

Filer Commands:

GET	EXTENDED DIRECTORY LIST	KRUNCH
SAVE	REMOVE	MAKE
NEW	TRANSFER	ZERO
WHAT	DATE	QUIT
VOLUMES	PREFIX	XAMINE
LIST DIRECTORY	BAD BLOCKS	CHANGE

System Utilities Include:

- Desk calculator—performs simple calculations: addition, subtraction, multiplication, division.
- Disk formatter—prepares new disk for use with the Apple Pascal system.
- System librarian—organizes separately compiled or assembled routines into a library file.

System Library Contains:

- The "Turtlegraphics" code unit, which provides easy access to Apple's High Resolution color graphics routines. Functions and procedures permit the user to choose a color, move and turn the cursor, specify viewport boundaries, fill the viewport with color, copy an array of data to the screen from memory, write text on the graphics screen, and interrogate the system regarding the state of the cursor and screen. It adds the following procedures and functions: INITTURTLE, TEXTMODE, GRAFMODE, VIEWPORT, PENCOLOR, PENMODE, SCREENCOLOR, FILLSCREEN, MOVETO, TURNTO, TURN, MOVE, TURTLEX, TURTLEY, TURTLEANG, SCREENBIT, DRAWBLOCK, WCHAR, WSTRING, CHARTYPE.
- The "Applestuff" code unit, which contains routines to generate random numbers, interfaces with the control paddles, and generate sounds on the Apple's speaker. It adds the following procedures and functions: RANDOM, RANDOMIZE, PADDLE, BUTTON, TTOUT, NOTE, KEYPRESS.
- The "Transcend" code unit, which contains transcendental functions useful for mathematical calculations. It adds the following functions: SIN, COS, ATAN, EXP, LN, LOG, SQRT.

Implementation Size Limits

- The following is a list of maximum size limitations in the current implementation of UCSD Pascal:
- Maximum number of bytes of object code in a PROCEDURE or FUNCTION is 1200. Local variables in a PROCEDURE or FUNCTION can occupy a maximum of 16383 words of memory.
 - Maximum number of characters in a STRING variable is 255.
 - Maximum number of elements in a SET is $32 \cdot 16 = 512$.
 - Maximum number of SEGMENT PROCEDURES and SEGMENT FUNCTIONS is 16. (Six are reserved for the Pascal system, ten are available for use by the user program.)
 - Maximum number of PROCEDURES or FUNCTIONS within a segment is 127.

The Apple Pascal Package (Apple Language System) Order No. A2B0006

- With your Apple Pascal order, you will receive the Apple Language System, which includes:
- Apple Language Card with 16K bytes of RAM;
 - Six (6) diskettes, including Pascal System (4), Integer BASIC and Applesoft Extended BASIC (1), and one blank;
 - IC puller;
 - Three (3) Pascal manuals;
 - Apple Language System Installation and Operating Manual;
 - Apple II BASIC Programming Manual;
 - Applesoft II Tutorial Manual;
 - Applesoft II BASIC Programming Reference Manual;
 - Two (2) 16 sector Disk Controller PROMS, P5A and P6A.

Apple PILOT

Courseware Development System

Language Library and Utilities

Apple PILOT is a powerful, easy to use system designed to support program development for Computer-Assisted-Instruction (CAI). If you're familiar with the PILOT language, you'll quickly become proficient in developing Apple PILOT courseware—and at a fraction of the cost of most other systems.

Based on COMMON PILOT, Apple PILOT offers much more than simple language capabilities. Color graphics, sound effects, and a character set editor allow lessons to be presented in words, pictures and sounds.

Benefits**Apple PILOT...**

- significantly heightens students' interest and retention through its graphics, animation and sound effects capabilities...
- allows educators to share material in creating new and different lessons, because libraries of pictures, sounds, character sets, and PILOT routines can be saved on diskettes...
- may be learned quickly by anyone familiar with the PILOT language, because it is menu-driven and provides HELP screens...
- gives instructors access to large libraries of material, because programs written in PILOT 73 and COMMON PILOT may be run on the Apple system...
- provides the capability of recording both student lessons and grades on the same diskette, because the author can programmatically create files for general purpose record keeping...
- places no restriction on lesson length, since a single lesson may span many files and/or diskettes...
- helps evaluate student performance by timing individual student responses...
- assists in foreign language instruction, because character sets in different languages can be developed easily...
- allows educators to make hardcopy files of lesson text through a built-in print routine.

Apple PILOT—A Closer Look

Apple PILOT operates in two modes—Author and Lesson. In Author Mode, the instructor/designer creates lessons and stores them on a lesson diskette. The student then uses that diskette to "take a lesson," that is, interact with the computer as specified by the teacher.

In Author mode, menus and HELP screens direct and assist in creating a lesson. The main menu provides the following options:
Initialize a Diskette—Automatically formats a diskette and copies from the Author diskette certain required system programs and files.
Create/Edit PILOT Lesson Text—PILOT is a high level language particularly suited to the needs of courseware developers. It is the heart of the system. Using simple commands, the author defines the flow and logic of a lesson and integrates any previously defined graphics, sound effects, and special characters into that lesson. The lesson can also be tested by using the RUN option.

Create/Edit Graphics—The author can create high-resolution color graphics to include anywhere in the lesson(s). Simple keyboard commands draw lines, circles and rectangles; or the control paddles can be used to sketch free form designs. Text may be written anywhere on the graphic screen. These "pictures" are stored on diskette.

Create/Edit Sound Effects—Music/sounds can be dynamically created and played back using simple menus and keyboard commands. The sounds are stored on diskette for inclusion in any lesson.

Create/Edit Character Sets—User-defined characters are simply "drawn" on a grid using keyboard commands or control paddles. These special characters can be associated with any Apple keyboard printing characters.

Copy a Lesson Diskette—allows the author to make multiple copies of a lesson diskette for wide distribution or concurrent use by students.

In Lesson Mode, the student merely inserts a lesson diskette into a disk drive and is presented with the material as specified by the author/teacher.

System Configuration

To use Apple PILOT, you will need the following system:

- Apple II or Apple II Plus, with 48K of memory;
- One Apple Disk II drive with controller for Lesson Mode; or two Disk II drives, one with controller, for both Author and Lesson Modes. No more than two drives are supported.
- DOS 3.3 or the Apple Language System, each with 16-sector state and boot PROMS;
- Video monitor or television.

Optionally, if lessons are to be printed, a compatible printer and printer controller card are required. The Apple Computer System works with several printers and appropriate controller cards, including those specified below:

- Apple Silentype Printer
Card: Silentype Interface Card (supplied with printer)
- Centronics
Card: Centronics Printer Interface Card (Apple Product A2B0007)
- Printronix
Card: Parallel Interface Card (Apple Product A2B0002)
- Qume Sprint 5, Diablo Hyterm, and NEC Spinwriter 5510R
Card: High Speed Serial Interface Card (Apple Product A2B0005) with P8-02 PROM

Technical Specifications

Language:

Written in Pascal; however the Apple Language System is not required to run Apple PILOT.

Diskettes: 16-sector format

Commands:

Apple PILOT includes all of the following standard COMMON PILOT commands:

A:	Accept	FO:	File Output	T:	Type
AS:	Accept Single	G:	Graphics	TH:	Type and Hang
C:	Compute	J:	Jump	U:	Use
D:	Dimension	M:	Match	XI:	Execute Indirect
E:	End	PR:	Problem		
FI:	File Input	R:	Remark		

In addition to providing all of the COMMON PILOT commands and facilities, Apple features the following extensions:

AP:	Accepts point on graphics screen.
FIX:n,var\$	Opens diskette file <var\$> for input and/or output with <n> records.
FOX:n,var\$	Creates new diskette file <var\$> with <n> records.
G: C n	Sets pen color to <n>.
G:ES n	Erases the graphics screen color to <n>.
G:T	Prints text at the graphic cursor position.
G:Vl,r,t,b	Sets graphic viewport coordinates.
GX:name	Draws previously defined graphic image <name> onto the screen.
L:name	
L:name, label	Links to PILOT lesson <name>, optionally at the specified point <label>.
PR:T nnn	Sets accept response time in seconds.
S:p,d	Generates a sound of pitch <p> for duration <d>.
SX:name	Plays previously defined sound effect <name>.
TX:name	Types output and accepts input using previously defined character set <name>.
W:nnn	Waits <nnn> seconds.
X = BTN(n)	Returns push button status.
X = KEY(0)	Returns keyboard status.
X = PDL(n)	Returns control paddle position.
X = RND(0)	Returns a random number between zero and one.
X = TIM(0)	Reads accept response time.

The Apple PILOT Package Order No. A2D0028

With your Apple PILOT order, you will receive:

- Write-Protected copy of the Apple PILOT Author Diskette;
- Apple PILOT Language Reference Manual;
- Apple PILOT Editors Reference Manual.

Apple FORTRAN

For the FORTRAN Programmer

Language Library and Utilities

FORTRAN is a powerful programming language, especially suitable for work in mathematics, engineering and the sciences. Apple FORTRAN, usable with the Apple Language System, is the ANSI Standard Subset of the recently-defined FORTRAN 77 standard; in several areas, Apple FORTRAN contains enhanced features and capabilities.

Apple is providing FORTRAN for use by technical professionals and educators who are both familiar with the FORTRAN language and are using packages written in FORTRAN. Because FORTRAN is a well-established language, large libraries of FORTRAN programs are already in existence, particularly for engineering and scientific applications. Apple FORTRAN provides the sophisticated FORTRAN user with the capability to develop new and modify existing FORTRAN programs on an Apple.

Benefits

Apple FORTRAN...

- offers enhanced features and capabilities because it supports the newest computer industry standard, ANSI X3.9-1978...
- operates in the Apple Language System, which provides a comprehensive software design environment including an editor, linker, file handler, assembler, Apple Pascal compiler, and system library...
- eliminates the need to recompile or reassemble existing code files when incorporating them into FORTRAN programs; compiled P-code and assembled machine code can be combined with a FORTRAN P-code file through the Apple Language System's linker facilities...
- allows you to take full advantage of Apple's Hires graphics capabilities by interfacing to graphics routines in the system library...
- gives programmers access to large libraries of material, since FORTRAN is a familiar, well-established language...
- provides access to special Apple features, such as sound generation and control paddles, through its system library routines...
- permits you to combine several source files in a single compilation through compiler directives in the source code.

Apple FORTRAN— A Closer Look

First, Some Words About FORTRAN '77

FORTRAN 77 contains significant additions and enhancements to the previous 1966 standard. For example, mixed-mode arithmetic expressions are allowed. Structured programming is supported through expanded IF statement constructs. Logical IF, Block IF, ELSE IF, ELSE, and END IF statements provide a vastly improved method of clearly and accurately specifying the flow of program control. CHARACTER data type replaces Hollerith; alphanumeric data can be represented as strings rather than array elements.

Some Specifics About Apple FORTRAN

Apple FORTRAN is the ANSI Standard Subset FORTRAN 77. It also supports enhancements and facilities from the full FORTRAN 77 language. In particular:

- Subscript expressions may include array elements and function calls.
- DO statement limits may be defined by expressions, rather than just single variables.
- I/O units may be specified by expressions, rather than just constants or simple variables.
- The I/O list of a WRITE statement may include expressions.

- All combinations of FORMATTED/UNFORMATTED and SEQUENTIAL/DIRECT files are allowed, with the following restrictions:
 - BACKSPACE is supported only for files connected to the blocked devices; it is not supported for UNFORMATTED SEQUENTIAL files;
 - DIRECT files must be connected to block devices.

Apple FORTRAN contains a number of enhancements beyond the full FORTRAN 77 specifications. In particular:

- Compiler directives may be included in the source code. For instance, the \$INCLUDE directive allows you to insert previously-developed code into your program without having to repeat the code. This is useful, for example, when you are writing many subroutines which use the same COMMON block. You can write the COMMON block just once, and \$INCLUDE it in every subroutine.
- An additional parameter to the OPEN statement allows you to specify whether the file is blocked or unblocked.

There are two minor differences between the ANSI Standard Subset FORTRAN 77 and Apple FORTRAN. They are:

- Subprogram names cannot be passed as parameters.
- INTEGER and REAL data types have different storage requirements—two bytes for INTEGER, four bytes for REAL.

System Configuration

To use Apple FORTRAN, you will need:

- Apple II or Apple II Plus with 48K of memory;
- Apple Language System;
- video monitor or television.

*While a single drive system is adequate for very small programs, two drives are strongly recommended for ease of operation and more serious program development.

Technical Specifications

Apple FORTRAN is written in Pascal and produces P-code which runs in the Apple Pascal Operating System.

Diskettes: 16 sector format

The standard library of intrinsic functions supplied with Apple FORTRAN includes:

ABS	AMOD	EOF	LGE	NINT
ACOS	ANINT	EXP	LGT	REAL
AINT	ASIN	FLOAT	LLE	SIGN
ALOG	ATAN	IABS	LLT	SIN
ALOG10	ATAN2	ICHAR	MAX0	SINH
AMAX0	CHAR	IDIM	MAX1	SQRT
AMAX1	COS	IFIX	MIN0	TAN
AMIN0	COSH	INT	MIN1	TANH
AMIN1	DIM	ISIGN	MOD	

The Apple FORTRAN Package Order No. A2D0032

With your Apple FORTRAN order, you will receive:

- Two FORTRAN system diskettes;
- Apple FORTRAN Language Reference Manual.

