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**CAT Computer
Reviewed:
colour graphics
plus
sound effects**



Electronics Australia reviews the **Cat Computer**

Apple compatible plus extensive graphics

Dick Smith Electronics has come up with a winner with the CAT personal computer, a system which offers extensive text and graphics display capabilities, music and sound effects, and a powerful Basic interpreter.

by **PETER VERNON**

The CAT computer from Dick Smith Electronics is actually two machines in one. In itself it is similar to the Apple II but provides enhanced display capabilities and sound effects and a more extensive Basic interpreter. With the addition of an extra-cost emulator cartridge and disk drive the CAT becomes an Apple II "workalike", able to run most Apple II software.

Manufactured by Video Technology Limited of Hong Kong, the CAT is a big, heavy "all in one" unit with processor, memory and interface electronics packaged in the keyboard console. Dimensions are 486 × 248 × 65mm (W × D × H at rear), sloping to 45mm high at the front of the console. The colour scheme is beige and tan.

A 55 key alphanumeric keyboard and an 18 key numeric pad are provided, along with eight double-size function keys which in conjunction with the SHIFT and CTRL keys give 24 programmable functions. The keyboard is "dished", with the top surfaces of the keys arranged in a concave plane for comfortable typing, and special function keys are picked out in yellow and tan.

Automatic repeat operates on all alphanumeric keys and the programmable function keys are initially defined to allow single-key entry of commonly used Basic statements such as LIST and RUN.

One minor irritation is the positioning of the RUBOUT key above the RETURN key. It is a little too easy to reach for the RETURN key and instead delete a character accidentally.

At the rear of the console is an array of controls and connectors. From left to right (looking from the rear) are the

rocker type power switch, an IEC socket for 240VAC power, a reset button, colour defeat switch, RGB output, composite video output, cassette interface connector, volume control for the internal speaker, a connector for an add-on RS-232C interface, system bus connector and a parallel printer port. An external RF modulator is also available.

The connector at the rear of the CAT console provides an audio output as well as composite video, while when using an RF modulator sound is heard from the speaker of the television set, in addition to the CAT's internal speaker (depending on the setting of the volume control). The "colour defeat" switch eliminates the chroma component of the video signal to provide a clearer picture when the CAT is used with a monochrome monitor.

Additional connectors on the right side of the console are for an expansion interface and a 9-pin D type socket for dual joystick controls. Tucked away underneath the console are two small slide switches, one to specify 50 or 60Hz operation and the other to select a 40 or 80 column display format. The width of the display can also be changed by software — the switch selects which format is operative when the system is first turned on.

The system bus connector at the rear of the console is normally used by an add-on floppy disk drive controller cartridge which allows the use of two 13cm minifloppy disk drives. The expansion port at the right takes the "emulator" cartridge, which in conjunction with special software on disk turns the CAT into an Apple II "workalike".

Given the recent furore over the "Wombat" computer, and the on-going debate about software protection sparked by Apple Computer's attempts to defend its investment, compatibility with the Apple II is no light claim. Prompted by Dick Smith Electronics, the manufacturers of the CAT have gone to some lengths to ensure that Apple copyright (if any) has not been infringed.

Features of the CAT

High resolution (560 × 192) graphics in six colours and bit-mapped 280 × 192 graphics in eight colours, a choice of 40 or 80-column text display in upper and lower case and three-voice sound effects and music capability are the high points of the CAT's capabilities. Couple this hardware with a Microsoft Basic interpreter with support for graphics and sound and the system has a lot of potential.

The Basic of the CAT is an expanded version of that of the Apple II, which was also written by the Microsoft company. There is one notable omission, however, in that the Apple II 40 × 40 "chunky graphics" mode is not available on the CAT. Typing "GR", which on the Apple II enables this mode, causes a syntax error on the CAT.

When it is not emulating an Apple II the CAT provides five video display modes. Two of these are text modes and allow either 40 or 80 characters per line, with 24 lines on the screen. Both upper and lower case characters are supported, although program statements typed in lower case will be converted to upper case when the program is listed. The conversion is not total however, as some of the parameters of program statements remain in lower case and will cause a syntax error when the program is run.

