

# Australian Personal Computer

February 1982  
\$2.50\* N.Z. \$3.00\*

Australia's leading micro magazine



**APPLE III REVIEWED**

# The Personal Computer

## Your information window

### An extension of your brain

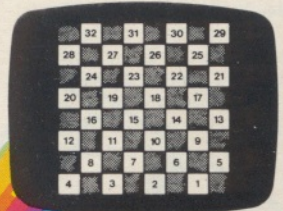
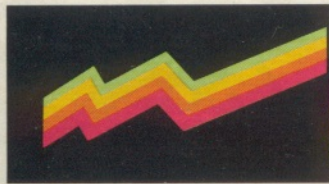
An Apple Personal Computer puts you at the forefront of the technological revolution. Use it well and it will mediate the availabilities of a wealth of conceptual tools, data bases, communication channels and information processes. An Apple will help you simplify a myriad of tasks from ordinary data processing through information retrieval to economic forecasting.

### Apple is versatile

Your Apple is an extremely powerful and robust problem solver backed by a comprehensive set of software programmes. Already, over 300,000 Apples are used for business, domestic, educational research and recreational purposes.

### Apple as information processor

An Apple personal computer performs a full range of standard functions like statistics, word-processing, graphics, number crunching, filing, storage/retrieval and cross-referencing.



### Apple is cost-efficient

For roughly the price of a plain paper copier, you get a sophisticated, powerful machine, which not only processes numbers and words, but gives you direct access to a wealth of information through a rich network of data bases and direct communications with other computers.



Mail this coupon for an "Apple Pack" brochure or talk to your local Apple authorised dealer about the specific applications for you.

If the coupon has been removed, send your name and address to:  
ELECTRONIC CONCEPTS PTY LTD,  
55-57 WENTWORTH AVENUE,  
SYDNEY, NSW 2000.



**apple computer**

Mail to: ELECTRONIC CONCEPTS PTY LTD, 55-57 WENTWORTH AVENUE, SYDNEY, NSW 2000. Please send me a free "Apple Pack" brochure.

PPCB374B

NAME \_\_\_\_\_  
ADDRESS \_\_\_\_\_  
POSTCODE \_\_\_\_\_  
PROFESSION \_\_\_\_\_

APPLE APPLE = PERSONAL COMPUTER PERSONAL COMPUTER = APPLE APPLE

# PRINTOUT

Computer and course cost \$295 including freight.

Computer Galerie is at 66 Walker Street, North Sydney, NSW 2060; Tel: (02) 929 5497.

## MASTER PLANNER

Informative Systems has a new Cromemco financial planning and general purpose numeric analysis package called Planmaster. It provides automatic spreadsheet analysis for financial planning cost accounting, sales forecasting, production planning, cash flow analysis, scientific data evaluation, and hundreds of other applications. Data entry is via direct cursor positioning to the desired location, with decimal positioning done automatically.

A plan can include up to 1010 lines or up to 130 columns, limited by a maximum of 12,000 entries. Each line or column can be given a user-defined label, while mathematical relationships between the entries may be defined in terms of these labels.

Available on 5 inch or 8 inch diskette for \$395, from Informative Systems, 337 Moray Street, South Melbourne, Vic 3205; Tel: (03) 690 2899.

## WINCHESTER

More from Warburton Franki for the Zenith micros. An 8 inch Winchester disk drive with floppy disk back up has been introduced by Zenith Data Systems for its business machines.

The non-removable Winchester in the new Z-67

increases the storage capacity to almost 10 million bytes, with the 8 inch floppy diskette back-up providing an additional 1 million.

The floppy is provided for back-up, data interchange and portability of programs and data. It is compatible with the industry standard IBM 3740 format and will record in single or double density; either single sided or double sided. The diskettes are also compatible with the Z-47 dual 8 inch system, which has been around for a year.

The floppy disk drive sits alongside the Winchester in a cabinet. A switching power supply is built in. The new drive connects directly to the back of the Z-89 or Z-90 micros using a flat cable.

## LEARN WITH ZEST

Zenith Education Systems will be running two courses beginning in early March. "Computer and Computing - Getting Started" it is for complete novices; and "Basic Programming" will include graphics and sound generation.

There will be practical work and class sizes will be restricted to one instructor for five students.

For further details, write to Zenith Education Systems, P.O. Box 505, Bankstown, NSW 2200; or ring (02) 708 3140.

## P.S.

The latest rumours about Hitachi are incorrect. Contrary to the opinions in the APC art room, no left hand versions of the Peach are being manufactured. For once my source is both authoritative and emphatic (!)



The Zenith Data Systems Winchester disk drive.

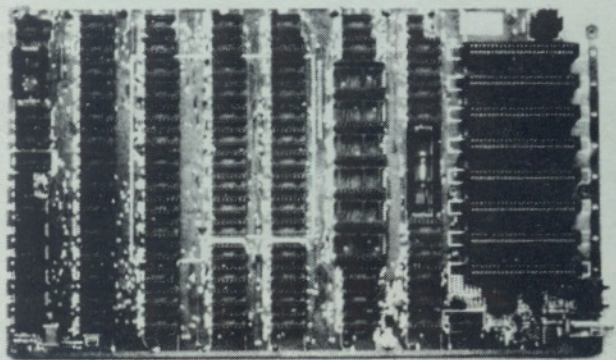
# SAVE! SAVE!

ON

# apple™

BUILD AN

## Orange Micro

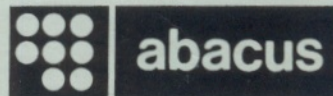


(Price \$275.00 + 17½% S/Tax)

### FEATURES:

- \* runs Apple software
- \* will take all add on cards as it has same type BUSS
- \* PAL is on main board, saves buying a PAL add on card
- \* board is fully socketed and has all passive components and crystal. Just add IC's, ROM's, keyboard, power supply and case.
- \* plug straight into your home colour TV via RF modulator and save on buying a monitor.

Dealer enquiries invited



512 Bridge Road, Richmond, Vic. 3121  
Telephone (03) 429 5844

TM Reg trade mark of Apple Computers Inc.

### AVAILABLE FROM:

RITRONICS WHOLESALE	(03) 481 1923
COMP-SOFT	(03) 428 5269
MICRO-BASE (WA)	(09) 328 9308
MICRO VISIONS (NSW)	(02) 662 4063
CUSTOM COMPUTER SERV (QLD)	(07) 204 4995
COASTAL COMPUTERS (TAS)	(004) 31 3259



**APPLE III**

The Apple III first appeared as an ever changing set of rumours in 1979, when people realised that Apple's considerable development effort was about to produce a new machine. The machine was released at NCC 81 and quickly gained a reputation for being bug-ridden. Consequently, the machine was put on hold while the problems were fixed. Most of them were associated with chips coming loose from the sockets in the motherboard and clock chip stability.