Applesoft and Integer BASIC

Language Library and Utilities

How to Program An Apple Without Really Trying

When you purchase an Apple II or Apple II Plus computer, you buy more than hardware—you receive a built-in programming system as well. This "firmware" makes it easy to create interesting and useful programs, even if you've never programmed before. In the Apple II computer, the resident firmware is Integer BASIC; in the Apple II Plus, it is Applesoft Extended Floating Point BASIC, or Applesoft for short. Both Integer BASIC and Applesoft are versions of the very popular BASIC programming language.

Both Integer BASIC and Applesoft come with easy-to-follow tutorial manuals that start you doing useful work with your Apple right away.

Benefits

Integer BASIC and Applesoft ...

- allow you to take advantage of large libraries of existing programs because both are very popular languages...
- permit critical portions (e.g., graphics animation) of programs to be run at high speed, because both allow direct access to assembly language subprograms...
- turn your Apple into a desktop calculator because both automatically perform arithmetic computations (add, subtract, multiply, divide, raise to a power)...
- allow you to modify and store data for repeated use, because both accept input/output operations from the keyboard, video monitor or television, disk drive, and other peripheral devices...
- provide you with greater flexibility in conveying information, because both will create dots and horizontal and vertical lines on the screen...
- allow you to quickly and easily change or correct any part of a program because both accept editing commands...
- save you time in locating programming errors, because both give immediate feedback if an error exists and provide its location.

Applesoft and Integer BASIC—A Closer Look

Applesoft II Floating Point BASIC language, resident in Apple II Plus computers, is an expanded version of Microsoft's popular floating point BASIC. It is a fast, convenient, general purpose language. Applesoft's 9-digit arithmetic and large function library make it ideal for the majority of BASIC programming applications. Features like high resolution graphics routines and user-programmable error messages make the language both powerful and friendly.

Integer BASIC, resident in Apple II computers, is a subset of standard BASIC. It is well suited to writing games, because its high performance makes realistic animation possible. It is not generally suitable for business or scientific applications, since it works only with integers (whole numbers).

A Special Note to Non-Programmers

Have you ever purchased a product advertised as "so simple to use even a child can do it," only to discover that it was neither simple nor child's play? This is not the case with Applesoft or Integer BASIC. All you need to use either language is an interest in programming. Apple's comprehensive tutorial manuals will provide the rest. As you progress, you'll learn to speak a BASIC language to your Apple, create new applications, and become familiar with programming terminology. Before you know it, you'll be writing programs for your Apple.

For Those Already Familiar with Programming

There is one fundamental difference between Applesoft and Integer BASIC. Integer BASIC deals only with integer values in the range $\pm 32,767$. Applesoft, in addition to dealing with those same integer values, is also capable of manipulating floating point (real) quantities. Its range is approximately ± 10 to the 38th power, with 9-digit precision. Additionally, Applesoft offers built-in trigonometric, transcendental, and other mathematical functions ideal for financial and scientific calculations. Applesoft can also handle multi-dimensional arrays (up to 88 dimensions, both numeric and string), while Integer BASIC recognizes only single-dimension arrays.

System Configuration

If you own an Apple II, Integer BASIC is resident within the system. To run Applesoft BASIC on your Apple II, you will need either:

- an Applesoft Firmware Card, or
- the Apple Language System.

If you own an Apple II Plus, Applesoft BASIC is resident within the system. To run Integer BASIC on your Apple II Plus, you will need:

- an Integer BASIC Firmware Card, or
- the Apple Language System.

Technical Specifications**Applesoft BASIC**

Applesoft BASIC capabilities include:

- Three data types—Real, Integer, and String
- N-Dimensional Arrays and N-Letter Variable Names (first two letters significant)
- Extensive Mathematical, Logical and Scientific Capabilities: EXP, LN, SQ RT., SIN, COS, TAN, ARCTAN, AND, OR, NOT, ABS, INT, RND, SIGN
- String Operations to Aid the Business Programmer:
 - Compare >, <, >=, <=, <>
 - Concatenate: +
 - Variable Type Conversion: ASC, STR, VAL
 - Substring Functions: LEFT, RIGHT, MID, LEN
- Graphics Statements that Simplify Display Programming:
 - Print Control: NORMAL, INVERSE, FLASH
 - Graphics Control: COLOR, PLOT, POSN, HLIN, VLIN, SCRIN, GRAPHICS, TEXT, HGR, ROT, SCALE, SHLOAD
- General Operations that Include and Extend Upon Dartmouth BASIC:
 - Program Manipulation: CLEAR, NEW, LIST, RUN, CONT, LOAD, SAVE
 - Variable and Function Definition: DATA, DEF, DIM
 - Data Handling and Storage: READ, RESTORE, STORE, RECALL
 - Loops and Branching: FOR...NEXT, IF...GOTO, IF...THEN, ON...GOTO, ON...GOSUB, ONERRGOTO, RESUME, GOTO, GOSUB, RETURN
 - Input/Output and Format Control: INPUT, GET, PRINT IN #, PR#, VTAB, TAB, HOME
 - Machine Level Statements: PEEK, POKE, CALL, POP, LOMEM, HIMEM

Integer BASIC

In addition to normal BASIC capabilities, Apple Integer BASIC includes:

- Any-length variable names (ALPHA, BETA\$) (all characters significant)
- Syntax and range errors indicated immediately when entered
- Multiple statements on one line
- Integers from -32767 to $+32767$
- Strings to 255 characters; single-dimension integer arrays
- Graphics Commands
- Paddle read function
- TEXT and Graphics Commands to set display mode from BASIC
- Immediate execution of most statements
- Break and Continue program execution
- Debug commands: line number trace and variable trace
- Switchable I/O device assignments
- PEEK, POKE, CALL, POP commands
- Auto line number mode
- RND, SGN, ASC, LEN and ABS functions
- GOTO expr, GOSUB expr allowed

The Applesoft BASIC Package

With your order for an Apple II Plus computer, you will receive:

- Applesoft BASIC language resident within the system;
- Applesoft II Tutorial Manual;
- Applesoft II Basic Programming Reference Manual.

The Integer BASIC Package

With your order for an Apple II computer, you will receive:

- Integer BASIC Language resident within the system;
- Apple II BASIC Programming Manual (Tutorial).

Note: If you purchase the Apple Language System (Pascal), both Applesoft and Integer BASIC languages and manuals are included.

DOS Toolkit**Software****Selected Aids For The Apple II Programmer**

Apple's DOS Toolkit is a collection of programs and subroutines designed to aid the Apple II user in the development of Applesoft BASIC and 6502 Assembly Language programs. The Toolkit simplifies program development by providing a number of handy features that make programming easier.

Included are an assembler and source editor for use under DOS on Apple II or Apple II Plus systems, as well as an assembly language program that rennumbers, merges, and deletes remarks from Applesoft BASIC programs. In addition, there are two special high resolution graphics programs in the Toolkit—one that helps you create and edit high resolution character sets, and another that lets you display characters on the high resolution graphics screen. Also included are three graphics demo programs, and character sets for editing high resolution characters.

If you're a programmer familiar with Applesoft BASIC and/or machine language, Apple's DOS Toolkit contains a number of unique programming aids that will prove invaluable to you.

Benefits**Apple's DOS Toolkit...**

- reduces programming time, by providing the user with such powerful program editing capabilities as character search, line search, and string replace...
- allows the user to assemble arbitrarily large source files, because its disk-based operation requires that only the symbol table be held in RAM...
- makes the assembler easier to learn, since it is fully compatible with 6502 syntax...
- increases programming flexibility, because its text files feature provides a degree of compatibility with other assemblers...
- simplifies the creation of relocatable modules by providing the user with a relocating loader...
- speeds program development, because its multiple applications assist users in accomplishing many time-consuming and difficult programming tasks...
- aids in the design of high-resolution graphics characters through the use of a special graphics editor.

The DOS Toolkit—A Closer Look

The four programs and subroutines that make up the DOS Toolkit were designed to meet a variety of programming needs. *The Editor/Assembler* is an integrated assembler and source editor designed for the creation of 6502 assembly language programs. After accessing the Editor/Assembler from the Toolkit diskette, you can create and edit source code files in RAM; store and retrieve programs as text files; assemble disk source files into disk object files; and create your own symbol table summary. The Editor/Assembler program also features relocatable or absolute code output, as well as a relocating loader.

The Hi-Res Character Generator is an assembly language program for displaying text on the high-resolution graphics screen. Using the Generator, you can mix text with high-resolution graphics; write text over an existing background; automatically downshift alphabetic characters for displaying lower case text; and animate figures. The Generator also allows alternate character sets for user-defined characters, and features a text wrap-around within the text window. Additionally, it provides examples of graphic implementation through three graphics-oriented demos and several alphabetic fonts.

Animatrix (Character Editor) is a special Applesoft BASIC program which makes it easy for you to create and edit character sets for the Hi-Res Character Generator.

Applesoft Programmer's Assistant is an assembly language program that helps you write your own programs in Applesoft BASIC. The Assistant can determine program length, renumber and merge several programs, and delete remarks. Its automatic line numbering feature makes program entry easier, and—since it allows you to cross reference variables—takes some of the confusion out of programming. The Assistant also provides you with the use of three, non-standard keys: underscore, left bracket, and backslash. In addition, it will print non-visible characters when listing a program.

System Configuration	To use the DOS Toolkit, you will need: <ul style="list-style-type: none"> ■ Apple II (with Applesoft Firmware Card) or Apple II Plus, each with 48K of memory; ■ Apple II or Apple II Plus with the Apple Language System; ■ Apple Disk II with controller and 16-sector PROMs; ■ video monitor or television.
Technical Specifications	Language: DOS Toolkit is written in Applesoft BASIC and Machine Language.
The DOS Toolkit Package Order No. A2D0029	With your DOS Toolkit order, you will receive: <ul style="list-style-type: none"> ■ DOS Toolkit diskette; ■ 6502 Assembler/Editor Instruction Manual; ■ Applesoft Toolkit Instruction Manual.

Apple Business BASIC

Apple III's Advanced BASIC For Business Applications

Language Library and Utilities

Apple Business BASIC for the Apple III Computer System is one of the most powerful versions of BASIC ever developed for a microcomputer. Designed for those who want the flexibility, power, and ease-of-use of the popular BASIC language, Apple Business BASIC incorporates a number of innovative features which can be used to satisfy some of the most demanding business and scientific programming needs.

With Apple Business BASIC, programmers can address over 70K bytes of extended memory—the largest workspace available on any personal computer. In addition, Apple Business BASIC's special 64-bit, 18-digit data type handles the toughest accounting chores with "penny accuracy."

For producing reports, Apple Business BASIC offers some of the most comprehensive and flexible formatted output capabilities found on any version of BASIC—even those used on large system mainframes. Apple Business BASIC also features advanced file handling, with flexible file formats to match application needs; 16-bit binary integer, and 32-bit binary floating point data types; 64-character variable names (all characters significant) for documentation purposes; easy access to a wide variety of plug-in peripherals or auxiliary devices; and a trace mode for debugging.

If you prefer programming in BASIC, but require more power, flexibility, and precision than most BASICs can give you, turn to Apple Business BASIC for the Apple III—an advanced language for an advanced computer system. Apple Business BASIC is supplied with all Apple III system configurations.

Benefits

Apple Business BASIC...

- makes it easier to generate reports, because of its flexible, extensive, formatted output capabilities, and versatile PRINT USING and IMAGE statements...
- increases system efficiency, because its large, user-available workspace (over 70K bytes) allows lengthy programs to be kept in memory...
- adds programming flexibility, because it lets you keep multiple (up to 10) files open simultaneously, with virtually no size constraints...
- allows you to display and calculate financial accounting data with "penny accuracy," through the use of a 64-bit, 18-digit data type and special functions...
- speeds up disk file storage, because its built-in facilities let programs read and write files more efficiently...
- simplifies system input/output (I/O) control, because just a few key words let you control a wide variety of peripherals, as well as machine language routines and graphics facilities...
- aids development and debugging of complex programs, because its optional ELSE statement and automatically indented listings encourage a structured approach to programming.

Apple Business BASIC— A Closer Look

Apple Business BASIC is a general-purpose, problem solving language, designed especially for business and scientific applications calling for: 1) an easy-to-use debugging environment; 2) fast, high precision operations—such as accounting—on numbers with a range less than $\pm 10^{18}$; 3) a high degree of output formatting for printing reports; and 4) greater flexibility for file I/O operations. Apple Business BASIC's powerful features provide the programmer with a number of advanced capabilities and conveniences.

Extended User Program Memory Space

In an Apple III Computer System with 128K bytes of RAM, Apple Business BASIC presents you with a huge, 70K byte workspace—more than is available with any other personal computer BASIC. This means you can write large programs more easily and run them more efficiently. Access time is reduced, because large files can be kept in memory—instead of on disk—and because many files can be opened for access simultaneously. In addition, large, high-resolution graphics areas can be used without fear of unduly restricting program size.

Flexible Output Formatting

Apple Business BASIC's versatile PRINT USING and IMAGE statements allow you to use a variety of format strings to prepare reports. Specifications are extremely flexible, and include string, literal, digit, scientific notation, and engineering notation categories.