As well as converting all keywords to upper case the Basic interpreter automatically inserts spaces between statements and symbols, making program listings easier to read, although a little disjointed at times.

Using the WIDTH statement the text display can be formatted with any line



length between one and 80 characters, with displays of over 40 characters per line using a special half-size character set. On an inexpensive colour video monitor or converted television set there is not sufficient bandwidth to make these characters legible, and a wider bandwidth monochrome or RGB colour monitor is required to make this display mode useful.

The colour of characters, screen background and border can be altered with the TEXT statement, which takes three parameters, one for each colour selection, chosen from a range of eight.

Colours can also be swapped between characters and background with the INVERSE statement, although some colour combinations are unreadable on a low resolution monitor. Messages on the screen can also be highlighted with

the FLASH statement, which causes text to alternate between INVERSE and NORMAL modes.

In addition to two text modes, the CAT has three graphics modes. The first is an Apple-compatible 280×192 resolution display in six colours (including black and white) but the effect of a colour specification varies according to the exact position of a pixel on the screen. Pixels in even-numbered columns are always either blue or magenta while pixels in odd numbered columns are either red or green. Two adjacent pixels, however, are always shown as white.

A second version of this same mode is also available, which limits vertical resolution to 160 points but allows four lines of text to be displayed at the bottom of the graphics screen.

The same resolution with more

colours, is available in a "bit-mapped" mode which is not derived from the Apple II. This mode also has a resolution of 280×192 but allows eight colours, with no limitations on how colours are mixed on the screen. Two pixels placed next to each other will retain their individual colours.

A "double resolution" mode is also available, allowing displays of 560×192 pixels. Colour combinations are the same as for the Apple-compatible 280×192 mode display mode.

In practice, the bit image graphics mode results in the most pleasing displays. The limitations on the use of colour imposed by low and double resolution modes mean that the colour of an arbitrary line cannot be guaranteed and that coloured shapes will be incomplete.

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Note that except for a four line text area at the bottom of the graphics display screen, text and graphics cannot be mixed. When a graphics program does not perform as expected the computer often remains in the graphics mode, giving the user no indication of what has gone wrong. Returning to the text mode requires typing "TEXT", without the benefit of seeing what you type, or pressing Function key 4 (defined as "TEXT" by default).

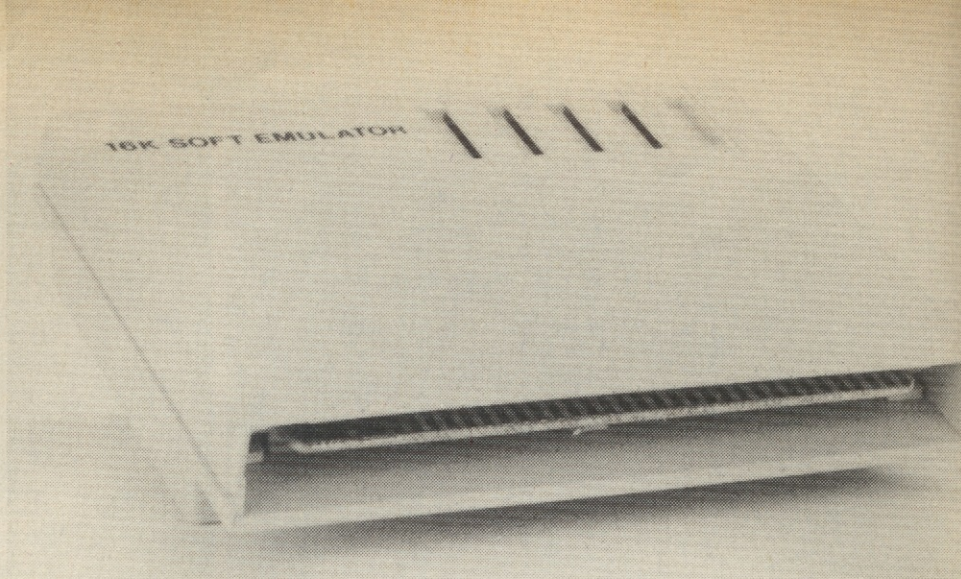
We tested the CAT on a colour television set converted for direct video entry and on the same set using an RF modulator and found that there was insufficient resolution to allow the 80 column characters to be legible. Colours were also "washed out", lacking in saturation, and the fine detail of some displays was lost.