The release of Pascal III and the Profile hard disk system provided Apple with an opportunity to relaunch the III and to express their satisfaction with the product.

Steve Jobs has said that Apple intends to build a range of machines exploring the dimensions of the personal computer, and this has been the basis of Apple's design philosophy. These machines are based on large RAM based computers supported by sophisticated operating environments. This evaluation was written during a Festival of Sydney workshop. People with experience in video, audio and photography were being introduced to computers as a creative medium. The experience of the workshop really confirmed the importance of Steve Jobs observations.

## THE STANDARD MACHINE

The Apple III is a 6502B based machine with 128k of RAM memory. There is a built-in 5.25 inch floppy disk drive. The machine has an RS232B port, two joystick interfaces, video and audio ports, a Silenttype printer interface and four expansion slots. The system is packaged with a separate monitor: either colour or green screen. The SOS operating system, Business Basic and Visicalc are supplied with the machine. The expansion options are to daisy chain up to three floppy disk drives from the built in drive, the Profile hard disk and Apple Pascal III.

## HARDWARE

The Apple III has a cast aluminium case with an extended keyboard. The motherboard is under the case. There is a moulded plastic cover over the built-in disk drive, the power supply and a space for four expansion boards. The computer is fairly heavy and sits firmly on the table.

The keyboard extends from the front of the computer, and could easily have been detachable. The keyboard has 61 keys and a 13 key keypad. All 128 ASCII characters can be generated and all keys have auto-repeat. (The four cursor keys have two speed auto-repeat.) The keyboard is an improvement on the Apple II keyboard, but the keys still feel a little insecure.

A 5¼ inch (140k) floppy disk drive is built into the lefthand side of the case. The disk controller is on the motherboard and can accommodate three daisy chained drives.

A 2 inch speaker driven by a six bit DAC is mounted in the center of the case.

The motherboard is a 15 inch x 10 inch board that is only accessible from the bottom of the case. The board contains all chips except for the RAM which is contained on a piggyback card that has 32 16k bit RAMs and 16 32k bit RAMs. The board can take 256k RAM.

There is only 4k ROM on board and a number of unidentified proprietary chips. An empty socket is intended for the clock chip, and an empty space for the clock battery. The board is well designed with only one wire jump and has a number of undocumented plugs that may provide access to features of the system.

All interface connectors are on the back end of the motherboard. The expansion sockets are accessed through the top of the computer. Video signals available on the board are PAL B&W, PAL composite video and true RGB video. A variety of text and graphic display modes are available. The standard text display is 80x24 characters, with options for 40x24 black and white and 40x24 with 16 foreground and background colours.

Graphics modes are 280x192 and 560x192 in B & W. Color modes are 280x192 with 16 colours and a composite 140x192. Colour is displayed as a grey scale on a B & W monitor.

The board has several memory management switches to support a 64k RAM space with the 6502 processor. The boot ROM is mapped into \$F000-\$FFFF and is switched out of memory space after system boot. The memory mapped I/O space at \$C000-\$CFFF can also be switched out of address space and replaced with RAM and system supports multiple stacks. The Environment register at \$FDFF, used to reflect the state of the system, is a good

example of the type of hardware environments that can be established.

## ENVIRONMENT REGISTER

BIT	USE	CLEAR	SET
7	Clock Speed	2 Mhz	1 Mhz
6	\$C000 switch	RAM	ROM
5	Video output	Off	On
4	RESET key	disable	enable
3	Protect \$C000	On	Off
2	Stack	reloc	\$100
1	\$F000 switch	ROM A	ROM B
0	\$F000	RAM	ROM

The hardware is an innovative design to provide an environment that will support more than 64k of memory and integrate standard peripheral devices into the motherboard.

The Apple III was designed to provide a standard set of peripheral devices on the motherboard and to support a hard disk. Apple began to develop a hard disk system for the Apple III in 1980, based on a Seagate 5Mb drive, and the PROFILE hard disk system has just been released.

The disk is enclosed in a small moulded plastic case (15" x 8" x 4") in regulation Apple colours. Installation of the disk requires that a driver PROFILE be configured into the system and the interface card plugged into the Apple III expansion slot so that the disk is then fully supported by the SOS. A good feature is the quietness of the drive, even during extensive disk searching.

There is a parallel card for the Apple III and other cards are being developed. Overall, the expansion bus is very similar to the Apple II bus: small interface cards that do not use a lot of the bus will work in the Apple III system. Microsoft is developing a Z-80 Softcard. The Keyboard Company has developed a joystick and M&R Enterprises have released a RGB video interface box.

## SOFTWARE

The system software for the Apple III consists of 4k boot ROM and the SOS operating system.

The motherboard ROM contains the system boot code and a series of diagnostic tests that are performed after every boot. The diagnostics test RAM, ROM, I/O ports and the memory management hardware. The ROM also contains an undocumented monitor with similar functions to the Apple II

# REVIEWED

by Ian Webster.

monitor. Memory can be moved, verified, displayed and searched. The monitor can also Read and Write disk blocks.

SOS provides a complete environment for all software on the Apple III. The system has combined the Apple DOS user command interface with the structure of the UCSD operating system and UNIX style hierarchical directories. A uniform interface to the system is provided for all language implemented on the Apple III.

SOS provides extensive high and low level calls to the system.

It consists of KERNEL, which has the low level interface to the system hardware, a DRIVER file that contains the interfaces that all peripheral devices configured into the system, and a P-code interpreter.

SOS has five component interfaces. The first is the file management interface. All devices in the system can be treated as clock or character structured files. A hierarchical directory structure is used where each device has a root directory that may contain both files and other directories. The location of a file is specified by the pathname of the file. The root directory must be specified followed by the other directories until the directory that contains the file is reached. A file called DEMO.CODE that is in a directory called MYDISK on the Profile hard disk would be accessed by the pathname:— PROFILE/MYDISK/DEMO.CODE. This feature is one of the hardest for Apple II users to get used to, but provides a powerful facility for the management of files on large storage devices.

A drawback is that SOS, in its provision of a universal interface for all languages, has a proliferation of filetypes. It supports 13 filetypes, from SYSTEM to UNKNWN.

The second interface is the device management interface that provides access to the drivers. The drivers accept control codes for the operation of the device or to report on status enquiries. The CONSOLE driver controls cursor position, screen window size and text colour. The 128 byte type ahead buffer and the software definable character sets are also controlled by the CONSOLE driver. The keyboard can also be remapped through the device control interface. The GRAPHIX driver provides control over the colour options table and the type of point plot on the screen. The RS232B interface can specify baud rate, data format, buffer size and a choice of no, XON/XOFF or ENQ/ACK communication protocols.