Advanced File Handling

In Business BASIC, file handling is done through numbered file references defined within the program. You can make these file definitions perform chores simply by using generic terms. To print, for example, call out the generic term ".printer" within the program. Apple Business BASIC works with the Apple III's Sophisticated Operating System (SOS) to handle the details automatically, including which printer you're addressing (if your system has more than one), its I/O address, etc. For greater user convenience, disk files are referenced by directory, sub-directory, and file name, without regard to the storage device on which the file resides.

Long Variable Names

Apple Business BASIC allows you to use variable names (up to 64 characters in length) for documentation purposes, with each character significant. Furthermore, because spaces are used as delimiters, embedded BASIC keywords are allowed in variable names, permitting even more flexibility.

"Structured" BASIC Features

With Apple Business BASIC, you can add the ELSE statement to the usual IF... THEN statement provided by BASIC. And your ELSE clauses can themselves contain other IF... THEN... ELSE constructs. Apple Business BASIC also provides a LISTING feature that automatically indents the contents of FOR... NEXT loops. These "structured" BASIC features encourage programmers to use a more logical, structured approach to developing their programs, and greatly aid development and debugging of complex programs.

Powerful Interface to Assembly Language

Because Apple Business BASIC runs in the SOS environment, you don't have to worry about memory management, buffer allocation, or file handling. This freedom will save you a significant amount of programming time.

Additionally, Apple Business BASIC relates to SOS through a powerful Invoke/Perform interface mechanism. For example, if you have created assembly language routines using the disk assembler, you can specify the assembled routine by name in an Apple Business BASIC program. Once the routines are mentioned in the "INVOKE" statement, Apple Business BASIC works with SOS to find a residence in memory for the routines, and to establish—as entry points in the resultant linked module—any function or procedure names mentioned in the routines. All you have to do is PERFORM the previously invoked routine—specifying any variables to be passed—and Apple Business BASIC and SOS automatically handle all the operational details.

Apple Business BASIC makes life a lot easier for programmers by expanding system capabilities, reducing program development time, and adding greater flexibility to formatted output and file handling facilities.

Technical Specifications**Variables**

- 64 characters (max.), all significant
- Reserved variables: ERR, KBD, EOF, VPOS, ERRLIN, HPOS, FRE, TIME\$, DATE\$, PREFIX\$
- Data Types
 - 16-bit binary integers (−32768 to +32767)
 - 64-bit binary integers (± 9223372036854775807 or $2^{63} - 1$)
 - 32-bit binary floating point ($\pm 10^{38}$ with 6-digit precision)
 - Character strings (0 to 255 characters, dynamic)
 - String and numeric arrays (indexed starting with 0, no dimensional limits)

Operators

- General: +, −, *, /, DIV, mod
(Note: DIV and MOD are only for long integer operations)
- Binary logical operators: AND, OR, =, <, >, <>, ><, >=, <=, =<, =>
- Unary logical operator: NOT
- String operator: + (concatenation)

Statements

(Note: No statement or statement list may exceed 254 characters, including delimiters.)

```
LET (optional)
REM
GOTO
IF...GOTO
IF...THEN
IF...statementlist: ELSE statementlist
FOR ctrl variable = expression TO expression STEP expression
NEXT ctrl variable (, other ctrl variable)
GOSUB
RETURN
POP
ON expression GOTO
ON expression GOSUB
ON ERR
ON KBD
ON EOF #
OFF ERR
OFF KBD
OFF EOF #
RESUME

Utility Statements:
NEW          LOAD          STOP
CLEAR        SAVE          END
FRE          DELETE        CONT
PREFIX$     RUN           CHAIN prog name, line number
```

User-Defined Functions:

```
FN functionname (argument)
DEF FN functionname (argument) = expression
```

Debugging:

```
TRACE
NOTRACE
```

Cursor and Screen:

```
LIST      VPOS      HOME      NORMAL
DEL       HPOS      INVERSE   TEXT
```

String, Numeric and File Functions:

```
LEN      TEN      CONV      TAN      SQR
STR$     MID$     CONV%     ATN      EXP
VAL      LEFT$    CONV&     INT      LOG
CHR$     RIGHT$   CONV$     RND      TYP
ASC      SUB$     SIN       SGN      REC
HEX$     INSTR    COS       ABS
```

Program resident data statements:

DATA
READ
RESTORE

Machine statements and functions:

INVOKE
PERFORM
EXFN
EXFN%

File I/O:

CATALOG
DELETE
RENAME
LOCK
UNLOCK
CREATE
OPEN # filename (AS INPUT, AS OUTPUT, AS EXTENSION)
CLOSE # filename
CLOSE
INPUT # filename, recordnumber
OUTPUT # filename
PRINT # filename, recordnumber
PRINT # filename, recordnumber USING
READ # filename, recordnumber
WRITE # filename, recordnumber

Console I/O:

INPUT
GET
TAB
SPC
SCALE
PRINT
PRINT USING
IMAGE specification(s)

String specifications:

A reserves a character position left-justified
C reserves a character position center-justified
R reserves a character position right-justified

Literal specifications:

X prints a space
/ prints a carriage return/line feed
"literal" prints whatever is in quotes

Digit specifications:

reserves one numeric digit, leading zeros suppressed
Z reserves one numeric digit, leading zeros printed
& reserves one numeric digit or comma
(comma fill every three digits)
. reserves a position for the decimal point
+ reserves a position for the sign
- reserves a position for the sign (if negative)
\$ reserves a position for the dollar sign
** asterisk fill
++ floating sign
-- floating sign (if negative)
\$\$ floating dollar sign

Scientific notation specification:

E reserves a position for the exponent (power of ten)

Engineering notation specification:

same as scientific notation, except the exponent is always a multiple of three

Apple III Pascal

The Powerful, Flexible Language

Language Library and Utilities

Available first quarter 1981

Apple III Pascal is a fully professional system development environment. It incorporates an Apple III version of the UCSD Pascal Operating System (Version 2.1) and SOS, Apple III's Sophisticated Operating System. Because it offers a compiled language, the Apple III Pascal system allows programs to execute quickly and take up minimal space. The structured programming facilities and extensive data structures in Apple III Pascal make it the language to choose for large business, scientific, and educational programs.

Benefits

Apple III Pascal...

- increases programmer productivity because it provides a total software development facility...
- simplifies program design through Pascal's convenient structural mechanisms and rich variety of data types...
- lowers development costs as extended, built-in error checking catches syntax, data type, and value range errors...
- increases system flexibility, because it is software compatible with programs written in Apple II Pascal...
- lowers maintenance costs because Pascal's modular structure minimizes convoluted code which is difficult to understand and modify...
- optimizes your use of available memory, because its option processor allows you to use only as much graphics space as needed...
- expands your programming workspace, because it automatically adapts itself to available memory—which can exceed 64K bytes...
- allows documentation, as well as program source code, to be written and modified through the utilization of a powerful, easy-to-use text editor...
- provides flexible input/output (I/O) through its user-transparent use of Apple III's Sophisticated Operating System...
- is the most transportable of all languages: it allows access to large libraries of Pascal programs and provides the capability to run your own programs on most Pascal systems.

Apple III Pascal— A Closer Look

Apple III Pascal has been designed for the sophisticated programmer or computer science student. Its richness of data types, control functions and powerful utility routines can dramatically improve a programmer's productivity on large projects. For this reason, Apple has selected Pascal as its standard system and applications development vehicle.

Why UCSD Pascal?

Since UCSD Pascal is recognized as the microcomputer industry standard, using it as a basis for Apple III Pascal gives a programmer portability. Not only can a user access large libraries of Pascal programs already in existence, but also Apple III Pascal programs can run with minimum conversion on most computer systems offering Pascal.

UCSD Pascal is more than a language: compiler, assembler, editor, linker, and file handler are integrated within a single, powerful system. This provides the user with a comprehensive set of software tools for optimal program development, and the ability to create and maintain program libraries. Built-in procedures and functions enhance the string, byte, and I/O capabilities.

Why Pascal For Apple III?

Apple has taken advantage of all of UCSD Pascal's capabilities and can offer others as well. These include:

- up to 64K bytes of memory for data;
- code space limited only by total memory size of the machine;
- easy access to Apple III's human interface features: color graphics, speaker, joysticks, and keyboard;
- transcendental functions;
- faster disk response and transfer rates;
- extensive documentation.

System Configuration

- To use Apple III Pascal, you will need the following system:
- an Apple III system with 128K bytes RAM;
 - a high resolution, black and white, video monitor (Apple III Monitor recommended);
 - expansion disk drive for your Apple III.

Technical Specifications

Diskettes:

16-sector format, 140K (143,360) bytes per diskette;

Editor:

Editing functions include cursor control, text modification, formatting, searching and marking capabilities. The Editor offers:

- fast, screen-oriented editing for program development and text editing;
- 80-character lines;
- editing capabilities for Apple Business BASIC ASCII data files;
- a new EXIT option that saves to a previously specified file instead of workfile.

Editor Commands:

JUMP
PAGE
WRITE
FIND
INSERT
REPLACE
RETURN
ADJUST
MARGIN
SET MARKER
SET ENVIRONMENT
AUTO-INDENT
DELETE
XCHANGE
COPY
ZAP
VERIFY
QUIT
UPDATE
EXIT
FILLING
LEFT MARGIN
RIGHT MARGIN
PARAGRAPH MARGIN
COMMAND CHARACTER
TOKEN DEFAULT

Compiler:

- Apple III Pascal source text is translated into P-code.
- A group of one or more source language procedures or functions can be compiled separately as a UNIT, allowing a large program to be subdivided into smaller, more manageable parts. Commonly used procedures and functions can be compiled once, stored in a library file, and accessed by other programs through the Linker.
- EXTERNAL routines can be declared and are later linked into the host program by the Linker.
- Compiler option specifications can be embedded in the source text to control listings, screen messages, range-checking, inclusion of separate source files, and other compiler parameters.

Compiler Options:

C	Following characters are placed directly into codefile.
G+	Allows GOTO statements.
G-	Forbids GOTO statements
I+	Generates I/O checking code.
I-	No I/O checking.
Ifilename	Includes named source file in compilation.
L+	Sends compiled listing to SYSTEM.LST.TEXT.
L-	Makes no compiled listing.
Lfilename	Sends compiled listing to named file.
N+	Forces all units to be normally non-resident.
P	Pages listing.
Q+	Suppress screen messages.
Q-	Sends procedure names and line numbers to CONSOLE.
Runitname	Resident option forces named units to remain resident during execution of calling procedure.
R+	Generates range-checking code for array subscripts and variables.
R-	No range checking.
S+	Puts compiler in swapping mode.
S++	Compiler does even more swapping.
S-	Non-swapping mode: entire Compiler in memory.
U+	Compiles on user lex level.
U-	Compiles on system lex level.
Ufilename	Specifies name of library file for finding UNITS.

6502 Assembler:

- Permits relocatable assembly language routines to be generated for linking to Apple III Pascal programs.
- Supports parameterized macros.

Assembler Directives

Delimiting Directive for Routines:

.PROC
.FUNC
.END

Label Definitions and Space Allocation Directives:

.ASCII
.BYTE
.BLOCK
.WORD
.EQU
.ORG
.ABSOLUTE
.INTERP

Macro Facility Directives:

.MACRO
.ENDM

Conditional Assembly Directives:

.IF
.ELSE
.ENDC

Apple III Pascal Host Communication Directives:

.CONST
.PUBLIC
.PRIVATE

External Reference Directives:

.DEF
.REF

Listing Control Directives:

.LIST
.MACROLIST
.NOLIST
.NOMACROLIST
.PATCHLIST
.NOPATCHLIST
.PAGE
.TITLE

File Directive:

.INCLUDE

Linker:

- Combines compiled P-code or assembled machine code files into the system work file or another specified code file. This eliminates the need to recompile or reassemble existing code files when incorporating them into a program.
- Designates any procedure or function at the P-code level as a SEGMENT, which means that its code can be swapped in and out of memory. Handles up to 64 code segments.
- Resolves references in compiled code to UNITS or EXTERNAL routines before program execution.

Filer:

- Handles the tasks of transferring information, i.e., storing and retrieving data on disk, moving and deleting disk files, creating and modifying diskette directories.
- Provides a general utility to control SOS files.
- Provides complete control over all SOS file facilities, including directories, sub-directories, and files.
- Sets or changes prefix so that long filenames can be entered easily.

Filer Commands:

GET
 SAVE
 NEW
 WHAT
 VOLUMES
 LIST DIRECTORY
 EXTENDED DIRECTORY LIST
 REMOVE
 TRANSFER
 DATE
 PREFIX
 BAD BLOCKS
 MAKE
 ZERO
 QUIT
 XAMINE
 CHANGE
 KRUNCH (applied only to Apple
 // formatted diskettes)

System Utilities Include:

- System librarian—links separately compiled or assembled routines into a library file.