We also tried an RGB video monitor, an AMUST unit made available by Dick Smith Electronics. This monitor connects to the RGB video connector at the rear of the console, and although small (28cm diagonal, 20 x 14cm usable area) provided a far superior picture. Colour displays were bright and fully saturated and details of the picture were crisp and clear. At around \$700 though, the use of an RGB monitor adds considerably to the cost of the CAT system.

Basic statements and functions

The Microsoft Basic of the CAT is compatible with that of the Apple II but includes extensions to enhance the capabilities of the system. Program listings intended for the Apple II can be typed in as is and will run as specified, except for the "chunky graphics" mode.

SHLOAD, DRAW, XDRAW, ROT and SCALE support the "shape table" feature. Graphics shapes defined as a series of vectors can be stored in memory and reproduced at any point on the screen in Apple-compatible high resolution and CAT "double resolution" modes. Before



The emulator cartridge provides 16K of RAM to store Apple-compatible software.

drawing the shape can be rotated and/or scaled, and shapes can also be erased and re-drawn elsewhere for animated effects. Shape tables can also be saved on cassette or disk and re-loaded as required.

Points and lines can also be plotted on the screen with the HPLOT statement. A pair of coordinates as parameters to this statement sets a single point, while HPLOT with two pairs of coordinates separated by "TO" will draw a line. Multiple lines can be drawn with a single statement by adding further coordinate pairs, as follows:

```
HPLOT 0, 0, TO 279, 191, TO 0, 191  
TO 0, 0
```

The task of graphics programming is further eased by statements such as DRAW SCIRCLE, DRAW HSQUARE and PAINT. Outlines of circles, arcs, rectangles and ellipses can be drawn with a single statement with the H prefix, while equivalent statements with an S prefix draw solid shapes. The PAINT statement is also available to fill irregular shapes with colour. It takes parameters specifying the point where PAINTing is to begin, the colour to be used as fill and the colour of the boundary at which PAINTing is to stop.

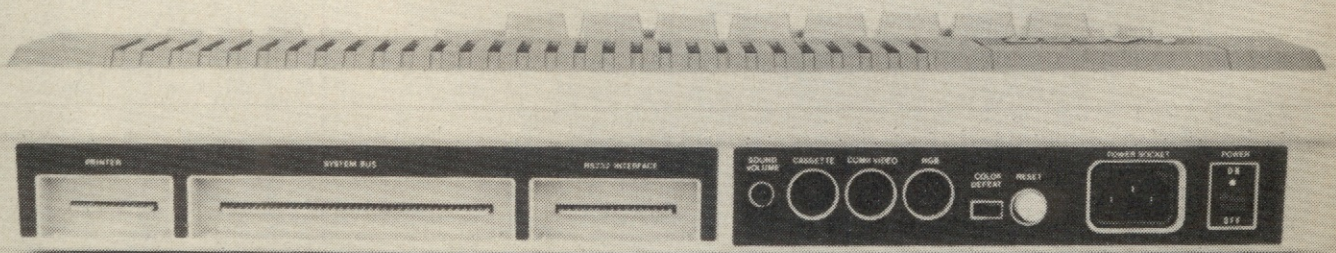
In addition to the graphics enhancements the CAT offers expanded

sound effects and music capabilities. The original Apple II design allows only "single bit" sound activated by the BEEP statement. One bit of a particular memory location is connected to a small amplifier and internal speaker and is toggled on and off to create square waves with a frequency depending on the rate of switching.

While it is possible to produce music in this way, the amount of work required is out of all proportion to the effects produced. The addition of a separate sound generator chip in the CAT is therefore a welcome development to those unconcerned with Apple compatibility.