The third interface is the memory management interface that manages the allocation of memory in the system. Switches control the bank select, I/O space select and the ROM select. Memory management also controls stack relocation and the management of memory in the system.

Interrupt management is largely handled by SOS, although a user interrupt mechanism has been imple-

128k Apple		
-----	\$0000K	
8K System Space		
-----	\$1FFF	
		----- \$2000
32K Bank 0	32K Bank 1	32K Bank 2
-----		----- \$9FFF
	\$A000	
24K System Space		----- \$C000
		CAN BE I/O Space
		----- \$CFFF
		----- \$F0000
		CAN BE ROM
-----	\$FFFF	----- \$FFFF

#### TECHNICAL SPECIFICATIONS

Size	17.5" x 18.2" x 4.8" Cast aluminium base with plastic moulded cover
Weight	26lbs
Processor	6502B with extended addressing hardware
Clock Speed	2Mhz peak, 1.4Mhz average
RAM memory	128 k
ROM memory	4 k
Disk Storage	One 5.25 inch floppy disk (140k)
Keyboard	74 Keys with auto-repeat, generating the full ASCII set
Screen	Text 40 x 24 Black & White 80 x 24 Black & White 40 x 24 16 foreground and background colours All characters are software definable Graphic 280 x 192 Black & White 280 x 192 16 foreground and background colours 140 x 192 16 colours 560 x 192 Black & White
Video Output	Black & White Composite colour RGB pure video Signals Pal standard
Audio output	2 inch speaker with a 6 bit DAC
Serial I/O	RS232B port
Joystick	2 joystick interfaces
Printer	Apple silenttype interface
Expansion	4 50 pin expansion slots

#### PROFILE HARD DISK

Disk	Seagate drive - 5M formatted data
Surfaces	4
Heads	4
Tracks/Surf	153
Sectors/Trk	16
Bytes/Sector	532
Rotation	3600 RPM
Seek time	95 msec
Data trans	5 Megabits/sec

mented that preserves the priority of SOS peripheral interrupts.

The utility interface provides access to the software clock and joystick ports in the system.

The SOS software includes a utilities disk that is an enhanced version of the Pascal Filer. The system support software is written in Pascal. This utility allows manipulation of disks and files, format disks and generation of a new system.

Apple III Pascal is an enhanced version of Apple UCSD Pascal 2.1.

SOS has lessened the severity of the UCSD operating environment. Several additions have been made to the system including an OTHERWISE clause for the CASE statement, Bytestream and Wordstream datatypes, conditional compilation and the implementation of the IEEE single precision floating point standard. The general parameters of the system have been enlarged to utilise the available memory space. A compiler option (\$SETC APPLE:=2) will generate code that is compatible with Apple II Pascal.

Essentially, the Basic has been written to the Microsoft V5.0 standard with several extensions. The language has adopted the Microsoft format for Disk instruction (OPEN #1 AS OUTOUT). The most interesting feature of the language is the implementation of LONG INTEGERS with 19 digits for financial programming, a powerful PRINT USING statement, indented program listings to highlight structures, and ON KBD and ON EOF # statements.

There are no PEEK, POKE and CALL commands. The interface between Basic and machine code is contained in the INVOKE and PERFORM commands. INVOKE will load a machine code file into memory. SOS handles all memory management details and decides where to put the file. PERFORM will call the routine passing a parameter list via the stack. PEEK and POKE have no place in an environment where the system is capable of managing the environment and where there is enough control with system calls to interrogate the system. If PEEK and POKE functions are required then a machine code routine can be written to provide the information.

A separate graphics module provides commands to Draw images, points and lines and to Fill screen area and control colour selection.

Business Basic should have been available for the Apple II years ago, and will make Apple II programmers realise the inadequacy of the Apple-soft Basic implementation for serious programming.

Apple has released an enhanced version of VISICALC for the III and has a word processor called Word Painter almost ready for release. Several Special Delivery Software packages have been released, including Apple Writer. There are at least six other word processing programs available for the Apple III.

Enhanced versions of Desktop Plan and PFS are also available. The PFS dealer disk includes an impressive demo for the Profile that contains all of the Skarbeks current software directory.

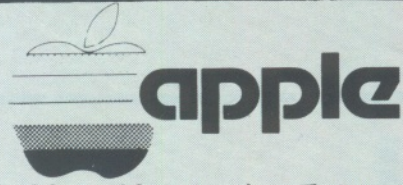
Paul Lutus has also produced versions of his assembler, ALD III and Forth, TransForth III for the machine.

The manuals are a delight to use, explaining the operation of the system in clear and patient style. The documentation assumes that the user is reasonably computer literate and there is little tutorial material. The specification of Business Basic and Pascal is excellent, but I get the impression that Apple has omitted a lot of technical information in an attempt to dissuade people from tampering with SOS.

The manuals have been written from the programmers point of view and provide all the information necessary to use the system.

## APPLE II EMULATION

The Apple II emulation mode converts the Apple III into an Apple II.



Your Key to the Future

## THE COMPLETE APPLE COMPUTER

48K Apple ][, GREENSCREEN MONITOR  
DISK DRIVE AND EPSON MX 80 PRINTER

APPLE ][ NOW AVAILABLE

WORD PROCESSING: \$295 EXTRA  
ACCOUNTING AND BUSINESS SYSTEMS



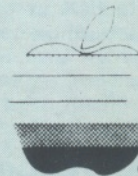
MOEBIUS COMPUTER COMPANY  
96a Pacific Highway, ROSEVILLE, 2069  
(Opposite the Station)

Phone: (02) 46 6521

A.H. 411 7165

Open 7 Days. Phone Inquiries Welcome

Authorised Agent for:



apple computer

The clock speed reverts to 1 Mhz and memory is configured to a 48k Apple. The emulation disk can provide Integer or Applesoft in ROM and the Apple III serial port can be configured to emulate an Apple high speed serial card or a communications card. The configuration cannot be changed without a reboot of the emulation disk.

A wide variety of Apple II programs were tested under emulation mode including several games which are known to exploit features of the Apple II. All programs executed without any problems. Problems could occur with the game socket because the Apple III emulates the paddles using joystick ports. If a program does not use a standard paddle driver then the Apple III joystick may not respond correctly.

Not all of the features of the Apple III keyboard can be used in emulation mode as the keyboard is remapped and

some keys do not generate ASCII codes that correspond to that key.

## CONCLUSION

The power of the system is not in the hardware but in the complete machine environment.

The major achievement of the system is compatibility with Apple II while building a software system that provides independence from the hardware design of future Apple computer systems.

The machine will be a delight for programmers, perhaps a little daunting to the home hacker and a powerful work station for users who require a computer system to assist with their work. Anyone with an information management application that requires a small hard disk should consider the Apple III.