System Library Contains:

- The "Turtlegraphics" code unit, which provides easy access to Apple III's High Resolution color graphics routines. Functions and procedures permit the user to choose a color, move and turn the cursor, specify viewport boundaries, fill the viewport with color, copy an array of data to the screen from memory, write text on the graphics screen, and interrogate the system regarding the state of the cursor and screen. It adds the following procedures and functions: INITTURTLE, TEXTMODE, GRAFMODE, VIEWPORT, PENCOLOR, PENMODE, SCREENCOLOR, FILLSCREEN, MOVETO, TURNT0, TURN, MOVE, TURTLEX, TURTLEY, TURTLEANG, SCREENBIT, DRAWBLOCK, WCHAR, WSTRING, CHARTYPE.
- The "Applestuff" code unit which contains routines to generate random numbers, interface with the joysticks, and generate sounds on the Apple III's speaker. It adds the following procedures and functions: RANDOM, RANDOMIZE, JOYSTICK, DATE, TIMEOFDAY, CLOCKINFO, NOTE, KEYPRESS, SOUND.
- The "Transcend" code unit, which contains transcendental functions useful for mathematical calculations. It adds the following procedures and functions: SIN, COS, ATAN, EXP, LN, LOG, SQRT.

**Implementation
 Size Limits**

The following is a list of maximum size limitations imposed upon the user by the current implementation of UCSD Pascal:

- Maximum number of bytes of object code in a PROCEDURE or FUNCTION is 1300. Local variables in a PROCEDURE or FUNCTION can occupy a maximum of 16383 words of memory.

**The Apple III
 Pascal Package
 Order No. A3D0005**

With your Apple III Pascal order, you will receive:

- Four (4) Apple III Pascal System diskettes;
- Apple III Editing and File Facilities manual;
- Apple III Program Preparation Tools Manual;
- Apple III Pascal Language Reference Manual;
- Two (2) general texts on Pascal.

DOS 3.3

The Apple Disk II "Housekeeper"

DOS 3.3 is the handy housekeeper developed by Apple to help you take full advantage of your Disk II Floppy Disk Subsystem. DOS automatically keeps track of files, saves and retrieves information on a diskette, and performs a variety of other "housekeeping" chores. It dynamically allocates diskette space, maximizing diskette capacity. DOS stands for Disk Operating System; 3.3 is the version update number. When you purchase an Apple Disk II with controller, you are buying an Apple floppy disk drive and DOS 3.3.

NOTE: DOS 3.2.1 has been superseded by DOS 3.3. Programs which operate under DOS 3.2.1 cannot be read by DOS 3.3 (unless converted by "Muffin", a DOS 3.3 utility program). Conversely, DOS 3.2.1 cannot read DOS 3.3 programs.

For those Apple II/II Plus owners who wish to use, or are currently using, programs running under the previous operating system, Apple will continue to offer and support DOS 3.2.1 (Apple Product #A2D0010).

Benefits

DOS 3.3...

- simplifies system start up by allowing for turnkey operation under Apple BASIC...
- increases disk capacity by more than 20% over previous versions of DOS...
- increases a system's capability by storing and retrieving information much more accurately, quickly, and conveniently than is possible with cassette tape...
- adds to system efficiency by allowing you to access data by the name under which it is filed...
- saves time spent searching for files because it automatically catalogs them by name and displays the complete catalog upon command...
- provides the capability to save, load, run, rename, delete, and verify files quickly and easily through its variety of housekeeping commands...
- allows rapid data retrieval through both sequential and random access to the data...
- allows you to make back-up copies of diskettes on a single disk drive system, rather than requiring two drives for the same purpose.

DOS 3.3— A Closer Look

If you've purchased an Apple Disk II with DOS 3.3, only a few keystrokes are required to put the program to work for you. This process is called "booting" the disk and is explained in detail in the DOS manual.

If you are using a previous version of DOS and want to update your system to run DOS 3.3, you'll need the DOS 3.3 Kit to boost your disk capacity to accommodate the new version. The kit contains two PROMs which you will need to install. (If you are using the Apple Language System, you've already installed them.)

The System Master diskette that comes with the DOS manual is a very special one: it allows you to copy an entire diskette, convert any diskette that has an earlier version of DOS, and much more. Programs that demonstrate various capabilities of DOS are also included on the diskette and discussed in the manual.

With approximately 20% more storage capacity per diskette made available by DOS 3.3, you can store even more files on each diskette. Just type SAVE and the file name, and DOS will save it for you.

So that you'll know exactly which programs you've stored to a particular diskette, DOS provides the CATALOG command. When you



use it, a list of all the files contained on the diskette will appear on your screen. To access a particular program, simply type LOAD and its name, and within seconds, you'll be using the code you've selected.

DOS also lets you rename your files quickly and simply. To change the name of your telephone number file from *PHONE NUMBERS* to *FREQUENTLY CALLED NUMBERS*, for example, just type *RENAME PHONE NUMBERS, FREQUENTLY CALLED NUMBERS*. Presto—you've got a new file name.

It's just as easy to delete an entire file as it is to rename it. Type DELETE and the file name, and it's gone.

Some files will be more important to you than others. To ensure their safety, DOS provides the LOCK command. To prevent your file from accidental erasure, simply type LOCK and the file name. If you decide later that you want to delete the file, just type UNLOCK and the file name. You can then use the DELETE command.

The DOS 3.3 package also includes some important utility programs for file and diskette maintenance and back-up. Once you become familiar with them, you'll find that they perform many chores that save you time and make your life easier.

System Configuration DOS 3.3 is included with all Apple II Disk Drives (with controller). To use DOS 3.3 and its utilities, you will need the following system:

- Apple II or Apple II Plus, with minimum of 32K memory.

Technical Specifications

Housekeeping Commands:

INIT	LOAD	DELETE	VERIFY
CATALOG	RUN	LOCK	MON
SAVE	RENAME	UNLOCK	NOMON
MAXFILES			

Access Commands:

FP	INT	PR#	IN#	CHAIN
----	-----	-----	-----	-------

Sequential Text File Commands:

OPEN	READ	APPEND	EXEC
CLOSE	WRITE	POSITION	

Random-Access Text File Commands:

OPEN	CLOSE	READ	WRITE
BYTE			

Machine-Language File Commands:

BLOAD	BRUN	BSAVE
-------	------	-------

DOS Messages:

DISK FULL	NO BUFFERS AVAILABLE
END OF DATA	NOT DIRECT COMMAND
FILE LOCKED	PROGRAM TOO LARGE
FILE NOT FOUND	RANGE ERROR
FILE TYPE MISMATCH	SYNTAX ERROR
I/O ERROR	VOLUME MISMATCH
LANGUAGE NOT AVAILABLE	WRITE PROTECTED

The DOS 3.3 Package
Order No. A2M0044
(Disk II with controller)

With your order for an Apple Disk II with controller, you will receive:

- Apple Disk II with controller;
- DOS 3.3 System Master diskette, including utility programs;
- DOS Version 3.3 Instructional and Reference Manual;
- BASICS diskette (for diskettes written under earlier versions of DOS);
- Blank diskette.

The DOS 3.3 Kit Package
Order No. A2D0023

With your order for the DOS 3.3 Kit, you will receive:

- Two (2) 16 sector PROMs* (P5A and P6A)
- IC puller;
- DOS 3.3 System Master diskette, including utility programs;
- DOS Version 3.3 Instructional and Reference Manual;
- BASICS diskette (for diskettes written under earlier versions of DOS);

*If you are using the Apple Language System (which already contains these PROMs), the PROMs supplied with the DOS 3.3 Kit will be spares.

Apple III Sophisticated Operating System (SOS)

Simplicity in System Control

Operating Systems

The Apple III Sophisticated Operating System (SOS) is a powerful software interface that helps you exploit Apple III's advanced system capabilities. With SOS, you don't need to worry about most internal system functions, such as which disk drive contains a file, which bank of memory is being used, or which slot a peripheral interface card occupies. These and other functions are all controlled automatically.

Designed for easy expandability as well as operational convenience, SOS enhances and ensures Apple III system flexibility. A simple-to-use System Configuration Program (supplied on diskette) allows even inexperienced users to custom configure SOS to meet their specific needs.

SOS provides a solid foundation for writing advanced applications on the Apple III. It features a hierarchical file system, device level interrupt capabilities, user level interrupt capability (events), a device-independent file system, and memory management capabilities. And, since all languages on the Apple III use SOS, they all share a common disk format. For instance, a Pascal application program can access a BASIC text file just as easily as it can access a Pascal text file.

Apple's Sophisticated Operating System for the Apple III gives you the efficiency, comprehensiveness, and expandability you've always wanted in an operating system, with a degree of convenience you may never have thought possible. SOS is supplied with all Apple III systems and software.

Benefits

The Apple III Sophisticated Operating System...

- improves personal productivity, because it frees you from most system control responsibilities...
- simplifies programming, because it provides powerful, standard device and file interfaces for all languages and applications...
- maximizes system efficiency, by automatically controlling the use and allocation of system resources...
- speeds up software development, by reducing program size and complexity...
- ensures system adaptability, because it's designed for easy expansion and custom configuration.

The Apple III Sophisticated Operating System—A Closer Look

SOS, which consists of five basic components, acts as a buffer between user programs and the Apple III hardware. Using these components, SOS controls Apple III system operation and resource allocation with a minimum of user involvement. As far as the user is concerned, handling the system's input/output (I/O) devices is as easy as handling its data files, once SOS has been configured with the proper drivers.

Configuring SOS is a quick and easy process, even for the most inexperienced user. Simply follow the directions in the "System Configuration Program," one of the programs contained on the System Master diskette supplied with your Apple III system.

Suppose, for example, that you've added an Apple Silentype Printer to your Apple III system. To configure SOS so it will automatically control the printer, execute the System Configuration Program and select the first option on the menu, ADD A DRIVER. Then simply follow the directions displayed on the screen.

Once you've configured SOS to control your Silentype, you need never concern yourself again with its system operational requirements. SOS handles them for you—automatically—whenever you use the printer. Configuring SOS for other printers and peripherals is just as easy.



You don't have to be a system architect to get complete access to the Apple III's advanced capabilities. Apple's Sophisticated Operating System helps you control and configure your Apple III, maximizing its benefits and power in every configuration and application.

Technical Specifications

The Structure Of SOS

At the core of SOS is the "Kernel," a set of programs and subroutines that control the flow of information around and through SOS. The Kernel is divided into five main areas: the File Manager, the Device Manager, the Memory Manager, the Interrupt Manager, and the Utility Manager.

The File Manager controls the logical storage, transfer and routing of information within the Apple. All information is stored in units called files. The File Manager can create and destroy files, read their contents, write new information into them, change their names, or move them from place to place.

The Device Manager controls the physical storage and flow of information, into and out of the Apple III. Together with its associated device drivers, it controls the operation of the console (the screen and keyboard), the serial port, the printer port, the disk drives, and all other peripheral devices connected to the Apple.

The Memory Manager in SOS allows programs and languages to use all the memory you have in your Apple quickly and efficiently. It keeps track of "banks" and "pages" of memory, and allocates their use to different programs and languages.

The Interrupt Manager works with the Device Manager to allow devices such as the keyboard or the serial port to interrupt the Apple in the middle of an operation. The Apple can then attend to the interrupting device, and resume its previous operation as if nothing had happened. The operation of the Interrupt Manager, like that of the Memory Manager, is normally invisible to you.

The Utility Manager lets programs access two built-in devices, the joystick interfaces and the clock/calendar. Most languages and applications that use the clock and joysticks will have more convenient, higher-level commands to read the status of those devices. These high-level commands simply request the information from the Utility Manager through SOS.

Besides those components of SOS making up the Kernel, there are two other components. One is **System Utilities**, which provides high level routines for performing more complicated system tasks with a minimum of user interaction. Another is the **System Configuration Program**, which allows custom configuration of SOS and the I/O device drivers, in order to match the user's specific needs.

File Management System Calls

CREATE (pathname,create list,length)
 DESTROY (pathname)
 RENAME (pathname,new pathname)
 SET FILE INFO (pathname,file list,length)
 GET FILE INFO (pathname,file list,length)
 VOLUME (dev name,vol name,free blocks)
 SET PREFIX (prefix path)
 GET PREFIX (prefix path,length)
 OPEN (pathname,ref num,open list,length)
 NEW LINE (ref num,is newline,newline char)
 READ (ref num,buf,bytes,bytes read)
 WRITE (ref num,buf,bytes)
 CLOSE (ref num)
 FLUSH (ref num)
 SET MARK (ref num,base,displacement)
 GET MARK (ref num,mark)
 SET EOF (ref num,base,displacement)
 GET EOF (ref num,eof)

Device Management System Calls

D READ (dev num,buf,bytes,block num,bytes read)
 D WRITE (dev num,buf,bytes,block num)
 D CONTROL (dev num,control code,control list)
 D STATUS (dev num,status code,status list)
 GET DEV NUM (dev name,dev num)
 D INFO (dev num,dev name,dev list,length)

Utility Management System Calls

SET FENCE (priority)
 GET FENCE (priority)
 SET TIME (time)
 GET TIME (time)
 JOYSTICK (j mode,j value)

Memory Management System Calls

REQUEST SEG (base,limit,seg id,seg num)
 FIND SEG (srch mode,seg id,pages,base,limit,seg num)
 CHANGE SEG (seg num,chg mode,pages)
 GET SEG INFO (seg num,base,limit,pages,seg id)
 GET SEG NUM (bankpage,seg num)
 RELEASE SEG (seg num)



Apple Disk II Floppy Disk Subsystem

Dynamic and Versatile Data Storage

77

Accessories

The Apple Disk II Floppy Disk Subsystem increases the capability of your Apple Computer System through the use of flexible, or "floppy", disks for data storage. Expanded memory capacity, greater data retrieval speed, and random access to your stored data—all of these, and more, are made available through the Disk II Subsystem. Whether you use your Apple with a Disk II in business to control inventory, or at home for household management, you'll find that it's the superior answer to your data storage needs.