Two versions of the SOUND statement control the three channel sound generator. The first version uses numbers between 1 and 63 to specify the pitch of each note, the duration, volume and sound channel to be used. Only one channel at a time can be activated with this version of the statement.

The second version of SOUND uses letters of the alphabet to specify notes over a seven octave range. The tempo, length and volume of any note can be specified, and more than one sound channel can be activated simultaneously. Each note is specified as one of A, B, C,



At the rear of the CAT console is an array of connectors including a printer port, expansion bus and two video outputs.



The CAT personal computer is an "all in one" unit with a keyboard and a numeric pad well-suited for prolonged use.

D, E, F, G in one of seven octaves, and optionally, as either sharp or flat.

SOUND C4 for example, produces the note middle C.

Percussion, phasor sounds and other effects can be produced with the NOISE statement, which controls a separate sound channel and allows either random ("white noise") or periodically varying waveforms with one of four predominant tones. Volume is specified as one of 16 levels between 0 (off) and 15 (maximum).

Duration of the sound is specified in increments of 1/50th second, using a parameter between 1 and 255. Longer noise effects are produced with two or more statements in succession.

Any of the graphics display pages of the CAT can be reproduced on an Epson type dot matrix printer using the Basic command PRINT SCREEN. This function is designed to work with the MX-80 and similar printers, but not the Seikosha CP-100 series, which use a differently configured print head.

Program editing features are not as extensive as those of some other machines, and appear over-complicated. They are not mentioned in initial copies of either manual accompanying the machine, but books on the Apple II are applicable. At the time of this review revised manuals were in preparation.

Variable names in CAT Basic can be up to 40 characters long, a boon to programmers who like to write self-explanatory code. All numeric variables are stored to nine-digit accuracy, and there is no provision for designating particular variables as integers or double precision.

Use of machine language routines is

CAT specifications

Processor	6502 at 2MHz.
RAM	48K, 64K in emulation mode.
ROM	32K, partly overlaid by emulator.
Interfaces	Cassette port, games port, parallel printer port, expansion port, system bus, optional RS-232C.
Display	Text: 40 x 24 lines; 80 x 24 lines. Graphics: 280 x 192, 560 x 192.
Sound	Three voices, six octave range, programmable noise.
Software	24K Microsoft Basic in ROM; machine language monitor; Apple II compatible Basic on emulator disk.
Documentation	Under revision at time of review.

well-supported. The "Ampersand" command (&), causes a Basic program to jump to a machine language routine starting at address \$03F5 (hex). Naturally, a machine language routine must be stored in memory before the statement is used or the results will be extremely unpredictable.

The CALL statement is also available, allowing a more flexible use of machine code from Basic. CALL takes a variable which represents the (decimal) address of a machine language subroutine. The ROM-based "kernel" routines of the CAT, including a machine language monitor program, can be activated with the statement CALL -151. Machine language subroutines can also be entered with the USR statement, which causes a jump to a machine language subroutine pointed to by an address stored in locations 000A-000B.

The built-in machine language monitor program allows the contents of memory to be examined and altered and machine code programs to be entered and run, although there is no mention of this feature in the manuals accompanying the machine.

Software and expansion

Dick Smith Electronics has tested around 400 programs for the Apple II which will run on the CAT either with or without the emulator cartridge. A list of these programs is available on request.

By far the largest proportion of this list are games programs, with the spectacular graphics familiar to admirers of the Apple II. Games such as Crisis Mountain, Zaxxon, Microsoft's Flight Simulator, Missile Defence and all the Scott Adams Adventures run without the emulator. Others such as Three Mile

Cat Computer

Island and Olympic Decathlon require the emulator.

Note that there is at present no software available for the CAT as such. None of the commercially available programs take advantage of the extra graphics and sound capabilities of the machine. A program written for the Apple II computer will run in exactly the same way on the CAT and would need to be modified to use the additional features of the machine.

We were however supplied with a demonstration disk which highlights the special capabilities of the CAT and each computer comes with a cassette copy of the same software. Additional purpose-designed programs may become available if independent software suppliers decide that the market is worthwhile.