# City Personal Computers

## FEATURES THE STARS FOR '82...

75 CASTLEREAGH ST  
SYDNEY

233 8992  
233 7591

apple



The APPLE II is Australia's most popular and versatile computer. Nowhere will you find it better supported than at City Personal Computers. We have all the Software and accessories for business and pleasure, to ensure that your Apple system is a success from day 1. And the experience of our Apple-trained staff will keep you one step ahead.

### Apple FAMILY SYSTEM

Apple's Family System combines hardware, software and manuals into a highly marketable package geared for the first time computer user **\$2780**



The Apple III is a powerful desktop computer that will solve complex problems and increase personal productivity. If you are a manager, engineer, financial analyst, accountant, or other professional - and you're looking for an affordable answer to your computer needs - you owe it to yourself to view this machine. Price on application.



### HITACHI "PEACH"

At \$1495.00 the Peach includes the following features: Industries highest density graphics (640x200), 8 numeric key pad programmable function keys, built-in RS 232c serial and parallel interfaces, six expansion slots, 32K RAM, 24K ROM, RAM expandable to 64K in microsoft basic, machine language.



### commodore

The VIC 20, a small but powerful colour machine, takes us another big step closer to the 'every home should have one' ideal of personal computing. This is our lowest priced colour computer system. Demand far exceeds supply so check first on availability. **\$399.**



### Epson \$1445

Is a printer that must be seen to be believed. It features unmatched correspondence quality printing, and an ultra-high resolution bit image graphics capability. Then the ability to print up to 233 columns of information on 15" wide paper to give you the most incredible spread sheets you're ever likely to see.

Deal with Australia's largest - EPSON dealer. Why? Call.

### Epson F/T Type II \$1145

This has all the same printing facilities as the MX 100 in a smaller package.



### Olympia Whisperdisc

This is the best value and best performing typewriter/printer available giving superb quality print at a reasonable price. It even has its own built-in communication capability. So check with us for the full story. **\$1995.**

## City Personal Computers

C.P.C. has established itself as Sydney's leading supplier of Microcomputers for business or home use.

We stock the most popular systems, together with a complete range of accessories and the widest selection of software in Australia. We have everything from disk drives and printers to full business packages, education systems and game programs.

So whatever your computer needs - from business forecasting and analysis, to games and education - rely on us for the best Micro-computing.



WORD	DEC ADDR	(HEX)
HOLD	62	3E
HOT	63	3F
IN	64	40
INCORRECT	65	41
INTRUDER	66	42
KEY	67	43
LEVEL	68	44
LIGHT	69	45
LOAD	70	46
LOCK	71	47
LONGER	72	48
MORE	73	49
MOVE	74	4A
NEXT	75	4B
NO	76	4C
NORMAL	77	4D
NORTH	78	4E
NOT	79	4F
NOTICE	80	50
OPEN	81	51
OPERATOR	82	52
OR	83	53
PASS	84	54
PER	85	55
POWER	86	56
PRESS	87	57
PRESSURE	88	58
PROCESS	89	59
PULL	90	5A
PUSH	91	5B
PUT	92	5C
QUARTER	93	5D
RANGE	94	5E
REACHED	95	5F
RECEIVE	96	60
RECORD	97	61
REVERSE	98	62
RED	99	63

WORD	DEC ADDR	(HEX)
REPAIR	100	64
REPEAT	101	65
REPLACE	102	66
ROOM	103	67
SAFE	104	68
SECOND	105	69
SECURE	106	6A
SELECT	107	6B
SEND	108	6C
SERVICE	109	6D
SIDE	110	6E
SLOW	111	6F
SLOWER	112	70
SMOKE	113	71
SOUTH	114	72
STATION	115	73
SWITCH	116	74
SYSTEM	117	75
TEMPERATURE	118	76
TEST	119	77
"TH"	120	78
THANK	121	79
THIRD	122	7A
THIS	123	7B
TURN	124	7C
UNDER	125	7D
USE	126	7E
WAITING	127	7F
WARNING	128	80
WAS	129	81
WATER	130	82
WEST	131	83
WIND	132	84
WINDOW	133	85
YELLOW	134	86
YES	135	87
ZONE	136	88

QUEENSLAND'S FASTEST GROWING APPLE DEALER  
600 OLD CLEVELAND ROAD, CAMP HILL, 4152, BRISBANE.



**COMPUTER  
CITY**

Sole Queensland Distributor  
**THE AUSTRALIAN SOURCE**

Introducing 'THE CASIO' FX-9000P  
The Engineers' Computer Calculator.

**THE 'NEC' PC 8000 DESK TOP COMPUTER.**

See us for our ever growing range of Hardware.

Phone Horrie or Richard now for details

**398 6759, 398 6571**

Now, having added the ABS function into line 30 to ensure that IV will always be positive, I am not sure that I have gained anything in efficiency. But, I think that it is more elegant, so I'll leave it!

If you try to run the program the way it is, you may have a problem: if the item that you are searching for is not on the list, you will get into an infinite loop and the only way out of the algorithm is to find the item. So, we have to check to see if IV has the value of 1. If it does we cannot cut in half any more; we cannot search any more. We need to test IV's absolute value, and I put it right after the compare, calling it line 25.

```
25 IF ABS(IV)=1 THEN GOTO (the search has failed)
```

If everything in the world were perfect, that would be the algorithm. However, since consistently rounding IV up for the reasons pointed out above, we may actually, at some times, exceed the bounds of the array, raising the error condition. There are several different ways to handle the problem; I believe the easiest is to take the value of IV away from PT and continue on from there. Since I don't know at this point if IV is negative or positive, I simply change its sign and add it to PT in line 55.

```
55 IF PT>TL OR PT<1 THEN IV=-IV: PT=PT+IV
```

```
THEN IV = -IV: PT=PT + IV
```

(if you really don't like to have IV go negative and then to have to use ABS, you can use the original version of lines 40 and 50, and then use two statements here in place of 55.

```
IF PT<1 THEN PT=PT + IV
```

```
and IF PT > TL THEN PT=PT-IV)
```

My version of the binary sort algorithm is shown in figure 2.

```
10 PT=INT(TL/2+.5): IV=PT
20 IF L1$(PT)=SW$ THEN GOTO [found it! PT
   is the number of the item]
25 IF ABS (IV)=1 THEN GOTO [the search
   has apparently failed]
30 IV=(INT((ABS(IV))/2+.5)
40 IF L1$(PT)>SW$ THEN IV=-IV
50 PT=PT+IV
55 IF PT>TL OR PT<1 THEN IV=-IV: PT=PT+IV
60 GOTO 20
```