Benefits

The Apple Disk II Floppy Disk Subsystem...

- optimizes efficiency by offering one of the highest storage capacities available with any personal computer on today's market...
- offers an economical advantage over other disk drives, by providing one of the lowest storage costs per character of any personal computer disk drive...
- increases productivity by allowing you to access data much more quickly than is possible with cassette tape...
- makes possible a wide range of computer applications by allowing software to access data...
- provides for greater system expansion than is possible with any other personal computer system, because it supports up to three interface cards and six disk drives.

Disk II—A Closer Look

The Disk II drive, unlike the Apple II, is a mechanical device with motors and moving parts. Understanding the principle behind the Apple Disk II drive is as simple as understanding the way a phonograph turntable works. Disk II has been designed in the same manner, although it is enclosed in a special cabinet. The record, or "diskette", is flexible ("floppy") and fits on a spindle inside the drive. The drive turns the diskette at much faster speeds than a phonograph turns a record.

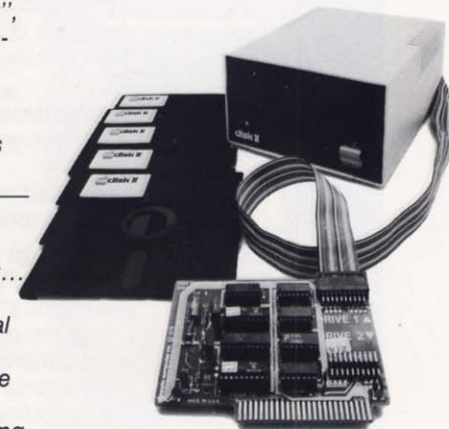
Within the drive, a special record/playback head replaces the phonograph needle, and it reads the diskette the way a tape head reads an audio cassette. The head is mounted on a positioner, the counterpart of the phonograph arm, and it moves the head laterally across the floppy diskette to any area requested by the computer program. This capability is called "random access". It allows you to retrieve information from the diskette much more quickly than is possible with cassette tape.

Apple's Disk II may be purchased with or without a controller; however, the first one you buy must have the controller in order to interface the Disk II system to your Apple. Because each controller supports two disk drives, you'll be able to attach a second drive to it when you wish to expand your system. Your Apple will support a recommended maximum of three interface cards and six drives.

In addition to the advantages offered by a disk storage system, you'll also receive a special disk operating system program (DOS)* when you purchase a Disk II with controller. It automatically keeps track of your files, saves and retrieves information on a diskette, and performs a variety of other functions.

**NOTE: DOS 3.2.1 has been superseded by DOS 3.3. Programs which operate under DOS 3.2.1 cannot be read by DOS 3.3 (unless converted by "Muffin", a DOS 3.3 utility program). Conversely, DOS 3.2.1 cannot read DOS 3.3 programs.*

For those Apple III/III Plus owners who wish to use, or are currently using, programs running under the previous operating system, Apple will continue to offer and support DOS 3.2.1 (Apple Product #A2D0010).



Suppose you want to include an intricate flower in your landscape layout, but feel uncertain about using the tiny drawing strokes it will require. The Tablet software was designed with that problem in mind. Set a VIEWPORT surrounding the area in which the flower will be drawn; then simply press the REDUCER command to shrink the entire Tablet working area into the VIEWPORT on the screen. This converts large pen motions on the Tablet into small motions on the screen, thus allowing you to draw intricate, detailed designs.

To achieve the opposite result—a large pen motion on the screen from a small motion on the Tablet—press the WINDOW command box. Select the portion of the Tablet to be enlarged, and that surface will be expanded to fill the screen.

When you have completed your landscape layout, or if you want to stop drawing for awhile, save your creation for future review or revision by pressing the SAVE command box. The picture will disappear from the screen and your Apple will ask you for the name of the drawing. Type in the name you choose, press the "return" key, and your drawing will be safely stored on a diskette.

Because the Graphics Tablet employs your Apple's problem solving capability, it does more than allow you to create drawings. Suppose you want to include a swimming pool in your landscape layout. First, draw the pool into your landscape. Then, to determine how many square feet of land you've used, convert the screen units into feet. To do this, simply press the CALIBRATE command box and wait for BEGINNING POINT? to appear. Select any point on the screen and press down on the Tablet with your pen. ENDING POINT? will then be displayed. Choose a destination point and again press down with your pen. Your Apple will automatically convert the distance between those two points into screen units and ask you to assign your value—for example, 10 screen units equals two feet. Then, using the AREA command, move the pen over the perimeter of the pool. Your Apple will convert the units into square feet automatically.

The Graphics Tablet can also be programmed to be a powerful tool for special applications. Suppose, for example, that you're conducting a telephone survey on laundry detergent. Instead of marking the responses on separate sheets and totaling them when the survey is complete, you can draw the form on your Tablet and write a program which will total the responses as you enter them with the pen. Your program could even request that the Apple break down the responses into different categories.

So, whether you're an engineer, a professional artist, an architect, illustrator, novice or programmer, the Apple Graphics Tablet offers you the opportunity to free both your imagination and your creative spirit.

System Configuration

To use the Apple Graphics Tablet, you will need the following system:

- Apple II with Applesoft Firmware Card, or Apple II Plus, with 48K of memory; or
- Apple II or Apple II Plus, with the Apple Language System;
- a composite video color monitor or television*;
- an Apple Disk II disk drive with controller.

*A black and white monitor or television may also be used if you do not require color.

Technical Specifications

Power Requirements (supplied from Apple power supply):

230mA + 5 VDC
40mA + 12 VDC
20mA - 5 VDC
40mA - 12 VDC

Software/Firmware:

Control program in Applesoft BASIC.
Quick-draw routine in Assembly Language.
Interface Firmware in ROM.

Digitizing Area:

28 cm x 28 cm (11 in x 11 in)

Overall Size:

39.5 cm x 39.5 cm x 2.5 cm (15.5 in x 15.5 in x 1 in)

Controller Card Size:

17.8 cm x 7.0 cm x 1.3 cm (7 in x 2.75 in x .5 in)

Pen Size:

15.2 cm (6 in) with 1.8m (6 ft) cable

Data Rate:

Up to 120 coordinate pairs per second

Coordinate System:

Absolute cartesian with selectable origin and scale

Output Forms:

Eight-bit binary coordinate pairs

Interface Levels:

TTL—provided by Apple interface

Operating Modes (Selectable from Tablet Menu)

Tablet Modes:

RESET

Sets Tablet to default modes.

CLEAR

Clears Apple screen or VIEWPORT, whichever is smaller.

WINDOW

Selects active portion of Tablet surface.

BKGND COLOR

Sets entire screen to chosen color.

DELTA

Sets the number of dots to move before drawing a line.
Also turns audio feedback ON/OFF.

SOFT RESET

Clears the viewport.

VIEWPORT

Sets a sub-area of the screen as the active area.

CALIBRATE

Sets screen scale.

REDUCER

Maps the entire tablet surface into the current viewport.

Pen Modes:

PEN COLOR

Sets drawing color to one of the six Hires colors.

DRAW

Draws lines.

LINES

Draws a line between two specified points.

DOTS

Draws a single dot each time the pen is placed on the active tablet area.

FRAME

Draws an open rectangle given diagonal corners.

BOX

Draws a solid rectangle using the current pencolor, given diagonal corners.

Command Functions:

CATALOG

Displays names of files currently stored on a diskette.

SAVE

Saves the current picture to diskette.

LOAD

Loads a previously generated picture file.

SEPARATE

Removes all colors from the screen except the selected color.

SLIDE

Repositions the image on the screen using both horizontal and vertical wraparound.

DISTANCE

Calculates the scale value of the length of a drawn line.

AREA

Calculates the scaled area of a drawn enclosed figure.

**The Graphics
Tablet Package
Order No. A2M0029**

With your Graphics Tablet order, you will receive:

- Apple Graphics Tablet with cable;
- Pen with 6-ft. connector cable;
- Two (2) "Graphics Tablet Software" Diskware diskettes;
- Graphics Tablet Instruction Manual;
- Interface;
- Mylar overlay;
- Warranty card.

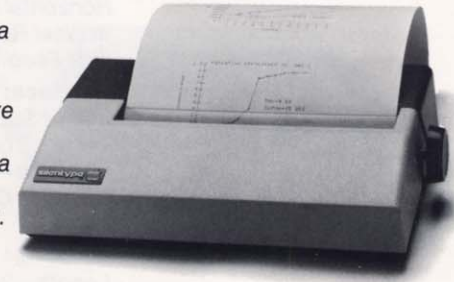
The Apple Silentype Thermal Printer

Accessories

Eliminating the High Cost of Hardcopy

The Apple Silentype is a quiet, versatile, and compact thermal graphics printer. It offers increased flexibility over other printers—at a fraction of the cost—because the Silentype receives both its power and intelligence from your Apple computer. To the extent you can program your Apple, you can program the Silentype—whether you're using machine language, BASIC, or Apple Pascal. Or you can use the Silentype effectively without doing any programming at all. With a few simple keystrokes, you can change margins and line spacing, specify printing intensity, and print finely detailed charts and graphs.

The Apple Silentype, offering you programmable printing—and much more—at an affordable price.



Benefits

The Apple Silentype...

- offers you higher reliability than other microprocessor-based printers, since it contains fewer components...
- offers you more printing flexibility, because it has the capability of printing high resolution graphics...
- may be used in any office or home environment without a muffler, because it's quiet...
- can be transported easily along with your Apple, because it takes up little space and weighs just six pounds...
- saves you time and money, because it requires no preventive maintenance, adjustments, or lubrication.

The Silentype— A Closer Look

Connecting the Apple Silentype to your Apple Computer System takes just minutes. With the Apple III, turn off the system and plug the printer cable into the Silentype interface jack, on the rear connector panel. Next, program the printer for the type style you want by inserting the supplied diskette into the Apple III's disk drive, and following the instructions. (Only Apple III Silentype systems can print in various type styles.) Once the type style has been programmed, you're ready to print.

If you're connecting the Silentype to an Apple II or Apple II Plus, begin by making sure your system is off. Plug the printer cable into the Silentype interface card (supplied with the Silentype package) and remove the Apple's cover. Then plug the interface card into one of its expansion slots (usually slot #1), and replace the cover. That's all there is to it.

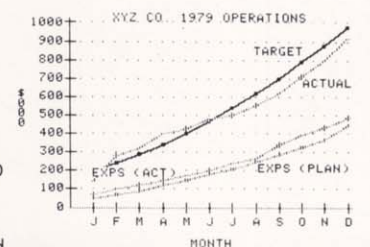
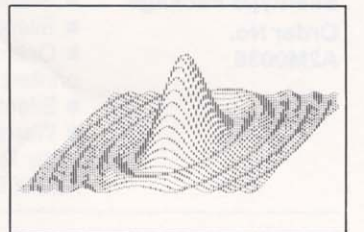
The Silentype prints upper and lower case text at up to 40 characters per second, 80 characters per line; high resolution graphics are printed at 60 dots per inch. The Silentype prints clear, readable copy on white paper—there's no hard-to-read, scratch-susceptible, aluminized paper required.

The Silentype paper path is short and straight, so you don't need to worry about paper jams. Paper is available in 80 ft. rolls, and—because the Silentype has no tractors—loading it into the printer takes just a minute. To alert you that reloading is necessary, a colored stripe along one edge signals the last few feet of the roll. While the printer cannot be damaged by running without paper, changing the roll when the stripe appears will ensure that you don't run out of paper in the middle of printing a file. Because the Silentype is a thermal printer, no ribbons—or messy ribbon changes—are required.

System Configuration

To use the Apple Silentype Printer, you will need:

- any Apple III; or
- any Apple II or Apple II Plus.



Technical Specifications

Text Mode:

Print Rate—Up to 40 characters/second, bidirectional
Line Length—80 characters
Horizontal Spacing—10 characters/inch, nominal
Vertical Spacing—6 lines/inch, nominal
Line Feed Time—65 milliseconds, nominal
Character Format—upper and lower case, 5x7

Graphics Mode:

Print Rate—240 columns of 7 dots each per second
Line Length—480 dots
Horizontal Resolution—60 dots/inch, nominal
Vertical Resolution—60 dots/inch, nominal
Line Feed Time—55 milliseconds, nominal

Interface:

Power Supply—From Apple computer via 9-conductor data/power interface cable (supplied)
Interface—Custom synchronous serial
Interface Cable—9-conductor, 1.2 meters (3½ feet) nominal length

Paper:

Width—21.6 cm (8½ in) nominal
Length—24.4 m (80 ft) nominal
Technology—Thermal, low temperature; black image

Mechanical:

Dimensions—19.7 cm (7¾ in) x 31.1 cm (12¼ in) x 7.0 cm (2¾ in) nominal
Weight—2.7 kg (6 pounds), excluding paper

**The Apple III
 Silentype Package**
 Order No.
 A3M0001

With your Apple III Silentype Package, you will receive:

- Silentype printer;
- Apple III Silentype Driver Diskette;
- One roll of heat-sensitive paper (already installed in the Silentype printer);
- Silentype Operation and Reference Manual;
- Warranty card.