Hardware expansion is at present limited to the disk controller cartridge, emulator and an RS-232C serial interface. The single expansion bus connector of the CAT is required for the emulator cartridge, while the external disk controller cartridge plugs into a bus connector at the rear of the computer. The RS-232C serial interface connects to its own port at the rear of the console.

The emulator cartridge is a bank of 16K RAM which can be switched in and out of circuit. It is equivalent to the Apple "language card" or other 16K memory expansion boards, and is supplied with a disk containing the DOS and copies of two Apple II compatible Basic

CAT Computer Basic statements and functions

ABS, AND, ASC, AT, ATN, CALL, CHR\$, CLR, CONT, COS, DATA, DEF, DEL, DIM, DRAW, END, EXP, FLASH, FN, FOR, FRE, GET, GOSUB, GOTO, HCOLOR=, HGR, HGR2,3,4,5,6, HIMEN, HOME, HPLLOT, HTAB, IF, IN, INPUT, INT, INVERSE, LEFT\$, LEN, LET, LIST, LOAD, LOG, LOMEM, MID\$, NEW, NEXT, NOISE, NOT, NORMAL, ON, ONERR, OR, PAINT, PDL, PEEK, POKE, POP, POS, PR#, PRINT, READ, RECALL, REM, RESTORE, RETURN, RESUME, RIGHT\$, RND, ROT=, RUN, SAVE, SCALE=, SGN, SHLOAD, SIN, SOUND, SPC, SPEED, SQR, STOP, STR\$, STORE, STEP, SWAP, TAB, TAN, TEXT, THEN, TO, R TROFF, TRON, USING, USR, VAL, VTAB, WAIT, WIDTH, XDRAW.

interpreters. When the CAT is first switched on with the emulation disk in the drive, the disk operating system is loaded into the emulator memory and the user is asked to select either standard or integer Basic.

Some programs definitely need the additional facilities provided by the emulator. Unfortunately for the user there is no way of determining beforehand whether a program which is not on the DSE list will need the emulator.


Even with the emulator, not all Apple II programs will run on the CAT although the odds are good. Of 140 programs tested by one Dick Smith Electronics staff member, only one was found to be incompatible with the CAT emulator combination. Those programs which make extensive calls to the lesser used machine language monitor subroutines of the Apple II give the most trouble.

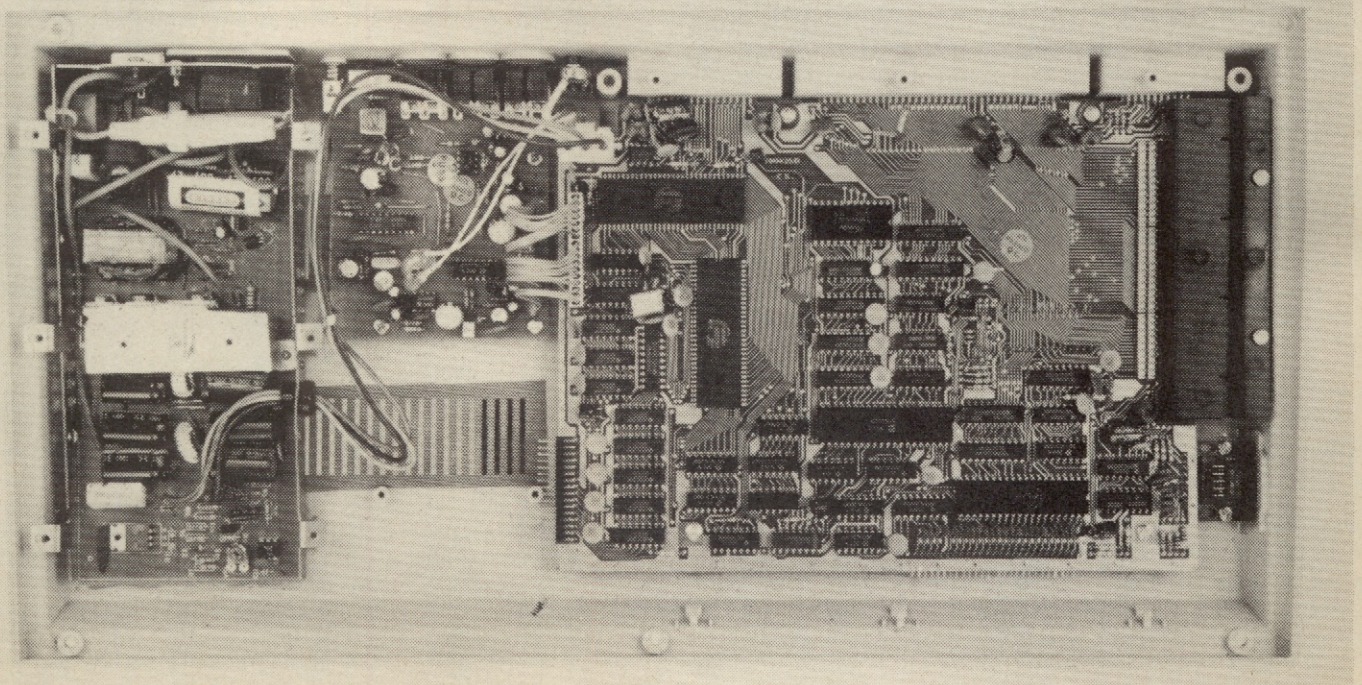
Sandy's Word processor and 80 column Visicalc for example, run when the emulator is fitted, but the Zardax word processor will not.