Figure 2

There is, unfortunately, still one more potential problem. If the number of items in the array (TL) is exactly a power of 2 (16, 32, 64, 128, etc), the search will not locate the very last item in the array. The reason is that when you cut in half, you don't cut perfectly in half. If the array has 16 elements in it, you look first at element 8: there are actually 7 elements above it in the array; but there are 8 elements below it! If the array has any number other than a power of 2, there is always one division which has to be rounded up, and that rounding up gives us room to get to the very end of the array. (Actually, it also caused the problem of going beyond the bounds of the array, which made us add line 55.) There are several ways to overcome the problem, including preventing the array ever from having an "undesirable" number of items. For me, the simplest thing to do is to check the last item in that array if the search fails. If they

don't match, then the search actually has failed. But if it does succeed at this point, I do have to assign the value of TL to PT, as PT is what is carried into the main program to tell what item number was found. I do the entire thing in line 70:

```
70 IF SW$=L1(TL)
```

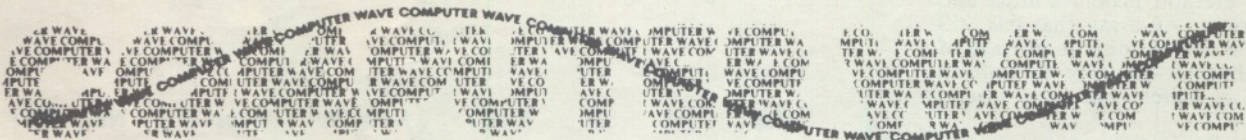
```
THEN PT=TL:GOTO [found it]
```

I also have to change line 25, so that the GOTO there branches to 70.

If the compare in line 70 yields a false, then the search has really failed, and you drop out of the binary search algorithm. Let's now look at the complete algorithm in figure 3, which is missing only the line numbers after the GOTO statements which will link the search to the programs you use it in.

```
10 PT=INT (TL/2+.5): IV=PT
20 IF L1$(PT)=SW$ THEN GOTO [found it]
25 IF ABS (IV)=1 THEN GOTO 70
30 IV=INT ((ABS(IV))/2+.5)
40 IF L1$(PT)>SW$ THEN IV=-IV
50 PT=PT+IV
55 IF PT TL OR PT 1 THEN IV=-IV: PT=PT+IV
60 GOTO 20
70 IF SW$=L1$(TL) THEN PT=TL: GOTO [found it]
80 REM Search has failed and you're out
   of the binary search algorithm.
```

Figure 3



LOWER GROUND FLOOR, MYERSYDNEY STORE,  
GEORGE & MARKET STREETS, SYDNEY  
BOX 672, G.P.O., SYDNEY, 2000, TELEPHONE (02) 238-9984

Invite you to come and leisurely compare our 20 Computers, various Disc Drives, several Printers, and a large selection of software for all our computers.

COMPUTERWAVE has the largest stock of ATARI 400 & ATARI 800 Computers in Australia, together with a wide selection of ATARI and Independent Supplier's Software.

COMPUTERWAVE also stock APPLE COMPUTERS & SOFTWARE  
COMPUTERWAVE are able to give expert & friendly advice to the First Timer or the Experienced User



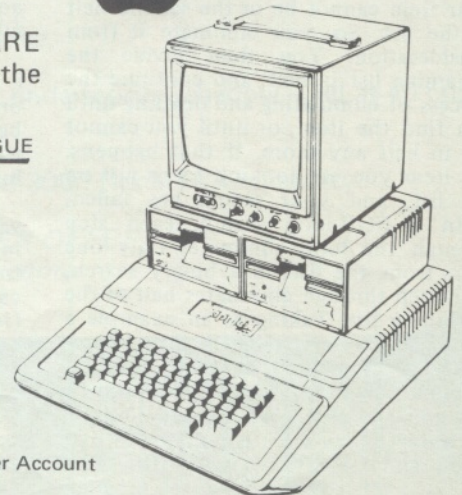
ATARI 800 & ATARI 400

ASK FOR OUR PRICE LIST AND CATALOGUE

We carry a large stock of ATARI  
400/800 Computers  
Discs — Selection of Printers —  
Atari Visicalcs — Space Invaders —  
Scram Tanks — Mailing — Word  
Processing and a large selection of  
Business, Personal, Educational and  
Entertainment Programs.

We accept Bankcard, American Express, or use a Myer Account  
MAIL ORDERS INVITED

**MYER**



JUMCAL	7C4F	07410	
JUMP	7C46	07360	03740
KEYBD	3B01	00280	00560
KEYEXP	7D84	01040	00410
KLOOP	7DFB	00570	00590
LOAD	7D98	01130	01120
LOOP	7EF7	04080	04130
MESSAGE	7F25	01730	01680
MOVE	7D3E	04850	03530
NEXTWD	7FB1	02590	02350
NOMOVE	7F55	01920	01870
NOSWAP	7D05	06450	06420
NOSWP	7C85	05870	05820
NOTNEG	7CA9	05760	05740
NOTNEW	7DF8	00560	00530
OLD	7C39	07250	
PAUSE1	0300	00260	00510 00950
PAUSE2	0160	00270	00690
PTR	7D86	01300	01040 01210 01230 01260
QUIT	7FD2	02830	02100
RCOUN1	7E38	00950	00620 00740
READCO	7C8C	05520	05350 05400
RECONT	7CF8	06380	06630
REDRAW	7D3A	06930	03660
REPEAT	7DEA	00500	01080
RESETR	7F3A	01800	01660
RETADD	7D0C	06490	04350
RETURN	7F88	02660	02470
REXIT	7E1D	00740	00550 00610 00720
SHFOUT	7D68	05160	05080
SKIPCH	7FB3	02610	02620
START	7FF7	03060	02220 02240
STRING	7DBA	01320	01160 01200 01300
TABLE	7E58	03270	02130
TRAPPR	7F5D	02030	01640
UNDRAW	7D35	06850	03620
WDLIST	7DC2	01380	01110
WINDUP	7FD0	02810	02280 02300
WORDLP	7FB6	02240	02630
XSTEP	7C8E	05940	05780
ZEXIT	7E1B	00730	00660
ZFREQ	7E4E	04350	04250
ZLOOP	7E4B	04320	04370

# SOFT-SWAP

666 GYMPIE ROAD,  
LAWNTON. Q'LD. 4501.

A joining fee of \$15.00 per year allows you to exchange programs (originals NOT copies).

For details about SOFT - SWAP send \$15.00 to become a member, or a stamped self addressed envelope to:

SOFT - SWAP,  
P.O. Box 22,  
Zillmere. Q'ld. 4034.