**The Apple II/II Plus
 Silentype Package**
 Order No.
 A2M0036

With your Apple II/II Plus Silentype Package, you will receive:

- Silentype printer;
- Silentype Interface Card with cable;
- One roll of heat-sensitive paper (already installed in the Silentype printer);
- Silentype Operation and Reference Manual;
- Warranty card.

Note: Replacement rolls of heat-sensitive paper (Apple order number A2C0001) may be ordered through your Apple dealer.

Daisy Wheel Printer

(Qume Sprint 5™)

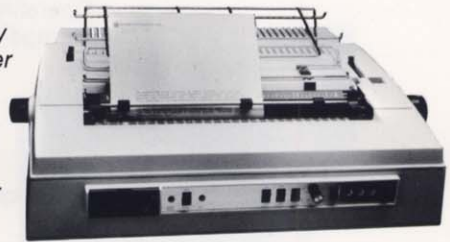
Letter-Quality Hardcopy For Business Communications

Accessories

The Qume Sprint 5 is a popular, fully-formed character, impact printer that produces documents of better than typewriter quality, at an average speed of 45 characters per second. Field-proven and highly reliable, it works with any Apple II, Apple II Plus, or Apple III computer system, in applications ranging from word processing to business forecasting.

When used with the Apple III, the Qume Sprint 5 connects directly to the serial (RS-232) interface port on the system's rear panel. With an Apple II or Apple II Plus system, the printer plugs into a connector on the High-Speed Serial Interface Card (A2B0005), which is then installed in any unused expansion slot in the Apple.

The Qume Sprint 5 handles all kinds of documents, from form letters printed on letterhead, to financial statements up to 198 characters per line in length. The Qume Sprint 5 is the professional printer for professional-looking documents.



Benefits

The Qume Sprint 5...

- improves the quality and impact of your letters and documents, because its fully-formed, highly readable characters give all your printed communications a thoroughly professional look...
- increases office productivity, through letter-perfect, 45 character per second printing...
- allows you to match type styles with your needs, because it provides a variety of available type fonts on easily interchanged printwheels...
- increases printing reliability, thanks to its field-proven, highly dependable design and components...
- interfaces quickly with your system, by plugging directly into the Apple III's back panel, or into a connector on the High-Speed Serial Interface Card for the Apple II or Apple II Plus.

System Configuration

To use the Qume Sprint 5, you will need:

- any Apple III system; or
- any Apple II or Apple II Plus system, with a High Speed Serial Interface Card installed.

Technical Specifications

Parameter	Description
Print Speed:	45 characters/second (average)
Interface:	Asynchronous Serial (RS-232C or 20 milliamp DC current loop)
Forms:	15" max. width, single sheet or continuous forms
Fonts:	96-character "daisy" printwheels in various styles/alphabets
Character Spacing:	10, 12, and 15 characters/inch, plus proportional spacing
Horizontal Format:	
—10 pitch	132 columns
—12 pitch	158 columns
—15 pitch	198 columns
Vertical Format:	6 lines/inch (normal)
Vertical Slew Rate:	5 inches/second
Plotting Resolution:	Two modes—5760 or 2880 points/inch ²
Paper Feed:	Pressure platen (standard); forms tractor (optional)
Ribbon:	Cartridge type; carbon or fabric ribbon
Printwheel:	Easily changeable; large variety of typestyles

™Sprint 5 is a trademark of Qume Corp.

Operator Controls:	Horizontal/Vertical Forms Positioning Forms Thickness Manual Ribbon Advance Communications Form Feed Printer Control Functions
Temperature:	
—Operating	10 to 40 degrees C. (50 to 105 degrees F.)
—Storage	- 40 to + 76 degrees C. (- 40 to + 170 degrees F.)
Relative Humidity:	
—Operating	10% to 90% RH (no condensation)
—Storage	2% to 98% RH (no condensation)
Size:	
—Width	59.7 cm (23.5 in)
—Height	19.4 cm (7.6 in)
—Depth	47.8 cm (18.8 in)
Weight:	20.0 kg (44 lbs)
Power Requirements:	115 volts @ 3.0 amps (Model A2M0045); 230 volts @ 1.5 amps (Model A2M0046)

The Qume Sprint 5 Package

Apple Order No.
A2M0045 (115 Volt)

Apple Order No.
A2M0046 (230 Volt)

With your Qume Sprint 5 order, you will receive:

- Qume Sprint 5;
- Pressure feed platen;
- Paper guide;
- Cover for power supply;
- Interface cable and connector;
- "Prestige Elite" printwheel;
- Fabric ribbon cartridge;
- Operating documentation;
- Warranty.

Note: To use the Qume Sprint 5 with the Apple II or Apple II Plus computers, an Apple High-Speed Serial Interface Card (Order No. A2B0005) is also required.

Disk II For Apple III

Accessories

All the Advantages of the Floppy Disk, And More

Disk II for the Apple III Professional Computer System is a floppy disk drive subsystem that allows you to increase the data storage capacity of your Apple III as your needs expand.

The Apple III Computer System accepts up to three external disk drives, in addition to its one built-in drive, for a total on-line storage capacity of 560K bytes. And because the Apple III was designed for easy, inexpensive system expansion, no extra control hardware or software are required as you add second, third, and fourth drives.

As your storage requirements increase, expand your system's capacity with Disk II for the Apple III—Apple's professional, reliable disk storage subsystem.



Benefits

Disk II for Apple III...

- increases your system's capabilities, by offering you up to 560K bytes of on-line storage capacity...
- maximizes your system's flexibility, because it allows you to expand disk storage in step with your needs, in convenient, 140K-byte increments...
- simplifies interfacing, because it quickly plugs in, and doesn't require any additional control hardware or software.

Disk II For Apple III—A Closer Look

Installation of the disk subsystem couldn't be easier. The first external drive that you add to your system just plugs into the back of your Apple III. Then up to two more drives can be added in "daisy-chain" fashion, simply by plugging the second drive into the first, and the third into the second. There are no separate power cords to tangle up, because the Apple III supplies power directly to the disks.

Whether you add expansion drives to the Apple III Information Analyst, the Apple III Word Processor, or any other system configuration, Apple III's Sophisticated Operating System (SOS) automatically takes care of all interface software requirements for up to three external disk drives. Once your expansion drives are installed, SOS automatically identifies the number and the name of each whenever you start up your system. SOS also automatically maintains and updates content directories of each diskette in a system drive. This allows you to access data—directly by file name—from any diskette in any of the drives.

The additional storage capacity provided by the Apple III Disk II expansion drives can speed up many of the common operations you perform with your Apple III. For example, adding just one expansion drive to your system cuts the time required to make a back-up copy of a diskette from minutes to seconds.

In addition, some Apple III programs require more than one disk drive to perform certain functions. For instance, some programs—such as Apple's Mail List Manager—need two drives to merge data files from two different diskettes into a separate, single file. Similarly, program development in Apple Pascal requires two or more disk drives.

Whether you want to increase your storage capacity or extend your system capabilities, Disk II for Apple III lets you quickly and easily expand your Apple III Professional Computer System.

System Configuration

- To use the Disk II for Apple III, you will need:
- any Apple III.

Technical Specifications**Format:**

Sectoring: soft (hard-sectored diskettes may be used)
Recording Surfaces: one
Tracks per Surface: 35

Capacity:

Formatted Data Capacity: 140K bytes

Characteristics:

Head movement time (track to track): 25 msec.
Head load time: 50 msec.
Average rotational delay: 100 msec.
Data transfer rate: 125K bits per second

Packaging:

Drive dimensions (HxWxD): 8.3 cm (3.25") x 14.6 cm (5.75") x 20.3 cm (8.0")
Drive weight: 1.36 kg (3.0 lbs)
Power source for drives: Apple III system power supply

**The Disk II For
Apple III Package**
Order No.
A3M0003

With your Disk II for Apple III order, you will receive:

- Disk II for Apple III;
- Drive identification labels for numbering your expansion drive(s) either 2, 3, or 4.

NOTE: All instructions and documentation for installation of expansion drives are contained in the Apple III Owner's Guide.

Apple III Monitor

Accessories

Up to 80 Sharp Characters Per Line

Apple's portable, 12-inch (diagonal), black & white monitor displays 80-character by 24-line text and high resolution graphics with precision and high readability. Designed for use with Apple III computer systems, it will also display 40 characters per line when used with Apple II or Apple II Plus computers, or when the Apple III is operating in Apple II emulation mode.

The Apple III Monitor connects easily to your Apple computer via a standard cable, supplied with every Apple III system. Up-front controls are concealed behind a flip-down panel below the display, and include power on/off, contrast, and brightness, as well as vertical and horizontal hold. Vertical linearity and height controls are located on the rear panel.

The monitor's case colors match the colors of the Apple III computer, giving the whole system an appearance as professional as its performance. Whether you're performing word processing or preparing sales forecasts, this dependable, 12-inch black & white monitor gives you the "big picture" you need to produce effective communications.

**Benefits****The Apple III Monitor...**

- displays highly readable characters and graphics, because its sharp resolution extends over the entire screen, even in the corners...
- allows quick adjustment of its display, through a bank of convenient front-panel controls...
- easily positions to your most comfortable viewing angle, fitting either on top or to the side of your Apple III computer...
- provides years of trouble-free service, with its heavy-duty case and quality construction throughout.

System Configuration

To use the Apple III Monitor, you will need:

- any Apple III, Apple II, or Apple II Plus system;
- RCA phono-type connector cable with toroids (supplied with the Apple III).

Technical Specifications**Electrical**

CRT Type: 12" (30.5 cm) diag., 90° deflection; anti-reflective faceplate
Phosphor: P4 (white)
Scanning: EIA Standard; 525 lines; 30 frames, 60 fields/sec.; overscan
Data Input Signal: 1.0 volt p-p ± 0.2 volt composite, sync neg. into 75 ohms
Drive Rates:
—Horizontal: 15.78 kHz
—Vertical: 60 Hz
Video Bandwidth: 18 MHz
Horizontal Resolution: 800 lines, center
Geometric Distortion: Less than 1%
Nonlinearity: Horizontal: less than 7%
Operating Temperature Range: 0 to 50 degrees C. (32 to 122 degrees F.)
Power Requirements: 117 VAC, 60 Hz, 27 Watts, w/power cord

Mechanical

Cabinet: Vinyl clad sheet steel, plastic front
Dimensions:
—Width: 31.0 cm (12¹/₂")

—Height	31.5 cm (12 ¹ / ₃₂ "")
Weight:	31.7 cm (12 ¹ / ₃₂ "")
Controls/Connector	
Front Controls:	Power on/off; contrast; bright; vert. hold; horiz. hold
Rear Controls:	Vertical linearity; height
Internal Controls:	Focus; sub-bright; B+ adjust
Signal Connector:	RCA-type; 75 ohms

**The Apple III
Monitor Package
Order No. A3M0006**

With your Apple III Monitor order, you will receive:

- Apple III Monitor;
- Documentation.

Apple Joystick

The Ultimate in Handheld Paddle Control

Accessories

Available first quarter 1981

The Apple Joystick is a true X-Y paddle control interface that's fun to use and simple to integrate into all kinds of programs. Easy to hold, it features a control shaft that moves a full 360 degrees, a push-button "fire" switch, and a three-position, mode selecting, toggle switch.

The Joystick was designed for use with Apple II, Apple II Plus, and Apple III systems. With the Apple III, up to two Joysticks can be used, both of which plug into existing sockets in the back of the system. The Apple II and Apple II Plus each accept a single Joystick, which simply plugs into the game I/O socket in either machine.

A uniquely-designed mechanical interface converts the Joystick's shaft motion to two analog signals (one for the X axis, the other for the Y axis). The result is a superbly professional "feel" and sensitivity that makes other paddles seem cumbersome.

Whether you employ it in applications requiring advanced hand input capabilities, or just use it to play a more stimulating game of Apple Trek, the Apple Joystick gives you an unbeatable degree of responsive, reliable control for your Apple computer system.



Benefits

The Apple Joystick...

- increases your handheld input capabilities, with its sensitive, 360-degree X-Y movement and positioning control...
- adds design and control flexibility, with its supplemental button and toggle switches...
- simplifies program development, especially with the Apple III, because of its simple software interface...
- improves the "feel" of manual control, because of its smooth action, spring-loaded control shaft, and easy to hold and operate design...
- increases the accuracy and reliability of handheld control, because of its true analog-to-digital conversion...
- easily interfaces with Apple systems, via built-in ports.

System Configuration

To use the Apple Joystick, you will need:

- any Apple III system; or
- any Apple II or Apple II Plus system.