In conclusion

If you want a machine which is compatible with the Apple II and which is supported by a reputable retailer, the CAT with emulator is good value. Readers will have to decide for themselves whether Apple compatibility is important to them and how much effort they are prepared to put into collecting and testing software for the system.

The best points of the CAT are its quality design and presentation, colour graphics and sound capabilities and powerful Basic interpreter. Even without Apple compatibility it is a personal computer worthy of note.

The CAT computer costs \$699, with the emulator cartridge an additional \$99. A controller cartridge for two disk drives costs \$149, with half-height 13cm disk drives to suit at \$349 each. The RS-232C interface is \$129, and a pair of joysticks is available for \$34.50. An Apple-compatible CAT with one disk drive is thus \$1296 including the emulator, disk operating system and Basic. 



Extensive use of LSI circuits in the CAT keeps the chip count low. Note the separate power supply board.

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Comparison: Dick Smith CAT vs Apple IIe

FEATURE	CAT	Apple IIe	FEATURE	CAT	Apple IIe
Processor	6502A	6502	RGB colour output as standard	YES	NO
Operating clock speed	2 MHz	1 MHz	280x192 graphics: number of colours	8	6
RAM memory inbuilt	64K	64K	560x192 graphics in colour	YES	NO
Maximum RAM possible	192K	128K	Sound channels	4	1
ROM memory inbuilt	32K	16K	Disk drive capacity	140K	140K
Enhanced Microsoft BASIC?	YES	NO	Centronics type printer port inbuilt	YES	NO
Size of BASIC interpreter in ROM	24K	10K	Separate processor for keyboard	YES	NO
Keyboard — number of keys	81	63	ROM cartridge slot	YES	NO
Numeric keypad	YES	NO	Cost of computer with 80-column text facility, RGB colour & printer port, floppy disk drive, controller & DOS and hi-res green screen monitor	\$1485	\$3170#
Function keys inbuilt	8	2			
80-column text display inbuilt	YES	NO			

The CAT is a trademark of Dick Smith Electronics

Average of quoted prices



Basic CAT Computer X-7500	\$699.00
Disk Drive X-7505	\$349.00
Disk Controller X-7510	\$149.00
Emulator Cartridge X-7530	\$ 99.00
Dual Joysticks X-7520	\$ 34.50
RF Modulator X-7550	\$ 34.90
RS-232C Serial Adaptor X-7515	\$129.00
Printer Cable (Centronics) X-7540	\$ 39.00
Filer utilities Disk with DOS & Manual X-7512	\$ 39.00
High resolution RGB Monitor X-1193	\$599.00

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See page 98 for full address details.