Name \_\_\_\_\_

Address \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

DEALER  
ENQUIRIES  
WELCOME

## SOFTWARE FOR APPLE II

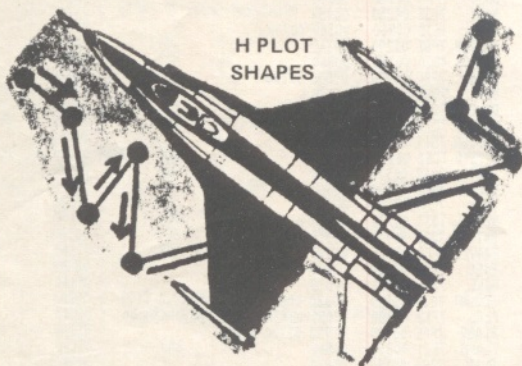
WE DEAL ONLY IN QUALITY PROVEN SOFTWARE

SOFTWARE  
FROM  
AVANT GARDE  
CREATIONS

### HI-RES SECRETS

INCLUDES

- Vector Shapes
- Block Shapes for Applesoft or assembly
- Animation (Machine Language)
- Page-Flipping
- Sound (Machine Language)
- Font Programs
- Hi-Res Scrolling
- Music (Write: Record: Play)
- Hi-Res Colour Palette



A graphics package like no other in existence. Now you can design programs that will easily and automatically create dozens of multi-coloured scenes and/or shapes . . . All necessary instructions and machine language routines included. **\$1490.95**

**ULTRA PLOT** — No plotting utility can match ULTRA PLOT for flexibility, ease of use and uniqueness. Full stats, incl mean standard deviation, slope, Y intercept, coefficient of correction and more. Pie charts, scatter charts, line charts and map charts. **\$79.95**



### HI-RES COMPUTER GOLF

HI-RES COMPUTER GOLF features the following:

- Five 18-hole courses from Beginner to Championship
- A golf bag full of golf clubs to choose from
- 1 to 4 players
- Amazing Dynamic Club-Swing Control
- Wind Gauge
- Multi-screen Fairways
- Contoured greens to make putting a challenge
- Fairway Obstacles: sand traps, roughs, water, trees, high winds, bounJaries
- Computerized Scorecard and display options to aid your playing
- Mach. Lang. Sounds and Full Hi-Res Colour
- No Green Fees
- No Waiting
- Yelling "FOUR" is optional.

**\$39.95**

*Zenith Education Systems*

P.O. BOX 505, BANKSTOWN, NSW. 2200.  
OR SEE YOUR LOCAL APPLE DEALER.

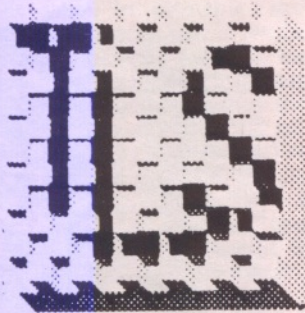
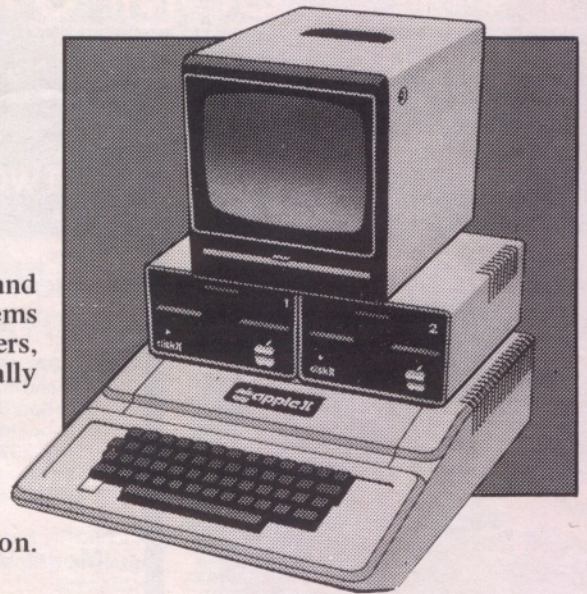


See the Apple II Computer at The Logic Shop.

The Logic Shop has a full range of Apple hardware and software including Visicalc, games and business systems written in Australia for small businesses, insurance brokers, farmers and doctors. We also have systems especially designed for schools and home education.

When you add The Logic Shop's professional level of customer support and service we offer a very attractive Apple Deal.

Call us today and see the amazing Apple II demonstration.



# The Logic Shop Computer Systems.

212 High Street, Prahran VIC 3181. (03) 51 1950, 529 2771.  
91 Regent Street, Chippendale NSW 2008. (02) 699 4910, 699 4919.  
Shop 16 Civic Arcade, Adelaide Street, Brisbane QLD 4000. (07) 31 2330.  
HOBART OPENING SOON!

Bankcard Welcome

LSI-024

## GLOBAL SOFTWARE NETWORK

### SORCERER SOFTWARE

#### UTILITIES:

##### GRAPHICS 1

Resolution of 128x90. Fantastic demonstration includes screen motion, X-Y-Z-plotting, bar charts, circles and stars. Figures can occupy the entire screen if desired. \$25.95.

##### GRAPHICS 2

Resolution of 512x240 using X and co-ordinates. It is persimonious. May be accessed from other BASIC's besides Exidy's Rom-Pac Basic. A dedicated interface is provided for the convenience of Rom-Pac users. Includes superb demonstration. \$25.95.

Both Graphics 1 and 2 include point and line drawing features in machine code.

##### SUPER DISASSEMBLER

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

The disassembler has a Displacement function which allows any program residing anywhere in memory to be decoded, whether it is at its normal address or it has been moved to be decoded.

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

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

##### EZYFILE

A general purpose database system for handling alphanumeric data. Written in Z-80 machine language and useful for catalogue/filing data, mailing lists, music libraries, club membership etc. etc. Files may be stored on disk under the CP/M 1.4 or later operating systems. Commands available: Create, Load, Merge, Save, Add, Delete, Edit, Sort, List, Report, Total, Printer, and more. Cassette \$35.95. Vista, FDS etc. floppies \$39.95.

##### 4 VOICE MUSIC SYSTEM

The software enables you to easily write music as it displays both the treble and bass staves on which one moves the cursor up and down to place the desired notes for each four-part chord. Features include:  
● hearing ● hearing a note before it is selected ● transposing ● copying refrains ● tempo control ● full editing to insert and delete notes in the music file ● key signature selection ● graphical notes and musical symbols. Includes three music files, hardware which connects to your stereo and throughout documentation. The music generation machine easily interfaces with your programs. \$54.95. (Compare this with 1 Voice S-100 cards costing over \$300!!)

#### GAMES:

##### PUNT

Graphical and musical horse race with sound effects. \$11.95.

##### HEAD-ON COLLISION

You must avoid the computer controlled car. Three levels of play. \$16.95.

##### BASEBALL

You play against the computer in this highly graphical game. \$15.95.