Technical Specifications

Parameter	Description
<i>(Apple III, II, II Plus systems):</i>	
Joystick Control:	resistive-type contacts
Switches:	(1) single pole, momentary pushbutton (1) single pole, three position (1 momentary) toggle switch
Axis position accuracy:	8 bits (1 part in 256)
Cable type:	6-wire
Cable length:	5 ft.
<i>(Apple III only):</i>	
Connector type:	DB-9
<i>Apple II, II Plus only):</i>	
Connector type:	16-pin DIP socket

**The Apple Joystick
Package
Order No.
A3M0007**

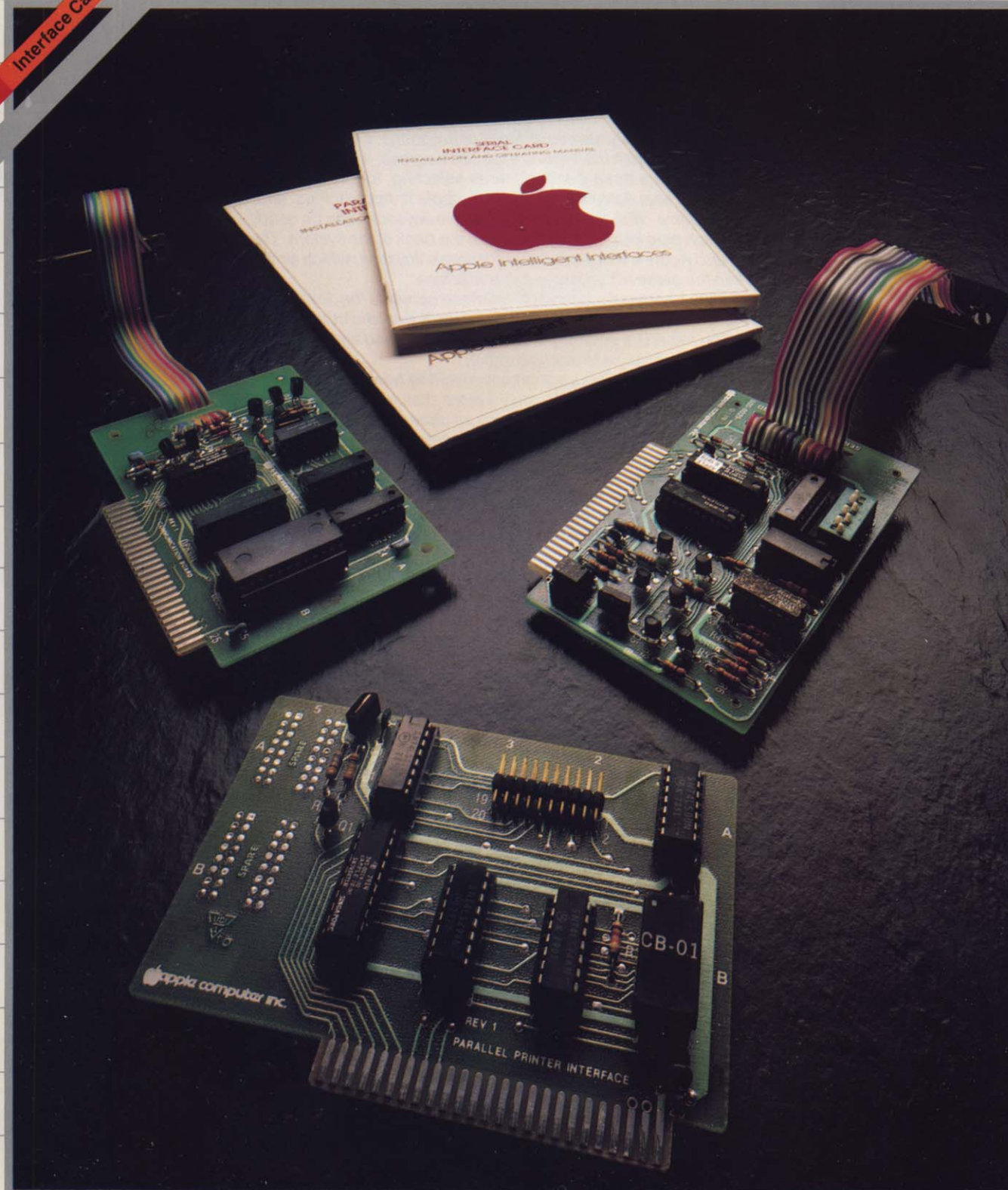
With your Apple Joystick order, you will receive:

- Apple Joystick;
- Joystick Owner's Guide.

Apple II/II Plus Interface Cards

Accessories

Intelligent Interfaces to Expand Your Apple System



Serial Interface Card

The Serial Interface Card allows an Apple computer to exchange data with other computers, printers, and accessories in serial format (one bit at a time). It is intended for applications that use data rates other than those handled by the Communications Interface Card (110 or 300 baud), or that involve serial printers that don't require "handshake."

The Serial Card features on-board firmware that provides BASIC control in both block-data-transfer and printer-operation modes. A number of hardware and software switches on the card serve to adapt it to a wide variety of applications, yet it remains simple to use because of its built-in intelligence.

NOTE: The Serial Interface Card will not allow you to use your Apple as an intelligent terminal. See the Communications Interface Card for this purpose.

Benefits

The Serial Interface Card...

- expands your system's usefulness by providing an industry standard (RS-232) interface to most computer accessories...
- eliminates the need to write or load assembly language control programs to control high speed printers and plotters, because of its built-in intelligence...
- is easily controlled from BASIC or Pascal using simple commands...
- provides access to a variety of local and remote computer equipment because it quickly transfers large blocks of data by telephone (through a modem), or directly, at speeds from 75-19K baud...
- offers easy set-up through switch-selectable preset conditions for speed, line length, auto line feed, and carriage return delay.

Technical Specifications

Parameter

Parameter	Description
Signal Level:	EIA RS-232C or 20mA current loop
Data Word Format:	1 start bit, 1 or 2 stop bits, 5-8 data bits; odd, even, or no parity. Checksum is optional.
Character Handling Options:	Lower-case characters optionally converted to upper-case or passed through unmodified and displayed in inverse video.

The Serial Interface Card Package Order No. A2B0005

With your Serial Interface Card order, you will receive:

- Serial Interface Card;
- DB-25 bulkhead connector and mounting bracket;
- Instruction Manual;
- Letter-quality printer control PROM.

Communications Interface Card

The Communications Interface Card allows you to connect your Apple to modems, CRT terminals, and other devices employing a bi-directional, serial (RS-232C) interface. The card's built-in intelligence lets you control these devices easily in BASIC.

Benefits

The Communications Interface Card...

- requires no external control software, because of its built-in intelligence...
- is easily controlled from BASIC or Pascal using simple commands...

- offers communications flexibility because it operates at 110 or 300 baud, half- or full-duplex...
- provides versatility in device attachment, because it is compatible with the industry-accepted, standard RS-232C Serial Interface.

Technical Specifications	Parameter	Description
	Signal Level:	EIA RS-232C
	Data Word Format:	1 start bit, 1 or 2 stop bits, 7 or 8 data bits; odd, even or no parity.

The Communications Interface Card Package
Order No. A2B0003

With your Communications Interface Card order, you will receive:

- Firmware in ROM;
- DB-25 bulkhead connector and mounting bracket;
- Demonstration tape;
- Communications Interface Card Operating Manual.

Parallel Printer Interface Card and Centronics Printer Interface Card

These Printer Interface Cards give you the capability to generate reports, listings, labels, and letters with your Apple computer, using a variety of parallel-interfaced printers. A special version of the card, the Centronics Interface Card, is available for use specifically with the Centronics 779 printer.

NOTE: The Centronics Interface Card does not support the Centronics 730 family of printers.

Benefits

Both the Parallel Printer Interface Card and the Centronics Interface Card...

- allow you to generate printed material on a variety of popular printers...
- eliminate the need to write or load assembly language programs to control attached printers, because of built-in intelligence...
- allow simple printer control from BASIC or Pascal...
- permit format flexibility by handling print formats up to 255 characters per line...
- allow printer speed flexibility, because both can accommodate printing of up to 5000 characters per second (3700 LPM at 80 characters per line).

Technical Specifications	Parameter	Description
	Data and Control:	
	Signals:	7-8 parallel data bits
	Print Line Width:	40-255 char/line. Automatic formatting of BASIC listings.

The Parallel Printer Interface Card Package
Order No. A2B0002

With your Parallel Printer Interface Card order, you will receive:

- Parallel Printer Interface Card;
- Ribbon cable with no connector on one end;
- Configuration jumper block;
- Instruction manual.

The Centronics Interface Card
Order No. A2B0007

With your Centronics Interface Card order, you will receive:

- Centronics Interface Card;
- Pre-wired configuration jumper block;
- Ribbon cable with Centronics connector;
- Instruction manual.

Apple IEEE-488 Interface Card

IEEE-488 Standard For Instrument Control

Apple II/II Plus versions available fourth quarter 1980; Apple III version available second quarter 1981.

With the Apple IEEE-488 Interface Card installed, Apple computer systems can be used to program and operate virtually any test, measurement, or control instrument that is bus-compatible with the IEEE-488 interface standard. The interface card plugs into any expansion slot in the Apple II, Apple II Plus, or Apple III computers. Its cable comes with a standard IEEE-488 bus plug for quick connection to IEEE-488 instruments.

The IEEE-488 interface card simplifies design and implementation of complex instrument systems—including frequency generators, digital multimeters, programmable power sources, and other equipment. Powerful resident software allows you to program instrument control in BASIC and assembly language using straightforward macro commands (FORTRAN and Pascal users can access the card through assembly language routines). And there's no need to worry about signal protocol on the bus, because the card's resident software handles it all for you.

The Apple IEEE-488 Interface Card lets you take advantage of the power, reliability, and reasonable price of Apple computers, to control a wide variety of scientific/industrial instruments.

Benefits

The Apple IEEE-488 Interface Card . . .

- simplifies the design of instrumentation systems, because it conforms to the industry-wide IEEE-488 standard . . .
- lets you use simple commands to operate the most complex instruments . . .
- expands your instrument control capabilities, by using fully-integrated Apple II and Apple III computer systems . . .
- provides for flexibility in system design, including the ability to plug multiple interface cards into a single Apple computer.

System Configuration

To use the Apple IEEE-488 Interface Card, you will need:

- any Apple III; or
- Apple II or Apple II Plus, each with a minimum 32K of memory;
- Apple Disk II with controller;
- a video monitor.

Technical Specifications

As a Listener/Talker/Controller, the Apple IEEE-488 Interface Card provides a fully compatible subset of the IEEE-488 standard. (Its only limitation is that it cannot pass control to another IEEE-488 controller.) The following is a list of GPIB (General Purpose Instrument Bus) commands that can be used with the Interface Card:

WRITE	Write Data Out
WRITECNT	Write Data Out With Count
READ	Read Data In
READCNT	Read Data In With Count
XFER	Transfer Data
TRIGR	Group Execute Trigger
CLRAL	Clear All Devices
CLEAR	Clear Selected Devices
REMAI	Remote Enable All
REMDV	Remote Selected Devices
LLKAL	Local Lockout All Devices
LOCAL	Local Mode All Devices
LOCDV	Local Selected Devices
SRQD	Service Requested
SPOLL	Serial Poll
PPOLL	Parallel Poll
PPENB	Parallel Poll Enable

PPDIS	Parallel Poll Disable
PPUAL	Parallel Poll Unconfigure All
DEVICE	Device Number
LINEFEED	Line Feed Off/On
EOS	End of String Character
SCREEN	Screen Control
ABORT	Abort

**The Apple III
IEEE-488 Interface
Card Package
Order No. A3B0015**

With Your Apple III IEEE-488 Interface Card order, you will receive:

- Apple III IEEE-488 Interface Card;
- Apple III IEEE-488 Interface Card driver diskette;
- Card-to-instrument cable with IEEE-488 standard plug;
- Instruction manual.

**The Apple II/II Plus
IEEE-488 Interface
Card Package
Order No. A2B0015**

With your Apple II/II Plus IEEE-488 Interface Card order, you will receive:

- Apple II IEEE-488 Interface Card;
- On-board, ROM-based software;
- Card-to-instrument cable with IEEE-488 standard plug;
- Instruction manual.

Apple III Universal Parallel Interface Card

Three Interface Cards in One

Available first quarter 1981

The Apple III Universal Parallel Interface (UPI) Card lets users attach a variety of parallel-mode printers—including most dot matrix models, plus some thermal and daisy wheel units—to Apple III computer systems. Included with the Card is a diskette containing an operating system driver, which lets you custom configure the card to work with the printer you are using.

Because the UPI Card also emulates two Apple II interface cards—the Centronics Interface Card and the Parallel Interface Card—it's able to control your printer directly from Apple III software, or from Apple II software running in emulation mode. And it spares you from having to juggle different cards for different jobs.

The Apple III UPI Card can also be used with equipment other than printers, functioning as a general-purpose, parallel input/output interface. Sixteen output lines (two groups of eight lines each) and eight input lines provide wide data paths for sending, receiving, and acknowledging data transfers. Other features of the Card's general-purpose function include: control signals with software-selectable priority; a programmable pulse-length strobe line; and software interrupt capabilities.

Because it's three cards in one, the Apple III Universal Parallel Interface Card gives you the convenience of printer plug-compatibility, the economy of Apple II printer emulation, and the flexibility of a fully-featured parallel interface.

Benefits

The Universal Parallel Interface Card...

- increases system flexibility, by permitting control of a wide range of dot matrix, thermal, and daisy wheel printers...
- reduces system costs and hardware requirements, by providing complete Apple II parallel printer emulation...
- broadens the Apple III's capabilities, because it can also be used as a powerful, general-purpose parallel input/output port for a wide range of custom applications.

System Configuration

To use the Universal Parallel Interface Card, you will need:

- any Apple III system with an available expansion slot.

