recorder. They require a specialised device made by the computer manufacturer and often selling for twice the price of a budget portable cassette player. The Commodore VIC 20 and 64 and the Spectravideo machines follow this practice. The VZ-200 also requires a comparatively expensive cassette player for reliable performance.

Memory size and the choice of a processor

Surprisingly, the size of a computer's programmable memory is not as important as it first appears. Most personal computer systems are provided with enough memory for typical applications, while those using software ROM cartridges can run programs without reducing the size of RAM.

Because of the low cost of dynamic RAM chips, memory sizes of 16K are most common, with expansion in increments of 16K. One "K" is 1024 bytes or characters, but because Basic programs are usually stored in a compressed form, more space is available than would first appear. Machine language programs, of course, are even more compact.

16K of memory is adequate for programming and educational applications. Word processing may require more, as a single typed page may contain around 2400 characters, limiting in-memory storage to around seven pages of text in 16K.

The Spectravideo SV-318 offers colour graphics and sound effects and a built-in joystick for $399. The graphics mode features 32 "sprites" or patterns which can be defined and moved around the screen independently of the remainder of the display, easing the task of writing fast-moving games and other display programs. The larger SV-328 does not have the built-in joystick but offers a larger, full-stroke keyboard. See EA for February 1984 for a review of the SV-318.

As important as the absolute size of a computer's memory is the use made of it. All computer operating systems require some RAM for storage of temporary variables and for display memory. What matters is "usable memory", which can be quite different from the total memory advertised. The Commodore 64, for example, is commonly advertised as a 64K system, but in fact only around 31K is usable from Basic.

The important distinction to be aware of is the difference between RAM and ROM. RAM, or Random Access Memory, holds the user's programs and data. ROM holds the computer's operating system and (usually) a Basic interpreter.

Read Only Memory size can vary between two models of the same computer. Many machines, such as the TRS-80 Color Computer or the TI-99/4A, offer two versions of Basic, one standard and the other an extra-cost "Extended" version which is required to make effective use of the computer's graphics and sound capabilities. You should be aware of which version you are getting for your money, as the most advanced facilities are usually only available with Extended Basic.

So far no mention has been made of the varieties of microprocessor chips which form the basis of all personal computers. There is a good reason for this — if a computer has the capabilities that you want, it doesn't matter which microprocessor it uses. Debates on the merits of the 6502 or Z80, or 8-bit versus 16-bit processors are irrelevant to the actual applications of a computer in the home. If a machine does the job that you want it to do, what more can you ask?

In conclusion

A computer console, cassette recorder and a television set are enough to get you started in personal computing. It is only a start, though not the end of the road (or the expense). If you intend to keep up the hobby, look for an expandable system which is well supported by software supplies and publishers.

Consider joining a computer user group, possibly even before you purchase your own computer. As a source of advice and assistance, for a subscription of around $20 per year, such groups are worth their weight in microchips!

In the end however, the decision on what sort of computer to buy is your own. The more time you put into defining your own requirements and applications, the easier the final choice will be.