##### MILITARY ENCOUNTER

A graphical war game played on a board. This could also be called Encounters of The Final Kind! \$15.95.

##### ARCADE GAMES WITH SOUND:

##### CHOMP THE GHOST MUNCHER

This is the Sorcerer's high resolution version of the classic real time arcade game. \$21.95.

##### MISSILE DEFENCE

You command your countries defence centre to protect against a foreign attack. As the missiles drop, you must fire at them while attempting to protect your cities and missile bases. \$19.95.

##### CIRCUS

An arcade game in which you must keep the performers bouncing on a trampoline and bursting balloons above. \$19.95.

*These programs and more available from:*

*Customized Technology, P.O. Box 461, Ashfield, NSW. 2131. Phone (02) 799 6373*

*Also available from: City Personal Computers; Electronic Agencies and other outlets. Ask for free catalogue.*



# Apple software from Micro-Educational

## APPLE SOFTWARE APPLE PERIPHERALS FROM MICRO-EDUCATIONAL

Australia's leading mail-order supplier for Apple Software and Peripherals. We offer wide range, phone advice, fast delivery ex stock, 10-day money-back warranty on Software and very competitive pricing.

### HARDWARE (Prices exclude sales tax. Add 17.5% S.T. if applicable.)

ANDROMEDA 16K EXPANSION CARD	195.00
MICROSOFT Z80 SOFTCARD	379.50
PAL COLOUR CARD	195.00
CCS ASYNCH SERIAL CARD	185.00
CCS COMMUNICATIONS CARD	210.00
CCS PARALLEL CARD	159.50
CCS A/D	145.50
CCS CLOCK/CALENDAR	149.50
CCS COMMUNICATIONS CARD	185.00
CCS GPIB IEEE 488	320.00
CCS ARITHMETIC PROCESSOR	495.00
MH CPS MULTIFUNCTION CARD	275.00
WESTSIDE SUPERCLOCK ELECTROMED SENDATA COUPLER	325.00
PAYMAR LOWER CASE	49.95
16K RAM UPGRADE	49.95
BLANK DISKS (10 IN LIBRARY BOX)	45.95
LIBRARY BOX	4.50
T&G PADDLES	44.95
JOYSTICK	69.95
ABT BARCODE READER	199.50

### SOFTWARE (Tax included. Sales Tax exemption does not apply.)

#### ADMINISTRATION

PFS	109.50
PFS: REPORT	109.50
VISICALC 3.3	219.50
VISILOT/TREND	295.00
VISIDEX	219.50
VISITERM	175.00
VISIFILE	275.00
DESKTOP PLAN II	219.50
TARGET BUSINESS PLANNER	249.95
REAL ESTATE ANALYSER	175.00
CONTEXT CONNECTOR	195.00
THE GENERAL MANAGER	109.95
WINCHENDON STATISTICS	220.00
DB MASTER	245.00
DB UTILITY PAK #1	109.95
WORDSTAR	349.50
SPELLSTAR	165.00
SANDY'S WORD PROCESSOR	175.00

SPELLBINDER	495.00
THE WORD	99.50
SUPERSCRIBE 'I	139.95
THE DICTIONARY	109.95
SCHOOL TIMETABLE	49.95
TIME MANAGEMENT	195.00
MICRO MEMO	39.95
CORP SYSTEM	190.00
DBASE II	700.00

#### EDUCATION

APPLE PILOT	175.00
FRACTIONS	39.95
DECIMALS	39.95
ARITHMETIC SKILLS	49.95
COMPU-SPELL	39.95
ELEMENTARY MATHEMATICS VOL 1	49.95
CARTELS & CUTTHROATS	43.95
SENTENCE DIAGRAMMING	24.95
THE LINGUIST	39.95

#### SIMULATIONS AND ADVENTURES

FLIGHT SIMULATOR	34.95
THREE MILE ISLAND	41.95
WARP FACTOR	43.95
OPERATION APOCALYPSE	64.95
SHATTERED ALLIANCE	64.95

BATTLE OF SHILOH	64.95
CONFLICT	27.50
SOUTHERN COMMAND	43.95
OLYMPIC DECATHLON	29.95
GLOBAL WAR	29.95
HIRES 0 (MISSION ASTEROID)	23.95
HIRES 1 (MYSTERY HOUSE)	27.50
HIRES 2 (WIZARD & PRINCESS)	37.50
HIRES 3 (CRANSTON MANOR)	41.95
HIRES 4 (ULYSSES)	39.95
HIRES 5 (TIME ZONE)	109.95
SOFTPORN ADVENTURE	32.95
ULTIMA	43.95
ZORK	37.50
ZORK II	37.50
OO TOPOS	37.50
CYBORG	37.50
GALACTIC EMPIRE	29.95
GALACTIC TRADER	29.95
GALACTIC REVOLUTION	29.95
TAWALA'S LAST REDOUBT	32.95
CRUSH CRUMBLE CHOMP	32.95
TEMPLE OF APSHAI	29.95
AKALABETH	39.95
STAR WARRIOR	42.95
ROBOT WAR	39.95
CASTLE WOLFENSTEIN	32.95
DUNGEON CAMPAIGN/ WILDERNESS	34.95
DRAGON'S EYE	24.95
DARK FOREST	32.95
STONE OF SISYPHUS	32.95

TARTURIANS	29.95
GOBLINS	29.95
CREATURE VENTURE	29.95
WIZARDRY	49.95
ALKEMSTONE	43.95
KAVES OF KARKHAN	43.95
SORCEROR OF SIRA	31.95
ODYSSEY	29.95
DUNGEON CAMPAIGN/ WILDERNESS	34.95
SARGON II	37.95
BACKGAMMON	31.95
BRIDGE	29.95
MONOPOLY	44.95
HI-RES GOLF	32.95

#### ACTION AND ARCADE GAMES

RASTER BLASTER	32.95
POOL 1.5	37.50
GORGON	42.95
APPLEOIDS	32.95
PHANTOMS FIVE	37.50
SPACE EGGS	32.95
STAR THIEF	32.95
FALCONS	32.95
APPLE PANIC	32.95
SNOGGLE	29.95
HEAD ON	27.50
INTERNATIONAL GRAND PRIX	32.95
AUTOBAHN	32.95
FENDER BENDER	29.95
HIRES SOCCER	34.95
MISSILE DEFENSE	32.95
BILL BUDGE SPACE ALBUM	44.95
EPOCH	37.50
SNEAKERS	32.50
PULSAR	32.95
STAR CRUISER	29.95
ORBITRON	32.95
OUTPOST	32.95
CYBER STRIKE	43.95
COPTS & ROBBERS	32.95
SPACE QUARKS	32.95
SPACE RAIDERS	32.95
ABM	29.95
GENETIC DRIFT	32.95
TRACK ATTACK	32.95
BUG ATTACK	32.95

FIREBIRD	32.95
DAVID'S MIDNIGHT MAGIC	37.50
RED ALERT	29.95
SHADOW HAWK	34.95
BEER RUN	29.95
RINGS OF SATURN	43.95
ESCAPE FROM ARCTURUS	39.95
SHUFFLEBOARD	32.95
GAMMA GOBLING	32.95
PEGASUS II	32.95
HADRON	32.95
THIEF	32.95
THRESHOLD	43.95
CROSSFIRE	32.95
MAZEMAN	32.95

#### GRAPHICS

BUDGE GRAPHICS	43.95
SUBLOGIC 3D GRAPHICS	69.95
A2-3D1 ENHANCEMENTS	29.95
A2-3D2 GRAPHICS EDITOR	39.95
APPLE WORLD	69.95
HIGHER TEXT	39.95
HIGHER GRAPHICS II	39.95
COMPLETE GRAPHICS SYSTEM	69.95
DATASOFT MICROPainter	39.95
EZ DRAW 3.3	57.50
PASCAL GRAPHICS EDITOR	109.95
ARCADE MACHINE	49.95

#### UTILITIES & LANGUAGES

GRAFFPAK	95.00
EXPEDITER COMPILER	109.50
HAYDEN COMPILER	195.00
TASC (MICROSOFT COMPILER)	195.00
TRANSFORTH II	135.00
ALD SYSTEM II	135.00
APPLE PILOT	175.00
APPLE FORTRAN	220.00
MICROSOFT FORTRAN	220.00
FORTH II	99.50
SUPERKRAM	179.50
PHIL'S CHEAP EDITOR	59.95
TINY PASCAL	54.95
LISA ASSEMBLER 2.0	62.50
LISP	109.95
MONITOR EXTENDER	27.50
DISK FIXER	32.95
DOSOURCE 3.3	49.95
TELLSTAR	85.00
APPLE-CILLIN	49.95
ACTION SOUNDS & HIRES SCROLLING	24.95
ASCII EXPRESS	79.50
Z-TERM	169.95
THE SOURCE	140.00
VISITERM	175.00

#### BOOKS

ASSEMBLY LANGUAGE	19.95
● BENEATH APPLE DOS	24.95
APPLE II USERS GUIDE	19.95
● APPLE MACHINE LANGUAGE	17.50
MOSTLY BASIC	17.50
PASCAL PROGRAMMING (LEWIS)	17.50
APPLESOFT LANGUAGE	12.95
APPLE BASIC FOR BUSINESS	19.95
● COMPUTER GRAPHICS PRIMER	19.95
SHAKE HANDS WITH THE APPLE	12.50

#### SUBSCRIPTIONS

INFOWORLD (WEEKLY AIRMAIL) 120.

#### SUBSCRIPTIONS

INFOWORLD (WEEKLY AIRMAIL) 120.00

For our free catalogue send the attached coupon or write to:  
MICRO-EDUCATIONAL, 17 PARK ROAD, GARDEN SUBURB, NSW 2288.



**MICROPROGRAMMING/MICROVOICE  
CONSULTANT, REPAIRS,  
MODIFICATIONS, SOFTWARE  
SUPPORT, EPROM Programming.**

Turn your SYSTEM 80 or TRS80\* into a real computer

1. Lower case with descenders. Extra characters can be added on request such as Greek, Chinese or French or Card Suits.
2. Reverse image on one or more letters. Simple to program in BASIC or ASSEMBLER.
3. Double your CPU speed. A must for tape users. Save or load programs in half the normal time. Great for speeding up thinking games or those slow Basic programs. Works with Disk including double density using NEWDOS80".

Complete kit assembled and tested \$69.00. Comes with full installation instructions or we will install for \$25.00. Reverse image & fast speed only \$52.00. Add \$2.50 for P & P.

**MICROPROGRAMMING, P.O. BOX 475,  
MOUNT WAVERLEY, VICTORIA 3149.  
or ring (03) 233 6280 for more details.**

\* Trade mark of Tandy Corp. \*\* Trade mark of Apparat Inc.

**DAMAR  
MANAGEMENT SYSTEMS**

**The HP 125 Business Assistant**

A personal office computer for:  
*Integrated General Accounting*

<i>Word Processing</i>	<i>Financial Decision making</i>
<i>Graphics Presentations</i>	<i>Budgeting</i>
<i>Data Communications</i>	<i>Forecasting</i>



**THE CP/M SOLUTIONS MACHINE**

**AVAILABLE EX STOCK FOR IMMEDIATE DELIVERY**

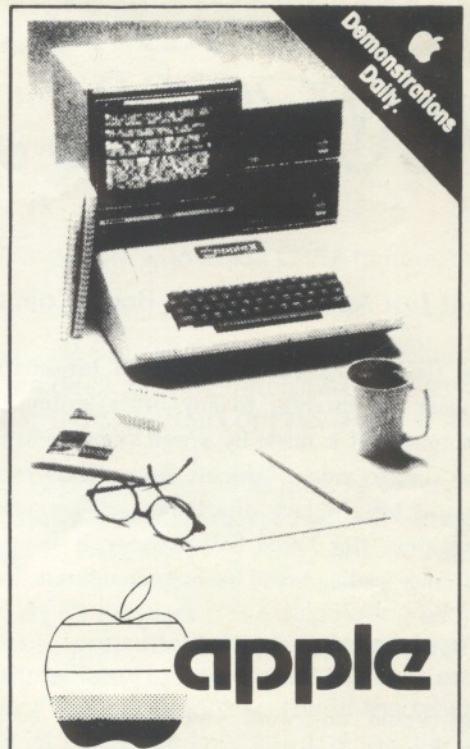
For further information or an obligation free demonstration

call or write now to:

**DAMAR MANAGEMENT SYSTEMS**

14 Cedar Grove,  
HIGHTON, 3216  
Victoria

Telephone  
(052) 61 3178  
(052) 43 1445



**Word Processors  
from \$4,500 to \$9,000**  
(Inc S Tax)

Professionals buy their  
Word Processor/Computers from  
**COMPUTER GALERIE**

The new 64K Apple II PLUS is a managerial computer. It has the full range of SIX-S BUSINESS PROGRAMS\* to help you solve your problems.

\* Fully supported quality Australian software. Invoicing, Stock Control, Word Processing, Cash Flow, Forecasting, Payroll.

AND NOW HAVE THE  
**REVOLUTIONARY**

**Epson F/T Type II**  
Low cost printer

- Tack-sharp 80 or 132 columns
- Letterhead forms
- Super graphics

call David Diprose  
BUSINESS DIVISION  
**COMPUTER GALERIE**  
66 Walker Street  
NORTH SYDNEY 929 5497