Technical Specifications

Parameter	Description
Data Lines:	16 output (24 mA at 0.5V) 8 input (1 LSTTL load)
Control Lines:	Data Ready Output Acknowledge Input Reset Data Ready Output Strobe Signal Ground Chassis Ground
Control Signal Polarity:	Software settable
Signal Levels:	LSTTL
Strobe Length:	1-15 μ sec in 1 μ sec steps
Interrupts:	Software controlled

**The Apple III
Universal Parallel
Interface Card
Package
Order No. A3B0002**

With your Apple III Universal Parallel Interface Card order, you will receive:

- Universal Parallel Interface Card;
- Software driver diskette;
- Instruction manual;
- Centronics-type interface cable;
- Ribbon cable connector.

Expansion Options

Growing Your Apple System



Apple Language System

This system allows Apple users to take immediate advantage of the powerful Pascal language, as well as the Integer and Applesoft BASIC interpreters. It does this by means of the Language Card, which provides 16K bytes of RAM memory that electrically replace the ROM firmware built into each Apple. Upon start-up, this RAM memory is automatically loaded from disk with the user's choice of languages, then protected from change. This technique gives both Apple II and II Plus owners access to all available languages, as well as the hardware needed to run future language processors as they appear.

Equally important, this product comes with a set of conversion PROMs that allow for a 20% increase in disk capacity, by implementing a compatible 16-sector (143K byte) disk format. (This increase is available to all Pascal users, and to BASIC users who work with the DOS 3.3 Operating System.)

For a full description of the Pascal Operating System supplied with this product, see **Apple Pascal** in the Software section of this reference guide.

The Apple Language System Package Order No. A2B0006

With your Apple Language System order, you will receive:

- Apple Language Card containing:
 - 16K bytes of RAM on a plug-in card;
 - Auto-Start monitor ROM;
- Four (4) Pascal System Diskettes;
- BASICS diskette;
- Two (2) 16-sector PROMs for the Apple Disk II Controller;
- IC puller;
- Reference manuals for Pascal, Applesoft BASIC, Integer BASIC, and the Language Card.

Applesoft Firmware Card

The Applesoft Firmware Card provides access to the library of programs written in this extended BASIC language. It contains hardware and software controls that allow it to electrically replace the existing Integer BASIC firmware in Apple II computers.

A complete description of the Applesoft Language may be found in the **Software** section of this reference guide.

The Applesoft Firmware Card Package Order No. A2B0009

With your Applesoft Firmware Card order, you will receive:

- Applesoft Firmware Card;
- Auto-start monitor ROM;
- Applesoft II Reference Manual.

Integer Basic Firmware Card

This card provides access to a library of programs written in the Integer BASIC language.

It contains hardware and software controls that allow it to electrically replace the existing Applesoft BASIC firmware in Apple II Plus computers.

A complete description of the Integer BASIC language may be found in the **Software** section of this reference guide.

The Integer Basic Firmware Card Package
Order No. A2B0010

With your Integer Firmware Card order, you will receive:

- Integer Firmware Card;
- BASIC Programming Manual;
- Apple II monitor ROM;
- Programmer's Aid #1 ROM;
- Programmer's Aid #1 Installation and Operation manual.

Auto-Start ROM

The Auto-Start ROM makes any Apple II friendlier and easier to use by adding such features as:

- automatic start-up in BASIC for systems without disks;
- automatic disk program loading when system turns on;
- RESET protection (RESET key halts programs, returns to BASIC);
- easy screen editing, with up to 90% fewer keystrokes.

The device is a plug-in replacement for the existing Apple II monitor ROM. It is included with Apple II Plus systems, the Applesoft Firmware Card, and the Apple Language System.

The Auto-Start ROM Package
Order No. A2M0027

With your Auto-Start ROM order, you will receive:

- Auto-Start ROM;
- Auto-Start ROM Installation and Operation Manual.

16K Byte Expansion Memory Module

This module allows user memory expansion in 16K byte increments for any 16K or 32K Apple II computer.

The 16K Byte Expansion Memory Module Package
Order No. A2M0016

With your Expansion Memory Module order, you will receive:

- Eight (8) 16K bit RAM devices;
- Installation instructions;
- Test program to ensure installation is correct.

Hobby/Prototyping Card

Create your own Apple interface boards with this wire-wrap card. The 2 3/4" x 7", double-sided circuit board includes a hole pattern (on 100-mil centers) that accepts all conventional ICs and passive components. It plugs directly into any Apple expansion connector, and fits entirely within the computer case.

The Hobby/Prototyping Card Package
Order No. A2B0001

With your Hobby/Prototyping Card order, you will receive:

- Hobby/Prototyping Card;
- Complete bus documentation.

Programmer's Aid #1

Programmer's Aid #1 is a ROM-based library of routines to simplify and enhance your Integer BASIC programs. Its capabilities include:

- high resolution graphics generation;
- program renumbering and linking;
- tape verification;
- musical tone generation (12 timbres and 5 octaves);
- RAM testing;
- machine language program relocation.

Note: Programmer's Aid #1 is now included with Apple II computers and with the Integer BASIC Firmware Card.

The Programmer's Aid #1 Package
Order No. A2M0019

With your order for Programmer's Aid #1, you will receive:

- 2K byte ROM;
- Programmer's Aid #1 Installation and Operating Manual.

Apple III OEM Prototyping Card

An Effective Aid For Custom Interface Design

Apple's OEM Prototyping Card is a convenient, modular printed circuit card on which to build custom interfaces for the Apple III Computer System. The card offers ample space to handle the majority of interface designs. It accommodates most integrated circuits and components, and has built-in facilities for attaching a variety of edge connectors and switches to your circuits. Also included are decoupling networks and shields to ensure maximum immunity from RF noise.

Equally important, the OEM Prototyping Card assures you of Apple product quality and compatibility. The card is double-sided, with plated-through holes for positive connection. And its 50-pin, gold-plated edge connector plugs right into any unused expansion slot in your Apple III, giving you complete access to all of the signals on the bus.

Even the most advanced custom interfaces for the Apple III are easier to design and more reliable to use, when you start with Apple's OEM Prototyping Card.

Benefits

The Apple III OEM Prototyping Card...

- simplifies designing even the most advanced system interfaces, with its convenient, built-in RF shielding, power bus, and other features...
- allows greater flexibility, because it accepts a wide range and combination of components mounted in various positions...
- saves you time and money implementing Apple III custom interfaces, by reducing the effort required to assemble working prototypes...
- assures you of Apple reliability and compatibility, because of the card's high-quality printed circuits, connectors, and construction.

System Configuration

To use the Apple III OEM Prototyping Card, you will need:

- any Apple III system with an available expansion slot.

Technical Specifications

Circuit Development Area (A):

- 5.40" x 3.70" space;
- 0.10" hole spacing;
- accepts up to 42, 14-pin; 36, 16-pin; 24, 24-pin; or 12, 40-pin DIP packages; or combinations thereof.

Input Buffering Area (B):

- Two 8-line RC decoupling networks;
- 1-MHz RF rolloff.

Connector Interface Areas:

- Area C: for up to 67-pin, "D"-type connectors;
- Area D: for up to 50-pin, ribbon cable connectors.

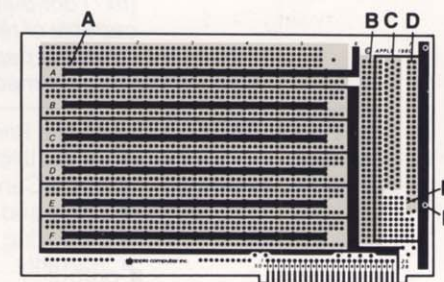
Additional Board Areas:

- SPST switch position (E);
- RF Shield (supplied) connection points (F);
- 50-pin, gold-plated edge connector.

The Apple III OEM Prototyping Card Package
Order No. A3B0001

With your Apple III OEM Prototyping Card order, you will receive:

- OEM Prototyping Card;
- Two 8-line RC networks for RF isolation;
- One RF Shield;
- Four power supply decoupling capacitors;
- Instruction manual (includes Apple III Bus technical description).



Expansion Options Addendum

Many companies offer both hardware and software products compatible with Apple Computer Systems. The products listed below are manufactured by others, but may be ordered from Apple through Apple Authorized Dealers.

Modem IIB

Modem IIB is a communications package that extends the power of your Apple by allowing it to tap the resources of timesharing services, computerized bulletin boards or your office computer from the comfort of your own home. It allows you to transfer programs to a friend's Apple over the telephone network. It even permits you to control an Apple in San Francisco from another computer in New York. And, with programs like Apple's Portfolio Evaluator, it makes your Apple an intelligent terminal, able to request and process information from large remote data bases.

The coupler is a 103A-type, asynchronous device, suitable for data communications at 110 or 300 baud (10 or 30 char/sec). It operates in either the Originate or Answer modes. Connection to the phone system is accomplished by placing the telephone handset in position on top of the modem. No permanent connection or wiring changes are required.

**The Modem IIB
Package**
Order No.
A2M0017-U.S.
A2M0017P-
European

With your Modem IIB order, you will receive:

- Acoustic coupler (modem);
- Apple Communications Interface Card (optional);
- Demonstration Tape;
- Connecting cable;
- Documentation.

Printer IIA (Centronics 779)

Printer IIA is a medium-speed impact printer for home and business applications requiring low cost, multi-copy printing. It prints 80 to 132 (5x7) dot-matrix characters per line, at 60 characters per second. It is capable of reproducing the 64-character, upper-case ASCII set, and its tractor paper feed allows printing of five-part forms in widths to 9.8". The mechanism is packaged in a low-profile, desk-top cabinet.

**The Printer IIA
Package**
Order No. A2M0011

With your Printer IIA order, you will receive:

- Printer IIA;
- Apple Centronics Printer Interface Card;
- Cable and connector;
- Operating documentation;
- Warranty.

Clock/Calendar Card (Mountain Computer)

This plug-in card provides a 388-day calendar and clock, with resolution to 1/1000 second. A built-in, rechargeable battery keeps the clock on time up to four days without system power, and external batteries may be used for longer periods. Optional interrupt capability simplifies control applications.

**The Clock/Calendar
Card Package**
Order No. A2M0024

With your Clock/Calendar Card order, you will receive:

- Clock/Calendar Card;
- Rechargeable battery;
- Operating instructions.

The Apple One-Year Extended Warranty

Low Cost Protection for Your Apple

The Apple Extended Warranty is an insurance policy for your Apple. It covers all Apple-manufactured hardware and system software for one full year.

Benefits

The Apple Extended Warranty...

- assures you of continuing product excellence, because any corrective update to Apple System software is yours free*...
- grows with your system, because all Apple-manufactured products, including those you buy during the one-year period, are automatically covered...
- offers you the lowest cost protection in the industry, less than 3/4% per month of a typical system's price.



The Apple Extended Warranty— A Closer Look

Apple has become a leader in the personal computer industry by providing the best products available on the market—and keeping them the best by finding ways to improve them. When you're part of the Apple Extended Warranty Program, any corrective update to Apple System software is yours—free. System software includes Integer BASIC, Applesoft BASIC, DOS, Apple Pascal, and more.

Because there are more than 500 Apple Authorized Service Centers, there's probably one located near you. Apple guarantees that your Extended Warranty will be honored at all of its service centers—added insurance should you move to a new area. Local service means you won't have to wait extra days while your Apple is shipped to and from a repair center.

If you purchase additional Apple products during the one-year Extended Warranty period, they are automatically covered. You don't have to buy more coverage or another warranty. And your Apple Extended Warranty is renewable in one-year increments. Although the price in future years can't be guaranteed, you're assured of the same outstanding coverage—and benefits—that you enjoyed the first year.

Although Apple recommends—for your maximum protection—that you buy your Extended Warranty with your system, Apple gives you the option to do so at any time. However, should your Apple be out of its initial 90-day warranty period, you'll need to take it to your local Apple service dealer for an owner-paid inspection before you can purchase the Extended Warranty.

The Apple Extended Warranty Package

Order No. A2G0003

With your Apple Extended Warranty order, you'll receive an attractive folder, designed for easy, convenient storage. Inside, you'll find:

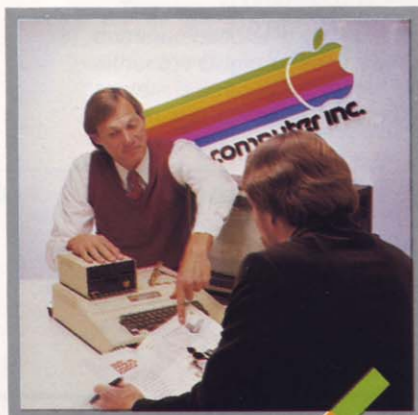
- a booklet explaining how you can take full advantage of Apple's warranty and service programs;
- a document containing all terms and conditions of the warranty;
- a warranty agreement in triplicate—one copy for you, one for your local Apple service dealer, and one for Apple's worldwide headquarters;
- warranty validation labels to identify your warranty and prevent others from using it.

*Note: When system software updates include significant product enhancements, a nominal fee will be charged.

Ask the Expert—Your Local Apple Dealer

Apple has a worldwide network of more than 1,000 dealers and service centers. There's probably one located near you. Your local dealer understands your needs and is in the best position to address them individually.

Visit your dealer for a demonstration of the Apple Personal Computer System. Talk to him about what you want your system to do for you. Then tell him you want to put an Apple to work. He'll do the rest.



Notes: