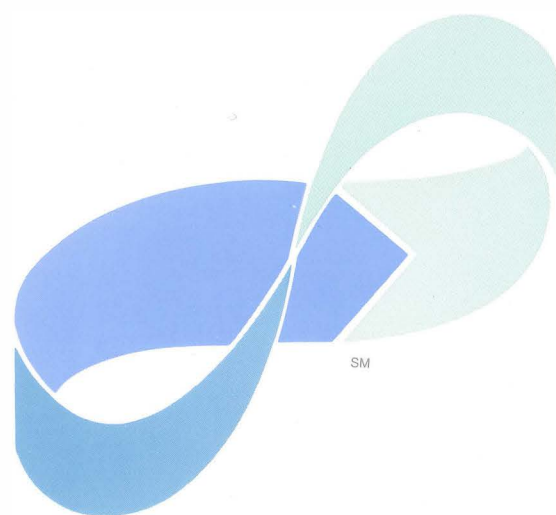


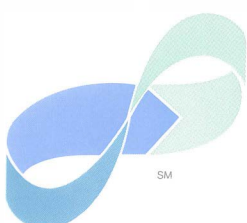


Apple
Developer
Services



Product
Information

Apple
Developer
Services



Product
Information





September, 1989

Dear Apple Developer:

We're pleased to present you with the first update of *The Information Exchange: Technical Guidebook*. To update your existing *Technical Guidebook*, remove the entire paper contents, NOT the Apple Product Data Sheets or the tabs, and replace them with this package. If you haven't received your *Technical Guidebook* binder, you will when you recertify into the Apple Partners program.

We've included two new main tabs in this update—an index tab and a price list tab. The index and index tab should be placed in the back of your guidebook; the price list tab is being provided so that you can keep your price lists in one central location.

This update of the *Technical Guidebook* does not include Apple Product Data Sheets, because we now send data sheets as they become available in the Developer Programs monthly mailings. Check the Developer Service bulletin board on the AppleLink network [path: Developer Programs: Technical Guidebook Program/ Updates: Apple Product Data Sheets] for a list of data sheets you should currently have in your *Technical Guidebook*. If you need a particular data sheet, send an AppleLink message to DEVSERVICES, and we'll send it to you. Please understand that we can furnish only one copy of each data sheet per developer.

In addition to the updated information, this edition of the *Technical Guidebook* contains new and exciting information, including the following documents:

- Object-oriented programming and MacApp
- MacWorkStation
- The Script Manager and Script Systems for international development
- LocalTalk cable connections
- Checklist for Apple's Human Interface Guidelines

We've also included a quick-reference chart and, as mentioned above, an index to help you navigate through all of the information. For a brief overview of the information included in the guidebook, see "Using the Guidebook" in the Introduction section.

As you've heard many times from us, your feedback is very important. To let us know what you want included in future editions of the *Technical Guidebook*, complete and return the Business Reply Card in your guidebook as soon as possible. Your response to the first edition of the guidebook was excellent, and very valuable, and in return, we've tried to incorporate many of your requests in this update. Let us know if we're on the right track.

Once again, thanks for your hard work and support of Apple Computer, Inc. As always, we look forward to working with you and value your partnership.

Good luck and much success in developing excellent Apple-compatible products.

Sincerely,

A handwritten signature in cursive script that reads "Eileen Devlin". The signature is fluid and elegant, with a large initial "E" and a long, sweeping tail on the "n".

Eileen Devlin

Program Manager, *Technical Guidebook*

AppleLink: DEVLIN.E

Acknowledgements

The *Technical Guidebook* is managed by Developer Programs, however, it could not have been possible without the help of a lot of dedicated people both at and outside of Apple Computer, Inc. Many people spent numerous hours in research, writing, and producing this publication. We wish to express our sincere thanks to all of the people who helped create this and previous versions of the *Technical Guidebook*.

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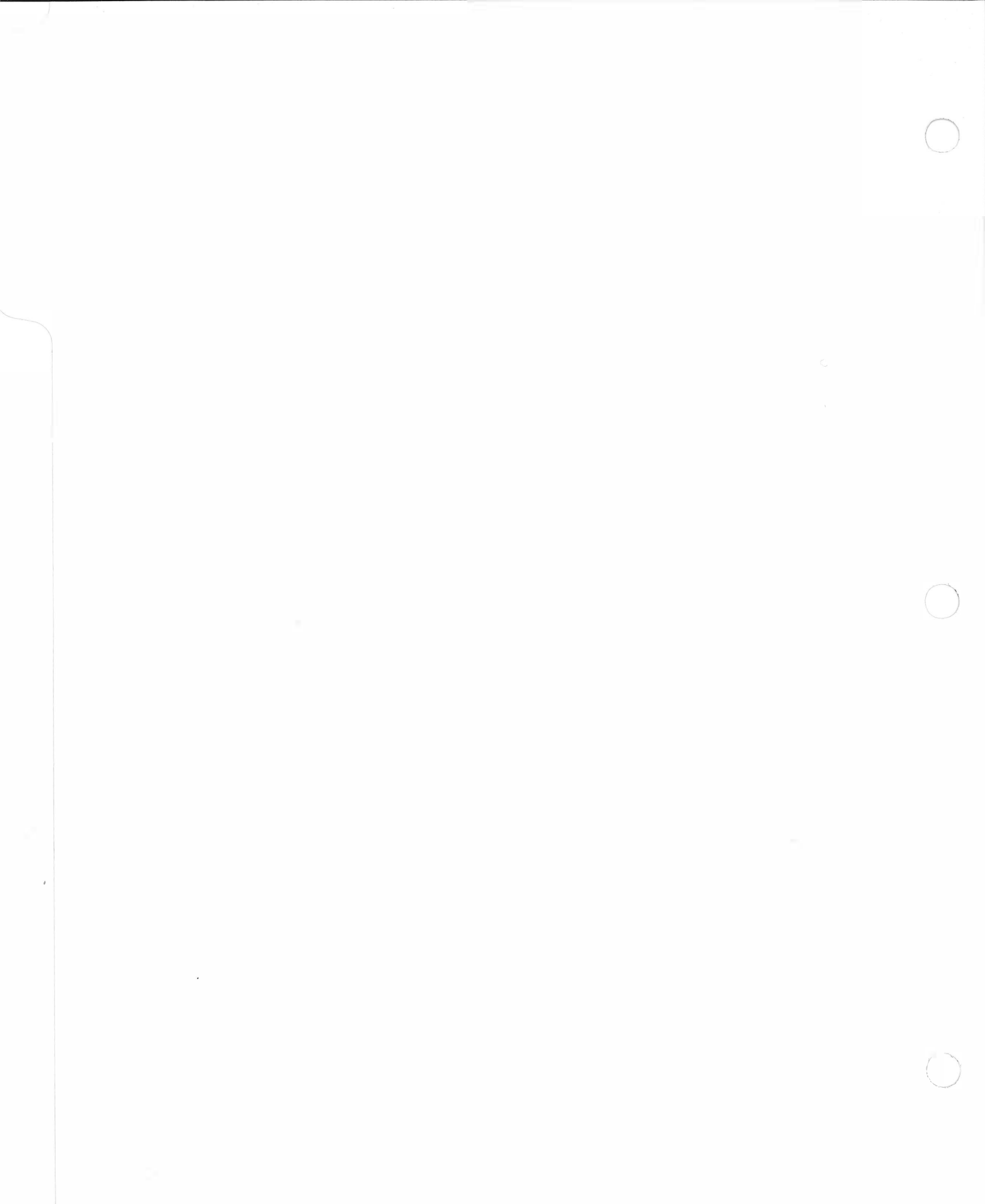
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Using the Technical Guidebook

The Information Exchange: Technical Guidebook has been designed for the person in your company that needs Apple product and development information. It is not necessarily a “how-to manual” but rather a reference tool to help you better understand Apple® products and platforms. Additionally, this guidebook contains information that will help you to determine the most effective ways to work with Apple throughout your development process.

How This Guidebook Is Organized

You will find that the *Technical Guidebook* is divided into the following major sections:

- Introduction
- Apple Organization
- Development Platforms
- Developer Technical Support
- International Development Support
- Training Resources
- Other Resources
- Apple Product Data Sheets
- Index

Some of the sections are broken down into subsections for easier and faster access to information. Within each section or subsection, you will find information encompassing a wide range of subject matter. This information ranges from general organizational information to detailed product development information.

The following is a brief description of each main section:

Apple Organization

The Apple Organization section provides information on groups within Apple that can assist you with your development efforts. Please review this section carefully, so that you know who to reach out to at Apple for information and assistance. You will find important contact names, phone numbers, and AppleLink® addresses here.

Development Platforms

The Development Platforms section provides information on Apple's development platforms. There is a wealth of information here, including documents detailing A/UX®, CD-ROM and the AppleCD SC™, CL/1™ MacApp and Object-Oriented programming, DEC™ connectivity, LocalTalk cable connections, and much more. Included is an overview of each development platform, recommended hardware configurations and documentation, Q & A's and more.

Developer Technical Support

The Developer Technical Support section provides information on how to work with Apple's Developer Technical Support (DTS) group. The DTS group provides many resources to help you with your development efforts, such as Technical Notes, sample code, a Q&A HyperCard Stack compiled from the most frequently posed questions to DTS, and bug reporting procedures. Refer to this section to determine the most effective method of accessing technical support.

International Development Support

The International Development Support section addresses “localizing,” or “internationalizing,” your product at the very early stages of product development. This section references support tools and support programs to assist you in making your product available for international markets. There’s also information on the Script Manager and Script Systems here. Localizing your product for international distribution may prove to be an excellent business decision.

Training Resources

The Training Resources section provides information on courses offered by Apple’s Developer University. Developer University provides expert instruction for beginning and advanced Macintosh® programmers. You will also find information—descriptions, locations, and fees—on the A/UX Administration courses offered by Apple’s Regional Training Centers. The most current information about training courses can be found on the AppleLink® network [path: Developer Services: Developer University].

Other Resources

The Other Resources section contains information on developer associations. These associations can put you in touch with people who share your interests, goals, and occupation, and who can help by providing you with important industry information or pointing you in the right direction to find the information you need.

Apple Product Data Sheets

The Apple Product Data Sheets section consists of product data sheets on Apple II and Macintosh CPUs, A/UX, networking and connectivity products, monitors, keyboards, storage devices, and much more. These product data sheets consist of an overview, features and benefits listing, and technical specifications for each product. Data sheets are being distributed in the Developer Programs monthly mailings as they become available, with instruction on where to place the data sheets in your *Technical Guidebook*.

Updates

The Technical Guidebook is published every six months. Between updates, the Developer Services bulletin board on the AppleLink network will offer the latest information on products, development platforms, and programs [path: Developer Programs: Technical Guidebook Program/Updates].

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Apple Organization



Quick Reference Chart

Group Name	Phone/AppleLink/ Mail Stop	When to Contact
APDA from within the U.S. from Canada from outside the U.S.	1-800-282-2732 1-800-637-0029 (408) 526-3910 APDA M/S 75-6A	Contact APDA™ to order Apple development tools and documentation, as well as many third-party development products.
Apple II Developer Technical Support	none AIIDTS M/S 75-3A	Provides you with the answers to your specific Apple® II development questions. These include questions and bug reports on Apple II ROMs, development systems, system software, and other programming issues.
AppleLink Helpline	(408) 974-3309 COMMENTS M/S 37R	Contact the Helpline if you have questions concerning your AppleLink® subscription.
Customer Relations	(408) 252-2775	Contact Customer Relations if you have questions regarding Apple consumer promotions, updates, and upgrade programs.
Customer Service	1-800-538-9696	Call Customer Service to find a local authorized Apple dealer. Dealers can help you with questions about using, repairing, or upgrading Apple products. These include questions about installing RAM, hardware/software problems of all kinds, and questions about Apple software availability.
	1-800-538-9696 ext. 100	Call Customer Service to find a local A/UX® dealer.
	1-800-538-9696 ext. 500	Call Customer Service to find a local user group. User groups can provide a wealth of information, from power-user shortcuts to example code.

Developer Events	none DEV.EVENTS M/S 75-2E	Contact the Developer Events group for information about upcoming developer conferences and events.
Developer Hotline	(408) 974-4897 DEVSERVICES M/S 75-2C	Contact the Developer Hotline for general nontechnical support. This includes information on Apple mailings, address changes, requests for order forms, and general questions about the Partners and Associates Programs. Checking the Developer Services bulletin board on the AppleLink network first can save you a phone call. The developer price list, developer order forms, technical and product information, training schedules, and a lot more are posted here.
Developer University Registrar	(408) 974-6215 DEVUNIV M/S 75-2B	Contact the Developer University Registrar to obtain a course catalog and registration forms for Apple's developer technical training classes.
Macintosh Developer Technical Support	none MACDTS M/S 75-3A	Provides you with answers to your specific Macintosh® development technical questions. These include questions and bug reports on Macintosh ROMs, development systems, system software, and other programming issues.
Software Licensing	(408) 974-4667 SW.LICENSE M/S 38I	Contact the Software Licensing group for information about getting a license for system software and other Apple-proprietary software so that you can legally distribute it with your product. This group also licenses some source code, for educational purposes.

**Support Centers
(Hardware Ordering)**

Sunnyvale Support	(408) 734-9790	General number for the Sunnyvale Support Center. Call the support centers to check on the status of an order and to check on product availability.
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Janet O'Connor
(408) 744-6349
OCONNOR4
M/S 17B

Contact if you are located in one of the following states: Arizona, Arkansas, Colorado, Kansas, Hawaii, Iowa, Louisiana, Missouri, Minnesota, Nevada, New Mexico, Oklahoma, Texas, Utah, and Southern California (CA area codes: 209, 213, 619, 714, 805, 818).

Janice Bronte
(408) 744-6265
BRONTE1
M/S 17B

Contact if you are located in the following states: Alaska, Idaho, Montana, Nebraska, North Dakota, Oregon, South Dakota, Washington, Wyoming, and Northern California (CA area codes: 408, 415, 707, 916).

Charlotte Support

(704) 357-4500

General number for the Charlotte Support Center.

Mary Jane Crouch
(704) 357-4559
CROUCH.MJ

Contact if you are located in one of the following states: Alabama, Connecticut, Delaware, District of Columbia, Florida, Georgia, Illinois, Indiana, Kentucky, Maine, Maryland, Massachusetts, Michigan, Mississippi, New Hampshire, New Jersey, New York, North Carolina, Ohio, Pennsylvania, Rhode Island, South Carolina, Tennessee, Vermont, Virginia, West Virginia, Wisconsin.



If you are a programmer or developer of software or hardware compatible with Apple® products, and you need fast access to the latest Apple and third-party technical information and development tools, APDA is for you.

APDA Overview

APDA is the source for Apple and selected third-party development tools, compilers, and technical documentation essential for programming on Apple systems. APDA provides fast and easy access to the widest available selection of Apple and third-party technical information and development tools for the Apple® II, Apple IIGS®, and Macintosh® personal computers.

APDA provides one-stop shopping for hundreds of software products and books made with the programmer or developer in mind. Its 25,000 customers represent in-house corporate developers, university professors and students, value-added resellers, and hobbyists, as well as commercial developers of hardware and software for Apple systems. Apple's non-retail development products such as MPW are available only to APDA customers.

Programs and Benefits

As an APDA customer, you are entitled to the following:

- *Wide product selection* – Provides hundreds of titles from Apple and third parties, offering the widest variety of Apple-compatible development products available from one source. Products include the Macintosh Programmer's Workshop (MPW™), Apple IIGS Programmer's Workshop (APW™), object-oriented MacApp®, MacWorkStation™, and HyperCard® development tools, in addition to technical documentation from the Apple Technical Library published by Addison-Wesley.
- *Quarterly APDA log catalog and information source* – Provides easy-to-read, accurate product descriptions. Other features include product highlights, new product previews, a readers' forum, and development-oriented articles written by Apple and industry development experts.
- *Customer Service* – Offers multiple methods of ordering and payment, for maximum customer convenience, and also discounts for high-volume purchases on certain products.

Ordering and Membership Information

Once you are certified as an Apple Partner or Apple Associate, you will automatically receive an APDA membership as part of your Developer Services package. If you are not an APDA member, you will become a member during Recertification. You may also become an APDA member prior to Recertification, by contacting APDA at the address or phone number listed below.

APDA will accept members from around the world, though from some nations we require a letter of assurance. To facilitate order-taking and delivery, we ask that payment be made in U.S. currency, either via credit card, wire transfers or checks drawn from U.S. banks. We also suggest that the international order be made via electronic mail or fax, after which we will contact you with the exact total charge including shipping, handling and insurance.

To order product from APDA, you may contact APDA directly, or get an order form via the AppleLink® network in the Developer Services bulletin board [AppleLink path: APDA: How to order from APDA].

APDA

Apple Computer, Inc.

20525 Mariani Avenue, M/S 75-6A

Cupertino, CA 95014

1-800-282-APDA or 1-800-282-2732

From Canada 1-800-637-0029

From outside the U.S. (408) 562-3910

AppleLink: APDA

CompuServe: 76666, 2045

MacNet: APDA

MCI: Postrom

GEnie: A.DEVELOPER3

TLX: 171-576

Fax: (408) 562-3971



Apple's Software Licensing Program

If your software or hardware product uses all or part of some Apple® software (for example, an operating system, U.S. or international version), you will need to license the use of that software from Apple Computer's Software Licensing Department. This applies to any Apple-compatible products that will be sold, used internally, or given away. The Software Licensing Department also handles some special license agreements, which are mentioned below.

When to Contact the Software Licensing Department

It is critical that you contact the Software Licensing Department before producing written materials associated with your product (such as manuals and disk labels), because there are several legal requirements that you need to be aware of. For example, Apple requires you to include a warranty disclaimer and other legal information in your manual.

If your product will ship overseas, the warranty disclaimer and legal requirements will differ depending on the individual country. For more information, you should speak directly with the third party manager in each Apple subsidiary. You will find the names, addresses, phone numbers and AppleLink addresses for the third party managers on the AppleLink network [path: Developer Services: Whom should I contact at Apple: International Contacts].

Special License Agreements

Some Apple products, such as AppleTalk® for VMS, and Apple Desktop Bus™ Specifications are available from Apple *only* upon the execution of a special license agreement. If you want to use these Apple products for your own product development, you must contact the Software Licensing Department. Additionally, requests for Apple source code are handled by the Software Licensing Department and require a written proposal.

Software License Agreement Packet

The Software License Agreement Packet you receive from Apple's Software Licensing Department contains the following:

- Two copies of the Software License Agreement, which describes your legal rights and limitations when distributing Apple-copyrighted software
- Two copies of the HyperCard® License Agreement and HyperCard Technical Guidelines
- A list of Apple software available for licensing for both U.S. and international products—includes information on license fees, special license agreements, source code agreements, and so on.
- Third-party trademark guidelines for the United States

The license fees, which vary depending on the Apple software, authorizes you to use the Apple software in your program. Apple does not receive royalties.

**Your Benefits as a Licensed
Apple Developer**

As a properly licensed developer, you will have the right to use Apple-produced software, which would be costly and time-consuming to develop yourself. In addition, you will receive free updates to the software you are using in your program, so you can always keep your product up-to-date.

Questions

If you have questions, or need to obtain the Software Licensing Packet, please contact Apple's Software Licensing Department at:

Apple Computer, Inc.
20525 Mariani Avenue, M/S 38I
Cupertino, CA 95014
Attention: Software Licensing Department
(408) 974-4667
AppleLink®: SW.LICENSE
MCI: 312-5360

Development Platforms

Apple II



The Apple IIGS® personal computer, with its high-performance graphics, sound, and other hardware features, has been a top-selling low-cost computer since its introduction in 1986. As an Apple IIGS developer, not only do you already have over a half million owners looking forward to new products, but also a new operating system (GS/OS™), a comprehensive set of system software tools, Apple IIGS native development and Macintosh-to-IIGS cross-development systems, and other programming aids to reduce your product development time.

As a new Apple developer, you should have received the Starter Kit containing basic resources, such as services, tools, and publications, to assist you with your development efforts on the Apple® II. These resources will make your programming efforts easier and more productive.

The following sections detail the components of the Starter Kit, as well as other helpful resources you may want to acquire to assist you with your development efforts. For information on Apple II and Apple IIGS Development Tools, refer to the Apple II Development Tools note in this section.

Basic Resources: Starter Kit Contents

Subscriptions—The following are provided to new developers who sign up for Apple's Developer Program:

- *AppleLink® network subscription* – Your communication line to Apple and other developers gives you easy access to current technical, marketing, product, and program information
- *APDA™ subscription* – APDA provides up-to-date technical documentation, example programs, development tools, utilities and development environments, books, and more

Developer Library – The following collection is available in the Starter Kit or from APDA:

- *Apple II and IIGS System Software* – Latest Apple II and Apple IIGS system software disks for testing your product
- *Technical Introduction to the Apple IIGS* – Overview of all aspects of the Apple IIGS, including its design and features, development environments, and the Toolbox
- *Programmers Introduction to the Apple IIGS* – Using a sample program as an example, this book demonstrates event-driven programming, Toolbox calls, effective segmentation, file handling, and other Apple IIGS programming techniques; C, Pascal, and assembly-language versions of the sample program are included on an accompanying disk
- *Apple IIGS Hardware Reference* (a must for hardware developers) – Describes system hardware components: CPU, custom ICs, memory, video, sound, Apple Desktop Bus™, and built-in I/O.

- *Apple IIGS Firmware Reference* – Extensive description of the internal operations of the Apple IIGS, including the system monitor, mini-assembler, disassembler, interrupt-handler, Apple Desktop Bus, mouse, video, serial port, disk drive firmware, and SmartPort (this is the best resource for the Apple II SmartPort protocol). Firmware entry points, vectors, soft-switches, and the Apple IIGS control panel are also detailed.
- *Apple IIGS Toolbox Reference*, Volumes 1 (A-M) and 2 (N-Z) – Comprehensive guide to the Apple IIGS Toolbox, describing syntax, data structures, error handling and more than 800 ready-to-use routines
- *Apple IIGS Toolbox Reference Update* – Documents new sound tools not described in the *Apple IIGS Toolbox Reference* volumes and updates the *Toolbox Reference* volumes with 65 new tool call descriptions and other corrections and additions
- *GS/OS Reference*, Volumes I and II – Volume I describes the high-level GS/OS application calls for accessing files and modifying the operating environment, and Volume II describes the low-level GS/OS-device interface and how to write device drivers
- *Apple II Technical Notes* – Detailed technical material, including file-type and bug notes, written by the Apple II Developer Technical Support group to expand upon and clarify Apple II/IIGS technical manuals
- *Apple IIGS Source Code Sampler*, Volume I – Source code for 13 Apple IIGS sample applications, demonstrating animation techniques and how to use many of the Apple IIGS tools; also included are C and assembly-language templates that can be used as a basis for applications software
- *Software Development for International Markets* (APDA draft) – Guidelines, tools, and techniques for localizing your software for international use
- *Apple Numerics Manual, Second Edition* – Complete definition and coverage of the Standard Apple Numeric Environment (SANE®)
- *Apple Human Interface Guidelines* – Describes the Apple human-interface principles and guidelines
- *AppleShare Programmer's Guide to Apple IIGS* – Documents how to write AppleTalk® network-aware applications for the Apple II family.

Suggested Resources

- *Developer Services Bulletin Board* – The Developer Technical Support group maintains several read-only folders on the AppleLink network dedicated specifically to the Apple II development platform [AppleLink path: Developer Services:Developer Technical Support:Apple II]. You will find Apple II Technical Notes, Apple II sample code, development tools, and other resources here.

The following documentation and tools are available from APDA:

- *Apple IIe Technical Reference* – Latest version of this manual covers original, enhanced, and extended-keyboard Apple IIe differences and details Apple IIe hardware and firmware, including input/output (I/O) features, memory organization, and using the monitor firmware
- *Apple IIc Technical Reference, Second Edition* – Describes all aspects of the Apple IIc, including its physical characteristics, memory organization, I/O interfaces, firmware entry points, and the system monitor

- *ProDOS 8 Technical Reference Manual* – Provides an overview of the ProDOS® 8 Apple II operating system and describes file use, ProDOS memory use, Machine Language Interface (MLI) calls, writing a ProDOS system program, and file organization; ProDOS 8 Exerciser disk is included with the manual
- *GSBug and Debugging Tools* – Debugger disk that assists you in testing your program. It includes three desk accessories for checking memory use and documentation describing how to use these tools.
- *Apple IIGS Programmer's Workshop (APW™)* – Software-development environment and documentation for the Apple IIGS that includes a 65816 assembler, command shell, linker, full-screen text editor, object-module disassembler, disk initial utility, librarian, and other utilities.
- *Apple IIGS Programmer's Workshop C* – Full Kernigham and Richie (K&R) implementation of C for the Apple IIGS that runs under APW and includes standard I/O libraries and IIGS tool interfaces. C program segments can be linked with assembly segments.
- *MPW IIGS Tools* – Powerful cross-development system for the Apple IIGS that runs in the Macintosh MPW™ development environment and includes a linker, an object file list utility, and several file translators; requires a Macintosh® computer with 2 megabytes of RAM and MPW 2.0.2 or later.
- *MPW IIGS Assembler* – Two disks and a reference manual make up this full-featured macro cross-assembler, which generates code for five 65xxx family processors, including the 65816, the 6502, and the 65C02.
- *MPW IIGS C* – A cross-development system C compiler for the Apple IIGS that runs under MPW IIGS on the Macintosh. Full K&R implementation with extensions. Supports source-level segmentation of load files, as well as standard C I/O library and Apple IIGS tool interfaces. MPW IIGS Pascal, C, and/or assembler program segments can be linked together.
- *MPW IIGS Pascal* – This MPW IIGS cross-development system Pascal compiler is a port of MPW Pascal with Apple IIGS Toolbox naming conventions; MPW IIGS Pascal, C, and/or assembler program segments can be linked together.
- *Applesoft BASIC Programmer's Reference* – Comprehensive reference manual for the Apple II Applesoft BASIC programming language.

For more information about the wide range of Apple II and Apple IIGS documentation available, check the APDA catalog, APDAlog.

Other Resources

- *Technical books* – There are many good third-party books on the Apple II and the Apple IIGS. Your local technical bookstore may have some helpful publications, or you may also find something to meet your needs in the APDAlog.
- *Apple User Groups* – User groups can provide a wealth of information, from power-user shortcuts to sample code libraries. To get a list of user groups in your area, call (800) 538-9696, ext. 500. Some user groups run bulletin board services that are tailored to the needs of their members. Contact the user groups directly for more information about the services they provide.
- *Bulletin board services* – Special interest groups on bulletin boards can provide a wealth of programming information. For more information, contact them directly. Examples of commercial bulletin board services with active Apple II interest groups are AppleLink—Personal Edition, GEnie and CompuServe.



Apple II/IIGS Development Tools

One of the most important choices you'll make when developing on an Apple®II computer is which development system to use. Knowing more about some of the key tools and technical references that are available will help make your development process easier and more productive. The tools described below are available from APDA™.

ProDOS 8 Environment

- *ProDOS 8 Assembly Tools*
This product comes with four programming tools—editor, assembler, debugger, and relocating loader—that help programmers create, debug, and execute assembly-language programs for any Apple II computer. Resulting applications run in the ProDOS®8 environment.
- *Apple II System Disk Version 3.1*
This update describes the principal changes to ProDOS 8 since version 1.1.1. It covers features visible to the user or of interest to the programmer. Features that apply to ProDOS 8 running on the Apple IIGS® computer are noted.

Apple IIGS Programmer's Workshop (APW)

- *Apple IIGS Programmer's Workshop and Assembler*
This is Apple's native development system for the Apple IIGS and includes a command shell, linker, and utilities. It is the host for other APW™ language products such as APW C and several third-party language products. It includes a complete 65816 macroassembler. The command shell performs such functions as file management, directory listing, I/O redirection, and pipelining. The full-screen text editor copies, moves, and deletes blocks; searches and replaces; and executes editor command macros.
The assembler produces 65816 programs that assemble to relocatable object modules. Utility macros to aid programming are provided, as well as tool interface macros; you may also create your own macros and library files. The linker takes files created by the assembler, C, or other compatible languages and generates load files, resolving external references and creating relocation dictionaries.
- *Apple IIGS Programmer's Workshop C*
This full Kernighan and Ritchie implementation of C generates APW object files. It has extensions that include void types, enumerated types, and structure passing. It supports source-level segmentation of load files and includes standard C I/O library and Apple IIGS tool interfaces. Program segments written in C can be linked with assembly segments.

Apple IIGS Tools

- *GSDbug and Debugging Tools*
A machine-level debugger that traces, or steps through, programs or inserts breakpoints; it can display registers, memory locations, and the direct page and stack, and lets you switch between the application's display screen and the debugger's. It also includes the Memory Mangler, Loader Dumper, and Scrambler

desk accessories. The Memory Mangler and Loader Dumper let you peek at Memory Manager and System Loader data structures during execution of a program. The Scrambler rearranges memory after each Memory Manager call to help you locate dereferenced handles that are unlocked. The GS/OS Exerciser, provided both as an application and as a desk accessory, lets you “exercise” GS/OS calls by providing parameters and executing the call.

- *Apple IIGS Source Code Sampler, Volume I*

This product contains source code for Apple IIGS applications that use the desktop interface. Assembly source-code samples include an empty shell application, an animation demo, a custom control, custom windows, dialogs, window caching, list handling, a sampled sound player, a Print Manager record spy, custom menus, and a math function grapher that uses SANE[®]. C source-code samples include an empty shell application and a program lister that can print to the ImageWriter[®] and LaserWriter printers.

- *Icon Editor*

The Apple IIGS Icon Editor is a tool for creating and modifying icons for display by the Apple IIGS Finder[™]. Icons can be created for applications or for documents. Using the Icon Editor, a programmer can match application icons to document icons, so that when a user opens a document from the Finder, the appropriate application is launched.

MPW IIGS Cross-Development System

- *MPW IIGS Tools*

These are the tools you need to use the MPW[™]-to-Apple IIGS Cross-Development System. The system allows programmers to use Macintosh speed and Macintosh Programmer's Workshop power and functionality to develop programs that execute on an Apple IIGS. This product includes a linker that can link object files created by an assembler with object files written in high-level languages such as C or Pascal, generating relocatable load files to run on the Apple IIGS. Other tools enable you to transfer files via disks between Macintosh[®] and Apple IIGS computers, display the contents of object files, convert GS/OS[™] load files into ProDOS 8 binary files, and make Apple IIGS object files into libraries.

- *MPW IIGS C*

The C compiler for the MPW-to-Apple IIGS Cross-Development System runs under MPW on a Macintosh, and produces code that executes on an Apple IIGS. It is source-code compatible with APW C, with minor exceptions. MPW IIGS C is a full implementation of the C language described by Kernighan and Ritchie, and additionally has extensions such as void types, enumerated types, and structure passing. It supports source-level segmentation of load files.

- *MPW IIGS Assembler*

The MPW IIGS Assembler is a full-featured macroassembler that runs in the MPW environment. It generates code for five 65xxx family processors: the 65816, the 6502, the 65C02, the NCR 65CX02, and the Mitsubishi 740 microcontroller chips. Object modules created by the MPW IIGS Assembler can be linked with MPW IIGS C object modules.

The MPW IIGS Assembler is based on the MPW Assembler and uses a similar syntax. Because the MPW IIGS Assembler syntax is significantly different from APW Assembler syntax, a one-way translation utility is included to help convert APW source.

- *MPW IIGS Pascal*
The Pascal compiler for the MPW-to-IIGS Cross-Development System runs under MPW on the Macintosh, and produces code that executes on the Apple IIGS. This Pascal is a port of MPW Pascal for the Macintosh, but uses the Toolbox naming conventions presented in *Apple IIGS Toolbox Reference*, Volumes 1 and 2. Program segments created using this compiler can be linked with segments created using MPW IIGS C and/or MPW IIGS Assembler.

Apple IIGS System Software

- *Apple IIGS System Disk 5.0*
This is the July 1989 version of the Apple IIGS system software. This developer package contains release notes on this version of the system software.
There are several fine tools and languages for Apple II computers which have been produced by third-party developers. For the Apple IIe and IIc, 6502 assembly language is a popular language and the popular assemblers are Merlin 8/16 from Roger Wagner Publishing (1050 Pioneer Way, Suite P, El Cajon, California 92020) and ORCA/M from the The Byte Works (4700 Irving Boulevard N.W., No. 207, Albuquerque, New Mexico 87114). For the Apple IIGS, Pascal is the most popular professional development environment. Pascal compilers are available from the Byte Works and from TML Systems (8837-B Goodbys Executive Drive, Jacksonville, Florida 32217). The Byte Works also sells an assembler and a C compiler for the Apple IIGS.

Documentation/Technical Reference Guides

- *Apple II Technical Notes*
These include detailed technical documentation written by the Apple II Developer Technical Support group to expand upon and clarify Apple technical documentation. The notes also document bugs in Apple software, hardware, and documentation. Technical Notes address specific questions commonly asked by developers. Currently, notes are issued bimonthly in the Developer mailings; back issues are available through APDA in both hard-copy and disk form.
- *Apple Technical Library*
Apple Computer has written a number of books that have been published by Addison-Wesley as the Apple Technical Library. These publications can be found at many technical bookstores. They are also available through APDA, as well as directly from Addison-Wesley, 6 Jacob Way, Reading, MA 01867.
The technical library includes the following publications related to the Apple II/IIGS. If you have recently signed up as an Apple Developer, many of these publications were included in your starter kit.
 - *Technical Introduction to the Apple IIGS*
 - *Programmer's Introduction to the Apple IIGS*
 - *Apple IIGS Firmware Reference*
 - *Apple IIGS Hardware Reference*
 - *Apple IIGS Toolbox Reference*, Volumes I and II
 - *Apple IIGS ProDOS 16 Reference*
 - *BASIC Programming with ProDOS*
 - *Applesoft BASIC Programmer's Reference Manual*
 - *ProDOS 8 Technical Reference Manual*

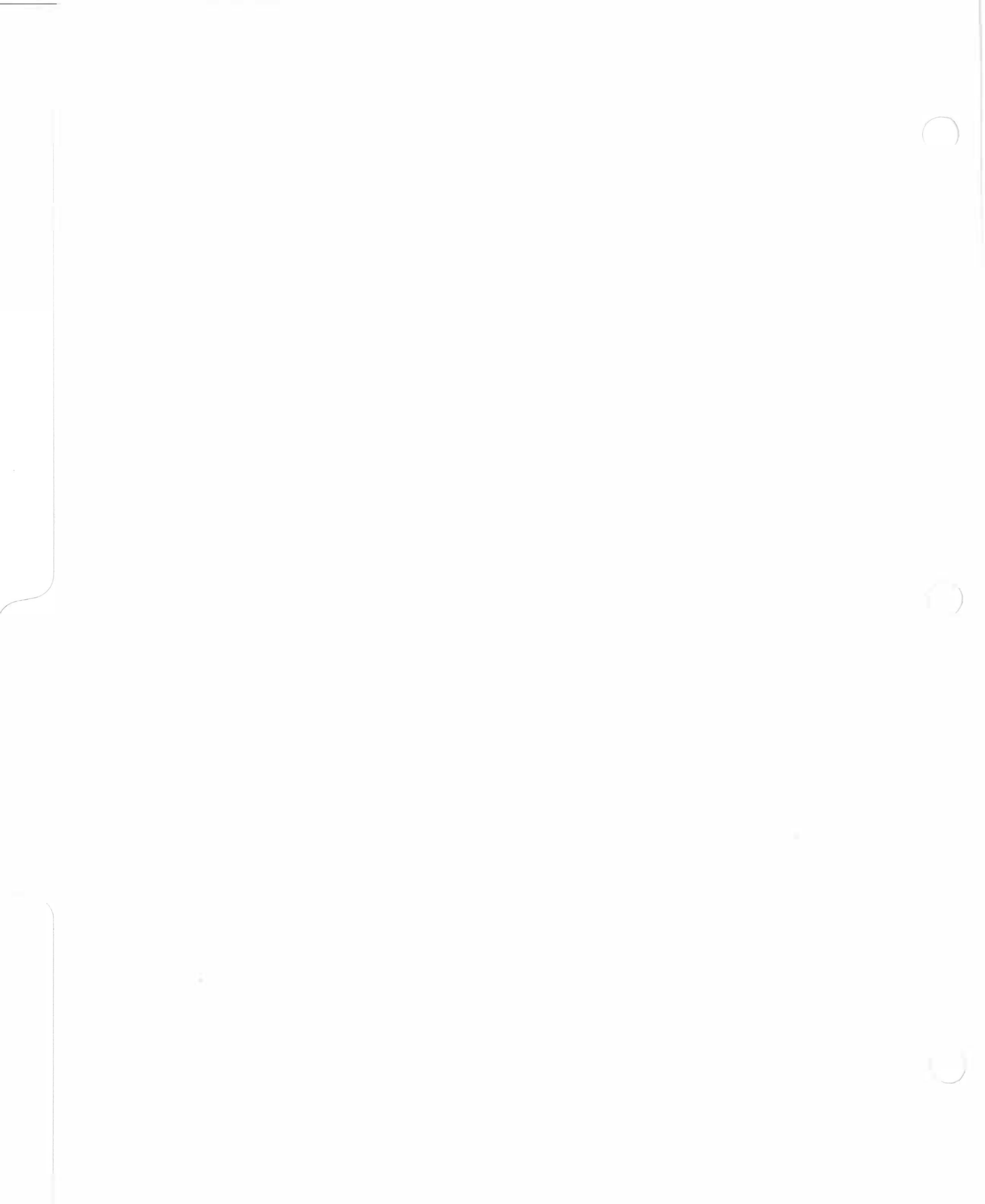
- *Apple IIc Technical Reference Manual*
- *Apple IIe Technical Reference Manual*
- *Apple Numerics Manual*

Other References

Other important reference manuals that are available in your starter kit or from APDA only:

- *GS/OS Reference, Volume I*
- *GS/OS Reference, Volume II*
- *Apple IIGS Toolbox Reference Update*
- *X-Ref: Apple II Cross-Reference*
- *Apple IIGS Assembler Toolbox Quick Reference*
- *Apple IIGS C Toolbox Quick Reference*

Macintosh





The Macintosh® personal computer is like nothing you've ever programmed. The most innovative products for personal computers are developed for the Macintosh.

As a new Apple developer, you should have received the Starter Kit containing basic resources, such as tools and publications, to assist you with your development efforts on the Macintosh. These resources should make your programming efforts easier and more productive.

The following sections detail the components of the Starter Kit, as well as other helpful resources you may want to acquire to assist you with your development efforts. For information on Macintosh Development Tools, refer to the Macintosh Development Tools note in this section.

Basic Resources: Starter Kit Contents

Subscriptions—The following are automatically provided to new developers who sign up for Apple's Developer Program:

- *AppleLink® network subscription* – Your communication line to Apple and other developers gives you easy access to current technical, marketing, product, and program information
- *APDA™ membership* – APDA provides up-to-date technical documentation, example programs, development tools, utilities and development environments, books, and more

Developer Library—The following collection is available in your Starter Kit or from APDA:

- *Inside Macintosh*, Volumes I through V – The technical reference manual for Macintosh personal computers
- *Inside Macintosh X-Reference* – Comprehensive index and cross reference for the five volumes of *Inside Macintosh*, plus the 1984 to 1987 Technical Notes, *Programmers Introduction to the Macintosh Family*, *Technical Introduction to the Macintosh Family*, and *Designing Cards and Drivers*
- *Technical Introduction to the Macintosh Family* – One-stop source containing an overview of the Macintosh hardware, its internal workings, and options it makes available
- *Programmers Introduction to the Macintosh Family* – The next level of detail for a developer, this volume is a companion to *Technical Introduction to the Macintosh Family*
- *Human Interface Guidelines* – Describes the Apple human-interface principles and guidelines
- *Apple Numerics Manual* – Complete definition and coverage of the Standard Apple Numeric Environment (SANE®)
- *HyperCard Script Language Guide* – Pertinent to those interested in writing HyperTalk™ scripts or to those interested in developing HyperCard® applications

- *Macintosh Technical Notes* – Detailed technical documentation written by the Macintosh Developer Support group to expand upon and clarify Apple technical documentation
- *Software Development for International Markets (APDA draft)* – Technical reference manual for developers who plan to sell their product overseas that provides localizability guidelines, as well as a description of localization tools and techniques
- *Macintosh System Software* – The latest version of the Macintosh system software with updates provided to the developer as they are released.

Suggested Resources

- *Developer Services Bulletin Board* – The Developer Technical Support group maintains several read-only folders on the AppleLink network dedicated specifically to the Macintosh development platform [AppleLink path: Developer Services:Developer Technical Support:Macintosh]. You will find all of the Macintosh Technical Notes, international keyboard illustrations, sample code, standard definition procedures, and the latest MPW™ interfaces, as well as some development tools (such as MacsBug and ResEdit™) here.
- *A Debugger* – After you've become familiar with the Macintosh and how it works, find a debugger. A good debugger can save an experienced Macintosh programmer many frustrating hours of guesswork. To use a debugger, you should have knowledge of both the 68000 assembler and the Macintosh. You should be using a debugger by the time you're putting the finishing touches on your product.

Other Resources

The following documentation and tools are available from APDA:

- *Script Manager Developer's Package* – Provides information to help you better develop international products. This publication includes information on the Script Manager, which provides a set of routines to handle text in both Roman and non-Roman (Japanese, Chinese, Arabic, or Hebrew) languages.
- *The Macintosh Family Hardware Reference* manual, published by Addison-Wesley – As a reference to Macintosh II, Macintosh SE, and Macintosh Plus hardware, this manual is critical for hardware developers and educational for software developers. Software developers, however, should not rely on the detailed hardware information in this document. If they do, they may experience serious software compatibility problems in the future.
- *Designing Cards and Drivers for the Macintosh II and Macintosh SE* manual – contains information on developing NuBus™ cards and drivers for the Macintosh II and Macintosh SE.
- *Software Applications in a Shared Environment* – Document which details the considerations involved in developing software that will function in a shared environment (such as an AppleShare® volume), discusses proper treatment of and open permissions for documents, byte range locking to allow concurrent writers to the same document, and architecture needed to allow applications sharing.
- *MacApp 2.X* manual (interim version) – Essential guide for MacApp® programmers and useful introduction to those investigating object-oriented programming and MacApp.

- Sample code products may be helpful in learning to use Macintosh ROM routines. These are generally not intended as examples of programming style, but rather as “quick-and-dirty” examples of how to use the Macintosh Toolbox.

For more information about the wide range of Macintosh documentation available, check the APDAlog.

Supplementary Resources

- *Technical books* – There are many good third-party books about Macintosh. Your local technical bookstore may have some helpful publications, or you may also find something to meet your needs in the APDAlog. See the Macintosh Development Tools note for information on other technical books.
- *Apple User Groups* – User groups can provide a wealth of information, from power-user shortcuts to example code libraries. To get a list of user groups in your area, call (800) 538-9696, ext. 500. Some user groups run bulletin-board services that are tailored to the needs of their members. For more information about the services they provide, contact the user groups directly.
- *Bulletin board services* – Special-interest groups on bulletin boards can provide a wealth of programming information. For more information, contact them directly. Examples of commercial bulletin board services with active Macintosh interest groups are GENie, Delphi, and CompuServe.
- *Developer Associations* – Developer Associations can put you in touch with people who share your interests, goals and occupation, and who can help by providing you with important industry information. Refer to the section “Other Resources” in this guidebook for more information on Developer Associations.



Macintosh Development Tools

One of the most important choices you'll make when developing products for the Apple® Macintosh® computer is which development system to use. Knowing more about some of the key tools and technical references that are available will help make your development process easier and more productive. This note describes some of the most popular development tools used by professional developers. All of these development tools and many other excellent development tools are available from APDA™.

Macintosh Programmer's Workshop (MPW)

MPW™, Apple's premier development system, is a family of products that includes a robust, full-function environment for professional-level software development, a powerful macroassembler that supports all current members of the MC68000 processor line, and compatible C and Pascal compilers, each with complete Macintosh interface libraries. Using MPW, a Macintosh application can be written in multiple languages. Users can write integrated tools and script files and customize the MPW interface by adding custom menu items. The power of MPW can be expanded by adding MPW-compatible products from third-party software developers.

- *MPW Development Environment*

The MPW Development Environment contains the MPW Shell, Macintosh interface libraries, resource tools, a linker, Projector™, and other tools.

The MPW Shell is both a multiwindow text editor and a command interpreter. It recognizes more than 80 built-in commands, and can launch a special class of applications called integrated tools. MPW comes with more than 30 of these tools. Any supplied command or integrated tool can optionally display a dialog interface to assist the programmer in specifying any desired parameters before execution. New integrated tools and scripts can be easily created by the user, installed in a menu, and invoked by name or by menu item selection. The Shell offers the capabilities of a regular Macintosh-style mouse-based text editor, including such functions as cut and paste, undo, search and replace, and markers.

Interface library files are included to provide complete Toolbox access to all Macintosh computers, and interfaces for writing applications compatible with the MultiFinder™ operating system. Interfaces are included so that programs can be easily integrated with the MPW Shell. Language-specific include files and sample programs and are provided with MPW Assembler, Pascal, and C.

Several tools are provided for creating and maintaining resource files; tools exist to compile and decompile resources, compare resource files, and check resource files for inconsistencies. The linker supports the object module format shared by the MPW Assembler, MPW Pascal compiler, MPW C compiler, and third-party language products.

The MPW Development Environment is most popular with developers working together as part of a large team and to those developers who wish to highly customize their development environment. It is also popular with

developers who need a flexible environment which provides them with exacting control over their projects.

- *MPW Assembler*
The macroassembler supports all the instructions and addressing modes of the MC68000, MC68010, MC68020, and MC68030 microprocessors and the MC68851, MC68881, and MC68882 coprocessors.
- *MPW C*
The C compiler is an optimizing compiler that generates code for the MC68000 and optionally for the MC68020/030 and the MC68881/882. MPW C 3.0 contains ANSI C enhancements such as function prototypes and strong type checking, and ANSI C additions to the Standard Library.
- *MPW Pascal*
The Pascal compiler is an optimizing compiler that generates code for the MC68000 and optionally for the MC68020/030 and the MC68881/882. MPW Pascal supports the Object Pascal extensions required by MacApp®.
- *Projector*
Projector is an easy-to-use built-in source code management system for controlling and accounting for all changes to software or documentation over the life of a project. The source is stored in a revision file so that any version of the software may be built on command. Projector controls access to the files so that only one person is modifying a file at a time. Projector keeps track of who has modified the files and why each modification was done. Projector is part of the MPW Shell.
- *SADE (Symbolic Application Debugging Environment)*
SADE™ is a source-level symbolic debugging environment that can be used to debug applications and MPW tools built using the MPW 3.0 C and Pascal compilers and assemblers. SADE provides a multiwindow editor for source display and debugger command input and output. It also provides a scripting language for controlling and analyzing your program and for customizing the debugging environment. SADE comes with a set of predefined menus that provide all of the basic debugging features.

MacApp

MacApp is an object-oriented programming library that implements the standard features common to most Macintosh applications programs. MacApp provides code for a complete generic Macintosh application that can be expanded into a specific application. MacApp applications can be written using MPW in Object Pascal (Pascal with object-oriented extensions that are supported by the MPW Pascal compiler).

MacApp consists of more than 800K of source code. Most of this code is written in Object Pascal, with the remainder written in Motorola 68000 Assembly language. Complete source code is included on the MacApp disks. The disks also contain MPW "Make" files that are set up for easy compilation of the MacApp source code into object files. A MacApp user can create these object files once; then he or she can incorporate them into an application by "using" them in the application's Pascal source code and linking them with the application's object files, to create a complete Macintosh application.

**Macintosh Allegro
Common Lisp**

Macintosh® Allegro Common Lisp is an extended implementation of the Common Lisp standard, with additional programming and Macintosh interface tools. Common Lisp is widely used to develop artificial intelligence programs and other advanced applications, and for rapid prototyping. Macintosh Allegro Common Lisp is a powerful system for developing all types of stand-alone Macintosh applications.

Macintosh Allegro Common Lisp provides numerous extensions to the Common Lisp language, including Object Lisp, which is a multiple-inheritance object-oriented programming system, and a set of high-level tools for the construction of a Macintosh interface. Object Lisp is used to implement windows, menus, dialogs, and streams. These predefined objects may be extended and customized by the user.

The Macintosh Allegro Common Lisp compiler produces efficient native 680x0 code. File compilation and incremental compilation are both supported. An evaluator is provided to support expression-by-expression execution of programs. A snapshot facility allows saving complete Lisp environments for quick restarts.

Macintosh Allegro Common Lisp provides an integrated programming environment that makes extensive use of the Macintosh graphic interface. A powerful integrated, programmable editor is provided, as well as a Lisp Listener, window-based Inspector, Stepper, and Stack Backtrace facility.

Additional tools are provided to support the development of large, full-function, Macintosh-style stand-alone applications. The Foreign Function Interface module provides the capability to call external procedures, such as those written in MPW™ (Macintosh Programmer's Workshop) Pascal, C, or Assembler, from a Lisp program. The Stand-Alone Application Generator turns Macintosh Allegro Common Lisp programs into ready-to-run Macintosh applications that users can launch with a double-click; the presence of the complete Lisp development environment is not required.

Symantec's LightspeedC

Symantec's LightspeedC is a powerful and easy-to-use C development environment, which combines a compiler, linker, multiwindow text editor, and source-level debugger in an integrated development environment. In addition, the integrated environment includes a project manager that keeps track of related files and automatically rebuilds your programs as needed.

Symantec's LightspeedC provides support for writing applications, desk accessories, device drivers, and code resources. Also provided are interfaces to the Macintosh Toolbox, as well as standard C libraries with full source code.

Symantec's LightspeedC is most popular with new Macintosh programmers, those who desire the ease of use offered by the Symantec's LightspeedC development environment, and programmers working alone or in small groups.

Symantec's Lightspeed Pascal

Symantec's Lightspeed Pascal is a powerful and easy-to-use Pascal development environment that combines a compiler, linker, multiwindow text editor, project manager for automating building programs, and source-level debugger in an integrated development environment.

Symantec's Lightspeed Pascal provides support for writing applications, desk accessories, device drivers, and code resources, along with full Macintosh Toolbox interfaces.

Symantec's Lightspeed Pascal is most popular with new Macintosh programmers, those who desire the ease of use offered by the Symantec's Lightspeed Pascal development environment, and programmers that are working alone or in small groups on small to medium size projects.

Debuggers and Supplemental Tools

- *MacsBug*
MacsBug is Apple's machine-level debugger for the Macintosh Plus, Macintosh SE, Macintosh SE/30, Macintosh II, Macintosh IIX, or Macintosh IICX. With MacsBug, programmers can trace or step through programs, insert breakpoints, check both system and application heaps for consistency, and display memory and registers.
- *ResEdit*
ResEdit™ is Apple's Resource Editor. With ResEdit, users can create or edit resources such as menus, dialogs, icons, alerts, and windows. ResEdit is an indispensable tool for anyone trying to develop Macintosh software, and should be a part of any developer's toolkit.
- *TMON*
TMON, from ICOM Simulations, is a multiwindow, mouse-driven debugger that supports full machine-level debugging of applications, desk accessories, drivers, and code resources. It provides Toolbox trap checking via Discipline™ and the ability to customize via the Extended User Area.

Documentation/Technical Reference Guides

- *Macintosh Technical Notes*
These include detailed technical documentation written by the Macintosh Developer Technical Support group to expand upon and clarify Macintosh technical documentation. The notes also document bugs in Macintosh software, hardware, and documentation. Technical Notes address specific questions commonly asked by developers. Currently, notes are issued bimonthly in the Developer mailings; back issues are available through APDA in both hard copy and disk form.
- *Apple Technical Library*
Apple Computer has written a number of books that have been published by Addison-Wesley as the Apple Technical Library. These publications can be found at many technical bookstores. They are also available through APDA, as well as directly from Addison-Wesley, 6 Jacob Way, Reading, MA 01867.
The technical library includes the following publications related to the Macintosh. If you have recently signed up as an Apple Developer, many of these publications were included in your starter kit.
 - *Technical Introduction to the Macintosh Family*
 - *Programmers Introduction to the Macintosh Family*
 - *Inside Macintosh*, Volumes I–V
 - *Inside Macintosh X-Ref*
 - *Macintosh Family Hardware Reference*
 - *Designing Cards and Drivers for Macintosh II and Macintosh SE*
 - *Human Interface Guidelines: The Apple Desktop Interface*
 - *Apple Numerics Manual*

- *Other References*

Other important references that are available in your starter kit or from APDA:

- *Programmer's Guide to MultiFinder*
- Macintosh Technical Notes
- Macintosh sample disks



Human Interface Guidelines Overview and Checklist

Apple's easy-to-use interface revolutionized the way people interact with computers. By replacing the complexity of code memorization with the simplicity and consistency of a functional, more *human* interface, users were given a machine that conformed to the way they naturally think and work. To bring consistency across all applications for the Macintosh® and Apple® II computers, the *Human Interface Design Guidelines* were published. These guidelines are to assist developers in designing interfaces for applications that conform to the "look and feel" of Apple's interface.

This document contains resources that will help you during the development of your product and a checklist to use when you are testing your interface for adherence to Apple's Human Interface Guidelines.

Resources

Human Interface Design Guidelines, available from APDA

An essential resource for programmers, this document discusses user-interface principles and provides information on how to use the windows, menus, dialog boxes, and controls that make up the Apple desktop interface. It includes advice for color and sound integration, as well as guidelines on designing for international markets and handicapped users.

Technical Notes and Technical Support

Human Interface Update Technical Notes are published as needed, and will be distributed with regular Technical Notes in the monthly developer mailings.

Apple Partners and Certified Developers can forward human interface design questions that cannot be answered in the *Human Interface Design Guidelines* to the AppleLink address MACINTERFACE or MACDTS. Include as much visual information as possible.

Software Testing

The following software testing groups have the ability to test your program for adherence to Apple's Human Interface Guidelines:

American Institutes for Research
Bedford Research and Technology Center
45 North Road
Bedford, MA 01730
(617) 275-0800
Attn: Robin Kinkeadz

LIST Services
15320 Wycliffe Drive, #28
Omaha, NE 68154
(402) 334-4991
Attn: Beverly Student

Tec-Ed Technical Publications and Graphic Services
P.O. Box 2351
Palo Alto, CA 94308
(415) 493-1010
Attn: Stephanie Rosenbaum

National Software Testing Lab., Inc.
One Winding Drive
Philadelphia, PA 19131
(215) 941-9600
Attn: Vicki Weiss

The Checklist

Once you've designed your interface according to Apple's *Human Interface Design Guidelines*, use the checklist below to determine how well your interface measures up to Apple's standards. This checklist is made up of questions regarding Apple's interface. These questions, except those concerning *selection*, apply to specific sets of standards. The selection standards of the guidelines are very detailed and are explained in their own section, "Selecting," in Chapter 3 of the *Human Interface Design Guidelines*. When examining your interface against the following checklist of questions, you should be able to answer "yes" to each one.

General Considerations

- Does the application have the "look" of the Apple desktop interface, including, but not limited to, desktop, windows, and menus?
- Does the application have the "feel" of the Apple desktop interface, including, but not limited to, pointing, selecting, and keyboard input?
- If a metaphor is being used, is it suitable for the application? Does the metaphor have a "real" visual and behavioral representation, as with the desktop, so that users do not have to carry a "map" in their heads?
- Does the application always provide some indication that an activity is being carried out in response to a command?
- Does the user always have the option of finding an object or action on the screen, as opposed to having to remember that object or action before inputting data?
- Are the operations consistent with the standard elements of the interface; that is, if a user is familiar with applications such as MacPaint, MacDraw, and MacWrite, will the application appear familiar to the user the first time?
- Is a printout of the application WYSIWYG? (Is it a replica of what the user sees on the screen?)
- Is suitable feedback provided during task processing? Is the completion of a processing task clearly indicated on the screen or with a sound? Is the duration of the task indicated?
- Is an explanation offered if a particular action cannot be carried out? Are alternatives offered?
- Are there warnings about risky actions? Are there different warnings for different levels of risky actions? Are there enough warnings without being too many? Are users allowed to back away gracefully from risky territory?

- Is there a feeling of stability? Are there enough landmarks to remind users what area of the application they are in?
- Can the operation be interrupted with Command-period? Can Escape be used to cancel an operation that has a Cancel button?

Graphic Design

- Do the commands, features, and parameters of the application, as well as all of the user's data, appear as graphic objects on the screen as often as possible?
- Does the screen look "clean" and free from clutter?
- Do users have control over the design of the workplace, allowing them to individualize it?

Window Standards

- Does the standard state of the window seem appropriate on a 9-inch display? On a larger display?
- Does the preliminary user-selected state seem appropriate on a 9-inch display? On a larger display?
- Does the choice made to open in either the standard or the user-selected state make sense?
- Can sizable windows be expanded to the maximum document size of single displays? Multiple displays?

Scrolling Standards

- Does the window use either the standard scroll-bar mechanism or the hand grabber for scrolling? If it uses the hand grabber, does the pointer either always become a hand or appear highlighted in a tool palette?



- Does clicking on a scroll arrow cause the document to "move" a distance of one unit in the chosen direction? (The unit should be appropriate to the application.)
- Does clicking on the scroll bar below the scroll box advance the document by a windowful (height or width of a window, minus a one-unit overlap)? Does clicking above the scroll box move the document back by a windowful?
- Is the function of the arrow keys different from the function of the scroll bar? (*Note:* All of these questions should be answerable with "yes"; arrow keys should not be substituted for scroll arrows.)

Dialog Box Standards

A modal dialog box is one that the user must explicitly dismiss before doing anything outside it. These boxes should be used sparingly.

- Is the question posed in a straightforward and positive way? For example, “Do you want to erase everything on this disk?” rather than “Do you not want to alter the contents of this disk?”
- When appropriate, do buttons have descriptive labels, such as “Destroy Power Supply” rather than “OK”?
- Does pressing Escape indicate Cancel in a dialog box? (Pressing Escape should never cause the user to lose information.)
- Do modal dialog boxes *not* lead to other modal dialog boxes?
- Do modal dialog boxes that can be moved have a drag region (title bar) as well as the 2-pixel-wide outline within the content region to signify that they are modal dialog boxes?
- Has room been left to allow the dialog box to grow during localization? (Most languages require more characters than English to convey equivalent messages.)

Alert Standards

There are three classes of alerts—Note, Caution, and Stop; each represented by a different icon.



Note

Caution

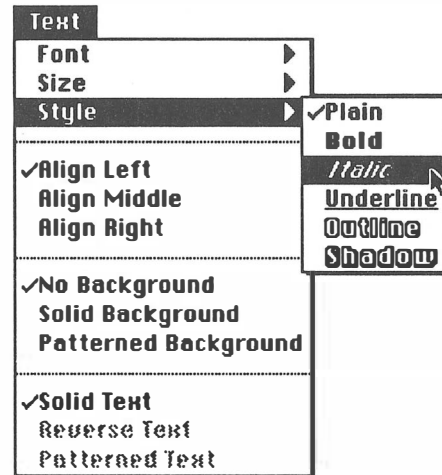
Stop

- Do the alert icon and message fit the situation?
- Is a beep alert accompanied by a flash (rapid inverting) of the menu bar so that people who can't hear don't miss the message?
- Does the alert message not only tell the user what is wrong but offer suggestions about corrective action?
- Is this alert necessary? (Often, the user can simply be prevented from making an error. Example: If the application cannot handle an 80-character file name, don't offer users an 80-character field in which to enter it.)

Menu Standards

- Does the menu bar contain only menu titles?
- Are the standard menus—Apple, File, and Edit—present with at least the standard items (these are needed for desk accessories, even when the application doesn't use them)?
- Has enough room been left on the right side of the menu bar for the additional menus provided by some desk accessories? Is there also enough extra room to allow for the expansion that almost always occurs during translation into other languages?
- Do the unique menus of the application have names that are appropriate? Are the names sufficiently different from the standard menu names? Can the user understand and remember their meaning?
- Are frequently used menu items available at the top level rather than in a hierarchical menu or a dialog box? If not, can the user move them up?
- When an item in a menu is currently disabled, is the menu title dimmed? Can the user still pull down the menu and see the dimmed names of the operations?

- Are the names of menu items appropriate? Can the user understand and remember their meaning?
- Are menu titles and items initially capitalized unless there is a compelling reason to have a different style (such as “ALL CAPS” in a Style menu)?
- Do menu items have an ellipsis (...) if more information is required from the user?
- Do hierarchical titles in a menu have a right-pointing triangle? Are hierarchical menus used only for lists of related items?



- Can the user see all the commands, items, and hierarchical titles in a menu without scrolling? (Scrolling should be necessary only for menus that users have added to or for menus that spill over because the user has selected a large system font.)
- Is the indication of a pop-up menu a drop-shadowed box around the current value? While the menu is showing, is its title inverted, and is the current value checked? If the menu must be scrolled, is this indicated by up- or down-pointing triangles?



- Do keyboard equivalents appear where appropriate? Are the keyboard equivalents case independent? (The second rule does not apply if the product uses both cases in the keyboard equivalents and enables the user to predict which case to use.)
- If the application is text oriented, can the user change the font and style by using menu commands? (Usually, fonts and printing styles are in menus called Font and Style, but there may be a good reason to put them in another menu.)
- If a palette is present, is the selected symbol—icon, pattern, character, or drawing—highlighted?
- If a menu has been torn off and moved, can the user still access it from the menu bar? When it is torn off a second time, does the first instance disappear?

Mouse Standards

- If the user initiates an action by pressing the mouse button, does the action take place only when the button is released?
- Are there ways other than double-clicking to perform a given action?

Programming Strategies

You may want to refresh your memory about the main programming issues, especially *event loop* and *modes*. See the section, “A Strategy for Programming” in Chapter 1 of the *Human Interface Design Guidelines*.

- Is there a clear visual indication of the current mode? Does the visual indication of the mode appear near the object most affected by the mode? (For example, the MacPaint pointer changes to a pencil in a draw mode and to a paint brush in a paint mode.)
- Is each mode absolutely necessary? Do the modes within the application properly track the user's own modes? Do users consistently avoid the kind of errors caused by the program being in a mode other than what the user wants or expects? (Making a mode visually apparent is no guarantee that the user will track it. Test the application on users, and find out what types of mistakes they are making. If the errors are modal, eliminate the modes.)
- Can users save a document or quit an application at any time, unless they are in a modal dialog box?
- Is the widest possible range of user activities available at any time? (The user should spend most of his or her time in the event loop.)
- Will a color-blind user be able to use the application? Will someone without a color monitor be able to use it? (The information conveyed by color coding should also be presented in another form, such as text, position, highlighting, gray-scale variations, or pattern. These questions do not apply to programs in which the task to be carried out requires full-color vision on a color monitor.)
- Will a user with a hearing disability be able to use the application? (Audible messages should be supplemented with visual cues or should allow the user to choose visible instead of audible messages. This question may not apply to music programs.)
- For those who cannot handle book-form manuals, is any part of the manual available in electronic form?

Documentation

- Does the manual include a glossary of potentially confusing terms that relate to the application or to the application's topic?
- If the manual refers the user to another document, is the reference more appropriate than having the information in the manual itself?

User Testing

Although you may feel comfortable with your interface because you've been following the Apple's *Human Interface Design Guidelines*, without testing, you may never know the strengths and weaknesses of your program. The Human Interface team offers this sound advice: *Test early and often.*



Object-Oriented Programming and MacApp

Welcome to the world of object-oriented programming (OOP) and MacApp®, Apple's object-oriented Macintosh® application framework. Long experience at Apple and elsewhere has shown that OOP offers substantial advantages over traditional functional-programming techniques, particularly for the kind of complex applications today's users have come to expect. Because we believe that OOP will be the programming model for future generations of computers, we will continue our long-term commitment to OOP. We think that when you take a look at the future direction of application development, you will recognize that OOP represents a better choice than procedural programming.

The information in this document provides a brief introduction to OOP and MacApp, and includes a description of the documentation and tools you'll need to get started. We encourage you to take advantage of the opportunities OOP has created.

Object-Oriented Programming Versus Procedural Programming

Compared with traditional procedural programming, object-oriented programming speeds software development and makes programs easier to create, understand, and maintain. Four concepts are key to the benefits of OOP: *object*, *class*, *inheritance*, and *polymorphism*. Let's look at each one.

Object

Consider a familiar object; for example, a light bulb. It has fixed states (wattage rating, mass, and bulb type), variable states (on or off), and behavior (heat and light production, current flow). Behavior and state are inextricably intertwined in real-world objects. Yet modern CPUs and traditional programming languages treat the computer analogs of behavior and state—code and data—as inherently separate. This separation complicates the design, debugging, and maintenance of software. We are all familiar with apparently innocent modifications to a data structure that break procedures throughout a program.

Object-oriented programming languages explicitly mimic the real world by linking data and the procedures that manipulate that data into what are called *objects*. A light-bulb object, for instance, would have variables for its state and procedures for computing heat, current flow, and light output. This encapsulation of data and code minimizes and localizes the procedures that rely upon detailed knowledge of an object's data structures. Consequently, object-oriented programs are easier to understand and to maintain.

Class

The object-oriented programmer describes different types of objects, including the appropriate linkage of data and procedures, by defining *classes*. A class specifies the structure of the data for all individual objects of the class, as does a Pascal RECORD or C struct. Unlike records or structs, however, each class also specifies the procedures unique to it. Although each individual object will normally have its own data, all objects of a given class share the same set of procedures.

Inheritance

The various types of real-world objects in an application domain become separate classes in the program. These classes need to share behavior because the corresponding types of real-world objects often share behavior. For instance, a taxi is a kind of car, which is a kind of vehicle. Therefore a taxi shares most of the behavior of any vehicle and almost all of the behavior of a car. Relationships such as these can be expressed naturally in OOP by making the more specialized class a subclass of the more general class. The sharing of behavior arises because a subclass *inherits* all of the data and procedures of its superclass. So if *taxi* is a subclass of *car*, then, with no further effort on the part of the programmer, *taxi objects* would already have all the structure and behavior of *car objects*. The programmer of the *taxi class* presumably would add new data items (two-way radios, fare meters, and so on) and new procedures (computing fares, for example). Procedures already implemented by cars may be modified or overridden (taxis may use special lanes at airports or always have broken air conditioners). But most of the structure and code of the *car* superclass is effortlessly reused by the *taxi* subclass. This reuse of inherited code simplifies maintenance.

Polymorphism

In traditional procedural programming, the code to be executed at every point in the program is specified exactly by the order of procedure calls. When a procedural language compiler encounters a procedure call, it knows precisely what code to invoke. But in OOP, a subclass may override a procedure implemented by its superclass. In that case, the *method* (or procedure) in the subclass and the superclass have the same name. The actual code to be executed depends on the class of the object on which it is supposed to act. This flexible binding of code with method names is called *polymorphism*.

Pascal or C programmers routinely use a limited form of polymorphism: Arithmetic operators such as the plus operator (+) invoke different code for integers than for floats. But this primitive polymorphism is hard-coded in the compiler, usually limited to a few mathematical operators, and cannot be extended by the programmer. By giving the programmer control of polymorphism (hence the ability to selectively override and enhance existing behavior in new subclasses), OOP makes code reuse practical and adds to the flexibility and mutability of the program.

Object-Oriented Programming Libraries and Tools

Object-oriented programming requires a mature class library and specialized programming tools, in addition to an OOP language.

Classes, inheritance, and polymorphism provide the opportunity for code reuse. Object-oriented class libraries provide the code to reuse. Mature class libraries turn the promise of OOP into successful practice. These libraries, however, must be carefully designed and well tested. With wide reuse, every weak spot (whether a boundary condition or careless assumption) will be tested. Designing classes for maximum reusability also requires insight into how best to generalize the classes. Good class hierarchies, like those of Smalltalk or MacApp, have grown by natural selection over a period of years. Much of the advertised productivity gain of OOP stems from the use of such libraries. Once the programmer learns a library, much of the functionality of each new program is borrowed or inherited from existing library code. Rather than measuring programming productivity in lines-per-

day of new code, the experienced OOP programmer takes pride in how *little* new code is needed.

Familiar development tools such as editors and debuggers have evolved to meet the needs of traditional procedural programming. The special features of OOP place additional demands on these development tools. The distribution of behavior among classes and the sharing of code fostered by inheritance require a tool for rapidly browsing code by class and method name. Typical editors are clumsy for such browsing. The distribution of most data amongst a variety of objects requires an object inspector tool for examining the state of active objects that “knows” the structure of the objects and can display that data in a meaningful form. Traditional tools for displaying individual memory locations in HEX are tedious at best, and an object-oriented debugger must be aware of classes and method invocations as well as the structure of objects. Class libraries that offer classes for construction of windows and dialogs also require a graphical direct-manipulation layout tool for easy construction of those visual interfaces. MacApp offers all of these.

MacApp

MacApp version 2.0B9 is the latest beta release of Apple’s second-generation object-oriented Macintosh application framework. MacApp offers a mature object-oriented class library that is ideal for programmers who wish to maximize their productivity as they develop robust, user-friendly, commercial Macintosh applications.

MacApp helps you work more productively by allowing you to program in a style well suited to Macintosh applications. Your application can inherit the behavior of a standard Macintosh application directly from MacApp code; you can then override the parts you wish to customize. With MacApp and less than a page of your own code, you can have a complete Macintosh application that creates windows, interprets mouse clicks, handles desk accessories, prints files, and supports every other standard feature a Macintosh application is likely to have.

The applications you create with MacApp can run on any Macintosh Plus, Macintosh SE, or Macintosh II computer. If the code you add follows Apple’s compatibility guidelines, your applications will run on both the Macintosh and A/UX® operating systems (including MultiFinder™ compatibility on the Macintosh OS).

MacApp is widely used for in-house development by firms such as GTE Government Systems, Peat Marwick & Main, and Arthur Andersen. It has been used by companies such as Odesta, Activision, and Olduvai to develop commercial applications for networking and communications, accounting, report generation, geographical data display, CAD, optical character recognition, knowledge engineering, and geology.

MacApp 2.0 Features and Benefits

The standard Macintosh application does the following:

- Manages menus.
- Supports Undo commands.
- Provides extensive support for exception handling.
- Supports multipage printing.
- Supports desk accessories.
- Supports scrolling, zooming, and opening and closing windows.

Strict adherence to Apple compatibility guidelines:

- Simplifies the task of creating applications that will be compatible with future hardware and system software.

MultiFinder support:

- Allows your MacApp applications to run in the background.

The new view architecture:

- Offers a simpler, more powerful view class hierarchy.
- Uses view resources that can be created and edited with the new ViewEdit tool.
- Includes optional 32-bit view coordinates to let you work with large views.

New TGridView view class:

- Supports one-dimensional lists and two-dimensional grids of views (such as spreadsheets).

Support tools include the following:

- A new WYSIWYG graphical window and dialog-box design tool speeds design of your views.
- An integrated object-oriented debugger speeds debugging.
- A new object inspector lets you examine objects.
- An improved build tool makes building your program easier and faster.

Six sample programs:

- Can be used as learning aids or as the foundation for actual programs.
- Include complete source code.

Features Added to MacApp 2.0

- *Views:* MacApp's designers have streamlined the classes that handle windows, dialogs, and views. The MacApp 1.1 window architecture based upon `TFrame` and `TContentView` has been replaced by a simpler structure, all of which descends from `TView`. This new, more general architecture allows you to stack views to get more complex screen displays.
- *Dialogs:* MacApp no longer uses the built-in Dialog Manager, but instead handles situations needing dialogs by using windows with nested views. This approach simplifies the architecture and gives you an elegant way to deal with both windows and dialogs.
- *Larger coordinate system:* MacApp version 1.1 was limited to a drawing area of 30,000 by 30,000 pixels (the built-in limitation of QuickDraw™). MacApp 2.0 allows you to use 32-bit addresses, giving you a coordinate space of more than 4 billion by 4 billion pixels. However, you must use MacApp procedures to convert 32-bit coordinates to and from a set of "local" QuickDraw coordinates before drawing can take place. This is only required if you opt to use these large views.
- *TextEdit:* Supports multiple fonts, sizes, and styles. There is still, however, a practical limitation of a maximum of 32,000 characters and maximum heights and widths of 32,000 pixels each.

- *Inspector*: During debugging, you can open one or more Inspector windows, each of which lets you browse through the fields of any existing objects.
- *ViewEdit*: This MacApp utility program lets you create view hierarchies (views with multiple subviews) and edit view resources visually (similar to what ResEdit™ does with resources).
- *Grids*: A new class—TGridView—helps you display and manipulate one-or two-dimensional grids of information.

Development Tools, Documentation, and Training

Development Tools

The following development tools are available from APDA™:

- MacApp version 2.0, (includes the MacApp class library, sample programs, debugger, inspector, MABuild, and ViewEdit)
- MPW™ version 3.0
- MPW Pascal version 3.0
- MacApp Browser

Documentation

The following documentation is available from APDA:

- *Introduction to MacApp 2.0 and Object-Oriented Programming*
- *MacApp 2.0 Tutorial*
- *MacApp 2.0 Cookbook*
- *Object-Oriented Programming for the Macintosh*
- *Inside Macintosh*, Volumes I-V

Recommended reading

- *Object-Oriented Software Construction*, Bertrand Meyer (1988); available at your local bookstore

Apple equipment needed for development

- Macintosh Plus, Macintosh SE, Macintosh SE/30, Macintosh II, Macintosh IIx, or Macintosh IIcx, with at least 2 megabytes of RAM and a hard disk

Developer Training

Apple's Developer University offers a course on MacApp and Object-Oriented Programming. For information on this course, see the section, "Training Resources" of this guidebook, or check the AppleLink® network (path: Developer Services: Developer University).

AUX



Introduction

Welcome to A/UX[®] and the A/UX Toolbox. This document explains the available application-development environments, describes development opportunities, and provides answers to commonly asked questions about A/UX. We hope the material will enable you to take advantage of the opportunities A/UX has created.

A/UX increases the market opportunities for both UNIX and Macintosh[®] developers. It provides Macintosh developers with additional markets for their current Macintosh products, because Macintosh applications that conform to the *Inside Macintosh* guidelines can run in A/UX without change. In other words, the same product that a developer offers for the Macintosh operating system platform can also be offered for the A/UX platform. For UNIX developers, A/UX provides a standard UNIX environment for porting applications to A/UX. A/UX also provides developers with an excellent platform for additional software development for university, federal government, and commercial customers who are committed to a standard UNIX environment.

If you're a Macintosh developer, try testing your existing Macintosh applications for compatibility with A/UX. You may *already* be able to offer your products to A/UX customers. If your code does not conform to *Inside Macintosh* guidelines, you are encouraged to start converting now; future release of the Macintosh operating system will also require strict compatibility to *Inside Macintosh*.

If you're a UNIX developer, you have two choices: port your existing applications to the A/UX platform, or develop new or enhanced A/UX-specific applications using the A/UX Toolbox.

Whether you are Macintosh or UNIX oriented, Apple and A/UX provide you with the tools and expertise to help you develop and market your applications for the emerging UNIX desktop market. Ultimately, it's your skills and imagination that users are depending on for new and innovative A/UX applications.

A/UX Development Tools and Documentation

To help you develop A/UX applications on the Macintosh II, IIx, or IIcx, the A/UX system includes a C compiler and other development tools. You will also need the following documentation and development tools:

Apple Equipment

- Macintosh II, IIx, or IIcx computer with a minimum of 4 megabytes of RAM (and a 68851 PMMU chip for Macintosh II systems)
- Macintosh-compatible monochrome or color monitor
- A/UX on an 80-megabyte disk drive, disks, or tape (includes A/UX Accessory Kit)
- Apple[®] Tape Backup 40SC (optional)
- Apple EtherTalk[™] Interface Card (optional, but recommended)
- Third-party communications card for LocalTalk[™] printing from A/UX Toolbox applications (optional)

A/UX supports the Apple ImageWriter®II and LaserWriter® printers, and the Apple Hard Disk Drives 20SC, 40SC, 80SC, and 160SC.

Documentation

- A/UX manuals (15-binder set), sold separately from A/UX software; available to Apple partners through the Developer Price List; and to Apple associates from an authorized Apple dealer
- *Inside Macintosh*, Volumes I–V (included in the Developer Starter Kit); also available from APDA
- Macintosh Technical Note #117: *Compatibility: Why and How*, available from APDA™
- A/UX Toolbox: *Macintosh ROM Interface* manual (included in the A/UX manual set)
- Macintosh Technical Note #212: *The Joy of Being 32-Bit Clean*, available from APDA

Introduction to A/UX

A/UX is an implementation of AT&T's UNIX® System V, Release 2, Version 2 operating system for the Macintosh II personal computer family. It conforms to the published System V Interface Definition (SVID) standard, POSIX 1003.1 Draft 12, and Federal Information Processing Standard (FIPS) #151. A/UX includes key features from Berkeley's BSD 4.3, as well as support for TCP/IP, X Window System, and Sun Microsystems' Network File System (NFS®).

A/UX serves as an alternative to the Macintosh operating system. It combines the strengths of an industry-standard, multitasking operating system with the enhancements of the Macintosh technology and human interface. A/UX also gives the Macintosh the capability to share software and data in a multivendor or networked environment.

Standard UNIX Features

AT&T System V is becoming widely used in business and government markets, while BSD is becoming widely used in higher education and engineering markets. A/UX, which combines the features of both, provides developers with a standard platform for these four major workstation markets.

As a standard platform, A/UX offers the following:

- Application source-code compatibility with other UNIX System V systems
- Smooth porting for BSD 4.3 applications
- Many connectivity options based on Ethernet or serial networks with industry-standard facilities such as Berkeley Networking Services, NFS, and X Window System

Features Added by Apple

In addition to key features of the UNIX environment, A/UX includes special features that allow A/UX applications to:

- Incorporate the Macintosh user interface
- Increase system reliability
- Reduce system administration requirements

Macintosh Toolbox Support

With A/UX, developers can access the Macintosh Toolbox to control user-interface options such as pull-down menus, multiple fonts, dialog boxes, and scroll bars; programs written for A/UX can utilize the standard Macintosh interface.

Macintosh Binary Support

Existing Macintosh applications can be launched directly into the A/UX environment. Consequently, Macintosh developers have an additional marketplace for their existing products, and customers have access to an expanded library of software.

Simple Startup

Unlike other UNIX systems, typing in a string of commands is unnecessary—you can start up A/UX by simply clicking on the A/UX icon.

Automatic Configuration

On startup, A/UX automatically reconfigures itself to access device drivers for cards installed in the Macintosh II system's NuBus™ slots. The ports and slots of the Macintosh II are polled for hardware changes. If a board has been removed, appropriate drivers are automatically removed from the kernel, requiring no operator intervention.

Automatic Self-Repair

A/UX keeps redundant copies of crucial system files. In the event of a damaging crash, it can automatically return the system to its operational state and repair lost or damaged critical system files.

TranScript® from Adobe Systems, Inc.

A/UX includes the **TranScript** utility from Adobe Systems. Output from the UNIX Documenter's Workbench document-processing system can be formatted for the Apple LaserWriter® printer, as well as for other printers that use Adobe's PostScript® page-description language.

Toolbox-Related Components of A/UX

Toolbox routines fall into two categories: user-interface Toolbox routines and Macintosh operating-system routines. When an A/UX application places a call to one of the Macintosh user-interface Toolbox routines, the A/UX Toolbox intercepts the call and, if necessary, translates the parameters into a form usable by the ROMs. After the A/UX Toolbox translates the call, it invokes the same ROM code that would be used in the native Macintosh environment.

When an A/UX Toolbox application issues a call to one of the Macintosh operating system routines, the A/UX Toolbox diverts the call to a substitute routine in its own library. The A/UX Toolbox operating system routines make calls to the standard A/UX libraries to perform A/UX equivalents of the Macintosh operating system functions.

In both cases, the A/UX Toolbox incorporates a toolboxdaemon that runs in the background and services A/UX Toolbox requests.

Contents of the Toolbox

- Source code for three sample programs (**term**, **sample**, and **qdsamp**) and the associated makefiles that demonstrate how to compile and link a program; executable code can be found in **/usr/toolboxbin**, while source code and makefiles are in **/user/lib/mac/examples**

- Utilities for use when developing and running A/UX Toolbox applications; executable code can be found in **/usr/toolboxbin**
- A library of routines that handle communications between an A/UX C program and the Macintosh ROM, in a file in **/usr/lib/libmac.a**
- C interface files that define the constants, types, and functions used by the A/UX Toolbox libraries, in **/usr/include/mac**
- Resource-declaration files that declare the Macintosh resource types, in **/usr/lib/mac/rincludes**
- The Macintosh file system, which contains resources required for operation of the A/UX Toolbox, in **/usr/lib/mac/system**
- A special initialization file that must be linked into all A/UX Toolbox applications developed in A/UX, labeled **/usr/lib/macrt.0.o**

New Features of A/UX

Release 1.1 of the A/UX Toolbox supports the following new features for developers (see the A/UX 1.1 data sheet for additional features added in release 1.1):

Standard Printing

Applications can print to the AppleTalk® Protocol Stack using the standard Macintosh printing calls. (*Note: The A/UX AppleTalk implementation does not use the built-in AppleTalk port. To use AppleTalk, you must install one of several third-party cards.*)

Custom Video Drivers

The A/UX Toolbox supports custom video drivers, including color video drivers.

Desk Accessories

The A/UX Toolbox supports desk accessories and other custom device drivers that do not manipulate hardware. The standard software distribution contains the basic Macintosh desk accessories, including the Chooser and the Control Panel.

String Formats and Point Passing

The ROM interface libraries include two versions of all routines that take or return strings and points. One version uses Pascal string formats and point-passing conventions. The second uses C string formats and point-passing conventions, parallel to the change in MPW™ C, Version 3.0.

File Conversion Utility

A new utility, **fcnvt**, converts files in A/UX among the AppleSingle, AppleDouble, and simple A/UX formats, replacing **rcnvt**.

Left-to-Right Compiler Evaluation

The A/UX C compiler evaluates multicharacter constants from left to right, as does the MPW™ C Compiler.

Applications Development Environments

You can develop applications in either the Macintosh operating system or A/UX. Through the A/UX Toolbox, you can run applications and tools in one environment that were developed in the Macintosh operating system.

Execution Environment

		Macintosh	A/UX
Development Environment	Macintosh	Develop, debug, and run programs with Macintosh tools.	Develop and debug program with Macintosh tools. Transfer binary file to A/UX; then launch with A/UX Toolbox utility.
	A/UX	Develop and debug program with A/UX tools. Use A/UX Toolbox calls. Transfer source code to Macintosh; then compile and link to run in native Macintosh environment.	Develop, debug, and run program with A/UX tools.

Both Macintosh binary files transferred to A/UX and A/UX Toolbox programs developed in A/UX must meet the A/UX Toolbox compatibility guidelines.

Porting a Macintosh Application to A/UX

When you port a Macintosh application to A/UX, follow these three steps: (See the attachment "Transferring Macintosh Applications to A/UX" for additional information on porting a Macintosh application to A/UX).

- *Check the source code for compatibility* – compare the program against the recommendations in *Inside Macintosh*, Volumes I–V. If necessary, modify, rebuild, and test the application in the Macintosh operating system before transferring the file to A/UX. Also, refer to Macintosh Technical Note #212: *The Joy of Being 32-Bit Clean*.
- *Transfer the binary file to A/UX* – use the **hfx** utility to transfer the file from the Macintosh operating system to A/UX; both utilities read Macintosh floppy disks from within A/UX.

The **hfx** utility is an A/UX Toolbox application with a Macintosh-like interface. It can read both Macintosh hierarchical file system (HFS) and Macintosh flat file system (MFS) floppy disks. **hfx** always transfers a Macintosh file into a pair of AppleDouble files.

If you intend to use a transferred file only from Macintosh applications, we recommend that the file be transferred to A/UX in AppleSingle format. With AppleSingle format, both data and resource information is stored in a single file. If you intend to use a transferred file from both Macintosh and UNIX applications and/or utilities, we recommend transferring to AppleDouble format. AppleDouble format separates Macintosh information into two files, one for resource information and one for data.

- *Run the application in A/UX* – during the initial porting, the safest way to run an application is through the **hfx** utility. **hfx** allows you to set a timer before launching an application. If the application hangs, you can regain control of the system without rebooting when the timer runs out. Then, to fully test the application in A/UX, you can run it with the **launch** utility.

If the ported application does not run in A/UX, use one of the A/UX debuggers (**adb** or **sdb**) to identify the problem. Be aware that the Symbol Table information is not recognized by these debuggers. If your application is

written in C, you might be able to use the debuggers more effectively if you transfer the source code to A/UX and compile it there. An A/UX version of MacsBug will be available from APDA in the near future.

When an A/UX Toolbox application is running, keyboard input is diverted to the Macintosh event queue. Input is not returned to the normal character queue until the program exits. Therefore, if you are using one of the A/UX debuggers on an A/UX Toolbox application from the Macintosh keyboard, you are unable to communicate with the machine after the debugger reports an error within the program. *Because of this, you should always run the debugger from a terminal attached to a serial port or communicating over the network.*

Shared Libraries

Because shared libraries are not implemented in Release 1.1 of A/UX, an A/UX Toolbox application (that is, a UNIX application with Toolbox calls) that you build now will contain the actual code for the current interface routine. The code is likely to be unusable in future releases. You can support future compatibility by shipping with your product the application's relocatable object code and makefile that link, or, "...and the makefile that links.." it to the appropriate libraries. Your customers can then rebuild the application using the new libraries after installing future releases of A/UX.



Transferring Macintosh Applications to A/UX

This note describes the basics for using the `hfx` utility. The note also presents guidelines for what information you need to include in a user's guide to accompany your software application. The `hfx` utility comes as a part of the A/UX 1.1 distribution, and is a file-transfer tool with a Macintosh interface. The `hfx` utility works similarly to the Font/DA mover, a Macintosh utility.

Any Macintosh application that is written according to the guidelines in *Inside Macintosh* and that is 32-bit clean runs without change in the A/UX environment. You simply transfer the application to your A/UX file system using the file-transfer tool `hfx`. You should test the application thoroughly under A/UX before you publish that your application runs under A/UX.

Using the `hfx` utility

You need to start up A/UX and bring it to multiuser mode to use `hfx`. You can invoke `hfx` from any location in the file system, except another A/UX Toolbox application. The steps that follow outline the simple procedure a user completes to transfer and launch a Macintosh application.

1. Start up A/UX.
2. Bring A/UX to multiuser mode by using the `init 2` command.
3. Invoke the `hfx` utility by entering the `hfx` command.
4. Mount the Macintosh volume containing the application you want to transfer by using the "Look for Disks" menu commands, or by inserting a 3.5-inch disk into the internal disk drive and clicking Drive.
5. Select a directory (folder) where you want the application to reside in your A/UX file system by opening directories or by using the volume-title menu to move up the file system structure.
6. Select the application that you want to transfer by clicking on the filename in the list that appears as the contents of the current Macintosh disk.
7. Click Copy.
8. Click OK.
9. Click Open.

The application should run just as it does in Macintosh OS. The first time you start up a Macintosh application in A/UX, you should use the option "Set background timer to 2 minutes." If the application runs successfully after two minutes, you will return to the A/UX shell or the `hfx` utility. Then you can disable the timer by deselecting the option and launch your application. If the application crashes, after two minutes A/UX returns control of the system to the console device, usually your Macintosh monitor.

Managing your application in A/UX

You can always start up Macintosh applications from the `hfx` utility. You can also use the `launch` command from a shell to start up applications. At the shell prompt, you enter the following command:

```
launch application_name
```

Replace the italics with the file name of the application. To open a document when you start up the application, enter the following command.

```
launch application_name filename
```

If your application doesn't run, try using the flag options for the launch command. If the application won't launch, use this command:

```
launch -i application_name
```

If the screen freezes while the application is running, try this command:

```
launch -t application_name
```

A/UX does not support low memory global variables. If your application utilizes them, you can use the `-t` option to initialize the system on start up.

To print a Macintosh document in A/UX, you follow standard Macintosh procedures. You must have a printer that uses AppleTalk software and is connected with LocalTalk compatible cables. The instructions for setting up a printer appear in *A/UX Local System Administration* and *A/UX Network System Administration*.

Documentation notes

Several important factors affect Macintosh applications and A/UX. You may want to include the following information as tips, warnings, and notes in your documentation.

- *Warning* – You must bring the system to multiuser mode to use A/UX Toolbox utilities. Use the `init 2` command to enter multiuser mode.
- *Important* – You can only mount hard disks using the “Look for Disks” menu commands. You cannot mount CD-ROM drives, tape backup devices, or other SCSI devices using `hfx`. Do not use the All command unless you only have hard disks connected to your A/UX system. Using this menu to mount other SCSI devices causes the system to stop functioning.
- *Important* – A/UX 1.1 does not support MultiFinder. You can only use one Macintosh application or one A/UX Toolbox application at a time.
- *Important* – Don't select the “CR to NL” option when transferring an application. This option translates the end-of-line character (hex ?) to a new line character (hex A).

Tip: If you are copying several applications or files at one time, you can skip the “Copy to” dialog box for each file by pressing the OPTION key when you click Copy.

You can change file attributes and assign the new values to all the files by pressing the OPTION key when you click OK in the first “Copy to” dialog box.



General Issues

Q. *How do I find an A/UX® dealer in my area?*

A. Call 1-800-538-9696, extension 100.

Q. *Is there a software update service available for A/UX? A manual update service?*

A. Yes and yes. Subscriptions for A/UX software updates and A/UX manual updates are available on the Developer Price List for purchase by Apple Partners and Certified Developers. Apple Associates may purchase these update subscriptions from an authorized Apple dealer.

By subscribing to these update services, you will receive all software and documentation updates released during a 12-month subscription period.

Q. *What is the A/UX Hotline? How can I subscribe to it?*

A. The A/UX Hotline is a subscription-based telephone support service for A/UX users. It is staffed by Apple support experts.

A subscription for A/UX Hotline support is available on the Developer Price List for purchase by Apple Partners and Certified Developers. Apple Associates can purchase a subscription for A/UX Hotline support from an authorized Apple dealer.

Note: The recommended way for Apple Partners and Certified Developers to receive development support for A/UX is by contacting Developer Technical Support via the AppleLink® network.

Licensing Issues

Q. *What licensing options are available for A/UX?*

A. We offer great flexibility in the area of licensing. Some of the options include:

- 1- to 16-user binary license with all A/UX 1.1 purchases
- Single right to copy
- Reseller license for VARs

Q. *What does a 1- to 16-user license mean?*

A. Each licensed A/UX 1.1 system may have up to 16 users logged in, either locally or remotely. Since A/UX is positioned for a single-user desktop computer, the additional users would primarily be remotely connected.

Q. *What licensing options are available for X Window System?*

A. All X Window System purchases include a single-user license and a form that can be used to apply, for a fee, for a site license.

A/UX 1.1 Development Issues

Q. *What is the key benefit of A/UX 1.1?*

A. A/UX is a very standard operating environment with the added value of Macintosh® capabilities. You can now run 32-bit clean Macintosh applications from our UNIX System “out of the box.”

Q. *What are the key additions to A/UX in version 1.1?*

A. A/UX 1.1

- Runs HyperCard® 1.2.2
- Supports POSIX FIPS
- Supports X Window System (sold separately)
- Supports color in Macintosh Toolbox and X Window System
- Supports printing from Macintosh applications (via third party cards)
- Supports Apple® Tape Backup 40SC and AppleCD SC™ drive
- Is available with 16-user license
- Provides Increased Macintosh Toolbox support, allowing more Macintosh applications to execute under A/UX

Q. *What's in the A/UX Accessory Kit?*

A. The kit includes the following:

- *A/UX Installation Guide*
- Road Map to A/UX documentation
- A/UX System Setup and Read Me disk
- A/UX Data Encryption Standard (DES) Software disk
- A/UX Standalone Shell disk
- A/UX Sash and Utilities disk
- A/UX Systems Checker disk
- Tape Backup/HD SC Setup disk
- *A/UX version 1.1 Release Notes*
- *A/UX Support* brochure

Q. *Which UNIX standard does Apple support?*

A. A/UX is a full AT&T version V.2.2 UNIX® system, and is compliant with the System V Validation Suite. A/UX is also FIPs #151 and IEEE 1003.1 (Posix Draft 12) compliant, and thus meets the requirements for many federal government bids.

We will also support additional standards, as defined by our end users, as they emerge. (We're closely watching standards groups such as OSF, UNIX International, and X/Open.)

Q. *I'm developing some peripheral hardware for the UNIX environment. Is it difficult to develop a device driver for A/UX?*

A. An Apple device driver kit is available through APDA™. The kit contains source code for A/UX 1.1 device drivers as well as documentation that explains how to write a device driver, how to configure it into the kernel and relink the kernel, and other important information.

Q. *What interface does Apple recommend for A/UX applications?*

A. We do not restrict developers to any user interface. You may choose to develop using the Macintosh Toolbox, X Toolkit, or another method of your choice. However, we feel that the Macintosh Toolbox interface has a strong advantage—a consistent interface that is familiar to all Macintosh users. Although conversion of current applications may present a difficult programming task, we believe that it will pay off for developers in the long run. (As more Macintosh programs become available, this interface will become more familiar to the UNIX community and will become the standard for A/UX.)

If you're considering the use of a different interface because of the ease of porting to other platforms, both the X Toolkit interface and the standard TTY interface are available and fully supported under A/UX.

Q. *What does it mean to be "32-bit clean"?*

A. Earlier versions of the Macintosh hardware recognized only 24 of the bits in a 32-bit address. Some Macintosh applications were therefore written as 24-bit applications, and play "tricks" with the remaining 8 bits of address fields (against *Inside Macintosh* guidelines). These applications must, therefore, be "cleaned up". The current Macintosh operating system (version 6) has assisted applications by masking the address in many instances. To allow larger programs to run (either with greater physical memory or with virtual memory), an operating system must use all 32 bits of the address. Since A/UX provides virtual memory, it is the first of the Apple operating systems to require 32-bit clean applications. The next version of the Macintosh operating system, version 7.0 (announced at the Spring Developers Conference), also requires 32-bit clean applications if virtual memory is to be used.

Q. *Will A/UX continue to track new features of the Macintosh Operating System? In particular, will System 7.0 features be ported to A/UX?*

A. Apple's commitment to bring the Macintosh experience to the Unix world focuses on two major goals:

- providing customer-demanded standards
- incorporating the functionality of the Macintosh operating system into A/UX

Apple has recently announced System 7.0 for release in 1990. Most Macintosh System Software features will be incorporated into A/UX shortly after the Macintosh operating system release. In the interim, A/UX will track toolbox compatibility at the System 6.0.4 level and will continue to require 32-bit cleanliness.

Since A/UX and System 7.0 both require 32-bit clean programming techniques, Apple recommends that Developers build 32-bit clean binaries that can run on System 6.0.x, A/UX 1.1, and System 7.0. By programming to test for 32-bit cleanliness, and testing for 7.0 features before using them, developers can build single application binaries that run in all three environments: 7.0, 6.0.x, and A/UX.

Testing for the presence of System 7.0 features can be accommodated by using Gestalt calls (System 7.0 environment status). By coding to discern the operating environment with Gestalt first, and SysEnviron second, developers can easily ensure maximum compatibility without releasing additional versions of their applications. Future releases of A/UX will support the Gestalt calls, and current releases of A/UX and System 6.0.x support the SysEnviron calls.

Refer to Technical Note #212: *The Joy of Being 32-bit Clean* and Technical Note # 117: *Compatibility: Why and How* for further information.

X Window System

- Q.** *Is the X Window System available?*
- A.** Yes. X Window System, version 11, Release 3, is available on the Developer Price List for purchase by Apple Partners and Certified Developers. Apple Associates may purchase the X Window System from an authorized Apple dealer.
- Q.** *Which toolkit is Apple shipping with the X Window System?*
- A.** We are shipping the standard X Toolkit, as released by MIT, on the standard source tape. We will evaluate other toolkits for future release.
- Q.** *Can I run an X application on another UNIX system and display on A/UX?*
- A.** Yes. Apple's display server has been adapted to present a user interface appropriate for a Macintosh user.
- Q.** *Can an X application on A/UX use more than one monitor?*
- A.** Yes. Apple's X Window System for A/UX supports up to five monitors simultaneously.

Multimedia



Introduction

Multimedia is the integration of high-quality sound, live-action video, and animation into the computing environment. Over the last two years, Apple has expanded and improved its hardware platforms and software support in this area to encourage third-party development. Apple has identified multimedia development as crucial to its strategy for future success, and developers are urged to “think multimedia,” regardless of the application.

This section discusses the new and enhanced sound features that will be available with the release of System Software 7.0. Also included is an introduction to CD-ROM and AppleCD SC™ drive technology. Because many audio and video development toolkits use HyperCard® as a front end, the HyperCard section should also be a valuable reference for audio and video development.

Fundamental Multimedia Design Principles

There are three basic design principles that support Apple’s plans to extend the Macintosh® architecture:

- *Empowering the user as an information creator.* Unlike today’s media environment of television, radio, and magazines, multimedia is interactive and allows users to participate in the *creation* of information. Extensions to the Macintosh architecture are designed as platform tools that allow users to access information, and also to create and distribute their original work.
- *Delivering quantity and quality.* Through multimedia, large quantities of information will be made available using the highest-quality interface. The burden of “information overload” can be lifted with tools that allow users not only to access, but also to manipulate information. As new data types come into the Macintosh environment, development opportunities will open up for the creation of new tools such as database applications for video and sound information; video and sound editing and organizing tools; and applications to help users navigate through environments that include sound and moving images.
- *Making it mainstream.* Although the idea of multimedia may be technologically advanced, these new capabilities should not belong to a specialized few but should permeate all of Apple’s products and third-party applications, providing the same advantages to all customers. Today, sophisticated applications of video, sound, and animation are associated with the entertainment and media industries. An important challenge for developers will be to bring these high-end capabilities out of the realm of specialists and into the hands of average users.

Development Opportunities

Although a great impact is expected to be made in changes to existing applications, there are also development opportunities for new applications specifically designed to work with the following data types:

- Video-image processing
- Video editing
- Still-image sequencing with sound

- Animation applications
- Sound synthesis and editing
- Speech recognition and synthesis
- Voice mail

An extremely important development area is *electronic-information products*. As Macintosh platforms become better for sound, video, and animation, Macintosh-compatible electronic-information products are expected to take their place beside the traditional applications of today. These new products will include news, music, current affairs, documentary video, "how-to" and reference data, and sound tracks from speeches and events. This information will be viewed and heard selectively and interactively; incorporated into original work; personally annotated and indexed; and utilized within traditional applications, such as spreadsheet and presentations programs. Developers are urged to be aware of partnerships that can bring productivity and creativity applications together with electronic-information resources from media technology.

Most important, because of Apple's focus on *creating* as well as accessing information, users will need the tools to create their own electronic-information products, whether they are for personal or business use, or commercial distribution. Apple customers with special skills, knowledge, and original ideas will need more powerful tools to transfer their insights to others. To make this happen, Apple will work actively to bring information "providers" together with the Apple developer community. Whether your business is making productivity applications, support tools, creativity products, hardware enhancements, or products that don't, as yet, have a category, we think multimedia offers you an exciting opportunity.



CD-ROM and the AppleCD SC Drive

Introduction

Imagine four times the amount of information found in the *Encyclopedia Britannica* on your desktop, with full text indexing and Boolean searches. Welcome to the world of CD-ROM technology. The phenomenal success of audio CDs has contributed to the initial success of CD-ROM; customers already know about the quality and reliability of the medium. CD-ROM is a reliable, easy, and relatively inexpensive means to distribute enormous amounts of data to computer users. The more than 200 currently available titles address a large range of markets—government, legal, financial, publishing, medical, education, libraries, research—and are mainly MS-DOS, but the AppleCD SC™ drive can access their data if they are formatted properly on ISO 9660/High Sierra discs. It can also access other disc formats, including audio CDs. The information in this document provides you with an introduction to CD-ROM technology, the AppleCD SC™ drive, and the opportunities in this area for the developer. Also included is information on an opportunity to press a test CD-ROM disc and 100 copies at a low cost.

Disk vs. Disc: What Is CD-ROM?

Both CD-ROM and audio CD are explained in great detail in two companion booklets—*The Yellow Book* and *The Red Book*, respectively—published by Sony & Philips. These texts define the data organization on the disc and provide information for additional error correction. CD-ROM is a close relative of the audio CD, and because both are optical storage mediums, as opposed to magnetic, there is a distinction in spelling: disc (optical) and disk (magnetic).

You can store more than 550 megabytes of information on a CD-ROM disc. CD-ROMs are also reliable; they have a plastic layer that protects the discs from most scratches. Because the medium is read-only, users can't erase information by mistake. And, as an optical medium, CD-ROMs are unaffected by magnets. CD-ROMs are also reasonably fast: access time to any information stored on the disc is an average of six tenths of a second.

CD-ROM discs are less expensive than other large-storage random-access media. The following is a quick glance at some of the advantages and disadvantages of each medium, including a cost comparison:

- *WORM (Write-Once-Read-Many) disc* – Though WORM discs' storage capacity is similar to that of CD-ROM discs, the disc and drive are totally different. WORM discs are excellent for storage of large amounts of information on one or very few copies; however, because of the cost and time required to duplicate the discs, they are totally inadequate for mass duplication.
- *Videodiscs* – Videodisc drives and discs are also a different technology from that of CD-ROM. Laserdiscs store analog video and analog/digital sound; no digital data standard exists for them. The only major advantage of laserdiscs over CD-ROM discs is their full-motion video capability.
- *Erasable optical discs* – Although erasable optical discs are now commercially available, their cost is going to be relatively high for some time. Like CD-ROM, erasable optical discs offer very large storage capacity; however, unlike CD-

ROM, users can both read data from the disc and write to the disc. Erasable discs will more likely be used for personal storage and customization of large amounts of data, as opposed to CD-ROM, which is used to distribute large amounts of information to large quantities of users.

- *Hard disks*—As an information-distribution medium, hard disks are very expensive, require a large amount of time for duplication, and, in most cases, offer limited storage space. They are a read/write medium and with a transfer rate approximately 10 times faster than that of CD-ROM discs. CD-ROM and hard disk technologies, however, address two very different market needs: CD-ROM is typically geared toward distribution of vast amounts of information to a large number of users; hard disks are for the personal storage needs of the individual user.

The following is a comparison, including cost per megabyte:

	Capacity	Cost for media	Cost per MB
CD-ROM	656MB*	\$2.50	\$0.003
Hard Disk	80MB	\$1,000.00	\$12.50
Floppy Disk	800KB	\$2.00	\$2.50
WORM	800MB	\$100.00	\$0.13
Erasable	300MB	\$100.00	\$0.33

* 656MB in mode 1 ; 748MB in mode 2

Opportunities for the Developer

CD-ROM's massive storage capacity—and its ability (with retrieval software) to provide immediate access to this data—make it an excellent medium for information distribution, and provide developers with many opportunities. Early uses of the AppleCD SC in the Apple II and Macintosh® community are in such areas like publishing and presentations, research and reference, sales training, topical databases, courseware, and encyclopedias. CD-ROM will become a critical component of Apple's effort to tap into emerging markets, in particular, government, medical, and financial services. CD-ROM is a natural fit for all of these, because of the amount of information professionals in these areas need to manage.

The federal government is quickly becoming an enormous market. For example, as the largest publisher in the United States, the government needs CD-ROM applications for massive projects such as mapping or recording regulations—not to mention the myriad possibilities within the government for scientific research and data collection.

There are many other opportunities for software application developers. Because of the enormous amount of space available on one disc, you could provide:

- Your traditional software application—such as a page-layout, spreadsheet, database, word processing program—and all the files you currently have on numerous disks in your package—help, sample files, thesauruses, glossaries, special fonts or DAs, and so forth
- An extensive tutorial with interactive animation capabilities even including digital-quality sound
- A self-running demonstration of the application
- Several templates
- Fully indexed documentation, coupled with a powerful search engine

- Demonstration versions of other products you publish
- Articles or audio comments of industry leaders or analysts about your company and products

In all, by publishing your software application on a CD-ROM incorporating these different add-ons, you will provide your end users with a product that offers much more functionality, convenience, and ease of use.

To date, the majority of applications on the market are largely alphanumeric. But developers should take advantage of the richness of the CD-ROM technology when coupled with the Apple IIGS® or Macintosh computer. The end result could be titles that incorporate graphics, sound, and animation. And such “hypermedia” applications can take much of the tediousness out of learning and research.

Other product ideas you should consider include:

- Tools for CD-ROM development, such as indexing, retrieval, animation, and simulation
- Drivers for other manufacturers’ CD-ROM drives
- Titles to be published using CD-ROM as a distribution means, such as standard reference works, libraries of publications, images, and clip art
- Innovative multimedia projects, such as multimedia encyclopedias and multimedia reference libraries or topical databases
- Alternative way to sell software applications that provides the user with much more functionality at a potentially lower price; interactive tutorials, full text searching on the user manual, templates, animated demonstrations, and so forth could be included on the disc

CD-ROM File Formats

The choice of file system is dependent upon your target audience and disc content. For instance, if all your information is stored in HyperCard® stacks, you should format your disc in HFS format—in which case, only the Macintosh will be able to read the data (HFS is the Macintosh system’s native format). If you partition your disc, you can use a combination of formats. For example, the Apple CD-ROM Explorer disc, created by Apple for Apple II and Macintosh owners contains two parts: one in HFS format for the Macintosh content, the other in ProDOS® format for the Apple II content. Audio CD tracks were also stored on the disc.

The following is a comparison of the formats used to store data on a CD-ROM:

- *Native File Systems* – HFS is the format for Macintosh, and ProDOS is the format for Apple II. Native file systems provide a good user interface, fair performance, AppleShare® file-server compatibility, and ease of creation; however they don’t provide good data portability.
- *Block-level (or absolute) CD-ROMs* – This is a design-it-yourself block structure and a retrieval engine to manipulate it. Block-level file systems provide good performance, easy data portability, and, with the right software, ease of creation. They do not provide a good user interface, and they provide no AppleShare compatibility.
- *ISO 9660/High Sierra* – This is the international standard supported by many companies, including Apple, Microsoft, and Digital. The ISO 9660/High Sierra file system provides good user interface, good performance, AppleShare compatibility, easy data portability, and, with the right software, ease of creation.

ISO 9660/High Sierra (more information)

The ISO (International Standards Organization) adopted the ISO 9660 standard using the High Sierra standard as a draft. However, people already had pressed CD-ROMs using the proposed standard. Consequently, many discs now exist in the original High Sierra standard. There are minor differences between High Sierra and ISO 9660, and Apple supports them both on the Macintosh and the Apple IIGS. As with HFS discs, the disc appears as an icon on the desktop. Developers pressing new discs should only use the ISO 9660 format. This is the official international standard, superseding the original High Sierra format. You can obtain the document describing ISO 9660 by writing to:

NISO, National Bureau of Standards
Administration 101
Library E-106
Gaithersburg, MD 20899

The ISO 9660 standard defines a hierarchical file format optimized for CD-ROM and enables a developer to target multiple computing platforms with a single disc (provided that you have the appropriate software to retrieve and read the data). It provides the following:

- A boot block, which can enable a computer to boot from the CD-ROM disc (this is not, however, currently available in the Apple implementation of the ISO 9660 standard)
- Information laid out in files located in a series of directories (up to eight levels are permitted)
- A volume table that specifies the location of files on the disc
- Parallel directory structures in different alphabets (to be supported in a future Apple release)

All pointers within directory information are stored in both least-significant-byte-first and most-significant-byte-first order. By this, one ISO 9660-formatted CD-ROM disc is readable on operating systems from many companies including Apple, Microsoft, and Digital.

Because ISO 9660 does not provide for some of the specific file information required by ProDOS and HFS, Apple has created a protocol that provides Apple extensions to ISO 9660, without corrupting the ISO 9660 structures. Discs created using the protocol are valid ISO 9660 discs and should not behave differently on non-Apple ISO 9660 compatible computers. The protocol provides support for HFS file type, file creator, and icon resource, ProDOS file type, and auxiliary file type. It also defines a mechanism for preserving file names across the ProDOS-ISO 9660-ProDOS translation. The protocol is defined in the *AppleCD SC Developer's Guide* and in the *GS/OS™ Reference* manual. (See the Getting Started section below.)

If you choose to format your CD-ROM disc in ISO 9660, we recommend that you also implement the Apple extensions to the standard, so that your Apple customers get more value from your information. Here are some examples of CD-ROM discs that you should publish using ISO 9660 formatting:

- dBASE III data files, so that they can be read by PC owners using dBASE III or by Macintosh owners using FoxBASE+/Mac

- Any ASCII text files, so that they can be read by virtually any word processor on a PC, Macintosh, mainframe, UNIX system, or minicomputer
- RTF files, so that they can be read by Microsoft Word on a PC or on a Macintosh
- TIFF images, so that they can be retrieved by any graphics or page-layout applications that support that format, independent of the computer running the application
- PageMaker documents, so that they can be opened using Aldus PageMaker on a PC or on a Macintosh

Storing your shareable data files on an ISO 9660 CD-ROM disc will enable you to reach many users while pressing only one master disc. And using the Apple extensions to ISO 9660 will make accessing your information a more user-friendly experience for Apple users.

The AppleCD SC

Apple's CD-ROM drive is the AppleCD SC. The drive has the same form factor as the Apple Hard Disk 20SC and features an industry-standard protective front-loading caddy with a 64K RAM buffer to improve data throughput. The AppleCD SC is an SCSI peripheral device and can be used with both the Macintosh and the Apple II (using the Rev C SCSI card) product lines. It also works in a shared environment under AppleShare File Server 2.0 software, allowing CD-ROM access from multiple workstations. With an AppleCD SC connected to a Macintosh or Apple II computer, a user has access to more than 550 megabytes of text, audio, graphics, and images on a single disc.

Because of the software drivers provided, the AppleCD SC is well integrated in the computer's environment. Using a CD-ROM disc is largely identical to using a hard disk. A CD-ROM icon appears on the desktop, it can be opened to a window showing the files on it; applications or documents can be launched by double-clicking on them.

With the AppleCD SC, you can also listen to audio CDs via the headphone jack in the front or through amplified speakers attached to the RCA stereo phono plugs in the back of the drive. The driver software for both the Macintosh and the Apple II computers provides full access to audio tracks (whether on a CD-ROM or audio CD disc). A desk accessory that allows you to control the playback of your audio CDs, called CD Remote, comes with the drive on the Macintosh and Apple II computers.

AppleCD SC features:

- Access time: (first to last block) less than 600 milliseconds, average; less than 1.2 seconds, maximum
- Mode 1, mode 2 (as specified in *The Yellow Book*), and audio recognition (mode 1 allows for more data capacity (748MB) than mode 2 (656MB), because it provides for slightly lower data correction)
- Data-streaming rate: 150K/second in mode 1, and 171K/second in mode 2
- Block rate: 75 blocks/second
- SCSI bus transfer rate: approximately 800K/second
- Rotational speed: approximately 230 to 530 rpm (variable)
- Startup time: 5 seconds (media-dependent)
- Spin-down time: 2 seconds

- 64K RAM buffer
- Heavy random-access design
- SCSI ports and controller
- One recording surface
- Data capacity: 656 megabytes in mode 1, and 748 megabytes in mode 2
- Data block: 2,048 bytes in mode 1, and 2,336 bytes in mode 2
- Blocks per disc: more than 270,000
- Audio playback playing time: more than 1 hour
- Audio frequency response: 20 to 20,000 hertz

AppleCD SC Software: HFS and ISO 9660/High Sierra

Apple CD-ROM

Included with the AppleCD SC is a disk containing a Macintosh driver labeled “Apple CD-ROM” to be installed in your System Folder. Installation of the driver provides support of HFS on the Macintosh. It causes the CD-ROM disc in the AppleCD SC to appear as an icon on the desktop. You manipulate the disc in a manner similar to other storage devices on the Macintosh, except, of course, that you cannot write to the medium.

High Sierra File Access, ISO 9660 File Access, Audio CD Access

The AppleCD SC software version 2.0.1 or later supports the other file formats—ISO 9660, High Sierra, and CD Audio—through use of an INTT called “Foreign File Access.”

ProDOS

CD-ROM discs can be formatted for Apple II ProDOS and used by all Apple II computers as any other ProDOS disk would be. However, the ProDOS limitation of 32 megabytes per volume limits the usefulness of this technique. GS/OS (on Apple IIGS System disk 4.0 and later) includes an ISO 9660/High Sierra FST (File System Translator), so that any Apple IIGS application can access both High Sierra and ISO 9660 CD-ROM discs, transparent to the user.

AppleCD SC and HyperCard

Just as CD-ROM is an ideal method to distribute vast amounts of diverse data, HyperCard® software provides an excellent way to organize and distribute this information. HyperCard offers you the technology for navigating and presenting a sea of information. HyperCard is included with all Macintosh computers. It has a familiar interface and is available to a large customer base. *[Note: If you want to use HyperCard for your CD-ROM project, you will need HyperCard 1.2 or later (available from your dealer)]*

Because HyperCard is flexible and extensible enough for a variety of uses, CD-ROM developers are already involved with some very interesting projects using this tool. For example, some developers with powerful retrieval engines in other environments have turned their engines into HyperCard XCMDs (external commands) and designed a HyperCard front end that hooks into them. Further information regarding the HyperCard/CD-ROM relationship can be found in the *AppleCD SC Developer's Guide*.

HyperCard CD Audio Toolkit

A new HyperCard Toolkit for use with The AppleCD SC drive and CD-ROM is available from APDA. The HyperCard CD Audio Toolkit is a set of extensions

designed to give HyperCard developers and users control, interaction, and random access to audio tracks on any compact disc. Designed for use with the AppleCD SC drive, the toolkit is a powerful set of external commands and functions to add CD audio sound quality to applications created with HyperCard. Working in tandem with HyperTalk (the advanced programming language built into HyperCard) the XCMDs and XFCNs provide highly precise and simple to advanced control of audio tracks on CDs at block level—1/75th of a second.

The HyperCard CD Audio Toolkit enables a new class of CD-ROM products with applications in: business presentations, narrated courseware, training and online help, language learning, music theory, composition and appreciation, CD sound samplers, catalogs, and interactive notes and mixed media CD-ROMs.

The toolkit comes with an assortment of sample stacks; Example CD control buttons, a sound “button builder,” a catalog stack, a toolkit documentation stack, and others. For example, the Controller and XCMD installer stack gives you direct control of CD audio tracks from within HyperCard.

HyperSource ToolKit

HyperSource ToolKit, which will be available in the near future, will bring new functionality to in-house and commercial developers of graphic databases on CD-ROM. This HyperCard stack automates the development of graphic databases. The stack searches through a directory for graphic files. Each time a graphic file is found, HyperSource:

- creates a card in the HyperCard stack
- creates a thumbnail sketch of the graphic
- pastes the sketch onto the card
- puts the graphic's into the appropriate fields

This stack is then associated with the original graphics—which can reside on a local hard disk, file server or CD-ROM disc. With HyperSource, the different file formats (MPNT, PICT, or EPSF) are handled transparently. This transparent access means you can preview, open, copy, or print a graphic without needing the application that created the file. When words have been assigned to a particular graphic, HyperSource automatically creates indexes. With small extensions HyperSource also can support additional file formats, such as TIFF.

HyperSource, in conjunction with graphic databases on CD-ROM, will make cataloging, organizing, and accessing these databases much easier and more interesting; and promises to become a popular standard within the CD-ROM world.

Getting Started

Documentation/Software for CD-ROM Development

You can order the following documents and disks from APDA™:

- *AppleCD SC Developer's Guide*
- *HyperCard Stack Design Guidelines*
- AIFF (Audio Interchange File Format) document
- PICT2 document
- *Apple II SCSI Card Technical Reference* manual
- Macintosh Technical Notes
 - #209: *What's Wrong with My High Sierra Disc?*
 - #210: *The Desktop File's Outer Limits*

We also recommend that you read the following documents, which are available from APDA or at your bookstore:

- *Human Interface Guidelines*
- *Inside Macintosh*
- *GS/OS Reference manual*

You can obtain the following by calling the Apple Developer Programs Hotline at (408) 974-4897, or sending an AppleLink® message to DEVSERVICES.

- *The CD-ROM Development Resource Guide*, a directory of companies providing various types of services to CD-ROM developers, such as audio, animation, and authoring tools, data preparation, premastering, retrieval systems, and so forth

The Apple Starter Offer for CD-ROM Disc Mastering (until December 31, 1989)

In order to encourage and stimulate CD-ROM development, Apple has arranged a starter offer available to you to make your first test CD-ROM disc. We want to allow developers to experiment with putting data on an HFS-formatted CD-ROM. We hope that after completion of a successful test CD-ROM, you will progress to more sophisticated methods of data preparation more suitable to a full 550-plus megabyte disc of data.

To take advantage of the Apple Starter Offer for CD-ROM Disc Mastering, arrange your data on a media form the mastering house will accept, such as a hard disk, a back-up cartridge, a WORM cartridge, or floppy diskettes. You may send up to 550-megabytes of data. Send the prepared data off to one of the mastering facilities participating in this offer. For a maximum price of \$1,500, in less than 10 days, you will receive 100 HFS-formatted CD-ROM discs that contain an exact copy of your data.

To test the quality of their work, Apple has been pressing discs with the mastering facilities that are part of this program, and we have been satisfied with the quality of the services offered.

This is a unique opportunity for you to see how great CD-ROM technology can be for you. By creating a test disc, you will:

- Offer your technical staff an important experience
- Test the performance and usability of your product
- Create a demonstration for clients and colleagues
- Be able to estimate the time and resources needed to complete the whole project
- Gain an understanding the benefits CD-ROM offers as a medium of distribution and interactive presentation of large amounts of information

Because of the promotional and experimental nature of the starter kit, we are limiting this offer to one pressing per developer. If you want to conduct further experiments, we suggest that you deal directly with the mastering facilities to negotiate for services. This CD-ROM Starter Offer program will expire on December 31, 1989.

Vendors honoring this special starter offer package are:

3M Optical Recording
Building 223-5S-01
3M Center
St. Paul, MN 55144
(612) 736-3274
Mark Arps/Dick Tendill
AppleLink: D2462

DADC
1800 North Fruitridge Avenue
Terre Haute, IN 47804
(812) 462-8100
Linda Watson
AppleLink: D2125

Discovery Systems
7001 Discovery Blvd.
Dublin, Ohio 43017
(614) 761-4287
Jack Ryan
AppleLink: D1191

Philips Dupont Optical
1409 Foulk Road, Suite 200
Wilmington, DE 19803
(800) 433-3475
Sue Stern
AppleLink: D2173

Note: Mention by Apple Computer, Inc. of the above mentioned companies is for informational purposes only and constitutes neither an endorsement nor a recommendation. Apple assumes no responsibility with regard to the selection of the listed vendors, performance of the resulting CD-ROM master or CD-ROM disc, or use of these products. All understanding, agreements, or warranties, if any, take place directly between the vendors and the prospective users.



Introduction

You've heard about HyperCard®. You even have an idea for a HyperCard application. Before you decide to invest your valuable time developing applications for this organizational tool you need to know some general information about what it is, and what does it do? This document is designed to answer these questions (and some others), and discuss the development opportunities HyperCard offers.

What Is HyperCard?

HyperCard is a personal software toolkit that gives you the power to manipulate information stored in the form of text, graphics, video, or sound. HyperCard lets you organize and access information in much the same way as you think—by association and context, as well as hierarchy. With HyperCard, you can browse through large bodies of information or search quickly for a specific fact. In addition, HyperCard offers an easy-to-use English-based scripting language called HyperTalk™, which allows you to create more complex HyperCard stacks or to customize more basic ones.

HyperCard uses a simple metaphor: the index card. *Cards*, which are the basic units of information, are organized into *stacks*. You can treat HyperCard cards just as you would standard index cards; you can browse through a stack of cards, sort or reorder the cards, or add information (text or graphics) to them. Stackware™ is the term Apple has coined to describe the applications developed using HyperCard technology.

But HyperCard cards offer significantly more flexibility than index cards. In particular, they can be linked to other cards by adding *buttons*—one of the most powerful features of HyperCard. Buttons let users create personalized links to related cards in other stacks. They allow users to link facts, concepts, and images, as well as to perform a variety of tasks, such as launching another Macintosh® application, dialing the telephone, sorting a stack, or finding a videodisc sequence.

How HyperCard Works

HyperCard works on a variety of levels. At the simplest level, it functions as an “information player,” allowing users to browse through bodies of information. For example, stacks containing quotations, clip art, and a list of area codes in the United States and Canada come with HyperCard and can be browsed through easily.

At a higher level, users can add information to the desktop stacks that are included in the package (an address file, datebook, and to-do lists). Users can also customize stacks. For example, a field can be added to the address book or the background pattern on a page can be changed.

In short, HyperCard is a development platform that facilitates the creation and organization (remote or local) of bodies of information. It includes a powerful scripting language and makes it easy for you to customize existing stacks or to create your own, for personal or commercial use.

HyperCard Development Opportunities

HyperCard provides an excellent alternative to standard publishing as a delivery vehicle for information. Additionally, HyperTalk can be extended to control external devices such as videodisc players or to access information from on-line information

services through the use of XCMDs (External Commands). HyperTalk also allows you to control the way text, graphics, and video are integrated and organized.

For the education market, you might develop curriculum or subject-matter stacks, or stacks for interactive learning. For the business market, you might provide directories, reference materials, or demographic data. Interactive learning stacks are also appropriate for business and industry. Some industries welcome parts-catalog stacks; for example, a catalog for mechanics might allow them to point to a diagram of an engine and then point to specific buttons to display part numbers, prices, or suppliers.

When to Use HyperCard

HyperCard is good for screen-based presentations, information publishing (references, books on disk, indexes), and data management. It is also good for multimedia control (for example, providing an easy-to-use front end to videodiscs, enabling interactive video authoring, or furnishing an index to the contents of a CD-ROM), low to medium-performance telecommunications prototyping, and computer-based interactive learning (on-line help, documentation, tutorials, dealer demos, or sales tools).

When Not to Use HyperCard

As a general rule, don't use HyperCard as a substitute when a dedicated application would serve you better, such as for sophisticated word processing, high-end database needs, general-purpose terminal emulation, or structured vector graphics. In addition, don't use it for redundant and very dense volumes of text or applications requiring large or color screens.

HyperTalk Programming

As previously mentioned, one of the HyperCard software's unique features is its built-in programming language. HyperTalk helps simplify programming in two ways: first, while most programming languages require you to write entire programs, HyperTalk only requires that you write short scripts; second, HyperTalk uses command lines that resemble simple English sentences, for example, "Go to card 1 of this stack" and "Open 'Expenses' with Excel."

To learn more about scripts and stack guidelines, you can purchase the *HyperCard Script Language Guide*, which is part of the HyperCard Technical Reference Package referenced below. As with other Macintosh development, human-interface design is a critical facet of HyperCard development. To help you design stacks that adhere to the Macintosh human-interface standards, Apple publishes the *HyperCard Stack Design Guidelines*, available from APDA.

Extending the Functionality of HyperCard

XCMDs (External Commands) and XFCNs (External Functions) logically extend the HyperCard interface. They are resources that contain executable machine language. External commands have resource type "XCMD" and are invoked as commands from HyperTalk. External functions have resource type "XFCN" and are invoked as functions from HyperTalk. External commands and functions are collectively referred to as "externals". Externals have been used for changing parts of the interface, putting up new windows, adding index-driven search engines, serial communications, drawing in color, and so forth. You may write your own XCMDs or, in some cases, license those provided by Apple and third-party developers.

HyperCard and AppleCD SC

Just as HyperCard is an excellent way to organize and distribute information, CD-ROM is an ideal method to distribute vast amounts of diverse data. Together they offer you the technology for navigating and presenting a sea of information.

Because it is flexible and extensible enough to suit a variety of users, CD-ROM developers are already involved with some very interesting projects with HyperCard. For example, some developers who have powerful retrieval engines in other environments have tuned their engines into XCMDs and designed a nice HyperCard front end that hooks into them. Further information regarding the HyperCard/CD-ROM relationship can be found in the AppleCD SC note in this guidebook.

HyperCard is included with all Macintosh computers, has a familiar interface, and is available to a large customer base. HyperCard, Version 1.2 or higher, supports CD-ROM.

System Requirements

To use HyperCard, you will need a Macintosh Plus, Macintosh SE, Macintosh SE/30, Macintosh II, Macintosh IIX, or Macintosh IICX with a minimum of 1 megabyte of RAM and two 800K floppy disk drives (or one 800K floppy disk drive and hard disk drive). We strongly recommend a hard disk drive for HyperCard development and at least 2 megabytes of RAM for use with the MultiFinder™ operating system. Apple does not support HyperCard development on 512K Macintosh computers because HyperCard requires a minimum of 700K of RAM.

How Can I Get HyperCard?

HyperCard is included with all new Macintosh CPUs; Apple Partners may purchase it through the Developer Purchase Program as a separate product; Apple Associates may purchase HyperCard from an authorized Apple dealer. If you have an older version of HyperCard, the latest update, version 1.2.2, is available on the AppleLink network, [AppleLink path: Software Updates icon: Hypercard 1.2.2.] or from APDA.

You may also wish to participate in the HyperCard Update Program. For an annual fee you will automatically receive all HyperCard updates, documentation, and a license to duplicate HyperCard (one copy for each CPU). For more information, call the Developer Programs Hotline at (408) 974-4897.

A Few Specifics About HyperCard

Currently, the HyperCard file formats are proprietary, so we cannot make that information available. Likewise, the HyperCard source code is not available for licensing. You can, however, license HyperCard's binary code. Contact the Apple Software Licensing group for an application and for information about fees and usage.

How Can I Get in Touch with Other HyperCard Developers?

A good place to start is the Apple HyperCard User Group (AHUG). Its purpose is to facilitate the exchange of information among HyperCard users and developers, and to offer a direct connection for HyperCard users to report suggestions for the further development of Hypercard. AHUG offers activities for Macintosh and HyperCard enthusiasts. Refer to the HyperCard Resources note in this section for more information on AHUG.

HyperCard Documentation and Tools

See the HyperCard Resources note in this section for information on HyperCard resources, documentation, and tools.



Introduction

There are many outside resources that you can use to supplement your knowledge of the HyperCard® software. We have listed some of them here for your convenience. (Note: The listing of third-party publications in this document does not imply Apple's endorsement of these products.)

The Apple HyperCard User Group

The Apple HyperCard User Group (AHUG) has been created to provide users and developers with educational, technical, and practical information about HyperCard. It is also an excellent way for Apple to get feedback from its HyperCard users.

As a member of AHUG, you will receive three newsletters; *Windoid* which has a technical focus; *AHUGNews* which has an informational focus; and *HyperCard Update* which has a marketing focus. Access to STAKTrak, a networking system that includes the STAKTrack HyperCard Library Exchange, HyperCard Resource Listings, and General News Listings, will also be provided. Local and national AHUG meetings will be held as the organization evolves; HyperCard training will be offered through those groups. Membership dues are \$10 per year.

To become a member of the Apple HyperCard User Group, send a stamped, self-addressed envelope for the membership form to the following address:

HyperCard User Group
Apple Computer, Inc.
20525 Mariani Avenue, M/S 27-AHUG
Cupertino, CA 95014

HyperCard Documentation and Tools Available from APDA

- *HyperCard Stack Design Guidelines* – A must for all developers, this book describes Apple's guidelines for designing effective HyperCard stacks.
- *HyperCard Script Language Guide* – This document is valuable if you are interested in writing HyperTalk or developing stacks. (Also sold as a bound book, published by Addison-Wesley)
- *HyperCard Videodisc Toolkit* – A two-disk set that includes all the software you need to start using and creating HyperCard videodisc applications. To use this Toolkit, you'll need a Macintosh with a least 1 megabyte of RAM, Macintosh system software, Version 4.2 or later, and HyperCard.
- *HyperCard AppleTalk Toolkit* – Provides everything you need to use the AppleTalk® Transaction Protocol and AppleTalk Name Binding Protocol from HyperCard. It includes a set of XCMDs and XFCNs that extend HyperCard to allow access to these facilities. It also includes the source code for the XCMDs and XFCNs. This code will serve as an example if you want to write your own XCMDs and as a starting point if you want to build more sophisticated AppleTalk access. (Note: This version of the Toolkit does not support zones, so all HyperCard stations must be in the same zone. Future versions of the Toolkit may add zone support.)

- *HyperCard CD Audio Toolkit* – A set of extensions designed to give HyperCard users random access to audio tracks on any CD. This toolkit comes with sample stacks, example CD control buttons, sound button, and a toolkit documentation stack. The controller and XCMD Installer stack gives you direct control of CD audio tracks from within HyperCard.
- *HyperSource Toolkit* – Contains a HyperCard stack that automates the creation of graphic databases via HyperCard. With this toolkit you can preview, open copy or print a graphic without needing the application that created the file.
- *HyperCard Serial Toolkit* – Contains everything you need to access the serial ports of your Macintosh computer from HyperCard. Besides the XCMDs and XFCNs needed, the toolkit provides a complete set of documentation and full source code for the XCMDs and XFCNs.
- *HyperCard Developer's Toolkit* – Contains the HyperCard Stack Design Guidelines, a disk with documentation on writing XCMDs and XFCNs, interfaces for XCMDs, sample XCMDs, examples of stacks that use XCMD resources, videodisc drivers, and sound resources.
- *ResCopy* – ResCopy is a HyperCard XCMD developed by Apple to move icons, sounds, XCMDs, XFCNs, cursors and other Macintosh resources files. When used manually it has an interface like the Font/DA mover, but it may also be used transparently under HyperTalk script control.

If any of the source code from these toolkits is to be used in a product for resale, a license must first be obtained from the Apple Software Licensing Group.

Books on HyperCard

Compute's Quick and Easy Guide to HyperCard

By Steve Ansovin
 Compute Publication
 1 Chilton Way
 Radnor, PA 19089

XCMDs for HyperCard

By Gary Bond
 MIS Press
 1107 NW 14th Avenue
 Portland, OR 97209

Applied HyperCard: Developing and Marketing Superior Stackware®

By Jerry Daniels and Mary Jane Mara
 Brady Utility Software
 Simon & Schuster, Inc.
 1 Gulf & Western Plaza
 New York City, NY 10023

HyperTalk™ and External Commands, A Pocket Reference

By David Gewirtz
 HyperPress Publishing Corporation
 P.O. Box 8243
 Foster City, CA 94404

*The Complete HyperCard Handbook and
Danny Goodman's HyperCard Developer's Guide*
By Danny Goodman
Bantam Books
666 Fifth Avenue
New York City, NY 10103

Understanding HyperCard
By Greg Harvey
Sybex Publishing
2021 Challenger Drive
Alameda, CA 94501

HyperCard Power: Techniques and Scripts
By Carol Kaehler
Addison-Wesley
Route #128
Reading, MA 01867

HyperCard Illustrated
By Richard Maren
Que Corporation
11711 N. College, Suite 140
Carmel, IN 46032

HyperCard: The Complete Reference
By Stephen Michel
Osborne McGraw-Hill
2600 Tenth Street
Berkeley, CA 94710
(415) 548-2805

*HyperCard Made Easy and
Using Macintosh® HyperCard and MultiFinder™*
By William B. Sanders
Scott, Foresman & Co.
1900 East Lake Avenue
Glenview, IL 60025

*HyperTalk Programming and
HyperTalk Programmer's Guide*
By Dan Shafer
Howard W. Sams & Co. (Hayden Books)
4300 West 62nd Street
Indianapolis, IN 46268

*Concise Guide to HyperTalk and
Running HyperCard with HyperTalk*
By Barry Shell
MIS Press
1107 NW 14th Avenue
Portland, OR 97209

Using HyperCard: From Home to HyperTalk

By Tay Vaughn
Que Corporation
11711 North College Ave.
Carmel, IN 46032
(317) 573-2500

*The HyperTalk Bible: Programming with HyperCard and
Tricks of the HyperTalk Masters*

By The Waite Group
Howard W. Sams & Co. (Hayden Books)
4300 West 62nd Street
Indianapolis, IN 46268
(317) 298-5400

Mastering HyperTalk

By Keith Weiskamp and Namir Shammas
John Wiley and Sons, Inc.
605 Third Avenue
New York, NY 10158-0012
(212) 850-6000

**HyperCard Publishing and
Distribution**

APDA™
Apple Computer, Inc.
20525 Mariani Avenue
Cupertino, CA 95014
800-282-APDA (800 282-2732)

Broderbund Software
17 Paul Drive
San Rafael, CA 94903
(415) 492-3200

Power Up! Software
2929 Campus Drive
San Mateo, CA 94403
(415) 345-5900

Heizer Software
P.O. Box 232019
Pleasant Hill, CA 94523
(415) 943-7667

HyperPress Publishing Corporation
P.O. Box 8243
Foster City, CA 94404
(415) 345-4620

Individual Software
125 Shoreway Road, Suite 3000
San Carlos, CA 94070-2704
(415) 595-8855

Macintosh Hands On (formerly Nibble Mac)
52 Domino Drive
Concord, MA 01742-9906
(508) 371-1660

Mediagenic
3885 Bohannon Drive
Menlo Park, CA 94025-1001
(415) 329-0500

The Voyager Company
1351 Pacific Coast Hwy.
Santa Monica, CA 90401
(213) 451-1383



Macintosh and Sound Directions

In addition to traditional data sources such as networks and host connectivity services, scanners, OCRs, and keyboards; audio sources such as the telephone, prerecorded audio, and speech can now furnish data for use in the Macintosh® environment. Apple supports sound through hardware—in the Apple® sound chip (which ships with all modular Macintosh computers)—and software—which will be available in the form of the Sound Manager, which “orchestrates” the sound activity within the CPUs. The MIDI Manager, a stand-alone product, is the first step toward making it easier for developers and end users to integrate, manipulate, and play back sound and music. With the MIDI Manager, MIDI data can be seamlessly integrated with the Macintosh operating system.

System Software 7.0, which was presented at Apple’s WorldWide Developers Conference in May 1989 and is still in development, brings developers new general development features, including more efficient graphics and printing, direct communications between programs, and easier access to mainframes and databases. Multimedia developers will find that the future versions of the Macintosh operating system will provide greater support for their efforts. Sound Manager, which will replace the older Sound Driver in the new System Software 7.0, gives developers new features and options that require less programming effort (that is, sound will now be easily defined as a resource and will not need to be programmed). A new feature—the Real-Time Event Sequencer—will allow developers to synchronize different events (for example, sound and color appearing on the screen). A third sound feature—Macintosh Audio Compression and Expansion—which is part of the Sound Manager, provides a way to compress and expand large amounts of digitized audio data for efficient storage.

The following sections provide a general overview of the sound direction System Software 7.0 is presently taking. Documentation will be released simultaneously with the release of System Software 7.0, and although these features are presently in the development schedule, they may be subject to change.

Sound Manager

The Sound Manager is a collection of routines that can be used to create sounds without knowledge of, or dependence on, the hardware available. Using the Sound Manager, assures applications of upward compatibility with future hardware and software releases; additionally, the Sound Manager will always take advantage of hardware advancements.

When a command is sent to the Sound Manager, it is actually a request. For example, if sound code written to play on a Macintosh II is being used on a Macintosh Plus or Macintosh SE (which have slower CPU clocks and less capable audio hardware), the Sound Manager will use synthesizers fitted best to those machines’ abilities. Conversely, future Macintosh systems may have improved audio hardware, and that same code will be utilized by the Sound Manager to take full advantage of this hardware. All of this is transparent to the application, yet serves to make the application compatible with all Macintosh computers, present and future.

Real-Time Event Sequencer

The Real-Time Event Sequencer addresses the needs of sophisticated developers and the complexities of multimedia software. The event-sequencing routines allow easy and precise monitoring and control of events in the computer and in any peripheral device. They allow a developer to control all events whether or not they are audio.

An application can request services from the Event Sequencer by using the supplied routines. Routines are available to initialize, start, pause, and continue sequences of events, as well as to alter the key or tempo of sound-related events. An application can add tracks to or delete them from an existing sequence. In all of these cases, the timing specification can be based on either beats or milliseconds.

The Event Sequencer provides for synchronization of events in two slightly different ways. If the events are *all* sound related, the Event Sequencer passes commands directly to the Sound Manager at the specified time. If an event is *not* sound related, then the Event Sequencer passes a callback to the appropriate application at the specified time. The application must then determine what action to take. If a sequence includes *both* sound and nonsound events, then the Event Sequencer notifies both the Sound Manager and the interested application or applications.

The relationship between the Event Sequencer and the Sound Manager is similar to a client-server relationship: Whenever the Event Sequencer receives instructions to cue a sound-related event, it passes an appropriate request to the Sound Manager, which is responsible for seeing that the event actually occurs. The Event Sequencer obtains its timing information from the Time Manager, from an external clock (such as might be provided by the MIDI Manager), or from an application.

The audio events coordinated by the Event Sequencer can produce audio output on the internal speaker of the Macintosh; on speakers connected to the audio jack; or, in conjunction with the software-based MIDI Manager, on MIDI devices. Nonsound events are keyed by the application's code, which may draw graphics on the screen, control peripheral devices, or accomplish whatever else the application requires.

Macintosh Audio Compression and Expansion

More and more developers are using sound to enhance their applications. New multimedia applications will contribute to this trend, and sound will continue to become more important in Macintosh software. The space problem, however, is particularly acute for multimedia applications: One minute of single-channel music recorded with the fidelity you would expect from a commercial compact disc occupies 5.3 megabytes of disk space. One minute of sound digitized by the current lower-quality peripherals for the Macintosh occupies more than a megabyte of disk space. Even one minute of telephone-quality speech takes up more than half a megabyte on a disk. Since a large portion of the space occupied by a multimedia application is likely to be taken up by sound data, the complexity and richness of the application's sound component is limited.

Audio compression provides one way to minimize this problem, and Macintosh audio compression and expansion features help to reduce the enormous space required to store digitized audio data. These features are provided by a set of tools in the Sound Manager that enables Macintosh developers to provide more audio information in a given amount of memory space.

The new audio compression and expansion features are intended to provide capabilities that will enhance the content of multimedia applications by allowing developers to include more audio data. They should also relieve some distribution problems by reducing the number of disks required for shipping an application that relies heavily on sound. Macintosh Audio Compression and Expansion may make some new kinds of applications feasible, such as talking dictionaries and language-instruction software.

Compatibility

Macintosh Audio Compression and Expansion's functions are compatible with all currently supported Macintosh computers; the new features will work with all existing Macintosh sound hardware and will remain compatible with future versions of the Macintosh. Existing applications that use the Sound Manager's SndPlay trap to play digitized audio signals will be able to play compressed audio without modification or recompilation.

How It Works

The new features provide a software-only approach to audio compression. The Sound Manager supports compression in ratios of either 3:1 or 6:1 on all Macintosh CPUs. The principal audio compression and expansion functions of the Sound Manager are as follows:

- *Compression* – Compresses a buffer of digital audio data either in real time or for storage in a separate buffer.
- *Expansion playback* – Expands the compressed audio data in a small internal buffer and plays it back at the same time.
- *Buffered expansion* – Expands a specified buffer of compressed audio data and stores the result in a separate buffer.

MIDI Manager

The MIDI Manager provides your Macintosh personal computer with a highly flexible MIDI environment. Used with third-party compatible MIDI software, the tools included with the MIDI Manager provide a standardized means of dealing with the Apple MIDI interface and MIDI data.

The primary benefits of the MIDI Manager tool set include the following:

- Existence of one standard MIDI driver from Apple and compatibility with future versions of Apple hardware (developers no longer have to produce their own driver for individual MIDI applications)
- Ability to share MIDI data across multiple applications (MultiFinder™ compatible)
- Seamless integration of MIDI data into the Macintosh operating system

The MIDI Manager includes the following:

- *MIDI Driver* – Provides the first universal MIDI driver from Apple for assisting its developers in transferring data between the CPU and an external MIDI device.
- *The MIDI Manager* – Oversees interaction between the application software and the MIDI driver, and reads and writes MIDI data from the serial port.
- *Patchbay* – Interface that graphically portrays the connection of multiple serial ports for the purpose of sharing MIDI data among multiple applications in a MultiFinder environment.

The Macintosh Platform and Hardware Configurations

The following hardware configurations allow users to produce printed pages, overheads or 35mm slides, and live animation and sound—and eventually, video.

- Apple Scanner/Macintosh SE/LaserWriter® IINT (black and white)
- AppleCD SC™/Macintosh IICx/LaserWriter IINT (color)
- Apple Scanner/Macintosh IICx/Laserwriter IINT (black and white)
- AppleCD SC or Color Scanner/Macintosh IIX/LaserWriter IINTX (color)

Sound Toolkits

The following tools for sound development are presently available as stand-alone products from APDA™:

- MIDI Manager
- Macintosh Audio Compression and Expansion Toolkits
- HyperCard CD Audio Toolkit



Apple CD-ROM Development Resource Guide

May 1989





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Apple CD-ROM Development Resource Guide

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You may want to insert this guide behind the Multimedia sub-section in *The Information Exchange: Technical Guidebook*.





Apple CD-ROM Development Resource Guide

CD Audio Implementation

Denon America, Inc.
222 New Road
Parsippany, NJ 07054
(201) 575-7810
Fax: (201) 575-2532
Contact: Nob Tokutake
Technical Support: Ben Garcia
(404) 342-3032

Denon made the world's first commercial POM (Pulse Code Modulation) digital audio recorder in 1972. The firm offers advanced digital audio technology, including super linear digital-to-analog and digital-from-analog conversion, time alignment, and various levels of audio data compression. Virtually all commonly used analog and digital audio tape formats can be processed into CD-ROM.

Discovery Systems
CD-ROM Services Group
7001 Discovery Blvd.
Dublin, OH 43017
(614) 761-4287
(614) 761-4196
Fax: (614) 761-4258
AppleLink: D1191
CompuServe: 76164,1273
Contact: Jack Ryan

Discovery Systems offers a full-function 24-track digital recording studio at its CD-ROM manufacturing facility. Complete audio recording capabilities, editing, premastering, voice and musical talent services, and sound-effects libraries are available.

Nimbus Information Systems
SR 629 Guildford Farm
Ruckersville, VA 22968
(804) 985-1100
Fax: (804) 985-4625
Contact: Larry Boden

Nimbus can transfer audio to the Philips/Sony standard from audiocassette, 1/4-inch and 1/2-inch analog tape masters of any standard speed, DAT tape, Sony 1610/30, and JVC 900 digital audio formats.

Philips and DuPont Optical Company
1409 Foulk Road, Suite 200
Wilmington, DE 19803-0469
1-800-433-3475
AppleLink: D2173
Contact: Jill Jones

Philips and DuPont Optical Company provides conversion services for analog and digital audio to PCM CD-quality audio. Other audio mastering services include a check of lead-in and lead-out periods, start-access time of track number one, end-access time of the last track, and PQ-data assessment. CD Assist is software that consists of source code and examples of applications that take advantage of the benefits of audio on compact discs; documentation is also provided.

Data Preparation

Aries Systems Corporation
One Dundee Park
Andover, MA 01810
(508) 475-7200
Contact: Lyndon Holmes
AppleLink®: D1539
CompuServe: 72117,1302
MCI Mail: LHOLMES

Aries provides consultation, software support, and data preparation support services as required for CD-ROM data preparation. Aries Systems is particularly interested in working with other developers who want to integrate biomedical knowledge bases into their products. Its Knowledge Host system is suitable for this purpose, and allows other applications to have simple, yet powerful, access to large knowledge bases such as MEDLINE and CANCERLIT.

Discovery Systems
CD-ROM Services Group
7001 Discovery Blvd.
Dublin, OH 43017
(614) 761-4287
(614) 761-4196
Fax: (614) 761-4258
AppleLink: D1191
CompuServe: 76164,1273
Contact: Jack Ryan

Discovery Systems offers custom software development services, including image scanning, modification, and video capture services, for all types of image-based CD-ROM projects. The firm offers MS-DOS file conversion, audio digitization (both Macintosh audio and Red Book CD-audio), and text indexing of HyperCard stacks.

Keva Systems, Inc.
550 S. Wadsworth Blvd., Suite 411
Lakewood, CO 80226
(303) 936-0076
Fax: (303) 936-8236
AppleLink: KEVA
MacNET: KEVA
Contact: Bruce R. Tizes

Keva's data-capture process consists of two phases—collecting the desired information from diverse sources and organizing the potentially dissimilar data in a coherent, machine-readable format. There is no limit to the number of data formats. Data can take the form of ASCII text, PostScript® illustrations, digitized photographs, HyperCard® stacks, or analog sound. Data organization requires that the material be organized into logical files that describe the disc layout. The indexing schemes and application designs can be customized to provide consistency with your specific information.

Nimbus Information Systems
SR 629, Guildford Farm
Ruckersville, VA 22968
(804) 985-1100
Fax: (804) 985-4625
Contact: Larry Boden

Nimbus can import files in any standard format to create Apple-compatible data. Data can be merged, edited, deduped, and verified from any machine-readable input. Services include transferring data from a hard disk, building images in HFS (Hierarchical File System) format, and porting Apple® files in binary format through MS-DOS architecture to the ISO 9660 standard format. Nimbus also works with images in Apple's A/UX® format.

Reference Technology, Inc.
5700 Flatiron Parkway
Boulder, CO 80301
(303) 449-4157
Fax: (303) 442-1816
Contact: Mike Befeler

Reference Technology's applications and data services allow you to apply CD-ROM technology to meeting your information-distribution needs. Reference Technology provides a comprehensive set of services to assist organizations by developing applications, customizing software, receiving raw data in any form, completing any necessary data capture, converting data from any unique formats, indexing the data, formatting the data for file-manager access, and producing quality-assured replicas.

Reteaco, Inc.
716 Gordon Baker Road
Willowdale, Ontario
Canada, M2H 3B4
(416) 497-0579
Contact: Nathan Leslie

Reteaco provides full data preparation services, including data conversion, data cleanup, data indexing, and sophisticated sort/merge techniques for correlation of data from separate files. Data in any external format can be transformed—using a standard conversion routine or, if required, a user-definable routine—into an acceptable format for subsequent processing. The output of the conversion process is generally a fixed-format record. Other acceptable record types include fielded records and extensible records.

SilverPlatter Information, Inc.
37 Walnut Street
Wellesley Hills, MA 02181
(617) 239-0306
Fax: (617) 235-1715

SilverPlatter Information, Ltd.
10 Barley Mow Passage
Chiswick, London
W4 4PH, England
01-995-8242
Fax: 01-995-5159

SilverPlatter Information has five years of experience working with more than 30 information providers in designing and developing databases for the CD-ROM environment. The firm offers services in the design and development of databases, software development, customer support, and worldwide marketing to publishers.

Software Mart, Inc.
4131 Spicewood Springs Road, Suite I-3
Austin, TX 78759
(512) 346-7887
Fax: (512) 346-1393
Contact: Carolyn Kuhn

Software Mart specializes in the design and development of full-text, fielded data, and multimedia CD-ROM programs for all Apple computer systems. The agency offers such services as project management, design, programming, and data preparation, including image and audio production, data assembly, mastering, and packaging.

Disc Mastering and Replication

3M Corporation
Building 223-5S-01
3M Center
St. Paul, MN 55144
(612) 736-3274
(612) 736-5399
Fax: (612) 736-0158
AppleLink: D2462
Contact: Mark Arps or Dick Pendill

The 3M Optical Recording Department is involved in mastering and replicating, packaging, and distributing customer-supplied input on CD-ROM discs and videodiscs. 3M accepts data input on data cartridges, rewritable optical media, WORM (Wrote Once, Read Many) media, and standard nine-track data tape. The firm is positioned to provide expertise in both the digital world of CD-ROM and the analog world of interactive videodisc.

Denon America, Inc.
222 New Road
Parsippany, NJ 07054
(201) 575-7810
Fax: (201) 575-2532
Contact: Nob Tokutake
Technical Support: Ben Garcia
(404) 342-3032

Denon accepts customer data tapes for premastering and pressing. The CD-ROM software staff can also advise you about applications and the organization of your data-tape preparation before you begin the premastering process. Denon Digital Industries, a subsidiary, was one of the first CD plants to open in the U.S., and started CD-ROM disc replication in May 1988. The firm has experience in quality control in silvering, surface levels, and ink surfacing.

Digital Audio Disc Corporation
1800 North Fruitridge Avenue
Terre Haute, IN 47804
(812) 466-6821
Fax: (812) 466-9125
AppleLink: D2125
Contact: Kozo Arai or Linda Watson, CD-ROM Marketing Division

Digital Audio Disc Corporation (DADC) is a wholly owned subsidiary of Sony Corporation of America. This large CD manufacturer has the capacity to produce more than 7 million compact discs each month, including audio, CD-ROM, and audio-combined formats. DADC services offer the following features: increased data capacity (to approximately 680 megabytes), 8-centimeter CD-ROM, acceptance of all standard nine-track and tape formats, audio-combined CD-ROM capability, standard Sony and Philips caddies, serialization, distribution, and no minimum required

replication quantity.

Discovery Systems
CD-ROM Services Group
7001 Discovery Blvd.
Dublin, OH 43017
(614) 761-4287
(614) 761-4196
Fax: (614) 761-4258
AppleLink: D1191
CompuServe: 76164,1273
Contact: Jack Ryan

Discovery Systems is a service-oriented CD-ROM manufacturing facility that offers five-day standard delivery with no minimum order size. Priority schedules are available, and no advance scheduling is required. Discovery Systems accepts data in any format (hard disk, floppy disk, magnetic tape reel or cartridge, WORM cartridge, or exabyte tape) with up to 680 megabytes supported. The firm supports HFS, ISO 9660, and High Sierra formats, as well as their own proprietary hybrid format that combines Apple HFS and High Sierra formats on the same disc. Other services include nonremoveable serialization, fulfillment, distribution, and complete artwork and graphics design.

Disctronics
1120 Cosby Way
Anaheim, CA 92806
(714) 630-6700
Fax: (714) 630-1025
Contact: Wan Seegmiller

Disctronics is a large independent manufacturer of compact discs. With plants in California, Alabama, Australia, and the U.K., Disctronics offers volume CD-ROM delivery in all the major markets. Disctronics' Anaheim, California, plant is dedicated to CD-ROM mastering and replication and to special projects involving optical discs, supplying research and development services to many companies working in the optical disc field. The company has a patented method of making a one only CD-ROM disc, which is playable on a drive in the same manner as a replicated disc and provides a good way to test a project for demonstration or development. The cost of this service includes premastering.

Nimbus Information Systems
SR 629, Guildford Farm
Ruckersville, VA 22968
1-800-782-0778
Fax: (804) 985-4625
Contact: Larry Boden

Nimbus Information Systems offers complete replication facilities and has processed

more than 150 CD-ROM titles in the past year. Nimbus accepts data in any commonly used media. There is no minimum quantity required for pressing, and the firm has a standard five-day turnaround, with faster service available.

Philips and DuPont Optical Company
1409 Foulk Road, Suite 200
Wilmington, DE 19803-0469
1-800-433-3475
AppleLink: D2173
Contact: Jill Jones

Philips and DuPont Optical Company (PDO) provides complete disc mastering and replicating services. PDO provides a written guarantee on all CD-ROMs produced, as well as complete checks of compact discs, custom packaging, and direct shipping to third-party customers.

Image Management

TMS, Inc.
110 West Third
P.O. Box 1358
Stillwater, OK 74076
(405) 377-0880
Fax: (405) 372-9288
Contact: Mark McClure

The TMSFAX product family is a set of software tools that offers versatile imaging capabilities to microcomputer and workstation users. These capabilities include decompression, compression, rotation, and scaling of bi-tonal images. TMSFAX quickly decompresses and compresses images, has user-linkable libraries for fast applications development, and costs only a fraction of what boards cost.

TMSFAX/Mac®II works within the Macintosh® environment and runs on both 68020 and 68030 processors. TMSFAX uses the CCITT Group 3 1-D, Group 3 2-D, and Group 4 standards for image compression and decompression. Because TMSFAX conforms to these well-known standards, users can share images with users in other companies, send images via facsimile machines, and work with images created by any of several other image compression systems on the market.

Indexing and Retrieval Systems

Aries Systems Corporation
One Dundee Park
Andover, MA 01810
(508) 475-7200
Contact: Lyndon Holmes
AppleLink: D1539
CompuServe: 72117,1302
MCI Mail: LHOLMES

Aries Systems' Knowledge Finder, text search and retrieval system supports citation and full-text retrieval. Aries provides tailored software solutions that match the characteristics of the database to be published on CD-ROM. Ease and effectiveness of end-user searching is emphasized. Knowledge Finder allows the searcher to specify a search sentence containing any number of words or terms, without requiring Boolean logic specification. The program identifies the database documents that best match the searcher's request, and presents the "hits" in order of likely relevance. Knowledge Finder database structures provide for very fast retrieval—single word search on CD-ROM is typically completed in under two seconds.

Discovery Systems
CD-ROM Services Group
7001 Discovery Blvd.
Dublin, OH 43017
(614) 761-4287
(614) 761-4196
Fax: (614) 761-4258
AppleLink: D1191
CompuServe: 76164,1273
Contact: Jack Ryan

Discovery Systems' HyperSearch is a full-text search engine for HyperCard databases. HyperSearch, a set of XCMDs, provides high-performance Boolean search capabilities across multiple HyperCard stacks. A developer kit includes the search run-time engine and the indexing engine. A run-time license for the search engine is available for use on CD-ROM discs. The run-time license can be purchased per CD-ROM disc, and a volume discount is also offered.

Fulcrum Technologies, Inc.
560 Rochester Street
Ottawa, Ontario
Canada K1S 5K2
(613) 238-1761
Fax: (613) 238-7695
Contact: David Dow

Fulcrum Ful/Text is a full-text retrieval software package suited to electronic publishing, CD-ROM, and large document management applications. Ful/Text is modular and portable, and can be integrated into a variety of support environments, including networks. It handles compound documents containing graphics or images, as well as structured and unstructured text. It provides high performance and low overhead, and features a formally defined application program interface (API). Products based on Fulcrum Ful/Text are installed in several thousand end-user sites and are available in a number of foreign languages.

KnowledgeSet Corporation
888 Villa Street, Suite 500
Mountain View, CA 94041

(415) 968-9888
Fax: (415) 968-9962
Contact: Gail Bower

HyperKRS and HyperIndexer from KnowledgeSet are retrieval systems that work with HyperCard. These applications provide Macintosh users with the ability to index data and build comprehensive search queries, retrieve specific information in seconds instead of minutes, and index every word in a HyperCard stack. They can be used with either magnetic or CD-ROM media.

Graphic Knowledge Retrieval System is a full-text and graphics retrieval system for technical documentation stored on CD-ROM discs or other optical media. This program handles vector and raster graphics, and provides a variety of search capabilities, including AND, OR, BUT, NOT, exact order, proximity, field specific, and right truncation. Extensive use is made of hypertext to provide links to references, citations, and images. The hierarchical browsing system also uses hypertext to move quickly through a database structure. Additional features include a dictionary, on-screen help, bookmarking, and a path-to-document feature. DeskTop DataPrep is an indexing system for use with the Graphic Knowledge Retrieval System. It creates the data structures for tables of contents, references, citations, tables, document outlines, and hypertext links.

Other products include KRSAPI, an application program interface (API) that allows developers to create custom retrieval software applications linked to the Knowledge Retrieval System search engine module; and KRSFAX, a software -based utility that provides fast decompression and display of CCITT Group 3 and Group 4, compressed images retrieved from storage media.

Meridian Data, Inc.
4450 Capitola Road, Suite 101
Capitola, CA 95010
(408) 476-5858
Fax: (408) 476-8908
Contact: Chris Andrews

HP LaserRETRIEVE is a CD-ROM database development and user interface software package. It provides CD-ROM publishers with the ability to create CD-ROM databases that contain both text and graphics, and it provides end users with software for CD-ROM database retrieval. Using this software, a CD-ROM publisher can deliver many types of information to end users who can then quickly pinpoint the exact information they need.

Online Computer Systems, Inc.
20251 Century Boulevard
Germantown, MD 20874
(301) 428-3700
1-800-922-9204
Fax: (301) 428-2903

Contact: Bill Ford

OPTI-WARE search, retrieval, and indexing software runs under both the Macintosh operating system and UNIX. The application supports features such as thesaurus field, keyword access, numerical range searching, note pad multiple-disc databases, multiple database access, hypertext links, and hierarchical access. It can also be used for developing audio CD-ROM applications. OPTI-WARE retrieval and indexing software was used to create Bowker's Books-in-Print Plus and Grolier's Electronic Encyclopedia which are available for Macintosh systems.

Quantum Access, Inc.
1700 W. Loop South, Suite 1460
Houston, TX 77027
(713) 622-3211
Fax: (713) 871-1310
Contact: Fran Dodson

Quantum Leap is a development system for producing multiple CD-ROM applications. It has full hypertext capabilities, allowing free-form text and full Boolean search. To use the system, just describe your data and retrieval requirements on Quantum Leap's menu-driven screens; the system automatically modifies the indexing procedures and the retrieval software to fit your specifications. Context-sensitive help files and developer-created guided tours maximize user efficiency and minimize training and support requirements.

Quantum Leap indexes and retrieves full text, graphics, image, and structured data information in any combination on the same file; and the Quantum Leap toolkit, QTools, can be used to modify query and display screens, or to replace them entirely, quickly, and inexpensively. The indexer operates on IBM PC or IBM PC-compatible microcomputers, and produces retrieval and display software for both the IBM PC and the Macintosh—the same CD can be accessed by either computer. Quantum Leap also offers CD-ROM product developers a fully automatic and end-user-transparent audit system for use during the beta testing phase of new CD-ROM products.

Reteaco, Inc.
716 Gordon Baker Road
Willowdale, Ontario
Canada, M2H 3B4
(416) 497-0579
Contact: Nathan Leslie

FindIT is a search and retrieval software system developed by Reteaco, Inc. FindIT works with Reteaco's indexing process and supports full-text, key field, phrase, character ranging, and combined indexing. The system allows for easy full-text searching. Where fields are used, there are no restrictions on their number or length. The user can browse through multiple databases, fields, indexes, or individual

records. FindIT works equally well with numeric data, text, images and other forms of information. You can even encrypt the database and specify different levels of user access. A Macintosh version of FindIT will be available in the summer of 1989.

SilverPlatter Information, Inc.
37 Walnut Street
Wellesley Hills, MA 02181
(617) 239-0306
Fax: (617) 235-1715

SilverPlatter Information, Ltd.
10 Barley Mow Passage
Chiswick, London
W4 4PH, England
01-995-8242
Fax: 01-995-5159

MacSPIRS is SilverPlatter's search and retrieval software for the Macintosh computer. Search features include full database indexing, Boolean operator searching, truncation, and lateral searching. With MacSPIRS you can view a list of every search term, word, or phrase from within the index; combine concepts using Boolean operators (AND, OR, NOT); or relate search terms using proximity operators (NEAR, WITH). MacSPIRS also offers an online help system and online guides with information about the database being searched. The program can be used with any Macintosh computer that has at least two 800K floppy disk drives and 1 megabyte of memory. SilverPlatter databases span many areas of interest including medicine, health and safety, education, social sciences, agriculture, and business and technology. Update frequency ranges from monthly to annual, and databases are available on a subscription basis.

SoftCore Creative Technology
Waversesteenweg 1045
B-1160 Brussels, Belgium
Contact: Marc Jadoul
AppleLink: BEL0038

HyperQL/CD, is a software toolkit for indexing large HyperCard stacks to be placed on CD-ROM discs. The toolkit includes installation software with a read/write indexing and retrieval XCMD. Also included is a script generator for automatic indexing of existing stacks, a tool for transforming index files to optimized read-only structures, and installation software for the read-only retrieval XCMD.

Software Mart, Inc.
4131 Spicewood Springs Road, Suite I-3
Austin, TX 78759
(512) 346-7887
Fax: (512) 346-1393
Contact: Carolyn Kuhn

Software Mart's Media-Mixer retrieval engine subroutine libraries and data preparation tools are source license tools that are used to create full-text and multimedia CD-ROM applications. Licenses are available for internal use and commercial products on a usage or source-code basis.

Virginia Systems, Inc.
5509 West Bay Court
Midlothian, VA 23112
(804) 739-3200
AppleLink: X1082

The Sonar Professional Text Retrieval System is capable of searching a large number of documents at a rate of more than 250,000 pages per minute. Boolean, proximity, and wildcard searching are supported. Sonar Professional can make an index and a table of contents for a single document or an entire folder. Hypertext links connecting related information can be created dynamically using Sonar Professional's analysis capabilities.

Xiphias
13464 Washington Blvd.
Marina Del Rey, CA 90292
(213) 821-0074
Fax: (213) 301-8427
AppleLink: D1371
Contact: Peter Black

The XEARCHXCMD is an XCMD resource, intended for the HyperCard developer, that utilizes an external index file for faster searching. In addition, the XEARCHXCMD permits full Boolean searching, browsing by categories, wildcard searching, and range retrieval. Because it uses an inverted index, most of the necessary processing is accomplished during data preparation. Tools included are XearchStack, which is used to install the XEARCHXCMD and allows automatic keywording of the fields, and XearchApp, which allows the developer to convert XearchStack into a XEARCHable index.

In-House CD-ROM Publishing

Meridian Data, Inc.
4450 Capitola Road, Suite 101
Capitola, CA 95010
(408) 476-5858
Fax: (408) 476-8908
Contact: Chris Andrews

Meridian Data's CD Publisher gives the in-house CD-ROM publisher the ability to prepare a data base for CD-ROM mastering. CD Publisher enables you to simulate the database as if it were a CD-ROM and test different variables to achieve maximum performance before committing to a mastered disc. The system is designed with

Winchester disk drives and a nine-track tape subsystem. CD Publisher operates with any Macintosh computer.

Meridain Data's CD Professional gives CD-ROM publishers the ability to develop, test, and print CD-ROM discs in-house. This application allows you to convert data, print a CD-ROM disc in real time, and provide end-user access to the disc. In conjunction with the Programmable Disc System (PDS), CD Master creates, in real time, discs that are compatible with standard CD-ROM drives. The PDS utilizes a compact laser recorder. Small-lot disc production is possible with this system, which was built to satisfy low-volume storage needs.

Reference Technology, Inc.
5700 Flatiron Parkway
Boulder, CO 80301
(303) 449-4157
Fax: (303) 442-1816
Contact: Mike Befeler

CD-Simulator is an in-house CD-ROM data preparation and development system. It is a complete subsystem of magnetic tape and disk that will load, store, build, and off-load data for CD-ROM production. You can complete the necessary steps in-house to prepare a CD-ROM disc that conforms to the High Sierra/ISO logical file format standard. Your personal computer (the controller) is used to perform the High Sierra/ISO build and to collect statistics during simulation. This controller is connected to a "host" system during the simulation step so that the host can run the application; the controller, in conjunction with the subsystem, simulates a CD-ROM drive and collects the information to debug and fine-tune an application. CD-Simulator can be configured with 300 megabytes to 2.4 gigabytes of magnetic disk storage. The magnetic tape drive can read and write nine-track 1/2-inch magnetic tapes at 1,600 or 6,250 bits per inch.

Reteaco, Inc.
716 Gordon Baker Road
Willowdale, Ontario
Canada, M2H 3B4
(416) 497-0579
Contact: Nathan Leslie

Reteaco's BuildIT is a complete CD-ROM publishing system that runs on the Macintosh II computer. The system incorporates commercial CD-ROM production software that has been used to publish more than 200 databases for a wide range of private-sector and government clients in Canada and the United States. A 300 megabyte hard disk and a combination 1,600/6,250-bits per-inch ANSI standard nine-track tape drive are required.

The BuildIT software license includes a library of data preparation modules; software for database inversion, indexing, and premastering; and FindIT search and retrieval software for CD-ROM simulation and quality assurance testing on the Macintosh

before disc mastering. The package requires that the target system have an A/UX software license. Available options include a BuildIT toolbox that allows customers to develop their own preprocessors, a data compression package, and security software with data encryption capabilities.

Large-Capacity Storage Devices

Meridian Data, Inc.
4450 Capitola Road, Suite 101
Capitola, CA 95010
(408) 476-5858
Fax: (408) 476-8908
Contact: Chris Andrews

Datamax from Meridian Data is a mass-storage subsystem for multiuser environments and local area networks. It can be used with a wide range of microcomputers, regardless of the operating system. By partitioning the storage to reflect the environment, Datamax is able to support the Macintosh computer. Expandable in 300-megabyte increments to 2.4 gigabytes, the Datamax system consists of Winchester disk drives, a sector-caching disk controller, and software. It is an SCSI-based subsystem, so up to three Datamax units can be daisy-chained together.

Online Computer Systems, Inc.
20251 Century Boulevard
Germantown, MD 20874
(301) 428-3700
1-800-922-9204
Fax: (301) 428-2903
Contact: Bill Ford

Online's Multimedia Data Storage device includes a combination of CD-ROM, WORM, (write once, read many) and magnetic drives to meet large storage requirements. Online will also be offering four-drive CD-ROM units that are compatible with Macintosh systems. The CD-ROM units will be available by the third quarter of 1989.

SoftCore Creative Technology
Waverssesteenweg 1045
B-1160 Brussels, Belgium
Contact: Marc Jadoul
32 2 647-4000
Fax: 32 2 647-9382
AppleLink: BEL0038

ArchIS, the optical archival and information system from SoftCore Creative Technology, combines the speed and capacity of a WORM device with the friendliness and flexibility of the HyperCard user interface. ArchIS archives compacted images (imported from a scanner or a PICT file) and text (in a time-resistant PostScript format) onto an unerasable optical disc. Stored information is managed from within Hyper-

Card using the HyperQL query language.

Storage Dimensions
2145 Hamilton Avenue
San Jose, CA 95125
(408) 879-0300
Fax: (408) 879-9330
AppleLink: D1546
Contact: Eric Herzog

Storage Dimensions offers internal and external storage devices with capacities ranging from 45 megabytes to 650 megabytes. Internal disk drives include a mounting bracket, data and power cables, and a software package that consists of driver, drive diagnostics, partitioning, data encryption, data recovery, backup and restore, and disk optimizer utilities. Storage Dimensions offers high-capacity external drives ranging in size from 320 megabytes to 650 megabytes. Models 345 and 650 feature 14.5-millisecond and 16.5-millisecond access rates and a 15-megabit-per-second data transfer rate. A WORM external drive provides 732 megabytes of permanent data storage and a ten-year media archival lifetime on a removable optical cartridge.

Macintosh-Compatible CD-ROM Drives

Denon America, Inc.
222 New Road
Parsippany, NJ 07054
(201) 575-7810
Fax: (201) 575-2532
Contact: Nob Tokutake
Technical Support: Ben Garcia
(404) 342-3032

Denon America's DRD-253 stand-alone CD-ROM drive has an industry-standard SCSI interface. The integrated buffer of 32 kilobytes enables optimum transfer of large amounts of data and allows for faster output and continuity in both text and graphics. The CD-ROM drive features a front-loading system with an Apple compatible cartridge that has been designed to protect the data surface, and an SCSI interface that supports arbitration, disconnect, and reconnect phases. Four drive units can be daisy-chained through one SCSI controller. Overlapped seek of multiple drives is also available to shorten the effective access time in an expanded system. Denon CD-ROM drives are equipped with standard digital-to-analog converters for stereo music reproduction. The stand-alone units are complete with main power supply and connectors so they can be added to the existing systems.

Optical Media International
485 Alberto Way
Los Gatos, CA 95032
(408) 395-4332
Fax: (408) 395-6544
AppleLink: D1490

Contact: Craig Larrew

Optical Media International (OMI) offers a universal Macintosh CD-ROM device driver that supports the AppleCD SC drive as well as Toshiba, Sony, JVC, Denon, and Hitachi CD-ROM drives. The OMI Macintosh CD-ROM device driver allows multiple HFS volumes to be placed on a single CD-ROM disc, and the driver supports interactive mounting and dismounting of up to 10 volumes per disc. Also available for systems integration are half-height, internal-mounting CD-ROM drives with no power supply, and external stand-alone CD-ROM drives with a power supply.

Premastering

3M Corporation
Building 223-5S-01
3M Center
St. Paul, MN 55144
(612) 736-3274
(612) 736-5399
Fax: (612) 736-0158
AppleLink: D2462
Contact: Mark Arps or Dick Pendill

The 3M Optical Recording Department offers premastering services for Apple HFS, High Sierra, ISO 9660, and Digital UNIFILE formats. The company accepts many data input formats, ranging from nine-track magnetic tape to rewritable optical discs. For the first-time CD-ROM developer, 3M offers special packages that include premastering, mastering, replication, and data cartridge hardware for transferring the data to the mastering facility.

Aries Systems Corporation
One Dundee Park
Andover, MA 01810
(508) 475-7200
Contact: Lyndon Holmes
AppleLink: D1539
CompuServe: 72117,1302
MCI Mail: LHOLMES

Aries Systems provides premastering services for production of CD-ROM volumes that can be formatted to the ISO 9660 standard.

Denon America, Inc.
222 New Road
Parsippany, NJ 07054
(201) 575-7810
Fax: (201) 575-2532
Contact: Nob Tokutake
Technical Contact: Ben Garcia
(404) 342-3032

Denon accepts customer data tapes for mastering and pressing. The CD-ROM software staff can advise you about applications and the organization of your data tape preparation before you begin the mastering process.

Discovery Systems
CD-ROM Services Group
7001 Discovery Blvd.
Dublin, OH 43017
(614) 761-4287
(614) 761-4196
Contact: Jack Ryan

Discovery Systems offers mastering services for Apple HFS, High Sierra, and ISO 9660 formats. Data files may be submitted on magnetic tape, WORM cartridges, any Apple SCSI hard disks, and floppy disks. A hybrid-format CD-ROM is available with both Apple HFS and High Sierra/ISO 9660 data partitions on the same physical CD-ROM disc.

Disctronics
1120 Cosby Way
Anaheim, CA 92806
(714) 630-6700
Contact: Wan Seegmiller

Disctronics masters on both OMI TOPIX and Meridian Publisher. The company accepts the following tape formats: nine-track 1,650, 3,250, or 6,250 bits per inch, and 3/4-inch Sony 1630 U-matic. Data can also be supplied on a hard disk or floppy disk, although these media may involve extra charges for downloading. Nine-track tapes may be ANSI-labeled or unlabeled. High Sierra, ISO 9660, and HFS formats are acceptable.

Keva Systems, Inc.
550 S. Wadsworth Blvd., Suite 411
Lakewood, CO 80226
(303) 936-0076
Fax: (303) 936-8236
AppleLink: KEVA
MacNET: KEVA
Contact: Bruce R. Tizes

Keva Systems offers an integrated mastering service that includes data capture, interface design, and indexing. Logical formatted file structures are created from all forms of data—text, graphics, and sound—and data is placed on a writable medium, such as nine-track tape, 1/2-inch magnetic tape, or a hard disk drive. You have the option of using a format readable by the target machine or picking a format that is accepted universally: You may choose from the native Macintosh HFS, ISO 9660, or High Sierra standard. Mastering bolsters your data image with control codes for

error detection, synchronization, and address/mode indication. These codes are combined with your data into individual data sectors.

Meridian Data
4450 Capitola Road, Suite 101
Capitola, CA 95010
(408) 476-5858
Fax: (408) 476-8908
Contact: Chris Andrews

Meridian Data's CD Master integrates audio and data into multimedia CD-ROM products, providing both development and mastering services. CD Master supports nine-track tape and 3/4-inch Sony U-matic tape. As a result, Meridian offers a tool that can accept data from a computer, as well as audio from a studio environment. The program prepares a multimedia disc for mastering, then sends the data directly to the laser beam cutter. Any CD audio mastering facility can upgrade to CD-ROM mastering through CD Master, which can produce up to 20 CD-ROM masters per day. It was designed with a layered ECC Augmentor board that performs error detection and correction coding. Future versions of CD Master will support emerging CD-ROM technologies, such as CD-I, DV-I, and CD-ROM XA.

Nimbus Information Systems
SR 629 Guildford Farm
Ruckersville, VA 22968
1-800-782-0778
Fax: (804) 985-4625
Contact: Larry Boden

Nimbus Information Systems offers premastering services for Apple HFS, High Sierra, and ISO 9660 formats. Data may be submitted on nine-track ANSI tape, WORM disks, hard disks, and floppy disks, as well as in Sony 1630 format.

Online Computer Systems, Inc.
20251 Century Boulevard
Germantown, MD 20874
(301) 428-3700
1-800-922-9204
Fax: (301) 428-2903
Contact: Bill Ford

Online Computer Systems offers complete on-site premastering contract services. The company can customize in-house premastering facilities for client-specific applications.

Optical Media International
485 Alberto Way
Los Gatos, CA 95032
(408) 395-4332

Fax: (408) 395-6544
AppleLink: D1490
Contact: Craig Larrew

Optical Media International (OMI) transfers data to CD-ROM format using its TOPIX CD-ROM Workstation. This process typically requires three to six hours of system use, (the time depends largely on the amount of data, the number of audio segments, and the amount of data preparation required). OMI also offers the following services: media conversion from floppy disk, hard disk, WORM cartridges containing HFS disk images, or nine-track magnetic tape; ISO file origination, which converts HFS data files into the ISO 9660 file structure; CD-ROM encoding; and 100 percent bit-by-bit verification of input data against output master tape data.

Philips and DuPont Optical Company
1409 Foulk Road, Suite 200
Wilmington, DE 19803-0469
1-800-433-3475
AppleLink: D2173
Contact: Jill Jones

Philips and DuPont Optical Company offers file formatting in both High Sierra and ISO 9660 formats. Specific services available to Apple developers include conversion from nine-track tape, external hard disks, WORM disks, and other SCSI devices.

Programming and Interface Design

Please note that this is not a complete list of programmers and designers. A much more comprehensive list will be available at a later time.

Aaron Marcus and Associates
1196 Euclid Avenue
Berkeley, CA 94708
(415) 527-6224
Fax: (415) 527-1994
Contact: N. Gregory Galle

Aaron Marcus and Associates plans, designs, and implements the human-computer user interface, as well as the content structure and organization of CD-ROM-based material. This company provides strategic planning, product definition, human-computer user interface design, including the design of icons, screen layouts, metaphor and color, and information graphics.

Aries Systems Corporation
One Dundee Park
Andover, MA 01810
(508) 475-7200
Contact: Lyndon Holmes
AppleLink: D1539
CompuServe: 72117,1302

MCI Mail: LHOLMES

Aries Systems' Knowledge Finder databases are matched with a user interface that reflects the characteristics of the database. Aries provides software design and development facilities to create the appropriate user interface. Knowledge Host, for use with the MultiFinder™ operating system software, allows the customer to create a unique user interface and to pass retrieval requests to Knowledge Host, which operates as a background task.

Online Computer Systems, Inc.
20251 Century Boulevard
Germantown, MD 20874
(301) 428-3700
1-800-922-9204
Fax: (301) 428-2903
Contact: Bill Ford

Online Computer Systems provides full programming and interface design services for producing CD-ROM discs, and can assist you in all the steps—from the initial concept and requirements to implementation and end-user support. Online's user interface can be customized for specific client applications. It features multiwindow capability, retrieval of text and color or monochrome graphic images, data extraction, RS-232 communications with remote systems, structured search menus, and multilanguage capability.

Software Mart, Inc.
4131 Spicewood Springs Road, Suite I-3
Austin, TX 78759
(512) 346-7887
Fax: (512) 346-1393
Contact: Carolyn Kuhn

Software Mart specializes in design and development of full-text, fielded data, and multimedia CD-ROM programs for all Apple Computer systems. The agency offers such services as project management, design, programming, and data preparation, including images and audio production, data assembly, premastering, and packaging.

Reference Materials and Publications

American National Standards Institute
Sales Department
1430 Broadway
New York, NY 10018
(212) 642-4900

You can obtain the Small Computer Systems Interface (SCSI) official specifications manual by writing to the American National Standards Institute. The reference number for the manual is ANSI X3.131-1986; the document was approved on June 23, 1986. Small Computer Systems Interface 2 is a draft version of proposed changes

to take place to the 1986 SCSI standard. The document is currently in its fifth revision and is available from the following regional offices: Global Engineering Documents, Western Region, 2805 McGaw Avenue, Irvine, CA 92714; Central Region, 7730 Carondelet Avenue, Suite 407, Clayton, MO 63105; Eastern Region, 1990 M Street, NW, Suite 400, Washington, DC 20036, or call 1-800-854-7179.

APDA

Apple Computer, Inc.
20525 Mariani Avenue, M/S 33G
Cupertino, CA 95014-6299
1-800-282-2732

Several useful references are available from APDA™. *AppleCD SC Developer's Guide* provides a description of the CD-ROM product design and creation process. This guide discusses Apple's AppleCD SC™ drive and the Macintosh user interface to the High Sierra and ISO 9660 file systems. Guidelines for using HyperCard as a retrieval engine for Macintosh CD-ROM products and an introduction to sound are also included. *Audio Interchange File Format v.1.2* is a supplemental tool that describes Apple's standard format for storing sample sounds. *PICT File Format Notes and Disk Set* gives eight examples of PICT files using various graphics formats. Included is an application called PICTView for viewing PICT files. These files aid developers in testing applications with Parse version 2 pictures. *Apple Technical Notes* numbers 209 and 210, "What's wrong with my High Sierra disc?" and "The Desktop file's outer limits," are also recommended.

Bureau of Electronic Publishing, Inc.
18 Louisburg Square
Verona, NJ 07043
(201) 857-4300
Fax: (201) 746-3034
Contact: Betty Ann Van Benschoten

The Bureau of Electronic Publishing is a source for in-house CD-ROM drives and titles. It carries Macintosh-compatible CD-ROM products, including a broad range of CD-ROM drives and a comprehensive selection of Macintosh CD-ROM titles (databases). If you call and identify yourself as an Apple Certified Developer, the bureau will send, at no charge, the latest version of its detailed product guide. The bureau sells to hundreds of dealers in the U.S. and abroad, and advertises in over 15 different end-user publications. As a distribution channel, it can help you reach Apple dealers and end users.

Discovery Systems
CD-ROM Services Group
7001 Discovery Blvd.
Dublin, OH 43017
(614) 761-4287
(614) 761-4196
Contact: Jack Ryan

The CD-ROM Forum on the CompuServe Information Service, with over 1,000 members, offers discussions on a wide variety of topics concerning CD-ROM. Contact Discovery Systems for information about joining the forum.

MacGuide Magazine, Inc.
550 South Wadsworth Blvd., Suite 550
Lakewood, CO 80226
(303) 935-8100
Fax: (303) 935-5040
AppleLink: DELTAGROUP
MacNET: MacGuide

MacGuide magazine keeps its readers up to date on the interesting and compelling technology of CD-ROM. *The MacGuide Report* is issued every six months. This comprehensive magazine lists over 4,000 released Macintosh products. *MacGuide USA* issued every trimester, is a CD-ROM disc containing HyperGuide CD, a 4-megabyte HyperCard stack that lists released products for the Macintosh. *MacGuide USA* also contains demonstrations of commercial software, hardware, and accessories; a shareware collection, and comprehensive user group listings. *MacGuide USA* with HyperGuide is also released on floppy disks.

NISO, National Bureau of Standards
Administration 101
Library E-106
Gaithersburg, MD 20899

You can get a copy of the ISO 9660 standards by writing to the National Bureau of Standards at the address above.

Software Mart, Inc.
4131 Spicewood Springs Road, Suite I-3
Austin, TX 78759
(512) 346-7887
Fax: (512) 346-1393
Contact: Carolyn Kuhn

Software Mart's CD-ROM Developer's Lab is an interactive production reference for CD-ROM developers who are creating programs for Apple computers and other PCs. It includes a full-text, searchable, "how to" database with specifications for audio, images, data preparation, premastering, and mastering input formats. Samples of multimedia CD-ROM applications and complete descriptions of the Media-Mixer data preparation and retrieval engine subroutine libraries are included, as well as demo tools and samples for sound production, editing, and imaging. Eighteen leading software and CD-ROM producers have contributed to this collection.

Quantum Access, Inc.
1700 W. Loop South, Suite 1460

Houston, TX 77027
(713) 622-3211
Fax: (713) 871-1310
Contact: Fran Dodson

ClubMac from Quantum Access is an organized collection of over 570 megabytes of CD-ROM files with retrieval through HyperCard. Available by annual subscription or on a single-copy basis, ClubMac provides users with an ongoing library of public domain software, shareware, clip art, fonts, desk accessories, utilities, and HyperCard stacks and databases. ClubMac provides the ability to search, copy, and launch applications and documents directly from HyperCard.

Service Bureaus

Aaron Marcus and Associates
1196 Euclid Avenue
Berkeley, CA 94708
(415) 527-6224
Fax: (415) 527-1994
Contact: N. Gregory Galle

Aaron Marcus and Associates is a management consulting, training, and product development firm that specializes in the design of user interfaces and electronic-publishing documents, including information displays, clip art libraries, and templates for computer graphics systems. This firm can prepare text and imagery on general and specific topics, write and edit documentation, research text material for subjects, and design publications that accompany or explain CD-ROM-based materials. Aaron Marcus & Associates plans, designs, and implements CD-ROM clip art libraries, including the design of pictograms, illustrations, charts, maps, and diagrams. Products are reviewed for legibility and readability, and marketing interviews are conducted to determine product usability.

Online Computer Systems, Inc.
20251 Century Boulevard
Germantown, MD 20874
(301) 428-3700
1-800-922-9204
Fax: (301) 428-2903
Contact: Bill Ford

Online provides a full range of CD-ROM development services—from data preparation to programming and interface design. The company has mastering services and customized in-house mastering facilities for client-specific applications. Online also offers document scanning services and optical character reading as required.

Optical Media International
485 Alberto Way
Los Gatos, CA 95032

(408) 395-4332
Fax: (408) 395-6544
AppleLink: D1490
Contact: Craig Larrew

OMI offers a wide range of CD-ROM services. The firm can process data input into CD-ROM format on OMI's TOPIX CD-ROM Workstation. This process typically requires three to six hours of system use, (the time depends largely on the amount of data, the number of audio segments, and the amount of data preparation required). OMI also offers the following services: media conversion from floppy disk, hard disk, WORM cartridges containing HFS disk images, or nine-track magnetic tape; ISO file origination, which converts HFS data files into the ISO 9660 file structure; CD-ROM encoding, and 100 percent bit-by-bit verification of input data against output master tape data. The company can make a compact disc containing your data for prototyping and in-house testing before replication of your master. OMI can also assist you with mastering, disc labeling, and packaging.

Nimbus Information Systems
SR 629 Guildford Farm
Ruckersville, VA 22968
(804) 985-1100
Fax: (804) 985-4625
Contact: Larry Boden

Nimbus offers such services as market needs analysis, data entry or tech scanning, and audio and/or video recording. The firm can assist in the creation of vector artwork or graphic algorithms, and can complete data integrity checks, content changes, or merge and verifications. Training is also offered.

Reteaco, Inc.
716 Gordon Baker Road
Willowdale, Ontario
Canada, M2H 3B4
(416) 497-0579
Contact: Nathan Leslie

Reteaco is a full-service supplier for organizations that need to distribute usable information to many individuals. Reteaco combines its own copyrighted software and database processing services with CD-ROM. Reteaco provides full database preparation services, including user needs analysis, product definition and specification, sophisticated database conversion, user interface design, custom report formatting, and coordination of mastering and replication of CD-ROM discs, including postproduction work and disc formatting in ISO 9660 format.

Software Mart, Inc.
4131 Spicewood Springs Road, Suite I-3
Austin, TX 78759
(512) 346-7887

Fax: (512) 346-1393
Contact: Carolyn Kuhn

Software Mart specializes in design and development of full-text, fielded data, and multimedia CD-ROM programs for all Apple Computer systems. The agency offers such services as project management, design, programming, and data preparation, including images and audio production, data assembly, mastering, and packaging.

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Mention of Products in this directory is for informational purposes only and constitutes neither an endorsement or recommendation. All product specifications and descriptions were supplied by the respective vendor or supplier. Apple assumes no responsibility with regard to the selection, performance or use of the products listed in this directory. All understandings, agreements or warranties take place directly between the vendors and prospective users.

Limitation of Liability

Apple makes no warranties with respect to the contents of products listed in this directory, or the completeness or accuracy of this publication. Apple specifically disclaims all warranties, express or implied, including but not limited to, the implied warranties of merchantability and fitness for a particular purpose.

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Apple's Networking and Communications Products Overview

Following is a brief description of Apple's networking and communications products for multivendor environments, grouped by the environment in which they primarily function. At the end of the document is a section describing available references for networking and communications. Partners and certified developers may purchase these products from the Developer Price List, APDA™, or Apple Software Licensing; Associates should contact an authorized Apple dealer, APDA, or Apple's Software Licensing Department.

For information about third-party networking products and solutions, refer to the *Apple Multivendor Network Solutions Guide* mentioned at the end of this document.

Products to extend the capabilities of AppleTalk

AppleTalk Internet Router – available from the Developer Price List or an authorized Apple dealer

Software installed in a nondedicated Macintosh computer that connects LocalTalk™, EtherTalk™, and TokenTalk™ networks. It maintains addressing information for each network to efficiently route data between them. It can interconnect up to eight networks into one internet. The AppleTalk® Internet Router software requires Macintosh® system software version 6.0.3 or greater (included on installation disk).

AppleShare PC – available from the Developer Price List or an authorized Apple dealer

Software installed in MS-DOS or compatible personal computers that allows them to connect to LocalTalk, EtherTalk, and TokenTalk networks. Requires a network card such as Apple's LocalTalk PC Card or cards from third-party vendors. AppleShare® PC requires MS-DOS or PC-DOS versions 3.1 or greater.

EtherTalk – available with the EtherTalk NB Card from the Developer Price List or an authorized Apple dealer

Software that allows a Macintosh computer running the Macintosh operating system to access AppleTalk services on an Ethernet network. Requires an Ethernet interface card, such as the EtherTalk NB Card for the Macintosh II family of computers. Version 2.0 is an upgrade of the original EtherTalk software that provides for the extended addressing capacity to support up to 16 million nodes per network, as well as improved routing capabilities.

Apple EtherTalk NB Card – available from the Developer Price List or an authorized Apple dealer

An interface card that enables the Macintosh II family of computers to connect to an Ethernet network. It includes a built-in thin-wire Ethernet transceiver and connectors for both standard and thin-wire Ethernet cabling. A selector on the card is used to specify the type of cabling in use.

TokenTalk – available with the TokenTalk NB card from the Developer Price List or an authorized Apple dealer

Software that allows Macintosh users to transparently access AppleTalk services on a Token Ring network. Requires a TokenTalk NB Card, enabling users to connect Macintosh computers to a Token Ring network.

Products for connecting to DEC environments

AppleTalk for VMS – available from Apple's Software Licensing Department

Software that provides AppleTalk protocols and a programming interface for VAX/VMS systems, so that developers can create distributed applications for seamless communication between the Macintosh and the VAX. The Macintosh must be running the Macintosh operating system, version 6.0.3 or greater, and the VAX must be running the VAX/VMS operating system, version 4.6 or greater. (See the Apple/Digital Development document in this guidebook for more information.)

Products for connecting to IBM environments

Token Ring products

Hardware and software that enables the Macintosh computer to communicate with IBM personal computers and other MS-DOS-compatible personal computers, IBM minicomputers and mainframes, and other peripheral devices over Token Ring networks. Apple's hardware and software for Token Ring networks support APPC, 3270, PC network protocols, and AppleTalk protocols. These products include:

- *The TokenTalk NB card (packaged with TokenTalk software and SMB File Transfer Utility), available from the Developer Price List or an authorized Apple dealer* – interface card that enables the Macintosh II family of computers to connect to a Token Ring network.
- *TokenTalk software* – allows Macintosh users on a Token Ring network to access AppleTalk services (such as printing to a LaserWriter or sharing files via an AppleShare file server).
- *SMB (Server Message Block) File Transfer Utility* – allows users to transfer files between a Macintosh computer and an SMB file server, such as an IBM PC LAN program.
- *MacDFT™ and MacAPPC™*, described below.

MacDFT – available from the Developer Price List or an authorized Apple dealer

A full-featured 3270 emulation program that emulates IBM's 327X Information Display System terminals, allowing Macintosh users to access data from an IBM host. MacDFT software supports file transfer, as well as the copying and pasting of data between the IBM host and the Macintosh computer. With MacDFT, you must be running the Macintosh operating system, version 6.0.3 or greater.

Apple 3270 Application Programming Interface (API) – available from Apple Software Licensing Department

A standardized application programming interface that provides a platform for developers to create customized Macintosh applications that communicate with 3270-based applications and services such as mail and database programs. The API is similar to the IBM 3270 PC High-Level Application Programming Interface.

Apple Coax/Twinax Card – available from the Developer Price List or an authorized Apple dealer

A Macintosh II interface card that provides a coaxial connection to an SNA network in support of 3270-based applications on IBM mainframes. The AppleCoax/Twinax card plugs into one of the NuBus™ slots in the Macintosh II family of computers and connects to an IBM host via a 3X74 cluster controller using standard coaxial cable. The card supports MacDFT application software.

MacAPPC – available from Apple's Software Licensing Department, a single-use license is available from APDA

System software protocols and interfaces that provide a complete implementation of SNA LU 6.2 and NT 2.1 protocols between Macintosh computers, IBM systems, and other systems that support these protocols. The Macintosh with MacAPPC installed can act as a server over an AppleTalk network. Developers can use a full range of programming languages to create APPC applications. The MacAPPC software runs on the TokenTalk NB Card and Serial NB Card. You must use MacAPPC version 1.1 and Macintosh operating system version 6.0.3 or later.

Apple Serial NB Card – available from the Developer Price List or an authorized Apple dealer

An intelligent communications card for the Macintosh II family of computers with four high-speed serial connections that provide connections to many different communications environments. The Serial NB Card supports MacAPPC and MacX25™ software; other applications requiring a serial connection may also be able to use the Serial NB Card.

Products for connecting to TCP/IP environments

MacTCP – available from Apple's Software Licensing Department, a single-use license is available from APDA

A set of software system drivers and programming libraries provided to application developers so they can create Macintosh applications for TCP/IP environments. MacTCP™ is coresident with AppleTalk protocols, so TCP/IP and AppleTalk can operate concurrently. It also runs over both Ethernet and LocalTalk networks. (See the MacTCP document in this guidebook for more information.)

MacX – will be available from the Developer Price List or an authorized Apple dealer

An X Window display server that runs under the Macintosh operating system. MacX™ supports the X Window protocol, version 11, release 3. MacX allows Macintosh users to display their desktop applications that are executing on remote hosts. MacX requires a minimum of 1 megabyte of memory, and will run over Ethernet and LocalTalk networks.

Developer tools for multiple environments

CL/1 – will be available from APDA in the latter part of 1989

A connectivity language for developers that gives personal computer users high-level access to information on host systems, independent of network technology, host system architecture, and database management systems. CL/1™ server software provides access to databases on supported host systems and works cooperatively with applications on Macintosh computers that support CL/1 clients. Servers can be installed on VAX computers from Digital running VMS, or IBM mainframes running MVS/TSO or VM/CMS. (See the CL/1 document in this guidebook for more information.)

Macintosh Communications Toolbox – will be available from APDA, and will become standard system software when released as part of System 7.0

An extension to the Macintosh Toolbox that provides developers with standard access mechanisms to communications services. Using the Toolbox, developers do not have to write low-level communications mechanisms for their software, but have the consistency of the communications interface across services.

MacWorkStation – available from Apple's Software Licensing Department, a single-use license is available from APDA

A programmer's tool to develop a Macintosh front end for new or existing host-based applications. MacWorkStation™ allows programmers not familiar with programming the Macintosh to easily build Macintosh-style interfaces for their applications. You must use the Macintosh operating system software, version 6.0.3 or later. In addition, you'll need to use MPW™ version 2.0 or later. (See the MacWorkStation document in this guidebook for more information.)

X.25 connectivity

MacX25 – will be available from APDA

Software included with MacX25:

- *MacX25 Server* – software that connects a Macintosh computer to packet-switched networks and acts as a server to distribute X.25 services to any Macintosh on the AppleTalk network.
- *MacPAD* – software running on a Macintosh that works in conjunction with the MacX25 Server to provide packet assemble/disassembler (PAD) services to application programs. Using a terminal emulation program and MacPAD™, users can access data and services over an X.25 wide area network.
- *MacX25 Programming Library* – a tool kit, or collection of routines, that offers a high-level program interface for applications. Routines are included for initiating and terminating contact with the MacX25 server, establishing and closing down a virtual circuit, and passing data across an established circuit, among other tasks.

Note: All X.25 products offered by Apple conform to the Consultative Committee on International Telegraphy and Telephone (CCITT) recommendations—the internationally recognized standards for communication in packet-switched networks.

Recommended Documentation

The following is a list of suggested resources and many of the technical books that provide greater technical detail on networking and communications and the protocol architecture of AppleTalk.

Available from APDA:

- *Understanding Computer Networks*, an introduction to networking and communications concepts and technologies
- *AppleTalk Network System Overview*, a description of the AppleTalk network system and a variety of Apple network products
- *Inside AppleTalk*, the definitive technical guide to the protocol architecture of the AppleTalk network system

- *EtherTalk and Alternate AppleTalk Connections Reference*, a detailed description of the EtherTalk implementation and extensions for alternate AppleTalk connections
- *Software Applications in a Shared Environment*, a description of considerations necessary for all applications to function in a shared environment

General Resources:

- Apple Product Data Sheets, see section “Apple Product Data Sheets” in this guidebook
- user or reference manuals published by Apple Computer
- *A Guide to Apple Networking and Communications Products* provides an overview of networking and communications products for multivendor environments—available from an authorized Apple dealer
- *Apple Multivendor Network Solutions Guide*, a collection of solutions that provide information about integrating Macintosh computers into various computing environments—available from an authorized Apple dealer



The AppleTalk Network System

Introduction

Applications development opportunities for the AppleTalk® Network System (ANS) abound, and products that allow users to work effectively together—groupware applications—are likely to be successful in the years to come. Products such as single-user word processing applications integrate well with single-user spreadsheets and page-layout programs, and the functionality of these solutions can be extended to include multiuser support. Just a few examples of the new generation of products enabled by the services provided in ANS include multiuser calendaring and scheduling, and project management applications.

Developers who can maintain the unique Macintosh experience while creating multiuser solutions are the ones who will develop the winning products in a shared environment. Before we examine the specific details of developing applications for the ANS, we'd like to provide some general directions that should give developers the best opportunity to create products that will stand apart from the crowd.

The AppleTalk Network System—Developer Opportunities

While Apple concentrates on providing the standard mechanisms for ANS—protocols and basic services—developers should concentrate on solutions that build upon the network infrastructure. The AppleTalk Filing Protocol (AFP) has been implemented in a number of different environments to provide, for example, file-sharing solutions based on several types of minicomputers and file-server platforms. While the resulting product provides a basic service, it maintains the same functionality as the original AppleShare® file server product and furthers the consistency of the user interface and the end user's experience.

On the hardware side, concepts worth investigating include providing AppleTalk support over alternative media types, uninterruptible power supply (UPS) support for AppleShare file servers, and network peripherals, such as plotters, facsimile modems, and modem and serial device servers.

With the introduction of AppleTalk Phase 2, in June 1989, developers of most AppleTalk-based services—multiuser databases, electronic-mail systems, and so on—do not have to modify their applications at all in order to remain compatible. The implementation of AppleTalk Phase 2 maintained the insulation of higher-level services that utilize AppleTalk from the underlying protocol layers that has been a hallmark of the AppleTalk network system since its inception.

Development Information: Required System Configuration, Documentation, and Tools

Once your product idea is clearly defined, you need to determine the minimum configuration of Apple equipment, as well as any third-party equipment needed, on which to develop and test your applications. We recommend that your products run on the broadest possible range of machines.

Apple Equipment and Software

- One dedicated Macintosh® Plus, Macintosh SE, Macintosh SE/30, Macintosh II, Macintosh Iix, or Macintosh Iicx computer to be used as an AppleShare® file server. The file server must have one or more SCSI hard disks attached to it.

- One Macintosh® Plus, Macintosh SE, Macintosh SE/30, Macintosh II, Macintosh IIfx, or Macintosh IIfx computer or Apple® IIe or Apple IIGS® computer to act as the development workstation. In the case of the Apple IIe, the Apple IIe Workstation Card is required; an Apple IIGS requires IIGS® Workstation software.
- For connection-oriented applications development on a Macintosh, the AppleTalk® Data Stream Protocol (ADSP) software is recommended, available from the Apple Software Licensing Department.
- AppleShare® File Server software, version 2.01 .
- LocalTalk™ or EtherTalk™ network cables, connectors, and interface cards for each workstation, server, and printer.

Documentation and Tools

In addition to the most recent versions of the System and Finder™ files, you should have the following documentation and tools, available from APDA™:

- AppleTalk Filing Protocol, version 2.0 release notes
- AppleTalk Data Stream Protocol preliminary note
- *EtherTalk and Alternate AppleTalk Connections Reference* manual. (A new version of this document has been produced to reflect the changes necessary to support AppleTalk Phase 2. This document should be available from APDA in the third quarter of 1989.)
- *Foreground Applications Development for AppleShare* manual
- *Inside Macintosh*, Volumes IV and V, published by Addison-Wesley
- *Inside AppleTalk*, published by Addison-Wesley
- *AppleTalk Network System Overview*, published by Addison-Wesley
- *Software Applications in a Shared Environment* manual

Apple's standard ADEV and Network CDEV are available for licensing for third parties who plan to develop EtherTalk or other alternate AppleTalk network adapters. Contact Apple's Software Licensing Department for more information.

Q&A: Background Information

The following are answers to commonly asked questions about Apple's networking strategy as it relates to the ANS:

Q. *Why does Apple refer to AppleTalk as a "network system"?*

A. The ANS is made up of a number of different components, including physical network components, file- and print-sharing components, and network management features, as well as support for connections to Digital VAX™ environments.

The ANS is unique in many respects. First, it is virtually self-configuring. Each machine in an AppleTalk network "negotiates" with its peer machines for assignment of its node identifier; the network manager does not have to configure the network in terms of software address assignment. It is not necessary to "halt" an AppleTalk network to add additional nodes.

Second, AppleTalk is independent of physical media and speed. AppleTalk has been implemented on Ethernet, Token Ring, shielded and unshielded twisted-pair cable, Northern Telecom's LANSTAR™ (LANSTAR AppleTalk) local area network, and fiber-optic cable (from Du Pont). Third parties are developing AppleTalk interfaces to DataPoint's ARCnet, as well.

Further, AppleTalk has built-in facilities for internetwork support that make network management extremely flexible and configuration extremely

easy. AppleTalk has built-in support for the assignment of logical groups of systems into what are called AppleTalk zones. These zones may be subsets or supersets of physical networks, and can be used by network administrators to create workgroup arrangements of individuals or machines that may not be part of the same contiguous physical network. The ANS has built-in support for network printing, allowing Macintosh systems to select printers from a list of available printers, and print to them regardless of their physical location; therefore, expensive printing resources can be shared among larger groups of users. Most AppleTalk services are selected through the use of Apple's Chooser interface, which provides a simple, intuitive means for selecting printers, file servers, print servers, and other network resources, either from the local zone or from a zone in another building or city. Numerous other special characteristics of AppleTalk are described in more detail in *Inside AppleTalk*, which is available from APDA.

The latest development in the introduction of the AppleTalk Network System is AppleTalk Phase 2. AppleTalk Phase 2 allows AppleTalk networks to increase in size to support the requirements of very large organizations. A single AppleTalk internet could contain 16 million AppleTalk nodes. All of the features described earlier continue to work in AppleTalk Phase 2.

Q. *Would you describe LocalTalk and EtherTalk?*

A. LocalTalk is a shielded twisted-pair cabling system that can connect to the AppleTalk hardware built into every Macintosh computer, LaserWriter® printer (except for the LaserWriter IIsc), and Apple IIGS system. In addition, LocalTalk cards are available for the Apple IIe computer, ImageWriter® II and ImageWriter LQ printers, and even IBM PCs, PS/2s and compatibles.

More recently, Apple has introduced the EtherTalk Interface Card, which allows Macintosh II computers to utilize AppleTalk services over Ethernet media. In addition, cards available through third-party vendors allow the Macintosh II family of computers and the Macintosh SE and the Macintosh SE/30 to take advantage of Ethernet. Third parties also offer SCSI-to-Ethernet products that link Macintosh Plus systems to EtherTalk; and network routers that link LocalTalk networks and LaserWriter printers to EtherTalk networks.

Q. *How can AppleTalk services operate over Ethernet media?*

A. Apple has developed a set of enabling technologies that manage link access (the LAP manager); address resolution between AppleTalk and Ethernet addressing schemes; and provide a user interface for selecting the type of network that the user wishes to utilize. This collection of facilities is described in the *EtherTalk and Alternate AppleTalk Connection Reference* manual, which is available through APDA. In order to develop an AppleTalk implementation on non-LocalTalk media, developers must license the appropriate LAP manager components from the Apple Software Licensing Department.

Q. *Why did Apple decide to produce "AppleTalk Phase 2"?*

A. AppleTalk Phase 2 is Apple's response to a number of customer requirements: larger AppleTalk networks, Token Ring support, support for MS-DOS PCs on EtherTalk networks, EtherTalk support for the A/UX[®] operating system, and an internet router from Apple Computer, Inc.

In an AppleTalk Phase 2 network, the 254-nodes-per-network limitation is eliminated. Networks of up to 16 million nodes can be built to serve the needs of the largest organizations.

EtherTalk 2.0 changed Apple's AppleTalk-over-Ethernet media offering. EtherTalk 2.0 is implemented to the IEEE 802.3 standard. This allows lower-level media access bridges to support large EtherTalk networks. This update is an example of the specific changes requested by Apple's customer base that were implemented in AppleTalk Phase 2. EtherTalk 2.0 is supported by a number of third parties, and is compatible with third-party routers and Apple's AppleTalk Internet Router.

TokenTalk[™] 2.0 allows NuBus-based Macintosh systems to utilize AppleTalk services over Token Ring media. TokenTalk 2.0 is compatible with AppleTalk Phase 2, and with the AppleTalk Internet Router. Like EtherTalk 2.0, TokenTalk 2.0 is implemented to the IEEE specifications for Token Ring, and uses the 802.2 Type 1 (connectionless) service for its packet format. TokenTalk 2.0 supports IBM source routing bridges, and includes the full 802.2 LLC implementation of IBM's Token Ring.

AppleShare PC 2.0 features a full implementation of AppleTalk Phase 2 for MS-DOS PCs. It includes support for LocalTalk, EtherTalk 2.0, and TokenTalk 2.0, and supports the OLI (Open Link Interface) that Apple and others jointly developed with Novell. AppleShare PC 2.0 requires a third-party Ethernet or Token Ring card with an appropriate OLI driver to connect PCs to EtherTalk or TokenTalk networks.

EtherTalk 2.0 for A/UX brings the benefits of AppleTalk Phase 2 to Macintosh systems running the A/UX operating system. EtherTalk 2.0 for A/UX supports toolbox printing directly from applications. A LocalTalk card is no longer required for A/UX systems to access AppleTalk.

One major area of the ANS that changes in AppleTalk Phase 2 is network router implementation. AppleTalk Phase 2 contains a number of performance enhancement features for routers, in addition to support for larger networks.

The AppleTalk Internet Router is a software-based router that can run in the background of a Macintosh. It is data-link independent; it can support nonextended (LocalTalk) and extended (EtherTalk 2.0, TokenTalk 2.0) networks. The router supports up to eight ports simultaneously, and is administered through a desk accessory. The router administration screen displays routing table and statistical information about the internet. Third parties that plan to offer alternate data link support for Macintosh computers can build drivers for the AppleTalk Internet Routers to internetwork the alternate links with the three standard data links supported by the router.

The AppleTalk Internet Router is not meant to replace third-party routers. It is meant to provide a benchmark for router performance and reliability. It serves as a springboard for future network management support.

Q. *How do I upgrade to AppleTalk Phase 2?*

A. Apple has provided upgrade utilities and associated documentation for network administrators to use to upgrade their networks to AppleTalk Phase 2. The first, the “AppleTalk Phase 2 Upgrade Utility,” is an INIT resource that is installed in AppleTalk Internet Routers. If a Phase 1 router is detected at startup time, the router will translate Phase 2 routing packets back to Phase 1 on that specific network. This allows incremental upgrade of the routers on the internet. However, some of the features specific to AppleTalk Phase 2, including network ranges and zone lists, are not available on the internet until all routers are upgraded to AppleTalk Phase 2 compatibility.

The “Phase 2 Node Identifier” is another utility that assists the administrator in identifying the Phase 1 and Phase 2 nodes on a specified network. The utility can be targeted to select nodes through selection of various criteria, and the resulting list can be saved to disk or printed, in addition to display on the Macintosh screen.

The *AppleTalk Phase 2 Introduction and Upgrade Guide* documents the benefits of AppleTalk Phase 2, and details the installation and use of the AppleTalk Phase 2 Upgrade Utility.

Q. *What do you mean by “network servers” in the ANS?*

A. Currently, two network servers are part of ANS. The first is the AppleShare File Server (AFS); the second is the AppleShare Print Server (APS). AppleShare provides a shared resource—a Macintosh running AppleShare software with one to seven hard disk volumes attached—that can be shared by users in the workgroup, or by other users in other groups, simply by selecting the desired file server through the familiar Chooser interface. If the user wished to use AFS services, he or she would sign on to the file server with an authorized user code and password and select the volume on that server that contains the desired information. When the volume appeared on the user’s desktop, it could be accessed as though it were any ordinary disk file.

The AppleShare File Server contains additional features that make it an ideal system for workgroups. For example, it allows the network administrator to group individual users in one arrangement to represent their membership within the organization and in another arrangement for a particular project or task force. The network administrator may, for security and privacy reasons, limit the access to particular files and folders. One typical use of this facility is to create a “drop box” folder, into which all users can insert files, but which can only be opened by the owner of the folder. Most AppleShare administrative tasks can be performed from the Macintosh acting as the file server while the file server is operating.

AppleShare allows one other application, typically operating in the foreground, to coexist on the same Macintosh. [*Note:* Apple does not recommend the development of background applications for AppleShare at this time (see the

Documentation and Tools section of this note for documents that discuss foreground operation in more detail).] This application is typically the AppleShare Print Server (APS). The APS provides print spooling and printer queue management facilities for one to five LaserWriter or ImageWriter printers (ImageWriter II and ImageWriter LQ printers must have the optional LocalTalk card installed to be attached to the network) and supports color printing on the ImageWriter. Like the AppleShare File Server, APS is configured while spooling is taking place, so changes can be made without halting the print-spooling function.

Q. *If only one foreground application can be coresident with AppleShare, what opportunities are there for developing applications compatible with AppleShare?*

A. Customers are asking for applications that allow end users to share data easily and, in many cases, simultaneously. AppleShare provides the enabling technologies and protocols to support these needs. AppleShare is based on the AppleTalk Filing Protocol (AFP), Apple's standard for file service. AFP provides facilities to support multilaunch applications. In addition, AFP provides byte-range-locking facilities for multiuser applications such as database systems, accounting packages, calendaring and scheduling packages, and any other applications that allow multiple users to update the same file at the same time.

Q. *Do MS-DOS PCs have a place in ANS?*

A. Apple provides AppleTalk services for MS-DOS PCs. The LocalTalk PC Card allows these systems to connect to AppleTalk networks, and to print to network LaserWriter and ImageWriter printers. Apple also offers AppleShare PC 2.0, which allows MS-DOS PCs equipped with the LocalTalk PC Card or third-party cards with appropriate OLI drivers to utilize AppleShare file servers. The OLI standard was developed by Novell, Apple, and others to allow developers to implement protocol stacks for network adapters (cards) in a standard, compatible fashion.

In addition to the normal benefits of AppleShare file service, many developers can take advantage of the fact that their applications share common file formats between their MS-DOS and Macintosh versions. Where possible, Apple has provided a facility that automatically maps the DOS file extension to the Macintosh creator and type. The Macintosh user sees the DOS file on the desktop as though it were an ordinary Macintosh file, complete with the file icon; double-clicking the mouse on the icon launches the application and opens the file on the Macintosh.

Q. *What about networking and the Apple II?*

A. Apple is committed to the education market and to the Apple II product line. As a result, the company supports Apple IIe and Apple IIGS participation in the ANS, including file and print service. Apple II systems can boot remotely from the AppleShare server, eliminating the need for individual disks for each system, and the AppleShare Print Server supports printing from Apple II systems. In addition, Apple II users enjoy a special menu facility called Aristotle™, which

allows educators to create special menus for networked classroom environments. As new features are introduced for AppleShare, the needs of Apple II users and the education community will continue to be addressed.

Q. *Is Apple encouraging third parties to enhance AppleTalk and AppleShare?*

A. Apple supports those developers who have introduced products that allow AppleTalk network connectivity over alternate media, such as unshielded telephone wiring or fiber-optic cabling. Apple also supports those developers who are providing AFP-based file services on minicomputers and mainframes. However, Apple considers products that do not adhere fully to the AFP standard to be detrimental to the user's experience, as well as to the overall performance of the network system. A key strength of the Macintosh has been its consistent user interface and high-quality performance of compatible products.

Developers interested in developing products, such as network routers (sometimes called bridges), network management products, network modems and serial servers, and other peripherals that utilize the network depend on a standard environment. Apple will keep those developers informed as AppleTalk standards evolve so that the installed base of products and networks, now approaching 3 million nodes, can migrate along with the standards. Apple discourages developers from promoting alternatives that conflict with the Apple-endorsed ANS standards.

Apple encourages developers to utilize the LAP manager and other facilities of the ANS to bring AppleTalk into new environments. Specialized media types, alternative transport systems such as infrared and packet-radio transmission, AFP servers on minicomputers and mainframes, and very high-performance network routers that interface to T-carrier facilities are a few examples of developer opportunities that Apple endorses in the network infrastructure arena.



Introduction

The agreement between Apple Computer, Inc. and Digital Equipment Corp. has expanded the Macintosh® applications development opportunities to include the VAX™ environment, and thus, has expanded the horizons for you, the developer. Because you've shown an interest in developing applications for this exciting new platform, we'd like to provide you with some background information about this agreement, give you an introduction to the development opportunities, and show you the support for developers that is available from Apple and Digital.

The Apple/Digital Equipment Corporation Agreement

In January 1988, Apple and Digital agreed to provide a jointly developed and endorsed environment for common communications based on AppleTalk® and DECnet™/OSI networking foundations. The development effort between the two companies is designed to provide you with standard technologies for Macintosh and VAX integration. Based on this consistent technical framework of industry standards and open service interfaces, you will be better equipped to plan for, implement, and deliver a new generation of world-class networked end-user applications.

The August 1988 Apple/Digital Developer's Conference, held in Boston, followed by the update session at the May 1989 Worldwide Developers' Conference in San Jose were steps toward the fulfillment of this agreement to integrate the Macintosh and VAX computing worlds. This commitment to better integrate these two technologies is a direct response to a mutual customer need: to share information and to use computing resources more effectively.

Apple and Digital are providing the common communications foundations and the core network services needed to support this goal. Developer opportunities will abound for products ranging from high-performance distributed and cooperative computing applications to network-intelligent productivity applications to friendly multimedia front-end interfaces for standard VMS-based applications.

Customers will reap the benefits of a highly integrated environment featuring the consistent, intuitive Macintosh user interface, AppleTalk network transparency and services, VAX computing power, and enterprisewide DECnet/OSI networking connectivity.

Additionally, Digital and Apple have signed a service agreement whereby Digital will provide service on Macintosh systems and related peripherals to Apple/Digital customers. Apple and Digital are also focusing on support for related third-party hardware and software products, more advanced network support, and international customer support.

Because the joint development efforts are based on the same technology foundations, customers' strategic investments in third-party connectivity products and services based on the AppleTalk Filing Protocol (AFP) will not be rendered obsolete. The joint development program will not only offer the tools for the next generation of AFP-based integration products, but will also provide conversion utilities for the migration of existing AFP-based files and databases. The collaboration will not make modifications to existing nonconnectivity-based Macintosh

applications necessary. Apple and Digital plan to support the OSI standard in future versions of the Apple/Digital network environment. *A majority of the "deliverables" mentioned in the following sections will be available in the early part of 1990.*

Development Opportunities

The Apple/Digital agreement increases opportunities for Macintosh and Digital developers. It provides them with a suitable platform for distributed applications in the areas of business, finance, engineering, desktop publishing, and Macintosh-to-VAX connectivity products.

Third-party development opportunities for distributed Macintosh/VAX applications exist in the following areas: CAD, CAM, MRP, simulation, host access, network management, and vendor data access. There is also a market for network-intelligent groupware applications in the areas of project management, word processing, spreadsheets, presentations, databases and calendars, as well as for front-ends for VAX applications, including access to Macintosh applications and services, graphic interface, and sound and video. Finally, developers should also look into filling needs that Apple and Digital will not address, such as 3278 gateway integration, VAX Notes client, and VAX VTX client.

Distributed Macintosh/VAX applications utilize the Macintosh as an integral portion of the application, where it performs the role of interfacing to the user and calls on VAX resources as necessary. For instance, in an engineering computer-aided design application, the Macintosh might be used to perform airflow analysis on portions of an aircraft design, and to graphically display the results. But if an engineer decided to perform an airflow analysis on the *entire* aircraft structure, the application would realize that this would take far longer on the Macintosh than was practical. Instead, the application would take advantage of the RPC mechanism and data access facilities available for Macintosh/VAX connectivity and automatically utilize the VAX systems to perform the computational analysis—without requiring any change in the way the engineer issues commands.

Macintosh/VAX-based network-intelligent groupware applications are actually a subset of a larger area involving Macintosh network-based applications in general. AppleTalk, through the AFP facilities, offers a rich set of protection mechanisms, such as byte-range locking, that allow developers to create true multiuser applications. Many Macintosh applications were originally designed around a single-user model and had multiuser features added later. But network-intelligent groupware applications are designed from the beginning with multiuser capabilities. The VAX systems, by offering AFP support, can also take advantage of any network-intelligent groupware applications that developers may create.

Finally, the user's acceptance of an existing VAX application may be enhanced with the addition of a Macintosh front end. Rather than try to redo the VAX application so that it becomes a distributed program between the Macintosh and VAX, by adding either MacWorkStation or X Window code, the application can utilize a Macintosh and its familiar, easy-to-use interface with only minimal alterations.

Development Configurations and Documentation

To develop Apple-to-Digital applications on the Macintosh II, Macintosh IIx, or Macintosh IICx you will need the equipment, development tools, and documentation listed below:

Apple Equipment and Software:

- Macintosh II, Macintosh IIx, or Macintosh IICx computer with a minimum of 2 megabytes of RAM
- 12-inch monochrome monitor with 4-bit video card or 13-inch color monitor with 8-bit video card
- Apple 40-megabyte hard disk
- Apple Tape Backup 40SC (optional)
- Macintosh II EtherTalk Interface Card (optional)
- *EtherTalk*, Version 1.1 (optional)

Development Tools

Apple Products:

- Macintosh Programmer's Workshop (MPW™) and MacApp®(available from APDA™)
- MacWorkStation (optional, available from the Apple Software Licensing group)
- AppleTalk for VMS (available from the Apple Software Licensing group)

There are a number of third-party products that are fundamental to connectivity in this area. For a list and description of these products, refer to the APDA catalog, APDAlog.

Documentation

The following publications are available from APDA:

- *Inside Macintosh*, Volume I-V
- *Inside AppleTalk*
- *Human Interface Guidelines*
- *Applications Development in a Shared Environment*
- *Ethernet and Alternate AppleTalk Reference*
- *MacWorkStation: A Programmer's Guide*
- *MacWorkStation: Programmer's Reference*
- *AppleTalk for VMS* documentation set
- *AppleTalk Data Stream Protocol* preliminary note
- *AppleTalk Filing Protocol (AFP) Engineering* technical notes
- *AppleTalk Manager Update*
- *EtherTalk* preliminary note

Foundation of the Technology Infrastructure

The technology infrastructure that supports this new developer environment is based on:

- Standardization of the connectivity hardware
- Standardization, provision, and support of the connectivity software based on AppleTalk for VMS
- Provision and support of a core set of network services, callable by third-party applications
- Provision of a standard set of network interfaces and developer tools

Network Connectivity Hardware

Many of these building blocks were in place prior to the agreement and have been reinforced as a result of these joint efforts.

Core-supported connectivity hardware includes:

- Both EtherTalk™ (the higher-performance AppleTalk network) and DECnet, which use Ethernet industry-standard 10 MB/sec LAN over thick, thin, or twisted-pair media
- LocalTalk™, Apple's broadly implemented low-cost network, which runs over twisted-pair wiring
- Routing between LocalTalk-to-Ethernet is accomplished with various routers based on standard published AppleTalk routing protocols

Network Connectivity Software***AppleTalk for VMS***

The standard development platform for Macintosh and VAX integration is AppleTalk for VMS. This software product is available through the Apple Software Licensing group to network applications developers. AppleTalk for VMS implements the AppleTalk protocol architecture on VAX/VMS systems, allowing them to be full participants in the AppleTalk Network System (ANS). Developers can then build VMS-based applications, such as AppleShare® file and print servers, that communicate over ANS to Macintosh, Apple II, and MS-DOS personal computers.

The advantages for Macintosh users of AppleTalk protocol support on the VAX include:

- Preservation and extension of the "look and feel" of the Macintosh interface in VAX communications
- Preservation of the AppleTalk network's ease of use, installation, and setup
- Access to powerful VAX-based file and print servers that retain the ease of use and interface of AppleShare file and print servers
- Leveraging of investment in Macintosh applications that already take advantage of ANS
- Interoperability with MS-DOS and Apple II personal computers and VAX applications and relational databases

Deliverables include:

- AppleTalk for VMS API (Applications Program Interface) specifications
- Extended AppleTalk for VMS will provide:
 - Enhanced performance
 - Additional wide-area AppleTalk routing capabilities via DECnet/OSI tunneling
 - Gateway functionality, facilitating the development of distributed AppleTalk and DECnet/OSI applications
 - Facility to enable networked terminal access to VMS
 - Support of Apple's network management protocols, for bidirectional AppleTalk-to-DECnet/OSI management.

Apple and Digital plan to use these future versions of AppleTalk for VMS as a platform for Macintosh/VAX integration products.

AppleTalk-DECnet Transport Gateway

In addition to AppleTalk for VMS, customers and developers will benefit from an entirely new capability: bidirectional end-to-end links between any AppleTalk computer system and any node in DECnet/OSI enterprisewide networks.

This new capability means that you can build applications capable of performing transparent task-to-task communications between AppleTalk Data Stream Protocol (ADSP) and DECnet NSP- (Network Services Protocol) based processes located on any remote DECnet/OSI node (such as PDP-11, VMS, or ULTRIX-based systems). This facilitates adaptation of existing DECnet/OSI applications and allows both computers to be programmed in their native communications environments. A manufacturing applications designer, for example, could take an existing DECnet/OSI-based process control application running on a PDP-11 and implement software allowing the Macintosh to act as a front end to the application.

The AppleTalk-to-DECnet transport gateway is an important adjunct to AppleTalk for VMS, because it allows Macintosh integration with VAX systems elsewhere in the extended DECnet/OSI network, regardless of whether the destination VAX is running the AppleTalk for VMS software. Using the AppleTalk-to-DECnet transport gateway, Macintosh users will be able to access DECnet/OSI enterprisewide mail networks and remote VAX-based network applications, such as VAX VTX and VAX Notes.

Digital will build and offer an AppleTalk-DECnet transport gateway to run on VAX/VMS systems. This ADSP-to-NSP transport gateway will run concurrently with AppleTalk for VMS, allowing any Macintosh in an AppleTalk network to access any DECnet/OSI node, or vice versa. (ADSP and NSP are bidirectional, connection oriented, end-to-end transport protocols available from Apple and Digital, respectively.)

Deliverables include:

- AppleTalk-to-DECnet transport gateway (will be provided by Digital)
- NSP protocol specifications are currently available from Digital
- Gateway access routines Macintosh API for release with the Toolkit (will be provided by Apple); ADSP protocol specifications are currently available

Network Management

Future versions of AppleTalk for VMS will provide network management functions to allow integrated management of combined AppleTalk and DECnet/OSI networks. AppleTalk for VMS and the DECnet transport gateway will provide full support for AppleTalk network management functions. Apple will provide capabilities that will allow AppleTalk management stations to view the DECnet network. Digital will provide capabilities that will allow a VMS manager to view an AppleTalk network. These will work together to provide:

- Necessary information to AppleTalk administrative tools, such as Inter•Poll™, for viewing the network, determining device status and response time, and detecting and locating faults
- Control of the AppleTalk-for-VMS internet-router process

- Information about DECnet/OSI needed for:
 - Link status used by AppleTalk for the VMS router
 - Link status used by DECnet transport gateway
 - DECnet/OSI control functions for AppleTalk

Apple will develop, release, and support a version of AppleTalk for VMS incorporating these network management capabilities; no third-party API is planned at this time.

Building Distributed Applications

Independent software developers now have a choice of several user-interface technologies with which to provide access to VMS applications, including VT terminal emulation and use of MacWorkStation™. We are also broadening the offering by supporting the X Window System.

VT Terminal Emulation

Networked terminal-emulation capabilities will be supported by inclusion of a terminal driver as a standard part of AppleTalk for VMS. This will support direct terminal sessions to VAX/VMS hosts via the network link from many terminal emulators that emulate a VT-class terminal.

Communications Toolbox

Apple will provide a new facility, the Communications Toolbox, which allows developers to easily build special-purpose terminal emulators and to incorporate terminal and file transfer capabilities into their applications. The Communications Toolbox will feature ADSP support. The Communications Toolbox is scheduled to ship in the latter part of 1989 or early part of 1990. It will be available from APDA and will be included in Macintosh System Software 7.0.

Deliverables include:

- AppleTalk for VMS that will contain the necessary port driver for VMS systems
- Communications Toolbox with a LAT™ (Local Area Transport) terminal driver interface for Macintosh developers

In addition to Apple's MacTerminal® product offering, several third-party VT-series terminal emulators are currently on the market.

X Window System Access

The X Window System is an industry standard for communicating with and controlling bit-mapped display devices. Developed at MIT as part of Project Athena (sponsored in part by Digital), it includes a standardized library of routines for display-oriented functions in a networked environment where a program running on one system can present information on another system's display. This insulates applications developers from the intricacies of network communications transports and minimizes the effort required to implement applications across different platforms.

Apple supports the X Window System and will provide an X11 server on the Macintosh. X Window availability will be of particular interest to VMS developers of graphics-intensive applications. An X Window to a VAX application will appear as part of the Macintosh user's desktop, allowing cut, copy, and paste functionality between the X Window application and other Macintosh applications. The

Macintosh X-server also provides a mechanism to start remote VAX-based applications that support the X Window System from the Macintosh.

MacWorkStation

MacWorkStation is a collection of high-level Toolbox routines that allow host programs running over any supported communications protocol to utilize the standard user-interface, file-management, and printing features of the Macintosh personal computer. It offers VAX/VMS programmers full access to and control over windows, pull-down menus, dialog boxes, and other features of the Macintosh user interface—without requiring them to learn the details of a traditional Macintosh programming environment. MacWorkStation is an extremely efficient user-interface programming model, allowing good performance to be delivered even over dial-up connections. MacWorkStation is an Apple product available from the Apple Software Licensing group.

Deliverables include:

- Macintosh X11-Server Toolkit which provides support for Digital's DEC Windows program (will be provided by Apple)
- MacWorkstation C programmer's library for VAX/VMS (will be provided by Apple)

Distributed Data Access and Information Sharing

AppleTalk Filing Protocol File Services

Customers have found that sharing of files and applications contributes to overall productivity. Digital's VAX/VMS systems will provide AppleShare-compatible file service to workstations on AppleTalk networks. In this environment, Macintosh files are stored on the VAX as VMS files. They are available to other VAX-based applications and appear to the Macintosh user as Macintosh files. Digital's server will offer full AppleTalk Filing Protocol (AFP), Version 2.0 compatibility, supporting Macintosh, ProDOS®, and MS-DOS systems running AppleShare client software. Popular high-quality AFP file servers for the VAX are available from third parties. Digital will provide tools, where necessary, for migration from existing AFP-compatible VMS file servers to the new Digital file server.

This implementation of AFP servers on VAX/VMS systems allows multiple users to make use of larger VAX disk resources and provides access to corporate-level data. It also gives customers a smooth growth path from Macintosh-based servers to higher-capacity servers based on VMS systems. The server will support VMS security mechanisms and simplify backup procedures.

Deliverables include:

- Implementation of AFP on VAX/VMS systems (will be provided by Digital)
- AFP, Version 2.0 specifications, currently available from APDA

Document Interchange

Digital's Compound Document Architecture (CDA) is a set of definitions for standard encoding of compound document components. In addition, the architecture describes mechanisms for building translators, viewers, and applications that use this standard encoding. Standardized encoding is important because the multivendor environment of most enterprises leads to a multiplicity of data formats that are often incompatible. CDA provides a scheme for applications-developer migration toward

a common language for communicating documents, data, and graphics. The Digital Document Interchange Format (DDIF), a component of CDA, is a format for encoding revisable-form text, graphics, and image data.

Apple will support Digital's DDIF document content standards for document interchange between Macintosh and VMS systems by:

- Providing a VAX-based translation tool that works with the VAX/VMS implementation of AFP to translate from DDIF to key Macintosh file formats, such as PICT, MacWrite, and MacPaint
- Providing a Macintosh API to this translation tool, allowing applications developers to incorporate DDIF format storage capability directly into their products (This capability will greatly enhance our customers' abilities to exchange documents between systems.)

Deliverables include:

- Translator tool (will be provided by Digital)
- API to the translator tool (will be provided by Apple)
- VAX-based conversion tools to move to DDIF from other VAX document formats (will be provided by Digital)

Print Sharing and Spooling

Further leveraging our customers' investments in high-quality printing resources, Digital's VAX/VMS systems will offer LaserWriter® print-spooling services to AppleTalk network-based workstations. These spooling services will allow Macintosh computers to print to Digital LN03R and LPS40 printers, as well as to AppleTalk-based LaserWriter printers. Additionally, Digital will provide the capability for VMS users to print to LaserWriter printers on AppleTalk networks. Digital's spooler will be compatible with Apple's AppleShare Print Server, Version 2.0. Digital will also support wide-area access to networked printer queues via its Distributed Queue Service. Third-parties currently offer popular high-quality print servers for Macintosh and VAX integration.

Deliverables include:

- AppleShare-compliant print services on VMS (will be provided by Digital)
- Support for Digital's LN03R and LPS40 printers (will be provided by Digital)

Database Access

Remote database access over the network allows Macintosh applications access to data stored on VAX/VMS systems as though it were locally available on the desktop. This form of data access eliminates the need for snapshot database extractions, common in batch modes, and ensures that timely, up-to-date data is provided on demand and in the format needed for effective decision making.

Macintosh applications' access to VAX/VMS databases will be supported in two ways. Apple and Digital will support database access via CL/1™ from Network Innovations for Macintosh-applications access to VAX system-based relational databases and RMS files. The CL/1 specification will be released in driver form by Apple. For access to Digital's Rdb/VMS relational database, Apple intends to support Digital's SQL Services by offering a client driver consistent with other SQL Services' clients being built by Digital.

CL/1 provides access to several VAX/VMS-based SQL database products while the Macintosh client for SQL services provides optimized, high-performance access only to Digital's Rdb/VMS relational database.

Deliverables include:

- CL/1 specifications, currently available from Network Innovations
- SQL Services specifications (will be provided by Digital)
- SQL server for Rdb/VMS (will be provided by Digital)
- CL/1 and SQL Services APIs and clients for Macintosh (will be provided by Apple)
- CL/1 server for VMS (will be provided by Apple)

Distributed Processing with Remote Procedure Calls

Apple will provide support for Digital's forthcoming Remote Procedure Call (RPC) mechanism. RPC is a high-level mechanism for distributing computing processes between computers on a network. This technology has the unique advantage of not requiring the programmer to have intimate knowledge of the underlying network. In fact, RPC provides the ability to implement facilities and services that are transparent not only to the end-user, but also to the programmer. Well-designed implementations of applications can be transported from platform to platform with little change. This RPC implementation will utilize the AppleTalk-to-DECnet gateway for its basic transport mechanism.

Implementation of this feature is scheduled for Phase II of the joint development project.

Business Communication Services

Messaging Architecture

Apple intends to offer a messaging service that will allow access to Digital's Mailbus architecture and X.400 mail systems, allowing developers to integrate store and forward messaging capabilities into their applications. Apple and Digital will publish specifications and implementations as they become available.

Electronic Conferencing

Electronic conferencing is an application that allows multiple users to exchange information on topics of interest. Digital's VAX Notes has proved invaluable inside Digital as a means of discussing important topics among project team members and as a mechanism for communicating information to a mass audience. Apple will provide Macintosh access to VAX Notes via terminal emulation in phase one of the joint development. At a later date, Digital and Apple will release an API for electronic conferencing to allow developers to take advantage of this capability.

Videotex

Videotex is a networked application for broadcasting or posting information, such as on-line reference manuals, price changes, and personnel announcements for a mass audience. VAX/VTX is Digital's implementation of videotext which has proved to have been valuable both inside Digital and among its customers. Apple will provide Macintosh access to VAX/VTX via terminal emulation in phase one of the joint development. At a later date, Digital and Apple will release an API for Videotex to allow developers to take advantage of this capability.



Introduction

As a developer, anything that will make your applications available to another part of the business community is seen as a tremendous boon to your business. CL/1™ gives Macintosh® applications access to shared data on VMS™ systems while allowing developers like yourself to deal with the Macintosh application, not with the network and VMS programming. In an effort to make this new connectivity language available to the people that can put it to work, we have created this document to introduce you to its benefits, objectives, and programming requirements.

Orientation: What Is CL/1?

CL/1 is a new connectivity language that gives Macintosh applications access to data stored in native files and databases on a host computer system. The host system may be a Digital VAX, running VAX/VMS, or it may be an IBM mainframe, running MVS or VM/CMS, or a minicomputer running UNIX. CL/1 was developed by Network Innovations Corporation, a wholly owned subsidiary of Apple® Computer, Inc. The goal of CL/1 is to provide an open, standard host data-access language that enables plug-and-play connectivity between desktop applications and organizational data. As a result, an out-of-the-box desktop application using CL/1 should be able to access data on a CL/1-supported host system, and to make that information an integral part of the data available to the desktop application user.

Using CL/1, a desktop application, such as a spreadsheet or word processor, can request and update host data processing (DP) data in a uniform manner, independent of variations in network technology, host system architecture, or database systems. The role of CL/1 is to insulate the desktop application from these details and differences, allowing it to concentrate, instead, on providing better interaction between personal processing on the desktop and organizational computing on the host system.

Benefits of CL/1

Instead of separate facilities for each host database and network connection, CL/1 lets the Macintosh developer implement a single host data-access facility. With CL/1, Macintosh developers can focus on integrating host data into the Macintosh application, instead of on network and host programming. Macintosh applications can thus become user-friendly front ends for accessing and manipulating shared data on the host system.

Objectives of CL/1

CL/1 is an enabling technology for applications developers. Its benefit to desktop system users comes through the desktop applications that support it. The objectives of CL/1 are to:

- Provide a platform for high-level access to host DP data
- Provide an interface that is uniform and consistent across underlying variations in computer networks and desktop system, host system, and DBMS manufacturers
- Build on existing standards

- Support “real world” DP data sources, such as sequential and ISAM files produced by COBOL and CL/1 programs and hierarchical and network databases, in addition to relational databases
- Offer an architecture that will support developments such as multitasking desktop operating systems, network coprocessors, and LAN servers, without changing the application program’s interface
- Meet the data-access needs of a broad range of desktop applications from spreadsheets and databases to word processors and hypertext packages
- Present an interface that is a natural extension of the desktop operating environment, using local types, calling conventions, and so on
- Provide an open facility that can be adopted by different desktop applications developers and DBMS, desktop system, DP hardware, and network vendors
- Be naturally extensible to support other forms of host system access in the future

Market Opportunities for CL/1-aware Applications

CL/1 gives an entirely new reason for Macintosh owners to purchase applications: ease of integration of host information into personal computer documents, spreadsheets, and other files. The burden on the MIS department to create special extract files, download procedures, and other special-case facilities for personal computers will be greatly reduced as CL/1-capable applications utilize standard facilities to interoperate with the host-processing environment. CL/1 will help change the paradigm of host access from simple terminal emulation to more sophisticated integration between desktop and mainframe. As end users realize the power that this change brings to them, applications that include CL/1 will become the preferred purchases of many corporations.

In the first half of 1990, the CL/1 client interface will become fully integrated into the Macintosh Toolbox, and as such, will become part of every Macintosh system, allowing client access to CL/1 services at no additional charge. The imbedded CL/1 client interface was discussed during the 1989 Spring Developers’ Conference and is known as the Database Manager. The CL/1 server will be sold by host computer manufacturers, or the server API will be imbedded into host database systems, in addition to direct sales of the CL/1 server by Network Innovations and Apple. Consequently, over time CL/1 will become widely available from many sources.

CL/1 will become a standard mechanism for developers to utilize across platforms to provide host data access. In addition to the Macintosh, CL/1 will be available for MS-DOS, and OS/2 client environments. Host database systems that will be supported by CL/1 included DB2 and SQL/DS on IBM systems, RDB and flat files on Digital VAX/VMS systems, and Oracle, Ingres, Informix and Sybase database servers. Clearly, this capability will provide applications developers with competitive advantages, as well as new challenges, to maintain the Macintosh user interface in a world where data can come from any host, anywhere.

How You Win: CL/1 Development Opportunities

You win by providing CL/1 access directly within your application. Immediately, your program is transformed from a stand-alone application dependent on traditional means for data entry and access to one that can proactively access data on host computers and database systems with CL/1 servers. The end user continues to use the same familiar application, only in a new more powerful way.

This means that you can “free associate” your application design incorporating CL/1. Almost any category of business activity performed on personal computers today can be enhanced through access to host computer data. What’s more, though the host data originates from the data center, users’ interactions with and manipulation of the data maintains the personal experience between users and their business needs.

One of the best examples of a CL/1 application would be a form of an Executive Information System (EIS). Today, while EIS products exist for other computers, they usually require an intermediate data-extraction process from the corporate mainframe into a different database system before the volumes of data can be processed into information that an executive can use. With CL/1, an EIS can circumvent this time-consuming process, reduce the workload on the host computer system, and make the data that an executive uses much more timely.

Apple wants developers of virtually all categories and types of applications to consider CL/1 carefully in their development plans. In the latter part of 1989, Apple and Network Innovations will provide Developer Technical Support, developer documentation, marketing support, and toolkits to those developers who accept the challenge and opportunities that CL/1 provides.

Required Development Configurations, Tools, and Documentation

To develop CL/1-aware applications for the Macintosh, you will need the equipment and documentation listed below:

Apple Equipment

- Macintosh Plus, Macintosh SE, Macintosh SE/30, Macintosh II, Macintosh IIfx, or Macintosh IIfx computer with System File 6.0 or higher to act as the client system.
- Appropriate hardware and software for a network supported by CL/1 for the client Macintosh system.
- Access to a host computer with a CL/1 server and with a database management system and networking software supported by CL/1. An alternative is to set up your own host system by using a Macintosh II, Macintosh IIfx, or Macintosh IIfx with the A/UX[®] operating system and appropriate networking hardware. A CL/1 server and sample database system for A/UX will be available from Network Innovations.

The CL/1 Developer's Toolkit for Macintosh (available late 1989)

- One 800K disk with CL/1 Developer's Toolkit for Macintosh software that includes: CL/1 Device Driver and Installer; C and Pascal call libraries; interactive CL/1 tester; sample application with source code; and CL/1 for HyperCard[®] XCMDs and XFCNs
- CL/1 Connectivity Language Description
- A royalty-free distribution license for CL/1 Driver and Driver Installer

The CL/1 Developer's Toolkit for MS-DOS (available late 1989)

- One 3.5-inch or two 5.25-inch disks with CL/1 Developer's Toolkit for MS-DOS software that includes: CL/1 TSR program and TSR installer; Microsoft C call library; interactive CL/1 tester; and sample application with source code

- CL/1 Connectivity Language description
- A royalty-free distribution license for CL/1 TSR program and CL/1 TSR installer

Related Documentation and Software, available from APDA™

- AppleTalk® Data Stream Protocol (ADSP) is available through the Apple Software Licensing group; if you want to review features and functionality before licensing, a preliminary note for ADSP is available
- *EtherTalk™* and *Alternate AppleTalk Connection Reference*

Macintosh Applications with CL/1

With CL/1, Macintosh applications can:

- Determine what databases are available on the host system
- Determine the structure of the host database
- Query databases to retrieve data from the host system
- Insert, delete, and update data in the host database
- Use database facilities for transaction commit and rollback

The network connection between the Macintosh and host systems can be a direct or dial-up serial connection, over a network using ADSP. CL/1 insulates Macintosh client applications from variations in networks, in host operating systems, and in host database management systems.

Architecture

CL/1 is a distributed processing facility with a client/server architecture. The key components of a complete CL/1 installation are as follows:

- *Client application* – User of CL/1 services, such as a spreadsheet, word processor, or user-written application.
- *CL/1 API* – CL/1 Applications Program Interface is the client application's point of contact with CL/1. The API receives CL/1 requests from the client application and returns the results to the client application.
- *Client system* – Computer system in which the client application executes CL/1 will be available for the Macintosh, IBM PC, and UNIX workstations.
- *Network* – Physical connection and protocols that link the client system to the host system. CL/1 is an applications-level (Layer 7) facility that can use a variety of lower-level protocols, such as the ADSP, DECnet™, 3270 data stream, APPC, TCP/IP, or named pipes.
- *Host system* – Computer system containing the DP data to which the client application desires access.
- *CL/1 Server* – CL/1 software that executes on the host system on behalf of the client application, carrying out its requests subject to host security and integrity constraints.
- *Host DBMS* – Host database management software that manages and stores the data which is to be accessed by the client application. CL/1 works through existing DBMS, taking advantage of their data access techniques, facilities, and performance.

Runtime Environment

CL/1 presents a coprocessing model of operation to its client application. The client application “sees” a CL/1 runtime environment on the other side of the CL/1 API, which acts as the applications connectivity agent. The application sends requests

across the API and receives back upon demand the results, if any, of those requests. To the client application, the CL/1 runtime environment appears to operate in parallel, as if it had its own processor with its own access to various networks, host systems, and host data sources. Control is immediately returned back to the client application, which can proceed with other work.

The coprocessing model used by CL/1 provides great flexibility in the underlying implementation. On desktop systems with limited resources, the runtime environment can be provided almost entirely by the CL/1 server on the host system, with the client system acting only as a means to forward and receive messages. In a more powerful desktop environment, the CL/1 runtime environment can be provided locally, making requests of the host server only when host data is specifically required. The model could also be implemented using an actual coprocessor to provide the CL/1 runtime environment, with the advantage of parallelism.

Basic Elements

CL/1 has the same basic elements found in programming languages such as C or Pascal. The structure of CL/1 is strongly influenced by the statement orientation of SQL, which forms the basis of its data manipulation facilities; indeed, all CL/1 statements have an SQL style, with an initial verb, one or more English-like clauses, and a statement terminator.

More Features

CL/1 provides much more than just a mechanism to allow applications to connect to database systems. It includes:

Automatic data translation

CL/1 includes automatic data translation when transferring data between the client (workstation) and server (host) systems. The language supports a set of standard data types that are used to represent all data manipulated by CL/1 programs. Data from a host source is automatically mapped into these standard data types when data is accessed. Descriptions of the host data source are also expressed in terms of the standard CL/1 types.

Uniform error handling

CL/1 provides uniform error handling for all supported host data sources. All errors are mapped into a standard set of CL/1 error codes, which are presented to the client application by the CL/1 API. The runtime environment offers two styles of error handling: one requires the application to handle the situation—the CL/1 program aborts; the other continues execution of CL/1—CL/1 handles the error and any required recovery (the client application actually may never know that an error took place).

Uniform models

CL/1 presents the client application with a uniform model of the host access, database organization, and database structure. The CL/1 server is responsible for presenting each supported host DBMS, host system, and network in terms of this model. The objects described below—*hostname*, *DBMS brand*, *database*, *tables*, *rows*, *columns*, and *linksets*—are manipulated by CL/1 language statements to perform the connectivity tasks specified by the client application.

Multiple hosts, identified by *hostname*, may exist in the network. If the client has sufficient capacity, it may itself be a host system.

Together with the hosts, one or more host DBMS systems, identified as *DBMS brand*, may be accessible. The DBMS brand may be an Oracle database, or it may be a set of DP tools that together provide DBMS functionality (such as RMS, CDD, and Datatrieve under VAX/VMS). For each DBMS brand on each host, zero or more *databases* are available.

A database consists of one or more named *tables* which contain its data, organized into *rows* and *columns*. Each row of a table has the same column structure as the other rows. Each column of a table has a name and an associated data type.

Finally, a database may also contain one or more *linksets*, which specify one-to-many directed relationships between pairs of tables. Linksets represent the implicit relationships that carry essential data in hierarchical databases, such as IBM's IMS, and network (CODASYL) databases, such as VAX DBMS.

Security and integrity of host data

CL/1 maintains the security and integrity of host data by operating under the facilities provided by the host operating system and DBMS software.

On the host system, the CL/1 server operates as a user-level process, subject to the same security restrictions as other user-level host applications. CL/1 similarly operates under the data-integrity constraints imposed by the host system and DBMS software. If a CL/1 client application attempts to modify host data in a way that would violate a database integrity constraint, the DBMS error caused by the attempt is reported back to the client application by CL/1, and the data is not modified. In addition, the CL/1 ROLLBACK and COMMIT statements provide access to the transaction-based integrity features provided by the host DBMS. Because CL/1 operates under existing host and DBMS security and integrity schemes, it introduces no new host security or integrity requirements.



Introduction

MacTCP™ is Apple's software-driver implementation of TCP/IP (Transmission Control Protocol/Internet Protocol) for the Macintosh® operating system. TCP/IP is a widely used industry standard for connecting multivendor computers. MacTCP is intended to be the standard for Macintosh developers of TCP/IP applications. With MacTCP software, you can create Macintosh applications for network environments that use TCP/IP protocols, enabling the Macintosh to communicate with such diverse systems as IBM, Digital Equipment, Sun, and Apollo computers. MacTCP conforms to Internet RFCs and MIL-STDs, offers manual, server, and dynamic addressing modes, and has an Administrator Dialog (accessed from the Control Panel) to facilitate configuration and management.

Although Apple is not in the TCP/IP applications business, the company wants to make TCP/IP development possible, so that Macintosh computers can operate with computers from other vendors. A very large installed base uses TCP/IP, and MacTCP gives developers the opportunity to develop applications that will bring the power and benefits of the Macintosh to these computer users.

Overview

TCP/IP development began when the Defense Advanced Research Projects Agency (DARPA) wanted more reliable communications protocols on the ARPANET, its packet-switched wide area network. DARPA initiated a research project to define and implement a suite of protocols, and its researchers developed TCP/IP. Eventually, TCP/IP became the standard protocol suite used on DARPA Internet, a collection of networks that includes the ARPANET, MILNET (Military Network), NSFnet (National Science Foundation Network), and other networks at universities, research institutions, and military installations. Since then, hundreds of vendors have developed products that support TCP/IP, and all kinds of networks use it.

Features

The MacTCP driver includes the following features:

- C and assembly-language interfaces that provide programmers with a familiar development environment.
- Coresidency with AppleTalk® protocols, preserving full access to them.
- Address-configuration maintenance done by means of the Control Panel.
- Speed—Throughput has been measured at 3.0 megabits per second memory to memory on a Macintosh II over Ethernet.
- A domain name resolver that maps domain names to internet addresses; the domain name resolver is compatible with domain name server implementations that comply with RFC (Internet Request for Comments) 1034 and 1035.

Development Opportunities

The primary focus for MacTCP and third-party TCP/IP applications is the engineering, government, and higher-education markets. By creating a TCP/IP software driver for the Macintosh operating system, Apple has made available a standard, fully supported platform for developers.

Third-party development opportunities using MacTCP exist in the following areas: electronic mail, virtual terminal, file transfer, remote printing, and database access. Many applications written for UNIX take advantage of network communications with TCP/IP. You can create a File Transfer Application (FTP) to transfer files between a UNIX host "speaking" TCP/IP and an AppleShare® server "speaking" AppleTalk. These applications might be useful in areas, such as calendar management and electronic mail, or they might be developed for a specific industry, such as commodities exchange. MacTCP lets you develop a Macintosh application that will communicate with other systems that understand only TCP/IP.

Development Tools and Documentation

To develop applications using MacTCP, you will need the following equipment, software, and documentation:

Apple Equipment and Software

MacTCP runs over both Ethernet and LocalTalk™ cabling systems and can be installed on the following Apple equipment:

- Macintosh 512K Enhanced, Macintosh Plus, Macintosh SE, Macintosh SE/30, Macintosh II, Macintosh IIfx, or Macintosh IIfx computer connected to a LocalTalk network *or* Macintosh SE, Macintosh SE/30, Macintosh II, Macintosh IIfx, or Macintosh IIfx computer with an EtherTalk™ Interface Card and EtherTalk software installed and connected to an Ethernet network.
- MacTCP software, available with internal-use and commercial-use licenses from Apple's Software Licensing Department. An evaluation kit is available from APDA™.
- Macintosh system software version 6.0.3 or later for the Macintosh Plus, Macintosh SE, Macintosh SE/30, Macintosh II, Macintosh IIfx, or Macintosh IIfx computer. Macintosh system software version 3.4 for the Macintosh 512K Enhanced computer.

Note: A HyperCard® MacTCP Toolkit will be available in the near future with MacTCP XCMDs. Check your APDA log.

Documentation

The following documentation is included with MacTCP software:

- *MacTCP Programmer's Guide* – Discusses in detail the operation of the driver and the application's program interface to the driver
- *MacTCP Administrator's Guide* – Describes how to install and operate the MacTCP driver on a range of machines, from the Macintosh 512K Enhanced to the Macintosh II family of computers

The following documentation is available from APDA:

- *Inside AppleTalk* – a complete description of the AppleTalk Network System
- *EtherTalk User's Guide* – describes how to install software for an EtherTalk Interface Card

Recommended reading

Internetworking with TCP/IP, Douglas Comer, 1988; available at your local bookstore

MacTCP and TCP/IP Protocols

TCP (Transmission Control Protocol) and IP (Internet Protocol) are the best known of the TCP/IP family of protocols—hence the name—however, a number of other protocols are also in the family. MacTCP offers TCP/IP services (IP, UDP, TCP, and domain name mapping) to applications. For example, a Telnet application for remote terminal service over a TCP/IP network would call MacTCP.

TCP, IP, and the User Datagram Protocol (UDP) provide basic transmission facilities that are augmented by application services in higher-level protocols such as Telnet, File Transfer Protocol (FTP), and Simple Mail Transfer Protocol (SMTP). The following is a brief description of each:

- *Internet Protocol (IP)*—As the fundamental protocol of the family, IP handles routing data in packets called *datagrams* based on destination address. IP accepts segments of data from TCP or UDP, places the data in datagrams, and determines the correct paths for the datagrams to take.
- *Transmission Control Protocol (TCP)*—As TCP provides reliable transmission of data between processes, it ensures that data is delivered error free, without loss or duplication, and in sequence.
- *User Datagram Protocol (UDP)*—This protocol provides unreliable transmission of data between processes because, unlike TCP, it does not provide error checking; it does not acknowledge that data has been successfully received; and it does not order incoming messages. The advantage of UDP is that the overhead associated with establishing and maintaining an error-free TCP session is avoided.

The following are application service protocols:

- *Telnet*—a remote-access protocol that allows a terminal on one host to appear as if it were directly connected to a remote host on an internet. Telnet also makes a personal computer act like a terminal.
- *File Transfer Protocol (FTP)*—used to transfer files across an internet. A host can connect to a remote host on an internet and send or receive files, list directories, and execute simple commands.
- *Simple Mail Transfer Protocol (SMTP)*—transfers electronic-mail messages from one host to another, across an internet.

Network Environment

As mentioned above, MacTCP runs over both LocalTalk and Ethernet cabling systems. MacTCP is coresident with AppleTalk protocols, so there can be concurrent TCP/IP and AppleTalk operation. For example, MacTCP can be run while a print job goes out to an Apple® LaserWriter® printer over LocalTalk cabling. AppleTalk and MacTCP can run over the same medium, or one protocol can run over one medium while the other protocol runs over a different media. This allows for flexible workstation configurations.

DDP-IP Gateways

To connect Macintosh computers using LocalTalk to other computers using Ethernet, a DDP-IP gateway must be used. This device takes a TCP/IP packet that is encapsulated in DDP (an AppleTalk protocol) and converts it to Ethernet format. DDP-IP gateways can also assign addresses to MacTCP nodes and handle routing to other networks.

The DDP-IP gateway should be located in the same AppleTalk zone as the Macintosh computer running MacTCP. Alternatively, a single DDP-IP gateway can support Macintosh computers in multiple AppleTalk zones; in this case, the zone where the DDP-IP gateway resides must be selected by the user using the MacTCP Control Panel.



Introduction

MacWorkStation™ is a developer's tool that brings together the ease of use of the Macintosh user interface and the power of host programs. Its ability to operate over any supported communications protocol makes access to information truly transparent. For the user, this means access to windows, pull-down menus, dialog boxes, and other Macintosh® user-interface features. Additionally, the introduction of version 3.1 brought new tasks, including local filing, printing, editing, and managing desk accessories (which is handled by the Macintosh), under control of the host application.

All of this is possible without having to program a traditional Macintosh application to create the standard user interface. Instead, MacWorkStation offers a common set of routines that allows any host application to create a Macintosh user interface.

MacWorkStation Overview

Providing the user interface, printing, and file services, MacWorkStation is a Macintosh server application to remote or local network host (client) applications. Client applications may reside on host computers, such as Digital Equipment VAX™ systems or IBM 370s, or on the same computer as MacWorkStation. The product provides client applications full access to and control over windows, pull-down menus, dialog boxes, and other features of the standard Macintosh user interface, by means of a high-level API. MacWorkStation handles all local processing between the user, desk accessories, Clipboard, and user-interface objects created by the host application. This reduces the levels of host processing necessary to maintain a graphics-based user interface and also reduces network-messaging traffic.

To use MacWorkStation, new or existing applications must send commands to MacWorkStation running on the Macintosh. Depending upon the commands sent by the host software, MacWorkStation will build and maintain menus, windows, lists, and other objects. The MacWorkStation software running on the Macintosh will also handle all local editing, printing, and filing. MacWorkStation's unique ability to operate with a variety of communications protocols is due to the low-level communications services that are provided by Macintosh code segments, which are added to MacWorkStation at run time.

Standard Features of MacWorkStation

- *Graphics support*
RGB color is supported in alerts, cursors, dialog boxes, dialog items, patterns, pictures, text, and windows. The MacWorkStation version 3.1 graphics director provides faster redrawing and scrolling of complex pictures.
- *HFS and AppleShare support*
MacWorkStation version 3.1 fully supports Hierarchical File System calls. In order to support AppleShare® file server directories and files, permission values can be set and retrieved, and byte ranges in a file can be locked.
- *Improved list management*
The list director has been extended to provide field-level editing in addition to the record-level editing provided in older versions of MacWorkStation. The

remote application can read only those records that have been modified. The host program can specify that records be sorted in either ascending or descending order, based on any field or combination of fields. The sort can also be done by a local menu command.

- *Improved error detection at the presentation level*

MacWorkStation version 3.1 provides optional command and parameter syntax checking. The host program can specify what action should be taken if any errors are encountered in the command data stream.

- *Event locking and unlocking*

The host can change a cursor to the watch symbol, indicating that data is being processed. MacWorkStation will then go into an *event lock* state until the host program sends another message.

How MacWorkStation Works

MacWorkStation relies on a set of elements called *directors*. Directors have the local intelligence to maintain and support the local user interface without the need for the host or host programmer to have Macintosh programming expertise. The window director will build and maintain windows for the host application without the host programmer or application realizing how it's done. The window can be resized, saved to disk, and moved without host interaction. Only when certain important events happen to that object will an event message be sent back to the host.

The director messages have been designed to be compact, and easily learned and implemented on any host platform. Even at 1200 baud, a host application can build a graphic interactive user interface that looks and feels like a local application. By using the MultiFinder™ environment, it's even possible to cut and paste data seamlessly between a local application and a remote application. Data placed into text, list, and graphics windows can be saved to local files in standard data formats. Director commands for all standard Macintosh objects include the following: windows, dialogs, graphics, texts, lists, menus, and files. These directors are grouped into categories called *director suites*, which are very easy to learn and implement.

Designing Host Applications

MacWorkStation applications differ from traditional terminal-oriented programs, which restrict the user to line-oriented terminal interface. In a MacWorkStation program, the user can choose a menu command or select a different window, which may cause an entirely different menu bar to appear.

Developing a MacWorkStation application is much like developing a traditional terminal-oriented application. Each message is sent to MacWorkStation as if it were a line to a terminal screen. The command is read by MacWorkStation which builds, maintains, or deletes a local object. Events are sent back to the host like data from a terminal. No new input/output procedures need to be learned by the host programmer.

MacWorkStation uses a communications system that dynamically loads and runs communications modules. As a developer, you can create special protocol modules for your specific host-computer environment. These protocol modules can then be placed in your MacWorkStation documents and called by the Communications Command Language (CCL) script.

You can create a transport protocol module by using the Macintosh Programmer's Workshop (MPW™) development environment. The steps usually involved in this procedure include compilation of the module source, linking with any support libraries, and then using ResEdit™ (or a similar program) to place the resulting transport-layer protocol module resource into your MacWorkStation document.

Architecture

A variety of networks can be used with MacWorkStation, including serial, SNA, AppleTalk®, and Ethernet. This makes it possible to share computers, terminals, files, printers, modems, software, and electronic mail, as well as other resources, among network users. The communications modules are responsible for ensuring that MacWorkStation never knows what type of communications network or host it is receiving messages from.

Apple provides TTY and AppleTalk communications modules. Source code for communications modules is also provided for third parties to build additional modules. Communication modules are easy to design and code using Pascal and can be “plugged” into MacWorkStation using ResEdit.

The Communication Command Language (CCL) provides a method of accessing the host. The CCL script can be as simple as one line (“use the AppleTalk communications module”) or very long and complex, for example, accessing a host over a public packet-switch network with passwords and access codes. Once the host is accessed, control is passed over to a communications module that passes director messages back and forth between the host and the main MacWorkStation module.

Another important component in MacWorkStation is the external code segment called Execs. An Exec is an object code segment that can be written in any compilable 68000 language and dropped into a MacWorkStation document using ResEdit™ application. Execs have total access to the Toolbox Manager and may also issue any of the director commands. Execs capture all communications from and to the host and the MacWorkStation main program, thus allowing additional custom protocols to be built. The Exec feature makes MacWorkStation highly flexible for a wide variety of needs and increases the ability for the host application to offload even additional processing to the local environment.

Equipment and Documentation

Apple Equipment

- Macintosh II, Macintosh IICx, Macintosh IIX, Macintosh SE, Macintosh SE/30, or Macintosh Plus with a minimum of 1 megabyte of RAM
- MacWorkStation version 3.1—single-user versions are available from APDA™; organizationwide licenses are available from Apple's Software Licensing Group

Documentation

The following documentation is available from APDA:

- MacWorkStation version 3.1 Documentation Kit—includes the *MacWorkStation Programmer's Guide* and the *MacWorkStation Programmers Reference*
- AppleTalk Data Stream Protocol (ADSP); preliminary note

Development Tools

The following development tools are available from APDA:

- Macintosh Programmer's Workshop (MPW)
- ResEdit

Conclusion

The MacWorkStation product is a revolutionary technology that provides for true distributed user-interface functionality. Any host program running on any computer can now have the same look and feel on a Macintosh as local Macintosh applications. This simple and elegant solution provides the additional benefits of reducing host-CPU and network communications loads.

Configurations



Apple Cable Compatibility

The following is a list of Apple cables, with product numbers and descriptions for each. The purpose of this list is to assist you in configuring your Macintosh® and Apple® II computers with the proper cable connections.

SCSI Cables

For further information on SCSI cables, see the note on the Apple SCSI Cable System following this note.

Part No.	Cable	Description
M0206	SCSI System Cable	Connects CPU to <i>first</i> SCSI device.
M0207	SCSI Peripheral Interface Cable	Connects any <i>two</i> SCSI peripherals together.
M0208	SCSI Cable Extender	1-meter extension for longer cable connections between SCSI devices.
M0209	SCSI Cable Terminator	Filters noise on SCSI cabling. One terminator is required between each CPU and the first (and last) SCSI peripheral.

LocalTalk Cables

LocalTalk™ cables and connectors allow you to connect your computer to other computers and peripheral devices in an AppleTalk® network system. An AppleTalk network system has three components: a cable system that links devices; software, built into every Macintosh® and Apple® IIGS computer, that supports the network; and optional services such as Apple's LaserWriter® printers and AppleShare™ file servers that network devices can share.

LocalTalk can support as many as 32 devices, including computers, printers, and file servers. You can exchange information between devices at speeds up to 230,400 bits per second. This is almost 200 times faster than the data transfer rate between devices using 1200 baud modems.

Part No.	Cable	Description
M2068	LocalTalk™ Locking Connector Kit—DIN-8	Includes one 2-meter LocalTalk connector with minicircular-8 connector, and one cable extender for Apple IIGS®, Macintosh Plus, Macintosh SE, Macintosh II, and the LaserWriter® IINT and IINTX printers. (To operate LaserWriter IINT or LaserWriter IINTX with Apple IIGS, Macintosh Plus, Macintosh SE, or Macintosh II, <i>order two of Part No. M2068</i> . To operate LaserWriter IINT or IINTX with Macintosh 512K, order Part No. M2065 and Part No. M2068.)

M2065	LocalTalk Locking Connector Kit—DB9	Includes one LocalTalk connector with plug, one 2-meter LocalTalk cable, and one cable extender for Macintosh 512K and the LocalTalk PC Card.
M2066	LocalTalk Locking Cable Kit—10 meter	Contains 10 meters of cable (approx. 40 ft.) and one cable extender.
M2069	LocalTalk Cable Kit—25 meter	Contains 25 meters of LocalTalk cable, (approx. 85 ft.).
M2070	LocalTalk Custom Wiring Kit	Contains 100 meters of LocalTalk cable, 20 preassembled plugs, 20 splice boxes, and 4 cable extenders (approx. 400 ft.).

Printer/Modem Cables

Part No.	Cable	Description
A9C0314	Apple II Printer-8 Cable	Connects an ImageWriter® II printer to a Super Serial Card on Apple IIe; or an ImageWriter LQ to an Apple IIc. Will also connect third party modems with 25-pin RS-232 serial ports to the Macintosh Plus, Macintosh SE, or Macintosh II.
A2C4313	Apple IIc Peripheral-8 Cable	Connects an ImageWriter II or LQ printer, or an Apple Personal Modem to the Apple IIc.
M0197	Apple System Peripheral-8 Cable	Connects an ImageWriter II or LQ printer or Apple Personal Modem to the Apple IIGS, Apple IIc Plus, (and AppleFax™ Modem), Macintosh Plus, Macintosh SE, or Macintosh II.
A9M0333	Apple IIGS Adapter	This adapter (circular-8 to DB-25) will enable use of peripherals and cables that require a DB-25 when connected to the Apple IIGS built-in serial port.
M0196	Macintosh Peripheral-8 Cable	Connects the ImageWriter II printer or Apple Personal Modem to the Macintosh 512K.
M0199	Macintosh Plus Peripheral Adapter	This adapter (circular-8 to DB-9) will enable use of peripherals and cables that require a DB-9 when connected to a Macintosh Plus, Macintosh SE, or Macintosh II.



This document provides a description of the Apple SCSI Cable System and includes diagrams of its four components. This information will help you connect a SCSI device to your Macintosh® or Apple® II computer with the correct SCSI cable configurations.

What Is the Apple SCSI Cable System?

The Apple SCSI Cable System gives you a fast, flexible, and expandable way to connect SCSI peripherals to your Macintosh computer with a built-in SCSI port, or to your Apple II equipped with an SCSI interface card.

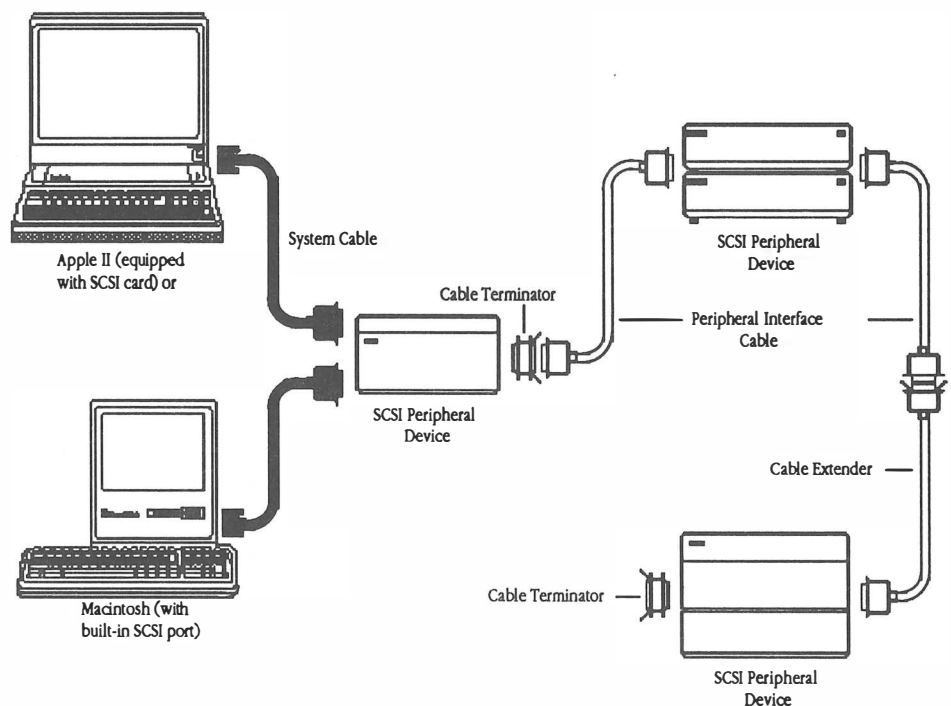
SCSI stands for Small Computer System Interface. Developed by engineers from many companies working together through the American National Standards Institute (ANSI), it is a recently adopted standard.

Its primary benefit is speed. With SCSI, you can send and retrieve data roughly five times faster than you can with the serial interface that is generally used for connecting printers and modems to your computer.

You get expandability, too. The Apple SCSI Cable System lets you attach as many as seven SCSI peripherals to your Macintosh with a built-in SCSI port, or up to four SCSI peripherals to your Apple II equipped with an SCSI card. You just “daisy chain” the devices together, using cables to hook one to the next along the chain. And thanks to the Cable Extender, you can make the links of your chain quite long—up to a maximum of 21 feet, or roughly 7 meters.

Four Components of the SCSI Cable System

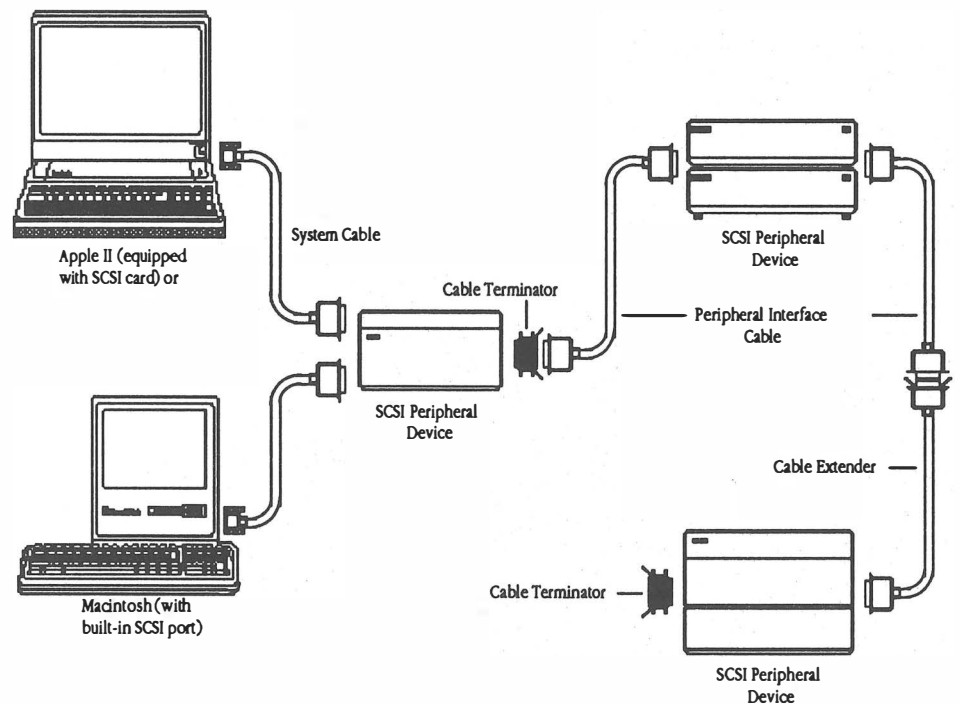
- *Apple SCSI System Cable* – Plugs into the built-in SCSI port on your Macintosh, or into a SCSI card on your Apple II. Included with the cable is a manual that explains how to install your cable system and connect your SCSI peripherals.



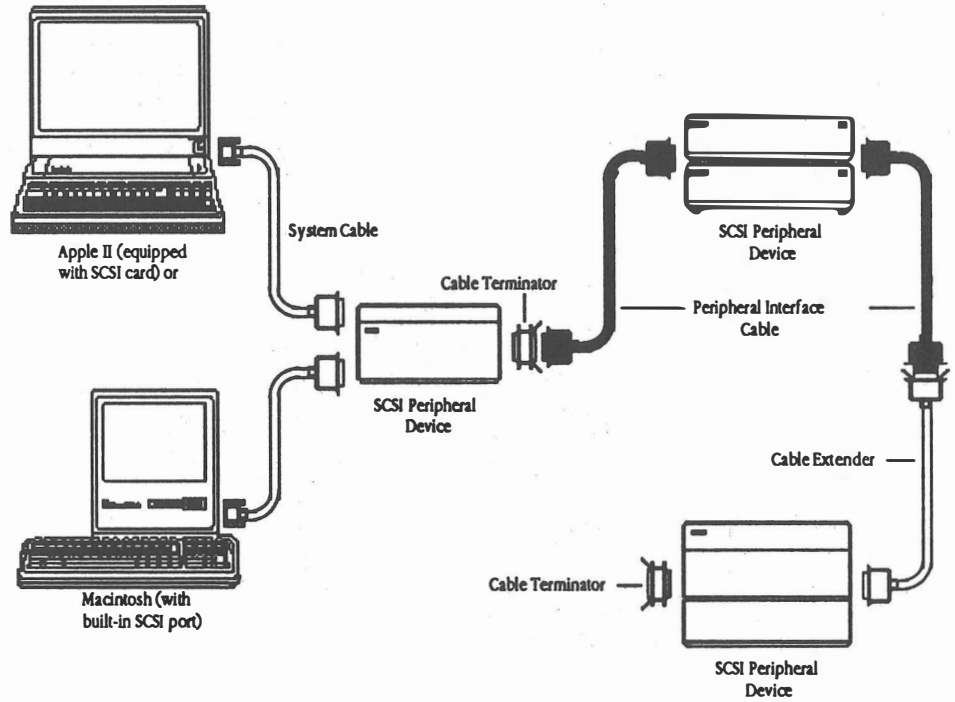
- *Apple SCSI Cable Terminator* – Filters out unwanted signals or noise along your SCSI cables. You'll need either one or two terminators, depending on the configuration of your SCSI bus. You can have *no more* than two terminators in the entire SCSI chain, however, because it might damage your computer. If more than one of the non-Apple devices in the chain has a built-in terminator, remove that terminator or have your authorized Apple dealer remove it. For further explanation of proper terminator positioning, consult your manual.

The following information may help you determine how to position terminators when configuring your Apple systems:

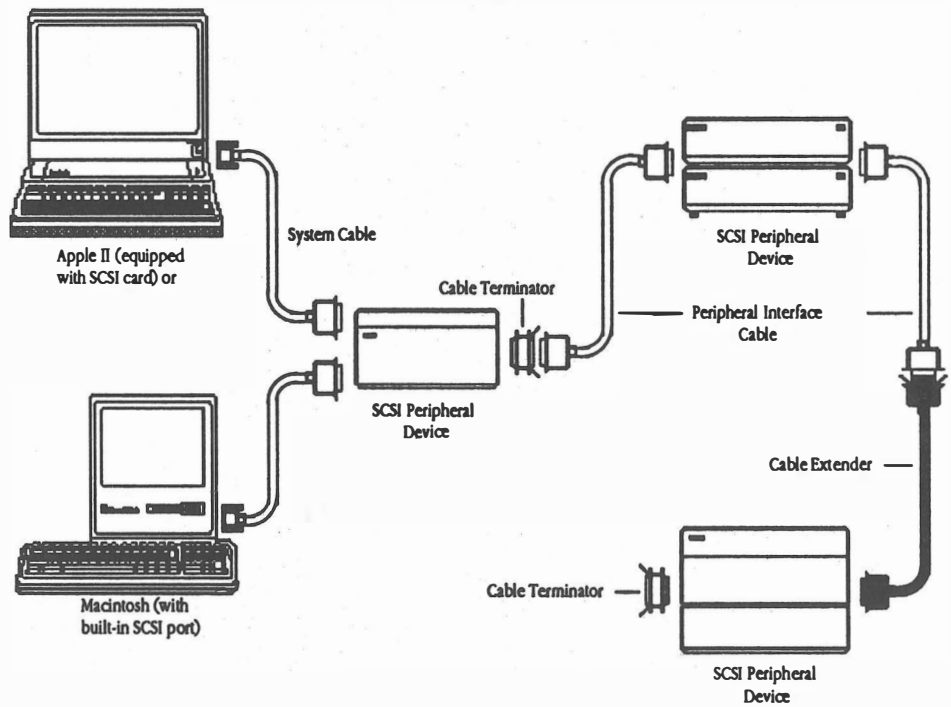
- CPU with an internal hard disk connected to a single external Apple device—Add a terminator between the SCSI cable and the SCSI connector on the external Apple device.
- CPU with no internal hard disk connected to a single external Apple device—Add a terminator between the SCSI cable and the SCSI connector on the external Apple device.
- CPU with internal hard disk connected to multiple external Apple devices—Add a terminator between the SCSI cable and the SCSI connector on the last device in the chain.
- CPU with no internal hard disk connected to multiple external Apple devices—Add a terminator between the SCSI cable and the SCSI connector on the first external Apple device in the chain; then add a terminator between the SCSI cable and the SCSI connector on the last device in the chain.



- *Apple SCSI Peripheral Interface Cable*— Connects one SCSI peripheral to the next.



- *Apple SCSI Cable Extender*— Lets you add a meter of cable where needed.



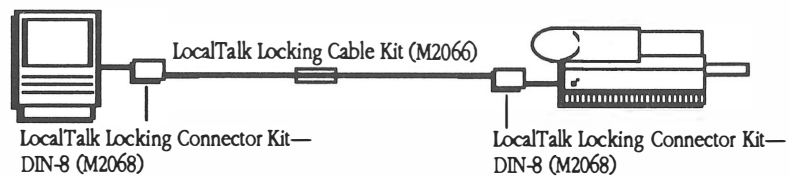


LocalTalk Cable Connections

This document provides diagrams and cable requirements for connecting AppleTalk® local area networks using the LocalTalk® cabling system. The diagrams show samples of small networks and should assist in setting up your own small network. Part numbers are given for the necessary cables. Partners and Certified Developers may purchase these products from the Developer Price List. Associates should contact an authorized Apple dealer.

For more information on Apple® cables and SCSI cable configurations refer to the Apple cable compatibility and Apple SCSI cable configuration documents in this section.

Connecting a Macintosh to a LaserWriter Printer

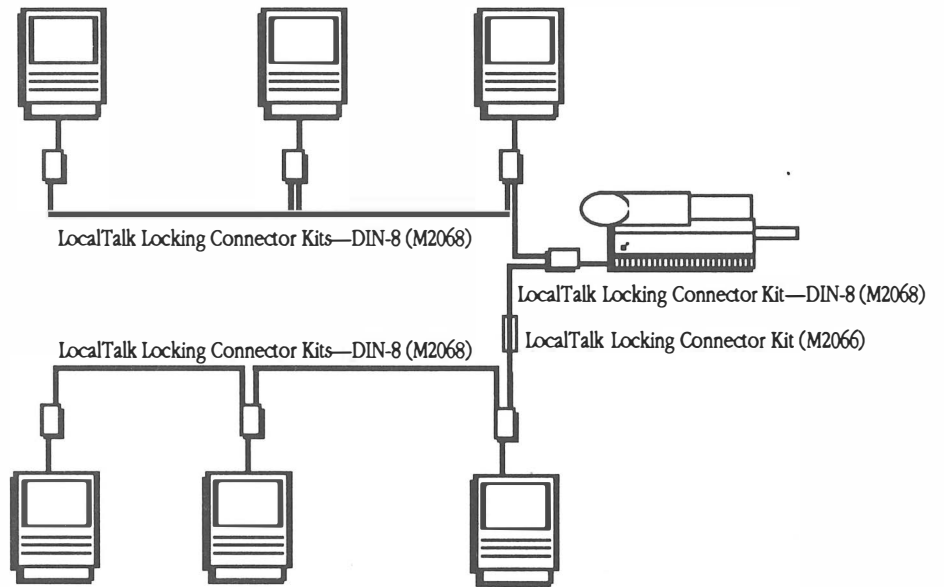


Necessary Cables:

Part Number	Cable	Description
M2068	LocalTalk Locking Connector Kit—DIN-8	One connector kit per device is required; for example, for this configuration, you should order two connector kits. The connector kit includes one 2-meter LocalTalk Connector, and one cable extender. Use this kit for the Apple IIGs®, Macintosh® Plus, the Macintosh SE, the Macintosh SE/30, the Macintosh II family of computers, the LaserWriter® IINT and the LaserWriter IINTX printers, and the ImageWriter® II and ImageWriter LQ printers, with the LocalTalk Option Card. The LaserWriter Plus will require a nine pin connector (DB-9).
M2066	LocalTalk Locking Cable Kit—10 Meter	Additional cable for connecting equipment that is not close together; contains 10 meters of cable and one cable extender.

Note: The LaserWriter Iisc is a single-user laser printer that does not have built-in networking capabilities. To connect the LaserWriter Iisc to a Macintosh requires the appropriate SCSI cable.

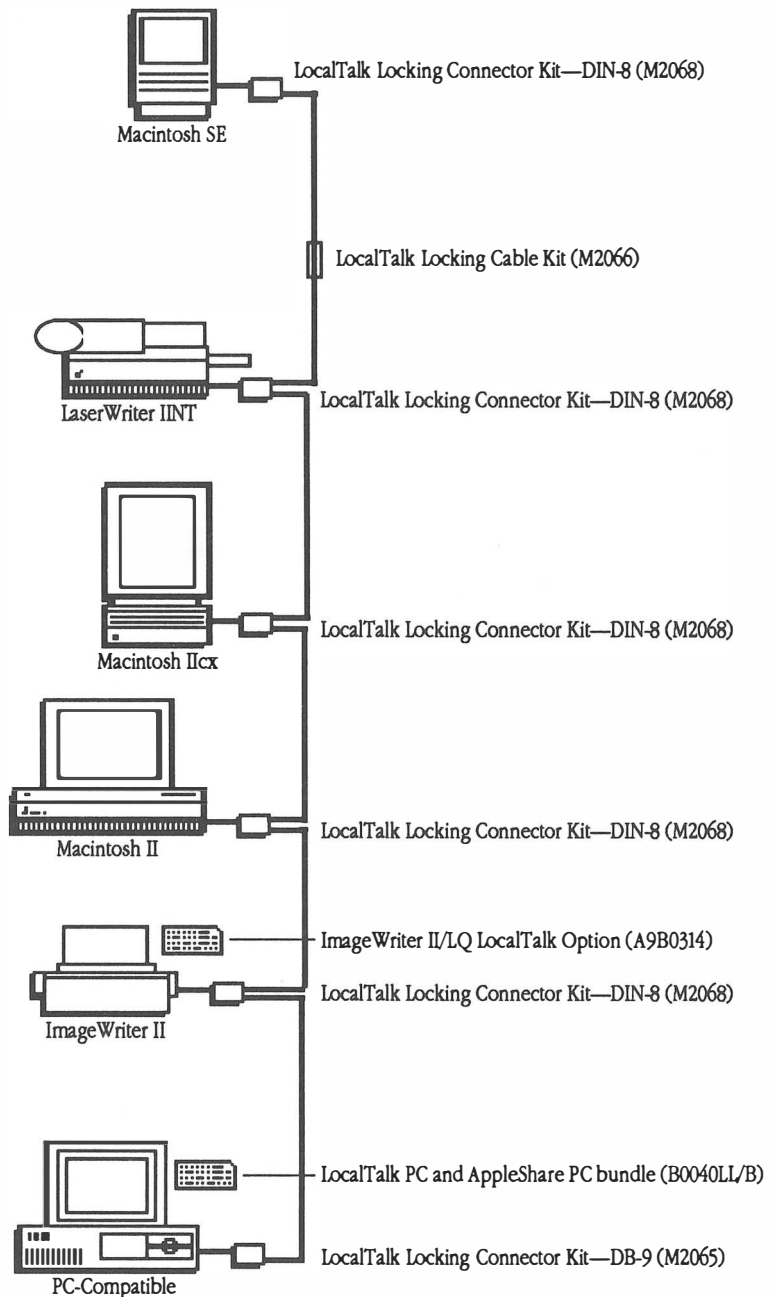
Connecting More Than One Macintosh to a LaserWriter Printer



Necessary Cables:

Part Number	Cable	Description
M2068	LocalTalk Locking Connector Kits—DIN-8	One connector kit per device is required; for example, for this configuration, you would need to order seven connector kits. (Most Macintosh computers and the LaserWriter printers require an 8-pin mini-circular plug.)
M2066	LocalTalk Locking Cable Kit—10 Meter	Additional cable for connecting equipment that is not close together; contains 10 meters of cable and one cable extender.

Connecting Macintosh Computers and a PC-Compatible Computer to a Printer



Necessary Cables:

Part Number	Cable	Description
M2068	LocalTalk Locking Connector Kits—DIN-8	One connector kit per device is required; for example, for this configuration, you would need to order five connector kits.
M2065	LocalTalk Locking Connector Kits—DB-9	One connector kit is needed per device; for example, for this configuration, you would order one DB-9 connector kit. (The IBM or PC compatible requires a 9-pin plug.)

Part Number	Cable	Description <i>(continued)</i>
M2066	LocalTalk Locking Cable Kit—10 Meter	Additional cable for connecting equipment that is not close together; contains 10 meters of cable and one cable extender.
M2069	LocalTalk Locking Cable Kit—25 Meter	Contains 25 meters of cable and one cable extender.
A9B0314	ImageWriter II LocalTalk Option Card	A card that fits into a slot inside the printer, providing the hardware and firmware needed for the ImageWriter printer to work on the AppleTalk network.
B0040LL/B	LocalTalk PC Card	A card that fits into the IBM or PC compatible that lets you connect to the AppleTalk network; it is bundled with AppleShare® PC software.



Hardware Configurations for Apple IIGS and Macintosh Development Tools

Below are the minimum requirements and recommended configurations for development using Apple's Apple IIGS® and Macintosh® development tools.

Apple IIGS Development Tools

APW 1.0 Family

Including APW™ Development Environment, APW Assembler, and APW C.

- *Required hardware* – Apple IIGS with at least 1.25 megabytes of RAM, and two 3.5-inch drives or one 3.5-inch drive and a hard disk.
- *Recommended hardware* – Apple IIGS with at least 1.75 megabytes of RAM, two 3.5-inch drives and a hard disk.

MPW IIGS Family

Including MPW™ IIGS Tools 1.0, MPW IIGS Assembler 1.0, MPW IIGS C 1.0.1, and MPW IIGS Pascal 1.0B1.

- *Required software* – MPW 2.0.2 or later. For MPW requirements, see below.
- *Required hardware* – Macintosh Plus, Macintosh SE, Macintosh SE/30, Macintosh II, Macintosh IIX, or Macintosh IICX with a hard disk and at least 1 megabyte of RAM. An Apple IIGS computer for testing your software is also required.
- *Recommended hardware* – Macintosh SE/30, Macintosh II, Macintosh IIX, or Macintosh IICX with a hard disk and at least 2 megabytes of RAM; 4 megabytes of RAM for development of large programs (since the Linker is entirely RAM-resident, more than 2 megabytes of RAM may be required by large programs).

Macintosh Development Tools

MPW 3.0 Family

Including MPW Development Environment, MPW SADE™, MPW Assembler, MPW Pascal, and MPW C.

- *Required hardware* – Macintosh Plus, Macintosh SE, Macintosh SE/30, Macintosh II, Macintosh IIX, or Macintosh IICX with a hard disk and at least 2 megabytes of RAM.
- *Recommended hardware* – Macintosh SE/30, Macintosh II, Macintosh IIX, or Macintosh IICX with a hard disk and at least 4 megabytes of RAM.

MPW 2.0.2 Family

Including MPW Development Environment, MPW Assembler, MPW Pascal, and MPW C.

- *Required hardware* – Macintosh Plus, Macintosh SE, Macintosh SE/30, Macintosh II, Macintosh IIX, or Macintosh IICX with a hard disk and at least 1 megabyte of RAM.
- *Recommended hardware* – Macintosh SE/30, Macintosh II, Macintosh IIX, or Macintosh IICX with a hard disk and at least 2 megabytes of RAM.

MacApp® 2.0B5

- *Required software* – MPW 2.0.2 and MPW Pascal 2.0.2, or later. For MPW requirements, see previous page.
- *Required hardware* – Macintosh Plus, Macintosh SE, Macintosh SE/30, Macintosh II, Macintosh IIX, or Macintosh IICX with a hard disk and at least 2 megabytes of RAM
- *Recommended hardware* – Macintosh SE/30, Macintosh II, Macintosh IIX, or Macintosh IICX with a hard disk and at least 2 megabytes of RAM

MacApp 1.1.1

- *Required software* – MPW 2.0.2 and MPW Pascal 2.0.2. For MPW requirements, see above
- *Required hardware* – Macintosh Plus, Macintosh SE, Macintosh SE/30, Macintosh II, Macintosh IIX, or Macintosh IICX with a hard disk and at least 1 megabyte of RAM.
- *Recommended hardware* – Macintosh SE/30, Macintosh II, Macintosh IIX, or Macintosh IICX with a hard disk and at least 2 megabytes of RAM.

Macintosh Allegro Common Lisp v.1.2.2

Including the Foreign Function Interface and the Stand-Alone Application Generator.

- *Required hardware* – Macintosh Plus, Macintosh SE, Macintosh SE/30, Macintosh II, Macintosh IIX, or Macintosh IICX with a second 800K disk drive and at least 1 megabyte of RAM.
- *Recommended hardware* – Macintosh SE/30, Macintosh II, Macintosh IIX, or Macintosh IICX with a hard disk and at least 2 megabytes of RAM.

How to Acquire Apple Development Tools

You can purchase Apple development tools from APDA™. Apple Partners and Associates receive the APDA catalog, APDAlog, on a regular basis. APDA can be reached at 1-800-282-2732.





How to Work with Developer Technical Support

The Developer Technical Support (DTS) group exists to make third-party software and hardware development easier and more straightforward. Third-party developers face many challenges, so we provide a wide variety of technical services.

We write Technical Notes

Technical Notes are detailed technical documentation written by DTS to expand upon and clarify Apple's technical documentation. They also document bugs in Apple® software, hardware, and documentation. These Notes address questions commonly asked by developers, so reading them early may save you time and exasperation later. In addition to the standard Technical Notes, Apple® II DTS distributes Apple II File Type Notes, which document registered file types and auxiliary file types on the Apple II. Macintosh® DTS also produces the Macintosh® Technical Notes HyperCard® Stack, which is meant to supplement the published Technical Notes. With this stack and HyperCard software, you can now search the entire set of Technical Notes electronically, as well as copy the code samples directly into your programming environment.

Because Technical Notes are revised frequently, you should refer to the Technical Note index before you look at any other Apple documentation. For the same reason, make sure that you keep your Technical Notes up-to-date. If you have questions about, or suggestions for, Technical Notes, don't hesitate to send them to us at the address at the end of this document.

Technical Notes are posted on the AppleLink® network [path: Developer Services: Developer Technical Support: Macintosh: Technical Notes or Apple II: Technical Notes].

We produce the Question and Answer HyperCard Stack

Macintosh DTS produces a Question & Answer HyperCard Stack to help you with the most frequently asked development questions. The Q&A Stack addresses questions commonly asked by developers, so referring to it first may save you time and money. Questions and answers are cross-referenced to other relevant questions in the stack, as well as to the Macintosh Technical Notes Stack. The two stacks are designed to work together to put a broad base of up-to-date technical information at your fingertips. You can search the Q&A Stack for specific topics or keywords, or just browse through questions in a particular area of interest. In addition, you can copy code samples directly into your programming environment. For further information on the Q&A HyperCard Stack, see the "Q&A stack" document in this section.

The Q&A Stack is posted on the AppleLink network [path: Developer Services: Developer Technical Support: Macintosh: Q&A].

We write sample programs

As you know, a well-documented sample is worth a thousand words. To save you time and aid in your development efforts, Apple II and Macintosh DTS release and distribute sample code. These groups make sure the code you receive is useful from both an educational and a practical standpoint. The sample code releases do not demonstrate all of the techniques necessary to program the Apple II or Macintosh

computer, but they cover a wide range of topics, from simple event-loop programming to the advanced techniques of each platform.

The Apple II Sample Code releases include both Apple Programmer's Workshop (APW™) and Macintosh Programmer's Workshop IIGS (MPW™ IIGS) code in 65816 assembly language, C, and Pascal. The Macintosh Sample Code releases include Macintosh Programmer's Workshop (MPW) code in 68000 assembly language, C, C++, Pascal, and Object Pascal.

Sample code is posted on the AppleLink network [path: Developer Services: Developer Technical Support: Macintosh: sample code].

Technical Notes, sample code, and the Q&A Stack are intended to show you how to write your program so that it is compatible with future, not just current, hardware and system software. If you read a warning in the Q&A Stack, in a Technical Note, or in some sample code, beware! Warnings usually hint at impending changes that we are not at liberty to discuss, but to which we can allude; if we say something may not be compatible with a future release of the operating system, it probably won't be. On the other hand, if we give no warning, DTS will work to protect the techniques we've published in these three developer references.

We report and validate the bugs you find

If you find a bug in an Apple product, you should use "Outside Bug Reporter" to report it to DTS. You can find "Outside Bug Reporter" on the AppleLink network [path: Developer Services: Developer Technical Support:Macintosh or Apple II: Bugs/Fixes] . Once we receive your report, we'll try to reproduce your bug and let you know what we find. If we think it may actually be a bug in your code, we'll write back in approximately 48 hours asking for more information, or tell you what we think you may have done wrong. If, however, it seems to be an Apple problem, we'll send it on to the Bug Reporting Center (BRC) staff, and they will make sure that it gets to the right engineers. For bug reporting procedures, refer to the "Bug Reporting Procedures" document in this section. We appreciate all your bug reports and thank you for taking the time to help make Apple products even better.

We contact developers whose applications will be incompatible with future products

Apple does not send prerelease hardware and software to every developer; however, we do test many of your products on our unannounced products. When our testing team finds incompatibilities between an unannounced Apple product and a released version of your product, you will get a letter from DTS telling you that we know of a change you should make to your hardware or software. These warnings may be vague (if we're not at liberty to discuss the product yet), but they should be carefully considered; ignoring a DTS warning virtually guarantees that your product will have problems with an upcoming Apple release. If we do not hear back from you after your company gets notified of an incompatibility, your product may show up on a list of third-party products that do not work with our new hardware or software. Please let us know if you need help in reproducing or fixing the problem; we can't help unless you communicate with us.

Of course, Apple doesn't have the resources to test *all* third-party applications and hardware. Those of you who don't get letters either have products that work fine on our future products, or products that are not currently being tested here at Apple. Whether or not you receive a letter from DTS, you should read Technical Notes and sample code very carefully for any warnings that they may contain.

We maintain the Developer Technical Support portions of AppleLink	We want to make technical information as accessible as possible, so we place no restrictions on copying information or using sample code officially released from DTS, and we make these things accessible in as many places and forms as possible. The sample code should not be pasted into your program until you fully understand it, of course. Our portion of the Developer Services bulletin board on the AppleLink network contains all of the technical information you get in the monthly mailings (such as Technical Notes, the Technical Notes Stack, the Q&A Stack, and sample code), as well as some tools that are available from APDA™.
We review Apple's technical documentation for accuracy and clarity	Because we realize how important accurate and clear documentation is to your development process, we review every piece of technical documentation that comes out of Apple. In addition to reviewing and improving Apple's "official" documentation before it goes out the door, we are working diligently to persuade our technical documentation folks that updatable documentation is imperative, so they can fix it even after it gets out.
We review APDA packages	APDA™ is an important source of technical information. Working with APDA, we review (and often initiate) packages that will directly benefit serious software developers. Look to APDA for most of your information needs.
We test APDA packages	We use prerelease Apple software and hardware so that we can better understand the possible pitfalls, and so that we can help to fix as many bugs as possible. With adequate time and engineers, we hope to contribute to an eminently more supportable future, with software and hardware that address developers' needs.
We register creators/file types	<p>When you ship your Macintosh or Apple II application, you must register your application's signature, and the types of any files your application creates, with DTS. Apple reserves all signatures and file types containing only lowercase letters. We also register NuBus™ board IDs.</p> <p>Unlike the Macintosh, the Apple II has a much more limited range of file types (256 on the Apple II, compared with a few million on the Macintosh). Apple has extended the Apple II File Type model by creating broadly generic file types and assigning individual auxiliary types to identify particular files. Those who do not obtain file type and auxiliary type assignments from DTS run a strong risk of future incompatibility.</p> <p>The form to register your signature and file types is on the AppleLink network [path: Developer Services: Developer Technical Support: Macintosh or Apple II]. This form is also mailed out to all developers once a year.</p>
We answer development questions	<p>We use all of the methods above to try to answer your development questions even before you know you have them. Sometimes, of course, you'll come up with a question before we've published an answer. In these cases, you should write to DTS via electronic mail.</p> <p>(Remember, we'll help developers implement pop-up menus or track down bugs in their applications, but if you're having trouble printing to an AppleTalk® ImageWriter® printer from Excel, you should contact your dealer or Microsoft—DTS supports development not applications use.)</p> <p>The Developer Technical Support AppleLink and MCI mail messages are read daily. After all the messages are read, printed, copied, and distributed, we have</p>

a meeting where the entire group discusses the best approach to each problem. When more people are working on a problem, the solution is likely to be a synthesis of ideas rather than an individual opinion. Many of the questions we're asked involve difficult judgment calls—when the input of everyone in the group is crucial.

In this meeting, each question is assigned to an engineer, who is responsible for responding to it before going home that night. Occasionally, our research doesn't pan out and we have to continue working on your question the next day; when this happens, we'll send you a message telling you so. We strive to provide turnaround within one business day, but when the questions far outnumber the available engineers, some questions will take longer than a day to answer.

Consider us your reference, not a replacement for the experimentation phase of your product development. We encourage you to use a debugger and to try things you aren't sure about. If the code does what you want it to do, but you're not certain it will continue to work in the future, write to us. Tell us what you've tried, what the results were, and voice your concern about whether it will continue to work.

As always, make sure you have the latest versions of software and documentation. For example, if you write to us asking about MPW 3.0b1, we will not be able to answer your question. Apple releases new versions of software and documentation because we realize that additional features are needed or that bugs need to be squashed, so take advantage of the APDA auto-order mechanism and get these updates as soon as they're released.

When asking for help from the Developer Technical Support group, please make sure your request is as complete as possible. Please include:

- A general idea of what you are trying to do
- A detailed description of the problem
- Information on your development environment (including version numbers)
- Information on your system configuration—hardware and software (including version numbers)
- The possibilities you've already exhausted (and their results)
- Name, company name, postal address, and phone number (in case we need to send you something or call for clarification)

Of course, these are just guidelines; you know best whether this type of information will help us to solve your problem.

If you want to reference an earlier message to us (or one from us), you should let us know what day it was sent. We keep a record of every message, who responded to it, and when. We also keep track of our responses, so we always have access to what we told you. (Our records are not sorted by AppleLink message numbers, so numbers assigned by the system are not useful as reference points.)

We're here to help you, so if you've got suggestions, or questions, send them in.

You can contact us at the following addresses:

Apple II

Apple II Developer Technical Support

Apple Computer, Inc.

20525 Mariani Avenue, M/S 75-3A

Cupertino, CA 95014

MCI: AIIDTS

AppleLink: AIIDTS

Macintosh

Macintosh Developer Technical Support

Apple Computer, Inc.

20525 Mariani Avenue, M/S 75-3A

Cupertino, CA 95014

MCI: MACDTS

AppleLink: MACDTS



What Is AppleLink?

AppleLink® is Apple's information and communications network, which runs on both Macintosh® and Apple® II personal computers. It is one of Apple's primary vehicles for communicating with key customers and business partners, including developers (both Partners and Associates), authorized Apple dealers, and user groups; as well as customers in the K-12, higher education, special education, VAR, and national account markets. Both domestic and international audiences are represented on the AppleLink network.

The AppleLink network can be a very useful source of technical data during your development process, providing information ranging from general specifications about Apple products to specific technical details. The following sections discuss the information you'll find under the AppleLink icons.

Bulletin Board Icons

Bulletin boards contain information about what's going on within the Apple community. Read-only bulletin boards are indicated by the newspaper icon; two-way bulletin boards, to which you can post items directly, are indicated by the bulletin board icon.

- **The Developer Services bulletin board** (a two-way board) is an important source of technical information. Folders on this board include the following:
 - *Developer Technical Support (read-only)*: Contains technical notes, sample code, tools, system software, and international keyboard information for Apple II and Macintosh products.
 - *Developer Technical Publications*: Contains an overview of the Developer Technical Publications group, as well as instructions for giving us feedback about our publications.
 - *Development Tool Discussions*: Provides a two-way forum for discussing Apple development tools, such as APW™, MPW™, MacApp®, and Macintosh Allegro Common LISP, with other developers and with Apple. Brief descriptions of development tools are also listed.
 - *Developer University*: Provides the most current information about courses offered by Apple's Developer University, including course descriptions, schedules, locations, and registration forms.
 - *Developers Ask Each Other*: Provides a two-way forum for discussing general technical questions with other developers. Discussion subfolders divide discussion into specific areas (General Discussion, A/UX® Discussions, International Development Discussion, HyperCard Discussion, Networking & Connectivity Discussion, and Printing Discussion). This is the place to post those "Does anyone out there know...?" types of questions.

- **The Third-Party Connection bulletin board** (a read-only board) is a comprehensive source of third-party information on AppleLink. Folders on this board include:
 - *Product Compatibility Lists*: When Apple releases new products, it publishes listings of third-party products that pass Apple's compatibility testing. Among the lists currently posted are those for the LaserWriter® printer, Macintosh II computer, EtherTalk™ network, and Macintosh System Software.
 - *Third-Party Products/New Features*: Provides lists of third-party products that take advantage of new features Apple equipment provides. The lists are updated monthly.
 - *Third-Party Technical Support via AppleLink*: Provides a listing of third-party developers who have agreed to offer technical support via AppleLink electronic mail to customers on the network. Company name, AppleLink address, and turnaround times are listed for each participating developer.
- **Other AppleLink bulletin boards** that contain technical information include the following:
 - *DTC (Desktop Communications)*: Provides product listings and technical information about Apple and third-party desktop communications products, such as the AppleTalk® network system, EtherTalk, modems, and third-party terminal emulators.
 - *Software Updates*: Contains information about Apple's Software Update Program, which, includes details about enhanced features and installation instructions for the most recent software updates. International system software is also posted here, as well as third-party software updates.
 - *TMIC (Technical Markets Information Center)*: Designed specifically for people who sell and support Apple technical solutions, the TMIC bulletin board focuses on the engineering, scientific, and other technical markets. The TMIC bulletin board contains read-only information such as product reviews and articles, product data sheets, new product press releases, technical market directories, and the Engineering/Scientific Solutions Guide. In addition, this board has a two-way forum that allows you to discuss current topics and exchange information with other AppleLink users.
- **Reference libraries** (indicated by the bookshelf icon) are another excellent resource for information about Apple and third-party products. Unlike bulletin boards, you can search reference libraries for specific topics.
 - *Apple Products Library*: Contains information about Apple products, including features and benefits, part numbers, and AppleCare® information.
 - *Technical Info Library*: Contains technical product specifications, documentation clarifications and errata sheets, and information about product compatibility, interfacing, and general hardware troubleshooting.
 - *MENU/Software Library*: Contains the MENU software database, which enables you to obtain information about more than 15,000 third-party software products for the Apple II and Macintosh personal computers, including the product name, vendor name and address, system requirements,

and price.

- *Special Ed Solutions Library*: Contains information about software, hardware, organizations, and publications that are specifically related to special education and rehabilitation products.
- *Reference Library*: Contains general information related to Apple products, such as product packing lists, descriptions of Apple manuals, compatibility guides, and current version numbers of Apple software.
- *K-12 Curriculum Library*: The K-12 Curriculum Library is the on-line version of the Apple K-12 Curriculum Software Guides and the Apple Education Solutions Guides. These Guides provide listings of educational software packages available for Apple computers in these subject areas: ABE (Adult Basic Education), Business Education, ESL (English as a Second Language), Foreign Languages, Language Arts, Mathematics, Science, and Social Studies.

Questions Regarding AppleLink?

As an on-line, interactive medium, AppleLink often undergoes changes, including modifications to and additions of folders and icons. For the most up-to-date information, refer to the AppleLink Guide icon and the "Guide to the DSBB & Other Boards" folder on the Developer Services bulletin board. If you have questions, or suggestions about the type of information you would find useful for inclusion on AppleLink, contact:

Jessa Vartanian
Developer Programs
Apple Computer, Inc.
20525 Mariani Avenue, M/S 75-2C
Cupertino, CA 95014
AppleLink: JESSA



What Is Sample Code?

As you know, a well-documented sample is worth a thousand words. To save you time and assist in your development efforts, the Apple® II and Macintosh® Developer Technical Support (DTS) groups release and distribute Sample Code. These groups make sure the code you receive is useful from both an educational and a practical standpoint. The Sample Code releases do not demonstrate all of the techniques necessary to program the Apple II or Macintosh computer, but they cover a wide range of topics, from simple event-loop programming to the advanced techniques of each platform.

Apple II

The Apple II Sample Code releases include both Apple Programmer's Workshop (APW™) and Macintosh Programmer's Workshop IIGS (MPW™ IIGS) code in 65816 assembly language, C, and Pascal. Both the Shell and C.Shell programs in Volume 1 provide examples of a basic desktop application and serve as a foundation for other Sample Code programs. We encourage you to use these Apple IIGS® examples as a basis for your applications.

Macintosh

The Macintosh Sample Code releases include Macintosh Programmer's Workshop (MPW) code in 68000 assembly language, C, C++, Pascal, and Object Pascal. The Sample and TESample programs demonstrate basic Macintosh programming techniques, and include an example of using TextEdit. Although the Macintosh Sample Code releases provide examples of the form of a typical Macintosh program, they do not demonstrate all of the techniques necessary to build a complete Macintosh application (for example, sophisticated memory management, exception handling, and Undo) and should not be used as templates for your applications.

Distribution

Sample Code releases are available through the following channels:

- Developer Programs' monthly mailings.
- Developer Group's *Phil & Dave's Excellent CD™*, available quarterly in the Developer Programs' monthly mailing.
- The DTS folder on the AppleLink® network. Apple II: [path: Developer Services: Developer Technical Support: Apple II: Sample Code]. Macintosh: [path: Developer Services: Developer Technical Support: Macintosh: Sample Code].
- Other public electronic networks, including AppleLink–Personal Edition, BIX, CompuServe, GENie, The Source, and Usenet.
- APDA™ customers may order Sample Code releases; refer to the APDAlog for product numbers and information.

Further Questions

Sample Code is just a part of Developer Technical Support's efforts to effectively support the needs of as many developers as possible. To help DTS achieve that end, please send suggestions for future Sample Code topics or questions about existing Sample Code releases to:

Apple II Sample Code or Macintosh Sample Code
Developer Technical Support
Apple Computer, Inc.
20525 Mariani Avenue, M/S 75-3A
Cupertino, CA 95014
AppleLink: AIIDTS or MacDTS
MCI Mail: AIIDTS (264-0103) or MacDTS (215-0798)



What Are Technical Notes?

Technical Notes are detailed technical documentation written by the Developer Technical Support (DTS) group to expand upon and clarify Apple's technical documentation. They also document bugs in Apple software, hardware, and documentation. These notes address questions commonly asked by developers, so reading them early may save you time and prevent later exasperation. Because Technical Notes are revised frequently, you should refer to the Technical Note index before you look at any other Apple documentation. For the same reason, make sure that you keep your Technical Notes up-to-date. If you have questions about, or suggestions for, Technical Notes, don't hesitate to send them to us at the address at the end of this document.

Apple II

DTS distributes Apple® II Technical Notes six times per year, in January, March, May, July, September, and November. There are currently more than 150 Apple II Technical Notes, in the following general subject areas: the Apple IIc, the Apple IIe, the Apple IIGS®, Apple II miscellaneous, AppleTalk®, the GS/OS™ operating system, the ImageWriter® printer, the Memory Expansion Card, the mouse, Pascal, ProDOS®8, SmartPort, and the UniDisk™ 3.5 drive. As the environment of the Apple II expands and changes, so do the Technical Notes. In addition to the standard Technical Notes, Apple II DTS distributes Apple II File Type Notes, which document registered file types and auxiliary file types on the Apple II.

Macintosh

Macintosh® Technical Notes are also distributed six times per year, in February, April, June, August, October, and December. There are currently more than 250 Macintosh Technical Notes, in the following general subject areas: ADB, AppleShare®, AppleTalk® Manager, applications, CD-ROM, compatibility, Control Manager, Control Panel, debugging, desk accessories, Device Manager, Dialog Manager, the Disk Initialization Package, Event Manager, File Manager, Font Manager, hardware, HyperCard®, International, MPW™, Memory Manager, Menu Manager, MultiFinder™, Notification Manager, Palette Manager, programming tips and languages, Print Manager, QuickDraw™, Resource Manager, Script Manager, SCSI Manager, Segment Loader, Sound Driver, Standard File Package, system software, TextEdit, and Window Manager.

DTS also produces the Macintosh Technical Notes HyperCard® Stack, which is meant to supplement the published Technical Notes. With this stack and HyperCard, you can now search the entire set of Technical Notes electronically, as well as copy the code samples directly into your programming environment. The Technical Notes Stack will help you get even more out of the information we publish in the notes, and DTS will be updating it on a quarterly basis.

Distribution

Apple II and Macintosh Technical Notes, Apple II File Type Notes, and the Macintosh Technical Notes Stack are available through the following channels:

- Developer Programs' monthly mailings.
- Developer Group's *Phil & Dave's Excellent CD™*, available quarterly in the Developer Programs' monthly mailing.
- The DTS folder on the AppleLink® network. Apple II: [path: Developer Services: Developer Technical Support: Apple II: Technical Notes or File Type Notes]. Macintosh: [path: Developer Services: Developer Technical Support: Macintosh: Technical Notes].
- Other public electronic networks, including AppleLink–Personal Edition, BIX, CompuServe, GENie, The Source, and Usenet.
- APDA™ customers may order Technical Notes and the Macintosh Technical Notes Stack. Notes are offered in either printed or disk format, and the Technical Notes Stack comes complete with a printed user's guide. Please refer to the APDAlog for product numbers and information.

Further Questions

Technical Notes and the Macintosh Technical Notes Stack are just a part of Developer Technical Support's efforts to effectively support the needs of as many developers as possible. To help DTS achieve that end, please send suggestions for future Technical Notes or questions about existing Technical Notes to:

Apple II Technical Notes or Macintosh Technical Notes
Developer Technical Support
Apple Computer, Inc.
20525 Mariani Avenue, M/S 75–3A
Cupertino, CA 95014
AppleLink: AIIDTS or MacDTS
MCI Mail: AIIDTS (264-0103) or MacDTS (215-0798)



The Question & Answer HyperCard Stack

What is the Q&A stack?

Macintosh® Developer Technical Support (DTS) produces a Question & Answer HyperCard® Stack to help you with the most frequent development questions. The Q&A Stack addresses questions commonly asked by developers, so referring to it first may save you time and effort early in your development process. Questions and answers are cross-referenced to other relevant questions in the stack, as well as to the Macintosh Technical Notes Stack. The two stacks are designed to work together to put a broad base of up-to-date technical information at your fingertips. You can search the Q&A Stack for specific topics or keywords, or just browse through questions in a particular area of interest. In addition, you can copy code samples directly into your programming environment.

Since DTS updates the Q&A Stack frequently, the latest version will always reflect the current "hot" development topics, so you should check it before writing to DTS with your question. Although the stack may not contain the answer for which you are looking (for example, How do I write to James Brown in jail?), it will, at a minimum, refer you to the proper place to obtain that information, whether Technical Notes, sample code, Software Licensing, Developer Programs, Evangelism, or, of course, DTS.

How is the stack organized?

The Q&A Stack is organized into general areas of interest with specific questions and answers in those areas. Currently, the stack covers the following development areas: A/UX®, AppleShare®, AppleTalk®, file system, general, hardware, HyperCard, international, MacApp®/OOP, MacWorkStation™, MPW™ and SADE™, MultiFinder™, printing, programming, QuickDraw™ and color, scanner & AppleFax™, Sound, and XCMD/XFCN.

The Q&A Stack is intended to put more useful information within your reach and provide you with immediate answers to the most frequently posed Macintosh development questions.

Distribution

The Q&A Stack is available through the following channels:

- Developer Programs' monthly mailings (as the stack is updated).
- The Developer Group's *Phil & Dave's Excellent CD™*, available quarterly in the Developer Programs' monthly mailing
- The DTS folder on the AppleLink® network [path: Developer Services: Developer Technical Support: Macintosh: Q&A].
- Other public electronic networks, including AppleLink–Personal Edition, BIX, CompuServe, GEnie, The Source, and Usenet.

Further Questions

The Q&A Stack is just a part of Developer Technical Support's efforts to effectively support the needs of as many developers as possible. To help DTS achieve that end, please send suggestions for the Q&A Stack to:

Macintosh Q&A Stack
Developer Technical Support
Apple Computer, Inc.
20525 Mariani Avenue, M/S 75-3A
Cupertino, CA 95014
AppleLink: MacDTS
MCI Mail: MacDTS (215-0798)



Bug Reporting Procedures

If you find bugs in Apple® software, hardware, or documentation, Developer Technical Support (DTS) wants to hear about them. We'll take a look at your bug, try to reproduce it, and if it's reproducible, we'll forward it to the Apple Bug Reporting Center (BRC). If we can't reproduce it, we'll contact you for more information.

How to Report Bugs

- *AppleLink* – Use Outside Bug Reporter, an application written by the Software Quality Assurance (SQA) group at Apple. Outside Bug Reporter is available on the AppleLink® network, [path: Developer services: Developer Technical Support: Macintosh *or* Apple II: Bugs/Fixes] and will help to ensure that you give us all the information we need to reproduce (and fix) the bugs you find. For more information about the specifics of using Outside Bug Reporter, see the documentation accompanying it on AppleLink.
- *MCI Mail (Macintosh bugs only)* – Use Outside Bug Reporter, and send via Desktop *Express*, to the appropriate address listed below.
- *U.S. Mail* – **Send the disk version, not the paper version**, of your bug report to the appropriate Developer Technical Support address listed below.

Where to Send Bugs

Send your completed bug reports to Developer Technical Support.

Send *Apple II* bug reports to:

Apple II Developer Technical Support
Apple Computer, Inc.
20525 Mariani Ave., M/S 75-3A
Cupertino CA, 95014
AppleLink: AIIDTS
MCI: AIIDTS

Send *Macintosh*® bug reports to:

Macintosh Developer Technical Support
Apple Computer, Inc.
20525 Mariani Ave., M/S 75-3A
Cupertino, CA 95014
AppleLink: MacDTS
MCI Mail: MacDTS

Thanks again for helping to make Apple products better and more bug free!



Product Compatibility Testing Tips

This document provides an overview of compatibility testing and describes the compatibility guidelines followed by Apple's Product Quality and Support (PQ&S) group. A sample compatibility checklist and a sample software and hardware matrix, which you may want to use during the testing phase of product development, are provided at the end of this document.

What is Compatibility Testing?

Compatibility testing is the process of ensuring that a product is able to utilize software and hardware that it supported before being modified. Compatibility testing does not attempt to find defects in software, firmware, or hardware, but rather documents the differences between the modified and the unmodified products or system. The unmodified product is often called the *benchmark*, the modified product is often called the *target*.

Types of Testing Methods

The following describes various types of testing methods that Apple's PQ&S group uses when testing a product.

Compatibility vs. functional testing

As mentioned, compatibility testing does not attempt to find defects in the product, but rather the differences between the modified and unmodified product. Functional testing *does* look for defects in the product and therefore relies less on third-party software and hardware. Preferably, the functional team tests the new product first and verifies its performance. Once the compatibility team receives the new product for testing, any problems that occur should be the result of improvements to the modified product that cause unexpected results to the current products, not actual defects.

Stress testing

Testing a program to see how it handles heavy loads or stresses is called stress testing. Stress testing subjects the program to a peak volume of data over a short span of time. This is different from volume testing, which subjects the program to enormous amounts of data with no time consideration.

Destructive testing

Testing a program beyond its capacities to see how it handles error conditions is destructive testing. This is done by subjecting the program to heavy volumes of data or by evoking error messages and testing how well the system recovers from input errors, hardware errors, and data errors such as noise on a communications line.

Regression testing

Verifying that a defect was fixed and that the change has not caused problems with other aspects of the program is regression testing. This is usually done by rerunning at least a subset of the previous testing. Regression testing is an important step, because changes and error corrections tend to be more error-prone than the original program code.

Testing for Compatibility

Test configurations

During compatibility testing, many different hardware and software configurations are utilized. A configuration is defined as any one of many possible combinations of computers and peripheral and network devices. A configuration might also include software such as INTS, CDEVs, fonts, and memory. Within the time limits of the test effort, programs should be tested with many different configurations, especially “normal” configurations and fully loaded configurations (with every slot or port used).

Compatibility Guidelines

The following guidelines can assist the testing engineer when doing compatibility testing. Not all of this information will be relevant for every test.

- Test all the major product features. Go to every menu and screen in the program; work through the tutorial or other documentation in an organized manner to ensure completeness of the test.
- Test any Apple product in 40-column and 80-column modes, if applicable.
- Test products with all supported hardware as documented in the user manuals.
- Check error conditions, by behaving as though you were a novice user.
- After you have finished testing all the features, do as much destructive testing as time permits.
- As a rule, if all features of the newly developed product run properly on the target system, you don't need to duplicate your tests on the benchmark system.
- If a product exhibits any unusual behavior, test that product on the benchmark system.
- If you observe any bugs in the product on the benchmark system, determine whether they also exist on the target system.
- Test for various user levels and/or approaches:
 - Novice users: Test for stability of error checking (What happens if the user does the wrong thing?) and ease of use.
 - Average users: Make sure that the standard features are robust.
 - Experienced users: Do stress testing.

Sample Checklist

Attached are sample checklists that Apple's PQ&S group has used in the past for testing third-party applications. These checklists are being provided for informational purposes only and may not include all of Apple's products or possible test criteria. One is for testing the application and the other is for tracking different configurations used during testing.



Sample Compatibility Script Checklist

Tester's Name _____ CPU _____ Date _____

Application Name _____ Version _____ System Software _____

SF MF*

Set Startup Tests

- Set Startup to application
- Set Startup to application and DAs
- Set Startup to application's file
- Select About the finder and verify application's memory size allocation

Application Tests

- Open as many applications as is possible
- Switch layers via Apple menu, icon, and activating windows
- Create a new document
- Save
- Save As
- Save in different formats
- Use any sample documents
- Close
- Quit
- Open multiple documents
- Copy, Cut, Paste
- Undo
- Use Keyboard command equivalents
- Paste graphics from Scrapbook
- Select About (Application) from the Apple menu
- Select About MultiFinder from within the application
- Open all Apple DAs and use briefly
- Open several third-party DAs and use briefly
- Play with windows: resize, move, drag offscreen
- Open other applications and switch between layers
- Use application's text editor to: change font, style, size, and so on
- Use the Arrow keys

System Tests

- Use Disk Init Package from within the application
- Use Standard File to call Disk Init Package
- Use Standard File to open a file
- Test with RAM Cache On
- Test with RAM Cache Off

SF MF*

Alert Tests

- Restart with unsaved document open to prompt alert
- Save to a full disk
- Save to a locked disk

Font Tests

- Select & use at least two Macintosh fonts
- Select & use at least two LaserWriter fonts
- Select & use at least two LQ fonts
- Select & use at least two third-party downloadable fonts
- Scale fonts
- Use large fonts

Printing Tests

- Print a document from the application
- Print selected pages
- Change Page Setup to: Landscape, Enlarged, Reduced, and so on
- Print in Background to LaserWriter
- Print in Foreground to LaserWriter
- Print a document from the Finder
- Print to all Apple Printers (see *Printer Matrix*)

Additional Tests

- _____
- _____
- _____
- _____
- _____

* SF = Single Finder, MF = MultiFinder



Sample Software and Hardware Matrix

NAME/CPU

Name	CPU	Application/Version	Date

SYSTEM HARDWARE

RAM	Internal Hard Disks	External Hard Disks	Internal Disk Drives	External Disk Drives	Monitor	Keyboard	Mouse
8	20MB SCSI	20MB SCSI	SuperDrive	800K	Standard	Standard	Standard
5	40MB SCSI	40MB SCSI	800K		Color	Extended	Low-Power
4	80MB SCSI	80MB SCSI			Multiple		
2	160MB SCSI	160MB SCSI			Two page		
1					Full page		

SYSTEM SOFTWARE

DAs	CDEVs	INITs	Printer Drivers	Fonts
Alarm clock	General	AppleShare WS	AT ImageWriter	Macintosh
Calculator	Color	MacsBug 6.0	DC ImageWriter	LaserWriter Plus
Chooser	Keyboard	Responder	LaserWriter	LQ
Control Panel	Monitors	MacroMaker	LaserWriter IISC	Adobe
Find File	Mouse	Suitcase	AT LQ ImageWriter	CassadyWare
Key Caps	Pyro	_____	DC LQ ImageWriter	_____
Note Pad	Sound	_____	PrintMonitor	_____
Puzzle	Startup Device	_____		_____
Scrapbook	_____	_____		_____
_____	_____	_____	System/Finder	
_____	_____	_____	System _____	
_____	_____	_____	Finder _____	
_____	_____	_____		
_____	_____	_____		
_____	_____	_____		
_____	_____	_____		

PRINTERS

LaserWriter	AT ImageWriter II	DC ImageWriter II
LaserWriter Plus	AT ImageWriter LQ	DC ImageWriter LQ
LaserWriter II NTX		DC ImageWriter 1 8 in
LaserWriter II NT		DC ImageWriter 1 15in.
LaserWriter II SC		

Circle options used

AT = AppleTalk
DC = Direct Connect



International Software Development

This document provides a brief overview of the guidelines you should follow and the tools you will need to adapt your products to international markets.

Developing for International Markets

International markets may be viable ones for your product; therefore, it is important that you understand what it means to develop a “localizable” product. Creating a localizable product is making sure that your product can be easily translated into another language. It also means adhering to country-specific standards such as time, date, currency, and sorting sequences. During “localization” your application and its accompanying documentation are translated and adapted to a country’s culture and standards (for example: right-to-left or left-to-right text handling, commas versus periods as decimal separators, and appropriate currency symbols).

The ease with which a product can be localized will vary depending upon the overall design of the product. Placing text in resources is one of the signs of a well-designed product because it facilitates the localization process. Apple has created the following tools to facilitate the design of localizable products and the localization process.

Tools and Guidelines

- The most important rule is to follow the programming guidelines set forth in *Inside Macintosh*, available from APDA™, especially Volumes I and V, which contain calls to the International Utilities (date, time, number formats, and so on) and to the Script Manager for Roman text handling, such as French, Italian, Spanish, and non-Roman text handling, such as Japanese, Arabic, and Hebrew. Also included is a section on the International Human Interface Guidelines.
- Other guidelines can be found in the alpha draft of the *Software Development for International Markets* manual. This manual, also available from APDA, explains the things that you need to consider during the design stage, as well as which tools you should use during the development phase. It also describes the localization tools and how to use them.
- The *Localizability Checklist*, following this document, is a guideline for world-wide product development. It should be used before, during, and after you complete the development of your product to make sure you are addressing all the localizability issues. For detailed information on each item or area, refer to the *Software Development for International Markets* manual, available from APDA.
- In addition to the documentation mentioned above, you should use the following tools:

Script Manager Developer's Package

The Script Manager Developer’s Package, available from APDA™, contains documentation and tools to aid you in writing and testing applications that are compatible with the Script Manager. The Script Manager allows Macintosh applications to handle Roman and non-Roman scripts correctly. It also supplies a number of routines that aid in text handling in general. For more information on Script Manager, see the Script Manager document in this section.

ResEdit

As Apple's resource editor, ResEdit allows you to create and edit resources such as menus and menu items, strings, icons, windows, dialogue boxes, and alert messages. It is used in the localization process to translate resources. ResEdit is an indispensable tool for all developers, and it is also available from APDA™.

Localized System Software

To ensure that your product is fully localizable, you will need to test it with one or more foreign-language versions of the system software. Apple has released 25 localized versions of the system software which are available from APDA™. When you are ready to market your product overseas, contact Apple's Software Licensing Department to license your system software.

Glossaries

The foreign language glossaries provide the translations of the most commonly used terms, such as menu, edit, and cut and paste. You will find the glossaries on *Phil and Dave's Excellent CD* available quarterly in the Developer Programs' monthly mailing or on the AppleLink network [path: Developer Technical Supports Macintosh: Tools: Translate it!] The languages that are currently available are Dutch, German, Finnish and Italian.

Technical Notes

Macintosh Technical Notes contain detailed information written by the Macintosh Developer Technical Support Group. The notes expand and clarify Apples documentation, including errors found in software, hardware and manuals. They also contain commonly asked developer questions.

Of particular interest to worldwide product development are the following international specific technical notes:

- 138 Using KanjiTalk with a non-Japanese Macintosh Plus
- 153 Changes in International Utilities and Resources
- 174 Accessing the Script Manager Print Action Routine
- 178 Modifying the Standard String Comparison
- 182 How to Construct Word-Break Tables

Technical Notes are available through the following channels:

- Developer Programs' monthly mailings
- The AppleLink network, Macintosh: [path: Developer Technical Support: Macintosh: Technical Notes] Apple II: [path: Developer Technical Support: Apple II: Technical Notes]
- APDA

Support Programs

The Developer Programs and Developer Technical Support groups at Apple are committed to supporting your efforts to create localizable products and to distributing your products overseas. So that you can benefit from our experience, we recommend that you contact us during the design stage of your product. As you approach the distribution, marketing, and localization stages, we will also make sure that you receive the support and guidance you need from our international subsidiaries.

For more information on localizing your products, contact:

Developer Programs
Apple Computer
20525 Mariani Avenue, M/S 75-2C
Cupertino, CA 95014
(408) 974-4897
AppleLink: DEVSERVICES



The following checklist is being provided as a guideline for worldwide product development. It should be used before, during, and after the development of your product to make sure you are addressing all of the localizability issues. For detailed information on each item or area, refer to the *Software Development for International Markets* manual, available through APDA™.

Text contained in the application/DA/driver/and so on

The following should be in resources:

- ALL text (including special characters, delimiters, and so on)
- Lengths of string and text resources
- Menus and power keys
- Character/word/phrase/text translators (tables)
- Address formats, including “ZIP” codes and phone numbers
- Text data compaction, encoding, and transmission must allow character codes from \$20 to \$FF to be used.

When creating your resources, keep in mind:

- Text needs room to grow (up, down, and sideways)
 - Translated text data is often 50 percent larger than the U.S. English text data.
 - Diacritical marks, widely used outside the United States, extend up to the ascent line.
 - Some system fonts contain characters that extend to *both* ascent and descent lines.
- Potential grammar problems (error messages, “natural” programming language structures, and so on).
- Text location within a window should be easy to change.

Text handling

Use the Script Manager for:

- Word Boundaries (word wrap, selection, search, and cut and paste).
- Character Boundaries (search, replace, sort, word wrap, backspace, delete, and cut and paste).
- Right-to-left and mixed-direction text (justification, cursor positioning, highlighting).
- Displaying font names in the proper font.

Remember:

- Use TextEdit and Dialog Manager for all text handling (preferred).
- Font #0 is not always Chicago.
- Use system and application fonts (0,1) when the user cannot select the font.
- Avoid hard-coded font sizes (if you must, use a font size of 0; otherwise, let the user choose).
- When using fonts to provide symbols, use proper font ID numbers as defined by International System Software.

Formats and special symbols/words

Use the International Utilities for:

- Searching
- Sorting
- Formats and separators for:
 - Numbers (decimal mark, and so on).
 - Dates (short, long form, calendars—European, non-Gregorian).
 - Time formats (12 hr, 24 hr, AM/PM and so on).
- Units of measure (currency, metric vs. nonmetric).

Additional data that needs to be localizable

- Keep in mind that some countries perform financial calculations differently.
- Graphics and icons (mailboxes, champagne bottles, and so on) should be in resources.

Additional issues

Use Script Manager for:

- Properly changing the current script and the key script when needed.
- Changing the case of text (lowercase or uppercase)—use Transliterate.

Script Interface System–related issues:

- Hiding the Menu Bar (script icon)—save and restore MBarHeight.
- Don't use <Command><Space> (and arrow keys) for Command-key equivalents.



About Script Manager

The Apple®Macintosh® computer has always presented one of the most flexible architectures for producing international software. Software that supports non-Roman character sets has a far larger potential market; however, this involves complexities that create special needs above and beyond the needs of computer systems based on Roman scripts. In order to handle these differences, the Macintosh Script Management System, which consists of Script Manager and one or more script systems, was developed.

Script Manager is low-level software that enables Macintosh applications to work with various scripts. Script Manager and individual script systems patch the Macintosh Toolbox to properly draw and measure text in QuickDraw™ software or to edit unstyled text in TextEdit application. Script Manager also provides a set of routines for more sophisticated text manipulation for use with purely domestic applications and with applications intended for international distribution.

Note: TextEdit 3.0 will be available with System Software Release 7.0 and is compatible with the Script Management System for both unstyled and styled text.

Script Manager provides the following features:

- It allows different script systems to be installed.
- It maintains global data structures.
- It supports switching keyboards between different scripts.
- It provides a central dispatch for programmatic access to script systems.

The central dispatch mechanism supports routines with a standard interface that allows application programs to be written independently of the particular script in use. Because the Roman system is always installed with Script Manager, you can also use these routines with the Roman system for text manipulation.

Script Manager offers three main benefits:

- It provides standard, easy-to-use tools for the sophisticated manipulation of ordinary text.
- It makes it easy to translate an application into another writing system.
- It works together with the International Utilities package to provide localizable date, time, and number conversion.

How Script Manager Works with a Script System

The actual implementation of a given script is provided by a script system. All of the following are examples of script systems: Kanji (KanjiTalk™), Arabic, Chinese (Hanze), Taiwan, Korean (Hangul), Devanagari (Hindi, Marathi), Thai, Pakistani (Urdu), Hebrew, and Greek. These systems determine the function of the script components such as the character encoding, composition rules, and so on. Each script system is responsible for providing a system for native users that is complete, configurable, and as compatible with as many applications as possible.

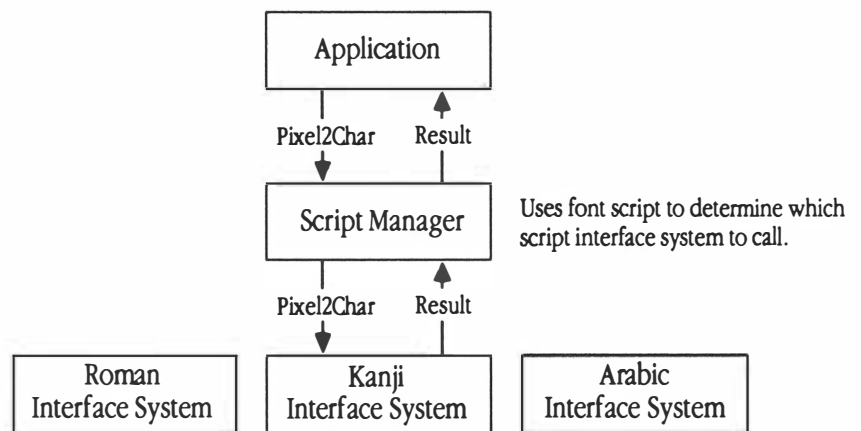
Script Manager coordinates applications and script systems in the following ways:

- It relieves applications from the burden of implementing script handling.
- It allows text manipulation while maintaining independence from scripts.
- It unifies the elements of any individual script system.
- It coordinates different script systems and allows for the addition of new scripts.

Script Manager includes utilities and initialization code to create an environment in which scripts of all kinds can be handled. In order for an application to use a particular script, a script system to support that script must also be present. On some models, it may be in ROM. A script system typically provides the following:

- Fonts for the target language
- Keyboard-mapping tables
- Special routines to perform character input, conversion, sorting, and text manipulation
- A utilities package to handle date, number, and time formats
- A Control Panel feature (CDEV) or desk accessory utility for system maintenance and control

Script Manager calls a script system to perform specific procedure calls for a given script. The illustration below shows how a typical call (in this case, Pixel2Char) is passed from an application through Script Manager to a script system and back.



Example of a procedure call

Script Manager implements several routines itself, but for many others, it acts as a dispatcher to the appropriate script system. For example, each script system provides a CharType routine; when a program calls CharType, Script Manager uses the current font script to dispatch the call to the correct script system.

In many cases, the versatility provided by script systems allows applications to be localized for non-Roman languages with no change to their program code (assuming they were written to permit localization to Roman script). Multiple script systems can be installed at one time on the Macintosh, allowing an application to switch back and forth between different scripts. When more than one script system is installed, an icon symbolizing the current keyboard for the script in use appears at the right side of the menu bar.



Introduction

The Apple® Macintosh® computer provides script systems for Roman, Japanese, Arabic, Chinese, Hebrew, Greek, Thai, Devanagari, Pakistani, and Korean. The Roman, Thai, and Greek systems are relatively straightforward; these script systems provide support for basic differences between languages, such as keyboards, text collation, word breaks, and the formatting of dates, times, and numbers. The Roman Script System includes the European languages covered by the standard Roman character set (such as English or French) and is standard on all system software numbered 4.1 and higher.

The other scripts represent some of the most complex modern writing systems and go far beyond basic script support. Japanese, Chinese, and Korean have extremely large character sets and must have comprehensive methods for character input. These character sets are too large to represent with single bytes (the characters are generally 2 bytes in length) and require an independent font mechanism for display and printing.

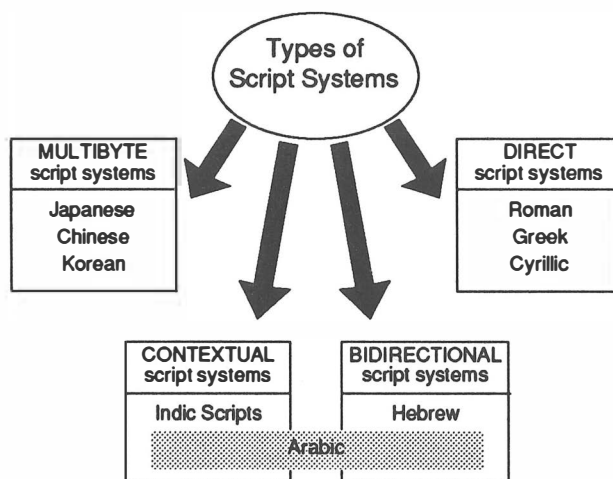
Arabic and Hebrew are right-to-left scripts, (text is generally flush right and characters are entered from right to left). Arabic uses ligatures (two or more characters combined to create a new character) and a cursive font (letters connecting together like handwriting).

What Script Systems Do

Each script system determines the components for the script: character encoding; fonts; input methods; sorting; date, time, and number formats; and script-specific access routines. For example, the composition rules must support all of the necessary features of the script: direction, conjunct characters, accent placement, and so forth. Moreover, all of this must be done without degrading the performance of the Macintosh and maintaining as much compatibility with applications as possible. Each script system also has a desk accessory (DA) or a Control Panel feature (CDEV) that allows the user to configure the individual characteristics of the script at any time.

The script systems supply much of the same capability for entering and displaying text as dedicated word processors for different scripts, but they provide it on a system level. Because the capabilities are built into the system, each developer does not have to duplicate the code necessary to support the script (a process that can be very complicated). Instead, the developer can devote those resources to the primary function of the application program.

In this section, you will find information on the Kanji and Arabic script systems, because they represent the toughest compatibility problems that developers may encounter. Kanji is a multibyte script system (2-byte characters are needed because of the size of the character set), and Arabic is a contextual (one character depending on the position of another) and bidirectional (right-to-left or left-to-right writing) script system.



General Features of Script Systems

A number of features are shared by all the script systems. These include methods for changing scripts, for changing keyboards, and for choosing international date and measurement formats.

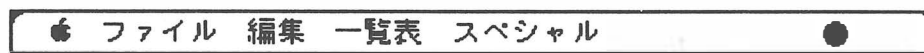
Note: With System Software Release 7.0, a new International CDEV will provide a way for users to control measurement units (date, time, currency, and number formats), collation sequences, and so on. It will allow users limited editing of the resources that specify these items.

Many of the features provided by script systems are independent of applications; many others must be supported by applications. Applications that support the general features of script systems are called *Script Manager compatible*. Applications may go further in offering features that are particular to given scripts (such as *furigana* in Japanese) or in offering more control over languages and scripts. For example, an application may allow users to mark text as belonging to a different language, and search, sort, or spell-check the text based upon that language.

Script Manager-compatible software, including word-processing, database, desktop publishing, and spreadsheet programs, is available through various third parties.

Methods for changing scripts

Other than a different language in the menus, the first thing you will notice on a non-Roman system disk is the script keyboard symbol in the upper right of the menu bar.



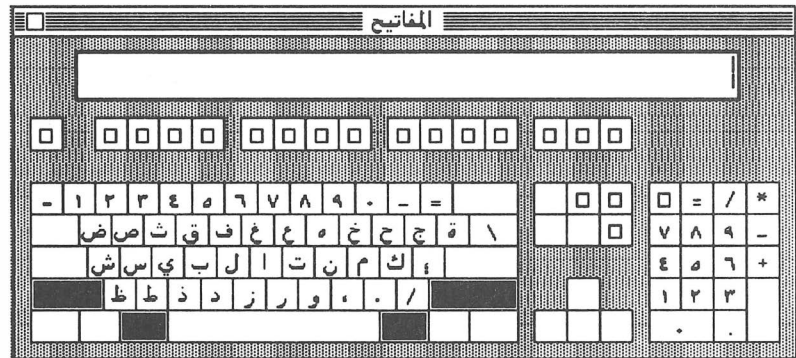
Script keyboard symbol

This symbol indicates which keyboard layout and keyboard script are currently being used. For example, the Arabic keyboard is represented by a crescent moon ☾, Japanese by a rising sun ☀, Hebrew by a Star of David ★, Chinese by a broken coin ⚔, the default Roman (U.S.) keyboard by a diamond ♦, common European keyboards by their national flags, and so forth.

To change the keyboard so that you can enter characters from a different script, you can use two methods: click on the *script* icon in the corner of the menu bar, or press Command-Space. Both of these actions will change from one keyboard to another. (If there are more than two scripts installed, they will rotate through the scripts.)

Script Manager-compatible applications automatically synchronize the font that you are using with the keyboard. In these applications, if you change fonts, the keyboard will automatically change to the corresponding script; if you change keyboards, the next time a character is typed, the font will also change accordingly.

Other applications require you to change the font explicitly by using the menu commands. In these applications, you must take care that the font is always set properly for the keyboard (or vice versa). If you fail to do this (for example, having the Geneva font set for Japanese characters), you will see only a random mixture of boxes, European characters, and odd symbols.

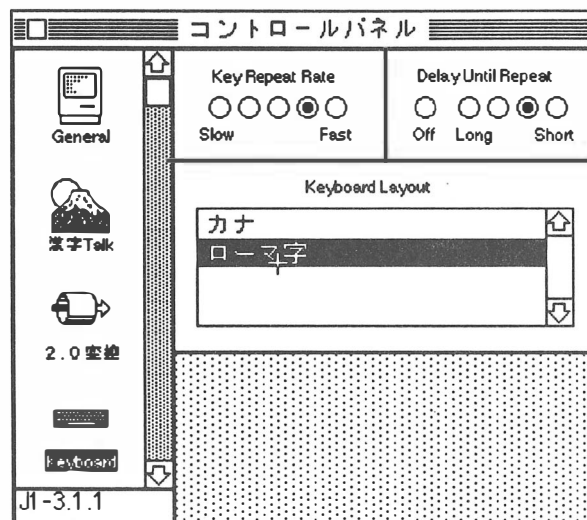


Arabic key caps

To see the effect of an individual script system on the keyboard, select the Key Caps desk accessory. Select the appropriate font, and you will see the current layout. Older versions of Key Caps do not synchronize the font with the keyboard, so you will have to change them in tandem. (Note that the Korean system does not support Key Caps, so Roman characters are displayed.) Each script can provide many different keyboards. Japanese, for example, provides Katakana and Romaji keyboards.

Methods for Changing Keyboards

When your system has more than one keyboard installed, then you can choose among the different keyboards. To do this, open the Control Panel, and click on the Keyboard icon. The keyboard display shows the available keyboards for the given keyboard script. To see keyboards for other scripts, change the keyboard script.



Kanji Keyboard CDEV

Note that the list of keyboards only appears when there is more than one keyboard installed. There are well over two dozen keyboards for different language systems. Although most systems are shipped with only one keyboard, many different keyboards can be installed.

Controlling and Configuring a Script System

Complex script systems include a desk accessory or some Control Panel devices (CDEVs) that allow users to control and configure the system. Generally, a help option can be used to find out more information about the system.

The Arabic script system, as previously noted, permits a choice among several calendars.

Some East Asian script systems support multiple input methods and allow you to choose among these input methods, configuring them as you wish.

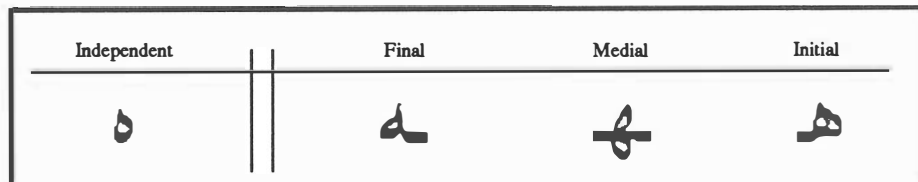


Kanji Script System Configuration CDEV



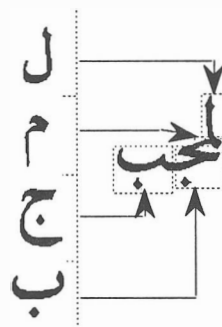
The Arabic Script System

Input for Arabic is very straightforward, simply using a standard keyboard character table. The composition rules, however, are much more complex. Each character can have up to four contextual forms, and the precise form depends upon a varying number of characters that precede and follow it, as shown in the following diagram:



Contextual forms in Arabic

In addition, dozens of characters form ligatures (two or more distinct characters, which, when combined, form a new character); in some cases, up to three characters join together into a completely different form, though usually there are only two characters.



Arabic ligatures

Any time a string of characters is drawn or measured, the Arabic text is parsed, character forms are derived, ligatures are substituted, and the text is reversed. When a given character is being located (as with a mouse-click on a character), then these changes must essentially be reversed in order to derive the original character. All of this is transparent to a program: it sets the font and draws the text as usual. QuickDraw™ has been modified to perform these operations when an Arabic font is used, and the pen still travels from left to right—even though the characters in the text may be reversed.

Since it is common in Arabic to make text flush right (in English, we make text flush left), the menus appear flush right, and the normal radio buttons and check boxes are modified to have the boxes or buttons on the right. In addition, Arabic numerals differ in shape from Western numerals. The system routines that perform numeric conversions (between human-readable and internal format) are also modified not only to accept both Western and Arabic numerals, but also to interpret the Arabic digits in the reverse order. For example, 53 is written by pressing the

three key (٣), then the *five* key (٥), but since the text is reversed, it appears in the order *five-three* (٥٣).

Sorting in Arabic is quite straightforward, with only one unusual feature: Some characters are ignorable; for example, vowels and the extension bar (used to lengthen the cursive connection between characters). Vowels in Arabic are also diacritical marks, overlapping over or under the previous character to the right.



Arabic Script System Configuration CDEV

The Configuration CDEV in the Arabic Script System supports a number of configuration parameters. A separate Calendar CDEV offers the ability to choose among three calendars. The Arabic Script System not only supports the standard Gregorian calendar and an algorithmic (civil) Arabic lunar calendar, it also supports an astronomical lunar calendar.

This calendar is truly lunar. Each month starts with the first visible new moon after sunset. To compute the date correctly, the calendar routine not only must calculate the orbits of the sun and moon, it also must also know and take into account the exact latitude, longitude, and time difference from Greenwich Mean Time. Users can set these parameters with the Arabic Calendar CDEV, shown on the following page. Due to the complex nature of this algorithm, *date caching* was introduced. Each of the 1683 lunar months covered by the Macintosh® internal clock (which covers the period from 1904 to 2042) has a cached value indicating an offset from the civil lunar calendar. Whenever a date in a new month must be calculated, that value is stored for later use.



Arabic Calendar CDEV

For More Information on Arabic Scripts

If you are interested in localizing your product for the Middle East, you should contact Apple's third-party product manager for AMME (Africa, Mediterranean, Middle East). Apple Associates and Apple Partners will find this information on the AppleLink® network [path: Developer Services: Whom Should I Contact at Apple?: International Contacts]. Apple Partners will also find this information in *The Information Exchange: Marketing Guidebook* in the International Contacts document in the Apple Organization section.



The Kanji Script System

Japanese is one of the most intricate scripts in the world, essentially containing four individual subscripts: *Romaji* (alphabetic Roman letters), *Katakana* and *Hiragana* (syllabic characters), and *Kanji* (ideographic characters). For example, the word Japan can be written as: N i h o n (Romaji), ニホン (Katakana), にほん (Hiragana), or 日本 (Kanji). Katakana and Hiragana are phonetic characters, known together as Kana. Romaji, Katakana, and Hiragana each have relatively few characters, but a minimal set of Kanji contains more than 3,000 characters.

Although Japanese, like Chinese, is traditionally written from top to bottom (vertically), in business it is acceptable to use left-to-right text. (*Note:* The Line Layout Manager, available with System Software Release 7.0, will support vertical text.)

The Kanji Script System supplements the keyboard by providing an input method: software for converting Kana (phonetic Japanese) into Kanji (ideographic). Each Kanji may correspond to more than one possible Kana sequence, and vice versa. The input method must parse sentences or phrases of Kana text (which has no word separations), and select the best combination of Kanji and Kana characters to represent that text. To give some idea of the scale of this task, one syllable, こう (kou), has more than 100 different possible Kanji representations: 高、好、後、...

The East Asian script systems allow for many different input methods, including both those shipped with the system and third-party methods. This note describes the Apple methods, which are fairly representative of the interfaces available.

When a user types a character, the input method opens a window at the bottom of the screen for text entry. The user can type using either a Romaji keyboard or a Kana keyboard. When the characters are in the window, the user can freely cut and paste or convert to any of the other subscripts, even to single-byte versions of Romaji and Katakana.

When the text is converted to Kanji, the user has the option of changing any individual phrase: lengthening, shortening, or selecting different possible interpretations. All of the commands have both mouse and keyboard equivalents. Once the user presses the Return key, the text is entered as if it had been typed directly from the keyboard.

The Kanji script system also supplies a desk accessory for configuring the system. This accessory allows users to change parameters in the system and add their own characters. A bit editor can be used to design a character in the required size. The character can then be added to a conversion dictionary for use by the input method. To assist the input method in performing the proper conversions, basic grammatical categories can also be assigned.

Aside from the main dictionary, two such conversion dictionaries can be used at the same time. Thus specialized dictionaries, such as legal or medical dictionaries, can be added to extend the range of the input method. One of the parameters the user can set is dictionary-learning. This allows the input method to

incorporate frequency information as the user works, so that the frequency of Kana combinations *in the particular grammatical context* is taken into account in doing conversions.

For More Information on Kanji Scripts

If you are interested in localizing your product for Japan and the Far East, you should contact Apple's third party product managers for Japan and the Far East. Apple Associates and Apple Partners will find this information on the AppleLink® network [path: Developer Services: Whom Should I Contact at Apple?: International Contacts]. Apple Partners will also find this information in *The Information Exchange: Marketing Guidebook* in the International Contacts document in the section "Apple Organization".

Training Resources



What is the Developer University?

The Apple Developer University provides expert instruction for beginning and advanced Macintosh® programmers. It currently offers eleven Macintosh programming courses—all designed to teach you how to produce fast, efficient code that takes maximum advantage of the Macintosh Toolbox.

Developer University instructors are experts in Macintosh programming. They enjoy working with students and sharing their development experience and expertise.

What Courses are Offered?

The courses currently offered by the Developer University are as follows:

- Macintosh Programming Fundamentals (MPF)
- Technical Introduction to AppleTalk®
- MacWorkStation™
- Macintosh Programmer's Workshop (MPW™)
- C++ for the Macintosh
- MacApp® and Object-Oriented Programming (Pascal or C++)
- Advanced Macintosh Programming
- Macintosh User-Centered Design (a self-paced course)
- Object-Oriented Design (C++)
- System Software Version 7.0 Update
- CL/1 Fundamentals

You will find course descriptions on the AppleLink® network [path: Developer Services: Developer University]. For a course catalog, contact the Developer University Registrar.

Course Schedules and Registration

You will find the latest schedules, training locations (Apple sales offices around the country), and registration information, on the AppleLink network [path: Developer Services: Developer University]. The latest training schedule is also mailed quarterly to all Apple developers and attendees of previous classes.

How to Register

You can register for Developer University courses by sending an AppleLink message to the Developer University Registrar at DEVUNIV. If you do not have an AppleLink account, contact the Developer Programs hotline at (408) 974-4897 for an AppleLink application. You may also contact the registrar directly to receive a registration form.

Developer University Registrar
Apple Computer, Inc.
20525 Mariani Avenue, M/S 75-2B
Cupertino, CA 95014
(408) 974-6215
AppleLink: DEVUNIV



A/UX System Administration Courses

What Are A/UX System Administration Courses?

A/UX® System Administration Courses were created for developers who wish to set up and maintain an A/UX system in a stand-alone or networked environment. These courses are not meant to cover A/UX applications development and do not cover programming with the Macintosh® Toolbox.

If you cannot attend these courses, you may wish to purchase the A/UX Student Guide for A/UX Systems Administration (Parts 1 and 2). These self-paced guides cover specific A/UX features, and assumes an intermediate to advanced level of UNIX expertise. Apple Partners can purchase the guide from the Developer Price List, and Apple Associates can purchase the guide from an authorized Apple dealer. Each guide costs \$30.

How to Register

To register for an A/UX System Administration course in your area, call the Developer Programs Hotline at (408) 974-4897. The hotline personnel will refer you to an Apple Regional Training Center for dates, times, and locations of A/UX System Administration courses. Course descriptions and registration forms are located on the AppleLink® network in the Developer Services bulletin board. [AppleLink path: Developer Services:Developer Training].

The training centers will also review course content with you, mail you registration forms, review payment terms (a certified check or money order should accompany your order, unless you have credit terms with Apple), and review Apple's cancellation policy.

Course Descriptions

A/UX System Administration, Section I: Local System Administration (Price: \$195; Part No. M8141)

Course description:

This course covers the specifics of A/UX system administration in a stand-alone environment. The participant will develop the skills necessary to set up and maintain the system in single and multiuser modes, use the unique A/UX system administration tools, and make an initial connection to a network. This course takes two days to complete.

Topics covered include:

- Introduction
- System Installation and Verification
- Adding and Managing New Users and Peripherals
- Stand-alone Shell
- Autoconfiguration
- Backup and Restore
- Security
- Connecting to B-NET
- Autorecovery

Prerequisites:

Knowledge of basic UNIX® system administration
Familiarity with the basic use of the VI editor
Ability to write shell scripts
Ability to create file backups
Disk formatting ability
Knowledge of the UNIX security criteria and file permissions

A/UX System Administration, Section II: Network Administration (Price: \$265; Part No. M8151)

Course description:

A/UX System Administration, Section II, provides the knowledge and skills necessary to set up and maintain an A/UX system in a networked environment. This course takes 2.5 days to complete. The two sections can be taken together as a 4.5 day course.

Topics covered include:

Monitoring and Tuning System Performance
Advanced Networking (TCP/IP)
NFS
Yellow Pages
UUCP

Prerequisites:

Completion of A/UX System Administration, Section I, course

Other Resources

Developer Associations



MacApp Developers' Association

What Is The MacApp Developers' Association?

The MacApp Developers' Association is an independent organization dedicated to promoting the use of object-oriented programming on the Apple® Macintosh® computer. The association was started by MacApp® enthusiasts at Macworld® Expo in 1986. Currently, there are more than 1,000 individual and corporate members.

The association keeps developers informed about the latest developments in object-oriented programming. It offers information and help for developers using MacApp through a bimonthly journal, meetings, and group discussions via a dial-in file server and the AppleLink® network. The association acts as a clearinghouse for a programmer-produced MacApp Object Library, as well as providing registration and identification assignment for MacApp objects and classes via the dial-in file server.

Membership Benefits*MacApp Journal*

The MacApp journal, *Frameworks*, is a bimonthly (six issues each year) technical publication covering topics relevant to object-oriented programming. It is sent to all members of the association and also sold through selected bookstores. Each issue contains a variety of technical materials, such as discussions of the MacApp programming guidelines, technical transcripts from developer meetings, and excerpts of developer issues taken from the MacApp group addresses on AppleLink, CompuServe, and BIX. Also included are descriptions of new MacApp recipes and building blocks, often with the original source code.

Membership Meetings

Meetings of the MacApp Developers' Association are held at the three annual Macworld shows, in Boston, San Francisco, and Washington D.C. Topics covered range from general news about the association to the status and future of MacApp, Object Pascal, and the C++ language on Apple computers. Guest speakers are invited from Apple's MacApp and MPW™ engineering team and are available to answer questions.

MacApp.Tech\$, MacApp.News\$, and the MacApp Dial-In File Server

MacApp group addresses on AppleLink are a frequently used forum for relaying general and technical messages to association members. MacApp.News\$ is for general news concerning meetings and association information that would be of interest to all MacApp users. MacApp.Tech\$ is for higher-level technical discussions and questions and answers on object-oriented programming issues. The new MacApp Dial-In File Server will provide some of the same information for members who do not have an AppleLink account. The file server also will be used for developers to register and identify their MacApp classes and objects.

MacApp Object Library

Currently, there are nine sets of MacApp Object Library Disks available to association members, ranging in price from \$35 to \$75. The disks contain useful MacApp object modules, such as custom menus, MacApp UNITS and MPW tools, shell scripts, and source code from major universities. Development tools, such as the MacApp

Browser v.1.4 desk accessory, are also available to help programmers peruse their source code. Each disk set is packaged with a manual and may be registered for future updates and upgrades. The MacApp Developers' Association welcomes any contributions to its library of MacApp object disks and is an eager publisher of helpful tools, and MacApp building blocks and recipes.

Membership Details

The annual membership fee for the MacApp Developers' Association is \$40 (\$50 outside the United States). If you would like to join, or have questions about the association, please contact:

MacApp Developers' Association
4327 Rucker Avenue
P.O. Box 23
Everett, WA 98206
Attention: Ann Thomas, Member Services Director
(206) 252-6946 (from 9:00 A.M. to 5:00 P.M. Pacific time)
AppleLink: X0501



What Is The NuGroup Association?

The NuGroup Association is the NuBus™ Manufacturers and Users Group. It is an independent organization dedicated to the advancement of NuBus as a viable bus alternative, both for personal computer add-ins and as an independent system bus architecture. NuGroup was founded in April 1988 by 11 companies and was formally organized in May to target 32-bit mainstream applications. Currently, more than 60 companies belong to the association.

NuGroup offers three levels of membership: director, participation, and subscription. The director and participation levels are for companies involved in the development of NuBus. Director-level members have a seat on the board of directors, participate in the development of a yearly business plan for the association, and officially represent NuGroup at industry meetings. Participation-level members have voting privileges and committee membership. The subscription level is a nonvoting membership for individuals who are involved in the development or use of products for NuBus.

Programs and Benefits

All levels of membership are entitled to the following benefits:

NuGroup General Meetings

The general meetings are held semiannually at the BUSCON East and West trade shows. BUSCON is a conference and exhibit for bus-board users. Guest speakers discuss new developments related to NuBus and other topics, such as the requirements for using NuBus systems in industrial and manufacturing environments.

Trade Show Activities

Members of the association may receive discounted exhibit opportunities at BUSCON East and West. There are 200 exhibitors at BUSCON, and the expected attendance is 4,000.

NuBus Product Directory/Buyer's Guide

The *NuBus Product Directory*, produced and distributed by the association, describes by category various NuBus products developed by association members.

Additional Benefits

Subscription-level members receive IEEE NuBus specifications, minutes from all meetings, a mailing list of all participating and subscribing members, the NuBus product directory, and inclusion in all NuGroup quarterly press releases. Participation-level members receive all of the above benefits, as well as NuGroup specialty promotional items and logos. Participating members are eligible for membership in the technical and promotions committees. These two important committees will determine the direction NuBus technology and manufacturing will take in the next decade. Director-level members receive all of the above, as well as sitting on the board of directors and having a voice in developing the business plan for the association.

Membership Details

The annual membership fee for NuGroup is \$2,500 for the director level, \$1,500 for the participation level, or \$250 for the subscription level. If you would like to join NuGroup, or have questions about the association or NuBus, please contact:

NuGroup
12747 Barrett Lane
Santa Ana, CA 92705
Attention: Anne Weber
(714) 669-1201
Fax: 714-669-9105



What is OOPSTAD?

OOPSTAD (Object-Oriented Programming for Smalltalk Applications Developers Association) is an independent nonprofit organization that works to benefit programmers, developers, and users of Smalltalk (a personal, integrated, interactive programming environment), MacApp®, and other object-oriented programming languages. The association's broad goals are the expansion of object-oriented programming and assistance to those developing applications for either commercial, in-house, or personal use. The association offers both an individual and corporate membership plan. Currently, there are more than 500 individual members and 20 corporate members.

The organization was founded in early 1987 by Carl Nelson of the MacApp Developer's Association, with the support of several key people in the Smalltalk community. It publishes a quarterly newsletter, holds meetings at the annual OOPSLA (Object-Oriented Programming: Systems, Languages and Applications) Conference, and offers an electronic bulletin board service. Members are also eligible for discount prices on some commercial products written in Smalltalk.

Membership Benefits*Membership Meeting*

OOPSTAD meetings are held each fall at the OOPSLA Conference, which is sponsored by the Association Computer Machinery (ACM) organization. Topics covered include general news about the association, status and future of the Smalltalk programming environment, and solutions to common development problems.

Newsletter

HOOPLA! (Hooray for Object-Oriented Programming Languages!) is a technical newsletter (generally 40 to 52 pages) published quarterly by the association for its members. Each issue covers a variety of subjects, including technical discussions of Smalltalk implementation and development, answers to common questions, tips from some of today's leading object-oriented programmers, and reviews of newly released commercial products.

Electronic Bulletin Board

The OOPSTAD bulletin board operates around the clock and provides a useful forum for technical discussions and problemsolving. Source code from both the association newsletter and association members is posted on the bulletin board for members' use. Members must pay an additional fee for a subscription to this bulletin board.

Developer Discount Program

Popular commercial Smalltalk products are available to members through the association at discounts of up to 20 percent off retail price. The association has an agreement with two suppliers and is currently working with other vendors to increase the range of products it can offer to members at a discount. These discounts are only available to OOPSTAD members.

Membership Details

Annual membership fees are \$25 for an individual (\$35 outside the United States), and \$250 for a corporation or institution. Subscription to the OOPSTAD electronic bulletin board costs an additional \$35 a year for an individual or \$250 for a corporation or institution. If you join would like more information or to join OOPSTAD, please contact:

OOPSTAD
P.O. Box 1565
Everett, WA 98206
Attention: Ann Thomas, Member Services Director
(206) 252-6946 (from 9:00 A.M. to 5:00 P.M. Pacific time)
AppleLink: X0501



What Is the Software Entrepreneurs' Forum?

The Software Entrepreneurs' Forum (SEF) is an independent non-profit organization that was formed four years ago to support software developers. It provides developers with educational programs, as well as opportunities to exchange information with other developers and build professional relationships within the developer community. SEF has approximately 500 members. It holds monthly meetings, publishes a monthly newsletter (which summarizes the meetings), and publishes an annual directory of members. SEF includes several special-interest groups for Macintosh® software developers:

- MacSEF (the Macintosh Developers Special Interest Group)
- Multimedia and HyperCard® Developers Special Interest Group
- OOP SIG (the Object-Oriented Programming Special Interest Group)
- Marketing Special Interest Group

Membership Benefits*SEF Meetings and Seminars*

SEF dinner meetings, held in the San Francisco Bay Area, are designed to enable members to get together and discuss marketing and technical topics. Well-known industry figures are invited to speak at the meetings on topics of interest to the group. Recent speakers have included Ted Nelson (inventor of the term "hypertext"), Jay Levinson (of "Guerrilla Marketing" fame), Esther Dyson (editor of RELease 1.0), Jean-Louis Gassée (President, Apple Products, and Adele Goldberg (of ParcPlace Systems).

Several times a year, SEF sponsors seminars on important industry topics. For example, in February 1989, SEF sponsored a seminar on "Object-Oriented Programming with MacApp." A dozen speakers spent a day explaining the basic concepts of object-oriented programming, the architecture of MacApp® Version 2.0, and experiences using MacApp.

Special-Interest-Group Meetings

MacSEF meetings, held once a month, cover a wide range of both technical and marketing topics related to Macintosh computers. This is one of the largest groups of Macintosh developers to meet on a regular basis. Attendance at these meetings ranges from 70 to 100 people. Some of the recent speakers have been David Gilbert, of Apple Computer, talking about ISDN; Apple Computer's MPW (Macintosh Programmer's Workshop) team presenting MPW™ Version 3.0; Larry Rosenstein, of Apple Computer, talking about developing with the MacApp application toolkit; Bill Campbell, of Claris; and Jean-Louis Gassée, of Apple Computer.

Multimedia and HyperCard Developers SIG meetings, held once a month, cover both technical and marketing topics of interest to HyperCard developers. Recent speakers have included Kristee Kreitman, from Apple Computer's Human Interface Group; Nancy Dunn, from Macworld, and Dan Shafer, author.

Object-Oriented Programming SIG meetings, held on the third Tuesday of each month, cover technical topics. Recent speakers have included Stephen Pope, of ParcPlace Systems, talking about object-oriented design; and Ann Hardy, of Key Logic, talking about object-oriented operating systems.

Marketing SIG meetings, held once a month, often feature a panel of speakers on a topic such as implementing a telemarketing plan, experiences in marketing software, groupware opportunities, and the order fulfillment process.

SEF Newsletter

The SEF newsletter is published once a month to keep members informed of coming monthly activities of SEF and the special-interest groups. It also briefly summarizes the last month's meetings.

Membership Details

The annual membership fee for SEF is \$95. Company memberships, available for \$250, entitle three people to attend meetings and receive the newsletter. If you would like to join SEF, or have questions about the organization, please contact:

Software Entrepreneurs' Forum
P.O. Box 60131
Palo Alto, CA 94306
(415) 854-7219

If you would like to know more about the MacSEF Special Interest Group, please contact:

Anthony Meadow
Bear River Associates, Inc.
(415) 644-9400
AppleLink®: D0068

If you would like to know more about the Multimedia and HyperCard Developers Special Interest Group, please contact:

David Gewirtz
HyperPress Publishing
(415) 345-4620

If you would like to know more about the Object-Oriented Programming Special Interest Group, please contact:

Dean Ritz
ParcPlace Systems
(415) 691-6727

If you would like to know more about the Marketing Special Interest Group, please contact:

Don Morrison
The Santa Cruz Operations, Inc.
(408) 425-7222



What Is TechAlliance?

TechAlliance (formerly A.P.P.L.E. Co-op) is an independent cooperative dedicated to the growth of the Apple® II and Macintosh® technical community. A.P.P.L.E. (Apple PugetSound Program Library Exchange) was founded in February of 1978 as an organization to share information and public domain software for the Apple II computer. The name was changed in 1988 to TechAlliance to reflect the industry changes and microcomputer growth.

Today, TechAlliance specializes in third-party development tools, books, and information for the Apple computer environment, including many tools created by TechAlliance members. Members of the TechAlliance Co-op gain benefits such as discounts on products sold by catalog and in retail locations, discounts on TechAlliance special services, and access to and listing in the referral network.

Membership Benefits*TechAlliance Publications*

TechAlliance publishes two quarterly magazines: *MacTech Quarterly* and *Call A.P.P.L.E.* These magazines are the primary vehicles used for dissemination of information gathered for its readership. Included in each of the technical journals is a complete catalog of third-party programming tools, languages, and books. The cover price is \$10 per issue and subscriptions are \$30 per year.

- The *MacTech Quarterly* is a publication designed for Macintosh programmers and developers; from students and advanced users to full-time professional programmers. Topics covered include C, Pascal, FORTRAN, C++, HyperTalk™, SuperTalk, Smalltalk, MacApp®, MPW™, spreadsheets and databases, interface tools, the Macintosh operating system, and the software business in general.
- *Call A.P.P.L.E.* is a journal aimed at advanced Apple II and Apple IIGS® users, specializing in programming and development issues and products.

Referral Network Service

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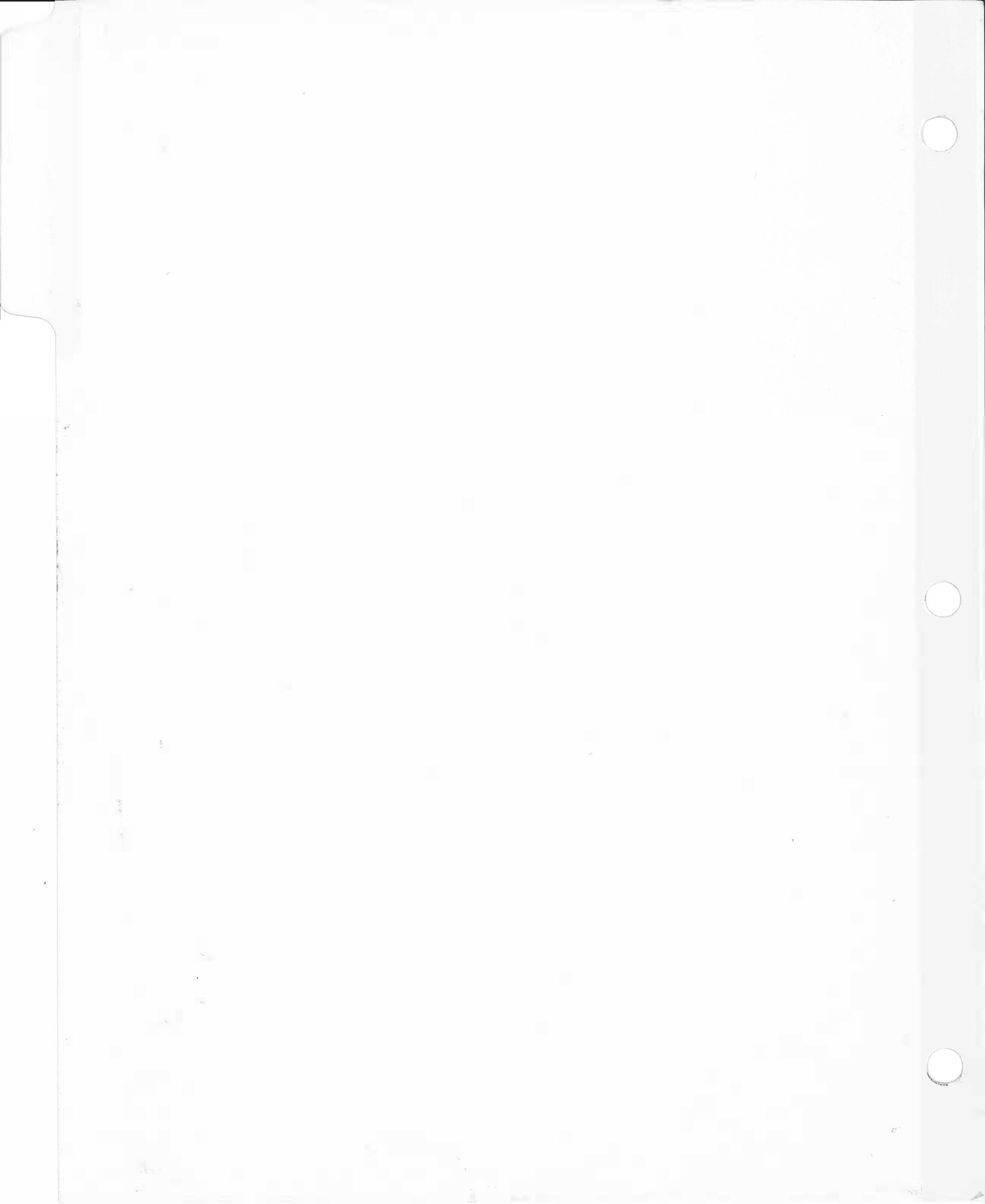
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Overview

The Apple® IIc Plus personal computer gives you all the most important benefits of the Apple II family—versatility, expandability, ease of use, and software compatibility—in one compact, lightweight, elegantly designed package. In addition, it has over five times the disk storage capacity of previous Apple IIc models, and up to four times the processing speed.

The Apple IIc Plus offers high-quality color graphics, built-in connectors for easy accessory expansion, a full-size keyboard, and a 3.5-inch high-capacity (800 kilobytes) disk drive. A completely self-contained power supply makes the computer highly transportable, and the

handle locks downward to provide a stable, inclined keyboard for typing convenience. Naturally, the IIc Plus also offers the ease of use that has characterized the Apple II family since its inception.

If you're a first-time computer buyer who wants a system that will just "plug in and go," the Apple IIc Plus is a smart choice.

Features

Benefits

-
- | | |
|---|--|
| ▶ Computer, keyboard, disk drive, and power supply in one unit | ▶ Eliminates complicated setup—just attach a monitor and a power cord, and the Apple IIc Plus is ready to go. |
| ▶ Selectable 4 megahertz or 1 megahertz clock speed | ▶ Allows productivity programs to calculate your data up to four times faster than on previous Apple IIc models. |
| ▶ 128 kilobytes of user memory (RAM), expandable to more than 1 megabyte | ▶ Lets you increase the memory as needed for faster access to large documents and powerful applications. |
| ▶ 800-kilobyte disk drive (uses 3.5-inch disks) | ▶ Provides faster, quieter disk access and over five times the storage capacity of previous Apple IIc models. |
| ▶ Disk drive connector | ▶ Allows you to “daisy-chain” as many as three external 3.5-inch and/or 5.25-inch disk drives,* for easy access to thousands of applications for the Apple II family. |
| ▶ Additional built-in peripherals ports | ▶ Lets you easily customize your system with a mouse, printer, modem, joystick, or other accessories.
▶ Provides a flexible growth path for future expansion—without requiring interface cards. |
| ▶ Built-in color graphics | ▶ Lets you design graphics in up to 16 colors for home, school, and business applications. |
| ▶ Complete set of interactive tutorials on one 3.5-inch disk | ▶ Gets you up and running quickly, even if you’ve never used a computer before. |
| ▶ Built-in Applesoft BASIC programming language, plus an on-disk tutorial | ▶ Makes it easy and fun to program your computer. |

* See the *Apple IIc Plus Owner's Guide* for allowable configurations.

Technical Specifications

Central processing unit (CPU)

- ▶ Microprocessor: 65C02
- ▶ Clock speed: 1 to 4 megahertz (user selectable)
- ▶ Address bus: 16 bits
- ▶ Address range: 65,536 bytes (64K)
- ▶ Data bus: 8 bits
- ▶ Registers (8-bit): accumulator, two index registers, stack pointer, and processor status register

Memory

- ▶ 128K of RAM (random-access memory), optionally expandable to 1.15 megabytes
- ▶ 32K of ROM (read-only memory), containing:
 - System monitor
 - Applesoft BASIC interpreter
 - 80-column display firmware

Text display modes

- ▶ 80-column text (80 columns by 24 lines)
- ▶ 40-column text (40 columns by 24 lines)
- ▶ All text can appear on the screen as normal, inverse, flashing, or MouseText characters

Graphics display modes

- ▶ Double high-resolution (560 dots horizontally by 192 dots vertically; 16 colors)
- ▶ High-resolution (280 dots horizontally by 192 dots vertically; 6 colors)
- ▶ Low-resolution (40 dots horizontally by 48 dots vertically; 16 colors)
- ▶ All graphics modes can be configured to allow four lines of text at the bottom of the screen

Keyboard

- ▶ 63-key full-size keyboard
- ▶ Full 128-character ASCII, including 96 uppercase and lowercase alphanumeric characters, and 32 control characters
- ▶ Special-purpose keys: Shift, Caps Lock, Control, Escape, Return, Tab, Delete, up arrow, down arrow, left arrow, right arrow, Reset, Open Apple
- ▶ Keyboard is switchable between Sholes (QWERTY) and Dvorak layouts
- ▶ Includes speaker-volume slide control

Disk drive

- ▶ Disk size: 3.5 inches
- ▶ Capacity: 800 kilobytes
- ▶ Recording surfaces: 2
- ▶ Tracks per surface: 80
- ▶ Blocks per disk: 1,600
- ▶ Push button for motorized eject

Interfaces

- ▶ External disk drive port, using 19-pin D-style connector; allows daisy-chain connection of up to three additional drives (Apple 3.5 Drive, UniDisk™ 3.5, and/or Apple 5.25 Drive)
- ▶ Two RS-232 serial ports with 8-pin minicircular connectors (for printer, modem, and other accessories)
- ▶ NTSC (composite) color video, via RCA phono jack
- ▶ 15-pin D-style connector for video expansion
- ▶ 9-pin D-style connector for mouse, joystick, hand controllers, or other accessories
- ▶ Internal 34-pin connector for memory expansion up to 1.15 megabytes
- ▶ Standard 3-pin grounded power plug

Electrical requirements

- ▶ Line voltage: 90 to 130 volts AC
- ▶ Line frequency: 50 to 60 hertz
- ▶ Maximum power consumption: 20 watts continuous
- ▶ Supply voltages:
 - +5 volts ($\pm 5\%$)
 - +12 volts ($\pm 10\%$)
 - 12 volts ($\pm 10\%$)
- ▶ Maximum supply currents:
 - +5 volts 1.5 amps
 - +12 volts 0.9 amps continuous
1.5 amps intermittent
 - 12 volts 100 milliamps

Environmental requirements

- ▶ Operating temperature: 50° to 104° F (10° to 40° C)
- ▶ Relative humidity: 20% to 95%

Safety and EMI qualifications

- ▶ FCC Part 15 Class B Computing Devices
- ▶ UL 114—Office Appliances and Business Equipment

Size and weight

- ▶ Height: 2.5 in. (6.35 cm)
- ▶ Width: 12 in. (30.48 cm)
- ▶ Depth: 11.5 in. (29.2 cm)
- ▶ Weight: 7 lb. (3.2 kg)



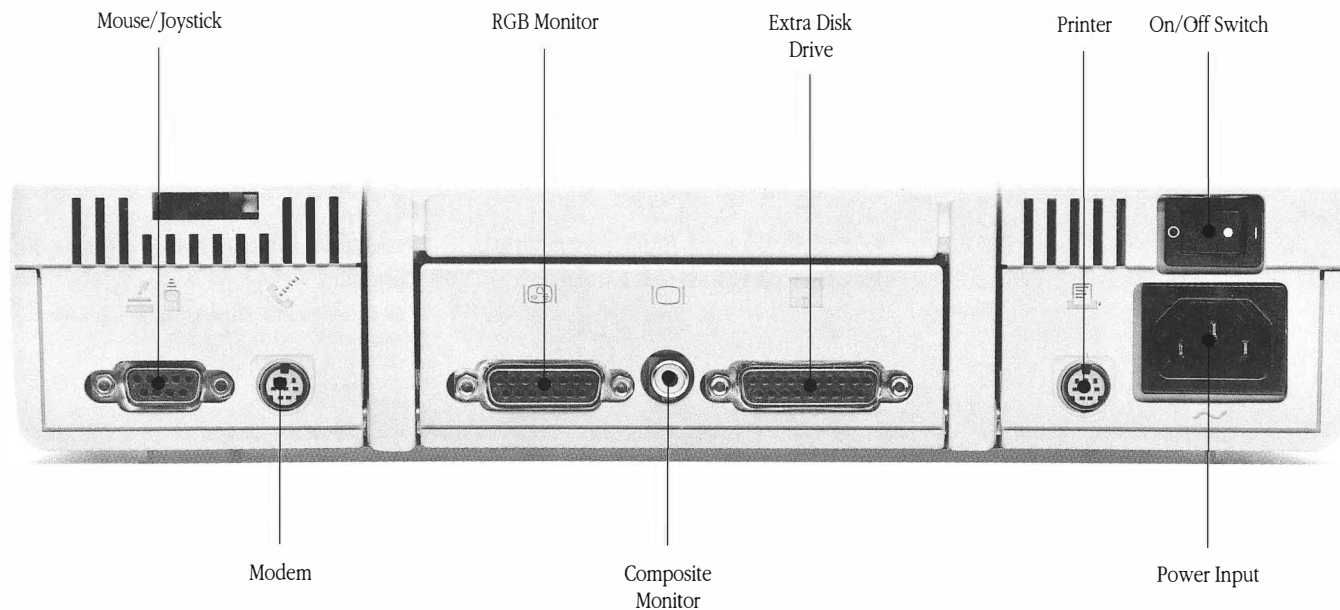
Apple IIc Plus

Ordering Information

Apple IIc Plus
Order No. A2S4500

With your order, you'll receive:

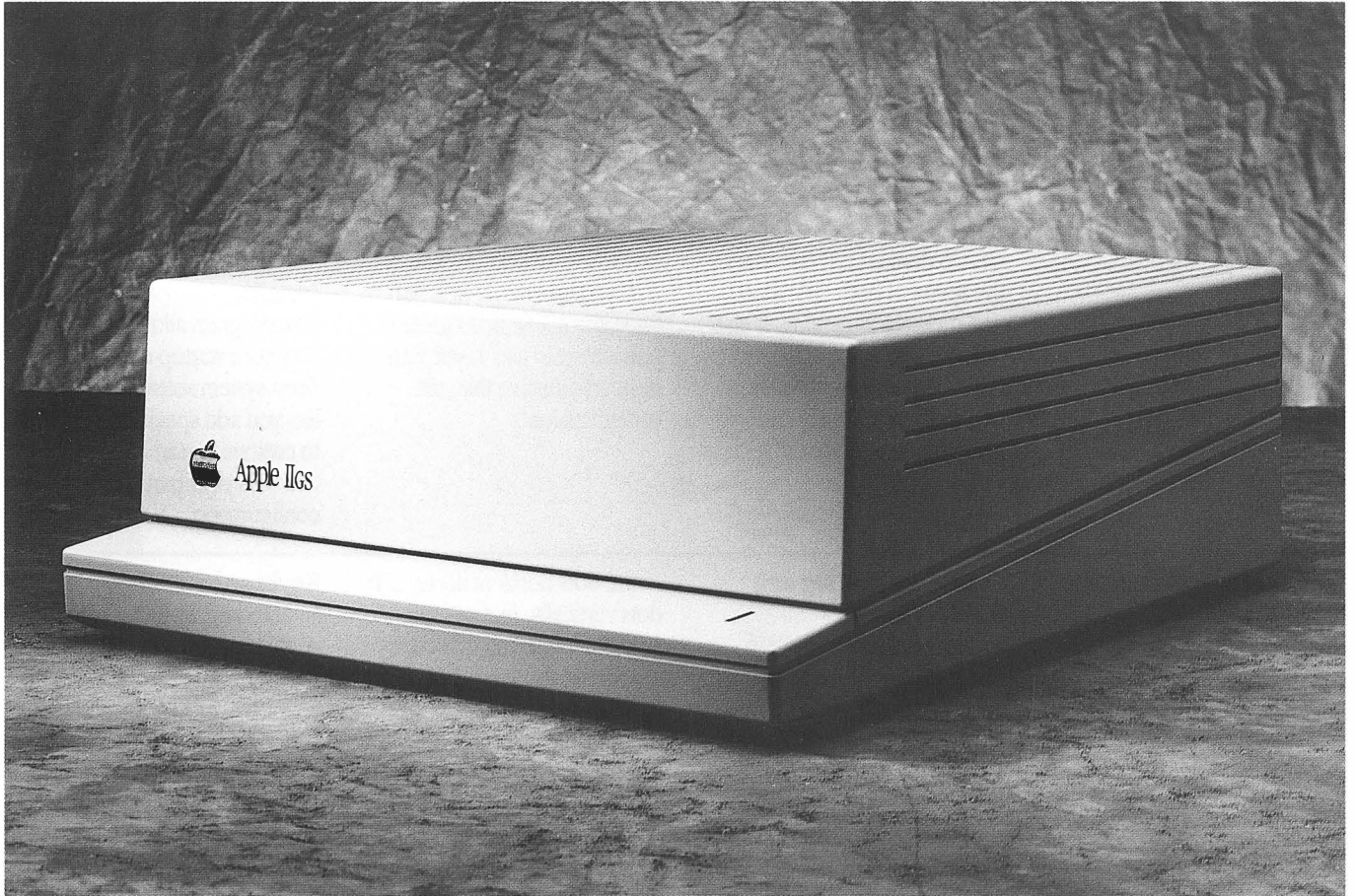
- ▶ Apple IIc Plus personal computer with built-in 800K disk drive
- ▶ Apple II System Disk
- ▶ Tutorial disk
- ▶ Owner's guide
- ▶ *Apple II System Disk User's Guide*
- ▶ *A Touch of Applesoft BASIC* manual
- ▶ Power cord
- ▶ Limited warranty statement



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July 1988. Product specifications are subject to change without notice. Printed in U.S.A.
A2F4020 200K



Overview

The Apple IIgs® personal computer is the most powerful, most colorful Apple® II ever made.

Combining the best of the previous Apple II computers—built-in accessory ports for easy addition of peripherals, and versatile expansion slots for system customization—the Apple IIgs

provides an easy-to-use interface similar to that of the Macintosh® personal computer. It also offers powerful features such as high-resolution color graphics, 15-voice sound capability, and the advanced 65C816 micro-processor.

The Apple IIgs features GS/OS™, an operating system developed exclusively to take advantage of the computer's

hardware features. GS/OS offers high-performance capabilities such as rapid disk access and program launching, while increasing the system's ease of use.

Powerful hardware capabilities and advanced system software that puts them at your fingertips: It all adds up to the ultimate Apple II personal computer.

Features

Benefits

▶ Powerful 16-bit 65C816 processor

▶ Runs software that takes advantage of the advanced graphics and sound capabilities of the Apple IIGS system.

▶ Compatible with the 65C02 microprocessor used in the earlier Apple II systems

▶ Runs virtually all existing Apple II software—thousands of programs, including the educational software used by many schools.
▶ Protects your investment by letting you upgrade or trade up without sacrificing software or hardware compatibility.

▶ 512 kilobytes of user memory (RAM)

▶ Allows you to work with large documents (spreadsheets, databases, and so forth).

▶ Seven general-purpose expansion slots

▶ Provides a virtually unlimited growth path.

▶ Seven peripherals ports

▶ Allows you to connect commonly used peripherals (such as disk drives, a printer, an RGB or composite monitor, a modem, and AppleTalk® network devices) without the need for special interface cards.

▶ One dedicated memory expansion slot

▶ Lets you easily expand the system memory to as much as 1.25 megabytes, using the Apple IIGS Memory Expansion Kits.
▶ Permits expansion to 8 megabytes when higher-capacity chips become available.

▶ Built-in 32-oscillator sound chip

▶ Lets you compose for and simultaneously play back as many as 15 separate instruments, sound effects, or voices.

▶ Built-in speaker and standard output jack for external speakers or headphones

▶ Permits the sounds of music, games, educational software, and even human voices to be presented with startling realism.

▶ Two super-high-resolution graphics modes, offering a palette of 4,096 colors

▶ Lets you produce richly detailed graphics using home, school, or business applications.
▶ Enables the development of graphically enhanced educational and productivity applications.

Product Details

The Apple IIGs personal computer features the Apple IIGs System Software Version 4.0, which includes the following:

GS/OS operating system

Exclusively created for the Apple IIGs personal computer, GS/OS dramatically increases the speed of both disk access and program launching. It also includes File System Translators (FSTs) that allow applications to directly access files created using other file systems, such as

the ISO/High Sierra file system used by CD-ROM devices.

Finder

The Apple IIGs Finder™ has been revised extensively to take full advantage of the GS/OS operating system. In addition to providing support for disk partitions and other new features, the Apple IIGs Finder is now easier to use, faster, and more informative than the earlier version.

Advanced Disk Utility

With its graphics-based interface, the Advanced Disk Utility makes it easy for you to initialize, name, erase, and partition hard disks, as well as to work with both 5.25- and 3.5-inch floppy disks.

Installer

This program allows you to update your startup disks with the latest system software. It also lets you add special system files to customize startup disks for use with your particular system configuration.

Technical Specifications

Central processing unit (CPU)

- ▶ Microprocessor: 65C816
- ▶ Clock speed: 2.8 or 1.02 megahertz; user- or software-selectable
- ▶ Address bus: 24 bits
- ▶ Data bus: 8 bits
- ▶ Address range: 16,777,216 bytes
- ▶ 16-bit registers: accumulator, two index registers, direct register, stack pointer, and program counter
- ▶ 8-bit registers: data bank, program bank, and status
- ▶ Addressable memory: up to 8 megabytes of RAM (random-access memory) and up to 1 megabyte of ROM (read-only memory)

Memory

- ▶ 512K of RAM, expandable to 8 megabytes
- ▶ 128K of ROM, expandable to 1 megabyte

Text display modes

- ▶ 40 columns by 24 lines
- ▶ 80 columns by 24 lines

Graphics display modes

- ▶ Super-high-resolution—320 dots horizontally by 200 dots vertically, in up to 16 colors per line and 256 colors per screen, from a palette of 4,096 colors

—640 dots horizontally by 200 dots vertically, in 4 or more colors per line and 128 colors per screen, from a palette of 4,096 colors

- ▶ Double-high-resolution (560 dots horizontally by 192 dots vertically; 16 colors)
- ▶ Double-low-resolution (80 dots horizontally by 48 dots vertically; 6 colors)
- ▶ High-resolution (280 dots horizontally by 192 dots vertically; 6 colors)
- ▶ Low-resolution (40 dots horizontally by 48 dots vertically; 16 colors)

Sound capability

- ▶ Ensoniq 32-oscillator digital synthesizer chip with dedicated 64K RAM
- Produces up to 15 voices simultaneously
- Uses internal speaker, or external speaker or headphones via audio output jack (volume is set through the Control Panel)

Character sets

- ▶ 32 letters (uppercase and lowercase), 32 special characters, 32 Mousetext characters, and 12 unique characters for each of these international character sets: U.S., U.K., French, Danish, Spanish, Italian, German, and Swedish

Keyboard

- ▶ Standard typewriter-style
- ▶ 80 keys, plus 14-key numeric keypad
- ▶ Two Apple Desktop Bus™ connectors (one for attaching the keyboard to the computer; one for daisy-chaining additional input devices)
- ▶ Keyboard layouts (selectable through the Control Panel)
 - QWERTY (Sholes)
 - Dvorak
 - Nine international (all those listed under Character sets, plus French Canadian)

Interfaces

- ▶ Expansion slots
 - One multipurpose RAM/ROM memory expansion slot
 - Seven general-purpose input/output slots for peripherals control cards, all fully buffered, with interrupt and DMA priority
- ▶ Serial ports: two 8-pin mini-circular connectors (either can be used to connect AppleTalk devices); utilize SCC communications chip
- ▶ Disk-drive port: one 19-pin D-style connector (allows daisy-chain connection of up to four Apple 3.5, Apple 5.25, or UniDisk™ disk drives)



Apple IIGs

Technical Specifications (continued)

- ▶ Video output
 - Analog RGB, via 15-pin D-style connector
 - Composite color, via RCA phono connector
- ▶ Apple Desktop Bus port: one 4-pin mini-circular connector on back of computer
- ▶ Game I/O: 9-pin D-style connector for joysticks, graphics tablet, and other such devices
- ▶ Audio
 - RCA mini headphone/speaker output jack with programmable volume control
 - Input/Output connector on main logic board

Operating systems

- ▶ GS/OS
- ▶ ProDOS® 16 and ProDOS 8

- ▶ Pascal
- ▶ DOS 3.3
- ▶ CP/M (with appropriate coprocessor card)

Other features

- ▶ Real-time clock (set through the Control Panel)
- ▶ Battery backup for Control Panel settings

Electrical requirements

- ▶ Line voltage: 107 to 132 volts AC; 50 to 60 hertz
- ▶ Power consumption:
 - Typical: 11 watts
 - Maximum: 60 watts
- ▶ Supply voltages:
 - +5 volts (±3%)
 - +12 volts (±6%)
 - 5 volts (±10%)
 - 12 volts (±10%)

- ▶ Maximum supply currents:
 - +5 volts: 2.5 amps
 - +12 volts: 1.5 amps
 - 5 volts: 250 milliamps
 - 12 volts: 250 milliamps

Environmental requirements

- ▶ Operating temperature: 32° to 113° F (0° to 45° C)
- ▶ Maximum temperature on power-supply case: 130° F (55° C)
- ▶ Relative humidity: 5% to 85%

Safety and EMI qualifications

- ▶ FCC Part 15 Class B Computing Devices
- ▶ CSA 22.2, No. 154-1979
- ▶ UL 114—Office Appliances and Business Equipment

Size and weight (main unit)

- ▶ Height: 4.6 in. (11.7 cm)
- ▶ Width: 11.2 in. (28.4 cm)
- ▶ Depth: 13.7 in. (34.8 cm)
- ▶ Weight: 8.72 lb. (3.96 kg)

Ordering Information

Apple IIGs
Order No. A2S6010

- With your order, you'll receive:
- ▶ Apple IIGs personal computer with 512K of RAM and 128K of ROM
 - ▶ Apple Desktop Bus detached keyboard with numeric keypad
 - ▶ Keyboard cable
 - ▶ Apple Desktop Bus mouse
 - ▶ Power cord
 - ▶ Apple IIGs System disk
 - ▶ Apple IIGs System Tools disk
 - ▶ Your Tour of the Apple IIGs interactive training disk
 - ▶ *Apple IIGs Owner's Guide*

- ▶ *Apple IIGs System Disk User's Guide*
- ▶ *Apple IIGs System Tools manual*
- ▶ *A Touch of Applesoft BASIC* introduction to programming
- ▶ Informational materials on related products and services
- ▶ Limited warranty statement
- ▶ Product registration card

Apple IIGs systems are now shipped with the Apple IIGs Memory Expansion Card, Order No. A2B6002.

Apple IIGs System Fan
Order No. A2M6004

If your Apple IIGs will contain three or more expansion cards, you should also obtain the Apple IIGs System Fan.

Features

Benefits

▶ Genlock circuitry that synchronizes Apple II timing to external video timing

▶ Allows you to superimpose Apple II graphics on video from an external source, for titling or annotating video material.

▶ High-quality video

▶ If you use broadcast-quality video as input, your output will be broadcast-quality video with overlay. The Video Overlay Card also improves the quality of images displayed on Apple IIe and IIgs computers.

▶ VideoMix software

▶ Makes it easy to control the mix of video and graphics, and to adjust the tint and color of your video images.

▶ Accepts video input from a VCR, videodisc, camera, or television; displays video with overlay on an RGB or composite monitor, and records it on a VCR

▶ Allows you to work with a variety of input and output configurations.

▶ Apple IIe and IIgs compatibility

▶ Allows you to use the Video Overlay Card with your existing hardware and the large library of Apple II software.*

*Painting, animation, presentation, titling, and authoring software programs are most appropriate.

System Requirements

To use the Apple II Video Overlay Card, you will need one of the following systems:

- ▶ An Apple IIGS personal computer with at least 512K of RAM, ROM version 01, and at least one 800K 3.5-inch disk drive; and a VCR, videodisc, or video camera
- ▶ An Apple IIe personal computer with 128K of RAM and an enhanced main logic board (revision B); and a VCR, videodisc, or video camera

To display your videos, you can use the Apple IIGS or IIe computer with either the AppleColor™ RGB Monitor or the AppleColor Composite Monitor. The AppleColor RGB Monitor comes with the required DB-15 connector. The AppleColor Composite Monitor comes with the required RCA cable.

Technical Specifications**NTSC output**

The output of the Apple II Video Overlay Card meets RS-170A output specifications with RS-170A input.

Environmental requirements

- ▶ Operating temperature: 50° to 104° F (10° C to 40° C)
- ▶ Storage temperature: -40° to 116.6° F (-40° to 47° C)

- ▶ Relative humidity: 20% to 95% (noncondensing)
- ▶ Altitude: 0 to 10,000 ft. (0 to 3,048 m)



Apple II Video Overlay Card

Ordering Information

Apple II Video Overlay Card
Order No. A2B2092

With your order, you'll receive:

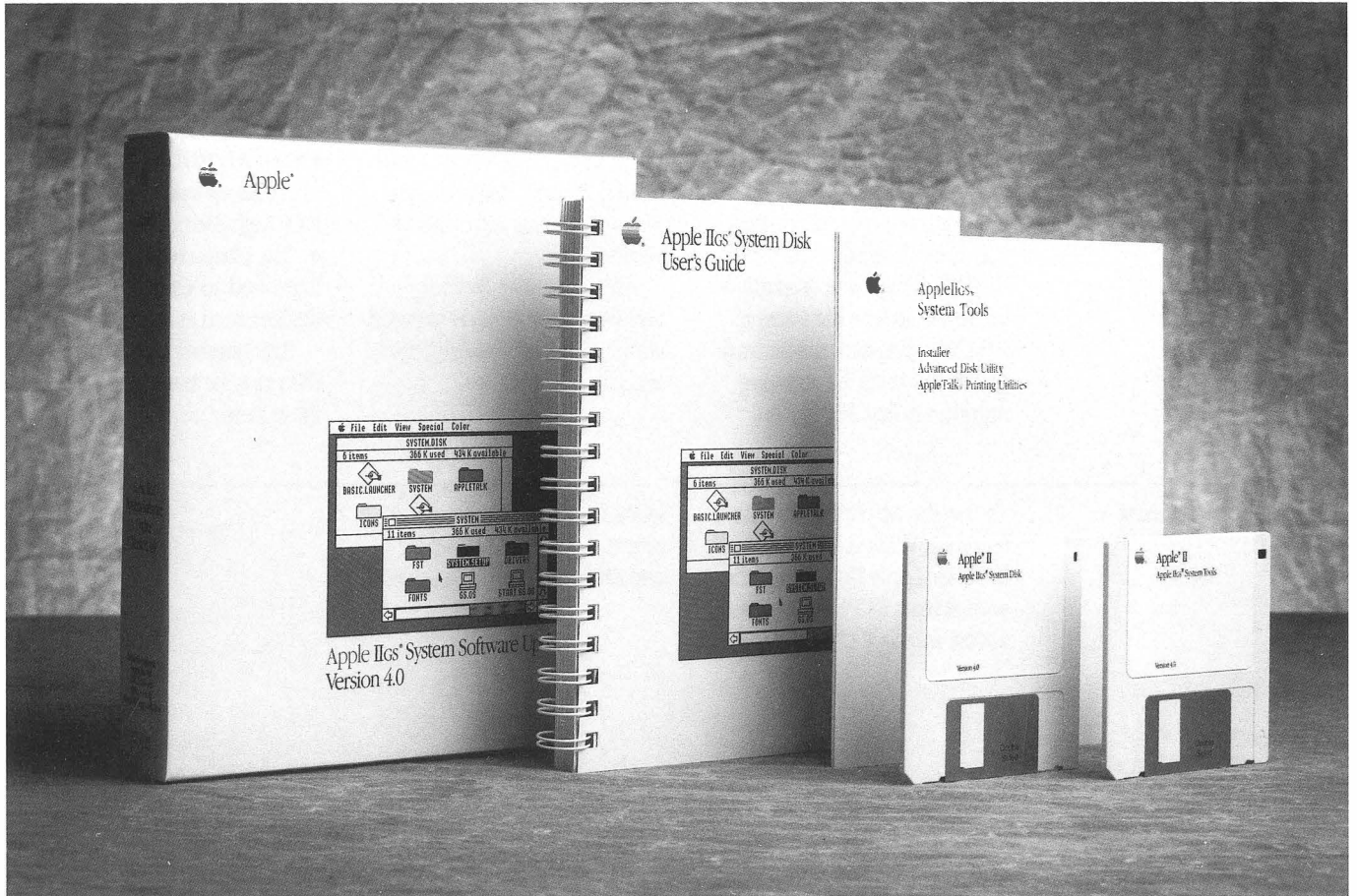
- ▶ Apple II Video Overlay Card
- ▶ One 3.5-inch Apple VideoMix program disk (for Apple IIgs computer)
- ▶ One 5.25-inch Apple VideoMix program disk (for Apple IIe computer)

- ▶ *Apple II Video Overlay Card Owner's Guide*
- ▶ Video in/out cable
- ▶ RGB cable
- ▶ Limited warranty statement

Apple Computer, Inc.

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Overview

The Apple IIGS® System Software Version 4.0 gives you all the advantages of the latest system software for the Apple IIGS personal computer. It features a new operating system—designed exclusively for the Apple IIGS—that takes advantage of the computer's advanced hardware features to greatly enhance performance.

This new operating system, GS/OS™, improves the startup time, and speeds up disk access, program launching, and file copy and transfer tasks. It includes File System Translators that enable applications to directly access files created using

other file systems, such as the ISO/High Sierra file system used by CD-ROM applications. GS/OS also provides complete compatibility with ProDOS® 16, which it supersedes.

In addition to the new operating system, the Apple IIGS System Software Version 4.0 offers several features that significantly improve the computer's functionality and ease of use, including a revised Finder™ and two new utility programs.

The Finder (a graphics-based interface that allows you to manipulate files on the desktop) has been enhanced to take full advantage of the capabilities of

the Apple IIGS system. In addition to providing support for disk partitions and other new features, the Apple IIGS Finder is now easier to use, faster, and more informative than the earlier version.

The Advanced Disk Utility features an easy-to-use, graphics-based interface, and allows you to initialize, erase, and partition hard disks, as well as both 5.25- and 3.5-inch floppy disks. The Installer lets you update your startup disks and customize their configuration for your system and its attached peripherals.

Features

Benefits

GS/OS operating system

- | | |
|---|--|
| ▶ Improved disk access | ▶ Permits faster program loading and launching. |
| ▶ File System Translators | ▶ Allows applications to directly access files from a wide range of file systems, including the ISO/High Sierra file system (used by CD-ROM drives).
▶ Provides access to file systems that support very large files and storage media (up to 4 gigabytes). |
| ▶ Compatibility with ProDOS 16 operating system | ▶ Allows existing ProDOS 16 programs to benefit from the increased power of GS/OS.
▶ Runs applications that follow ProDOS 16 design guidelines. |

Finder

- | | |
|--|--|
| ▶ Optimized for GS/OS | ▶ Written specifically for the GS/OS operating system.
▶ Provides better overall desktop performance. |
| ▶ Improved interface | ▶ Offers users more information, enabling them to better manage their desktop environment. |
| ▶ ProDOS 8, ProDOS 16, and GS/OS file-system support | ▶ Runs a wide range of applications written for Apple® II systems. |

Advanced Disk Utility

- | | |
|---|--|
| ▶ Hard disk partitioning | ▶ Lets you have more than one file system on a single hard disk. |
| ▶ Easy-to-use, graphics-based interface | ▶ Simplifies hard disk information management. |

Installer

- | | |
|--|--|
| ▶ Installs new system software and updates startup disks | ▶ Ensures system software integrity by updating all components of the disk to the correct version level.
▶ Enables you to customize your startup disks to match your particular system configuration. |
|--|--|

Product Details**The GS/OS operating system**

The GS/OS operating system was developed specifically for the Apple IIGS personal computer, so it takes full advantage of the system's hardware to provide performance improvements in all standard file and disk handling tasks. In particular, in the area of file transfer, GS/OS supports access to various file systems via software modules called File System

Translators (FSTs). This means that disks using a wide range of file systems may be accessed from the desktop simultaneously, and that an application need not know what file system it is dealing with when it accesses a file.

The Apple IIGS System Software Version 4.0 is shipped with ProDOS, ISO/High Sierra, and Character FSTs.

▶ The ProDOS FST lets you run programs written for the Apple II ProDOS operating system.

▶ The ISO/High Sierra FST allows you to run CD-ROM applications that follow the ISO/High Sierra standard.

▶ The Character FST provides improved access to character devices such as printers.

Any number of additional FSTs may be configured into the system.

System Requirements

To use the Apple IIGS System Software Version 4.0, you must have an Apple IIGS computer with at least 512K of random-access memory (RAM) and

ROM Version 01 or a more recent version, and at least one 800K 3.5-inch disk drive.



Apple IIgs System Software Version 4.0

Ordering Information**Apple IIgs System Software
Version 4.0**

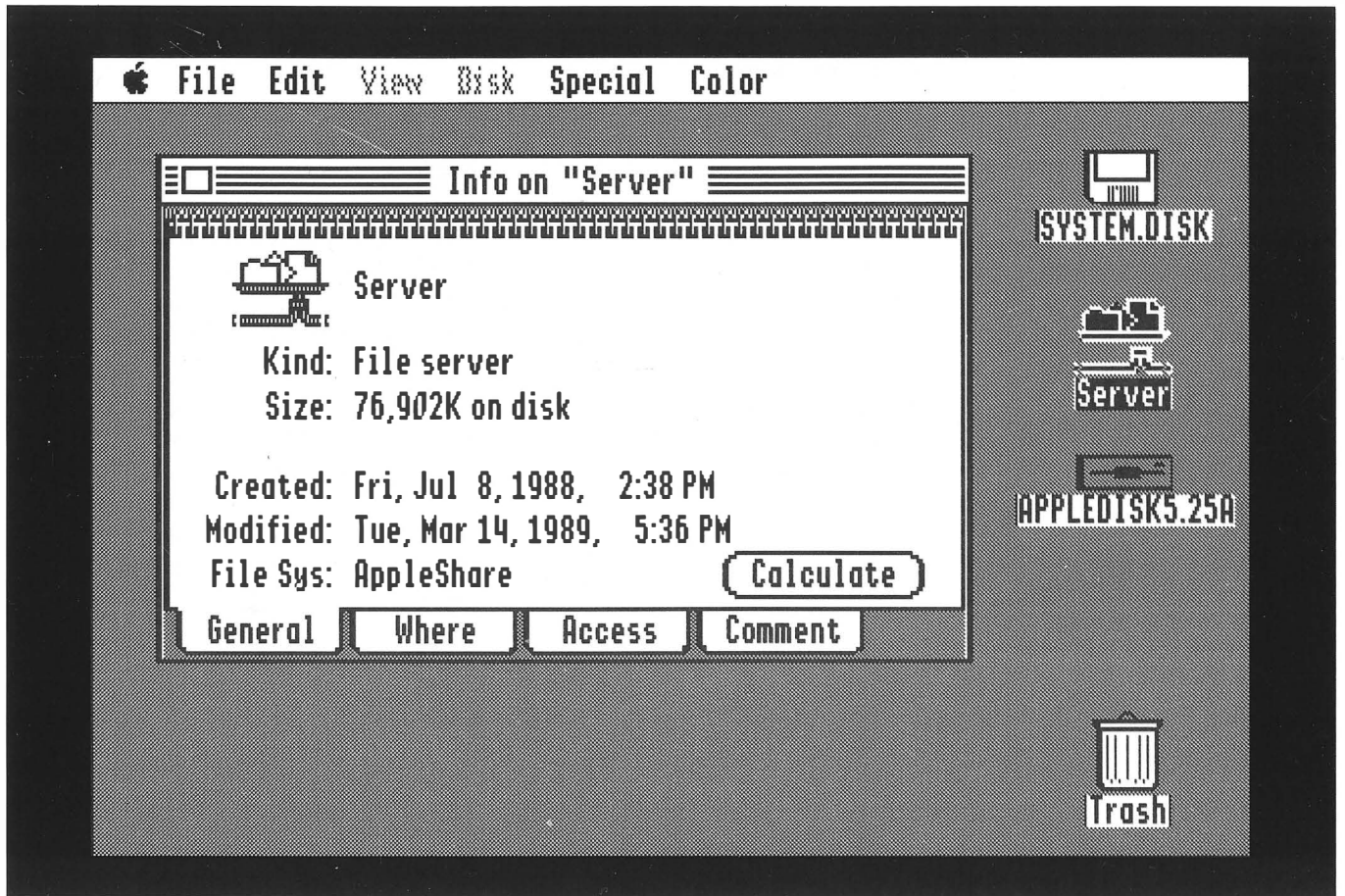
Order No. A2D6013

With your order, you'll receive:

- ▶ System disk
- ▶ System Tools disk
- ▶ *System Disk User's Guide*
- ▶ *System Tools* manual

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TLX: 171-576

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A2F0158 100K



Overview

The Apple IIGS® System Software Version 5.0 gives you all the advantages of the latest system software for the Apple IIGS personal computer. It features GS/OS™, an operating system that improves the startup time and speeds up disk access, program launching, and file copy and transfer tasks.

GS/OS includes File System Translators (FSTs) that enable applications to directly access files created using other file systems. For example, the ISO/High Sierra FST allows you to run CD-ROM applications that follow the ISO/High Sierra standard, and the AppleShare® FST gives you access to files on AppleShare file servers.

The Apple IIGS System Software Version 5.0 also offers several features that significantly improve the computer's functionality and ease of use.

The Finder™ (a graphics-based interface that allows you to manipulate files on the desktop) is now easier to use, faster, and more informative than earlier versions. It has also been revised to allow access to the AppleTalk® Network System, so you can share programs and data located on an AppleShare file server, as well as networked printers, with other AppleShare users.

Another important feature is the new graphics-based Control Panel, which you access from the

Finder via the Apple® menu. You can use the Control Panel to set the time and date, raise or lower the sound volume, log on to network servers, configure slot assignments, and even change screen borders or background and text colors.

Version 5.0 includes the Advanced Disk Utility, which features an easy-to-use, graphics-based interface and allows you to initialize, erase, and partition hard disks, as well as both 5.25- and 3.5-inch floppy disks. You also get the Installer utility, which lets you update your startup disks and customize their configuration for your system and its attached peripherals.

Features

Benefits

GS/OS operating system

- | | |
|---|---|
| ▶ Improved disk access | ▶ Permits faster program loading and launching. |
| ▶ File System Translators | ▶ Allows applications to directly access files from a wide variety of sources, including the ISO/High Sierra file system (used on CD-ROM drives).
▶ Provides access to file systems that support very large files and storage media (up to 4 gigabytes). |
| ▶ Compatible with ProDOS® 16 operating system | ▶ Allows existing ProDOS 16 programs to benefit from the increased power of GS/OS.
▶ Runs most ProDOS 16 applications. |
-

Finder

- | | |
|--|--|
| ▶ Optimized for GS/OS | ▶ Written specifically for the GS/OS operating system.
▶ Provides better overall desktop performance. |
| ▶ Improved interface | ▶ Offers users more information, enabling them to better manage their desktop environment. |
| ▶ ProDOS 8, ProDOS 16, and GS/OS file system support | ▶ Runs a wide range of applications written for Apple II systems. |
-

AppleShare support

- | | |
|---|---|
| ▶ Access to shared peripherals and to files on an AppleShare file server via the AppleTalk Network System | ▶ Allows for easy sharing of files among Apple II, Macintosh®, and MS-DOS computers without special conversion programs.
▶ Lets you maximize your investment in peripherals. |
| ▶ Uses the LocalTalk™ cabling port built into the Apple IIGS computer | ▶ Eliminates the need for additional interface cards. |
| ▶ Compatible with the ProDOS 16 implementation of AppleShare | ▶ Protects your investment in existing ProDOS 16 applications. |

Features

Benefits

Control Panel desk accessory

- ▶ Available from desktop applications via the Apple menu
- ▶ Provides easy access to system controls.

-
- ▶ New graphics-based format

- ▶ Provides an intuitive user interface, making it easier to select system preferences.

Advanced Disk Utility

- ▶ Hard disk partitioning

- ▶ Lets you have more than one file system on a single hard disk.

-
- ▶ Easy-to-use, graphics-based interface

- ▶ Simplifies hard disk information management.

Installer

- ▶ Installs new system software and updates startup disks

- ▶ Ensures system software integrity by updating all components of the disk to match your particular system configuration.

-
- ▶ Multiple update selection

- ▶ Enables you to customize your startup disks to match your particular system configuration in one easy step.



Apple IIGs System Software Version 5.0

Product Details

The GS/OS operating system was developed specifically for the Apple IIGs personal computer, so it takes full advantage of the system's hardware to provide performance improvements in all standard file and disk handling tasks. In particular, in the area of file transfer, GS/OS supports access to various file systems via software modules called File System Translators (FSTs). This means that disks using a wide range of file

systems may be accessed from the desktop simultaneously, and that an application need not know what file system it is dealing with when it accesses a file.

The Apple IIGs System Software Version 5.0 is shipped with AppleShare, ProDOS, ISO/High Sierra, and Character FSTs.

▶ The AppleShare FST provides access to files on AppleShare file servers. In addition, you may boot your Apple IIGs from an AppleShare file server.

▶ The ProDOS FST lets you run programs written for the Apple II ProDOS operating system.

▶ The ISO/High Sierra FST allows you to run CD-ROM applications that follow the ISO/High Sierra standard.

▶ The Character FST provides improved access to character devices such as printers.

Any number of additional FSTs may be configured into the system.

System Requirements

To use the Apple IIGs System Software Version 5.0, you must have an Apple IIGs computer with at least 512K of random-access memory (RAM) and ROM

Version 01 or a more recent version, and at least one 800K 3.5-inch disk drive.

To use your Apple IIGs computer with an AppleShare file server, you must have at least 768K of RAM.

Ordering Information

Apple IIGs System Software Version 5.0

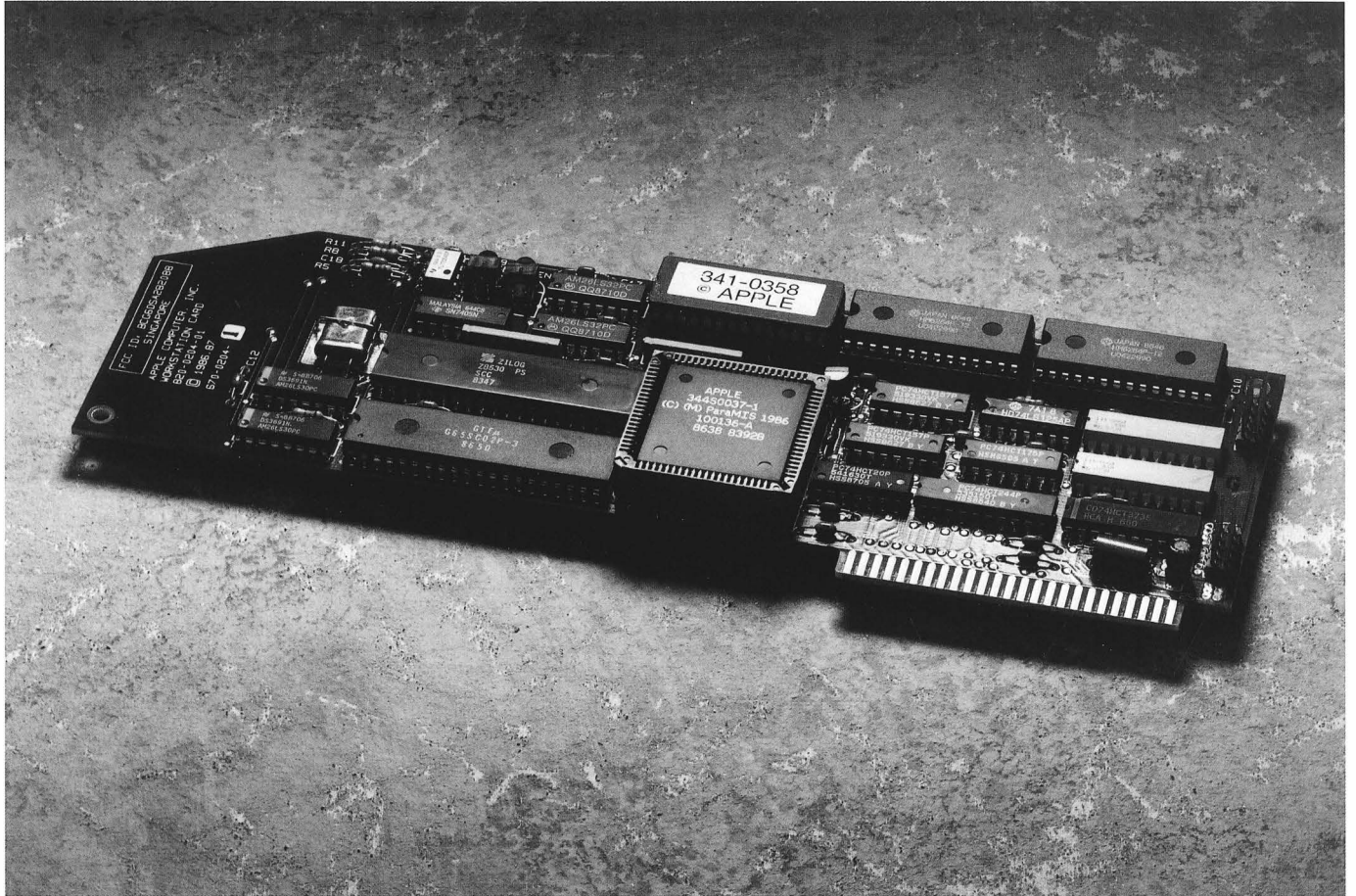
Order No. A0013LL/A

With your order, you'll receive:

- ▶ System disk
- ▶ System Tools disk
- ▶ AppleShare Apple II Setup disk

▶ *System Software User's Guide*

▶ *AppleTalk Network User's Guide*



Overview

The Apple® II Workstation Card and the AppleShare® IIe Workstation software included with it give users at enhanced Apple IIe computers access to AppleShare file servers, network printers (such as the Apple LaserWriter® and ImageWriter®), and AppleShare print servers. The Apple II Workstation Card, in conjunction with an AppleShare file server connected to an AppleTalk® network, also allows Apple IIe users to start up from the file server, without using local disk drives.

Apple IIe users can print to network printers and share information stored on AppleShare file servers. At the same time, other Apple II, Macintosh®, and MS-DOS users have the ability to access folders (directories), documents, applications, and storage space. And using an AppleShare file server or network printer is as easy as using a local ProDOS® disk or serial printer.

The Apple II Workstation Card connects your Apple IIe computer to an AppleTalk network using the LocalTalk™ Cabling System.

This card also includes a built-in super serial port for direct connection to serial devices such as ImageWriter printers.

The Apple II Workstation Card is ideally suited to the requirements of users in educational environments who want to share printers and reduce the amount of time spent handling disks.

Features

Benefits

▶ Diskless startup from AppleShare file server

▶ Eliminates the necessity for disk drives at workstations.
▶ Eliminates software management for ProDOS 8 system software and network-access software.

▶ AppleShare file-server access from ProDOS 8

▶ Allows Apple IIe users to share data with other Apple IIe, Apple IIGs®, Macintosh, and MS-DOS users.

▶ Menu-driven network software

▶ Makes it easy to access network resources such as file servers and printers.

▶ Transparent ProDOS 8 support

▶ Enables ProDOS applications to be stored on and run from server volumes.
▶ Supports standard ProDOS commands and utilities.

▶ Transparent print software

▶ Allows users to directly access network printers, including the ImageWriter and LaserWriter, and spoolers, such as the AppleShare print server, from within ProDOS applications.

▶ Board-resident AppleTalk protocols and processor

▶ Minimizes motherboard RAM usage.
▶ Enhances network booting and overall performance.
▶ Enables the Apple IIe to be connected to an economical LocalTalk-based AppleTalk network.

▶ Super serial port on card

▶ Lets users directly connect to a local printer, such as an ImageWriter, without additional hardware.

Product Details

► **AppleShare volumes**

AppleShare volumes appear to ProDOS 8 users as logical ProDOS drives, accessed with ProDOS pathnames and standard system utilities. ProDOS applications and documents can be stored and used from server volumes.

► **Access procedures**

Accessing information is simple and efficient using the file-server and printer-access software that's included with the workstation card. Users need remember only one password; once logged on, the server automatically manages all directory access.

► **Information exchange**

With an AppleShare file server, ProDOS, Macintosh, and MS-DOS users have common access to stored documents. Apple File Exchange for the Macintosh provides document format conversion where necessary.

► **Privacy**

AppleShare IIe workstation software fully supports the AppleShare server's powerful privacy system with an easy-to-use interface. File-server users control information by selectively granting access to the directories they own on server volumes. Access privileges allow the owner of a directory to keep information private, share it with a group, or make it

available to all server users, with complete control over how the information is used.

► **Network printers**

Network printers and spoolers, such as the LaserWriter, ImageWriter (with the LocalTalk option), and AppleShare print server, appear as locally attached serial printers and can be transparently accessed from within ProDOS applications.



Apple II Workstation Card

System Requirements

Workstation Requirements:

- ▶ An enhanced Apple IIe computer with 128K RAM, monitor, and LocalTalk cabling
- ▶ If network doesn't include an AppleShare file server, a 3.5-inch disk drive

Network Requirements:

- ▶ To load workstation software onto an AppleShare file server *initially*, one 3.5-inch disk drive at a workstation

Recommended Equipment:

- ▶ One or more AppleShare file servers (for diskless startup and file-server access)
- ▶ One or more Apple LaserWriter, ImageWriter II, or ImageWriter LQ printers
- ▶ Additional Apple IIe (with Apple II Workstation Card) or Apple IIGS computers for additional users

Technical Specifications

Processor

- ▶ 65C02; two-megahertz clock speed

Memory

- ▶ 16K RAM
- ▶ 64K ROM

Ports

- ▶ Two 8-pin minicircular (RS-422) ports:
 - One LocalTalk port
 - One super serial port

Ordering Information

Apple II Workstation Card

Order No. A2B2088

With your order, you'll receive:

- ▶ An Apple II Workstation Card
- ▶ One 800K 3.5-inch AppleShare IIe Workstation installer disk
- ▶ Apple II Workstation Card user's manual
- ▶ Limited warranty statement

LocalTalk Locking Connector Kit

Order No. M2068

With your order, you'll receive:

- ▶ One LocalTalk connector with 8-pin minicircular plug
- ▶ LocalTalk Cabling System user's manual
- ▶ One 2-meter cable
- ▶ One cable extender



Overview

The Macintosh™ Plus personal computer gives you the most important benefits of the Macintosh family—power, versatility, and ease of use—in an affordable, entry-level system.

Like others in the Macintosh family, the Macintosh Plus is simple to learn and use. It provides high-resolution text and graphics, and features plug-in

compatibility with the AppleTalk® network, the Apple® LaserWriter® and LaserWriter Plus printers.

In addition, the Macintosh Plus offers more memory, more storage space, and more room to expand than previous Macintosh systems. That means faster execution of most programs—no waiting for parts of the program to be loaded from disk. More disk storage space means less disk swapping and faster loading of important information. The ability to add

more peripherals means you can expand your Macintosh system with the accessories you need.

These features, together with an improved operating system, enhance system performance so that the Macintosh Plus can operate as much as 50 percent faster than its predecessors.

Macintosh Plus

Features

Benefits

▶ 1 megabyte of RAM, expandable to 4 megabytes

▶ Quickly executes applications, even those requiring large amounts of memory.
▶ Provides room for memory-intensive applications, large models and data bases.
▶ Lets you expand memory easily, without board swapping.

▶ 800K built-in disk drive

▶ Provides more storage capacity for applications, documents, fonts, and desk accessories.
> Means fewer disks to swap and manage.
▶ Offers compatibility with single-sided 400K disks.

▶ SCSI (Small Computer System Interface) port

▶ Transfers data at up to 265 kilobytes per second, up to six times faster than serial or external disk-drive ports.
▶ Lets you expand your system with up to seven peripherals, including high-performance disk drives, tape backups, and other products made by Apple and independent Macintosh developers.

▶ 128K ROM includes:
—Hierarchical File System
—Drivers for 800K disk drive, Apple Hard Disk 20SC drive, AppleTalk network, and SCSI port
—Faster QuickDraw graphics
—RAM caching support

▶ Hierarchical File System creates organized storage for documents and allows easy access to files.
▶ Provides faster system performance because of enhanced software in ROM.
▶ Lets you start up directly from hard disks, without a startup disk.
▶ Results in faster printing and greater screen-to-page fidelity when using the LaserWriter or LaserWriter Plus printer.
▶ RAM caching speeds operation by automatically loading frequently-used data from RAM rather than from disk.

▶ Standard typewriter-style keyboard with numeric keypad and cursor keys

▶ Numeric keypad speeds data entry for number-intensive applications such as spreadsheets and accounting packages.
▶ Cursor keys let you control the on-screen cursor without moving your hands from the keyboard.

Features

▶ High-resolution 9-inch, bit-mapped graphic display

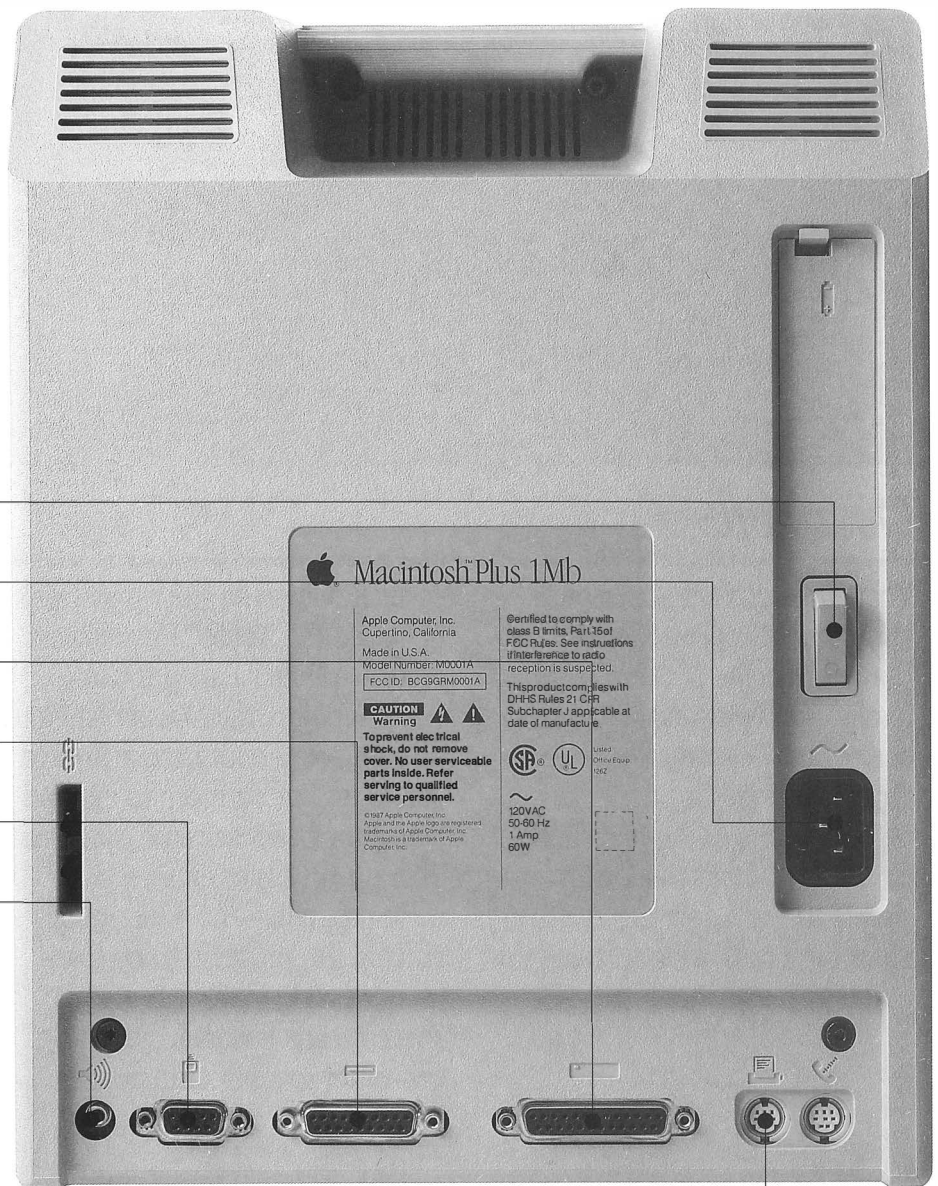
▶ Macintosh user interface: mouse, icons, windows, and pull-down menus

Benefits

▶ Offers an economical, compact display that's easily transported.
▶ Makes it easy to create impressive, professional documents that integrate text and graphics.
▶ Lets you view documents on the screen as they will appear when printed.

▶ Lets you work quickly and naturally with the computer.
▶ Provides a consistent interface across applications.

- ▶ On/Off Switch
- ▶ Power Input Unit
- ▶ SCSI Port
- ▶ Disk Drive Port
- ▶ Mouse Port
- ▶ Audio Jack
- ▶ Serial Port





Macintosh Plus

Technical Specifications

Processor

- ▶ MC68000; 32-bit internal data bus; 7.83-megahertz clock speed

Memory

- ▶ 1 megabyte RAM, expandable to 4 megabytes in a socketed SIMMs (Single Inline Memory Module) configuration
- ▶ 128K ROM standard

Disk storage

- ▶ One built-in double-sided drive: uses 3.5-inch hard-case floppy disks either double-sided, 800K capacity; or single-sided, 400K capacity

Keyboard

- ▶ 78 keys, including numeric keypad and cursor keys; detachable; software mapped

Mouse

- ▶ Mechanical tracking; optical shaft encoding at 3.54 pulses per mm (90 pulses per inch) of travel

Screen

- ▶ 9-inch (diagonal) screen; 512 by 342 pixel bit-mapped display

Interfaces

- ▶ Two RS-422 serial ports (230.4-kilobaud data transfer rate; up to 920 kilobaud if externally clocked)
- ▶ One SCSI parallel port (up to 265 kilobytes/second depending upon the application)

Sound generator

- ▶ Four-voice sound with 8-bit digital/analog conversion using 22-kilohertz sampling rate

Clock/Calendar

- ▶ CMOS custom chip with 4.5-volt user-replaceable battery backup (includes 256 bytes of memory which remembers system parameters even with the machine turned off)

Electrical requirements

- ▶ Line voltage: 105 to 125 volts AC
- ▶ Frequency: 50 to 60 hertz
- ▶ Maximum power: 60 watts

Size and weight

- ▶ Height: 13.5 in. (34.3 mm)
- ▶ Width: 9.7 in. (24.6 mm)
- ▶ Depth: 10.9 in. (27.7 mm)
- ▶ Weight: 16 lb. 7 oz. (7.6 kg)

Ordering Information

Macintosh Plus Package

Order No. M2503

With your order, you'll receive:

- ▶ Macintosh Plus personal computer with built-in 9-inch monitor and 800K disk drive
- ▶ Mouse
- ▶ Detachable keyboard
- ▶ Owner's guide
- ▶ System Tools disk and backup
- ▶ Software Sampler disk and flyer
- ▶ Utilities disk and guide
- ▶ Your Apple Tour of the Macintosh Plus disk
- ▶ Limited warranty statement



Overview

The Apple® Macintosh® Classic® personal computer offers all of the most valued advantages associated with Macintosh computers—including unsurpassed ease of use, the ability to run thousands of applications that work well together, built-in networking, and an easy growth path—in the lowest-cost Macintosh. It's an excellent choice for first-time Macintosh buyers who want the essential features of a Macintosh in a complete, affordable system. And the integrated design of the Macintosh Classic makes it a good choice if you want a system that's easy to set up and move around.

An updated version of Apple's most popular Macintosh design, the Macintosh Classic offers high system

performance (up to 25 percent faster than the Macintosh Plus) and comes standard with the Apple SuperDrive™, a 3.5-inch disk drive that can read from and write to Macintosh disks as well as MS-DOS, OS/2, and ProDOS® disks. The Macintosh Classic can be configured with an internal hard disk drive, which gives you plenty of room to store applications and files.

Like every Macintosh system, the Macintosh Classic offers numerous built-in capabilities not always found in other personal computers. Because AppleTalk® networking capabilities are built in, for example, the Macintosh Classic can function as an individual productivity system or as a cost-effective member of a network environment. Also, a SCSI (Small Computer System Interface)

port lets you connect as many as seven peripheral products—ranging from CD-ROM drives, high-capacity hard disk drives, and scanners to an Apple LaserWriter® printer—to the system. And built-in sound output capabilities make the Macintosh Classic ready for a new generation of applications that incorporate sound as well as text and graphics.

This combination of built-in capabilities and external ports gives you an easy, “plug-and-play” way to expand the Macintosh Classic. And because it can support the required memory and an internal hard disk, the Macintosh Classic has the capability to run the next generation of innovative Macintosh applications—those based on Macintosh system software version 7.0.

Features

Benefits

▶ 68000 microprocessor, running at 7.8336 megahertz

▶ Apple SuperDrive (1.4-megabyte floppy disk drive)

▶ Six built-in ports:
—One SCSI port
—One Apple Desktop Bus™ (ADB) port
—One external 3.5-inch disk interface
—Two serial ports
—One sound port

▶ Optional 40-megabyte internal hard disk drive

▶ 1 or 2 megabytes of RAM, expandable to 4 megabytes

▶ Offers up to 25 percent faster performance and system responsiveness than Macintosh Plus system.

▶ Allows convenient transfer of data files between Macintosh, OS/2, MS-DOS, and Apple II systems.
▶ Provides almost twice the storage capacity of 800K disk drives.

▶ Make it easy to expand your system with additional peripheral devices.
▶ Permit communication with the keyboard, mouse, and other devices.
▶ Accommodate a second 800K or 1.4-megabyte external 3.5-inch disk drive.
▶ Provide access to LocalTalk® cable-based networks, which allow you to connect Macintosh Classic systems to other computers and to LaserWriter printers through the AppleTalk network system.
▶ Supply high-quality, four-voice digital sound that is compatible with all applications that use Macintosh sound.

▶ Handles a broad range of computing needs by providing ample storage capacity for files and applications.

▶ Provides a simple growth path as you need additional memory.
▶ Lets you work with large amounts of data, such as large spreadsheets, scanned images, and sound files.
▶ Supports Macintosh system software version 7.0 applications when available.

Features

Benefits

- ▶ 512K of ROM, including:
 - Hierarchical File System
 - Drivers for Macintosh hard disks, ADB, SCSI, and an AppleTalk network
 - Macintosh Toolbox
 - QuickDraw™

-
- ▶ Macintosh user interface, including mouse, icons, windows, and pull-down menus

-
- ▶ MultiFinder® operating system

-
- ▶ Software compatibility

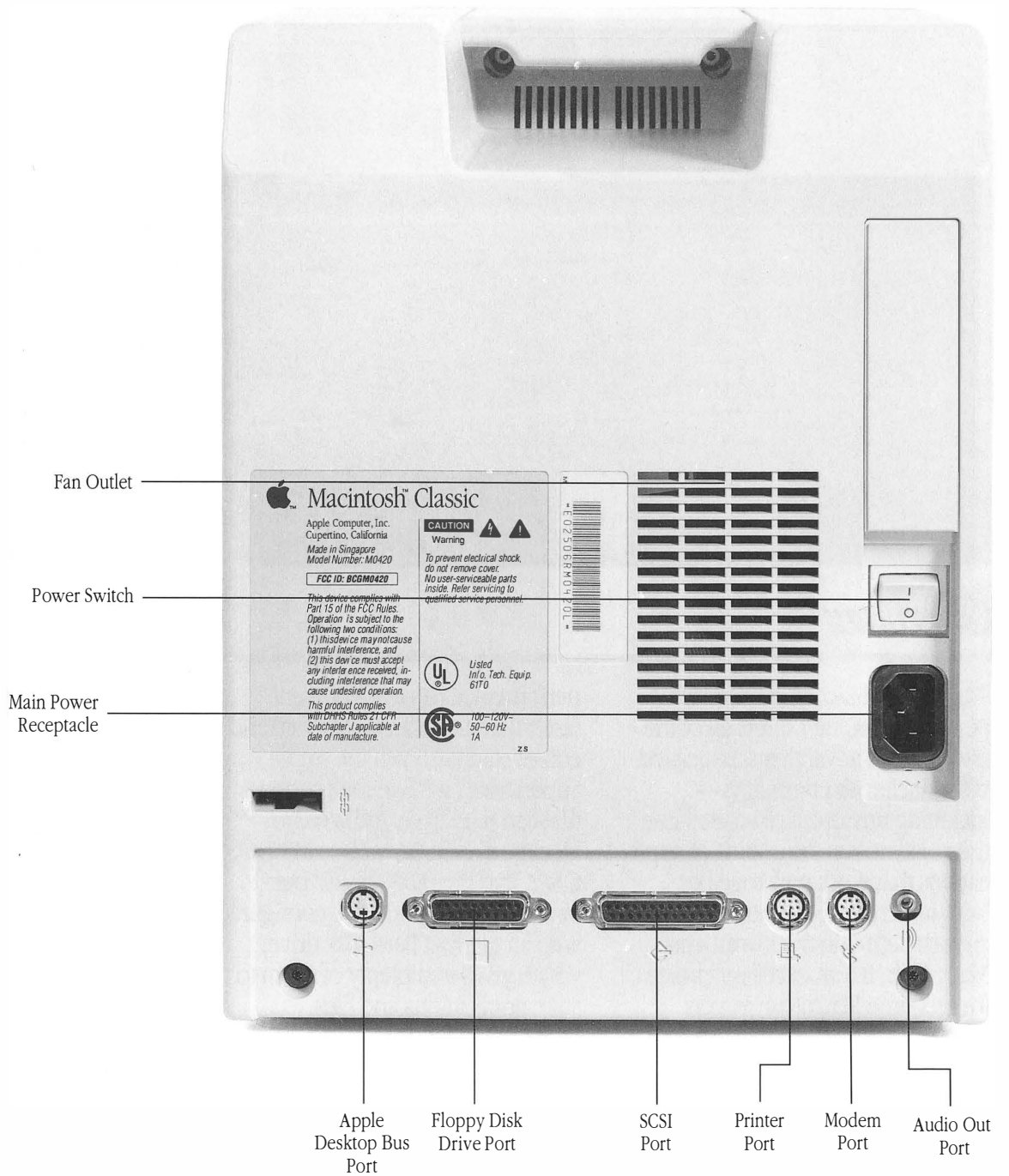
- ▶ Organizes storage for documents and allows easy access to files, with the Hierarchical File System.
- ▶ Supports high-performance peripherals, with the SCSI interface.
- ▶ Provides the consistent graphics interface for applications, with QuickDraw.

-
- ▶ Makes most applications intuitive and easy to learn.
 - ▶ Reduces training and support costs.
 - ▶ Provides a consistent user interface across applications.

-
- ▶ Allows multiple applications to be opened concurrently.
 - ▶ Lets you easily cut and paste parts of documents from one application to another.
 - ▶ Allows background tasks to be run while you interact with applications in the foreground.

-
- ▶ Lets you run virtually all Macintosh software.

Product Details



Product Details

System configurations

▶ Two configurations of the Macintosh Classic are available.

—The Macintosh Classic comes with 1 megabyte of RAM (expandable to 2 megabytes), internal 1.4-megabyte Apple SuperDrive floppy disk drive, ADB keyboard and mouse, system software, and training disk.

—The Macintosh Classic 2/40 comes with 2 megabytes of RAM (expandable to 4 megabytes), internal 40-megabyte hard disk drive, internal 1.4-megabyte Apple SuperDrive floppy disk drive, ADB keyboard and mouse, system software, and training disk.

RAM configurations

▶ The Macintosh Classic comes with 1 or 2 megabytes of RAM. The Macintosh Classic with 1 megabyte of RAM can be expanded to 2 megabytes by adding the Macintosh Classic Memory Expansion Card. A 2-megabyte Macintosh Classic can be expanded to 4 megabytes by installing Single In-line Memory Modules (SIMMs).

SCSI

▶ SCSI (Small Computer System Interface) is a high-performance interface bus used to connect hard disks and other SCSI-based devices, such as the AppleCD SC® CD-ROM drive, the Apple Scanner, and the Apple Personal Laser-Writer to the Macintosh Classic. This single interface can support up to seven SCSI peripheral devices (six if you have an internal hard disk).

Network support

▶ The Macintosh Classic provides full ROM support for all AppleTalk protocols and includes built-in serial ports for Local-Talk network connections.

Operating system support

▶ Macintosh system software includes:

—System software version 6.0.6 or later (the Macintosh Operating System) with System Startup disk.

—System Additions disk (includes utilities such as the Apple File Exchange, HD SC Setup, CloseView, Disk First Aid™, and Font/DA Mover).

▶ HyperCard® 2.0 Home, Addresses with Audio, Appointments with Audio, Audio Palette, and Audio Help stacks.

Technical Specifications

Microprocessor

- ▶ MC68000, 32-bit architecture
- ▶ 7.8336-megahertz clock speed

Memory

- ▶ 1 or 2 megabytes of RAM, expandable to 4 megabytes
- ▶ 512K of ROM
- ▶ 256 bytes of parameter memory

Disk drives

- ▶ Built-in Apple SuperDrive 1.4-megabyte floppy disk drive (optional external 1.4-megabyte or 800K disk drive available)
- ▶ Optional internal 40-megabyte Apple SCSI hard disk drive
- ▶ Optional external Apple SCSI hard disk (many capacities available)

Monitor

- ▶ Built-in 9-inch diagonal, high-resolution (512- by 342-pixel) bit-mapped monochrome display

Interfaces

- ▶ One Apple Desktop Bus (ADB) port, supporting a keyboard, mouse, and other devices daisy-chained through a low-speed, synchronous serial bus (a maximum of three chained devices is recommended)
- ▶ Two serial (RS-232/RS-422) ports, 230 kilobits per second maximum (up to 0.920 megabits per second if clocked externally)
- ▶ SCSI interface, using a 50-pin internal connector and a DB-25 connector for the first external device; all subsequent SCSI-based peripherals use standard SCSI-to-SCSI interface cables.
- ▶ 3.5-inch external floppy disk drive (800K or 1.4-megabyte) interface
- ▶ Sound port for external audio amplifier or headphones

Keyboard

- ▶ ADB keyboard with numeric keypad
- ▶ Two-level tilt adjustment

Mouse

- ▶ Apple Desktop Bus Mouse; mechanical tracking; optical shaft or contact encoding; 100 ± 10 pulses per in. (3.9 ± 0.39 pulses per mm) of travel

Sound generator

- ▶ Four-voice sound with 8-bit digital-analog conversion using 22-kilohertz sample rate—capable of driving stereo headphones or other stereo equipment through the sound jack

Clock/calendar

- ▶ CMOS custom chip with long-life lithium battery

Fan

- ▶ 10 cu. ft./min. axial
- ▶ Positive pressure cooling

(continued)



Macintosh Classic

Technical Specifications

(continued)

Electrical requirements

- ▶ Line voltage: 120 volts AC, RMS (nominal)
- ▶ Frequency: 47 to 63 hertz, single phase
- ▶ Power: 100 watts maximum

ADB power requirements

- ▶ Maximum power draw for all ADB devices: 500 milliamps (a maximum of three ADB devices, daisy-chained to the port, is recommended)
- ▶ Mouse draws 80 milliamps.
- ▶ Keyboard draws 25 milliamps.

Size and weight

Main unit:

- ▶ Height: 13.2 in. (33.6 cm)
- ▶ Width: 9.7 in. (24.6 cm)
- ▶ Depth: 11.2 in. (28.5 cm)
- ▶ Weight: 16 to 17.1 lb. (7.3 to 7.8 kg)*

Mouse:

- ▶ Height: 1.1 in. (2.8 cm)
- ▶ Width: 2.1 in. (5.3 cm)
- ▶ Depth: 3.8 in. (9.7 cm)
- ▶ Weight: 6 oz. (.17 kg)

Keyboard:

- ▶ Height: 1.3 in. (3.3 cm)
- ▶ Width: 16.0 in. (40.5 cm)
- ▶ Depth: 5.9 in. (15.1 cm)
- ▶ Weight: 1.96 lb. (.89 kg)

Operating environment

- ▶ Operating temperature: 50° F to 104° F (10° C to 40° C)
- ▶ Storage temperature: -40° F to 116.6° F (-40° C to 47° C)
- ▶ Relative humidity: 5% to 95% noncondensing
- ▶ Maximum altitude: 15,000 ft. (4,722 m)

*Weight will be greater with internal hard disk.

Ordering Information

Macintosh Classic

Order No. M0421LL/A

With your order, you'll receive:

- ▶ Macintosh Classic personal computer with 1 megabyte of RAM and built-in 1.4-megabyte Apple SuperDrive
- ▶ Keyboard
- ▶ Mouse

- ▶ Complete setup, learning, and reference documentation
- ▶ System software and HyperCard software
- ▶ Training disk
- ▶ Limited warranty statement

Macintosh Classic 2/40

Order No. M0435LL/A

With your order, you'll receive:

- ▶ Macintosh Classic personal computer with 2 megabytes of RAM, built-in 1.4-megabyte Apple SuperDrive, and internal 40-megabyte hard disk drive
- ▶ Keyboard

- ▶ Mouse
- ▶ Complete setup, learning, and reference documentation
- ▶ System software and HyperCard software
- ▶ Training disk
- ▶ Limited warranty statement

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August 1990. Product specifications are subject to change without notice. Printed in U.S.A.
M0913LL/A



Overview

The Macintosh® SE personal computer combines the compact design of the Macintosh Plus with added power, faster file access, and greater flexibility.

It includes an internal expansion slot that allows you to customize the system to meet your needs, and it offers a choice of three storage configurations.

The Macintosh SE uses the Apple® FDHD™ Internal Drive, a high-capacity 3.5-inch floppy disk drive capable of reading 400K, 800K, and 1.4-megabyte Macintosh disks. In addition, the FDHD drive lets you read from and write to MS-DOS®, OS/2®, and ProDOS®

formatted disks. This combination of capabilities makes the Macintosh SE an excellent choice for use in multivendor environments.

Adding to the power and versatility of the Macintosh SE is Apple's multitasking operating system, MultiFinder.™ MultiFinder allows you to open multiple applications concurrently and perform background tasks—such as printing documents on laser printers—while you continue to work in an application.

In addition to the system software, the Macintosh SE is packaged with Apple's HyperCard® software. HyperCard

lets you organize information on your computer the way you organize it in your mind—by association and with unlimited cross-references.

The Macintosh SE continues to offer the benefits that characterize all Macintosh computers: a consistent user interface and intuitive design that make the Macintosh easy to learn and use.

The Macintosh SE is compatible with existing Macintosh hardware and software, and lets you share files with other members of the Macintosh family of computers.

Features

Benefits

▶ Macintosh SE expansion slot with accessory access port

▶ Allows you to customize a system with products such as accelerator cards, external monitor adapters, MS-DOS coprocessor cards, networking cards, communications cards, or a 5.25-inch MS-DOS disk drive controller card.

▶ Lets you install internal cards without modifying the system.

▶ Provides an easy way for external devices to be connected to cards plugged in to the expansion slot.

▶ Apple FDHD Internal Drive

▶ Provides almost twice the storage capacity of existing 800K disks (1.4 megabytes).

▶ Allows you to conveniently transfer data files between Macintosh, MS-DOS, OS/2, and Apple II systems using the Apple File Exchange software.

▶ Offers compatibility with existing 800K and 400K Macintosh disks.

▶ Three options for built-in storage: An FDHD drive and one of the following: a second FDHD floppy disk drive, a Macintosh Internal Hard Disk 20SC, or a Macintosh Internal Hard Disk 40SC

▶ Increases storage capacity with a second internal disk drive that requires no additional desk space.

▶ Minimizes disk swapping and, with a hard disk, provides ample storage for all applications and files.

▶ Significantly speeds program/data storage and retrieval using hard disk option.

▶ Macintosh user interface: mouse, icons, windows, and pull-down menus

▶ Makes applications easy to learn and intuitive.

▶ Provides a consistent interface across applications.

▶ Reduces training and support costs.

▶ Compact design with a high-resolution 9-inch screen

▶ Offers an economical, compact system that requires little desk space and is easy to set up and transport.

▶ MultiFinder multitasking operating system

▶ Lets you easily integrate information from multiple applications by cutting and pasting.

▶ Lets you move quickly and easily between applications.

▶ Allows you to continue working with applications while performing some tasks in the background, such as print spooling to an Apple LaserWriter® printer or downloading remote files.

▶ 68000 microprocessor

▶ Provides compatibility with existing Macintosh software.

Features

Benefits

▶ Improved processing speed relative to the Macintosh Plus

▶ 1 or 2 megabytes of RAM, expandable to 4 megabytes (the Macintosh SE with 40-megabyte hard disk comes standard with 2 megabytes of RAM)

▶ 256K of ROM that includes:
—Hierarchical File System
—Drivers for the FDHD disk drive, AppleTalk® network system, Apple Desktop Bus,™ and SCSI connector
—Macintosh Toolbox
—QuickDraw™ graphics

▶ Advanced graphics capability, including on-screen integration of text and graphics

▶ Seven built-in ports (one SCSI, one drive, two serial, two Apple Desktop Bus, one sound)

▶ Apple Desktop Bus interface

▶ Keyboard options
—Apple Keyboard
—Apple Extended Keyboard

▶ Completes work such as recalculations or repagination more quickly.

▶ Lets you work with large amounts of data, and run most available software applications.
▶ Provides memory-expansion options sufficient for running multiple applications concurrently under MultiFinder, and for running memory-intensive software applications.

▶ The Hierarchical File System organizes storage for documents and allows easy access to files.
▶ The SCSI interface supports high-performance peripherals.
▶ QuickDraw provides the consistent interface throughout the Macintosh family.

▶ Lets you produce professional-quality reports, newsletters, and business forms that integrate text and graphics.
▶ Ensures fidelity between what you see on the screen and what you get on the printed page.

▶ Makes it easy to expand your system with additional peripherals.
▶ Provides access to LocalTalk™ networks, allowing you to connect the Macintosh SE to other computers and to LaserWriter printers through the AppleTalk network system.
▶ Supports up to seven high-speed SCSI peripherals.
▶ Provides connections for Apple Desktop Bus devices, such as a keyboard, hand-controlled pointing device (such as a mouse or trackball), or graphics tablet.

▶ Allows daisy-chaining of up to 16 Apple Desktop Bus devices.

▶ Apple Keyboard includes a numeric keypad and cursor keys for efficient operation.
▶ Apple Extended Keyboard also includes 15 function keys, letting you work effectively with alternate operating systems, terminal-emulation programs, and other data communications applications.

Product Details

Configuration

- ▶ Three Macintosh SE systems are available:
 - The Macintosh SE CPU (includes the CPU, 1 megabyte of RAM, two 1.4-megabyte FDHD floppy disk drives, and mouse)
 - The Macintosh SE Hard Disk 20 CPU (includes the CPU, 1 megabyte of RAM, an internal 20-megabyte SCSI hard disk, one 1.4-megabyte FDHD floppy disk drive, and mouse)
 - The Macintosh SE Hard Disk 40 CPU (includes the CPU, 2 megabytes of RAM, an internal 40-megabyte SCSI hard disk, one 1.4-megabyte FDHD floppy disk drive, and mouse)
- ▶ The keyboard and other peripheral devices are packaged and sold separately.

RAM

- ▶ The Macintosh SE can be upgraded to 4 megabytes of RAM.

Performance

- ▶ Overall performance is 15 percent to 20 percent faster than that of the Macintosh Plus. Hard disk performance is up to two times faster with the Macintosh SE than with the Macintosh Plus.

SCSI (Small Computer System Interface)

- ▶ SCSI is a high-performance interface for connecting the computer to a hard disk and other mass-storage peripherals. Up to seven SCSI peripherals (including an internal hard disk) can be connected to the Macintosh SE.

Network support

- ▶ The Macintosh SE serial ports include full support for connection to the Apple-Talk network system.

Upgrade path for Macintosh SE computers with 800K disk drives

- ▶ An upgrade path is available for the standard 68000-based Macintosh SE.

Expansion slot

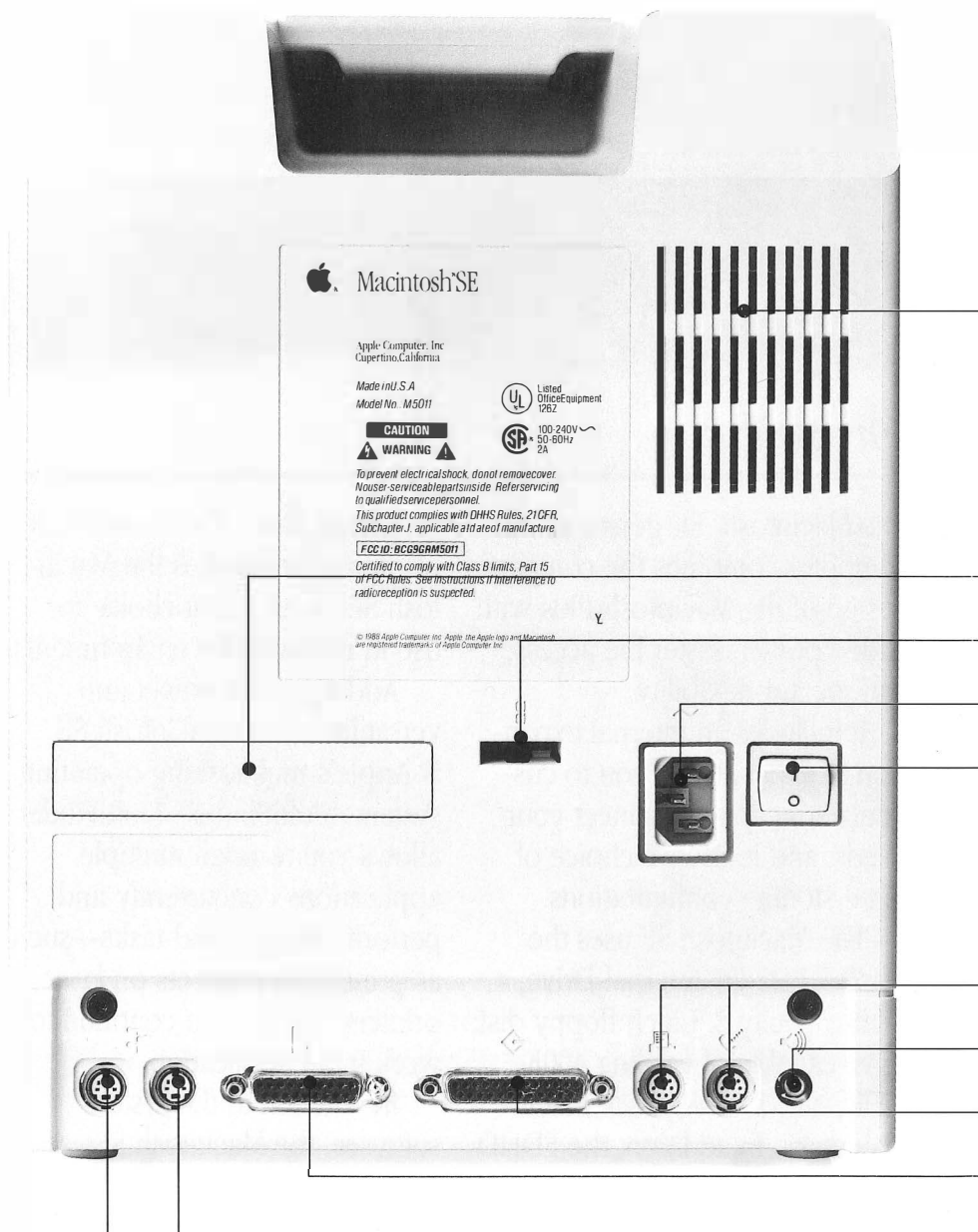
- ▶ The high-performance expansion slot supports one "SE-Bus" card. (Note: The expansion slot is not compatible with Macintosh SE/30 or NuBus™ expansion cards.)

Operating system software

- ▶ Macintosh system software includes:
 - System Tools 6.0.3 or higher (the Macintosh operating system) and Finder™ 6.1 or higher
 - Printer disk (the printer drivers for all Apple printers)
 - Utility disks, which include utilities such as Apple File Exchange, HD SC Setup, Disk First Aid™, and Font/DA Mover

HyperCard

- ▶ HyperCard software is included.



Technical Specifications

Processor

- ▶ MC68000; 32-bit internal architecture; 7.83-megahertz clock speed

Memory

- ▶ 1 or 2 megabytes of RAM, expandable to 4 megabytes
- ▶ 256K of ROM standard
- ▶ 256 bytes of parameter memory

Disk storage

- ▶ Internal 1.4-megabyte FDHD floppy disk drive
- ▶ Either a second internal 1.4-megabyte FDHD floppy disk drive, or a 20- or 40-megabyte internal Apple SCSI hard disk drive
- ▶ Optional external floppy disk drive or SCSI hard disk drives

Keyboard

- Detachable keyboard options:
- ▶ Apple Keyboard: 81 keys, including numeric keypad and cursor keys
 - ▶ Apple Extended Keyboard: 105 keys, including 15 function keys, separate cursor pad, 10-key numeric keypad, and Apple Desktop Bus connectors

Mouse

- ▶ Mechanical tracking; optical shaft encoding at 3.94 pulses per mm (100 pulses per inch) of travel; connects through Apple Desktop Bus

Screen

- ▶ 9-inch diagonal, high-resolution, 512- by 342-pixel bit-mapped display

Interfaces

- ▶ Two Apple Desktop Bus connectors for communication with keyboard, mouse, and other input devices
- ▶ Two RS-232/RS-422 serial ports, 230.4 kilobaud maximum; use mini-8 connectors
- ▶ External disk drive interface
- ▶ Macintosh SE expansion slot; uses a 96-pin Euro-DIN connector
- ▶ SCSI interface; uses a 50-pin connector (internal) and a DB-25 connector (external)
- ▶ Sound port for external audio amplifier (standard miniature)

Sound generator

- ▶ Four-voice sound with 8-bit digital/analog conversion using 22-kilohertz sampling rate

Clock/Calendar

- ▶ CMOS custom chip with seven-year lithium battery

Fan

- ▶ 10 CFM cross flow
- ▶ 38 dB

Electrical requirements

- ▶ Line voltage: 90 to 140 volts AC; 170 to 270 volts AC
- ▶ Frequency: 47 to 63 Hz
- ▶ Maximum power: 100 watts

Size and weight

Main unit

- ▶ Height: 13.6 in. (34.5 cm)
- ▶ Width: 9.6 in. (24.4 cm)
- ▶ Depth: 10.9 in. (27.6 cm)
- ▶ Weight: 17 to 21 lb. (7.7 to 9.5 kg)*

Mouse

- ▶ Height: 1.1 in. (2.8 cm)
- ▶ Width: 2.1 in. (5.3 cm)
- ▶ Depth: 3.8 in. (9.7 cm)
- ▶ Weight: 6 oz. (.17 kg)

* Weight varies depending on whether hard disk or second floppy disk drive has been installed.

▶ Fan Outlet

▶ Accessory Access Port

▶ Security Connector

▶ Power

▶ On/Off Switch

▶ Serial Ports

▶ Audio Jack

▶ SCSI Connector

▶ External Drive Port

▶ Apple Desktop Bus Connectors



Macintosh SE

Ordering Information**Macintosh SE CPU**

Order No. M0029LL/A

With your order, you'll receive the following:

- ▶ Macintosh SE personal computer with built-in 9-inch monitor, 1 megabyte of RAM, and two built-in 1.4-megabyte FDHD drives
 - ▶ Mouse
 - ▶ System software
 - ▶ HyperCard software
 - ▶ Guided Tour disk
 - ▶ Owner's guide
 - ▶ Getting Started guide
 - ▶ Limited warranty statement
-

**Macintosh SE
Hard Disk 20 CPU**

Order No. M0028LL/A

With your order, you'll receive the following:

- ▶ Macintosh SE personal computer with built-in 9-inch monitor, 1 megabyte of RAM, a built-in 1.4-megabyte FDHD drive, and an internal 20-megabyte hard disk drive
 - ▶ Mouse
 - ▶ System software
 - ▶ HyperCard software
 - ▶ Guided Tour disk
 - ▶ Owner's guide
 - ▶ Getting Started guide
 - ▶ Limited warranty statement
-

**Macintosh SE
Hard Disk 40 CPU**

Order No. M0031LL/A

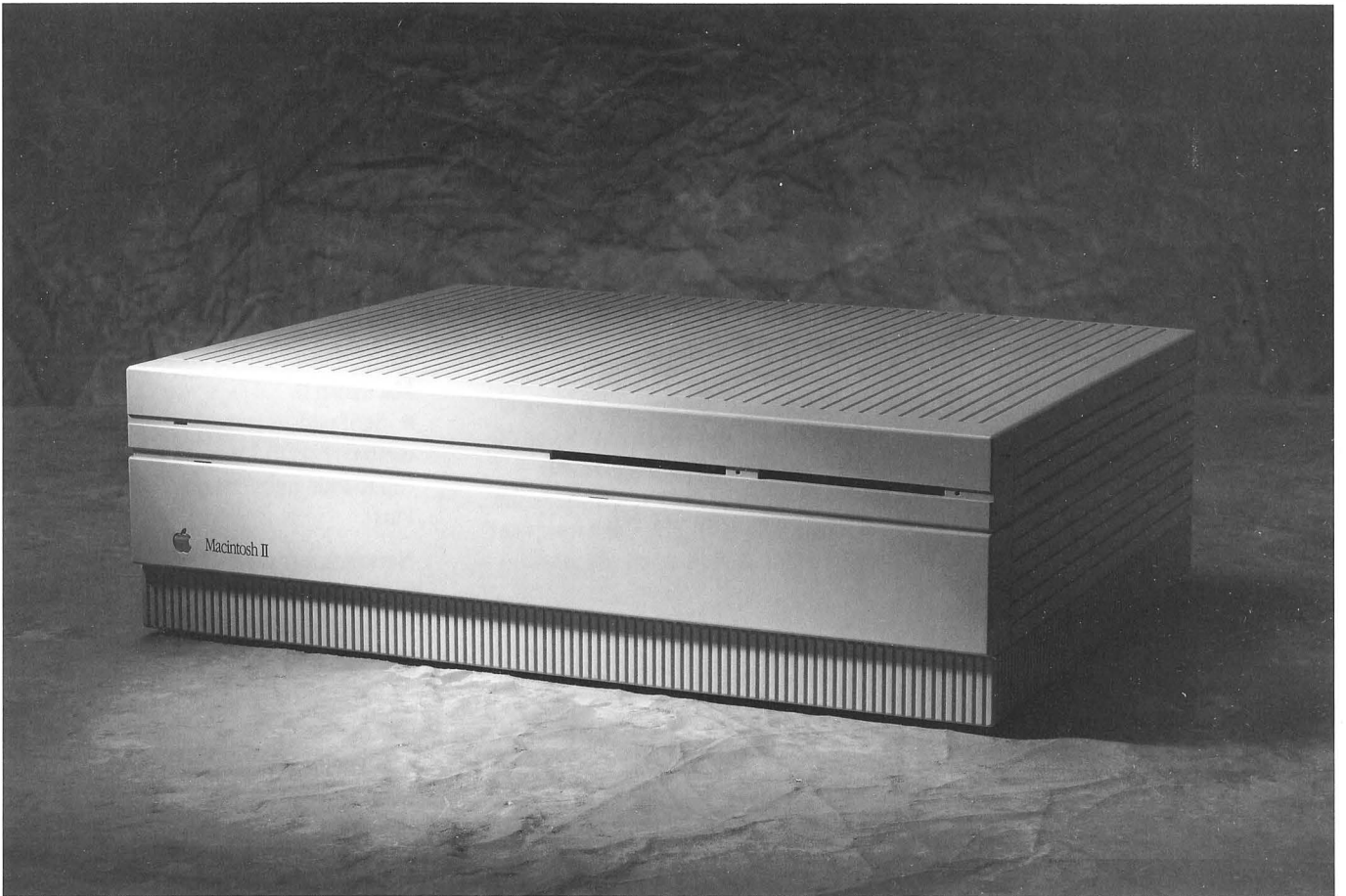
With your order, you'll receive the following:

- ▶ Macintosh SE personal computer with built-in 9-inch monitor, 2 megabytes of RAM, a built-in 1.4-megabyte FDHD drive, and an internal 40-megabyte hard disk drive
- ▶ Mouse
- ▶ System software
- ▶ HyperCard software
- ▶ Guided Tour disk
- ▶ Owner's guide
- ▶ Getting Started guide
- ▶ Limited warranty statement

Apple Computer, Inc.

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TLX: 171-576

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August 1989. Product specifications are subject to change without notice. Printed in U.S.A.
M2226/D



Overview

The Macintosh® II personal computer is the high-performance, open-architecture member of the Macintosh family. It provides advanced color and graphics capabilities, with a palette of over 16 million colors.

The Macintosh II is designed for advanced applications in business, desktop publishing, science, and engineering. It comes standard with a full 32-bit 68020 microprocessor and a 68881 floating-point coprocessor.

For maximum flexibility, the Macintosh II makes room for more memory—up to 8 megabytes of on-board RAM—and includes six built-in ports and six expansion slots that let you create virtually any system

configuration you need. Using hardware and software options from Apple and third parties, the Macintosh II can support other operating environments, including MS-DOS and AT&T UNIX®.

To go with the Macintosh II, you have a choice of monitors—including the AppleColor™ High-Resolution RGB Monitor—as well as keyboards and internal or external disk drives.

The Macintosh II is compatible with existing Macintosh software, and comes standard with 1 megabyte of RAM and a built-in 800-kilobyte floppy disk drive. It is available in two configurations: with or without an internal 40-megabyte hard disk drive.

Adding to the power and versatility of the Macintosh II is Apple's first-generation multitasking operating system, MultiFinder™. MultiFinder allows you to open multiple applications concurrently and perform background tasks—such as printing documents on laser printers—while you continue to work in an application.

In addition to the System software, the Macintosh II is packaged with Apple's exciting HyperCard® application. HyperCard is an information-management toolkit that lets you organize information on your computer the way you organize it in your mind—by association, and with unlimited cross-references.

Features

Benefits

▶ Full 32-bit, 68020 microprocessor operating at 15.7 megahertz

▶ Provides increased speed, power, and performance—up to four times greater than with Apple's previous 68000-based computers.

▶ 68881 floating-point coprocessor

▶ Performs arithmetic calculations up to 200 times faster than previous systems.

▶ 1 megabyte of on-board RAM, expandable to 8 megabytes

▶ Lets you run the most powerful, sophisticated software available.
▶ Accommodates extremely large models, documents, and databases.
▶ Provides the flexibility to grow as you need additional memory.
▶ With MultiFinder, allows you to use multiple applications simultaneously.

▶ 256K of ROM that includes:
—Hierarchical File System
—Drivers for Macintosh hard disk drives, NuBus™ expansion slots, Apple Desktop Bus™, 68881 floating-point coprocessor, SCSI, and AppleTalk® network
—Color QuickDraw

▶ The Hierarchical File System organizes storage for documents and allows easy access to files.
▶ The SCSI interface supports high-performance peripherals.
▶ QuickDraw provides the consistent graphics interface throughout the Macintosh family.
▶ Color QuickDraw provides a consistent interface for both black-and-white *and* color applications.

▶ Six NuBus expansion slots

▶ Makes it easy to add memory, communications, and coprocessor cards. (Cards are self-configuring—they require no DIP switches, and can be placed in any slot.)
▶ Lets you configure your system to meet your specific needs.
▶ Provides flexibility for expansion as requirements change and new technology becomes available.
▶ Lets you work within other operating environments.

▶ Advanced color graphics capabilities

▶ Allows you to create and display vivid, true-to-life graphics using over 16 million colors.

▶ Six built-in ports: two serial, two Apple Desktop Bus, one SCSI, one sound

▶ Lets you expand your system with popular peripherals without using expansion slots.
▶ Provides access to LocalTalk™ cabling-based networks, which allows you to connect your Macintosh II to other computers and to LaserWriter® II printers through the AppleTalk Network System.
▶ Provides connection for Apple Desktop Bus devices such as keyboards and mice.
▶ Supports up to seven high-speed SCSI peripherals.

Features

Benefits

-
- | | |
|--|---|
| ▶ Internal SCSI connector | ▶ Permits connection of internal hard disks. |
| | |
| ▶ SCSI transfer rate up to 1 megabyte per second | ▶ Allows fast loading and saving of applications and documents. |
| | |
| ▶ Two standard configurations:
—800K built-in disk drive
—800K drive, plus internal 40-megabyte hard disk drive
—A second internal 800K drive can be added to both configurations | ▶ Gives you multiple storage options.
▶ Uses standard 800K 3.5-inch disks.
▶ Requires no desk space for disk drives.
▶ Lets you add storage capacity as your requirements expand. |
| | |
| ▶ Macintosh user interface: mouse, icons, windows, and pull-down menus | ▶ Makes applications easy to learn and intuitive.
▶ Provides a consistent interface across applications.
▶ Reduces training and support costs in a corporate environment. |
| | |
| ▶ MultiFinder multitasking operating system | ▶ Enables you to use multiple applications simultaneously and easily transfer data among them by cutting and pasting.
▶ Allows you to continue working with applications while performing background tasks such as laser printing. |
| | |
| ▶ Macintosh software compatibility | ▶ Runs existing Macintosh software. |
| | |
| ▶ Apple stereo sound chip | ▶ Provides high-quality digital sound.
▶ Is compatible with most applications that use Macintosh sound. |
| | |
| ▶ Optional 68851 PMMU memory management upgrade | ▶ Provides memory management necessary to run multitasking, multi-user operating systems such as A/UX®, Apple's implementation of AT&T UNIX®. |
| | |
| ▶ Choice of keyboards (sold separately):
—Apple Keyboard
—Apple Extended Keyboard | ▶ Apple Keyboard includes numeric keypad and cursor keys for efficient operations.
▶ Apple Extended Keyboard also includes 15 function keys, letting you work effectively with alternate operating systems, terminal emulation programs, and other data communications applications. |
| | |
| ▶ Choice of monitors (sold separately):
—Apple High-Resolution Monochrome Monitor
—AppleColor High-Resolution RGB Monitor | ▶ Lets you choose the monitor that best fits your needs. |

Product Details

System configuration

- ▶ Two configurations are available:
 - The Macintosh II CPU, which includes the CPU, 68881 floating-point coprocessor, 1 megabyte of RAM, one 800K 3.5-inch floppy disk drive, and mouse.
 - The Macintosh II Hard Disk 40 CPU, which includes the Macintosh II CPU plus an internal 40-megabyte SCSI hard disk drive.
- ▶ Keyboard, monitors, and other peripheral devices are packaged and sold separately.

NuBus expansion slots

- ▶ NuBus provides a 32-bit single address bus and data bus on a 96-pin connector.
- ▶ NuBus is self-configuring. Cards can be plugged into any slot and the system will automatically identify and configure each card, without any DIP switches or jumper wires.

68020 processor

- ▶ The Macintosh II is equipped with the 32-bit 68020 processor running at 15.7 megahertz. Overall, the performance of the Macintosh II is at least four times faster than that of Apple's 68000-based systems.

- ▶ The 32-bit address bus provides a total addressable space of 4 gigabytes.

RAM

- ▶ RAM can be upgraded on the motherboard to 2 megabytes with the 1MB RAM Expansion Kit; it can be upgraded to 4, 5, or 8 megabytes with 2MB RAM Expansion Kits.

68881 floating-point math coprocessor

- ▶ Macintosh programs that utilize the Standard Apple Numerics Environment (SANE[®]) will have floating-point computations accelerated by 3 to 30 times.
- ▶ Programs that make direct use of the 68881 will have floating-point computations accelerated by up to 200 times.

Stereo sound

- ▶ The Apple Sound Chip supports stereo sound at a sampling rate of up to 44.1 kilohertz.

SCSI (Small Computer Systems Interface)

- ▶ SCSI is a high-performance interface for connecting the computer to hard disks and other mass-storage peripherals. Up to seven SCSI peripherals (including internal hard disk) can be connected to the Macintosh II.
- ▶ SCSI performance on the Macintosh II is rated at up to 1 megabyte per second (up to four times faster than on a Macintosh Plus).

Network support

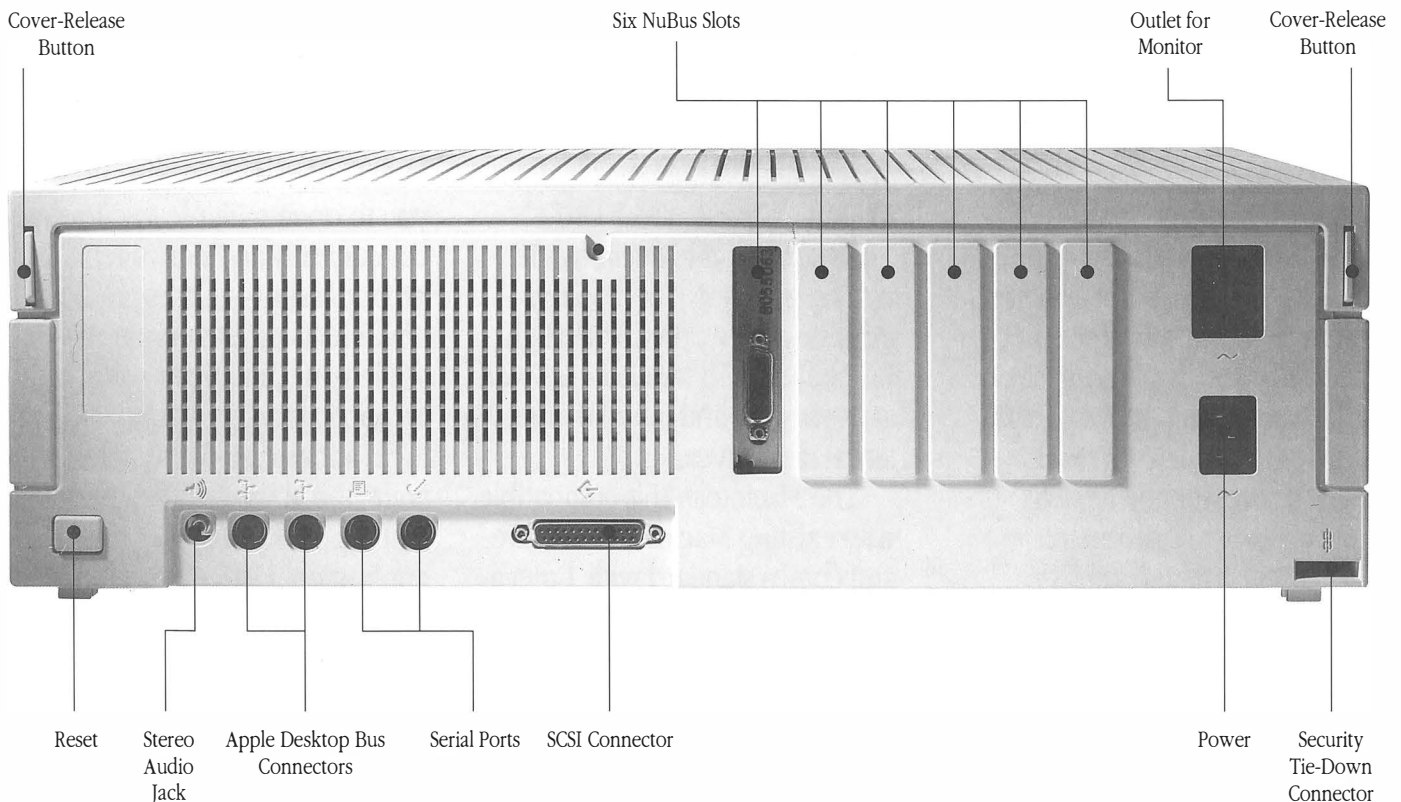
- ▶ The Macintosh II serial ports include full support for AppleTalk network connections.

Operating system software

- ▶ Macintosh System software includes:
 - MultiFinder
 - Utilities such as the Hard Disk Backup

HyperCard

- ▶ HyperCard software included.



Technical Specifications

Processor

MC68020, 32-bit internal architecture, 15.7-megahertz clock speed

Math coprocessor

- ▶ 68881 floating-point device (IEEE standard)

Memory

- ▶ 1 megabyte of RAM, expandable to 8 megabytes on board
- ▶ 256K of ROM standard

Memory management

- ▶ Optional 68851 PMMU

Disk storage

- ▶ Two standard configurations
 - One built-in 800K disk drive
 - One built-in 800K disk drive and an internal 40-megabyte SCSI hard disk drive
- ▶ Options include 20-, 40-, and 80-megabyte internal SCSI hard disk drives

Monitor options (sold separately)

- ▶ Apple High-Resolution Monochrome Monitor: an analog monitor with a 12-inch diagonal screen, 640 by 480 pixels
- ▶ AppleColor High-Resolution RGB Monitor: an analog RGB monitor with 13-inch diagonal screen, 640 by 480 pixels

Color capabilities

- ▶ Palette of over 16 million colors
- ▶ Color QuickDraw built into ROM

Keyboard options (sold separately)

Detachable keyboard options:

- ▶ Apple Keyboard: 81 keys, including numeric keypad and cursor keys
- ▶ Apple Extended Keyboard: 105 keys, including 15 function keys, separate cursor pad, 10-key numeric keypad, and Apple Desktop Bus connectors

Mouse (included)

- ▶ Mechanical tracking: optical shaft encoding at 3.54 pulses per mm (90 pulses per inch) of travel

Interfaces

- ▶ Two mini-8 serial (RS-232/RS-422) ports
- ▶ SCSI interface; uses a 50-pin connector (internal) and a DB-25 connector (external)
- ▶ Two Apple Desktop Bus (ADB) ports
- ▶ Six NuBus internal slots supporting full 32-bit address and data buses

Sound generator

- ▶ Apple custom digital sound chip (ASC), including four-voice wave-table synthesis, stereo sampling generator. Capable of driving stereo headphones or other stereo equipment.

Electrical requirements

- ▶ Line voltage: 90 to 140 volts AC; 170 to 270 volts AC, automatically configured
- ▶ Frequency: 48 to 62 Hz
- ▶ Maximum power: 230 watts, not including monitor power

Size and weight

Main unit

- ▶ Height: 5.51 in. (14.0 cm)
- ▶ Width: 18.66 in. (47.4 cm)
- ▶ Depth: 14.37 in. (36.5 cm)
- ▶ Weight: 24 lbs. to 26 lbs. (10.9 kg to 11.8 kg)*

Mouse

- ▶ Height: 1.11 in. (2.8 cm)
- ▶ Width: 2.1 in. (5.3 cm)
- ▶ Depth: 3.8 in. (9.7 cm)
- ▶ Weight: 6 oz. (.17 kg)

* Weight varies depending on whether optional hard disk or second floppy disk has been installed.



Macintosh II

Ordering Information**Macintosh II CPU**

Order No. M5333

With your order, you'll receive:

- ▶ Macintosh II personal computer with a built-in 800K disk drive
- ▶ Mouse
- ▶ Owner's guide
- ▶ System software
- ▶ Training disks (2)
- ▶ Limited warranty statement

**Macintosh II
Hard Disk 40 CPU**

Order No. M5430

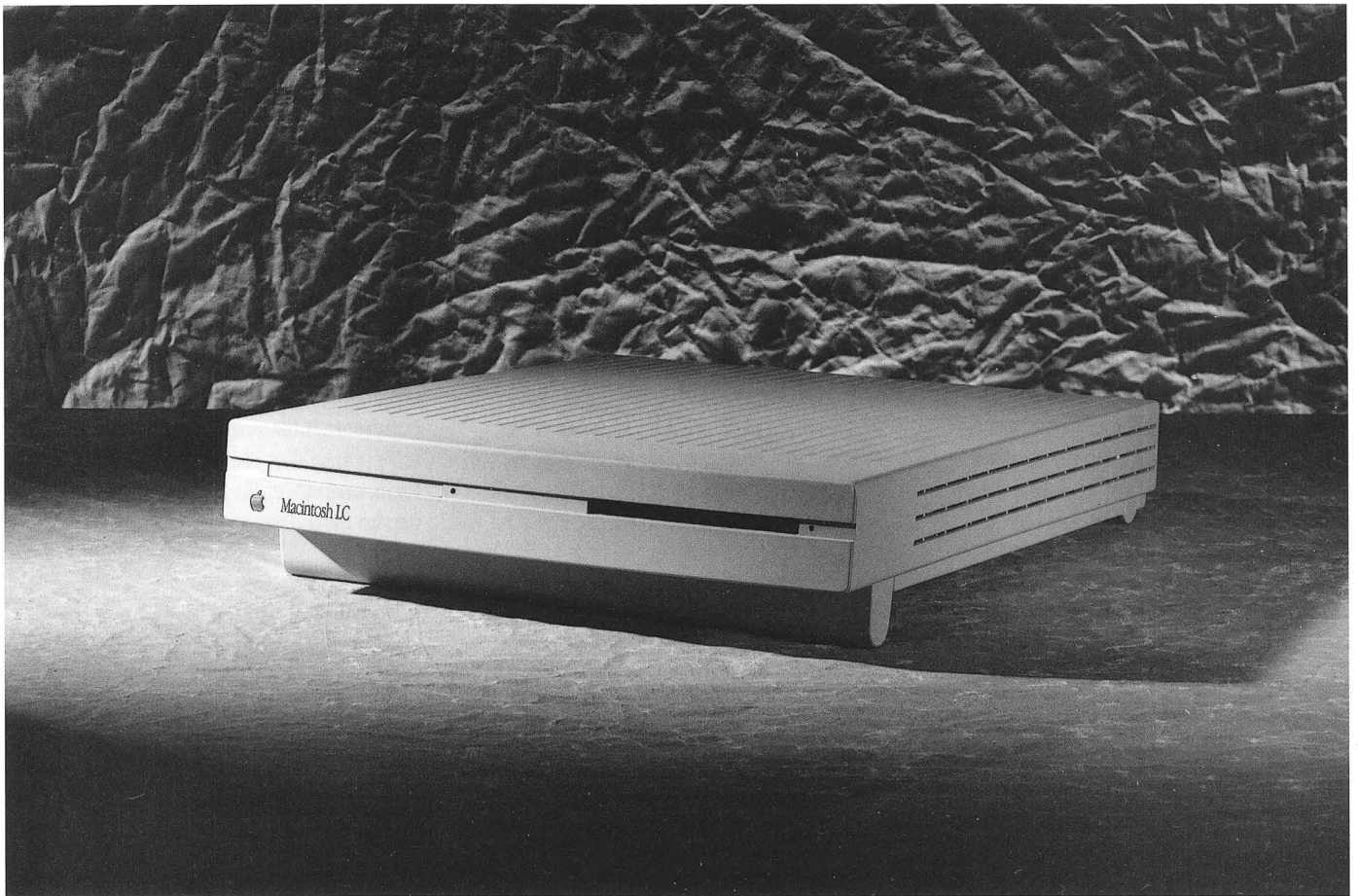
With your order, you'll receive:

- ▶ Macintosh II personal computer with a built-in 800K disk drive and an internal 40-mega-byte SCSI hard disk drive
- ▶ Mouse
- ▶ Owner's guide
- ▶ System software
- ▶ Training disks (2)
- ▶ Limited warranty statement

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June 1988. Product specifications are subject to change without notice. Printed in U.S.A.
M2227/B



Overview

The Apple® Macintosh® LC personal computer is Apple Computer's lowest-cost color-capable Macintosh. Combining the flexibility of a modular system with a sleek new design, the Macintosh LC gives you a range of options for larger screens, color displays, and system expansion, all at an even more affordable price.

The computer features a 16-megahertz 68020 microprocessor that increases system responsiveness more than 100 percent over the Macintosh SE and the Macintosh Classic.*

The Macintosh LC also offers built-in support for three Apple monitors—including the Macintosh 12" RGB Display, the Macintosh 12" Monochrome Display, and the AppleColor™ High-Resolution RGB Monitor. This means you can choose the monitor you want to work with—without having to add a separate video card.

Right from the start, with a Macintosh LC you can enhance graphics, presentation materials, and other documents with a range of shades and colors—256 colors on the Macintosh 12" RGB Display, 16 shades of gray on the Macintosh 12" Monochrome Display, and 16 colors on the AppleColor High-Resolution RGB Monitor.

With an optional Macintosh LC 512K VRAM (video random-access memory) SIMM (Single In-line Memory Module), the system is capable of generating even more colors or shades of gray on all three monitors.

The Macintosh LC also provides an important new Macintosh capability: sound input. Macintosh computers have always offered sound output, but the Macintosh LC has been designed so you can add sounds to documents created with the computer.

The system comes standard with the 1.4-megabyte Apple SuperDrive™ disk drive, which allows you to work more easily in different computing

environments because it can read from and write to 3.5-inch disks initialized for the Macintosh as well as MS-DOS, OS/2, and ProDOS®. In addition, a 40-megabyte internal hard disk drive accommodates large files and applications.

Seven built-in ports allow you to expand the system with popular peripheral equipment such as additional hard disks, scanners, and printers. Built-in networking makes it easy to connect to different networks for sharing information. And a processor-direct slot allows you to add a high-performance expansion card for additional graphics, communications, and other capabilities.

What's more, when equipped with the Apple IIe Card, the Macintosh LC can run virtually all applications developed for Apple IIe systems. And the Macintosh LC will be able to run the next generation of Macintosh applications—those supported by Macintosh system software version 7.0—when they become available.

Features

Benefits

▶ 68020 microprocessor, running at 16 megahertz

▶ Offers more than 100 percent faster performance and system responsiveness than Macintosh SE and Macintosh Classic systems.

▶ Built-in video support for three Apple monitors:
—Macintosh 12" RGB Display
—Macintosh 12" Monochrome Display
—AppleColor High-Resolution RGB Monitor

▶ Lets you choose from the most popular Apple displays; both color and monochrome.
▶ Lets you work with up to 256 colors simultaneously on the Macintosh 12" RGB Display, up to 16 shades of gray on the Macintosh 12" Monochrome Display, and up to 16 colors on the AppleColor High-Resolution RGB Monitor.
▶ Allows you to change displays without adding a video card.

▶ Optional Macintosh LC 512K VRAM SIMM

▶ Boosts the color depth to 256 colors or shades of gray on the AppleColor High-Resolution RGB Monitor and Macintosh 12" Monochrome Display.
▶ Provides 32,000 colors on the Macintosh 12" RGB Display.

▶ Sound input

▶ Allows you to add voice comments to voice-capable word processing, spreadsheet, and other documents; send spoken electronic mail messages; add voice excerpts to presentations; and create spoken password protection for sensitive files.

▶ Apple SuperDrive (1.4-megabyte floppy disk drive)

▶ Allows convenient transfer of data files between Macintosh, OS/2, MS-DOS, and Apple II systems.
▶ Provides almost twice the storage capacity of 800K disk drives.

▶ Apple IIe Card

▶ Allows you to run virtually all applications that have been developed for Apple IIe computers.
▶ Preserves your investment in Apple IIe software.

▶ 020 Direct Slot

▶ Allows you to expand system capabilities with a high-performance expansion card for communication, emulation, graphics and other options.

Features

Benefits

▶ Seven built-in ports:

- One SCSI port
- One Apple Desktop Bus™ (ADB) port
- Two serial ports
- One sound-in port
- One sound-out port
- One video output port

- ▶ Provide support for up to seven popular peripherals such as CD-ROM drives, scanners, and printers.
- ▶ Permit communication with the keyboard, mouse, and other input devices.
- ▶ Provide easy external access to optional expansion cards.
- ▶ Provide access to LocalTalk® cable-based networks, which allow you to connect Macintosh LC systems to other computers and to LaserWriter® printers through the AppleTalk® network system.
- ▶ Support sound input via microphone or phono jack adapter.
- ▶ Supply high-quality sound output that is compatible with all applications that use Macintosh sound.
- ▶ Provide connection to external video display devices.

▶ 40-megabyte internal hard disk drive

- ▶ Handles a broad range of computing needs by providing ample storage capacity for files and applications.

▶ 2 megabytes of on-board RAM, expandable to 10 megabytes

- ▶ Provides a simple growth path as you need additional memory.
- ▶ Lets you work with large amounts of data, such as spreadsheets, scanned images, and sound files.

▶ Macintosh user interface, including mouse, icons, windows, and pull-down menus

- ▶ Makes most applications intuitive and easy to learn.
- ▶ Reduces training and support costs.
- ▶ Provides a consistent user interface across applications.

▶ MultiFinder® operating system

- ▶ Allows multiple applications to be opened concurrently.
- ▶ Lets you easily cut and paste parts of documents from one application to another.
- ▶ Allows background tasks to be run while you interact with applications in the foreground.

▶ Software compatibility

- ▶ Lets you run virtually all Macintosh software.
- ▶ Allows you to run virtually all applications that have been developed for Apple IIe computers using the Apple IIe Card.

Product Details

System configuration

► The Macintosh LC comes with 2 megabytes of RAM (expandable to 10 megabytes), internal 1.4-megabyte Apple SuperDrive floppy disk drive, internal 40-megabyte hard disk drive, ADB keyboard and mouse, system software, and training disk.

RAM configurations

► The Macintosh LC comes with 2 megabytes of RAM on the main logic board. Up to 8 megabytes of RAM can be added by installing a memory expansion card and then adding SIMMs. Some possible configurations include:

—4 megabytes (2 megabytes on main logic board; two 1-megabyte SIMMs)

—10 megabytes (2 megabytes on main logic board; two 4-megabyte SIMMs)

SCSI

► SCSI (Small Computer System Interface) is a high-performance interface bus used to connect hard disks and other SCSI-based devices, such as the AppleCD SC® CD-ROM drive, the Apple Scanner, and the Apple Personal LaserWriter to the Macintosh LC. This single interface can support up to seven SCSI peripheral devices.

Network support

► The Macintosh LC provides full ROM support for all AppleTalk protocols and includes built-in serial ports for LocalTalk network connections.

Operating system support

► Macintosh system software includes:

—System software version 6.0.6 or later (the Macintosh Operating System) with System Startup disk

—System Additions disk (includes utilities such as the Apple File Exchange, HD SC Setup, CloseView, Disk First Aid™, and Font/DA Mover)

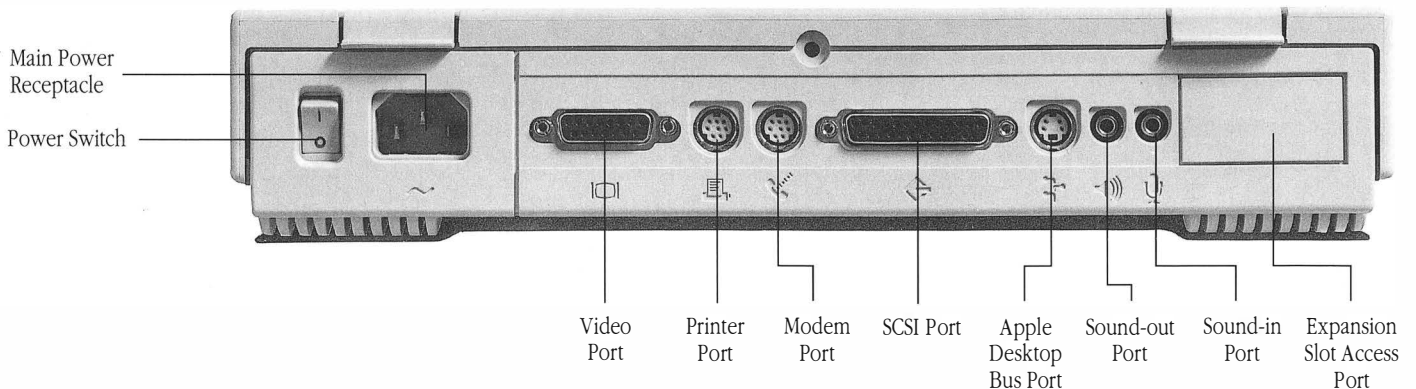
► HyperCard® 2.0 Home, Addresses with Audio, Appointments with Audio, Audio Palette, and Audio Help stacks.

Sound input

► The Macintosh LC has been designed to accept and process sound as well as generate it. Using a microphone or phono jack adapter, and appropriate software, you can speak into the computer to create electronic voice messages and add voice comments to files. Sound entering the computer is filtered through a custom filter/preamplifier chip, converted to digital form, and stored in DRAM or directly on the hard disk.

Sound generator

► The sound generator is a high-quality sampling generator that provides the sound signal to the internal speaker or to both channels of stereo mini-phone-jack headphones.



Technical Specifications

Microprocessor

- ▶ MC68020, 32-bit architecture
- ▶ 16-megahertz clock speed

Memory

- ▶ 2 megabytes of RAM, expandable to 4 or 10 megabytes
- ▶ 512K of ROM, socketed for future ROM upgrades
- ▶ 256 bytes of parameter memory

Disk drives

- ▶ Built-in Apple SuperDrive 1.4-megabyte floppy disk drive
- ▶ Internal 40-megabyte Apple SCSI hard disk drive
- ▶ Optional external Apple SCSI hard disk (many capacities available)

Monitors

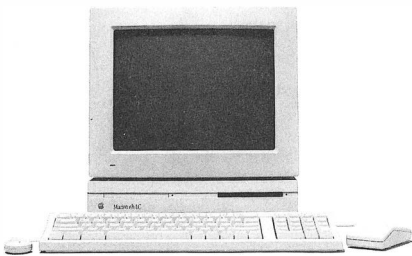
- ▶ Supports several color and monochrome monitors, including:
 - Macintosh 12" RGB Display
 - Macintosh 12" Monochrome Display
 - AppleColor High-Resolution RGB Monitor
- ▶ When equipped with a video expansion card, supports other Apple and non-Apple monitors; see your authorized Apple dealer for details.

Interfaces

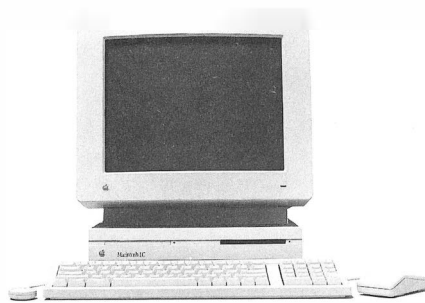
- ▶ One Apple Desktop Bus (ADB) port, supporting a keyboard, mouse, and other devices daisy-chained through a low-speed, synchronous serial bus (a maximum of three daisy-chained devices is recommended)

- ▶ Two serial (RS-232/RS-422) ports, 230 kilobits per second maximum (up to 0.920 megabits per second if clocked externally)
- ▶ Video port, supporting color and monochrome monitors of various sizes and resolutions
- ▶ SCSI interface, using a 50-pin internal connector and a DB-25 connector for the first external device; all subsequent SCSI-based peripheral devices use standard SCSI-to-SCSI interface cables.
- ▶ Internal expansion slot, supporting an 020 Direct Slot expansion card
- ▶ Monophonic sound output port for external audio devices
- ▶ Sound input port for monaural sound input

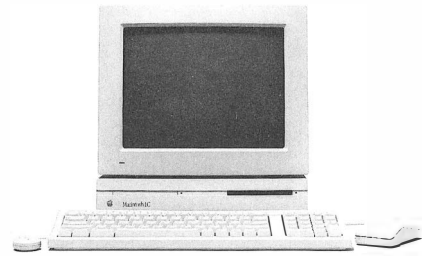
(continued)



Macintosh LC with ADB keyboard, mouse, microphone, and Macintosh 12" RGB Display.



Macintosh LC with ADB keyboard, mouse, microphone, and 13-inch AppleColor High-Resolution RGB Monitor.



Macintosh LC with ADB keyboard, mouse, microphone, and Macintosh 12" Monochrome Display.



Macintosh LC

Technical Specifications

(continued)

Sound input

- ▶ Monaural 8-bit sound
- ▶ Sound samples can be made at 22 or 11 kilohertz.
- ▶ Macintosh Audio Compression Expansion (MACE) sound utility, supporting 3:1 or 6:1 compression, which allows approximately half an hour of sound to be stored on a single 40-megabyte hard disk

Sound generator

- ▶ Monophonic 8-bit digital-analog conversion using 22-kilohertz sample rate—capable of supplying the same signal to both channels of stereo headphones or other stereo equipment through the sound jack

Microphone

- ▶ “Hands free” omnidirectional electret microphone

Keyboard

- ▶ ADB keyboard with numeric keypad
- ▶ Two-level tilt adjustment

Mouse

- ▶ Apple Desktop Bus Mouse; mechanical tracking: optical shaft or contact encoding; 100 ± 10 pulses per in. (3.9 ± 0.39 pulses per mm) of travel

Electrical requirements

- ▶ Line voltage: 90 to 240 volts AC, RMS
- ▶ Frequency: 47 to 63 hertz, single phase
- ▶ Power: 50 watts maximum, not including monitor power

ADB power requirements

- ▶ Maximum power draw for all ADB devices: 200 milliamps (a maximum of three ADB devices, daisy-chained to the port, is recommended)
- ▶ Mouse draws 80 milliamps.
- ▶ Keyboard draws 25 milliamps.

Size and weight

Main unit:

- ▶ Height: 3.0 in. (7.7 cm)
- ▶ Width: 12.2 in. (31.0 cm)
- ▶ Depth: 15.0 in. (38.2 cm)
- ▶ Weight: 8.8 lb (4.0 kg)

Mouse:

- ▶ Height: 1.1 in. (2.8 cm)
- ▶ Width: 2.1 in. (5.3 cm)
- ▶ Depth: 3.8 in. (9.7 cm)
- ▶ Weight: 6 oz. (.17 kg)

Keyboard:

- ▶ Height: 1.8 in. (4.4 cm)
- ▶ Width: 16.5 in. (41.8 cm)
- ▶ Depth: 5.6 in. (14.2 cm)
- ▶ Weight: 2 lb. (1 kg)

Operating environment

- ▶ Operating temperature: 50° F to 104° F (10° C to 40° C)
- ▶ Storage temperature: -40° F to 116.6° F (-40° C to 47° C)
- ▶ Relative humidity: 20% to 80%, noncondensing
- ▶ Maximum altitude: 10,000 ft (3,048 m)

Ordering Information

Macintosh LC

Order No. M0442LL/A

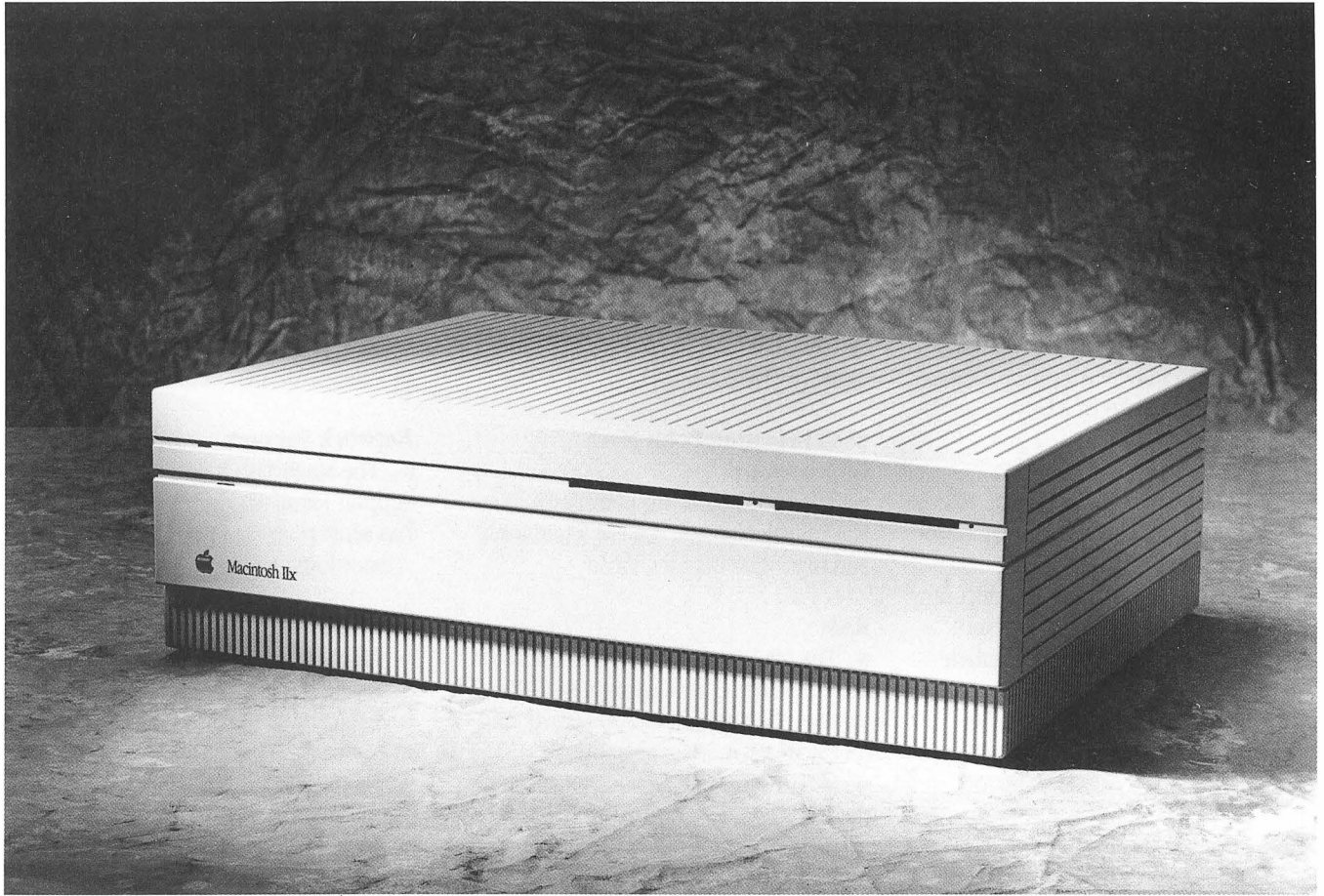
With your order, you'll receive:

- ▶ Macintosh LC personal computer with 2 megabytes of RAM, built-in 1.4-megabyte Apple SuperDrive floppy disk drive, and internal 40-megabyte hard disk drive
- ▶ Keyboard
- ▶ Mouse
- ▶ Complete setup, learning, and reference documentation
- ▶ System software and HyperCard software
- ▶ Training disks
- ▶ Limited warranty statement

Apple Computer, Inc.

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Overview

The Macintosh® IIfx is ideal for people who require maximum expandability, disk storage capacity, and the flexibility of a modular Macintosh personal computer system.

The performance of the Macintosh IIfx results primarily from its advanced 68030 microprocessor. And to accelerate the processing of complex math functions, the Macintosh IIfx comes standard with a 68882 coprocessor.

To meet the demands of the growing number of powerful Macintosh applications available today, the memory of the Macintosh IIfx can be expanded incrementally to 8 megabytes of RAM.

And virtually any type of Macintosh IIfx configuration can be created, because the system includes six internal NuBus™ expansion slots to add cards (such as additional network interfaces), as well as six external ports to accommodate peripherals (such as hard disks and printers) and LocalTalk™ network connections. The Macintosh IIfx also offers advanced color and gray-scale graphics capabilities, and can be used with a wide range of monitors.

For floppy disk storage, the Macintosh IIfx uses the unique 1.4-megabyte Apple® FDHD™

SuperDrive™, which allows it to read from and write to not only 3.5-inch Macintosh floppy disks, but also the 3.5-inch disks used in many other types of personal computers. An internal Apple hard disk—with up to 160 megabytes of capacity—can also be installed, as well as a second SuperDrive.

The Macintosh IIfx is compatible with virtually all Macintosh applications, and comes standard with Apple's MultiFinder™ operating system and HyperCard®, a tool for custom software solutions.

Features

Benefits

- ▶ Full 32-bit 68030 microprocessor with built-in Paged Memory Management Unit (PMMU)

- ▶ Offers power, performance, and high-speed processing.
- ▶ Supports multitasking operating systems (such as Apple's A/UX[®]) that require memory management capabilities in order to run.

- ▶ 68882 floating-point coprocessor

- ▶ Offers fast processing of complex mathematical functions, such as logarithmic and trigonometric series.

- ▶ Six NuBus expansion slots

- ▶ Lets you configure your system to meet specific needs.
- ▶ Makes it easy to add a variety of cards. (Cards are self-configuring—they require no DIP switches, and can be placed in any slot.)
- ▶ Provides flexibility for expansion as your requirements change and new technology becomes available.

- ▶ Apple FDHD SuperDrive
— A second SuperDrive can be installed.

- ▶ Provides 75 percent more storage capacity than 800K disk drives.
- ▶ Allows you to conveniently transfer data files between Macintosh, OS/2, MS-DOS, and Apple II systems on the same 3.5-inch disk, using the Apple File Exchange utility.

- ▶ Internal hard disk storage

- ▶ Accommodates either 5.25- or 3.5-inch hard disk drives (higher-capacity hard disk drives typically become available first in the 5.25-inch size).

- ▶ Choice of monitors (sold separately):
— Apple High-Resolution Monochrome Monitor
— AppleColor[™] High-Resolution RGB Monitor
— Apple Two-Page Monochrome Monitor
— Apple Macintosh Portrait Display

- ▶ Lets you choose the monitor you need—from high-quality RGB monitors with vivid colors to monochrome monitors that offer the crispness and clarity traditionally associated with Macintosh.

- ▶ Six built-in ports: two serial, two Apple Desktop Bus,[™] one SCSI, one sound

- ▶ Lets you expand your system with popular peripherals without using expansion slots.
- ▶ Provides access to LocalTalk cable-based networks, which allows you to connect your Macintosh IIx to other computers and to LaserWriter[®] printers through the AppleTalk[®] network system.
- ▶ Provides connection for Apple Desktop Bus devices such as a keyboard, hand-controlled pointing device (such as a mouse or trackball), or graphics tablet.
- ▶ Supports up to seven SCSI peripherals.

Features

- ▶ 1 megabyte of on-board RAM, expandable to 8 megabytes

- ▶ 256K of ROM on SIMM (Single In-line Memory Module), including:
 - Hierarchical File System
 - Drivers for Macintosh hard disk drives, NuBus expansion slots, Apple Desktop Bus, 68882 floating-point coprocessor, SCSI, and AppleTalk network
 - Color QuickDraw™

- ▶ Macintosh user interface: mouse, icons, windows, and pull-down menus

- ▶ MultiFinder operating system software

- ▶ Software compatibility

- ▶ Apple stereo sound chip

- ▶ Choice of keyboards (sold separately):
 - Apple Keyboard
 - Apple Extended Keyboard

Benefits

- ▶ Provides the flexibility to grow as you need additional memory.
- ▶ Lets you work with large amounts of data, such as large spreadsheets, large scanned images, and sound editing files.
- ▶ Lets you open multiple applications concurrently under MultiFinder.

- ▶ The SIMM mounting makes it easy to remove and replace ROM for more convenient configuration and servicing.
- ▶ The Hierarchical File System organizes storage for documents and allows easy access to files.
- ▶ The SCSI interface supports high-performance peripherals.
- ▶ QuickDraw and Color QuickDraw enable Macintosh applications to offer a consistent interface throughout the Macintosh family and enable color systems to display 256 colors or shades of gray simultaneously.

- ▶ Makes most applications intuitive and easy to learn.
- ▶ Provides a consistent interface across applications.
- ▶ Reduces training and support costs.

- ▶ Allows multiple applications to be opened concurrently.
- ▶ Lets you easily integrate information from multiple applications by cutting and pasting between them.
- ▶ Allows you to continue working with applications while performing tasks in the background, such as print spooling or downloading remote files.

- ▶ Runs virtually all Macintosh software, including applications designed to take advantage of floating-point coprocessors.

- ▶ Provides high-quality digital sound.
- ▶ Offers compatibility with all applications that use Macintosh sound.

- ▶ Apple Keyboard includes numeric keypad and cursor keys for efficient operation.
- ▶ Apple Extended Keyboard also includes 15 function keys, letting you work effectively with alternate operating systems, terminal-emulation programs, and other data communications applications.

Product Details

System Configuration

- ▶ Five configurations are available:
 - The Macintosh IIx CPU includes the 68030 microprocessor, 68882 floating-point coprocessor, 1 megabyte of RAM, one 1.4-megabyte floppy disk drive, and mouse.
 - The Macintosh IIx 1/40 CPU includes all of the features of the Macintosh IIx CPU, plus a 40-megabyte internal hard disk drive.
 - The Macintosh IIx 4/80 CPU includes all of the features of the Macintosh IIx, except that it has 4 megabytes of RAM and an 80-megabyte hard disk drive.
 - The Macintosh IIx 4/160 CPU includes all of the features of the Macintosh IIx, except that it has 4 megabytes of RAM and a 160-megabyte hard disk drive.
 - The Macintosh IIx also comes preconfigured with A/UX on a system that has 4 megabytes of RAM and an 80-megabyte hard disk.
- ▶ The keyboard, monitor, and other peripheral devices are packaged and sold separately.

NuBus Expansion Slots

- ▶ NuBus provides a multiplexed 32-bit address bus and data bus on a single 96-pin connector.
- ▶ NuBus is self-configuring: Cards can be plugged into any slot and the system will automatically identify and configure each card, without any DIP switches or jumper wires.
- ▶ The NuBus architecture supports data transfer rates of up to 37.5 megabytes per second.

68030 Processor

- ▶ The 32-bit 68030 processor runs at 15.667 megahertz.
- ▶ The 32-bit address bus provides a total addressable space of 4 gigabytes.
- ▶ Separate instruction and data caches provide significantly faster processing.
- ▶ Built-in PMMU supports virtual, shared, and protected memory in operating systems that have been designed for it (such as Apple's A/UX).

68882 Floating-Point Math Coprocessor

- ▶ The 68882 performs complex mathematical calculations, such as logarithmic and trigonometric functions.

RAM

- ▶ The Macintosh IIx can be upgraded incrementally to 8 megabytes of RAM through the addition of 1-megabyte or 4-megabyte memory expansion kits.
- ▶ When denser chips become available, the Macintosh IIx can be upgraded to 32 megabytes of RAM.

SCSI (Small Computer Systems Interface)

- ▶ SCSI is a high-performance interface for connecting the Macintosh IIx to hard disks and other peripherals, such as the Apple Scanner, AppleCD SC™ CD-ROM drive, and other devices. Up to seven SCSI peripherals (including an internal hard disk) can be connected.
- ▶ SCSI provides data transfer rates of up to 1 megabyte per second.

Network Support

- ▶ The Macintosh IIx provides full ROM support for all AppleTalk protocols, and has serial ports for LocalTalk network connections.

Operating System Software

- ▶ Macintosh system software includes:
 - System Tools Version 6.0.3 or greater (the Macintosh operating system)
 - Printer disk (the printer drivers for all Apple printers)
 - Utility disks, which include utilities such as Apple File Exchange, HD SC Setup, CloseView, Disk First Aid™, and the Font/DA Mover
- ▶ HyperCard is included.
- ▶ A/UX Version 1.1 (or greater) is compatible with the Macintosh IIx.

Technical Specifications

Processor

- ▶ 68030; 32-bit internal Harvard architecture
- ▶ 15.667-megahertz clock speed
- ▶ 256-byte instruction and data caches

Coprocessor

- ▶ 68882 floating-point coprocessor (IEEE standard—80 bits precision)
- ▶ 15.667-megahertz clock speed

Interfaces

- ▶ Six NuBus internal slots support full 32-bit address and data buses
- ▶ Two mini-8 serial (RS-232/RS-422) ports
- ▶ Two Apple Desktop Bus ports allow daisy-chaining of multiple peripheral devices
- ▶ SCSI interface: uses a 50-pin connector (internal) and a DB-25 connector (external)
- ▶ Sound jack for stereo output

Mouse

- ▶ Mechanical tracking; optical shaft encoding at 3.94 ± 0.39 pulses per mm (100 ± 10 pulses per inch) of travel

Sound generator

- ▶ Apple's custom digital sound chip provides 8-bit stereo sampling at 44.1 kilohertz, and includes four-voice wave-table synthesis. Capable of driving stereo headphones or other stereo equipment through the sound jack.

Electrical requirements

- ▶ Line voltage: 100 to 240 volts AC, automatically configured
- ▶ Frequency: 48 to 62 Hz
- ▶ Maximum power: 230 watts, not including monitor power

Size and weight

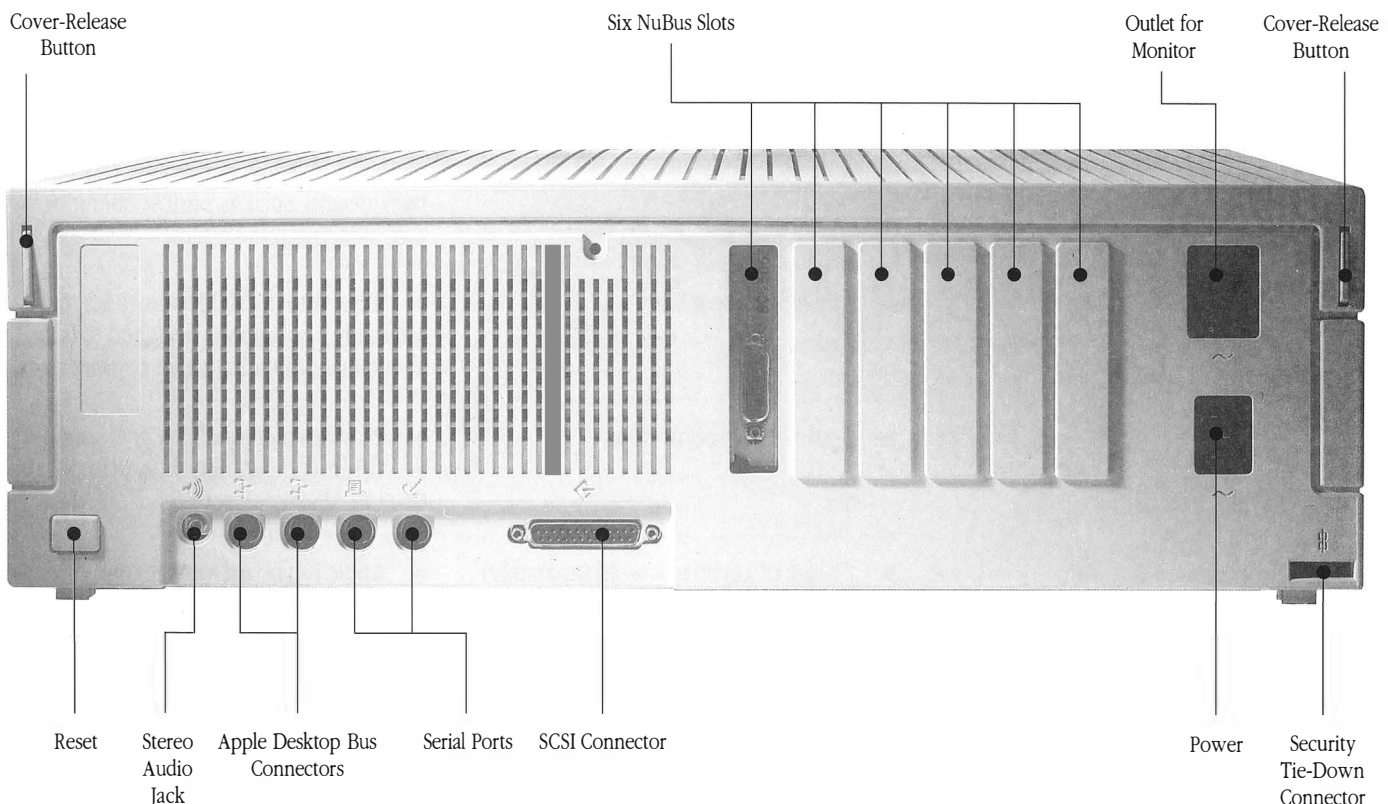
Main unit

- ▶ Height: 5.5 in. (14.0 cm)
- ▶ Width: 18.7 in. (47.4 cm)
- ▶ Depth: 14.4 in. (36.5 cm)
- ▶ Weight: 24 lb. (10.9 kg)*

*Weight will be more if hard disk drive is installed.

Mouse

- ▶ Height: 1.1 in. (2.8 cm)
- ▶ Width: 2.1 in. (5.3 cm)
- ▶ Depth: 3.8 in. (9.7 cm)
- ▶ Weight: 6 oz. (.17 kg)





Macintosh IIx

Ordering Information

Macintosh IIx CPU
Order No. M5790

With your order, you'll receive:
▶ Macintosh IIx personal computer with 1 megabyte of RAM and a built-in 1.4-megabyte floppy disk drive

- ▶ Mouse
- ▶ Owner's guide
- ▶ System software and HyperCard
- ▶ Training disks (2)
- ▶ Limited warranty statement

Macintosh IIx 1/40 CPU
Order No. M5810

With your order, you'll receive:
▶ Macintosh IIx personal computer with 1 megabyte of RAM, a built-in 1.4-megabyte floppy disk drive, and a 40-megabyte hard disk drive

- ▶ Mouse
- ▶ Owner's guide
- ▶ System software and HyperCard
- ▶ Training disks (2)
- ▶ Limited warranty statement

Macintosh IIx 4/80 CPU
Order No. M5830

With your order, you'll receive:
▶ Macintosh IIx personal computer with 4 megabytes of RAM, a built-in 1.4-megabyte floppy disk drive, and an 80-megabyte hard disk drive

- ▶ Mouse
- ▶ Owner's guide
- ▶ System software and HyperCard
- ▶ Training disks (2)
- ▶ Limited warranty statement

Macintosh IIx 4/160 CPU
Order No. M5860

With your order, you'll receive:
▶ Macintosh IIx personal computer with 4 megabytes of RAM, a built-in 1.4-megabyte floppy disk drive, and a 160-megabyte hard disk drive

- ▶ Mouse
- ▶ Owner's guide
- ▶ System software and HyperCard
- ▶ Training disks (2)
- ▶ Limited warranty statement

Macintosh IIx A/UX CPU
Order No. B0002LL/A

With your order, you'll receive:
▶ Macintosh IIx personal computer with 4 megabytes of RAM, a built-in 1.4-megabyte floppy disk drive, and an 80-megabyte hard disk drive with A/UX installed

- ▶ Mouse
- ▶ Owner's guide
- ▶ System software and HyperCard
- ▶ Training disks (2)
- ▶ Limited warranty statement

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M6022/B



Overview

The Macintosh® SE/30 personal computer was designed for people who want maximum performance from a compact computer system. It provides up to four times the computational speed of the Macintosh SE, while continuing to offer the benefits that characterize all Macintosh computers: a consistent user interface and intuitive design that make Macintosh easy to learn and use. The Macintosh SE/30 runs virtually all current versions of Macintosh software. And, like the Macintosh SE, it features a small footprint, easy setup, and transportability.

The performance increase of the Macintosh SE/30 derives

from the full 32-bit 68030 microprocessor. The 68030 runs at twice the clock speed of the 68000 microprocessor used in the Macintosh SE. And twice as much data can be moved at a time because its external data bus is twice as wide as that of the 68000. The Macintosh SE/30 also includes a 68882 floating-point coprocessor for faster processing of complex math functions—up to 100 times faster than the Macintosh SE.

The Macintosh SE/30 uses the new Apple® FDHD™ drive, a high-capacity 3.5-inch floppy disk drive capable of reading 400K, 800K, and 1.4-megabyte Macintosh disks. In addition, the

FDHD lets users read from and write to MS-DOS, OS/2, and ProDOS® formatted disks through the Apple File Exchange utility. This combination of capabilities makes the Macintosh SE/30 an excellent choice for use in multivendor environments.

Expansion options for the Macintosh SE/30 can be accommodated through the 030 Direct Slot. Via the 030 Direct Slot, the Macintosh SE/30 can accept communications cards, such as Ethernet and Token Ring cards, as well as high-performance video cards that support large gray-scale and color monitors.

Features

Benefits

▶ 32-bit 68030 microprocessor (operating at 16 megahertz) with instruction and data caches, and built-in Paged Memory Management Unit (PMMU)

▶ Executes applications at up to four times the speed of the 68000-based Macintosh SE.
▶ Provides hardware support for advanced, multitasking operating systems.

▶ 68882 floating-point coprocessor (operating at 16 megahertz)

▶ Provides fast processing of complex mathematical functions (such as logarithmic or trigonometric calculations) often used in spreadsheets and high-end graphics and statistics applications.

▶ Macintosh user interface: mouse, icons, windows, and pull-down menus

▶ Makes most applications intuitive and easy to learn.
▶ Provides a consistent interface across applications.
▶ Reduces training and support costs.

▶ Compact design with high-resolution 9-inch screen

▶ Offers an affordable, compact system that requires little desk space and is easy to set up and transport.

▶ Apple FDHD Internal Drive

▶ Provides almost twice the storage capacity of existing 800K disks (1.4 megabytes).
▶ Allows you to conveniently transfer data files between Macintosh, MS-DOS, OS/2, and Apple II systems using the Apple File Exchange software.
▶ Offers compatibility with existing 800K and 400K Macintosh disks.

▶ MultiFinder™ operating system

▶ Lets you easily integrate information from multiple applications by cutting and pasting.
▶ Lets you move quickly and easily between applications.
▶ Allows you to continue working with applications while performing some tasks in the background, such as print spooling to an Apple LaserWriter® printer or downloading remote files.

▶ Macintosh software compatibility

▶ Runs virtually all current versions of Macintosh SE and Macintosh II software, including applications designed to take advantage of the 68882 floating-point coprocessor.

▶ 030 Direct Slot

▶ Allows you to customize your system with high-performance expansion cards, including video cards for external color and gray-scale monitors, special memory cards, communications cards, and digital signal processing cards.

Features

Benefits

-
- ▶ 030 Direct Slot access port
-
- ▶ 1 or 4 megabytes of RAM, expandable to 8 megabytes
-
- ▶ Apple Sound Chip
-
- ▶ 256K of ROM on a SIMM (Single In-line Memory Module), including:
 - Hierarchical File System
 - Drivers for Macintosh hard disks, Apple Desktop Bus, 68882 floating-point coprocessor, SCSI, and AppleTalk® network
 - Macintosh Toolbox
 - QuickDraw™ and Color QuickDraw
-
- ▶ Seven built-in ports (one SCSI, one disk drive, two serial, two Apple Desktop Bus, one stereo sound)
-
- ▶ Choice of keyboards (sold separately):
 - Apple Keyboard
 - Apple Extended Keyboard
-
- ▶ Provides an easy way to connect external devices to 030 Direct Slot cards.
-
- ▶ Lets you run multiple applications concurrently under Apple's MultiFinder operating system.
 - ▶ Lets you work with large amounts of data, such as large spreadsheets, scanned images, and sound files.
 - ▶ Provides the flexibility to grow as you need additional memory.
-
- ▶ Provides high-quality, four-voice stereo sound.
 - ▶ Offers compatibility with all applications that use Macintosh sound.
-
- ▶ The SIMM mounting makes it easy to remove and replace ROMs for more convenient servicing.
 - ▶ The Hierarchical File System organizes storage for documents and allows easy access to files.
 - ▶ The SCSI interface supports high-performance peripherals.
 - ▶ QuickDraw provides the consistent interface throughout the Macintosh family.
 - ▶ Color QuickDraw provides a consistent interface for both black-and-white and color applications.
-
- ▶ Makes it easy to expand your system with additional peripherals.
 - ▶ Provides access to LocalTalk™ cable-based networks, allowing you to connect the Macintosh SE/30 to other computers and to LaserWriter printers through the AppleTalk Network System.
 - ▶ Supports up to seven high-speed SCSI peripherals.
 - ▶ Provides connections for Apple Desktop Bus™ devices, such as a keyboard, hand-controlled pointing device (such as a mouse or trackball), or graphics tablet.
-
- ▶ Apple Keyboard includes a numeric keypad and cursor keys for efficient operation.
 - ▶ Apple Extended Keyboard also includes 15 function keys, letting you work effectively with alternate operating systems, terminal-emulation programs, and other data communications applications.

Product Details

System Configuration

- ▶ Three configurations are available:
 - The Macintosh SE/30 CPU includes the main unit, 1 megabyte of RAM, one 1.4-megabyte FDHD floppy disk drive, and mouse.
 - The Macintosh SE/30 Hard Disk 40 CPU includes the main unit, 1 megabyte of RAM, an internal 40-megabyte hard disk, one 1.4-megabyte FDHD floppy disk drive, and mouse.
 - The Macintosh SE/30 Hard Disk 80 CPU includes the main unit, 4 megabytes of RAM, an internal 80-megabyte hard disk, one 1.4-megabyte FDHD floppy disk drive, and mouse.
- The keyboard and other peripheral devices are packaged and sold separately.

030 Direct Slot

- ▶ The 030 Direct Slot provides a 32-bit slot directly connected to the microprocessor bus that will support one high-performance expansion card. (Note: The slot is not compatible with SE-Bus expansion cards or Macintosh II expansion cards.)

RAM

- ▶ The Macintosh SE/30 CPU and the Macintosh SE/30 Hard Disk 40 CPU with 1 megabyte of RAM can be upgraded to 2 megabytes of RAM with a 1-megabyte Memory Expansion Kit, 5 megabytes of RAM with two 2-megabyte Memory Expansion Kits, or 8 megabytes of RAM with four 2-megabyte Memory Expansion Kits.
- ▶ The Macintosh SE/30 Hard Disk 80 CPU with 4 megabytes of RAM can be upgraded to 8 megabytes of RAM with two 2-megabyte Memory Expansion Kits.

Stereo Sound

- ▶ The Apple Sound Chip provides four-voice, wave-table synthesis and a stereo sampling generator capable of mixing left and right channels for the internal speaker or providing full stereo sound output through a miniature stereo phone plug.

SCSI (Small Computer Systems Interface)

- ▶ Up to seven SCSI peripherals (including an internal hard disk) can be connected to the Macintosh SE/30.
- ▶ SCSI provides data transfer rates of up to 1 megabyte per second.

Network Support

- ▶ The Macintosh SE/30 serial ports provide full support for LocalTalk network connections.
- ▶ The Macintosh SE/30 provides full ROM support for all AppleTalk protocols.

Operating System Software

- ▶ Macintosh System software includes:
 - System Tools 6.0.3 or higher (the Macintosh operating system) and Finder 6.1 or higher
 - Printer disk (the printer drivers for all

Apple printers)

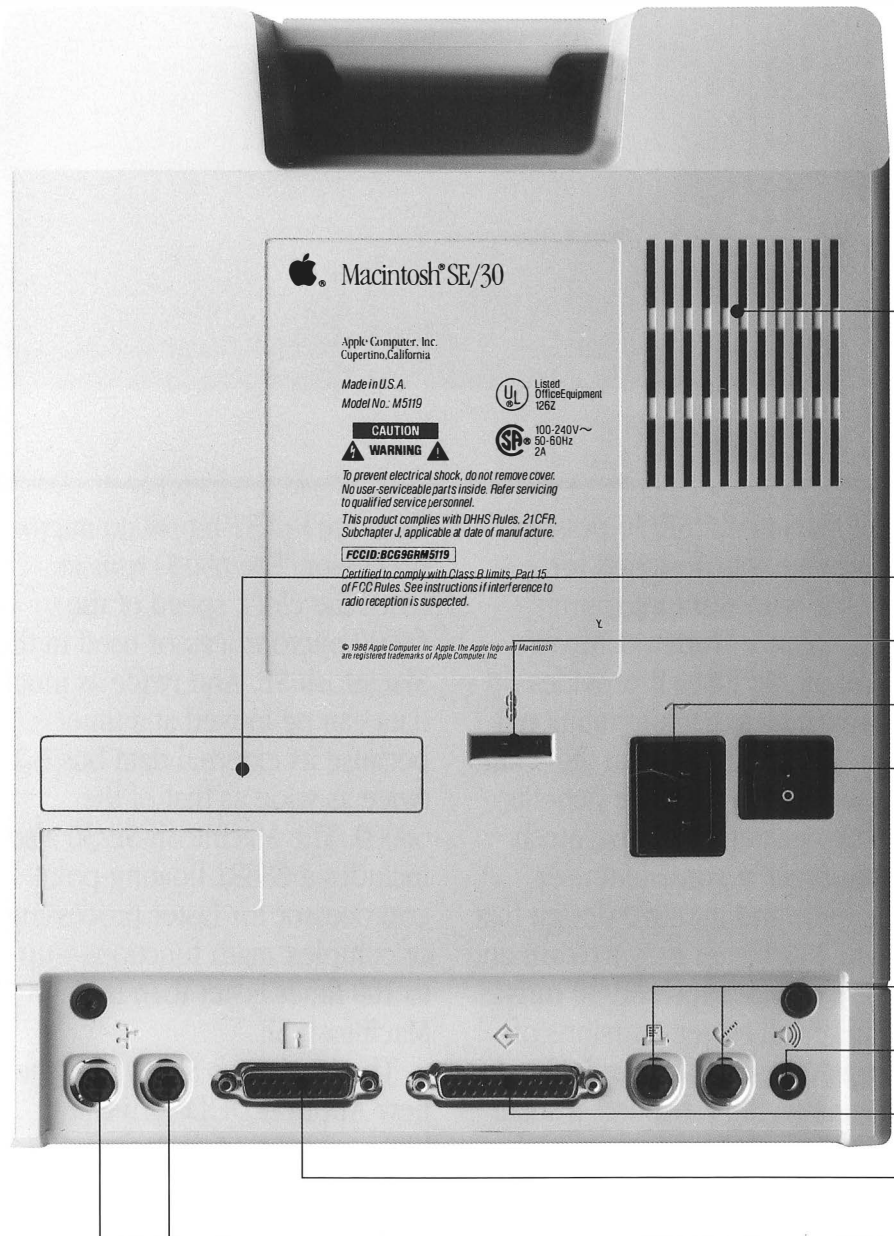
- Utility disks, which include utilities such as Apple File Exchange, HD SC Setup, Disk First Aid, and Font/DA Mover

HyperCard

- ▶ Apple's HyperCard® software (version 1.2 or higher) and manual are included.

Upgrade Path for Current Macintosh SE Computer Owners

- ▶ An upgrade is available for the standard 68000-based Macintosh SE.



Technical Specifications

Processor

- ▶ MC68030 32-bit internal Harvard architecture
- ▶ 15.667-megahertz clock frequency
- ▶ Built-in Paged Memory Management Unit (PMMU)
- ▶ 256-byte instruction and data caches

Coprocessor

- ▶ MC68882 floating-point unit (follows IEEE standards)

Memory

- ▶ 1 or 4 megabytes of RAM, expandable to 8 megabytes (expandable to 128 megabytes when SIMMs with higher-density DRAM chips become available; additionally expandable through 030 Direct Slot)
- ▶ 256K of ROM
- ▶ 256 bytes of user-settable parameter memory

Disk storage

- ▶ 1.4-megabyte high-density floppy disk drive (external floppy disk drive optional)
- ▶ Optional internal 40- or 80-megabyte Apple SCSI hard disk (external SCSI hard disks optional)

Video display

- ▶ Built-in 9-inch diagonal, high-resolution, 512- by 342-pixel bit-mapped display
- ▶ Color QuickDraw in ROM provides support for gray-scale and color video cards installed in the 030 Direct Slot

Interfaces

- ▶ Two Apple Desktop Bus connectors for communication with keyboard, mouse, and other input devices over low-speed, synchronous serial bus
- ▶ 030 Direct Slot supporting full 32-bit address and data lines through 120-pin Euro-DIN connector
- ▶ Two RS-232/RS-422 serial ports, 230.4 kilobaud maximum (up to 0.920 megabit per second if clocked externally)
- ▶ SCSI interface
- ▶ Stereo sound port for external audio amplifier

Sound generator

- ▶ Apple Sound Chip (ASC) including four-voice, wave-table synthesis and stereo sampling generator capable of driving stereo mini-phone-jack headphones or other stereo equipment
- ▶ Mixed stereo monophonic sound output through internal speaker

Clock/Calendar

- ▶ CMOS custom chip with long-life lithium battery

Keyboards (not included)

- ▶ Apple Keyboard
- ▶ Apple Extended Keyboard

Mouse

- ▶ Apple Desktop Bus mouse with mechanical tracking; optical shaft or contact encoding at 3.94 ± 0.39 pulse per mm (100 ± 10 pulses per inch) of travel

Fan

- ▶ 10 CFM radial

Electrical requirements

- ▶ Line voltage: 120 to 240 volts AC, RMS automatically configured
- ▶ Frequency: 48 to 62 Hz, single phase
- ▶ Maximum power: 75 watts

Size and weight

Main Unit

- ▶ Height: 13.6 in. (34.5 cm)
- ▶ Width: 9.6 in. (24.4 cm)
- ▶ Depth: 10.9 in. (27.6 cm)
- ▶ Weight: 21.5 lb. (9.75 kg)

Mouse

- ▶ Height: 1.1 in. (2.8 cm)
- ▶ Width: 2.1 in. (5.3 cm)
- ▶ Depth: 3.8 in. (9.7 cm)
- ▶ Weight: 6 oz. (.17 kg)

▶ Fan Outlet

▶ Accessory Access Port

▶ Security Connector

▶ Power

▶ On/Off Switch

▶ Serial Ports

▶ Audio Jack

▶ SCSI Connector

▶ External Drive Port

▶ Apple Desktop Bus Connectors



Macintosh SE/30

Ordering Information

Macintosh SE/30 CPU
(1 megabyte of RAM)

Order No. M5392

With your order, you'll receive:

- ▶ Macintosh SE/30 personal computer with 1 megabyte of RAM and a built-in 1.4-megabyte FDHD drive
- ▶ Mouse
- ▶ Owner's guide
- ▶ System software and HyperCard software
- ▶ Guided Tour disk
- ▶ Limited warranty statement

**Macintosh SE/30
Hard Disk 40 CPU**
(1 megabyte of RAM)

Order No. M5390

With your order, you'll receive:

- ▶ Macintosh SE/30 personal computer with 1 megabyte of RAM, a built-in 1.4-megabyte FDHD drive, and an internal 40-megabyte SCSI hard disk drive
- ▶ Mouse
- ▶ Owner's guide
- ▶ System software and HyperCard software
- ▶ Guided Tour disk
- ▶ Limited warranty statement

**Macintosh SE/30
Hard Disk 80 CPU**
(4 megabytes of RAM)

Order No. M5361

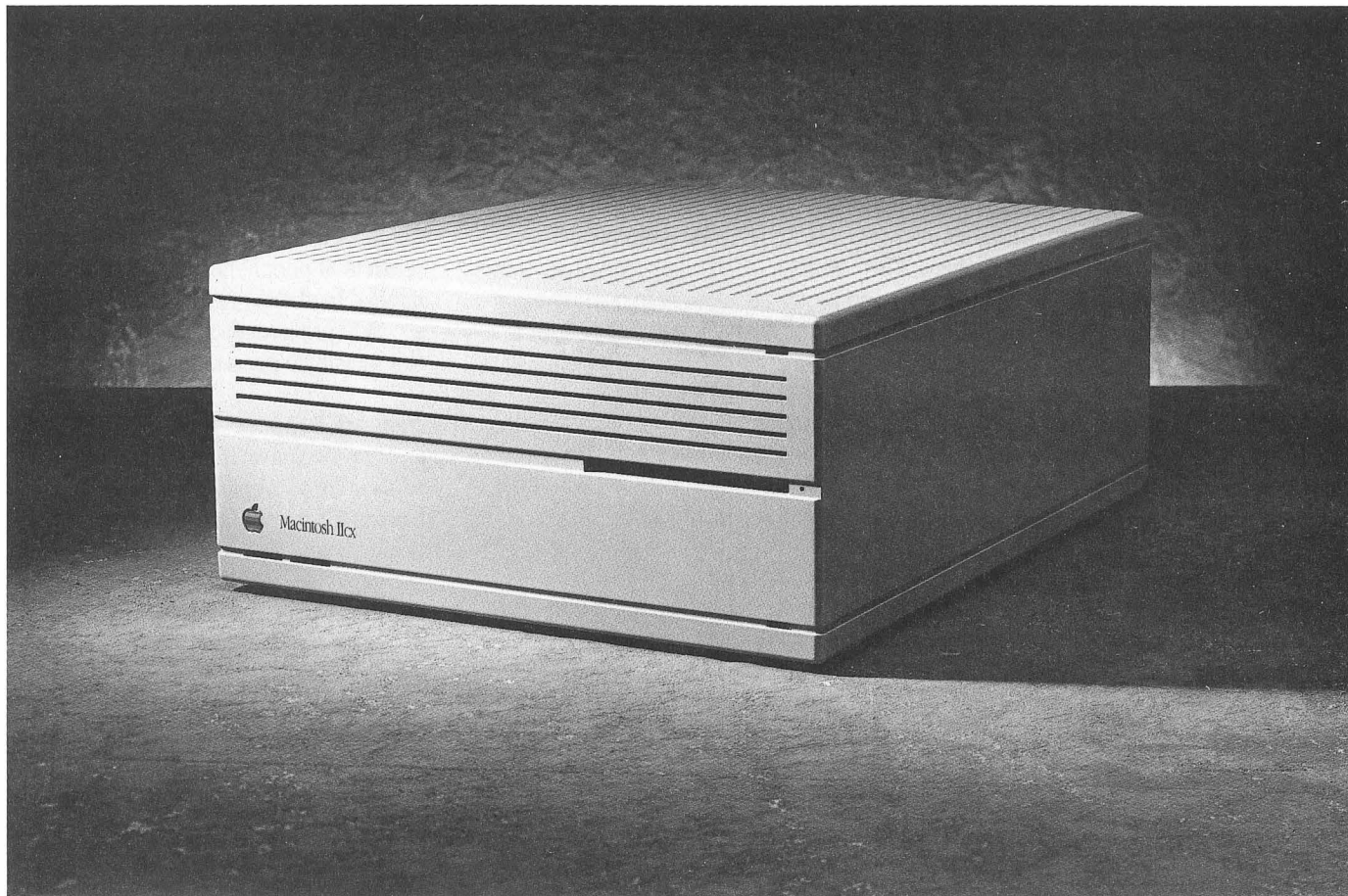
With your order, you'll receive:

- ▶ Macintosh SE/30 personal computer with 4 megabytes of RAM, a built-in 1.4-megabyte FDHD drive, and an internal 80-megabyte SCSI hard disk drive
- ▶ Mouse
- ▶ Owner's guide
- ▶ System software and HyperCard software
- ▶ Guided Tour disk
- ▶ Limited warranty statement

Apple Computer, Inc.

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January 1989. Product specifications are subject to change without notice.
M0032LL/B



Overview

The Macintosh® IIcx personal computer is designed for people who want the performance, functionality, and flexibility of the modular Macintosh product line in a system with a small footprint. Its versatile design allows it to be used in either a vertical or horizontal orientation—which means the Macintosh IIcx can be placed upright next to a monitor, underneath it, or on a shelf or other support nearby.

In terms of performance, the advanced 68030 microprocessor used in the Macintosh IIcx offers high-speed program execution. And to accelerate the processing of complex math functions, the Macintosh IIcx comes standard with a 68882 coprocessor.

To meet the growing demands of the advanced Macintosh applications available today, the memory of the Macintosh IIcx can be expanded incrementally to 8 megabytes of RAM. And virtually any type of Macintosh IIcx configuration can be created, because the system includes three internal NuBus™ expansion slots to add cards (such as additional network interfaces), as well as seven external ports to accommodate peripherals (such as hard disks and printers) and LocalTalk™ network connections. The Macintosh IIcx also offers advanced color and gray-scale graphics capabilities, and can be used with a range of monitors.

For floppy disk storage, the Macintosh IIcx uses the unique 1.4-megabyte Apple® FDHD™ SuperDrive™, which allows it to read from and write to not only 3.5-inch Macintosh floppy disks, but also the 3.5-inch disks used in many other types of personal computers. An internal hard disk can also be installed, and a second floppy disk drive can be connected externally.

The Macintosh IIcx is compatible with virtually all Macintosh applications, and comes standard with Apple's MultiFinder™ operating system and HyperCard®, a tool for custom software solutions.

Features

Benefits

▶ Full 32-bit 68030 microprocessor with built-in Paged Memory Management Unit (PMMU)

▶ Offers power, performance, and high-speed processing.
▶ Supports multitasking operating systems (such as Apple's A/UX®) that require memory management capabilities in order to run.

▶ 68882 floating-point coprocessor

▶ Offers fast processing of complex mathematical functions, such as logarithmic and trigonometric series.

▶ Three NuBus expansion slots

▶ Lets you configure your system to meet specific needs.
▶ Makes it easy to add a variety of cards. (Cards are self-configuring—they require no DIP switches, and can be placed in any slot.)
▶ Provides flexibility for expansion as your requirements change and new technology becomes available.

▶ Unique industrial design

—Small footprint
—Locking power switch

▶ Can be used in either horizontal or vertical orientation.
▶ Takes up little desktop space.
▶ Allows system to restart automatically in the event of a power failure; for example, when used as a file server.

▶ Apple FDHD SuperDrive

▶ Provides 75 percent more storage capacity than 800K disk drives.
▶ Allows you to conveniently transfer data files between Macintosh, OS/2, MS-DOS, and Apple II systems on the same 3.5-inch disk, using the Apple File Exchange utility.

▶ Internal hard disk storage

▶ Accommodates a 3.5-inch hard disk drive (several capacities are available).

▶ Choice of monitors (sold separately):

—Apple High-Resolution Monochrome Monitor
—AppleColor™ High-Resolution RGB Monitor
—Apple Two-Page Monochrome Monitor
—Apple Macintosh Portrait Display

▶ Lets you choose the monitor you need—from high-quality RGB monitors with vivid colors to monochrome monitors that offer the crispness and clarity traditionally associated with Macintosh.

▶ Seven built-in ports: two serial, two Apple Desktop Bus,™ one SCSI, one DB-19 serial (for external floppy disk drive), one sound

▶ Allows you to expand your system with popular peripherals without using expansion slots.
▶ Provides access to LocalTalk cable-based networks, which allows you to connect a Macintosh IIcx to other computers and to LaserWriter® printers through the AppleTalk® network system.
▶ Provides connection for Apple Desktop Bus devices such as a keyboard, hand-controlled pointing device (such as a mouse or trackball), or graphics tablet.
▶ Supports up to seven SCSI peripherals.

Features

Benefits

▶ 1 megabyte of on-board RAM, expandable to 8 megabytes

- ▶ Provides the flexibility to grow as you need additional memory.
- ▶ Lets you work with large amounts of data, such as large spreadsheets, large scanned images, and sound editing files.
- ▶ Enables you to open multiple applications concurrently under MultiFinder.

▶ 256K of ROM, including:
—Hierarchical File System
—Drivers for Macintosh hard disk drives, NuBus expansion slots, Apple Desktop Bus, 68882 floating-point coprocessor, SCSI, and AppleTalk network
—Color QuickDraw™

- ▶ The Hierarchical File System organizes storage for documents and allows easy access to files.
- ▶ The SCSI interface supports high-performance peripherals.
- ▶ QuickDraw and Color QuickDraw enable Macintosh applications to offer a consistent interface throughout the Macintosh family and enable color systems to display 256 colors or shades of gray simultaneously.

▶ Socket for ROMs on SIMM (Single In-Line Memory Module)

- ▶ Makes it easy to install SIMM-mounted ROM when upgrading or servicing.

▶ Macintosh user interface: mouse, icons, windows, and pull-down menus

- ▶ Makes most applications intuitive and easy to learn.
- ▶ Provides a consistent interface across applications.
- ▶ Reduces training and support costs.

▶ MultiFinder operating system software

- ▶ Allows multiple applications to be opened concurrently.
- ▶ Lets you easily integrate information from multiple applications by cutting and pasting between them.
- ▶ Allows you to continue working with applications while performing tasks in the background, such as print spooling or downloading remote files.

▶ Software compatibility

- ▶ Runs virtually all Macintosh software, including applications designed to take advantage of floating-point coprocessors.

▶ Apple stereo sound chip

- ▶ Provides high-quality digital sound.
- ▶ Offers compatibility with all applications that use Macintosh sound.

▶ Choice of keyboards (sold separately):
—Apple Keyboard
—Apple Extended Keyboard

- ▶ Apple Keyboard includes numeric keypad and cursor keys for efficient operation.
- ▶ Apple Extended Keyboard also includes 15 function keys, letting you work effectively with alternate operating systems, terminal-emulation programs, and other data communications applications.

Product Details

System Configuration

- ▶ Four configurations are available:
 - The Macintosh IIcx CPU includes the 68030 microprocessor, 68882 floating-point coprocessor, 1 megabyte of RAM, one 1.4-megabyte floppy disk drive, and mouse.
 - The Macintosh IIcx 1/40 CPU includes all of the features of the Macintosh IIcx, plus a 40-megabyte hard disk drive.
 - The Macintosh IIcx 4/80 CPU includes all of the features of the Macintosh IIcx, except that it has 4 megabytes of RAM and an 80-megabyte hard disk drive.
 - The Macintosh IIcx also comes with A/UX preconfigured on a system that has 4 megabytes of RAM and an 80-megabyte hard disk.
- ▶ The keyboard, monitor, and other peripheral devices are packaged and sold separately.

NuBus Expansion Slots

- ▶ NuBus provides a multiplexed 32-bit address bus and data bus on a single 96-pin connector.
- ▶ NuBus is self-configuring: Cards can be plugged into any slot and the system will automatically identify and configure each card, without any DIP switches or jumper wires.
- ▶ The NuBus architecture supports data transfer rates of up to 37.5 megabytes per second.

68030 Processor

- ▶ The 32-bit 68030 processor runs at 15.667 megahertz.
- ▶ The 32-bit address bus provides a total addressable space of 4 gigabytes.
- ▶ Separate instruction and data caches provide significantly faster processing.
- ▶ Built-in PMMU supports virtual, shared, and protected memory in operating systems that have been designed for it.

68882 Floating-Point Math Coprocessor

- ▶ The 68882 performs complex mathematical calculations, such as logarithmic and trigonometric functions.

RAM

- ▶ The Macintosh IIcx can be upgraded incrementally to 8 megabytes of RAM through the addition of 1-megabyte or 4-megabyte memory expansion kits.
- ▶ When denser chips become available, the Macintosh IIcx can be upgraded to 32 megabytes of RAM.

SCSI (Small Computer Systems Interface)

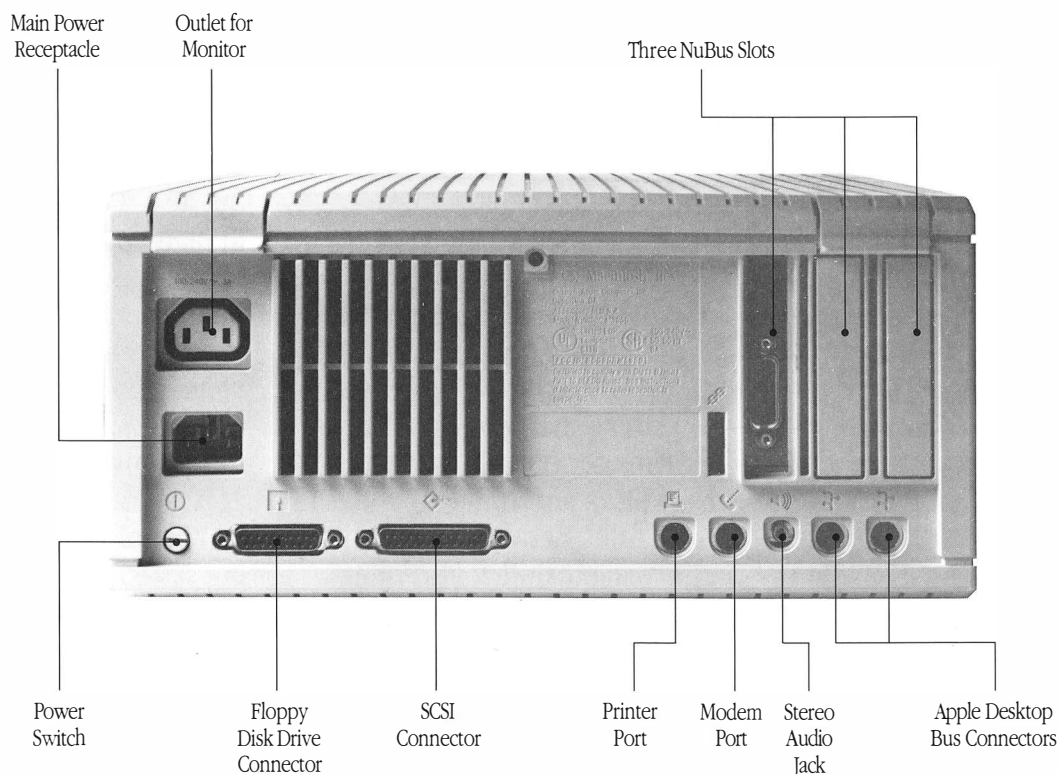
- ▶ SCSI is a high-performance interface for connecting the Macintosh IIcx to hard disks and other peripherals, such as the LaserWriter IIsc, Apple Scanner, AppleCD SC™ CD-ROM drive, and other devices. Up to seven SCSI peripherals (including an internal hard disk) can be connected.
- ▶ SCSI provides data transfer rates of up to 1 megabyte per second.

Network Support

- ▶ The Macintosh IIcx provides full ROM support for all AppleTalk protocols, and has serial ports for LocalTalk network connections.

Operating System Software

- ▶ Macintosh system software includes:
 - System Tools Version 6.0.3 or greater (the Macintosh operating system)
 - Printer disk (the printer drivers for all Apple printers)
 - Utility disks, which include utilities such as Apple File Exchange, HD SC Setup, CloseView, Disk First Aid™, and the Font/DA Mover
- ▶ HyperCard is included.
- ▶ A/UX Version 1.1 (or greater) is compatible with the Macintosh IIcx.



Technical Specifications

Processor

- ▶ 68030; 32-bit internal Harvard architecture
- ▶ 15.667-megahertz clock speed
- ▶ 256-byte instruction and data caches

Coprocessor

- ▶ 68882 floating-point coprocessor (IEEE standard—80 bits precision)

Interfaces

- ▶ Three NuBus internal slots support full 32-bit address and data buses
- ▶ Two mini-8 serial (RS-232/RS-422) ports
- ▶ Two Apple Desktop Bus ports allow daisy-chaining of multiple peripheral devices
- ▶ SCSI interface: uses a 50-pin connector (internal) and a DB-25 connector (external)
- ▶ One DB-19 serial port for connecting external floppy disk drives
- ▶ Sound jack

Mouse

- ▶ Mechanical tracking; optical shaft encoding at 3.94 ± 0.39 pulses per mm (100 ± 10 pulses per inch) of travel

Sound generator

- ▶ Apple's custom digital sound chip provides 8-bit stereo sampling at 44.1 kilohertz, and includes four-voice wave-table synthesis. Capable of driving stereo headphones or other stereo equipment through the sound jack.

Electrical requirements

- ▶ Line voltage: 100 to 240 volts AC, automatically configured
- ▶ Frequency: 50 to 60 Hz, single phase
- ▶ Maximum power: 90 watts, not including monitor power

Size and weight

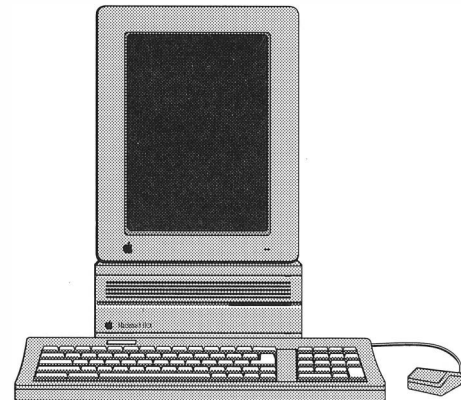
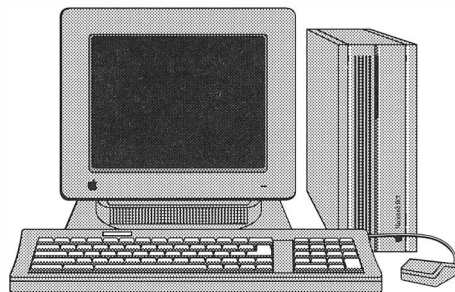
Main unit

- ▶ Height: 5.5 in. (14.0 cm)
- ▶ Width: 11.9 in. (30.2 cm)
- ▶ Depth: 14.4 in. (36.5 cm)
- ▶ Weight: 14 lb. (6.4 kg)*

*Weight will be less if no hard disk drive is installed.

Mouse

- ▶ Height: 1.1 in. (2.8 cm)
- ▶ Width: 2.1 in. (5.3 cm)
- ▶ Depth: 3.8 in. (9.7 cm)
- ▶ Weight: 6 oz. (.17 kg)



The versatile design of the Macintosh IIcx allows it to be used in either a vertical or horizontal orientation.



Macintosh IIcx

Ordering Information**Macintosh IIcx CPU**

Order No. M5660

With your order, you'll receive:

- ▶ Macintosh IIcx personal computer with 1 megabyte of RAM and a built-in 1.4-megabyte floppy disk drive
 - ▶ Mouse
 - ▶ Owner's guide
 - ▶ System software and HyperCard
 - ▶ Training disks (2)
 - ▶ Limited warranty statement
-

Macintosh IIcx 1/40 CPU

Order No. M5610

With your order, you'll receive:

- ▶ Macintosh IIcx personal computer with 1 megabyte of RAM, a built-in 1.4-megabyte floppy disk drive, and a 40-megabyte hard disk drive
 - ▶ Mouse
 - ▶ Owner's guide
 - ▶ System software and HyperCard
 - ▶ Training disks (2)
 - ▶ Limited warranty statement
-

Macintosh IIcx 4/80 CPU

Order No. M5680

With your order, you'll receive:

- ▶ Macintosh IIcx personal computer with 4 megabytes of RAM, a built-in 1.4-megabyte floppy disk drive, and an 80-megabyte hard disk drive
 - ▶ Mouse
 - ▶ Owner's guide
 - ▶ System software and HyperCard
 - ▶ Training disks (2)
 - ▶ Limited warranty statement
-

Macintosh IIcx A/UX CPU

Order No. M5690

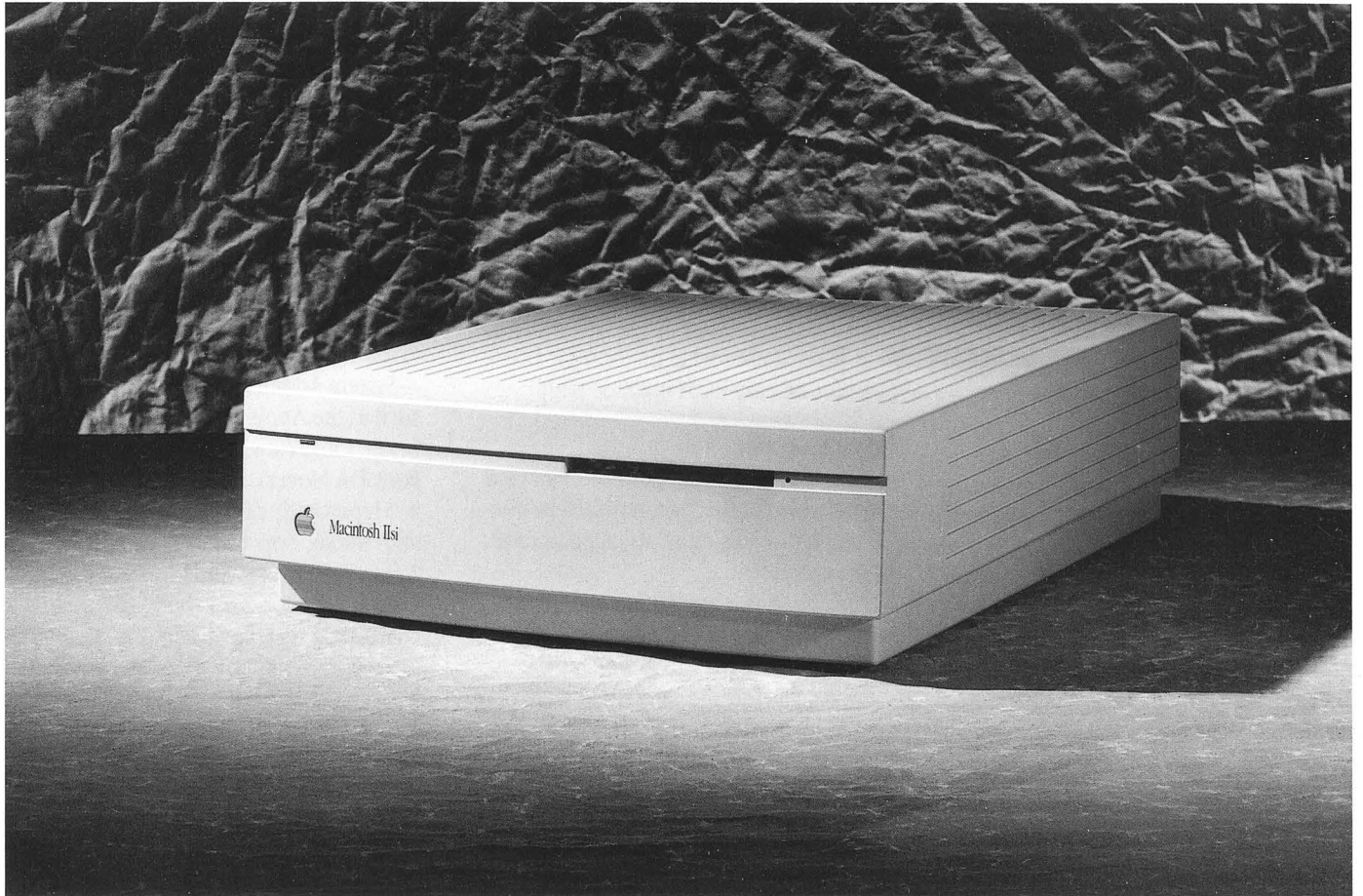
With your order, you'll receive:

- ▶ Macintosh IIcx personal computer with 4 megabytes of RAM, a built-in 1.4-megabyte floppy disk drive, and an 80-megabyte hard disk drive with A/UX installed
- ▶ Mouse
- ▶ Owner's guide
- ▶ System software and HyperCard
- ▶ Training disks (2)
- ▶ Limited warranty statement

Apple Computer, Inc.

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M0066L1/B



Overview

The Apple® Macintosh® IIsi is the lowest-cost member of the Macintosh II line, Apple Computer's most powerful line of Macintosh personal computers. Offering high performance and a wide range of expansion and video options, the Macintosh IIsi is ideal for people who need a powerful but very affordable Macintosh system that can easily grow with their needs over time.

Like other Macintosh II systems, the Macintosh IIsi offers excellent performance. At the heart of the Macintosh IIsi is a 20-megahertz 68030 microprocessor that lets you run Macintosh applications up to five times faster than the Macintosh Classic®. The 68030 microprocessor also lets you work under A/UX®, Apple's implementation of the AT&T UNIX® operating system. And with future versions of Macintosh system software, the 68030 microprocessor will allow you to run more applications with the same

amount of dynamic random-access memory (DRAM) through a new feature, virtual memory.

The Macintosh IIsi comes with built-in support for four Apple monitors as well as third-party monitors, so you can choose the monitor that best suits your needs—then simply plug it in. In addition, by adding a video expansion card, you can use any other Apple or third-party monitor with the Macintosh IIsi.

The Macintosh IIsi can be easily expanded to incorporate new capabilities or increase system performance. An internal expansion slot for either a NuBus™ card or an 030 Direct Slot card allows you to add one of hundreds of high-performance expansion cards that are available today for communications, video, coprocessing, and other uses. An optional floating-point math coprocessor also can be added to speed mathematical calculations generated by applications such as CAD/CAM and sophisticated graphics. And eight external ports allow you to connect popular peripheral equipment

such as printers, scanners, and CD-ROM disc drives, as well as access the built-in networking capabilities found in all Macintosh computers.

One exciting new Macintosh advancement incorporated into the Macintosh IIsi is sound input. The Macintosh IIsi comes with a microphone and phono jack adapter, which let you input your voice into documents, presentations, and even electronic mail messages.

Best of all, the Macintosh IIsi provides all of the important benefits for which the Macintosh is known—powerful technology that's easy to use, thousands of applications that work well together, "plug-and-play" compatibility, and the assurance that all Macintosh components will work together smoothly.

And since the Macintosh IIsi has been designed to run the next generation of innovative Macintosh applications—those supported by system software version 7.0—the value of the Macintosh IIsi will last, and even improve, over time.

Features

Benefits

▶ 68030 microprocessor, running at 20 megahertz
—Built-in Memory Management Unit (MMU)

▶ Delivers high-speed system performance and enables the Macintosh IIx to run applications up to five times faster than the Macintosh Classic.
▶ Supports A/UX, Apple's implementation of the AT&T UNIX operating system.
▶ Will support the virtual memory feature in future system software versions.

▶ Optional 68882 floating-point math coprocessor, running at 20 megahertz

▶ Provides fast processing of mathematical calculations generated by applications such as CAD/CAM and sophisticated graphics packages.

▶ Multiple monitor options including:
—Built-in video support for four Apple monitors: Macintosh 12" RGB Display, AppleColor™ High-Resolution RGB Monitor, Macintosh 12" Monochrome Display, and Apple Macintosh Portrait Display
—Support for other Apple or third-party monitor that requires a video expansion card

▶ Lets you choose from the most popular Apple displays, both color and monochrome.
▶ Eliminates the need for a separate video card or special driver software.
▶ Lets you work with up to 256 colors or shades of gray simultaneously on the Macintosh 12" RGB Display and the AppleColor High-Resolution RGB Monitor, up to 256 shades of gray with the Macintosh 12" Monochrome Display, and up to 16 shades of gray with the Apple Macintosh Portrait Display.
▶ Lets you work with the monitor that best suits your needs—including monitors that produce photographic-quality color.

▶ One internal expansion slot for either a NuBus card or an 030 Direct Slot card

▶ Lets you incorporate new capabilities or increase system performance by adding an expansion card for communications, graphics, emulation, and more.
▶ Lets you add one of hundreds of NuBus cards that are already available for all other Macintosh II systems.
▶ Lets you add one of the many 030 Direct Slot cards that are available for the Macintosh SE/30 personal computer.

▶ Sound input

▶ Allows you to add voice comments to voice-capable word processing, spreadsheet, presentations, and other documents.

▶ Apple SuperDrive™ (1.4-megabyte floppy disk drive)

▶ Allows convenient transfer of data files between Macintosh, OS/2, MS-DOS, and Apple II systems.
▶ Provides almost twice the storage capacity of 800K disk drives.

▶ 40- or 80-megabyte internal hard disk drive

▶ Provides ample storage capacity for files and applications.

Features

Benefits

-
- | | |
|---|--|
| <ul style="list-style-type: none">▶ Eight built-in ports:<ul style="list-style-type: none">—One SCSI port—One Apple Desktop Bus™ (ADB) port—External disk drive port—Two serial ports—One sound-in port—One sound-out port—One video port | <ul style="list-style-type: none">▶ Provide support for up to seven popular peripherals such as CD-ROM drives, scanners, and printers.▶ Permit communication with the keyboard, mouse, and other devices.▶ Support either an external 800K or 1.4-megabyte Apple SuperDrive floppy disk drive.▶ Provide access to LocalTalk® cable-based networks, which allow you to connect Macintosh IIsi systems to other computers and to LaserWriter® printers through the AppleTalk® network system.▶ Support sound input via microphone or phono jack adapter.▶ Supply high-quality, four-voice digital sound output that is compatible with all applications that use Macintosh sound.▶ Provide connection to all monitors supported by the Macintosh IIsi computer's built-in monitor support. |
| <hr/> <ul style="list-style-type: none">▶ 1 megabyte of on-board RAM, expandable to 17 megabytes | <ul style="list-style-type: none">▶ Lets you work with large amounts of data, such as large spreadsheets, scanned images, and sound files. |
| <hr/> <ul style="list-style-type: none">▶ 512K of ROM, including support for:<ul style="list-style-type: none">—32-bit addressing—Hierarchical File System—32-Bit QuickDraw™—Sound input | <ul style="list-style-type: none">▶ Enables future 32-bit versions of the Macintosh Operating System to address up to 4 gigabytes of memory.▶ Organizes document storage and allows easy access to files.▶ Enables color systems to display up to 16 million colors simultaneously. |
| <hr/> <ul style="list-style-type: none">▶ Choice of keyboards (sold separately)<ul style="list-style-type: none">—Apple Keyboard—Apple Extended Keyboard | <ul style="list-style-type: none">▶ Apple Keyboard includes a numeric keypad and cursor keys.▶ Apple Extended Keyboard also includes 15 function keys, letting you work effectively with alternate operating systems, terminal-emulation programs, and other data communications applications. |
| <hr/> <ul style="list-style-type: none">▶ Macintosh user interface, including mouse, icons, windows, and pull-down menus | <ul style="list-style-type: none">▶ Makes most applications intuitive and easy to learn.▶ Reduces training and support costs.▶ Provides a consistent user interface across applications. |
| <hr/> <ul style="list-style-type: none">▶ MultiFinder® operating system | <ul style="list-style-type: none">▶ Allows multiple applications to be opened concurrently.▶ Lets you easily cut and paste parts of documents from one application to another.▶ Allows background tasks to be run while you interact with applications in the foreground. |
| <hr/> <ul style="list-style-type: none">▶ Software compatibility | <ul style="list-style-type: none">▶ Lets you run virtually all Macintosh software. |

Product Details

68030 microprocessor

- ▶ The 68030 microprocessor runs at 20 megahertz and features a built-in Memory Management Unit (MMU). The MMU supports the A/UX operating system and provides the capabilities necessary to support virtual memory, a new feature of Macintosh system software version 7.0. Virtual memory lets you work with more applications without the need for large amounts of DRAM by setting up sections on the hard disk for easy memory swapping.
- ▶ 256-byte data and instruction caches accelerate overall system performance by eliminating one wait state that occurs with the 68020 processor.

68882 math coprocessor (optional)

- ▶ Customers who work routinely with software such as sophisticated CAD/CAM and graphics applications may want to add the Motorola 68882 floating-point math coprocessor to their systems. The 68882 optimizes the computer's performance during math-intensive calculations.

RAM configurations

- ▶ The Macintosh IIsi comes with 1 megabyte of RAM on the main logic board. Up to 16 megabytes of RAM can be added by installing Single In-line Memory Modules (SIMMs). Some possible configurations include:
 - 2 megabytes (1 megabyte on main logic board; four 256K SIMMs)
 - 3 megabytes (1 megabyte on main logic board; four 512K SIMMs)

- 5 megabytes (1 megabyte on main logic board; four 1-megabyte SIMMs)
- 9 megabytes (1 megabyte on main logic board; four 2-megabyte SIMMs)
- 17 megabytes (1 megabyte on main logic board; four 4-megabyte SIMMs)
- ▶ The Macintosh IIsi uses 100-nano-second (or faster) fast-paged mode RAM.

ROM

- ▶ A ROM SIMM socket on the logic board provides an easy ROM upgrade path.

Expansion slot

- ▶ One NuBus card or 030 Direct Slot card can be added to the Macintosh IIsi by connecting it to a Macintosh IIsi adapter card (sold separately).
- ▶ NuBus provides a multiplexed, 32-bit address bus and data bus on a single 96-pin connector. The NuBus architecture supports data transfer rates up to 3.75 megabytes per second.
- ▶ The 030 Direct Slot provides a 32-bit slot directly to the microprocessor via a 120-pin connector. This slot is compatible with expansion cards available for the Macintosh SE/30 personal computer.
- ▶ The Motorola 68882 floating-point math coprocessor is on the adapter cards.

SCSI

- ▶ SCSI (Small Computer System Interface) is a high-performance interface bus used to connect hard disks and other SCSI-based devices, such as the AppleCD SC® CD-ROM drive, the Apple Scanner, and the Apple Personal LaserWriter® to the Macintosh IIsi. This single interface can support up to seven SCSI peripheral devices.

Network support

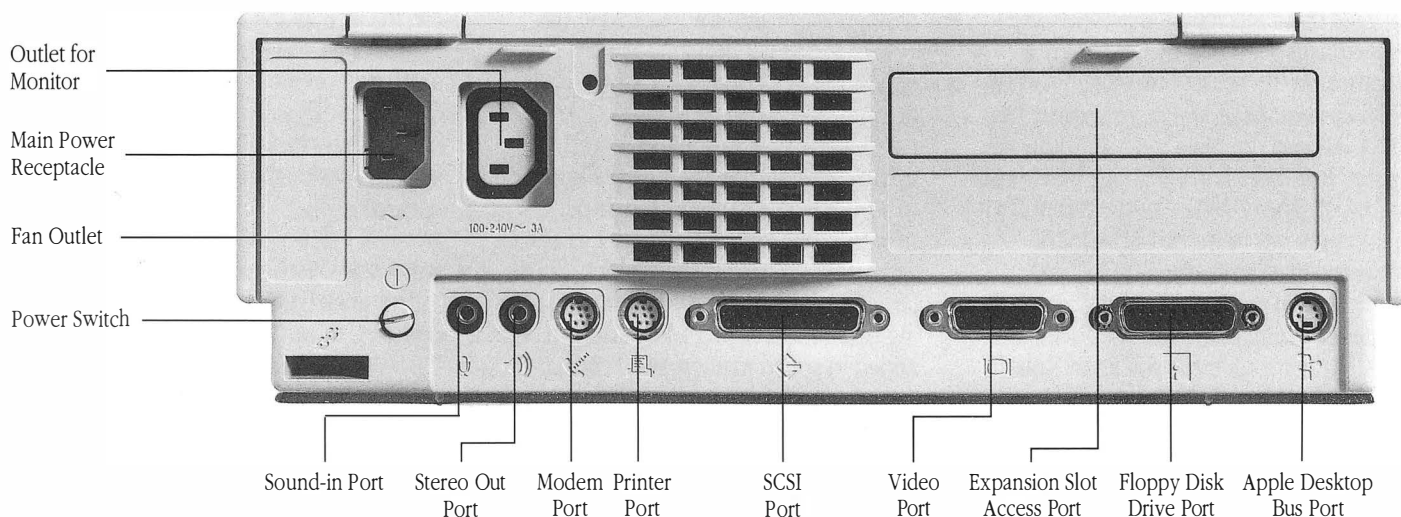
- ▶ The Macintosh IIsi provides full ROM support for all AppleTalk protocols, and includes built-in serial ports for LocalTalk network connections.

Operating system support

- ▶ Macintosh system software includes:
 - System software version 6.0.6 or later (the Macintosh Operating System) with System Startup disk.
 - System Additions disk (includes utilities such as the Apple File Exchange, HD SC Setup, CloseView, Disk First Aid™, and Font/DA Mover).
- ▶ HyperCard® 2.0 Home, Addresses with Audio, Appointments with Audio, Audio Palette, and Audio Help stacks.
- ▶ A/UX version 2.0.1 (optional) is compatible with the Macintosh IIsi.

Sound input

- ▶ The Macintosh IIsi has been designed to accept and process sound as well as generate it. Using a microphone or phono jack adapter, and appropriate software, you can speak into the computer to create electronic voice messages and add voice comments to files. Sound entering the computer is monaural, 8-bit sound. It is filtered through a custom filter/pre-amplifier chip, converted to digital form, and stored in DRAM or directly on the hard disk.
- ▶ An Apple electret microphone and phono jack adapter are included.



Technical Specifications

Microprocessor

- ▶ MC68030, 32-bit architecture (includes built-in Memory Management Unit)
- ▶ 20-megahertz clock speed
- ▶ Two 256-byte, built-in instruction and data caches

Coprocessor (optional)

- ▶ MC68882 floating-point math coprocessor
- ▶ 20-megahertz clock speed (IEEE standard 80-bits precision)

Memory

- ▶ 1 megabyte of on-board RAM, expandable to 17 megabytes
- ▶ 512K of ROM, with ROM SIMM access for future upgrades
- ▶ 256 bytes of parameter memory

Disk drives

- ▶ Built-in Apple SuperDrive 1.4-megabyte floppy disk drive (optional external 1.4-megabyte or 800K disk drive available)
- ▶ Internal Apple SCSI hard disk drive (1/3 height, 40 or 80 megabytes)
- ▶ Optional external Apple SCSI hard disk (many capacities available)

Monitors

- ▶ Supports four Apple color and monochrome monitors as well as some third-party monitors, including:
 - Macintosh 12" RGB Display: up to 256 colors, 512 by 384 pixels
 - AppleColor High-Resolution RGB Monitor: up to 256 colors, 640 by 480 pixels
 - Macintosh 12" Monochrome Display: up to 256 shades of gray, 640 by 480 pixels
 - Apple Macintosh Portrait Display: up to 16 shades of gray, 640 by 870 pixels
- ▶ When equipped with a video expansion card, supports other Apple and non-Apple monitors; see your authorized Apple dealers for details.

Interfaces

- ▶ One Apple Desktop Bus (ADB) port, supporting a keyboard, mouse, and other devices daisy-chained through a low-speed, synchronous serial bus (a maximum of three chained devices is recommended)
- ▶ One DB-15 video port, supporting color and monochrome monitors of various sizes and resolution
- ▶ Two serial (RS-232/RS-422) ports, 230 kilobits per second maximum (up to 0.920 megabits per second if clocked externally)

- ▶ SCSI interface using a 50-pin internal connector and a DB-25 connector for the first external device; all subsequent SCSI-based peripheral devices use standard SCSI-to-SCSI interface cables
- ▶ Internal expansion slot, supporting a NuBus or an 030 Direct Slot expansion card
- ▶ External 3.5-inch floppy disk drive (800K or 1.4-megabyte) interface
- ▶ Stereo sound output port for external audio devices
- ▶ Sound input port for monaural sound input

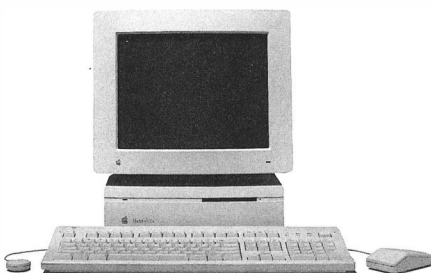
Sound input

- ▶ Monaural 8-bit sound
- ▶ Sound samples can be made at 22 or 11 kilohertz.
- ▶ Macintosh Audio Compression Expansion (MACE) sound utility supporting 3:1 or 6:1 compression, which allows up to 3 hours of sound to be stored on a single 40-megabyte hard disk

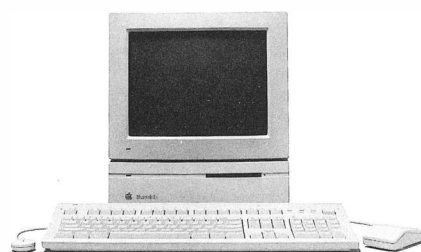
Microphone

- ▶ "Hands free" omnidirectional electret microphone

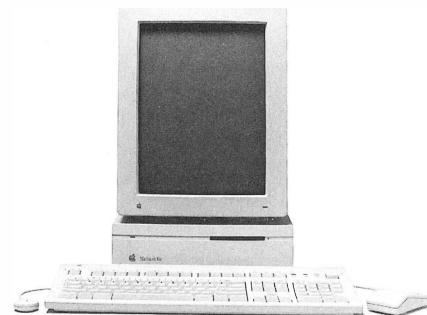
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Macintosh IIx with Apple Extended Keyboard, mouse, microphone, and 13-inch AppleColor High-Resolution RGB Monitor.



Macintosh IIx with Apple Extended Keyboard, mouse, microphone, and Macintosh 12" RGB Display or Macintosh 12" Monochrome Display.



Macintosh IIx with Apple Extended Keyboard, mouse, microphone, and Apple Portrait Display.



Macintosh IIsi

Technical Specifications (continued)

Sound generator

- ▶ Apple's custom digital sound chip provides 8-bit stereo sampling at 44.1 kilohertz, and includes four-voice wave-table synthesis—capable of driving stereo headphones or other stereo equipment through the sound jack.

Mouse

- ▶ Apple Desktop Bus Mouse; mechanical tracking: optical shaft or contact encoding; 100 ± 10 pulses per in. (3.9 ± 0.39 pulses per mm) of travel

Clock/calendar

- ▶ CMOS custom chip with long-life lithium battery

Electrical requirements

- ▶ Line voltage: 120 volts AC, RMS
- ▶ Frequency: 47 to 63 hertz, single phase
- ▶ Power: 100 watts maximum

ADB power requirements

- ▶ Maximum power draw for all ADB devices: 500 milliamps (a maximum of three ADB devices, daisy-chained to the port, is recommended)
- ▶ Mouse draws 80 milliamps.
- ▶ Keyboard draws 25 to 80 milliamps (varies with keyboard model used) (the practical total of ADB devices is three daisy-chained to the port).

Size and weight

Main unit:

- ▶ Height: 4 in. (10 cm)
- ▶ Width: 12.4 in. (31 cm)
- ▶ Depth: 14.9 in. (37.2 cm)
- ▶ Weight: 10 lb. (4.5 kg)

Mouse:

- ▶ Height: 1.1 inches (2.8 cm)
- ▶ Width: 2.1 inches (5.3 cm)
- ▶ Depth: 3.8 inches (9.7 cm)
- ▶ Weight: 6 ounces (.17 kg)

Operating environment

- ▶ Operating temperature: 50° F to 104° F (10° C to 40° C)
- ▶ Storage temperature: -40° F to 116.6° F (-40° C to 47° C)
- ▶ Relative humidity: 5% to 95%, noncondensing
- ▶ Maximum altitude: 10,000 ft (3048 m)

Ordering Information

Macintosh IIsi 2/40
Order No. M0363LL/A

With your order, you'll receive:

- ▶ Macintosh IIsi personal computer with 2 megabytes of RAM, built-in 1.4-megabyte Apple SuperDrive floppy disk drive, and internal 40-megabyte hard disk drive

- ▶ Mouse
- ▶ Microphone
- ▶ Complete setup, learning, and reference documentation
- ▶ System software and HyperCard software
- ▶ Training disks
- ▶ Limited warranty statement

Macintosh IIsi 5/80
Order No. M0364LL/A

With your order, you'll receive:

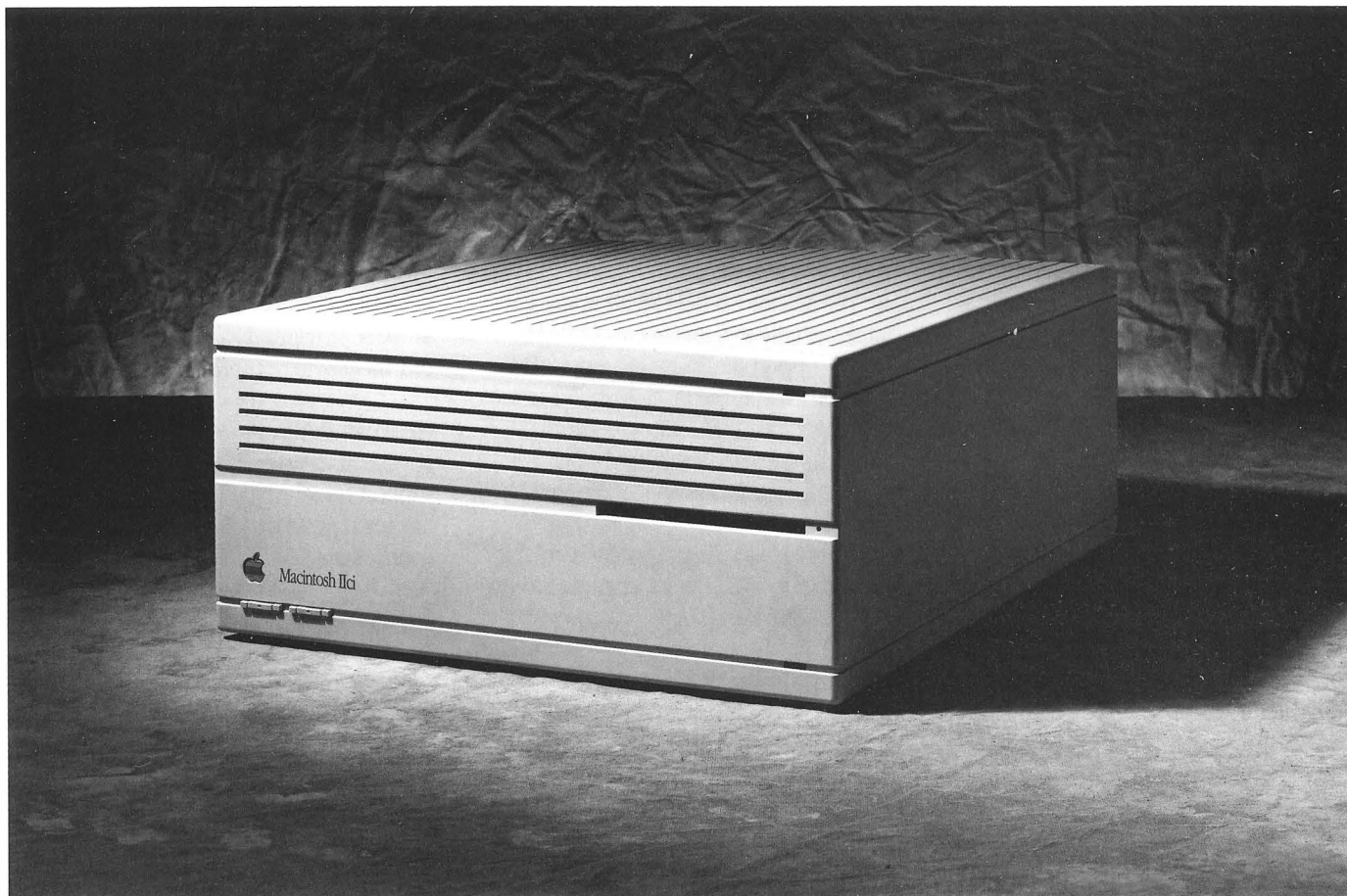
- ▶ Macintosh IIsi personal computer with 5 megabytes of RAM, built-in 1.4-megabyte Apple SuperDrive floppy disk drive, and internal 80-megabyte hard disk drive

- ▶ Mouse
- ▶ Microphone
- ▶ Complete setup, learning, and reference documentation
- ▶ System software and HyperCard software
- ▶ Training disks
- ▶ Limited warranty statement

Apple Computer, Inc.

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Overview

The Macintosh® IIfx personal computer offers high performance and enhanced functionality in a system with the same small footprint and flexible design as the Macintosh IIfx. People who require high-speed program execution for large spreadsheets, databases, and graphically intensive applications will appreciate the performance delivered by the Macintosh IIfx.

A 25-megahertz 68030 microprocessor makes the most significant contribution to the dramatic performance improvement offered by the Macintosh IIfx. Increasing the clock speed of the 68030 enables the system to perform up to 45 percent

faster than the Macintosh IIfx and Macintosh IIfx computers. To speed the processing of complex mathematical functions, a 68882 math coprocessor comes standard with the Macintosh IIfx.

By installing an optional cache memory card, users can improve system performance by an additional 20 percent to 30 percent, for an overall performance improvement of up to 75 percent over that of the Macintosh IIfx and IIfx.

The Macintosh IIfx also comes with built-in video capability that enables the system to display up to 256 colors or shades of gray simultaneously on a variety of Apple® color and gray-scale monitors.

The Macintosh IIfx includes three internal NuBus™ expansion slots, space for a 3.5-inch internal hard disk drive, seven standard external ports to accommodate peripherals, and the capability of expanding RAM to up to 8 megabytes. The Macintosh IIfx uses the 1.4-megabyte Apple FDHD™ SuperDrive™, which allows it to read from and write to 3.5-inch Macintosh floppy disks, as well as the 3.5-inch disks used by many other personal computers.

The Macintosh IIfx is compatible with virtually all Macintosh applications, and comes standard with Apple's MultiFinder™ operating system and HyperCard®, a tool for custom software solutions.

Features

Benefits

- ▶ Full 32-bit 68030 microprocessor, running at 25 megahertz
 - Built-in Paged Memory Management Unit (PMMU)
 - Burst mode RAM access capability

- ▶ Offers superior processing speed, power, and performance.
 - ▶ Supports multitasking operating systems (such as Apple's A/UX[®]) that require memory management capabilities in order to run.
 - ▶ Allows instructions and data to be read in fewer clock cycles than in the normal access mode, improving overall system performance.

- ▶ 68882 floating-point math coprocessor

- ▶ Provides fast processing of complex mathematical functions.

- ▶ Cache connector

- ▶ With installation of a high-speed cache memory card, provides 20 percent to 30 percent improvement in overall system performance.

- ▶ Built-in video support for the following Apple monitors:
 - 12-inch Apple High-Resolution Monochrome Monitor with up to 256 shades of gray
 - 13-inch AppleColor[™] High-Resolution RGB Monitor with up to 256 colors or shades of gray
 - 15-inch Apple Macintosh Portrait Display with up to 16 shades of gray

- ▶ Provides the flexibility to choose among three of Apple's most popular monitors.
 - ▶ Makes it easier to set up the system.
 - ▶ Enhances system expandability by freeing up the NuBus slot usually occupied by the video card.
 - ▶ Reduces system cost by eliminating the cost of a video card.

- ▶ Three NuBus expansion slots

- ▶ Lets you configure your system to meet specific needs.
 - ▶ Makes it easy to add a variety of cards. (Cards are self-configuring—they require no DIP switches, and can be placed in any slot.)

- ▶ Unique industrial design
 - Small footprint
 - Locking power switch

- ▶ Can be used in either a horizontal or a vertical orientation.
 - ▶ Takes up very little desktop space.
 - ▶ Allows the system to restart automatically in the event of a power failure.

- ▶ Apple FDHD SuperDrive

- ▶ Provides 75 percent more storage capacity than 800K disk drives.
 - ▶ Allows you to transfer data files conveniently between Macintosh, OS/2, MS-DOS, and Apple II systems on the same 3.5-inch disk, using the Apple File Exchange utility.

- ▶ Internal hard disk storage

- ▶ Accommodates a 3.5-inch hard disk drive (several capacities are available).

Features

Benefits

- ▶ Eight built-in ports:
 - Two serial ports
 - Two Apple Desktop Bus™ ports
 - One SCSI port
 - One DB-19 serial port (for an external floppy disk drive)
 - One DB-15 video port (for built-in video support)
 - One sound port

- ▶ Allows you to tailor your system to your needs with popular peripherals without using expansion slots.
- ▶ Provides access to LocalTalk™ networks, allowing you to connect your Macintosh IIci to other computers and to LaserWriter® printers through the AppleTalk® network system.
- ▶ Provides connection for Apple Desktop Bus devices such as a keyboard, mouse, trackball, or graphics tablet.
- ▶ Supports up to seven SCSI peripherals.
- ▶ Provides connection to built-in video.
- ▶ Supplies high-quality stereo sound to the stereo jack.

- ▶ 1 megabyte of on-board RAM, expandable to 8 megabytes

- ▶ Provides the flexibility to grow as you need additional memory.
- ▶ Enables you to open multiple applications concurrently under MultiFinder.

- ▶ Optional parity support

- ▶ With installation of optional parity RAM, provides memory-checking capability.

- ▶ 512K of ROM, including:
 - 32-bit addressing
 - Hierarchical File System
 - 32-bit Color QuickDraw™

- ▶ Enables future 32-bit versions of the Macintosh operating system to address up to 4 gigabytes of memory.
- ▶ Organizes document storage and allows easy access to files.
- ▶ Provides a consistent user interface throughout the Macintosh family and enables color systems to display up to 16 million colors simultaneously.

- ▶ Macintosh user interface, including mouse, icons, windows, and pull-down menus

- ▶ Makes most applications intuitive and easy to learn, reducing training and support costs.
- ▶ Provides a consistent user interface across applications.

- ▶ MultiFinder operating system

- ▶ Allows multiple applications to be opened concurrently.
- ▶ Lets you integrate information from multiple applications easily by cutting and pasting between them.
- ▶ Allows you to continue working with applications while performing certain tasks in the background.

- ▶ Software compatibility

- ▶ Allows you to run virtually all Macintosh software, including applications designed to take advantage of floating-point coprocessors.

- ▶ Apple Sound Chip

- ▶ Provides high-quality, four-voice digital sound.
- ▶ Is compatible with all applications that use Macintosh sound.

Product Details

68030 Processor

- ▶ The 32-bit 68030 microprocessor runs at 25 megahertz.
- ▶ The 32-bit address bus provides a total addressable space of 4 gigabytes.
- ▶ Separate instruction and data caches provide significantly faster processing.
- ▶ Built-in PMMU supports virtual, shared, and protected memory in operating systems that have been designed for it.
- ▶ Burst mode RAM access enables groups of instructions or data to be read in fewer clock cycles than are required in normal access mode.

Built-in Video

- ▶ The built-in video capabilities of the Macintosh IIci are made possible through the addition of three components to the logic board: the RBV (RAM-Based Video) chip, which functions as the video controller; a digital-to-analog converter (DAC); and a DB-15 external connector. The screen image is stored in a screen buffer located in main memory.

Optional Parity Support

- ▶ When ordering the Macintosh IIci, users can request a parity system. The system will be configured with a parity controller and parity RAM.

ROM

- ▶ The Macintosh IIci comes standard with 512K of ROM. In addition, a ROM SIMM socket located on the logic board will facilitate the installation of future versions of ROM as they become available.

RAM

- ▶ The Macintosh IIci can be upgraded incrementally to 8 megabytes of RAM.
- ▶ To support the 25-megahertz 68030 microprocessor, the Macintosh IIci utilizes very high-speed (80-nanosecond) RAM. Users can increase system memory capacity with Macintosh IIci Memory Expansion Kits.
- ▶ When denser chips become available, the Macintosh IIci can be upgraded to up to 32 megabytes of RAM.

NuBus Expansion Slots

- ▶ NuBus provides a multiplexed 32-bit address bus and data bus on a single 96-pin connector.
- ▶ NuBus is self-configuring: Cards can be plugged into any slot and the system will automatically identify and configure each card, without DIP switches or jumper wires.
- ▶ The NuBus architecture supports data transfer rates of up to 37.5 megabytes per second.

SCSI (Small Computer Systems Interface)

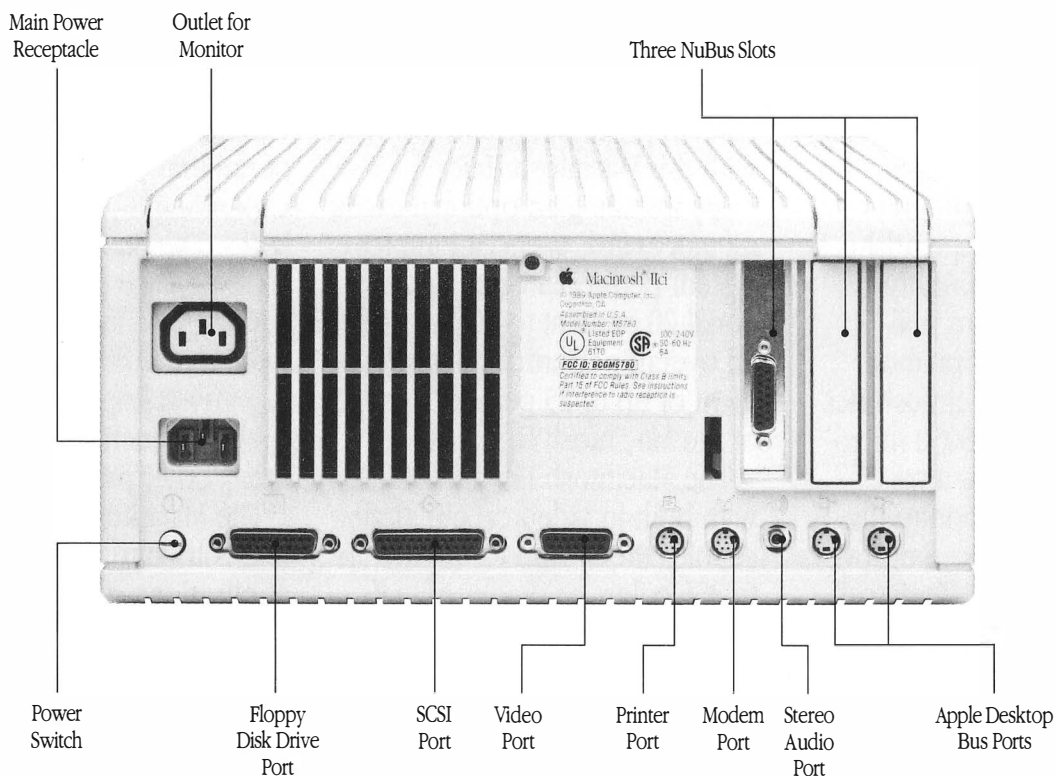
- ▶ SCSI is a high-performance interface for connecting the Macintosh IIci to hard disks and other peripherals, such as the Laser-Writer IIsc, Apple Scanner, AppleCD SC™ CD-ROM drive, and other devices. Up to seven SCSI peripherals (including an internal hard disk) can be connected.
- ▶ SCSI provides data transfer rates of up to 1 megabyte per second.

Network Support

- ▶ The Macintosh IIci provides full ROM support for all AppleTalk protocols, and has serial ports for LocalTalk network connections.

Operating System Software

- ▶ Macintosh system software includes:
 - System Tools Version 6.0.4 or greater (the Macintosh operating system)
 - Printer disk (printer drivers for all Apple printers)
 - Utilities disks (include utilities such as the Apple File Exchange, HD SC Setup, CloseView, Disk First Aid™, and Font/DA Mover)
- ▶ HyperCard Version 1.2.3 (or greater) is included.
- ▶ A/UX Version 1.1.1 (or greater) is compatible with the Macintosh IIci.



Technical Specifications

Processor

- ▶ 68030; 32-bit internal Harvard architecture
- ▶ 25-megahertz clock speed
- ▶ Burst mode RAM access
- ▶ 256-byte instruction and data caches

Coprocessor

- ▶ 68882 floating-point coprocessor (IEEE standard—80 bits precision)

Cache connector

- ▶ 120-pin memory cache connector (for connection of optional high-speed memory cache card)

Built-in video support

- ▶ Supports 640- by 480-pixel screens (such as the 12-inch Apple High-Resolution Monochrome Monitor and 13-inch AppleColor High-Resolution RGB Monitor) at up to 256 colors or shades of gray (up to 8 bits per pixel)
- ▶ Supports 640- by 870-pixel screens (such as the 15-inch Apple Macintosh Portrait Display) at up to 16 shades of gray

Optional parity support

- ▶ Installation of parity generating chip and parity RAM converts the system to a parity system

Interfaces

- ▶ Three NuBus internal slots support full 32-bit address and data buses
- ▶ Two mini-8 serial (RS-232/RS-422) ports
- ▶ Two Apple Desktop Bus ports allow daisy-chaining of multiple peripheral devices
- ▶ SCSI interface: one 50-pin internal connector and one DB-25 external connector
- ▶ One DB-19 serial port for connecting external floppy disk drives
- ▶ One DB-15 video port for built-in video
- ▶ Stereo sound jack

Mouse

- ▶ Mechanical tracking; optical shaft encoding at 3.9 ± 0.39 pulses per millimeter (100 ± 10 pulses per inch) of travel

Sound generator

- ▶ Apple's custom digital sound chip provides 8-bit stereo sampling at 44.1 kilohertz, and includes four-voice wave-table synthesis—capable of driving stereo headphones or other stereo equipment through the sound jack

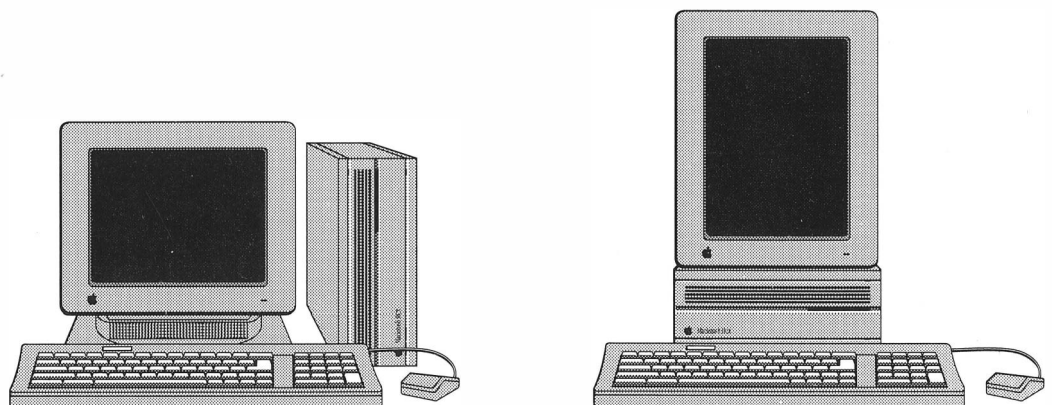
Electrical requirements

- ▶ Line voltage: 100 to 240 volts AC, automatically configured
- ▶ Frequency: 50 to 60 hertz, single phase
- ▶ Maximum power: 90 watts, not including monitor power

Size and weight

Main unit

- ▶ Height: 5.5 in. (14.0 cm)
 - ▶ Width: 11.9 in. (30.2 cm)
 - ▶ Depth: 14.4 in. (36.5 cm)
 - ▶ Weight: 14 lb. (6.4 kg) with internal hard disk drive
- ### Mouse
- ▶ Height: 1.1 in. (2.8 cm)
 - ▶ Width: 2.1 in. (5.3 cm)
 - ▶ Depth: 3.8 in. (9.7 cm)
 - ▶ Weight: 6 oz. (.17 kg)



The versatile design of the Macintosh IIcx allows it to be used in either vertical or horizontal orientation.

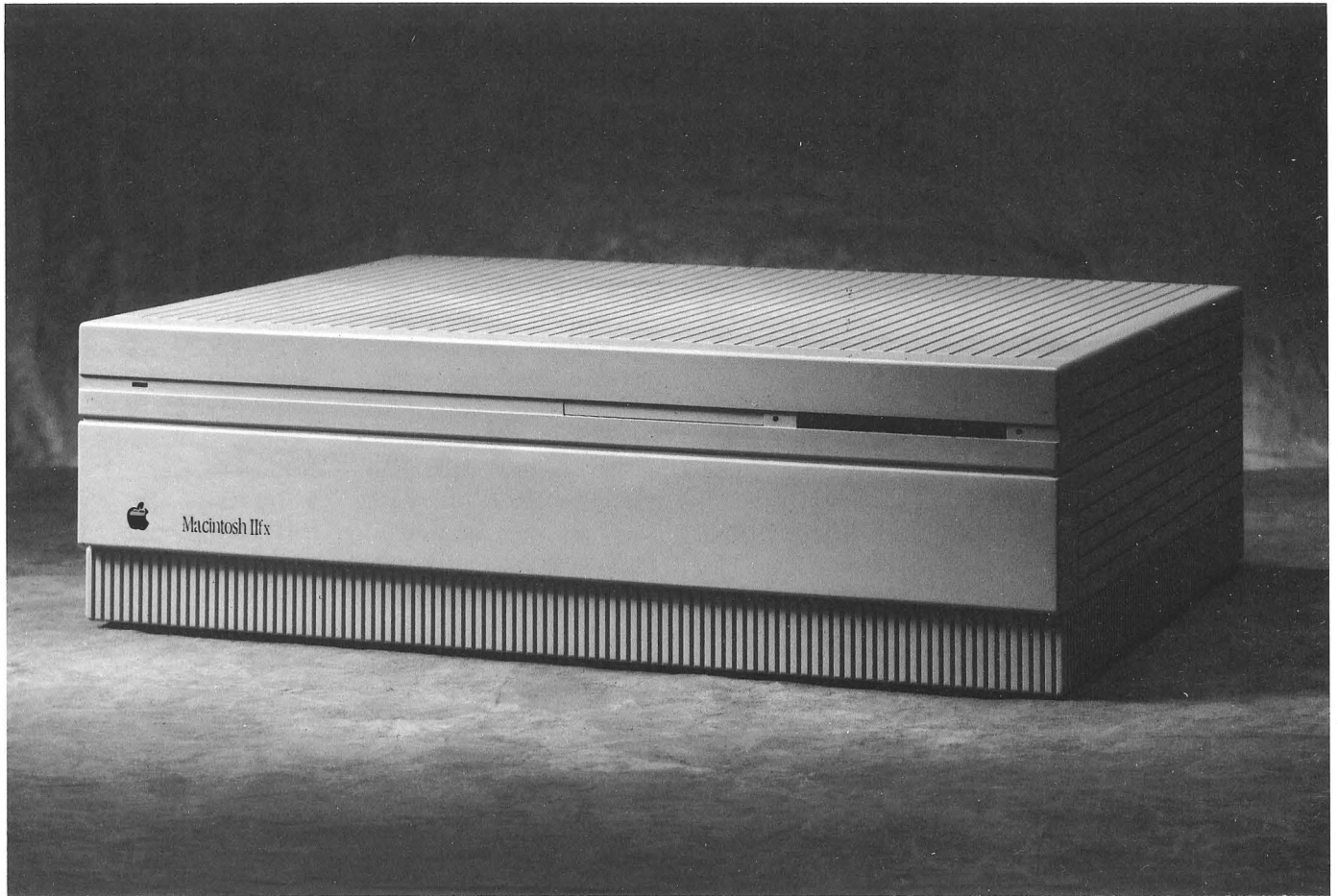


Macintosh IIci

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M0338LL/A



Overview

The Apple®Macintosh®IIfx is an extremely high-speed and elegantly engineered personal computer that has been designed for people who need the ultimate in Macintosh responsiveness as well as new Macintosh capabilities.

To provide maximum Macintosh performance and responsiveness, the Macintosh IIfx incorporates a high-speed, 40-megahertz 68030 microprocessor, a 32K Static RAM Cache memory subsystem, and a 68882 floating-point coprocessor for high-speed processing of complex mathematical functions.

The Macintosh IIfx also incorporates, for the first time, dedicated I/O (input/output) processors. These custom-designed ASICs (application-specific integrated circuits) boost system efficiency by managing low-level I/O tasks—for the Apple Desktop Bus™ floppy disk drives, and serial ports—that were previously carried out by the 68030 processor.

In addition, the Macintosh IIfx contains a dedicated SCSI/DMA (Small Computer System Interface/Direct Memory Access) controller that improves SCSI performance.

Users who need maximum system expandability will especially appreciate the versatility of the Macintosh IIfx. First, system memory can be expanded from 4 to 8 megabytes for high-performance applications that demand superior system responsiveness.

Second, the Macintosh IIfx includes six NuBus™ expansion slots that can accommodate a wide range of Apple and third-party expansion cards, such as additional network interface and graphics cards. A new Processor Direct Slot (PDS) provides a direct interface for third-party hardware options. And six external interface ports accommodate peripherals such as hard disks and printers, LocalTalk™ network connections, and Apple Desktop Bus devices.

For floppy disk storage, the Macintosh IIfx uses the 1.4-megabyte Apple SuperDrive™ disk drive, which allows users to read from and write to 3.5-inch Macintosh floppy disks as well as 3.5-inch disks used in a variety of other personal computers. The Macintosh IIfx can also be configured with up to 160 megabytes of internal hard disk storage, and it will accommodate a second SuperDrive.

Best of all, the Macintosh IIfx is a Macintosh, which means that it still offers all of the benefits of earlier Macintosh systems: access to more than 3,000 of the most powerful, graphics-based applications available; ease of learning and ease of use through a consistent, graphics-based interface; choice without confusion in hardware and software; the convenience of “plug and play” compatibility; and the assurance that all Macintosh components will work together smoothly.

Features

Benefits

- ▶ Full 32-bit 68030 microprocessor, running at 40 megahertz
- Built-in Paged Memory Management Unit (PMMU)

- ▶ Offers increased levels of performance and system responsiveness over other Macintosh II systems.
- ▶ Supports multitasking operating systems such as A/UX[®], Apple's implementation of the AT&T UNIX[®] operating system.

- ▶ 68882 floating-point math coprocessor, running at 40 megahertz

- ▶ Provides fast processing of complex mathematical functions while complying with IEEE 80-bit floating-point standards.

- ▶ Built-in zero-wait-state 32K Static RAM Cache

- ▶ Accelerates system performance.

- ▶ Two dedicated I/O processors

- ▶ Improves system efficiency by handling low-level tasks previously carried out by the 68030 microprocessor and associated with the floppy disk drive(s), Apple Desktop Bus, and serial ports.

- ▶ SCSI/DMA controller

- ▶ Increases performance of the SCSI bus.

- ▶ Built-in Processor Direct Slot (PDS)

- ▶ Provides a fast, 32-bit direct interface to the system bus for high-speed, third-party option cards.

- ▶ SuperDrive floppy disk drive

- ▶ Provides 75 percent more storage capacity than 800K disk drives.
- ▶ Allows convenient transfer of data files between Macintosh, OS/2, MS-DOS, and Apple II systems on the same 3.5-inch disk, using the Apple File Exchange utility.

- ▶ Support for up to 160 megabytes of internal hard disk storage

- ▶ Accommodates either a 5.25-inch half-height hard disk drive or a 3.5-inch hard disk drive in several capacities.

- ▶ Six NuBus expansion slots

- ▶ Makes it easy to create custom configurations to meet specific needs. (Cards are self-configuring—they require no DIP switches, and can be placed in any slot.)

- ▶ Six built-in ports:
 - Two serial ports
 - Two Apple Desktop Bus ports
 - One SCSI port
 - One sound port

- ▶ Provides support for popular peripherals without using NuBus expansion slots.
- ▶ Provides access to LocalTalk networks, which allow users to connect Macintosh IIx systems to other computers and to LaserWriter[®] printers through the AppleTalk[®] network system.
- ▶ Supplies high-quality, four-voice digital sound that is compatible with all applications that use Macintosh sound.

Features

- ▶ 4 megabytes of on-board RAM, expandable to 8 megabytes

-
- ▶ Optional parity support

-
- ▶ 512K of ROM on a SIMM (Single In-Line Memory Module), including:
 - 32-bit addressing
 - Hierarchical File System
 - 32-bit Color QuickDraw™

-
- ▶ Macintosh user interface, including mouse, icons, windows, and pull-down menus

-
- ▶ MultiFinder operating system

-
- ▶ Software compatibility

-
- ▶ Variable-speed fan controller

Benefits

- ▶ Provides a simple growth path for users as they need additional memory.
- ▶ Allows multiple applications to be opened concurrently under the MultiFinder® operating system.
- ▶ Provides memory space for manipulation of large amounts of data, such as large spreadsheets, complex CAD drawings, scanned images, and sound files.

-
- ▶ Provides detection of DRAM (dynamic RAM) parity errors for increased data integrity.

-
- ▶ Enables future 32-bit versions of the Macintosh operating system to address up to 4 gigabytes of memory.
 - ▶ Organizes document storage and allows easy access to files.
 - ▶ Provides a consistent user interface throughout the Macintosh family and enables color systems to display up to 16 million colors simultaneously.

-
- ▶ Makes most applications intuitive and easy to learn.
 - ▶ Reduces training and support costs.
 - ▶ Provides a consistent user interface across applications.

-
- ▶ Allows multiple applications to be opened concurrently.
 - ▶ Lets users easily cut and paste information between applications.
 - ▶ Allows background tasks to be run while users interact with applications in the foreground.

-
- ▶ Lets users run virtually all Macintosh software.

-
- ▶ Provides quiet system operation.

Product Details

68030 Processor

- ▶ Full 32-bit 68030 microprocessor runs at 40 megahertz.
- ▶ The 32-bit address bus provides up to 4 gigabytes of address space.
- ▶ 256-byte, on-chip data and instruction caches provide high levels of performance.
- ▶ Built-in PMMU supports virtual, shared, and protected memory in operating systems that have been designed for it.
- ▶ Burst mode RAM access enables groups of instructions and data to be read in fewer clock cycles than are required in normal access mode.

68882 Math Coprocessor

- ▶ The 32-bit 68882 math coprocessor runs at 40 megahertz and accelerates the execution of complex math functions, including trigonometric and logarithmic series.

Optional Parity Support

- ▶ Parity DRAM and a parity controller can be built into the Macintosh IIx system as an option.

ROM

- ▶ A 512K ROM SIMM socket on the logic board provides an easy upgrade path to future versions of ROM SIMMs.

Static RAM Cache

- ▶ A built-in zero-wait-state 32K Static RAM Cache provides high

levels of zero-wait-state CPU performance.

RAM

- ▶ RAM in the Macintosh IIx can be increased to 8 megabytes.
- ▶ The Macintosh IIx uses 80-nanosecond RAM.
- ▶ As denser, 4-megabit and 16-megabit RAM chips become available, RAM can be increased to 32 and 128 megabytes, respectively.

Input/Output Processors

- ▶ Two dedicated I/O processors manage low-level I/O tasks for the serial ports, floppy disk drive(s), and Apple Desktop Bus, providing higher levels of overall system performance.

NuBus Expansion Slots

- ▶ NuBus provides a multiplexed 32-bit address bus and data bus on a single 96-pin connector.
- ▶ NuBus is self-configuring. Cards can be plugged into any slot and the system will automatically identify and configure each card, without DIP switches or jumper wires.
- ▶ The NuBus architecture supports data transfer rates of up to 37.5 megabytes per second.

SCSI (Small Computer System Interface)

- ▶ SCSI is a high-performance interface bus used to connect hard disks and other SCSI-based

devices, such as the AppleCD SC[®] CD-ROM drive and the Apple Scanner, to the Macintosh IIx. Up to seven SCSI peripherals, including an internal hard disk, can be connected.

- ▶ The Macintosh IIx SCSI subsystem is managed by a dedicated SCSI/DMA controller, which increases system efficiency.
- ▶ The SCSI I/O subsystem can provide data transfer rates in excess of 3 megabytes per second.

Network Support

- ▶ The Macintosh IIx provides full ROM support for all AppleTalk protocols, and includes built-in serial ports for LocalTalk network connections.

Operating System Support

- ▶ Macintosh system software includes:
 - System Tools Version 6.0.5 or greater (the Macintosh operating system)
 - Printer disk (printer drivers for all Apple printers)
 - Utilities disks (include utilities such as the Apple File Exchange, HD SC Setup, CloseView, Disk First Aid[™], and Font/DA Mover)
- ▶ HyperCard[®] Version 1.2.5 (or greater) is included.
- ▶ A/UX Version 2.0 (optional) is compatible with the Macintosh IIx.

Technical Specifications

Processor

- ▶ 68030, 32-bit architecture
- ▶ 40-megahertz clock speed
- ▶ Burst mode RAM access
- ▶ Two 256-byte, built-in instruction and data caches (Harvard architecture)

Coprocessor

- ▶ 68882 floating-point coprocessor (IEEE standard—80 bits precision)
- ▶ 40-megahertz clock speed

Static RAM Cache

- ▶ Built-in zero-wait-state 32K Static RAM Cache memory architecture

DRAM

- ▶ 80-nanosecond, fast-page mode, 64-pin SIMMs
- ▶ 1-megabit DRAM package
- ▶ 4- or 8-megabyte memory configurations

Optional Parity Support

- ▶ Installation of parity generating chip and parity DRAM (9-chip

SIMM) provides parity error detection

Memory Subsystem

- ▶ Supports overlapping reads from Cache/ROM and writes to DRAM

Input/Output Processor (IOP) Chips

- ▶ Two IOP chips are standard cell implementations of a 2-megahertz 6502. The IOP chips manage the floppy disk drive(s) (SWIM chip), the Apple Desktop Bus, and the serial ports (SCC chip).

**Technical Specifications
(continued)****SCSI/DMA Controller**

- ▶ Standard cell implementation of 53C80 SCSI chip and DMA control logic. The SCSI/DMA chip manages the SCSI bus.

Interfaces

- ▶ Six internal NuBus slots support full 32-bit address and data buses
- ▶ Processor Direct Slot (PDS) provides high-speed, 32-bit access to the system bus
- ▶ Two mini-8 serial (RS-232/RS-422) ports
- ▶ Two Apple Desktop Bus ports allow daisy-chaining of multiple peripheral devices
- ▶ SCSI interface uses a 50-pin internal connector and a DB-25 connector for the first external device; all subsequent SCSI-based

peripherals use standard SCSI-to-SCSI interface cables

- ▶ Stereo sound jack

Mouse

- ▶ Mechanical tracking: Optical shaft encoding at 3.9 ± 0.39 pulses per millimeter (100 ± 10 pulses per inch) of travel

Sound Generator

- ▶ Apple's custom digital sound chip provides 8-bit stereo sampling at 44.1 kilohertz, and includes four-voice wave-table synthesis—capable of driving stereo headphones or other stereo equipment through the sound jack

Electrical Requirements

- ▶ Line voltage: 100 to 240 volts AC, automatically configured

- ▶ Frequency: 48 to 62 hertz, single phase
- ▶ Maximum power: 230 watts, not including monitor power

Size and Weight

Main unit:

- ▶ Height: 5.5 in. (14.0 cm)
- ▶ Width: 18.7 in. (47.4 cm)
- ▶ Depth: 14.4 in. (36.5 cm)
- ▶ Weight: 24 lb. (10.9 kg)*

Mouse:

- ▶ Height: 1.1 in. (2.8 cm)
- ▶ Width: 2.1 in. (5.3 cm)
- ▶ Depth: 3.8 in. (9.7 cm)
- ▶ Weight: 6 oz. (.17 kg)

*Weight will be greater with internal hard disk drive.

Ordering Information**Macintosh IIfx CPU**

Order No.
M5510LL/A

With your order, you'll receive:

- ▶ Macintosh IIfx personal computer with 4 megabytes of RAM and a built-in 1.4-megabyte SuperDrive
- ▶ Mouse
- ▶ Documentation set
- ▶ System software and HyperCard software
- ▶ Training disks
- ▶ Limited warranty statement

Macintosh IIfx 4/80 CPU

Order No.
M5515LL/A

With your order, you'll receive:

- ▶ Macintosh IIfx personal computer with 4 megabytes of RAM, a built-in 1.4-megabyte SuperDrive, and an 80-megabyte internal hard disk drive
- ▶ Mouse
- ▶ Documentation set
- ▶ System software and HyperCard software
- ▶ Training disks
- ▶ Limited warranty statement



Macintosh IIfx

Ordering Information (continued)

Macintosh IIfx 4/160 CPU

Order No.
M5520LL/A

With your order, you'll receive:

- ▶ Macintosh IIfx personal computer with 4 megabytes of RAM, a built-in 1.4-megabyte SuperDrive, and a 160-megabyte internal hard disk drive
- ▶ Mouse
- ▶ Documentation set
- ▶ System software and HyperCard software
- ▶ Training disks
- ▶ Limited warranty statement

Macintosh IIfx 4/80 CPU with A/UX

Order No.
M5523LL/A

With your order, you'll receive:

- ▶ Macintosh IIfx personal computer with 4 megabytes of RAM, a built-in 1.4-megabyte SuperDrive, and an 80-megabyte internal hard disk drive containing A/UX
- ▶ Mouse
- ▶ Documentation set
- ▶ System software and HyperCard software
- ▶ Training disks
- ▶ Limited warranty statement

Macintosh IIfx 4/80 CPU with Parity Support

Order No.
M5524LL/A

With your order, you'll receive:

- ▶ Macintosh IIfx personal computer with 4 megabytes of parity error detection RAM, a built-in 1.4-megabyte SuperDrive, and an 80-megabyte internal hard disk drive
- ▶ Mouse
- ▶ Documentation set
- ▶ System software and HyperCard software
- ▶ Training disks
- ▶ Limited warranty statement

Macintosh IIfx 4MB Memory Expansion Kit*

Order No.
M0376LL/A

With your order, you'll receive:

- ▶ 4-megabyte DRAM upgrade

Macintosh IIfx 4MB Parity Memory Expansion Kit*

Order No.
M0377LL/A

With your order, you'll receive:

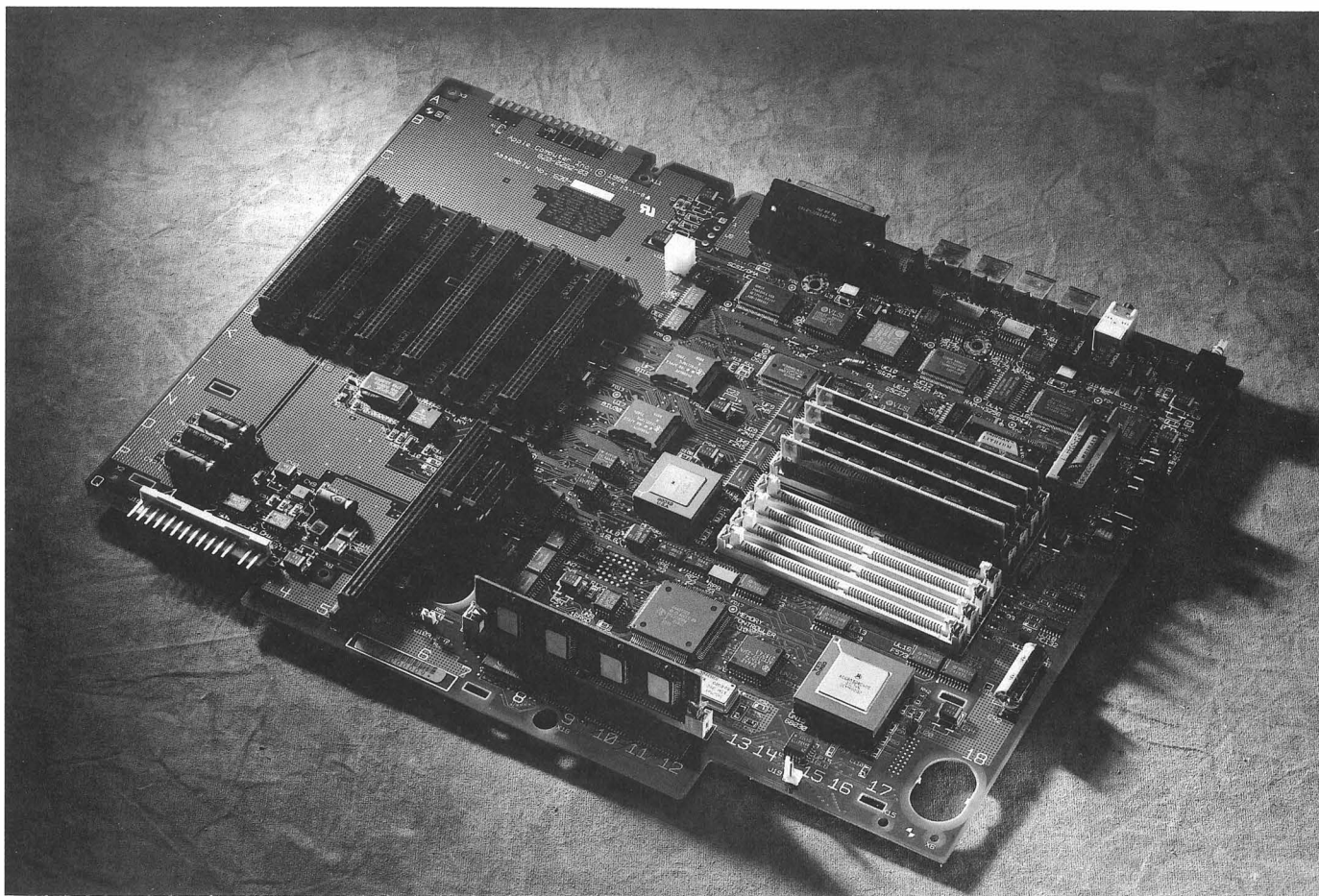
- ▶ 4-megabyte parity DRAM upgrade

*Dealer installation required.

Apple Computer, Inc.

20525 Mariani Avenue
Cupertino, CA 95014
(408) 996-1010
TLX: 171-576

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March 1990. Product specifications are subject to change without notice. Printed in U.S.A.
M0655LL/A



Overview

The Macintosh® IIfx Logic Board Upgrade gives users of Apple® Macintosh II and IIfx computers all the advantages—including high-speed system performance and advanced capabilities—of the Macintosh IIfx. Overall, the Macintosh IIfx Logic Board Upgrade enables the system to perform up to four times faster than the Macintosh II or Macintosh IIfx.

To provide the extremely fast program execution and calculations that are characteristic of the Macintosh IIfx, the Macintosh IIfx Logic Board Upgrade incorporates a very high-speed, 40-megahertz 68030 microprocessor, a 32K Static

RAM Cache memory subsystem, and a 40-megahertz 68882 floating-point coprocessor.

In addition, the Macintosh IIfx Logic Board Upgrade uses custom, dedicated input/output (I/O) processors. These processors significantly boost system performance by managing low-level I/O tasks—for the Apple Desktop Bus™, floppy disk drives, and serial ports—that had been previously handled by the 68030 processor. Also, a dedicated SCSI/DMA (direct memory access) controller improves performance of the SCSI bus.

Like the Macintosh II and Macintosh IIfx, the Macintosh IIfx Logic Board Upgrade includes six

NuBus™ expansion slots that can accommodate a wide range of Apple and third-party expansion cards, such as network interface and graphics cards. Also, a new Processor Direct Slot (PDS) provides a direct interface for third-party options.

The Macintosh IIfx Logic Board Upgrade can be configured with either 4 or 8 megabytes of RAM.* It is compatible with the Macintosh IIfx 4MB Memory Expansion Kit, the full range of NuBus expansion cards, and virtually all current versions of Macintosh applications.

*RAM must be purchased separately. See Product Details for more information.

Features

Benefits

- ▶ Full 32-bit 68030 microprocessor, running at 40 megahertz
- Built-in Paged Memory Management Unit (PMMU)

- ▶ Offers increased levels of performance and system responsiveness over Macintosh II and Macintosh IIX systems.
- ▶ Supports multitasking operating systems such as A/UX[®], Apple's implementation of the UNIX[®] operating system.

- ▶ 68882 floating-point math coprocessor, running at 40 megahertz

- ▶ Provides fast processing of complex mathematical functions while complying with IEEE 80-bit floating-point standards.

- ▶ Built-in zero-wait-state 32K Static RAM Cache

- ▶ Accelerates system performance.

- ▶ Two dedicated I/O processors

- ▶ Improves system efficiency by handling low-level tasks previously carried out by the 68030 microprocessor, and associated with the floppy disk drive(s), Apple Desktop Bus, and serial ports.

- ▶ Dedicated SCSI/DMA controller

- ▶ Improves performance of the SCSI bus.

- ▶ Built-in Processor Direct Slot (PDS)

- ▶ Provides a fast, 32-bit direct interface to the system bus for high-speed, third-party option cards.

- ▶ Six NuBus expansion slots

- ▶ Makes it easy to create custom configurations to meet specific needs. (Cards are self-configuring—they require no DIP switches, and can be placed in any slot.)

- ▶ Six built-in ports:
 - Two serial ports
 - Two Apple Desktop Bus ports
 - One SCSI port
 - One sound port

- ▶ Provides support for popular peripherals without using NuBus expansion slots.
- ▶ Provides access to LocalTalk[™] networks, which allow users to connect Macintosh IIfx systems to other computers and to LaserWriter[®] printers through the AppleTalk[®] network system.
- ▶ Supplies high-quality, four-voice digital sound that is compatible with all applications that use Macintosh sound.

Features

- ▶ Support for 4 or 8 megabytes of RAM

-
- ▶ 512K of ROM on a SIMM (Single In-Line Memory Module) including:
 - 32-bit addressing
 - Hierarchical File System
 - 32-bit Color QuickDraw™

-
- ▶ Macintosh user interface, including mouse, icons, windows, and pull-down menus

-
- ▶ MultiFinder® operating system

-
- ▶ Software compatibility

Benefits

- ▶ Gives users maximum flexibility to configure their system with the amount of RAM that meets their application requirements.
- ▶ Gives users a choice of using either Apple Macintosh IIx RAM or compatible third-party RAM.

-
- ▶ Enables future 32-bit versions of the Macintosh operating system to address up to 4 gigabytes of memory.
 - ▶ Organizes document storage and allows easy access to files.
 - ▶ Provides a consistent user interface throughout the Macintosh family and enables color systems to display up to 16 million colors simultaneously.

-
- ▶ Makes most applications intuitive and easy to learn.
 - ▶ Reduces training and support costs.
 - ▶ Provides a consistent user interface across applications.

-
- ▶ Allows multiple applications to be opened concurrently.
 - ▶ Lets users easily cut and paste information between applications.
 - ▶ Allows background tasks to be run while users interact with applications in the foreground.

-
- ▶ Lets users run virtually all Macintosh software.

Product Details

68030 Processor

- ▶ Full 32-bit 68030 microprocessor runs at 40 megahertz.
- ▶ The 32-bit address bus provides up to 4 gigabytes of address space.
- ▶ 256-byte, on-chip address and instruction caches provide high levels of performance.
- ▶ Built-in PMMU supports virtual, shared, and protected memory in operating systems that have been designed for it.
- ▶ Burst mode RAM access enables groups of instructions and data to be read in fewer clock cycles than are required in normal access mode.

68882 Math Coprocessor

- ▶ The 32-bit 68882 math coprocessor runs at 40 megahertz and accelerates the execution of complex math functions, including trigonometric and logarithmic series.

ROM

- ▶ A 512K ROM SIMM socket on the logic board provides an easy upgrade path to future versions of ROM SIMMs.

RAM

- ▶ A minimum of 4 megabytes and a maximum of 8 megabytes of RAM can be installed into a Macintosh IIfx Logic Board Upgrade.
- ▶ As denser, 4-megabit and 16-megabit RAM chips become available, RAM can be increased to 32 and 128 megabytes, respectively.
- ▶ The Macintosh IIfx Logic Board Upgrade uses 80-nanosecond RAM chips mounted on

64-pin SIMMs. These memory modules differ significantly from those used in previous Macintosh II computers. As a result, only Apple Macintosh IIfx Memory Expansion Kits or third-party memory expansion kits expressly made for the Macintosh IIfx personal computer may be used with the Macintosh IIfx Logic Board Upgrade.

NuBus Expansion Slots

- ▶ NuBus provides a multiplexed 32-bit address bus and data bus on a single 96-pin connector.
- ▶ NuBus is self-configuring. Cards can be plugged into any slot and the system will automatically identify and configure each card, without DIP switches or jumper wires.
- ▶ The NuBus architecture supports data transfer rates of up to 37.5 megabytes per second.

SCSI (Small Computer System Interface)

- ▶ SCSI is a high-performance interface bus used to connect hard disks and other SCSI-based devices, such as the AppleCD SC[®] CD-ROM drive and the Apple Scanner, to the Macintosh IIfx. Up to seven SCSI peripherals, including an internal hard disk, can be connected.
- ▶ The Macintosh IIfx SCSI subsystem is managed by a dedicated SCSI/DMA controller to increase system efficiency.
- ▶ The SCSI I/O subsystem can provide data transfer rates in excess of 3 megabytes per second.

Network Support

- ▶ The Macintosh IIfx provides full ROM support for all AppleTalk protocols, and includes built-in serial ports for LocalTalk network connections.

Operating System Support

- ▶ Macintosh system software includes:
 - System Tools Version 6.0.5 or greater (the Macintosh operating system)
 - Printer disk (printer drivers for all Apple printers)
 - Utilities disks (include utilities such as the Apple File Exchange, HD SC Setup, CloseView, Disk First Aid[™], and Font/DA Mover)
- ▶ HyperCard[®] Version 1.2.5 (or greater) is included.
- ▶ A/UX Version 2.0 (optional) is compatible with the Macintosh IIfx.

System Requirements

To use the Macintosh IIfx Logic Board Upgrade, you'll need:

- ▶ A Macintosh II or IIfx personal computer
- ▶ RAM from either the Apple Macintosh IIfx 4MB Memory Expansion Kit (M0376LL/A) or third-party memory expansion kits expressly made for the Macintosh IIfx personal computer.

.....
The following chart shows the possible configurations and the upgrade required for each one.

Starting configuration

- ▶ Macintosh II or IIfx personal computer with 1, 2, or 4 megabytes of RAM
- ▶ Macintosh II or IIfx personal computer with 5 or 8 megabytes of RAM

Required upgrade

- ▶ Macintosh IIfx Logic Board Upgrade (M0375LL/A)
- ▶ Macintosh IIfx 4MB Memory Expansion Kit (M0376LL/A)
- ▶ Macintosh IIfx Logic Board Upgrade (M0375LL/A)
- ▶ Two Macintosh IIfx 4MB Memory Expansion Kits (M0376LL/A)

Upgraded configuration

- ▶ Macintosh IIfx personal computer with 4 megabytes of RAM
- ▶ Macintosh IIfx personal computer with 8 megabytes of RAM

Technical Specifications

Processor

- ▶ 68030, 32-bit architecture
- ▶ 40-megahertz clock speed
- ▶ Burst mode RAM access
- ▶ Two 256-byte, built-in instruction and data caches (Harvard architecture)

Coprocessor

- ▶ 68882 floating-point coprocessor (IEEE standard—80 bits precision)

Static RAM Cache

- ▶ Built-in zero-wait-state 32K Static RAM Cache memory architecture

DRAM

- ▶ 80-nanosecond, fast-page mode, 64-pin SIMMs
- ▶ 1-megabit DRAM (dynamic RAM) package
- ▶ 4- or 8-megabyte memory configurations

I/O processor (IOP) chips

- ▶ Two IOP chips are standard cell implementations of a 2-megahertz 6502. The IOP chips manage the floppy disk drive(s) (SWIM chip), the Apple Desktop Bus, and the serial ports (SCC chip).

SCSI/DMA controller

- ▶ Standard cell implementation of 53C80 SCSI chip and DMA control logic. The SCSI/DMA chip manages the SCSI bus.

Interfaces

- ▶ Six internal NuBus slots support full 32-bit address and data buses
- ▶ Processor Direct Slot (PDS) provides high-speed, 32-bit access to the system bus
- ▶ Two mini-8 serial (RS-232/RS-422) ports
- ▶ Two Apple Desktop Bus ports allow daisy-chaining of multiple peripheral devices

- ▶ SCSI interface uses a 50-pin internal connector and a DB-25 connector for the first external device; all subsequent SCSI-based peripherals use standard SCSI-to-SCSI interface cables
- ▶ Stereo sound jack

Sound generator

- ▶ Apple's custom digital sound chip provides 8-bit stereo sampling at 44.1 kilohertz, and includes four-voice wave-table synthesis—capable of driving stereo headphones or other stereo equipment through the sound jack.

Electrical requirements

- ▶ Line voltage: 100 to 240 volts AC, automatically configured
- ▶ Frequency: 48 to 62 hertz, single phase
- ▶ Maximum power: 230 watts, not including monitor power



Macintosh IIx Logic Board Upgrade

Ordering Information

**Macintosh IIx
Logic Board Upgrade**

Order No.
M0375LL/A

With your order, you'll receive:

- ▶ Macintosh IIx Logic Board
- ▶ Owner's guide
- ▶ System software and HyperCard software
- ▶ Limited warranty statement

.....
**Macintosh IIx
4MB Memory
Expansion Kit***

Order No.
M0376LL/A

With your order, you'll receive:

- ▶ Macintosh IIx 4MB Memory Expansion Kit

.....
*Dealer installation required.

Apple Computer, Inc.

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Cupertino, CA 95014
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TLX: 171-576

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March 1990. Product specifications are subject to change without notice. Printed in U.S.A.
M0656LL/A



Overview

The Apple® Macintosh® Portable personal computer offers complete Macintosh functionality in a portable design. It runs virtually all current versions of Macintosh software and provides full compatibility with other Macintosh hardware.

In addition, the all-in-one design of the Macintosh Portable makes it ideal for users who want to take their work with them. Everything a user needs—CPU, screen, keyboard, pointing device, battery, and disk storage—is integrated into a single, easy-to-carry package.

The Macintosh Portable also delivers the superior graphics that people have come to

associate with the Macintosh. Its high-contrast Active Matrix Liquid Crystal Display has such a fast response rate that the Macintosh interface looks and feels just the way it does on any other Macintosh computer. It also displays the full width of a letter-size page, and makes the screen easy to see in almost any lighting condition and from almost any angle.

Customers will especially appreciate the long battery life and intelligent power management provided by the Macintosh Portable. Unlike most battery-powered computers, which operate for two to three hours before batteries need recharging,

the Macintosh Portable can provide 6 to 12 hours of operation, depending on the system configuration and usage.

To conserve power and extend battery life, the Macintosh Portable includes a special microprocessor that manages power use. And a Battery desk accessory monitors and displays battery power levels.

The Macintosh Portable comes standard with 1 megabyte of RAM, and is available in two configurations: with a built-in Apple FDHD™ SuperDrive™; or with an Apple FDHD SuperDrive and an internal 40-megabyte hard disk drive.

Features

Benefits

▶ Full Macintosh software and hardware compatibility

▶ Allows you to run virtually all current versions of Macintosh software.
▶ Lets you connect your computer to Macintosh-compatible peripherals and networks.

▶ Macintosh user interface: icons, windows, and pull-down menus

▶ Makes applications intuitive and easy to learn.
▶ Provides a consistent interface across applications.
▶ Reduces training and support costs.

▶ CMOS 68000 processor, operating at 16 megahertz

▶ Conserves power and extends battery life.
▶ Provides rapid processing for spreadsheets, databases, and other applications.

▶ Active Matrix Liquid Crystal Display, 640 by 400 pixels

▶ Delivers superior graphics capabilities.
▶ Provides a fast response rate that enables the Macintosh Portable to display the Macintosh graphics-based user interface and graphical programs.
▶ Lets you work in a wide range of lighting conditions, from low to bright light.
▶ Permits you to see the screen clearly from almost any viewing angle.
▶ Allows you to view the full width of a letter-size page, for working with documents more easily.

▶ Intelligent power-management operations:

—Dedicated microprocessor for power management

—Control Panel settings

—Replaceable lead acid battery

—Battery desk accessory

—Automatic low-power warnings

—Power adapter for 70 to 270 volts, 40 to 70 hertz

▶ Provides long battery life, allowing you to work for 6 to 12 hours before recharging the battery.
▶ Lets you control power use by specifying how much time will elapse before the system automatically turns off the power.
▶ Lets you recharge the battery at any time, without requiring a deep-discharge cycle.
▶ Allows you to replace the battery while the computer is turned on.
▶ Lets you quickly check the battery charge and plan power use accordingly.
▶ Reduces the possibility of accidentally running out of power, by notifying you when power is low.
▶ Allows you to use the computer in almost any country without using transformers (needs only a simple plug adapter).

▶ All-in-one design with built-in display, trackball, disk drive, and keyboard

▶ Makes it easy to quickly pack, carry, set up, and use the system almost anywhere.
▶ Eliminates the need for a mouse pad or flat surface, while providing the functionality of a mouse.

▶ Standard Macintosh keyboard layout

▶ Eliminates the need to learn a new keyboard, because all of the keys are in a familiar location.

Features

Benefits

-
- | | |
|--|---|
| <ul style="list-style-type: none">▶ Flexible keyboard configuration | <ul style="list-style-type: none">▶ Lets you work the way you like, with the trackball or numeric keypad installed on either side of the keyboard, for left- or right-handed use.▶ Allows replacement of the trackball with a keypad for number-intensive applications. |
| <hr/> | |
| <ul style="list-style-type: none">▶ 1 megabyte of low-power-consumption RAM, expandable to 2 megabytes* | <ul style="list-style-type: none">▶ Minimizes power consumption, allowing you to work for a long time between battery charges.▶ Retains the contents of memory while the system is in sleep mode. |
| <hr/> | |
| <ul style="list-style-type: none">▶ Built-in Apple FDHD SuperDrive (a second internal FDHD floppy disk drive can also be installed) | <ul style="list-style-type: none">▶ Provides 75 percent more storage capacity than existing 800K disk drives.▶ Allows you to transfer data files conveniently between Macintosh, OS/2, MS-DOS, and Apple II systems on the same 3.5-inch disk, using the Apple File Exchange utility. |
| <hr/> | |
| <ul style="list-style-type: none">▶ Optional 40-megabyte hard disk | <ul style="list-style-type: none">▶ Gives you fast and easy access to multiple applications and large data files. |
| <hr/> | |
| <ul style="list-style-type: none">▶ Eight built-in ports<ul style="list-style-type: none">—External disk drive—SCSI—Apple Desktop Bus™—Printer—Modem—Audio—Power adapter—Video port | <ul style="list-style-type: none">▶ Lets you connect the Macintosh Portable with existing Macintosh peripherals.▶ Supports up to seven high-speed SCSI peripherals.▶ Provides connection for Apple Desktop Bus devices such as a mouse, graphics tablet, or keyboard.▶ Provides access to an AppleTalk® network system for file sharing, data transfer, and peripherals sharing.▶ With the Macintosh Portable Video Adapter, makes it easy to connect the Macintosh Portable to external monitors and projection devices. |
| <hr/> | |
| <ul style="list-style-type: none">▶ Internal connector for modem | <ul style="list-style-type: none">▶ Lets you install a modem for connection to numerous on-line databases and corporate computer systems, without using additional cables or connectors. |
| <hr/> | |
| <ul style="list-style-type: none">▶ Apple stereo sound chip | <ul style="list-style-type: none">▶ Provides high-quality digital sound.▶ Offers compatibility with all applications that use Macintosh sound. |
| <hr/> | |
| <ul style="list-style-type: none">▶ Polycarbonate plastic housing with rugged hard disk design | <ul style="list-style-type: none">▶ Reduces the need for special handling by protecting internal components. |
| <hr/> | |
| <ul style="list-style-type: none">▶ Carrying case with protective foam and pockets for items such as a battery charger, an extra battery, disks, and papers | <ul style="list-style-type: none">▶ Provides easy portability.▶ Protects sensitive components and accessories. |
-

*The Macintosh Portable architecture will support up to 9 megabytes of RAM when higher-density chips become available.

Product Details

Configuration

- ▶ Two Macintosh Portable systems are available:
 - The Macintosh Portable CPU includes the CPU, Active Matrix Liquid Crystal Display, keyboard, trackball, mouse, 1 megabyte of RAM, and a built-in 1.4-megabyte FDHD SuperDrive.
 - The Macintosh Portable Hard Disk 40 CPU includes all the features of the Macintosh Portable CPU, as well as an internal 40-megabyte hard disk.

CMOS Microprocessor

- ▶ The Macintosh Portable contains a special version of the Motorola 68000 microprocessor that conserves battery power and yet provides high-performance processing. The complementary metal oxide semiconductor (CMOS) 68000 microprocessor consumes less power than its non-CMOS counterpart, and operates at 16-megahertz clock speed—twice that of the 68000 in the Macintosh SE computer.

Active Matrix Liquid Crystal Display

- ▶ The Macintosh Portable Active Matrix Liquid Crystal Display (LCD) provides very high contrast—up to five times that of standard LCD screens—to offer the superior graphics capabilities that support Macintosh applications, including animated graphics. And because of the fast response rate of the Active Matrix LCD, Macintosh Portable users can see the cursor move when they drag it across the screen with the mouse or trackball; with other battery-operated computers, the cursor is harder to follow because it disappears when moving.
 - The Macintosh Portable screen also can be viewed clearly in most lighting conditions—especially in bright light—and from almost any angle. A transistor under every pixel of the Active Matrix LCD provides the fast response for the Macintosh user interface.

Power Management

- ▶ Most battery-powered computers provide only a few hours of usage before they need recharging, and include no options for managing the computer's power consumption. The Macintosh Portable, however, provides better power management and operates longer between recharges than comparable computers because of its Active Matrix Liquid Crystal Display, dedicated microprocessor (which serves as a power manager), low-power RAM, and lead acid batteries.

The power manager monitors and controls power allocation, and automatically puts the system into a standby “rest” mode or “sleep” mode when it has been inactive for a preset period. During rest mode, the system operating speed decreases from 16 megahertz to 1 megahertz—a change that is unnoticed by the user but saves significant power. During sleep mode, power is turned off but memory contents are retained. The user simply presses any key to instantly “wake up” the computer from either mode.

Processor Direct Slot (PDS)

- ▶ The PDS is a high-performance slot connected to the microprocessor bus that will support one expansion card. (Note: The PDS is not compatible with the SE, SE/30, or NuBus expansion slots.)

Low-power RAM

- ▶ To maximize battery life, the Macintosh Portable contains special low-power RAM, which consumes less power than standard dynamic RAM (DRAM). RAM can be upgraded from 1 megabyte to 2 megabytes by installing the Macintosh Portable 1MB Memory Expansion Kit in the RAM expansion slot. When higher-density chips become available, the Macintosh Portable will be able to support up to 9 megabytes of memory.

Lead Acid Batteries

- ▶ The Macintosh Portable uses lead acid batteries because they provide long operating life and can be recharged more fully and more often than nickel cadmium

batteries. And since the battery voltage of a lead acid battery diminishes gradually as power is used up, the computer can provide users with information about the power level, as well as posting low-power warnings.

Read-Only Memory (ROM) Slot

- ▶ This connector allows installation of up to 3 megabytes of ROM for permanent storage of custom applications or data.

Network Support

- ▶ The Macintosh Portable serial ports provide full support for LocalTalk™ network connections.
- ▶ The Macintosh Portable provides full ROM support for all AppleTalk protocols.

Stereo Sound

- ▶ The Apple Sound Chip supports stereo sound at a sampling rate of up to 44.1 kilohertz.

SCSI (Small Computer Systems Interface)

- ▶ SCSI is a high-performance interface for connecting the computer to hard disks and other mass-storage peripherals. Up to seven SCSI peripherals (including an internal hard disk) can be connected to the Macintosh Portable.
- ▶ SCSI provides data transfer rates of up to 1 megabyte per second.

Operating System Software

- ▶ Macintosh system software includes:
 - System Tools Version 6.0.4 or greater (the Macintosh operating system)
 - Printer disk (the printer drivers for all Apple printers)
 - Utilities disks, which include utilities such as the Apple File Exchange, HD SC Setup, CloseView, Disk First Aid™, and Font/DA Mover
- ▶ The Macintosh system software is preinstalled on the Macintosh Portable Hard Disk 40 CPU.

HyperCard

- ▶ The HyperCard® software and manual are included. HyperCard is preinstalled on the Macintosh Portable Hard Disk 40 CPU.

Technical Specifications

Processor

- ▶ CMOS 68000
- ▶ 16-megahertz clock speed

Memory

- ▶ 1 megabyte of low-power RAM, expandable to 2 megabytes through the installation of a memory card in the RAM slot, and to up to 9 megabytes when higher-density chips become available

Screen

- ▶ Active Matrix Liquid Crystal Display
- ▶ Full page width
- ▶ 640 by 400 pixels

Disk storage

- ▶ Two standard configurations:
 - One built-in double-sided FDHD SuperDrive that uses 1.4-megabyte high-density floppy disks; reads, writes, and formats Macintosh, MS-DOS, OS/2, and Apple II ProDOS® disks
 - One built-in double-sided FDHD SuperDrive that uses 1.4-megabyte high-density floppy disks, and an internal 40-megabyte hard disk drive

Keyboard

- ▶ Built-in keyboard with standard Macintosh layout
- ▶ 63 keys

Trackball

- ▶ 1.3-inch-diameter trackball pointing device
- ▶ Left- or right-handed placement
- ▶ Can be replaced with the numeric keypad

Numeric keypad (optional)

- ▶ 18 keys
- ▶ Can be installed as an alternative to the trackball

Mouse

- ▶ Low-power Apple Desktop Bus mouse
- ▶ Mechanical tracking: optical shaft encoding at 3.54 pulses per mm (90 pulses per inch) of travel

Interfaces

- ▶ One external disk drive interface
- ▶ One SCSI interface: uses a 50-pin connector (internal) and a DB-25 connector (external)

- ▶ One Apple Desktop Bus port allows daisy-chaining of multiple peripheral devices
- ▶ One audio port
- ▶ One power adapter port
- ▶ One printer port
- ▶ One external modem port
- ▶ One video port

Expansion connectors

- ▶ RAM expansion slot
- ▶ Modem connector
- ▶ Processor Direct Slot
- ▶ ROM expansion slot

Sound generator

- ▶ Apple custom digital sound chip provides 8-bit stereo sampling at 44 kilohertz, and includes four-voice wave-table synthesis. Capable of driving stereo headphones or other stereo equipment through the sound jack.

Electrical requirements

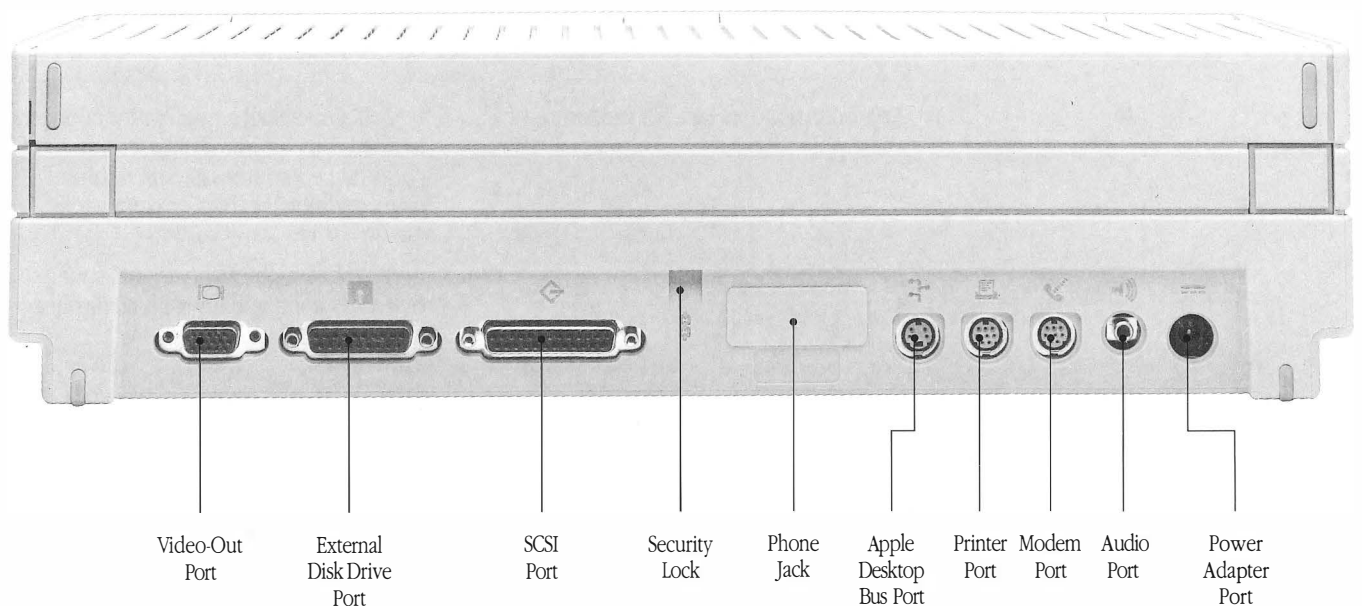
- ▶ Line voltage: 85 to 270 volts AC, 48 to 62 Hz
- ▶ Power: 15 watts maximum

Environmental requirements

- ▶ Operating temperature: 50° to 104° F (10° to 40° C)
- ▶ Storage temperature: -40° to 140° F (-25° to 60° C) for a period not to exceed 3 days; storage for a longer period must be within operating temperature range
- ▶ Relative humidity: 5% to 95%
- ▶ Altitude: 0 to 10,000 ft. (0 to 3,048 m)

Size and weight

- ▶ Height
 - Rear panel: 4.05 in. (10.29 cm)
 - Front panel: 2.1 in. (5.33 cm)
 - From base to highest point with display open: 11.0 in. (27.9 cm)
- ▶ Width: 15.25 in. (38.74 cm)
- ▶ Depth: 14.83 in. (37.69 cm)
- ▶ Weight (including battery)
 - Without hard disk: 13.75 lb. (6.25 kg)
 - With hard disk: 15.75 lb. (7.16 kg)





Macintosh Portable

Ordering Information

Macintosh Portable CPU
Order No. M5350

With your order, you'll receive:

- ▶ Macintosh Portable personal computer with built-in Active Matrix Liquid Crystal Display, trackball, keyboard, and 1.4-megabyte FDHD SuperDrive
- ▶ Mouse
- ▶ Carrying case
- ▶ *The Macintosh Portable Owner's Guide*

- ▶ *The Macintosh Portable Handbook*
- ▶ System software
- ▶ HyperCard software
- ▶ Inside the Macintosh Portable HyperCard stack
- ▶ Macintosh Portable Product Sampler HyperCard stack
- ▶ Limited warranty statement

Macintosh Portable Hard Disk 40 CPU
Order No. M5351

With your order, you'll receive:

- ▶ Macintosh Portable personal computer with built-in Active Matrix Liquid Crystal Display, trackball, keyboard, 1.4-megabyte FDHD SuperDrive, and internal 40-megabyte SCSI hard disk drive
- ▶ Mouse
- ▶ Carrying case
- ▶ *The Macintosh Portable Owner's Guide*

- ▶ *The Macintosh Portable Handbook*
- ▶ System software
- ▶ HyperCard software
- ▶ Inside the Macintosh Portable HyperCard stack
- ▶ Macintosh Portable Product Sampler HyperCard stack
- ▶ Limited warranty statement

Peripherals Options

Macintosh Portable Numeric Keypad Module
Order No. M0239
Requires installation by an authorized Apple service provider.

Macintosh Portable 1MB Memory Expansion Kit
Order No. M0248

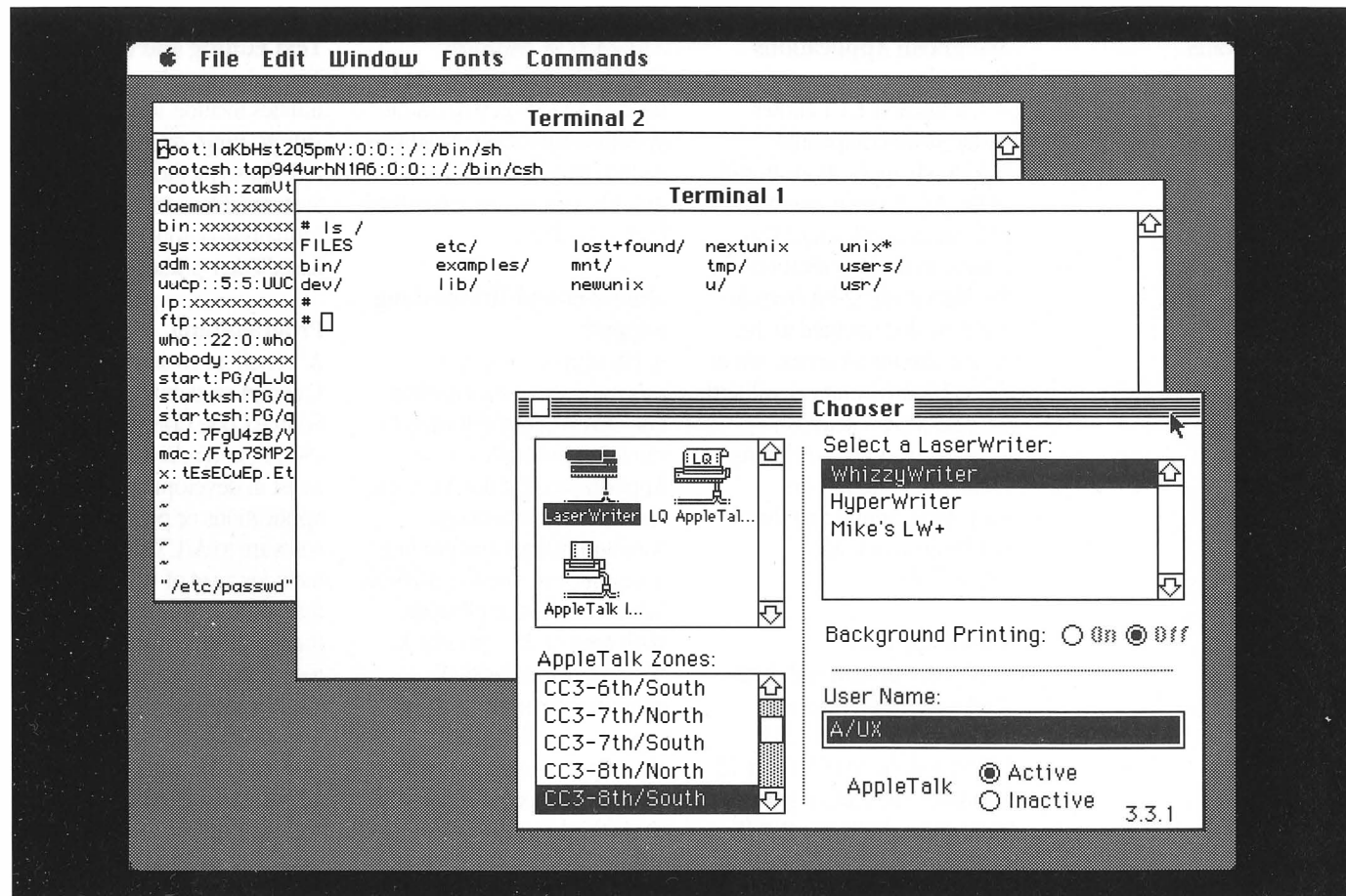
Macintosh Portable Data Modem 2400
Order No. M0250

Macintosh Portable Video Adapter
Order No. M0251
Required to drive an external monitor or projection system.

Macintosh Portable Internal FDHD SuperDrive Upgrade
Order No. M0262
To upgrade from one floppy disk drive to two floppy disk drives. Requires installation by an authorized Apple service provider.

Macintosh Portable Internal 40SC Hard Disk
Order No. M0268
To upgrade from one floppy disk drive to a 40-megabyte hard disk and a floppy disk drive. Requires installation by an authorized Apple service provider.

Macintosh Portable Battery Recharger
Order No. M0275
Includes power adapter.



Overview

The Apple® A/UX® operating system is a full implementation of AT&T's UNIX® System V, Release 2, Version 2 (with BSD 4.3 extensions) for the Apple Macintosh® II family of CPUs and the Macintosh SE/30 personal computer.

This industry-standard multi-tasking operating system provides higher education, government, engineering, scientific, and OEM/VAR users with excellent support for software development; research; computer-aided design, engineering, and manufacturing; technical publishing; office productivity; and database applications.

Version 1.1.1 enhances the usefulness of A/UX by allowing more Macintosh applications to run in the A/UX environment, and by broadening the range of platforms it supports to include the Macintosh IIci and Macintosh SE/30. It also supports the optional X Window System add-on product and conforms to the POSIX Federal Information Processing Standard (FIPS).

Features

Benefits

▶ Apple Tape Backup 40SC tape subsystem support

▶ Enables local tape backup using standard UNIX utilities, which provide flexible archival and restore facilities.

▶ Apple Macintosh desk accessory support

▶ Allows users to set parameters and select network printers for Macintosh and A/UX applications by using the Chooser and the Control Panel.

▶ File transfer between Macintosh and A/UX file systems

▶ Allows users to move their data files and applications between the Macintosh and A/UX environments.

▶ Macintosh video driver support

▶ Allows use of compatible video cards and monitors without requiring special drivers.

▶ Support for the AppleCD SC™ CD-ROM drive

▶ Allows inexpensive mass distribution of large A/UX file systems on compact discs.

▶ Other software enhancements

▶ Incorporates the latest functions of BSD networking (Version 4.3) and NFS (Version 3.2).
▶ Provides disk input/output up to two and a half times faster than the previous version; quadruples SCSI throughput to 1 megabyte per second.

▶ Multiple-user AT&T UNIX license

▶ Each binary copy and software update of A/UX Version 1.1.1 includes a 16-user AT&T UNIX license.

Features

Benefits

▶ Ability to run many 32-bit-compatible Macintosh applications

▶ Enables users to run both UNIX and Macintosh applications in the same operating environment.

▶ Support for color through the Macintosh Toolbox and X Window System

▶ Enables display of 256 colors from a palette of 16 million colors.

▶ Runs HyperCard® Version 1.2.2

▶ Allows users to organize information by association and context.
▶ Lets users create and manage information using virtually any medium.
▶ Allows for high-speed information searches.

▶ Support for POSIX Draft 12 and FIPS

▶ Provides application portability by following the standard guidelines of the Federal Information Processing Standard (FIPS) #151 for UNIX systems, enabling federal government buyers to purchase A/UX systems.

▶ X Window System Version 11, Release 3 (optional add-on)

▶ Allows programs written for the X Window System to run and/or use display service in the A/UX environment. Multiple screens and color displays are supported.

▶ Serial Line/Internet Protocol (SL/IP) support

▶ Enables internet access to A/UX services such as Sun Microsystems' Network File System (NFS) and standard BSD networking facilities over serial lines.

▶ AppleTalk® for A/UX Version 2.0 (included with A/UX Version 1.1.1)

▶ Allows any A/UX application—Macintosh or UNIX—to share Apple LaserWriter® and ImageWriter® printers over the AppleTalk network system. These printers can also be shared by Macintosh computers running the Macintosh operating system.

Product Details

Macintosh Applications Execution

A/UX Version 1.1.1 allows many 32-bit-compatible Macintosh applications to run in the A/UX environment. Macintosh applications that adhere to the specifications for the Macintosh 32-bit environment, as documented in the *Inside Macintosh* series, run in the A/UX environment without change. Most Macintosh Toolbox features—including color and printing—are supported. Sound and direct hardware access are not available.

POSIX Support

A/UX is compliant with both the Federal Information Processing Standard #151 (FIPS) and the POSIX Draft 12 standard. The federal government created FIPS for POSIX Draft 12. POSIX is the trade name of the IEEE P1003 standard for the UNIX operating system.

Apple Tape Backup 40SC Support

A/UX supports the UNIX archival utilities, including *tar* and *cpio*, for the Apple Tape Backup 40SC, which uses preformatted DC2000 1/4-inch tape cartridges in QIC-100 format.

AppleCD SC Support

The AppleCD SC drive can be used as a read-only A/UX file system of up to 500 megabytes, giving information systems providers an inexpensive distribution medium.

Multiuser and Multitasking Support

A/UX supports multiple processes per user, enabling one interactive application to run many subtasks at once. Applications that don't use the screen, such as network communications and printing functions, can also run invisibly behind another application. With *term* or the optional X Window System add-on, multiple interactive programs may run simultaneously. A/UX also supports multiuser activity via two back-panel serial ports or via third-party add-in boards.

Communications

A/UX provides standard UNIX communications such as *cu* and *uucp*, as well as more advanced UNIX facilities such as Berkeley Networking Services, NFS, Yellow Pages, and Mail. Serial, Ethernet, and TCP/IP support are provided. AppleTalk for A/UX Version 2.0 supports AppleTalk printing over LocalTalk™ and EtherTalk™ networks.

Text Editing and Processing

Text editing and processing utilities include *vi*, *ex*, *ed*, *ditroff*, *nroff*, *tbl*, *eqn*, and *pic*. A/UX also includes Adobe Systems' TranScript utility for formatting output to the Apple LaserWriter printer.

Programming

A/UX offers an assembler, a C compiler, debuggers, the Source Code Control System (SCCS), and related tools to assist in developing new applications or porting existing software to A/UX. It also includes a set of UNIX libraries that allow C programs to access the functionality of the Macintosh Toolbox, so that A/UX applications can present the graphics-based user interface familiar to Macintosh users, in addition to the traditional UNIX appearance. Numerous other languages and tools are available from developers.

System Administration

A/UX simplifies configuration and recovery. It automatically configures the smallest kernel possible, and simplifies the manual addition of new drivers. In addition, A/UX keeps redundant copies of crucial files so that, in the event of a damaging system crash, it can automatically return the system to a networkable state.

System Requirements

To use the Apple A/UX operating system, you will need:

- ▶ A Macintosh SE/30, IIfx, IIfx, or IIfx computer with a minimum of 4 megabytes of RAM, or a Macintosh II computer with a minimum of 4 megabytes of RAM and an Apple Paged Memory Management Unit (PMMU)
- ▶ An Apple hard disk (minimum 80 megabytes) or the equivalent
- ▶ An Apple or equivalent monitor that is compatible with A/UX Version 1.1.1
- ▶ For Ethernet connectivity, the Apple EtherTalk NB Card or equivalent for the Macintosh II, IIfx, IIfx, or IIfx. For the Macintosh SE/30, an Ethernet interface card is required.

Optional Equipment

- ▶ Additional memory
- ▶ An Apple Tape Backup 40SC or the equivalent
- ▶ An AppleCD SC drive

Technical Specifications

Portability standard

- ▶ AT&T UNIX System V, Release 2, Version 2
- ▶ Compliant with the System V Interface Definition (SVID), and conforms to the System V Verification Suite (SVVS)
- ▶ 4.3 BSD extensions (including signals, job control, groups, sockets, TCP/IP, subnets, and domains)
- ▶ Compliant with FIPS #151 and the IEEE P1003.1 (POSIX Draft 12) standard

Shells (command-line interpreters)

- ▶ Bourne, Korn, C

Development tools

- ▶ Editors (*vi*, *ex*, *ed*, *ditroff*, *nroff*, *tbl*, *eqn*, and *pic*)
- ▶ Assembler and C compiler
- ▶ *Lint*, *lex*, *yacc*
- ▶ Debuggers (*adb*, *sdb*)
- ▶ Linker (*ld*)
- ▶ Source control (SCCS, *make*, and other UNIX tools)

Communications

- ▶ Network access via Ethernet or serial lines using TCP/IP or SL/IP protocols, or via direct serial or modem connections
- ▶ File transfer, terminal emulation, and electronic mail with UNIX systems via *uucp* protocols
- ▶ Local area networking over Ethernet with the EtherTalk NB Card or over serial lines using SL/IP
- ▶ Transparent file sharing over Ethernet or serial lines using NFS Version 3.2
- ▶ Remote log-in and execution, resource sharing, file transfer, and electronic mail with Berkeley Networking Services (from BSD 4.3)
- ▶ Domains, name service, and subnets
- ▶ Remote execution or display service via X Window System Version 11, Release 3 (optional add-on)

Apple enhancements

- ▶ Access to Macintosh Toolbox for A/UX applications and Macintosh applications
- ▶ Automatic recovery of files in case of a crash
- ▶ Automatic reconfiguration of device drivers
- ▶ File transfer utility that converts Macintosh files to A/UX files
- ▶ AppleTalk printing support over LocalTalk and EtherTalk networks. (EtherTalk printing to LaserWriter and ImageWriter printers requires an EtherTalk-to-LocalTalk router such as the AppleTalk Internet Router.)



Apple A/UX Operating System Version 1.1.1

Ordering Information

Macintosh IICI A/UX System

Order No. B0159LL/A
Macintosh IICI personal computer with A/UX 1.1.1 on 80-megabyte internal hard disk

Macintosh IICX A/UX System

Order No. B0097LL/A
Macintosh IICX personal computer with A/UX 1.1.1 on 80-megabyte internal hard disk

Macintosh IIX A/UX System

Order No. B002LL/C
Macintosh IIX personal computer with A/UX 1.1.1 on 80-megabyte internal hard disk

A/UX External 80MB Hard Disk

Order No. M8004/D
A/UX 1.1.1 on 80-megabyte hard disk

A/UX Internal 80MB Hard Disk

Order No. M8011/C
A/UX 1.1.1 on 80-megabyte hard disk

A/UX Tape Product 1.1.1

Order No. B0043LL/B
A/UX 1.1.1 on a 40-megabyte tape cartridge

A/UX Floppy Disk Product

Order No. M8143/D
A/UX 1.1.1 on 800K floppy disks

A/UX Update Tape Product

Order No. B0055LL/C
Update A/UX Versions 1.0, 1.0.1, or 1.1 to A/UX 1.1.1 with a 40-megabyte tape cartridge

A/UX Update Floppy Disk Product

Order No. B0056LL/C
Update A/UX Versions 1.0, 1.0.1, or 1.1 to A/UX 1.1.1 with 800K floppy disks

A/UX Manual Set

Order No. M8044/A
15-binder manual set, includes references and guides on such topics as system administration, text-processing tools, man (manual) pages, software development tools, and networking

Related Products and Services

Apple 68851 Paged Memory Management Unit (PMMU)*

Order No. M0221

Macintosh II EtherTalk NB Card

Order No. M0405

Apple Tape Backup 40SC

Order No. M2640/A

Apple 4MB Memory Expansion Kit*

Order No. M0707

AppleCD SC Drive

Order No. M2700/A

Apple Hard Disk 80SC

Order No. M2688/A

X Window System for A/UX

Order No. M0709

Inside Macintosh

Available from APDA™

A/UX Hotline—5-hour Telephone Support

Order No. M8130

A/UX Hotline—15-hour Telephone Support

Order No. M8140

A/UX Manual Set Update Service—Single Copy

Order No. M8125

A/UX Software Set Update Service—Individual Workstation

Tape Order No. M8007

Disk Order No. M8002

*Dealer installation is required.

Information for Programmers and Developers

The Apple Programmers and Developers Association (APDA) provides a wide range of development products and documentation—from Apple and other suppliers—for programmers and developers who work with Apple equipment. For information about APDA, contact:

APDA
Apple Computer, Inc.
20525 Mariani Avenue, M/S 33G
Cupertino, CA 95014
800-282-APDA (800-282-2732)
Fax: (408) 562-3971
Telex: 171-576
AppleLink: APDA

If you plan to develop Apple-compatible hardware or software products for sale through

retail channels, you can get valuable support from Apple Developer Programs. Write to:

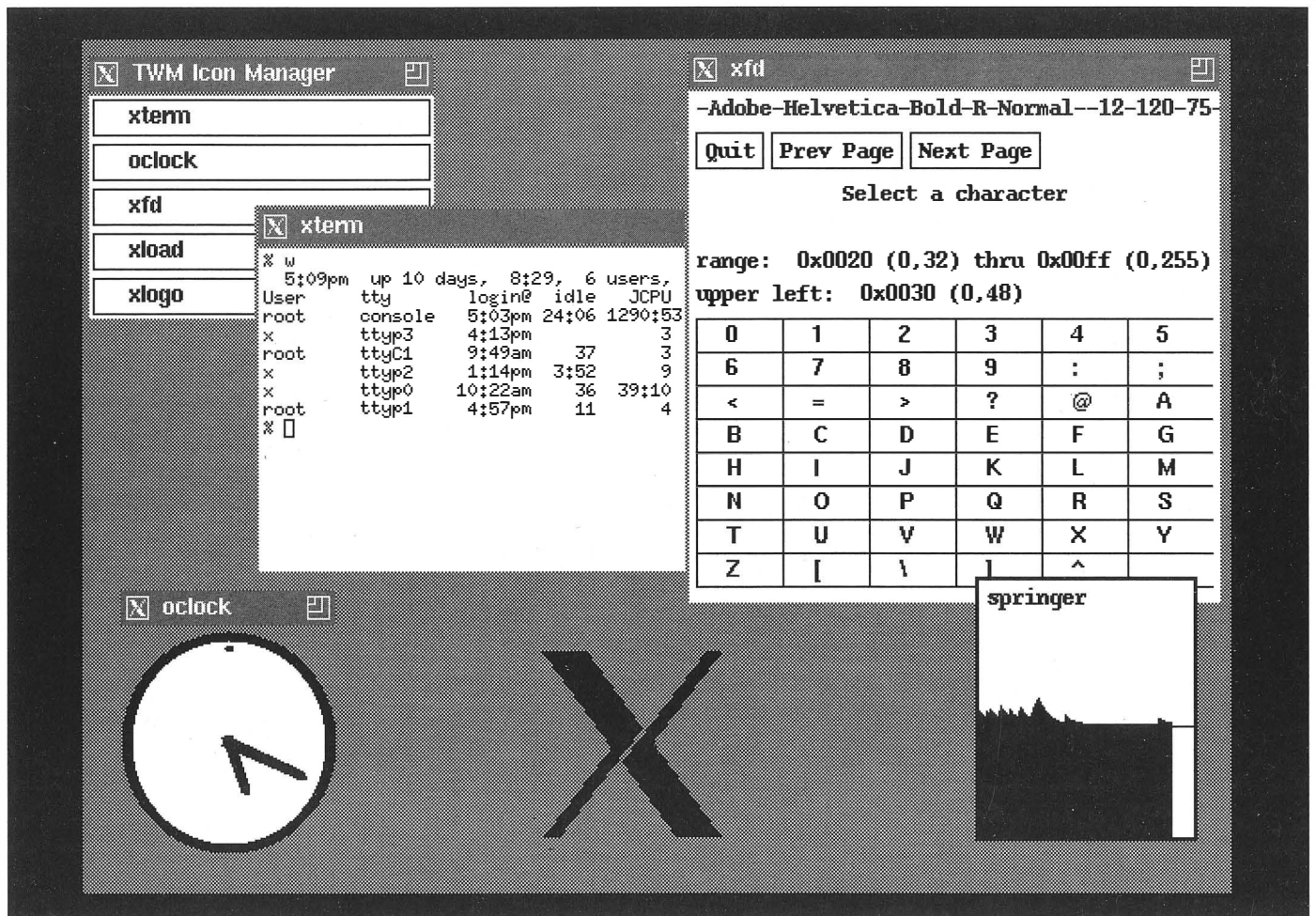
Apple Developer Programs
Apple Computer, Inc.
20525 Mariani Avenue, M/S 51W
Cupertino, CA 95014

For the name of your nearest authorized Apple A/UX dealer, call 800-538-9696.

Apple Computer, Inc.

20525 Mariani Avenue
Cupertino, CA 95014
(408) 996-1010
TLX: 171-576

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August 1989. Product specifications are subject to change without notice. Printed in the U.S.A.
M8142/B



Overview

Apple Computer's implementation of X Window System™, Version 11, Release 4 for the A/UX® operating system provides two distinct products: X11 and MacX™.

The first, X11, delivers a native X Window System environment that is well-suited for technical users and software developers. X11 provides a full development environment, including X programming libraries, the X Toolkit intrinsics, and the Athena Widget Set.

The second, MacX, allows X applications to share the A/UX software Finder™ desktop with Macintosh® and UNIX® applications. With MacX, users can open frequently-used X client applications by just choosing a command from a Macintosh pull-down menu.

Both X11 and MacX allow users to take advantage of the highly portable, network-transparent X Window System.

The X Window System is the result of years of development work by researchers from the computer industry and from the Massachusetts Institute of Technology (MIT).

Apple Computer's X Window System for A/UX complies with the standards and conventions set by the MIT X Consortium.

Product Details

X11 for A/UX

Environment

► X11 for A/UX offers the native X Window System environment with the improved performance of the X Window System, Version 11, Release 4 server. X11 controls the display and does not allow access to the A/UX Finder.

Network transparency

► X11 client applications can reside on any system on the network—on a local computer or a remote host computer. The applications can also be displayed on a local or remote system.

X libraries and applications

► Standard libraries, standard include files, applications, and utilities are provided for X client application development. These include `libX11`, `libXau`, `libXaw`, `libXdmcp`, `libXext`, `libXinput`, `libXmu`, `libXt`, and `liboldX`.

► X11 display font families include Charter, Clean, Courier, Helvetica®, Lucida, New Century Schoolbook, Symbol, and Times®.

Screen options

► X11 supports both monochrome and 8-bit color video cards and displays. The 8-bit color option allows simultaneous display of up to 256 colors or shades of gray from a palette of 16 million colors.

Documentation

► X11 documentation includes *X11 User's Guide for A/UX*, which describes how to use X11; and two reference guides, *X11 Command Reference for A/UX* and *X11 Programmer's Reference for A/UX*, which describe command usage and the programming libraries.

MacX for A/UX

Environment

► MacX allows X client applications to share the A/UX Finder with multiple Macintosh and UNIX applications. MacX is appropriate for novice and experienced users alike.

Documentation

► MacX documentation includes *MacX User's Guide*, which describes how to use MacX features.

► *MacX for A/UX Supplement* describes how to use the MacX server in the A/UX Finder environment.

Required equipment

To use the X Window System for A/UX, you'll need the following:

► Macintosh IIfx, Macintosh IIfx, Macintosh IIfx, Macintosh IIfx, Macintosh IIfx, Macintosh IIfx, or Macintosh SE/30 personal computer; or Macintosh II with PMMU

► At least 4 megabytes of RAM (5 megabytes recommended)

► Apple 80-megabyte (or larger) hard disk or the equivalent (160 megabytes recommended)

► A/UX operating system Version 2.0, A/UX Version 2.0.1, or later versions

Optional equipment

► Optional: an Apple® EtherTalk® NB Card for the Macintosh II family of computers, or an equivalent Ethernet card for the Macintosh SE/30 (the use of Ethernet is recommended)

Features

Benefits

X11 for A/UX

- | | |
|---|---|
| ▶ X Window System, Version 11, Release 4 server | ▶ Optimizes graphics performance and memory usage |
| | |
| ▶ Native X Window System user environment | ▶ Provides X Window System environment suitable for displaying client application running on other hardware platforms |
| | |
| ▶ Complete X11 Release 4 development tools | ▶ Allow users to develop X applications using the Xlib library and the Xtk Toolkit |
| | |
| ▶ Sample widget set | ▶ Includes MIT Athena Widget Set, suitable for customization |
| | |
| ▶ X Window System, Version 11, Release 4 client applications | ▶ Provides desktop client applications, such as <code>oclock</code> and <code>xcalc</code> ; utilities, such as <code>xterm</code> (X terminal emulator); and development tools |
| | |
| ▶ Support for 1-bit black-and-white display, and 256-color display with an 8-bit video card | ▶ Permits display of X client applications on any monitor connected to an A/UX system |
| | |
| ▶ Support for multiple-screen display | ▶ Lets users display an X client application on any monitor connected to an A/UX system |
| | |
| ▶ User and reference manuals | ▶ Provide documentation on using Apple Computer's X Window System for A/UX |
| | ▶ Provide reference pages that describe X11 commands, client applications, and programming libraries |

MacX for A/UX

- | | |
|---------------------------|---|
| ▶ A/UX Finder integration | ▶ Lets users run X client applications, Macintosh productivity applications, and UNIX applications concurrently on A/UX |
|---------------------------|---|



X Window System 2.1 for A/UX

Technical Specifications

X11 for A/UX

Environment

- ▶ Network transparency
- ▶ Color support
- ▶ Support for "backing store" and "save under" features that dramatically improve window system performance

Window manager

- ▶ User control of screen configuration and customization

- ▶ Ability to manage multiple screens (using `twm`) from a single window manager process

Client applications

- ▶ All client applications are based on X11 Release 4
- ▶ Terminal emulator with DEC™ VT102™ and Tektronix 4014 compatibility (`xterm`)
- ▶ Mouse-based screen editor (`xedit`)
- ▶ Manual page browser (`xman`)

- ▶ Bitmapped image manipulation utilities, including conversion from screen image to PostScript® format (`bitmap`, `xdpr`, `xwd`, `xwud`, `xpr`)

- ▶ Widget browser (`viewres`)
- ▶ Font displayer (`xfed`)

C libraries

- ▶ Full application development toolkit (X Toolkit intrinsics and Xaw Athena Widget Set)
- ▶ Graphics library (Xlib)
- ▶ Include files

MacX for A/UX

Environment

- ▶ Network transparency
- ▶ Integrated with the A/UX Finder

- ▶ Color support
- ▶ Full international character set support

Window Manager

- ▶ User control of screen configuration and customization

Ordering Information

X Window System 2.1 for A/UX

Order No. M0411LL/B

With your order, you'll receive X Window System 2.1 for A/UX software:

- 15 installation disks for X11
- 6 installation disks for MacX

—X Window System 2.1 for A/UX documentation, which includes

- ▶ *Getting Started with X Window System for A/UX*
- ▶ *MacX User's Guide*
- ▶ *MacX for A/UX Supplement*
- ▶ *X11 User's Guide for A/UX*
- ▶ *X11 Command Reference for A/UX*
- ▶ *X11 Programmer's Reference for A/UX*

X Window System Site License

Order No. M0747LL/B

X Window System 2.1 for A/UX Right to Copy

Order No. M0749LL/B

X Window System 2.1 for A/UX Manual Set

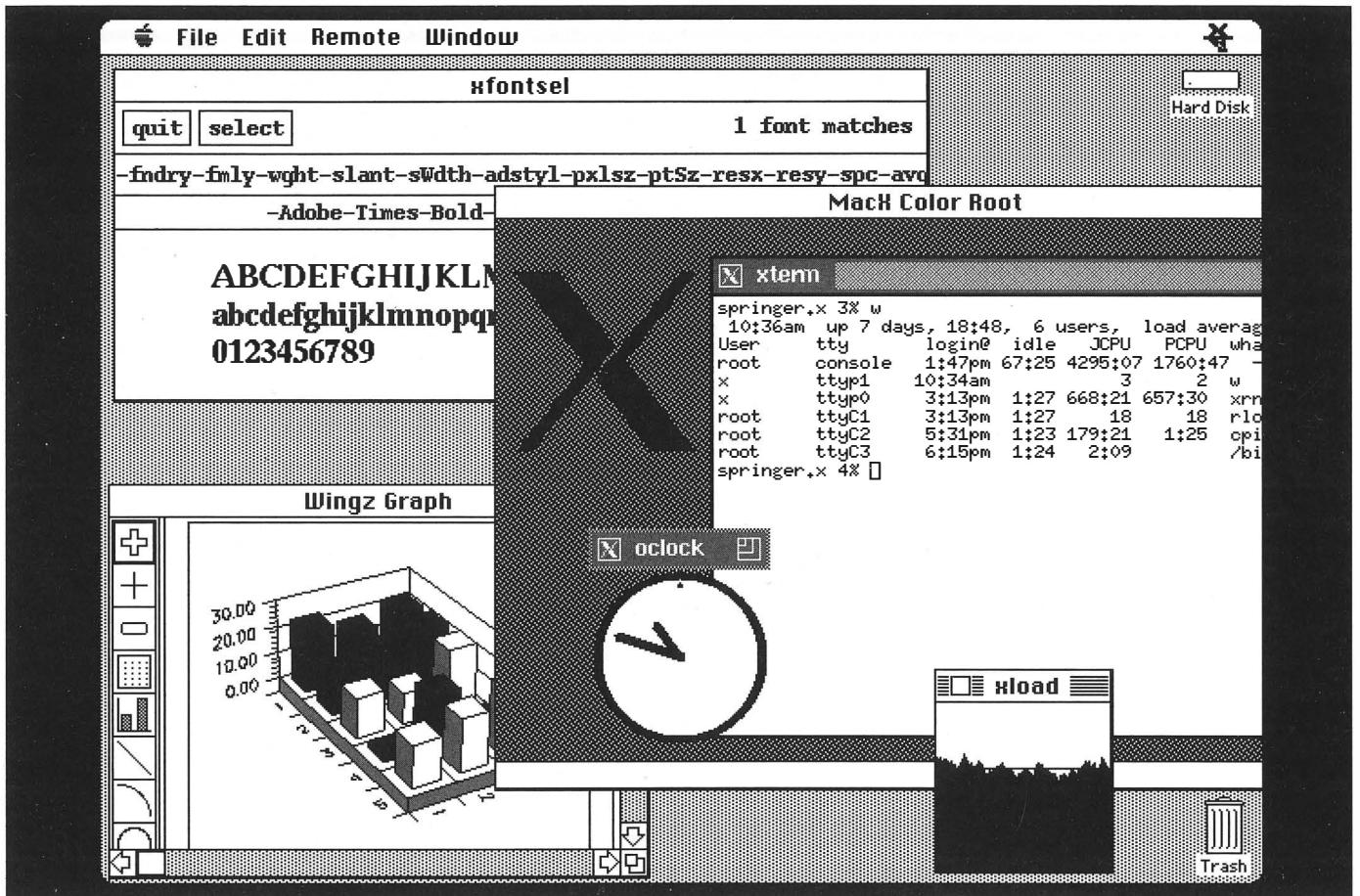
Order No. M0748LL/B

For the name of your nearest authorized Apple A/UX and X Window System dealer, call 800-538-9696.

Apple Computer, Inc.

20525 Mariani Avenue
Cupertino, CA 95014
408-996-1010
TLX: 171-576

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January 1990. Product specifications are subject to change without notice. Printed in the U.S.A.
M0659LL/B



Overview

MacX™ 1.1 software provides an X Window System™ display server for the Apple® Macintosh® and A/UX® operating systems. MacX allows X client applications to share the desktop with Macintosh applications.

Macintosh users can transparently access X applications running on a variety of computers that support the X Window

System. With MacX, users can display X applications in easy-to-use Macintosh windows by choosing commands from a customizable pull-down menu. MacX allows users to cut and paste graphics between X and Macintosh applications.

The X Window System is the result of years of development by researchers from the computer

industry and from the Massachusetts Institute of Technology (MIT). MacX 1.1 complies with the Version 11, Release 4 standards and conventions set by the MIT X Consortium.

MacX demonstrates Apple Computer's commitment to multivendor connectivity and industry standards.

Product Details

MultiFinder compatibility

▶ Client applications can share the desktop with Macintosh applications. Users can move easily back and forth between MacX, the desktop, and other Macintosh applications.

Standards conformance

▶ MacX 1.1 implements X Window System, Version 11, Release 4 standards, including X11 protocols, ICCCM window management, and the XLFD (X logical font description) protocol. MacX includes support for the Version 11, Release 4 shape extension.

MacX window manager

▶ MacX includes a built-in window manager that complies with the ICCCM standard. The MacX window manager provides title bars, close boxes, and other Macintosh window controls. Users can control client applications in windows on their desktop using Macintosh user interface capabilities.

Foreign window manager support

▶ MacX includes a special capability for those users who want to use a foreign window manager, such as mwm of OSF/Motif or t.wm. MacX offers a special Macintosh window devoted to displaying client applications controlled by a foreign window manager. This window can share the desktop with other client applications, which are controlled by the built-in MacX window manager.

Font Manager

▶ MacX includes a rich library of font families: Charter, Clean, Courier, Helvetica®, Lucida, Lucida Bright, Lucida Type-writer, New Century Schoolbook, Symbol, and Times®. In addition, MacX can access the Macintosh screen fonts located in the System file. MacX comes with sophisticated tools for font manipulation, such as a font compiler that compiles font files from bitmap distribution format (BDF) to the server's internal format.

DECwindows support

▶ MacX offers support for the use of DECwindows™. With the appropriate network software from Apple, MacX is compatible with DECwindows conventions for remote startup of applications and for cutting and pasting between Macintosh and DECwindows applications.

Color support

▶ MacX supports 8-bit color and gray-scale video cards. Users have access to 256 distinct colors or shades of gray from a palette of 16 million colors. MacX supports Apple video cards, including the 8•24 Card and 8•24 GC Card; third-party video cards; and built-in video on Macintosh computers, such as the Macintosh IIci.

Network configurations

▶ MacX takes advantage of the Macintosh Communications Toolbox, allowing multiple simultaneous connections over different transport protocols. A communications tool that supports TCP/IP is provided. DECnet connection tools are available from third-party sources.

Required equipment

To use MacX, you'll need the following:

- ▶ Any Macintosh computer
- ▶ At least 2 megabytes of memory
- ▶ At least two floppy disk drives (a hard disk is highly recommended)

▶ Macintosh system software version 6.0.4 (or later)

- ▶ A network connection (using the built-in LocalTalk® or an Ethernet connection)

Optional equipment

- ▶ Apple EtherTalk® NB Card or the equivalent
- ▶ Macintosh II Extended High-Resolution Display Video Card and AppleColor™ High-Resolution RGB Monitor or the equivalent (multiscreen configurations are supported)
- ▶ Apple Two-Page Monochrome Monitor
- ▶ Apple Macintosh Portrait Display

Features

Benefits

-
- | | |
|--|--|
| ▶ Compliance with the MIT X Consortium specifications for the X Window System, Version 11, Release 4 | ▶ Provides a complete standard-conforming X Window System server implementation for Macintosh computers |
| ▶ Integration with MultiFinder® software | ▶ Allows users to switch between X client applications and Macintosh applications from the desktop |
| ▶ Support for multiple networking protocols | ▶ Permits MacX to take full advantage of popular networking protocols for the Macintosh, including TCP/IP, third-party DECnet™ implementations, and the AppleTalk® network system |
| ▶ Support for multiple monitors | ▶ Enables users to take advantage of multiple monitor setups
▶ Allows client applications to display on multiple screens |
| ▶ Built-in window manager | ▶ Gives users the familiar techniques of the Macintosh user interface when moving and resizing MacX windows |
| ▶ Support for display of monochrome and color applications | ▶ Allows simultaneous display of up to 256 colors or shades of gray from a palette of 16 million colors with the appropriate video card |
| ▶ Easy X application startup using pull-down menus | ▶ Allows users to open a client application by choosing a command from a pull-down menu
▶ Includes capability to customize the pull-down menu; users can create, edit, and save commands to open frequently-used client applications quickly. |
| ▶ Full copy and paste capabilities for text and color graphics | ▶ Lets users copy images of X client applications and paste them into Macintosh applications through the Macintosh Clipboard
▶ Allows Macintosh applications to provide graphic selections for pasting into X client applications |
| ▶ Complete set of user manuals | ▶ Provides the information necessary to install, configure, and use MacX |
-



MacX 1.1

Technical Specifications

MacX display server

- ▶ Network transparency
- ▶ X11 Release 4 compliance
- ▶ Support for multiple monitors
- ▶ Copy and paste capabilities for text and graphics between X and Macintosh applications
- ▶ Color support
- ▶ Support for the full international character set, including the ability to translate automati-

cally between the Macintosh and X representations of 8-bit characters

- ▶ Support for the all Apple keyboards and the Apple Desktop Bus™ (ADB) mouse (for applications that make use of them, the second and third mouse buttons are emulated through the keyboard)
- ▶ Support for the “backing store” and “save under”

features, which dramatically improve X Window System performance

Network connections

- ▶ Support for LocalTalk and EtherTalk connections
- ▶ Transport protocols support includes MacTCP® (Apple Computer’s implementation of the TCP/IP protocols), AppleTalk ADSP, and DECnet

Ordering Information

MacX

Order No. M0108LL/B

With your order, you’ll receive

- ▶ MacX software
- ▶ Macintosh Communications Toolbox software
- ▶ MacTCP software
- ▶ MacX Font Library software
- ▶ *MacX User’s Guide*
- ▶ *MacX Installation Guide*
- ▶ *MacTCP Administrator’s Guide*

For information about site licenses, contact

Apple Software Licensing
 Apple Computer, Inc.
 20525 Mariani Avenue, M/S 38-I
 Cupertino, CA 95014
 408-974-4667

Related Products

MacX Manual Set

Order No. M0602LL/A

X Window System Site License

Order No. M0747LL/A

X Window System 2.1 for A/UX

Order No. M0411LL/B

X Window System for A/UX Manual Set

Order No. M0748LL/B

Apple EtherTalk NB Card

Order No. M0410LL/A

AppleColor High-Resolution RGB Monitor

Order No. M0401

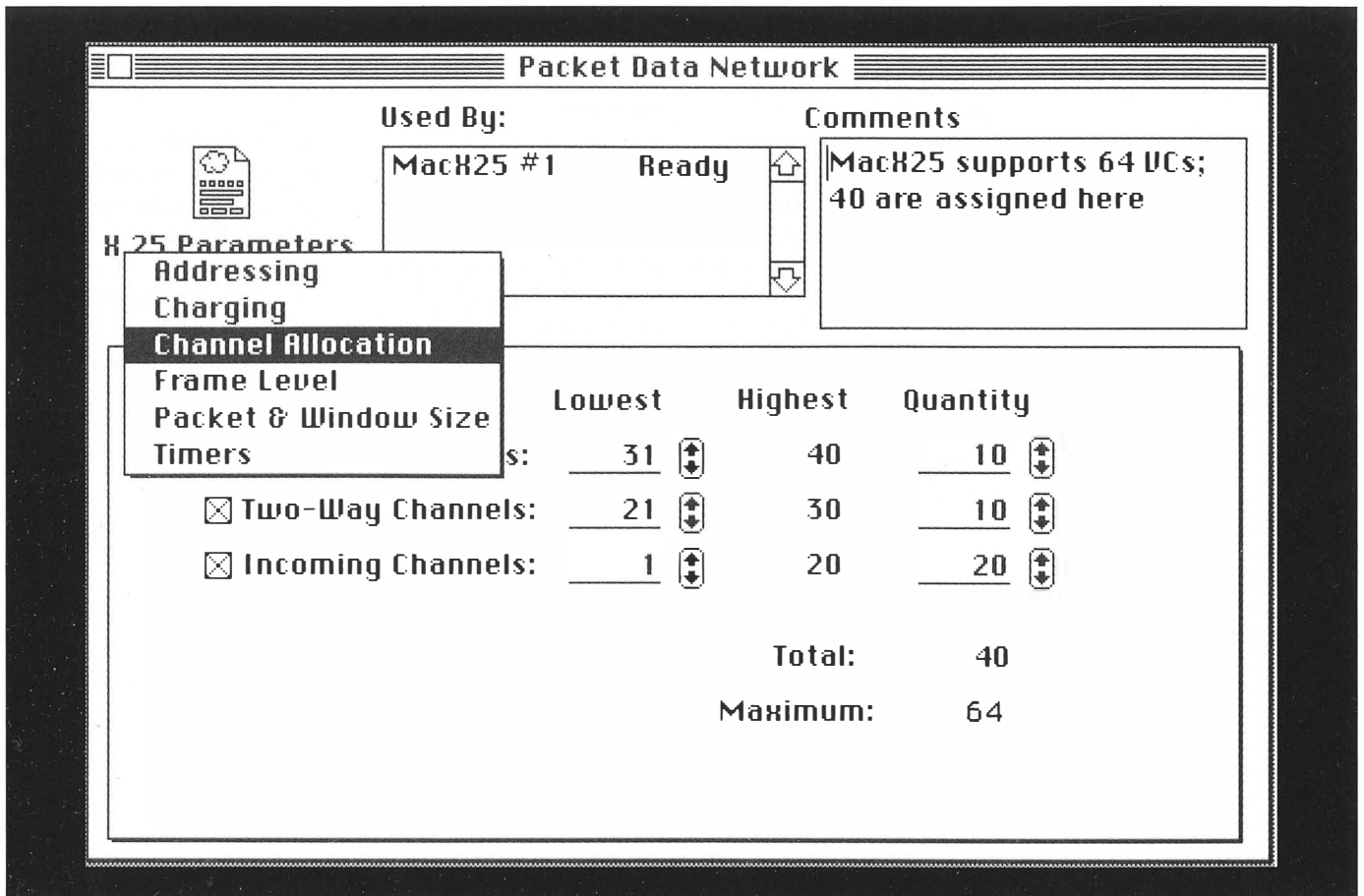
Apple Macintosh Portrait Display

Order No. M0404

Apple Computer, Inc.

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 408-996-1010
 TLX: 171-576

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 April 1990. Product specifications are subject to change without notice. Printed in U.S.A.
 M0246LL/C



Overview

The MacX25™ software links Apple® Macintosh® personal computers to packet-switched data networks (PSDNs) supporting CCITT Recommendation X.25.

MacX25 server software allows a Macintosh to be set up as a single entry point to the PSDN. Access to host computers and end-user services on the PSDN is distributed from the server to Macintosh computers over the AppleTalk® network system.

MacPAD™ software, included with MacX25, works in conjunction with the server software and

provides packet assembler/disassembler (PAD) connectivity to the PSDN. Implemented as a connection tool for the Macintosh Communications Toolbox, MacPAD allows terminal applications using the toolbox to connect to host systems on the PSDN.

MacX25 features an administrator's application that facilitates configuration and administration of the server. An address service allows administrators to set addressing details on the Macintosh server, presenting MacPAD

users with a menu listing available hosts and end-user services by name. Users connect to services simply by selecting the appropriate name—they aren't required to know PAD commands and address numbers.

The MacX25 Programming Library (available separately) works in conjunction with the MacX25 server to provide X.25 access to applications, enabling developers to create Macintosh solutions that give users access to packet-switched networks.

Features

Benefits

▶ X.25 network access

▶ Provides Macintosh computer users with reliable wide area network connectivity.

▶ Conformance to International Telegraph & Telephone Consultative Committee (CCITT) recommendations

▶ Provides universal interoperability with other X.25-conformant systems.

▶ Server-based access

▶ Makes it easy to add users.
▶ Reduces costs by maximizing use of expensive resources such as leased lines.

▶ Packet assembly/disassembly facility (MacPAD)

▶ Supports asynchronous terminal access to packet-switched networks.

▶ Easy-to-use Address Book with a graphics-based user interface

▶ Allows users to select an available service by name without having to learn traditional PAD commands.

▶ Graphics-based Administrator application

▶ Facilitates software installation and administration of user access.

▶ User passwords

▶ Prevents unauthorized users from accessing the server.

▶ Runs under the MultiFinder™ system software

▶ Eliminates the need for a dedicated computer, allowing the server to run other applications.

Technical Summary

General Features

- | | | |
|--|---|---|
| <ul style="list-style-type: none">▶ CCITT 1980 Compatible Mode▶ CCITT 1984 Compatible Mode▶ Packet Assembler/Disassembler (X.3, X.28, X.29)▶ Operation as a DTE | <ul style="list-style-type: none">▶ Operation as a DCE▶ Virtual Circuits: 64 maximum▶ Single link for each Apple Serial NB Card▶ Multiple cards for each Macintosh II▶ Operation at up to 19.2Kbps with RS-232C▶ Operation at up to 64Kbps with V.35 | <ul style="list-style-type: none">▶ Multiple servers for each AppleTalk network system <p>MacX25 does not support the following:</p> <ul style="list-style-type: none">▶ Permanent Virtual Circuits▶ X.32 switched circuit operation |
|--|---|---|

Optional Facilities

For Subscription Registration

- MacX25 supports the following:
- ▶ Extended Sequence numbers
 - ▶ Default Packet Size Assignment: 32 to 4,096
 - ▶ Default Window Size Assignment: 1 to 128
 - ▶ Flow Control Parameter Negotiation: Fixed (at "yes")
 - ▶ Throughput Class Negotiation: Fixed (at "yes")
 - ▶ Closed User Groups
 - ▶ Bilateral Closed User Groups
 - ▶ Fast Select Acceptance: Fixed (at "yes")
 - ▶ Reverse Charging Acceptance
 - ▶ Local Charging Prevention
- MacX25 does not support the following:
- ▶ On-Line Facility Registration
 - ▶ Default Throughput Class Assignment: Fixed (at 48000 bps)
 - ▶ D bit modification

At Call Initiation

- MacX25 supports the following:
- ▶ Packet Size Negotiation
 - ▶ Window Size Negotiation
 - ▶ Throughput Class Negotiation
 - ▶ CUG Group Specification
 - ▶ BCUG Group Specification
 - ▶ Fast Select
 - ▶ Network User Identification
 - ▶ Charging Information
 - ▶ Reverse Charging
 - ▶ RPOA Selection
 - ▶ Call Address Modified Notification
 - ▶ Transit Delay Selection
 - ▶ User Data Field
 - ▶ Calling Address Extension
 - ▶ Called Address Extension
 - ▶ Quality of Service Negotiation
 - ▶ Expedited Data Negotiation

At Call Reception

- MacX25 supports the following:
- ▶ Packet Size Negotiation
 - ▶ Window Size Negotiation
 - ▶ Throughput Class Negotiation
 - ▶ CUG Group Specification
 - ▶ BCUG Group Specification
 - ▶ Fast Select Acceptance
 - ▶ Reverse Charging Acceptance
 - ▶ Charging Information
 - ▶ Call Redirection Notification
 - ▶ Transit Delay Selection
 - ▶ User Data Field
 - ▶ Calling Address Extension
 - ▶ Called Address Extension
 - ▶ Quality of Service Negotiation
 - ▶ Expedited Data Negotiation

Note: The preceding sections list the capabilities of the MacX25 server, and not those of MacPAD. Use of a facility depends on support for it in the appropriate supported PSDN. All parameters listed under Subscription Registration can be set by the administrator via the Administrator application, except for parameters marked "Fixed"; these parameters are fixed at the specified values or settings. Parameters listed under Call Initiation and Call Reception are accessible to software developers via the MacX25 server.

Network Certification

MacX25 is certified for connection to Telenet and GEIS (GEISCO) networks. Certification is planned for Tymnet and DDN; and in Europe, for the U.K. (PSS), Germany (Datex-P), France (Transpac), Italy (ITAPAC), Sweden (Datapak), the Netherlands (DN-1), Canada (Datapak), and Australia (Austpac).

System Requirements

MacX25 Server

To set up a MacX25 server, you'll need:

- ▶ Any personal computer in the Macintosh II family with an internal hard disk (2 megabytes of RAM recommended)
- ▶ Macintosh System Software Version 6.0.3 (or later)
- ▶ An Apple Serial NB Card with the appropriate RS-232C or V.35 cable
- ▶ The appropriate LocalTalk™ network-compatible cable connectors

To use MacX25 on an Ethernet network, you'll need the appropriate Ethernet interface card for your Macintosh.

MacPAD

To use MacPAD, you'll need:

- ▶ A Macintosh Plus, Macintosh SE, or Macintosh SE/30 personal computer, or any computer in the Macintosh II family
- ▶ A terminal-service application that uses the Macintosh Communications Toolbox

- ▶ The appropriate LocalTalk-compatible cable connectors

To use MacPAD on an Ethernet network, you'll need the appropriate Ethernet interface card for your Macintosh.

The AppleTalk Data Stream Protocol (ADSP) software and the Macintosh Communications Toolbox software are included with the MacX25 server software.

MacX25 Programming Library

Overview

The MacX25 Programming Library allows developers to create software solutions that provide users with access to a packet-switched data network. It works in conjunction with the MacX25 server to provide X.25 services to application programs.

The library is a toolkit, or collection of routines, that offers a high-level program interface for applications. Routines are included for initiating and terminating contact with the MacX25 server, establishing and closing down a virtual circuit, passing data across an established circuit, and more. Technical support is available to Apple Partners.

Features

-
- ▶ High-level programming interface

-
- ▶ Library of X.25 service routines

Benefits

- ▶ Provides access to X.25 over the AppleTalk network system, using the AppleTalk Data Stream Protocol (ADSP).
- ▶ Eliminates the need for developers to have detailed knowledge of ADSP and AppleTalk.

-
- ▶ Facilitates development of distributed X.25 applications.
 - ▶ Allows applications to run on the MacX25 server under MultiFinder.

Product Details

C programming libraries are supplied with the MacX25 Programming Library. Routines are included that allow users to connect and disconnect from the server and to query server status and circuit information. A packet-level interface using control blocks is provided for developers who require maximum control. A higher-

level logical packet interface, also provided, performs data translation and formatting services, creates X.25 packets, and relieves the programmer of some lower-level tasks. The MacX25 Programming Library includes a programmer's guide.

System Requirements

To use the MacX25 Programming Library, you'll need:

- ▶ A Macintosh Plus, Macintosh SE, or Macintosh SE/30 personal computer, or any computer in the Macintosh II family
- ▶ Macintosh System Software Version 6.0.3 (or later)
- ▶ The appropriate LocalTalk-compatible cable connectors

To use the MacX25 Programming Library on an Ethernet network, you'll need an appropriate Ethernet interface card for your Macintosh.

For development work, the Macintosh Programmer's Workshop (MPW™) Version 3.0 with MPW C is required.



MacX25

Ordering Information

MacX25

Order No. M0711

With your order, you'll receive:

- ▶ MacX25 server software
- ▶ MacPAD software
- ▶ Macintosh Communications Toolbox software

- ▶ ADSP software
- ▶ *MacX25 Administrator's Guide*
- ▶ *MacPAD User's Guide*

MacX25 Programming Library

Order No. M0245LL/A

With your order, you'll receive:

- ▶ MacX25 Programming Library software
- ▶ *MacX25 Programmer's Guide*

For information about licensing, contact:
Apple Software Licensing
Apple Computer, Inc.
10431 De Anza Blvd., M/S 38I
Cupertino, CA 95014

Apple Serial NB Card

Order No. M0264

To use the Apple Serial NB Card, you'll need one of the following cables:

- ▶ RS-232C Cable
(Order No. M0128LL/A)
- ▶ V.35 Cable
(Order No. M0127LL/A)

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June 1989. Product specifications are subject to change without notice. Printed in U.S.A.
M0247LL/A

Macintosh Portable Numeric Keypad Module



Overview

The Macintosh® Portable Numeric Keypad Module is designed especially for the Apple® Macintosh Portable personal computer. This 18-key keypad can be inserted on the right or left of your keyboard, for your convenience, in place of the trackball. The keypad is ideal for number-intensive applications, because its firm, positive-response keys make it easy to enter numeric data quickly and accurately. And the keypad consumes very little power, enabling you to use your computer for a long time before recharging the battery.

Features

▶ Firm, positive-response keys in standard layout

▶ Flexible configuration

▶ Power-efficient design

Benefits

▶ Makes it easy to enter numbers quickly and accurately.
▶ Lets you do most calculations right on the keypad—without having to move back to the keyboard—with its four arithmetic function keys: Enter, Clear, decimal point, and equal sign.

▶ Lets you work the way you like, with the keypad mounted on either side of the keyboard, for left- or right-handed use.
▶ Is interchangeable with the Macintosh Portable Trackball* for convenient use of number-intensive applications as well as those that require frequent use of the trackball.

▶ Optimizes the life of your Macintosh battery.
▶ Lets you use your computer longer before recharging.

*Requires installation by an authorized Apple dealer.



Macintosh Portable Numeric Keypad Module

System Requirements

To use the Macintosh Portable Numeric Keypad Module, you'll need a Macintosh Portable personal computer with System Software Version 6.0.4 (or later).

Technical Specifications

Keys

- ▶ Number of keys: 18
- ▶ Keys included
 - Numbers: 0–9
 - Arithmetic operators: =, /, *, -, +
 - Decimal point
 - Enter
 - Clear

Size and weight

- ▶ Height: maximum 1.0 in. (2.5 cm)
- ▶ Width: 3.0 in. (7.6 cm)
- ▶ Depth: 5.0 in. (12.7 cm)
- ▶ Weight: 5.0 oz. (140 g)

Interface

- ▶ Direct internal connection with the Macintosh Portable personal computer

Environmental requirements

- ▶ Operating temperature: 32° to 122° F (0° to 50° C)
 - ▶ Storage temperature: -40° to 140° F (-40° to 60° C)
 - ▶ Relative humidity: 95% noncondensing at 32° to 122° F (0° to 50° C) for 8 hours
-

Ordering Information

Macintosh Portable Numeric Keypad Module*

Order No. M0239

With your order, you'll receive:

- ▶ Macintosh Portable Numeric Keypad Module
- ▶ Limited warranty statement

*Requires installation by an authorized Apple dealer.



Overview

The Apple® Keyboard is the standard keyboard for the Macintosh™ SE and Macintosh II personal computers. Featuring a typewriter-style layout plus a numeric keypad and cursor keys, it provides an ideal solution for business and higher-education uses.

Features

- ▶ Apple Desktop Bus™ (ADB) interface
- ▶ Standard typewriter-style keyboard with numeric keypad and cursor keys
- ▶ Remapping desk accessory (packaged separately)*

Benefits

- ▶ Plugs directly into any ADB port on your computer or another ADB peripheral.
- ▶ Allows the daisy-chain connection of other ADB input devices.
- ▶ Speeds data entry for number-intensive applications.
- ▶ Lets you quickly move the cursor through a document without taking your hands off the keyboard.
- ▶ Lets you assign menu-based commands or text strings to a particular key or key combination.



Apple Keyboard

System Requirements

Any Apple personal computer with an Apple Desktop Bus interface.

Technical Specifications**Number of keys**

▶ 81; includes 10-key numeric pad and four cursor-control keys

Size and weight

▶ Height: 1.75 in. (44.5 mm)
▶ Width: 16.5 in. (418 mm)
▶ Depth: 5.6 in. (142 mm)
▶ Weight: 2.25 lbs. (1 kg)

Ordering Information**Apple Keyboard**

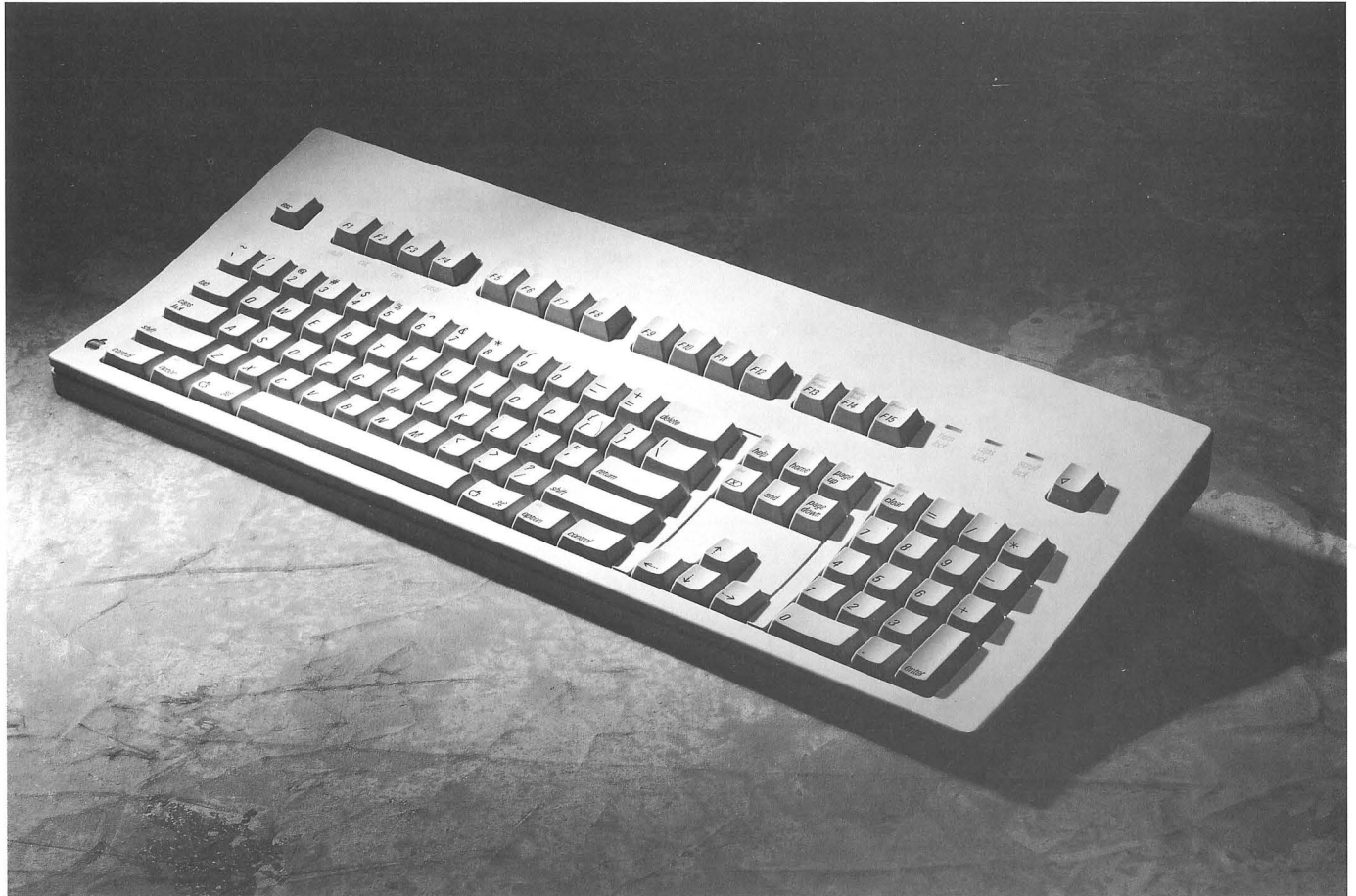
Order No. M0116

With your order, you'll receive:

- ▶ Apple Keyboard and cable
- ▶ Referral card
- ▶ Limited warranty statement

*See your authorized Apple representative for details regarding the remapping desk accessory.

Apple Extended Keyboard



Overview

The Apple® Extended Keyboard is an alternative keyboard for your Macintosh™ SE or Macintosh II personal computer. It includes 15 function keys, a numeric keypad, standard cursor arrow keys in a T-style layout, and 6 cursor control keys. It's ideal for running terminal-emulation and related data communications programs, alternate operating systems, and their applications.

Features

- ▶ Apple Desktop Bus™ (ADB) interface
- ▶ 15 built-in function keys
- ▶ Remapping desk accessory (packaged separately)
- ▶ Dual-legend keycaps
- ▶ T-style cursor pad
- ▶ 6 cursor control keys
- ▶ Numeric keypad

Benefits

- ▶ Plugs directly into any ADB port on your computer or another ADB peripheral.
- ▶ Allows the daisy-chain connection of other ADB input devices.
- ▶ Lets you take advantage of applications that support function keys.
- ▶ Lets you assign menu-based commands or text strings to a particular key or combination of keys (including the function keys).
- ▶ Represents some of the most common functions of the MS-DOS environment.
- ▶ Provides an intuitive layout of the cursor arrow keys.
- ▶ Lets you quickly move through a document without taking your hands off the keyboard.
- ▶ Speeds data entry for number-intensive applications.



Apple Extended Keyboard

System Requirements

Any Apple personal computer with an Apple Desktop Bus interface.

Technical Specifications

Keys

- ▶ Total number: 105
- ▶ Additional features:
 - 10-key numeric pad
 - 15 function keys
 - 4 arrow cursor-control keys in T-style layout
 - 6 special cursor-control keys (Home, Page Up, Page Down, Forward Delete, End, and Help)

Size and weight

- ▶ Height: 2.25 in. (56.4 mm)
- ▶ Width: 19.13 in. (486 mm)
- ▶ Depth: 7.4 in. (188 mm)
- ▶ Weight: 3.63 lbs. (1.6 kg)

Product Details

- ▶ The keyboard has 15 function keys (F1-F15) and 6 cursor control keys (Home, Page Up, Page Down, Forward Delete, End and Help).
- ▶ F1-F4 are labeled on the housing under the keys (F1=undo, F2=cut, F3=copy, and F4=paste). These are not predefined default values, however developers are being encouraged to

use these definitions as appropriate. The remaining 11 function keys can also be defined by the user.

- ▶ The remapping facility is available for a specific application or globally for all applications.
- ▶ The function keys are operative by using the remapping desk accessory or by using an MS-DOS application with appropriate co-processor card.

Developers are being encouraged to support these keys in their applications.

- ▶ The Caps Lock LED is operative in the Macintosh environment. The Num Lock and Scroll Lock are used by some third-party applications. Developers are being encouraged to support these LEDs in their applications.

Ordering Information

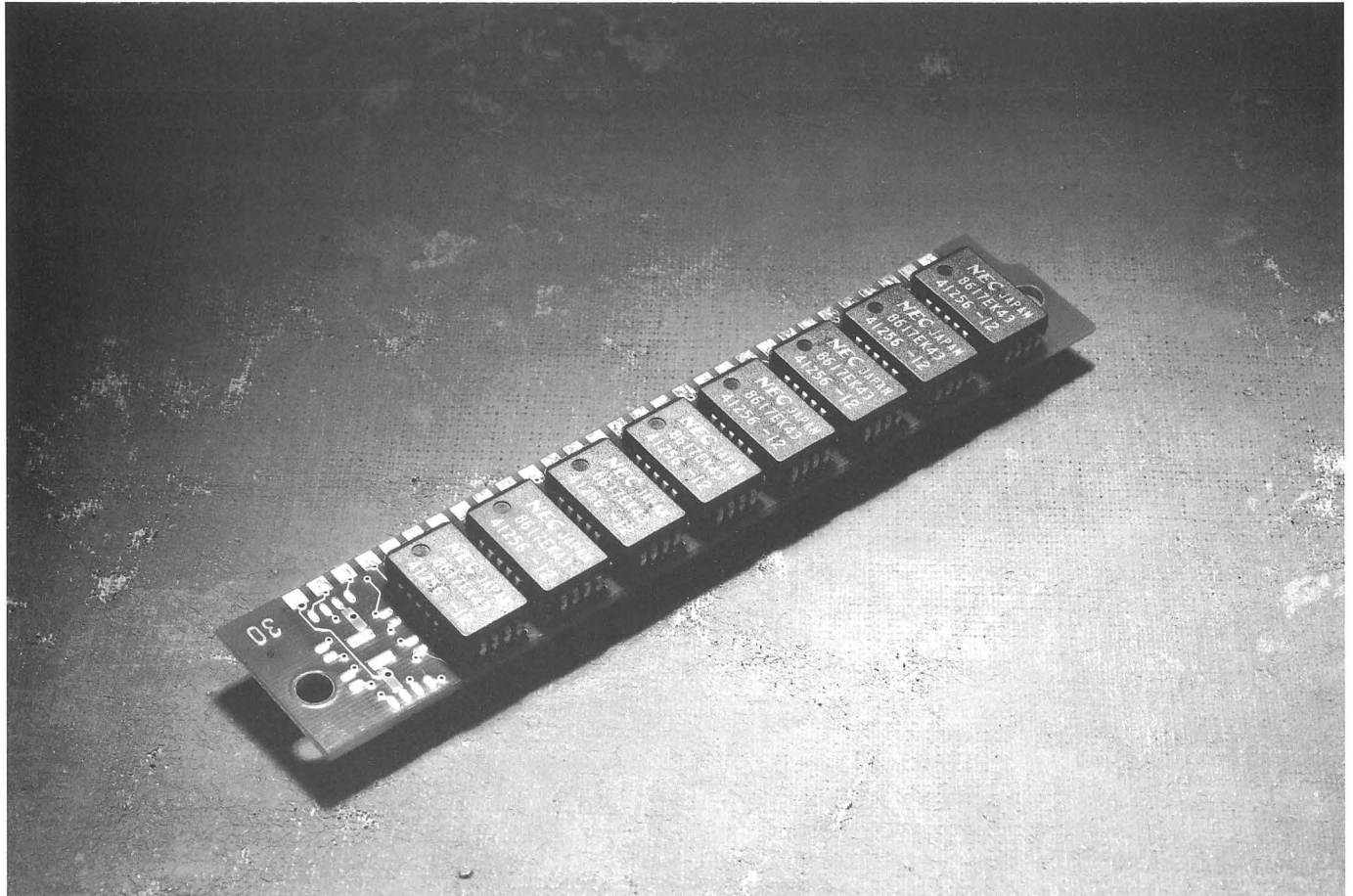
Apple Extended Keyboard

Order No. M0115

With your order, you'll receive:

- ▶ Apple Extended Keyboard and cable
- ▶ Referral card
- ▶ Limited warranty statement

*See your authorized Apple Representative for details regarding the remapping desk accessory.



Overview

Apple® Memory Expansion Kits give you the ability to expand your Macintosh™ Plus, Macintosh SE, or Macintosh II personal computer as your needs change. They let you go to the maximum user memory (RAM) immediately, or in convenient steps as your requirements increase.

Features

- ▶ Total RAM (random-access memory) of up to 4 megabytes for the Macintosh Plus and Macintosh SE, and 8 megabytes for the Macintosh II
- ▶ Flexible configurations
- ▶ RAM is fully addressable by both the processor and the operating system

Benefits

- ▶ Gives you all the memory you need for the most powerful applications.
- ▶ Provides a development platform for sophisticated new applications.
- ▶ Lets you run alternate operating systems.
- ▶ Lets you add just as much memory as you need, whenever you need it.
- ▶ Allows the operating system and applications to take full advantage of the expanded memory.



Apple Memory Expansion Kits: 1MB, 2MB.

Product Details

SIMMs and Logic Board Sockets

Both Apple Memory Expansion Kits come in the form of single in-line memory modules (SIMMs).

Each SIMM is a small circuit board containing eight RAM chips. The SIMMs fit into sockets on the main logic board of each computer.

The 1MB kit contains four 256K SIMMs, and the 2MB kit contains two 1MB SIMMs.

Macintosh Plus and Macintosh SE

Each of these computers has four SIMM sockets. At the time of manufacture, all four sockets are used to provide the basic 1 megabyte of RAM (256K in each socket). Since Macintosh Plus or SE SIMMs must be changed in multiples of two, the upgrade options

for these machines are as follows*:

- ▶ Replace two of the existing 256K SIMMs with the Apple 2MB Memory Expansion Kit, resulting in a total RAM of 2.5 megabytes.
- ▶ Replace all four existing 256K SIMMs with two Apple 2MB Memory Expansion Kits,

resulting in a total RAM of 4 megabytes.

Note: These options assume beginning with a 1MB machine. The RAM can also be increased to the maximum from the intermediate level.

* A 2-megabyte configuration is possible but not practical, because it would involve eliminating two of the existing 256K SIMMs without installing anything in their place.

Macintosh II

This computer has eight SIMM sockets. At the time of manufacture, four of the sockets are used to provide the basic 1 megabyte of RAM (256K in each socket), and four are left empty. Since Macintosh II SIMMs must be installed or changed in multiples of four, the upgrade options for this machine are as follows*:

- ▶ Add one Apple 1MB Memory Expansion Kit in the empty sockets, resulting in a total RAM of 2 megabytes.
- ▶ Add two Apple 2MB Memory Expansion Kits in the empty sockets, resulting in a total RAM of 5 megabytes.
- ▶ Install four Apple 2MB Memory Expansion Kits (replacing the existing RAM as well as filling the empty

sockets), resulting in a total RAM of 8 megabytes.

Note: These options assume beginning with a 1MB machine. The RAM can also be increased to the maximum from any intermediate level.

* A 4-megabyte configuration is possible but not practical, because it would involve eliminating the four existing 256K SIMMs without installing anything in their place.

System Requirements

The Apple 1MB Memory Expansion Kit can only be used with a Macintosh II personal computer.

The Apple 2MB Memory Expansion Kit can be used with a Macintosh Plus (or a Macintosh 128K or Macintosh 512K that

has been upgraded with the Macintosh Plus logic board), Macintosh SE, or Macintosh II personal computer.

Ordering Information

Apple 1MB Memory Expansion Kit*

Order No. M0218

With your order, you'll receive:

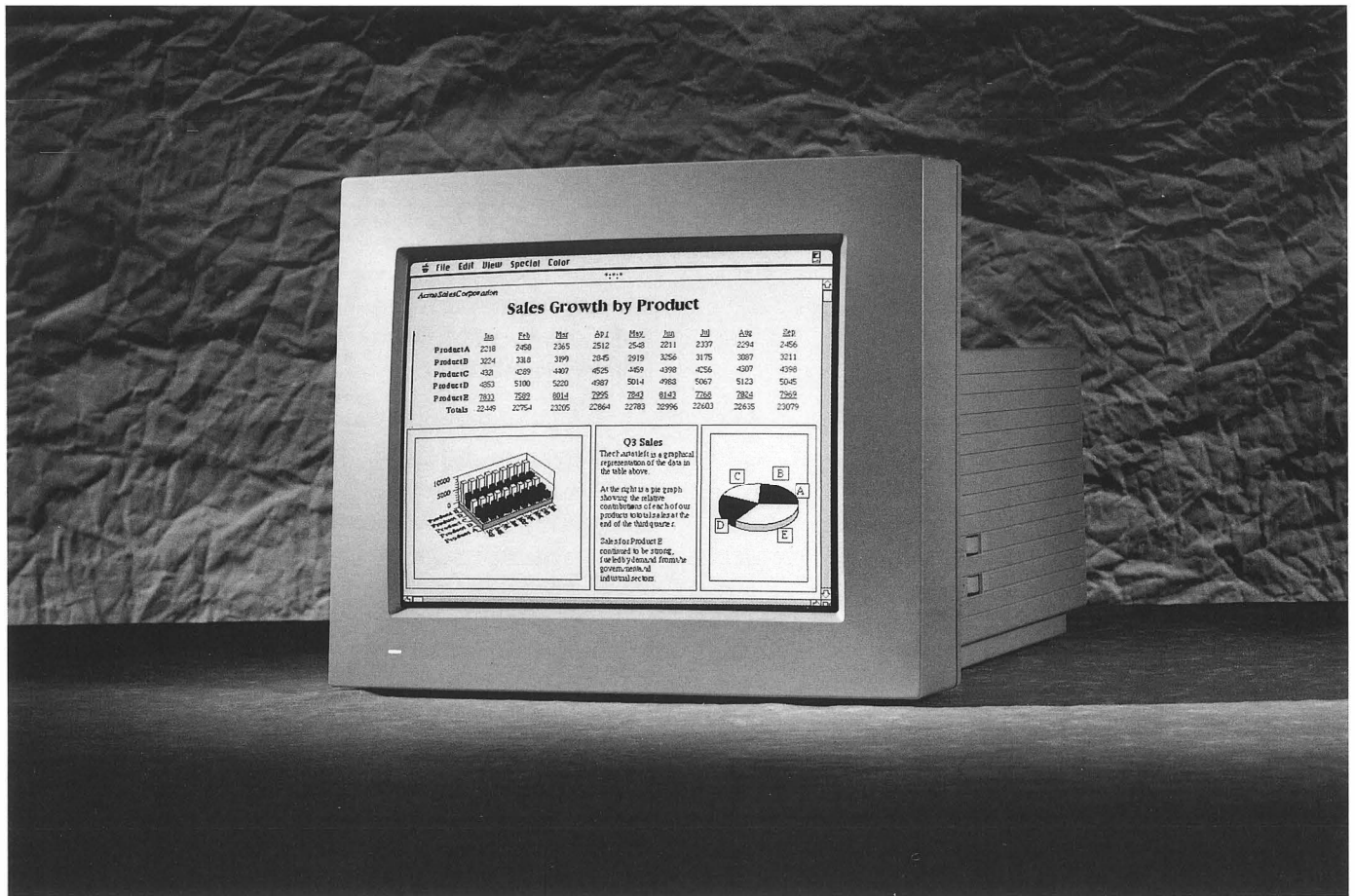
- ▶ Apple 1MB Memory Expansion Kit (contains four 256K SIMMs)
- ▶ Limited warranty statement

Apple 2MB Memory Expansion Kit*

Order No. M0219

* Dealer installation is required.

Macintosh 12" Monochrome Display



Overview

The Macintosh® 12" Monochrome Display offers users of modular Macintosh computers the lowest-cost option for high-resolution display of text and graphic images. It is an excellent choice for anyone who needs to view text and graphics in black and white or gray scale.

With a new "page-white" phosphor screen and dark glass, the Macintosh 12" Monochrome Display offers high brightness and sharp contrast. Its 12-inch, 640- by 480-pixel screen shows the full width and more than half the height of a letter-size page. It can also display up to 256 levels of gray simultaneously, depending on the Macintosh computer or video card to which it is connected.

Features

- ▶ 12-inch monochrome CRT
- ▶ 640 horizontal pixels by 480 vertical lines at 76 dots per inch (dpi)
- ▶ 67-hertz screen refresh rate
- ▶ "Page-white" phosphor screen and dark glass
- ▶ Antiglare screen
- ▶ Brightness and contrast controls

Benefits

- ▶ Delivers sharp, crisp display of text and graphics on a full-size screen.
- ▶ Offers superior resolution and focus for displaying small type and fine graphic details.
- ▶ Lets you display the full width (including margins) and more than half the height of a letter-size page.
- ▶ Maintains close size integrity between the screen and printed documents.
- ▶ Reduces eyestrain by eliminating flicker.
- ▶ Improves brightness and contrast.
- ▶ Minimizes reflected glare.
- ▶ Lets you work comfortably in bright rooms.
- ▶ Lets you adjust the display to suit your preferences and environment.



Macintosh 12" Monochrome Display

Product Details

When connected to a Macintosh IIsi, Macintosh IIfx, or modular Macintosh personal computer equipped with an

appropriate video card, the Macintosh 12" Monochrome Display lets you work with up to 256 shades of gray simultane-

ously. When connected to a Macintosh LC personal computer, it can display 16 shades of gray.

System Requirements

To use the Macintosh 12" Monochrome Display, you'll need the following:

- ▶ A Macintosh personal computer with a built-in video port or an appropriate video card, such as the Macintosh Display Card 4•8, the Macintosh

Display Card 8•24, or the Macintosh Display Card 8•24GC

- ▶ A video cable (supplied with the display)

Technical Specifications

Picture tube

- ▶ 12-in. diagonal
- ▶ Combination phosphor EIA Type P104 and P193 (white), dark glass
- ▶ High-contrast antiglare screen

Screen resolution

- ▶ 640 horizontal pixels by 480 vertical lines; 76 dots per inch (dpi)

User controls

- ▶ Back panel:
 - Power switch
- ▶ Right side:
 - Brightness
 - Contrast

Input signal

- ▶ RS-343 standard; TTL composite sync

Active video display area

- ▶ 8.35 in. horizontal by 6.26 in. vertical (212 mm horizontal by 159 mm vertical); remainder of display area is used for border.

Scanning and refresh rates

- ▶ Horizontal scan rate: 35.0 kilohertz
- ▶ Vertical refresh rate: 66.7 hertz

Rise and fall time

- ▶ 16 nanoseconds maximum

Electrical requirements

- ▶ Voltage: 90 to 132 and 190 to 270 volts AC
- ▶ Frequency: 47 to 63 hertz
- ▶ Power: 30 watts maximum, all line conditions

Fuse protection

- ▶ Internal power line fuse protection; the display fuse should be replaced with a fuse of the same type by a qualified service technician.

Operating environment

- ▶ Operating temperature: 50° F to 104° F (10° C to 40° C)
- ▶ Operating humidity: 95% maximum, noncondensing
- ▶ Operating altitude: 10,000 ft (3,048 m) maximum

Size and weight

- ▶ Height: 12.2 in. (31.0 cm)
 - ▶ Width: 14.4 in. (36.5 cm)
 - ▶ Depth: 10.2 in. (25.9 cm)
 - ▶ Weight: 16 lb. (7.3 kg)
-

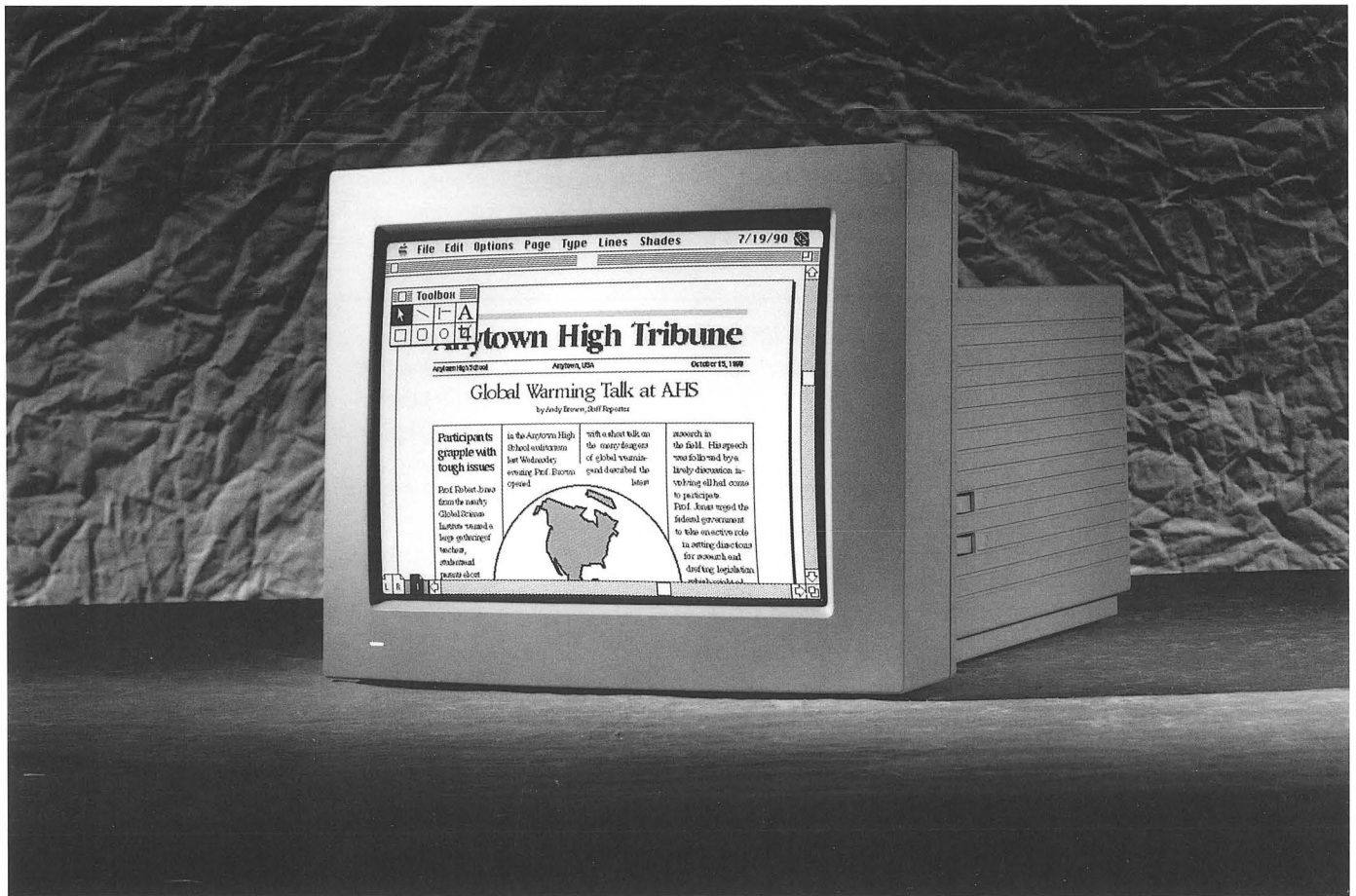
Ordering Information

Macintosh 12" Monochrome Display

Order No. M0298LL/A

With your order, you'll receive:

- ▶ Macintosh 12" Monochrome Display
 - ▶ Video cable
 - ▶ Power cable
 - ▶ Complete setup, learning, and reference documentation
 - ▶ Limited warranty statement
-



Overview

The Macintosh® 12" RGB Display is Apple's lowest-cost color display for Macintosh computers. It delivers the same high performance that you have come to expect from Apple® color displays in a bold new industrial design and at a lower cost.

The Macintosh 12" RGB Display produces bright, vibrant colors on a high-contrast screen that displays the full width of text on a letter-size page. It supports simultaneous display of color graphics and text and offers excellent focus for sharp, clear images.

The Macintosh 12" RGB Display can be used with any Macintosh personal computer that has a built-in video port or is equipped with an appropriate video card.

Features

- ▶ 12-inch CRT with full analog RGB color
- ▶ 512 horizontal pixels by 384 vertical lines at 64 dots per inch (dpi)
- ▶ 0.28-mm dot pitch
- ▶ 60-hertz screen refresh rate
- ▶ High brightness
- ▶ Brightness and contrast controls

Benefits

- ▶ Produces excellent, vibrant colors on a full-size screen.
- ▶ Lets you display the full width (except margins) and almost half the height of a letter-size page.
- ▶ Provides clear, crisp images, even in finely detailed drawings.
- ▶ Minimizes flickering and eyestrain.
- ▶ Reduces eyestrain.
- ▶ Lets you adjust the display to suit your preferences and environment.



Macintosh 12" RGB Display

Product Details

With the Macintosh 12" RGB Display, the number of colors that you can work with simultaneously depends on the Macintosh model and/or video card that you're using. For example, you can work with

256 colors simultaneously (from a color space of more than 16 million colors) if you have a Macintosh LC, a Macintosh IIsi, a Macintosh IIfx, or a modular Macintosh computer equipped with the Macintosh Display

Card 4•8. If you have a modular Macintosh equipped with the Macintosh Display Card 8•24, you can work with 16.7 million colors concurrently.

System Requirements

To use the Macintosh 12" RGB Display, you'll need the following:

- ▶ A Macintosh personal computer with a built-in video port or an appropriate video card, such as the Macintosh Display

- ▶ Card 4•8 or the Macintosh Display Card 8•24
- ▶ A video cable (supplied with the display)

Technical Specifications

Picture tube

- ▶ 12-in. viewable diagonal, with in-line gun
- ▶ 90° deflection angle
- ▶ Black matrix-type dot screen
- ▶ Phosphor type P22 (aluminized)
- ▶ Faceplate of spherical, gray filter glass
- ▶ Shadow mask

Screen resolution

- ▶ 512 horizontal pixels by 384 vertical lines; 64 dots per inch (dpi)
- ▶ 0.28-mm dot pitch

User controls

- ▶ Back panel:
 - Power switch
- ▶ Right side:
 - Brightness
 - Contrast

Input signals

- ▶ Red, green, and blue video signals using RS-343 standard; TTL composite sync

Active video display area

- ▶ 8.08 in. horizontal by 6.02 in. vertical (205 mm horizontal by 153 mm vertical); remainder of display area is used for border.

Scanning and refresh rates

- ▶ Horizontal scan rate: 24.48 kilohertz
- ▶ Vertical refresh rate: 60.15 hertz

Rise and fall time

- ▶ 27 nanoseconds maximum

Electrical requirements

- ▶ Voltage: 100 to 120 volts AC
- ▶ Frequency: 50 to 60 hertz
- ▶ Power: 90 watts maximum

Fuse protection

- ▶ Internal power line fuse protection; the display fuse should be replaced with a fuse of the same type by a qualified service technician.

Operating environment

- ▶ Operating temperature: 50° F to 104° F (10° C to 40° C)
- ▶ Operating humidity: 95% maximum, noncondensing
- ▶ Operating altitude: 10,000 ft. (3,048 m) maximum; 104° F (40° C) operation from 0 to 7000 ft. (2,134 m) and derated linearly to maximum 64° F (25° C) at 10,000 ft.

Size and weight

- ▶ Height: 12.2 in. (31.0 cm)
- ▶ Width: 14.4 in. (36.5 cm)
- ▶ Depth: 10.0 in. (25.3 cm)
- ▶ Weight: 35 lb. (15.9 kg)

Ordering Information

Macintosh 12" RGB Display

Order No. M0297LL/A

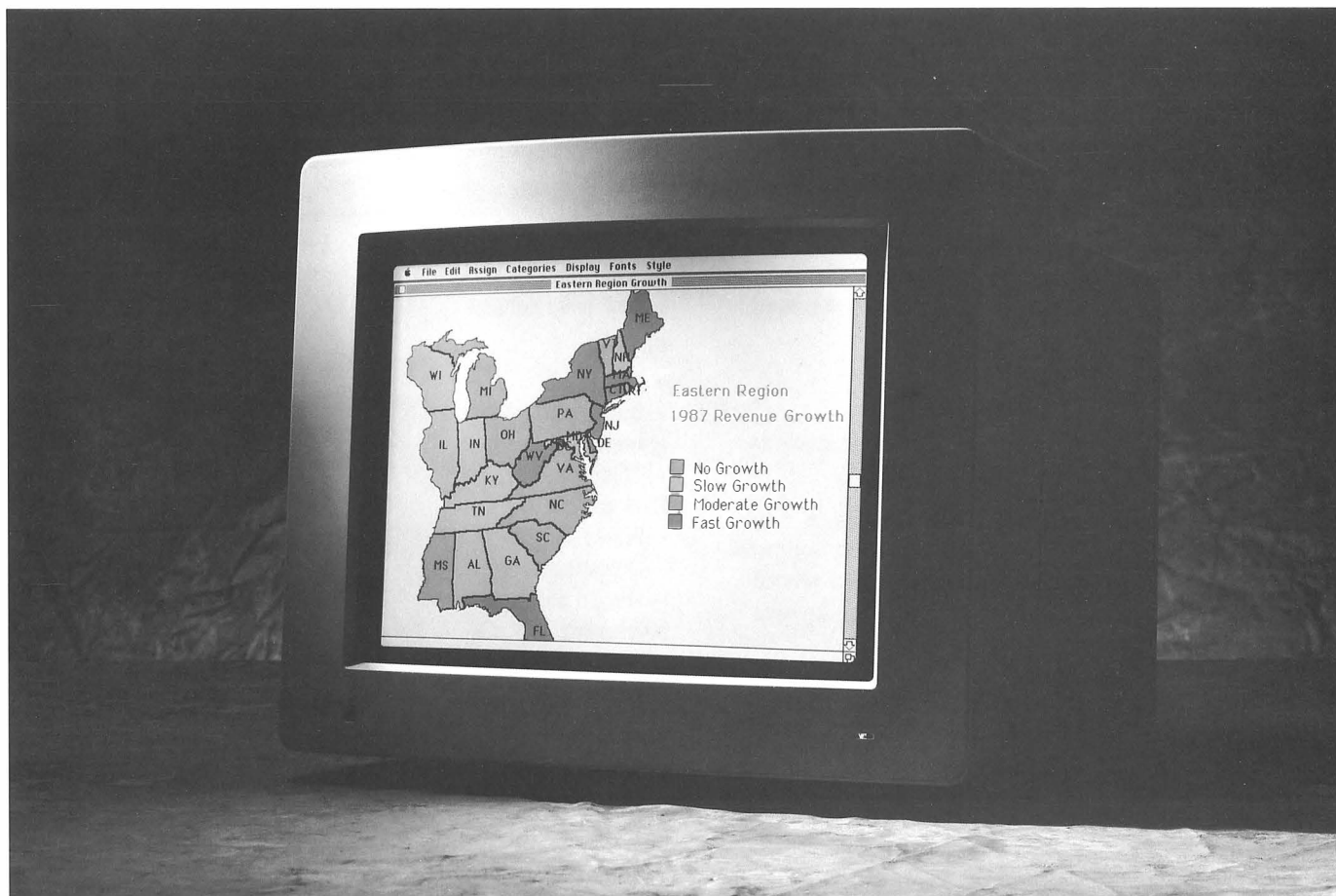
With your order, you'll receive:

- ▶ Macintosh 12" RGB Display
- ▶ Video cable
- ▶ Power cable
- ▶ Complete setup, learning, and reference documentation
- ▶ Limited warranty statement

Apple Computer, Inc.

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Cupertino, CA 95014
(408) 996-1010
TLX 171-576

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M0915LL/A



Overview

The AppleColor™ High-Resolution RGB Monitor sets a new standard in color graphics for personal computers. Taking full advantage of the advanced graphics capabilities of the Macintosh™ II personal computer, the AppleColor High-Resolution RGB Monitor brings you brilliant color graphics and equally sharp text on a high-resolution, 13-inch screen.

Combined with the Macintosh II Video Card or Video Expansion Kit, the AppleColor monitor is capable of simultaneously displaying 16 to 256 colors from a palette of more than 16 million.

Features

- ▶ 640- by 480-pixel resolution
- ▶ 13-inch Trinitron CRT
- ▶ Analog input format
- ▶ 66.7-hertz screen refresh rate
- ▶ Universal power supply

Benefits

- ▶ Provides sharper display of text and graphics in both colors and gray scales.
- ▶ Delivers professional color graphics quality.
- ▶ Displays a full range of text sizes.
- ▶ Lets you view the full width and more than half the length of a half-page document.
- ▶ Displays a full range of text sizes.
- ▶ Permits a much wider range of colors and gray scales than is possible with digital (TTL) RGB displays.
- ▶ Produces crisp, clear information.
- ▶ Reduces eye strain.
- ▶ Allows the monitor to be used with different line voltages.



AppleColor High-Resolution RGB Monitor

System Requirements

To use the AppleColor High-Resolution RGB Monitor, you must have the following:

- ▶ A Macintosh II personal computer
- ▶ A Macintosh II Video Card
- ▶ A video cable (supplied with monitor)

You may also want to purchase:

- ▶ An Apple Universal Monitor Stand
- ▶ A Macintosh II Video Card Expansion Kit

Technical Specifications

Picture tube

- ▶ 13-inch viewable diagonal
- ▶ .25-millimeter aperture grille pitch
- ▶ Trinitron™ CRT

Resolution

- ▶ 640 dots horizontally by 480 dots vertically

Active display area

- ▶ 235 millimeters horizontal by 176 millimeters vertical (remainder of display area is used for border)

Input signals

- ▶ Red, green, and blue video signals using RS-343 standard Composite synchronization, negative going TTL

Video bandwidth

- ▶ 23 megahertz

Scan rates

- ▶ 35.0 kilohertz horizontal
- ▶ 66.7 hertz vertical

Controls

- ▶ Right side:
 - Brightness, with detent reference
 - Contrast
- Back panel:
 - Power switch
 - Degauss switch
 - Vertical misconvergence adjustment
 - Horizontal misconvergence adjustment

Electrical requirements

- ▶ Line voltage: 85 to 270 volts AC
- ▶ Frequency: 47 to 63 Hz
- ▶ Nominal power: 90 watts

Environmental requirements

- ▶ Operating temperature: 50° to 104° F (10° to 40° C)
- ▶ Relative humidity: 90% maximum
- ▶ Maximum altitude: 10,000 feet (3,048 m)

Fuse protection

- ▶ The monitor contains internal power line fuse protection. This fuse should be replaced with the same type by a qualified service technician

Warm-up time

- ▶ 20 minutes to meet all specifications

Size and weight

- ▶ Height: 11 in. (281 mm)
- ▶ Width: 13.5 in. (344 mm)
- ▶ Depth: 15.2 in. (385 mm)
- ▶ Weight: 34 lbs. (15.5 kg)

Ordering Information

AppleColor High-Resolution RGB Monitor

Order No. M0401

With your order, you'll receive:

- ▶ AppleColor High-Resolution RGB Monitor
- ▶ Video cable
- ▶ Power cable
- ▶ Owner's guide
- ▶ Limited warranty statement

.....
Macintosh II Video Card*

Order No. M0211

.....
Macintosh II Video Card Expansion Kit*

Order No. M0213

.....
Apple Universal Monitor Stand

Order No. M0403

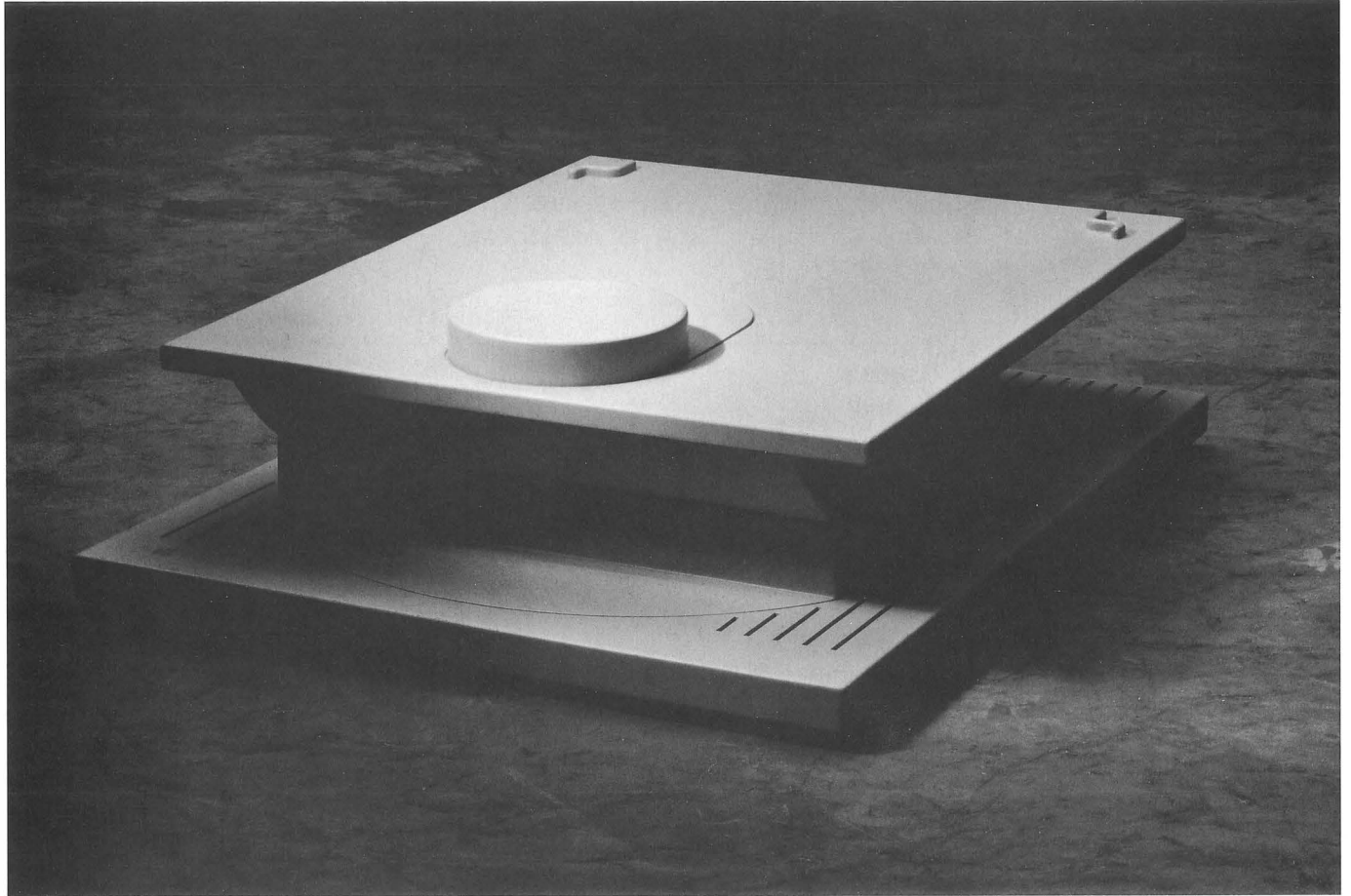
* Dealers installation of these chips is strongly recommended

Apple Computer, Inc.

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 M2231

Apple Universal Monitor Stand



Overview

With its tilt-and-swivel features, the Apple® Universal Monitor Stand makes it easy for you to adjust your monitor to the position you like best. Designed for use with the new Macintosh™ II monitors—the Apple High-Resolution Monochrome Monitor and AppleColor™ High-Resolution RGB Monitor—the Apple Universal Monitor Stand also can be used with Apple IIGs™ monitors.

Features

- ▶ Tilt-and-swivel functions

Benefits

- ▶ Lets you position the monitor at the angle you find most comfortable.



Apple Universal Monitor Stand

System Requirements

The Apple Universal Monitor Stand is compatible with these monitors:

- ▶ Apple High-Resolution Monochrome Monitor
- ▶ AppleColor High-Resolution RGB Monitor

- ▶ Apple Monochrome Monitor
- ▶ AppleColor Composite Monitor
- ▶ AppleColor RGB Monitor

Technical Specifications**Tilt range**

- ▶ Backwards 12°
- ▶ Forwards 10°

Swivel range

- ▶ 45° each direction

Size

- ▶ Height: 3.5 in. (140 mm)
- ▶ Width: 11.25 in. (550 mm)
- ▶ Depth: 14.5 in. (680 mm)

Ordering Information**Apple Universal Monitor Stand**

Order No. M0403

With your order, you'll receive:

- ▶ Apple Universal Monitor Stand
- ▶ Owner's guide
- ▶ Limited warranty statement

Macintosh Portable Video Adapter



Overview

The Apple® Macintosh® Portable Video Adapter lets you connect your Macintosh Portable personal computer to many types of external monitors and projection devices for desktop viewing or for use in presentations. A self-contained unit that is powered by the Macintosh Portable, the video adapter supplies monochrome images to the Apple High-Resolution Monochrome Monitor, the AppleColor™ High-Resolution RGB Monitor, NTSC-, PAL-, and SECAM-standard televisions, videocassette recorders, and projection televisions.

Features

- ▶ Industry-standard output signals: NTSC, PAL, and SECAM
- ▶ Support for the Apple High-Resolution Monochrome Monitor and AppleColor High-Resolution RGB Monitor
- ▶ Slow- and fast-phosphor settings
- ▶ Compact design

Benefits

- ▶ Lets you connect the Macintosh Portable computer to many types of external projection devices for large-group presentations and lectures.
- ▶ Lets you connect the Macintosh Portable computer to external Apple monitors for desktop or small-group work sessions.
- ▶ Lets you work with both slow- and fast-phosphor monitors.
- ▶ Ensures fast setup, because no power cord is required.
- ▶ Saves space, because it fits inside a pocket of the Macintosh Portable computer's carrying case.



Macintosh Portable Video Adapter

System Requirements

To use the Macintosh Portable Video Adapter, you'll need the following:

- ▶ Macintosh Portable computer

- ▶ An external video device
- ▶ A video cable

Technical Specifications

Display resolution

- ▶ 640 pixels horizontally by 400 pixels vertically

Connector

- ▶ Mini DB-15
- ▶ RCA jack

Input signals

- ▶ 8 data lines
- ▶ 4 power lines
- ▶ 3 LCD synchronizing signals

Controls

- ▶ Video output signal switch:
 - Apple High-Resolution Monochrome Monitor and AppleColor High-Resolution RGB Monitor
 - NTSC devices
 - PAL and SECAM devices

- ▶ Phosphor signal switch:
 - Slow-phosphor monitors
 - Fast-phosphor monitors

Power consumption

- ▶ 2 watts

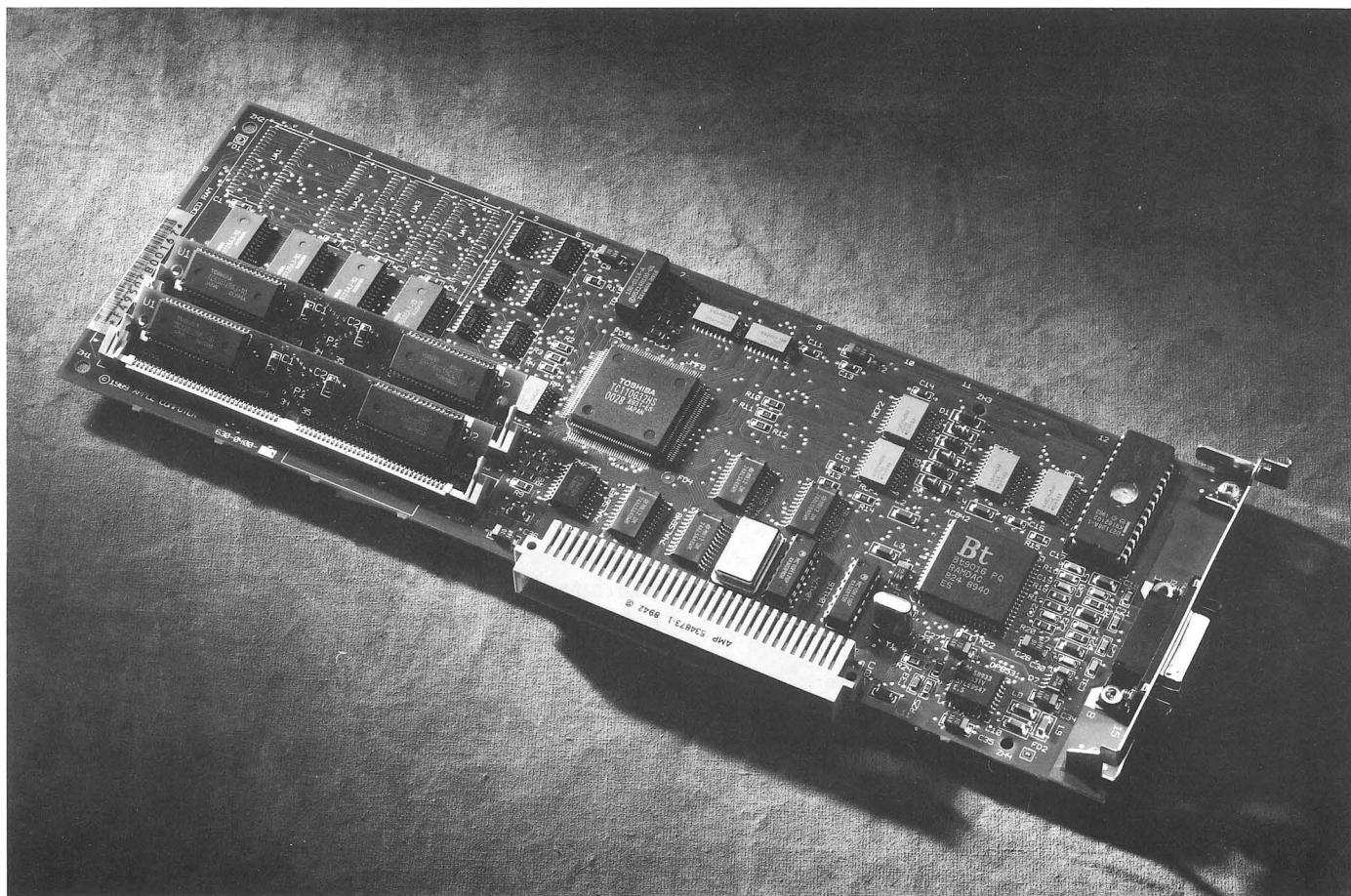
Ordering Information

Macintosh Portable Video Adapter

Order No. M0251

With your order, you'll receive:

- ▶ Macintosh Portable Video Adapter
- ▶ Owner's guide
- ▶ HyperCard® stack setup disk
- ▶ Limited warranty statement



Overview

The Macintosh® Display Card 4•8 and Macintosh Display Card 8•24 provide the Apple® Macintosh II family of modular computers with a single interface to all Apple displays and a broad range of graphics capabilities.

The Macintosh Display Card 4•8 provides support for up to 256 colors or shades of gray on the Apple High-Resolution Monochrome Monitor and the AppleColor™ High-Resolution RGB Monitor. In addition, it provides for up to 16 levels of gray on the Apple Macintosh Portrait Display and the Apple Two-Page Monochrome Monitor.

The Macintosh 8•24 Display Card supports all Apple displays to the maximum of their capabilities, including full 256-level true gray scale—all the shades of gray that the eye can

perceive—on all Apple displays. The card also supports full 24-bit true color on the AppleColor High-Resolution RGB Monitor, allowing you to generate images of photographic quality by displaying up to 16.7 million colors simultaneously. In addition to letting you display and work with photographic-quality images, true gray-scale and true color capabilities allow you to work with lifelike simulations, animations, and visual effects.

The Macintosh Display Card 4•8 can be upgraded to the Macintosh Display Card 8•24 by using the Macintosh Display Card VRAM Expansion Kit.

Both cards also support RS-170 standard timing, for compatibility with numerous interlaced video devices. In

addition, the Macintosh Display Card 8•24 provides the highest-possible-quality interlaced video through the use of Apple Convolution. A capability that is usually associated with much more expensive systems, Apple Convolution evaluates adjacent lines and pixels on interlaced video devices, then adjusts the image on the screen to provide smoother, more continuous images than could otherwise be generated.

The Macintosh Display Card 4•8 and Macintosh Display Card 8•24 provide a wide range of graphics capabilities, which, when combined with the power of the Macintosh II family of computers, enable you to take advantage of sophisticated applications and produce powerful results.

Features

Benefits

- ▶ Support for all Apple displays

- ▶ Provides support for a wide range of display types, both color and monochrome.
- ▶ Enables you to upgrade to color displays or to larger displays without replacing the card.
- ▶ Allows managers of large installations to mix and match monitors and computers more easily.

- ▶ Two versions of the card

- ▶ Provides easier configuration and the ability to grow as your needs grow.
- ▶ With the Macintosh Display Card VRAM Expansion Kit, allows the Macintosh Display Card 4•8 to be upgraded to the Macintosh Display Card 8•24.

- ▶ 24-bit true color and 256-level true gray-scale support

- ▶ Supports up to full 24-bit true color on the AppleColor High-Resolution RGB Monitor, and full 256-level gray scale on all Apple displays.
- ▶ Offers a comprehensive range of colors and gray levels for enhancing graphics, presentation materials, and other documents.

- ▶ Auto-configuration and software-selectable display modes

- ▶ Streamlines operation by automatically determining which Apple display is attached and switching modes without user intervention.
- ▶ Lets you choose pixel depths to display 2, 4, 16, 256, or 16.7 million colors with a simple change on the computer's Control Panel.

- ▶ RS-170 timing and Apple Convolution

- ▶ Provides interlaced video output compatible with many types of video equipment.
- ▶ Apple Convolution improves the image quality on interlaced video devices; with the Macintosh Display Card 8•24, provides support for up to 256 colors (8 bits per pixel).

- ▶ NuBus™ compatible

- ▶ Plugs easily into any Macintosh II slot.
- ▶ Gives complete flexibility of internal card placement.
- ▶ Supports multiple video cards and displays.
- ▶ Supports NuBus slave block transfer modes for fast access by NuBus master cards.

System Requirements

To use the Macintosh Display Card 4•8 or Macintosh Display Card 8•24, you'll need:

- ▶ A personal computer in the Macintosh II family with an available NuBus slot

- ▶ System Software Version 6.0.5 or later
- ▶ For Macintosh II, IIx, and IIcx: The 32-bit QuickDraw™ software is needed to run 24-bit color applications.

- ▶ To take advantage of full 24-bit color, a minimum of 2 megabytes of RAM is recommended.

Technical Specifications

Interface

- ▶ NuBus; plugs into any Macintosh II slot
- ▶ NuBus slave block transfer modes supported

Connector

- ▶ 15-pin D-style

Display modes

- ▶ 1, 2, 4, 8, or 24 bits per pixel (2, 4, 16, 256, or 16.7 million colors)
- ▶ Software-selectable

Display resolution

- ▶ Up to 1,152 pixels horizontally by 870 pixels vertically, depending on the resolution of the display
- ▶ Auto-configuring

Apple Convolution

- ▶ Convolution available for RS-170 interlaced video to up to 8 bits per pixel (256 colors) on the Macintosh Display Card 8•24

Color lookup table

- ▶ In 24-bit mode, provides direct access to 16.7 million colors, driving 8-bit DACs (digital-analog converters) for each of the three RGB channels
- ▶ In other modes, provides a palette of up to 256 colors out of 16.7 million

Output signals

- ▶ Modes: RGB (analog) and gray scale

- ▶ Video: RS-343 standard. Supports RS-170 timing standard for interlaced video with overscan and underscan modes.

- ▶ Sync: Separate or composite depending on display resolution; negative-going; TTL

Raster rates

- ▶ Variable raster rates under software control
- ▶ Vertical refresh: 66.7 or 75 hertz depending on display resolution
- ▶ Dot clock: 12.2727, 30.24, 57.2832, or 100 megahertz depending on display resolution

Power consumption

- ▶ 7 watts

Display Modes Supported

Display	Macintosh Display Card 4•8	Macintosh Display Card 8•24
▶ Apple High-Resolution Monochrome Monitor	▶ 640 x 480 pixels ▶ 2, 4, 16, or 256 gray levels	▶ 640 x 480 pixels ▶ 2, 4, 16, or 256 gray levels
▶ AppleColor High-Resolution RGB Monitor	▶ 640 x 480 pixels ▶ 2, 4, 16, or 256 colors	▶ 640 x 480 pixels ▶ 2, 4, 16, 256, or 16.7 million colors
▶ Apple Macintosh Portrait Display	▶ 640 x 870 pixels ▶ 2, 4, or 16 gray levels	▶ 640 x 870 pixels ▶ 2, 4, 16, or 256 gray levels
▶ Apple Two-Page Monochrome Monitor	▶ 1,152 x 870 pixels ▶ 2, 4, or 16 gray levels	▶ 1,152 x 870 pixels ▶ 2, 4, 16, or 256 gray levels
▶ Interlaced video devices	▶ 640 x 480 pixels ▶ 2, 4, 16, or 256 colors	▶ 640 x 480 pixels ▶ 2, 4, 16, 256, or 16.7 million colors (Apple Convolution enabled up to 256 colors)



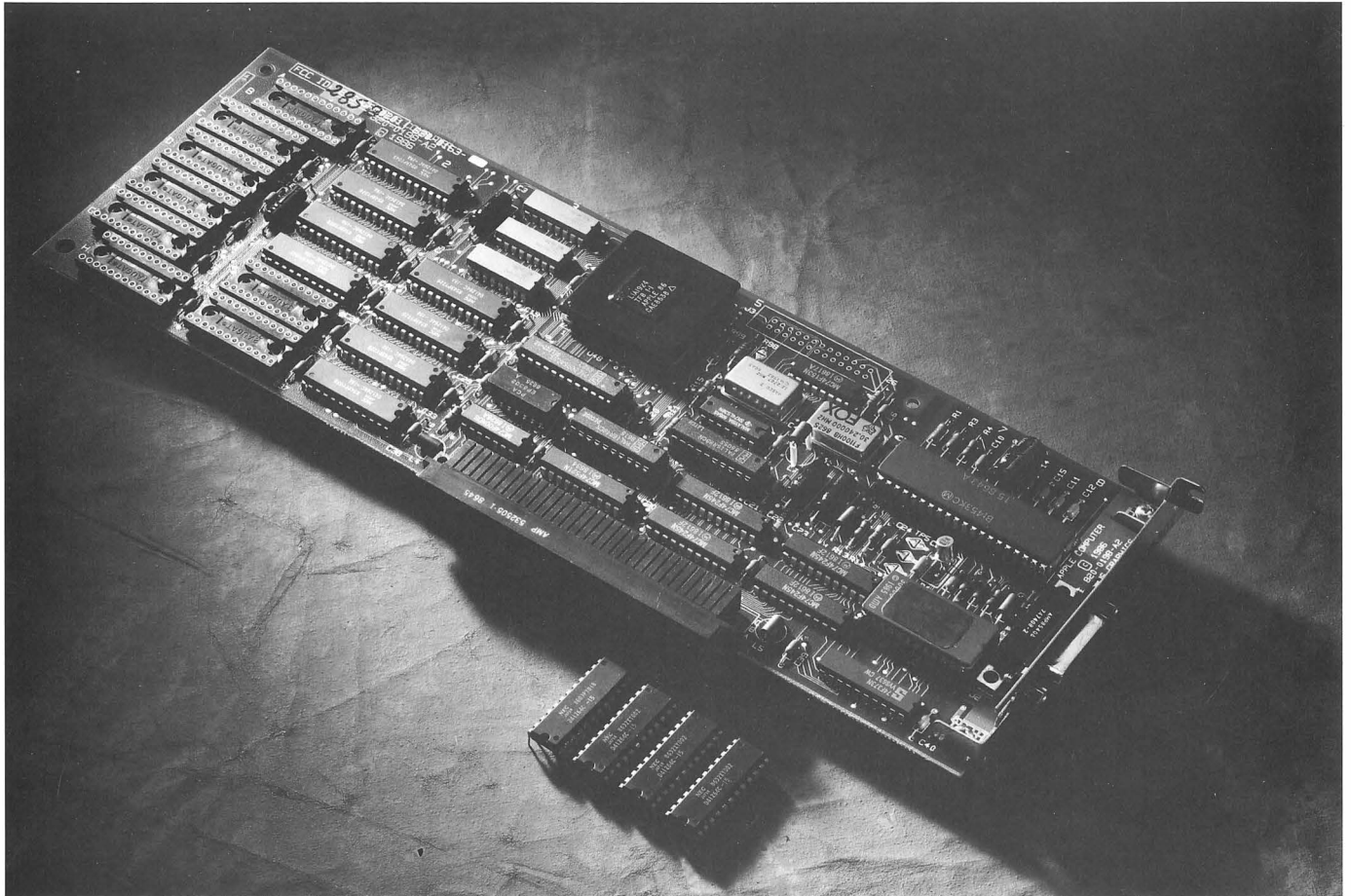
Macintosh Display Card 4•8 and 8•24

Ordering Information**Macintosh Display Card 4•8**Order No.
M0121PA/AWith your order, you'll receive:
▶ Macintosh Display Card 4•8
▶ Limited warranty statement

Macintosh Display Card 8•24Order No.
M0507PA/AWith your order, you'll receive:
▶ Macintosh Display Card 8•24
▶ Limited warranty statement

**Macintosh Display Card
VRAM Kit**Order No.
M0412LL/AWith your order, you'll receive:
▶ Two VRAM upgrade SIMMs

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M0658LL/A



Overview

The Macintosh™ II Video Card provides a single interface for both the Apple® High-Resolution Monochrome Monitor and the AppleColor™ High-Resolution RGB Monitor. It allows you to display up to 16 colors (or gray levels) simultaneously from a palette of more than 16 million.

The optional Macintosh II Video Card Expansion Kit increases the display capability of your monitor to 256 colors (or gray levels) simultaneously.

Features

- ▶ Compatible with both the AppleColor High-Resolution RGB Monitor and the Apple High-Resolution Monochrome Monitor
- ▶ Up to 16 colors (or shades of gray) at one time from a palette of more than 16 million colors/gray levels
- ▶ Optional 8-bit expansion kit
- ▶ Software-selectable display modes
- ▶ NuBus compatible
- ▶ RS-170 capability

Benefits

- ▶ Requires only one video card for either color or monochrome display.
- ▶ Provides a monitor upgrade path with no additional interface costs.
- ▶ Offers a comprehensive range of professional-quality colors for enhancing graphics, presentation materials, and other documents.
- ▶ Increases the display capability to 256 colors (or gray levels).
- ▶ Lets you display two, four, 16, or 256* colors/gray levels with a simple change from the computer's Control Panel.
- ▶ Plugs easily into any Macintosh II slot.
- ▶ Gives you complete flexibility with internal card placement.
- ▶ Provides interlaced video output compatible with many types of video equipment.

* 256-color option available only with expansion kit installed.



Macintosh II Video Card and Expansion Kit

Product Details

Software-selectable display modes

Using the Control Panel of the Macintosh II System file, you can set the Macintosh II Video Card to display one, two, or four bits per pixel. This provides, respectively, 2, 4, or 16 colors or gray levels. (The AppleColor High-Resolution RGB Monitor can display either colors or gray levels; the Apple

High-Resolution Monochrome Monitor will display gray levels.)

The ability to set a two-level display ensures the fastest operation of monochrome Macintosh applications.

Optional 8-bit upgrade

The Macintosh II Video Card comes with 4-bit-per-pixel dis-

play capability. By upgrading this to 8 bits per pixel with the Video Card Expansion Kit, you can then view up to 256 colors/gray levels on your monitor's screen simultaneously (by selecting the 8-bit option on the Control Panel). The upgrade consists of eight video RAM chips, which fit into sockets on the Video Card.

System Requirements

- ▶ A Macintosh II personal computer

Technical Specifications

Interface

- ▶ NuBus; plugs into any Macintosh II slot

Connector

- ▶ 15-pin D-style

Display modes

- ▶ 1, 2, or 4 bits per pixel (2, 4, or 16 colors/gray levels)
- ▶ Upgradable to 8 bits per pixel (256 colors/gray levels) with the Macintosh II Video Card Expansion Kit

Display resolution

- ▶ 640 pixels horizontally by 480 pixels vertically

Output signals

- ▶ Modes: RGB (analog) and monochrome
- ▶ Video: RS343 standard, and RS-170 timing-standard interlaced video
- ▶ Sync: Composite; negative-going TTL

Color lookup table

- ▶ Provides a palette of 16 million colors driving 8-bit DACs (digital-analog converters) for each of the three RGB channels

Read/write speed

- ▶ 400 nanoseconds (through NuBus interface)

Raster rates

- ▶ Vertical: 66.7 hertz
- ▶ Horizontal: 35.0 kilohertz
- ▶ Dot clock: 30.24 megahertz

Power consumption

- ▶ 10 watts

Ordering Information

Macintosh II Video Card

Order No. M0211

With your order, you'll receive:

- ▶ Macintosh II Video Card (4 bit per pixel on-board capability)
- ▶ Installation referral card
- ▶ Limited warranty statement

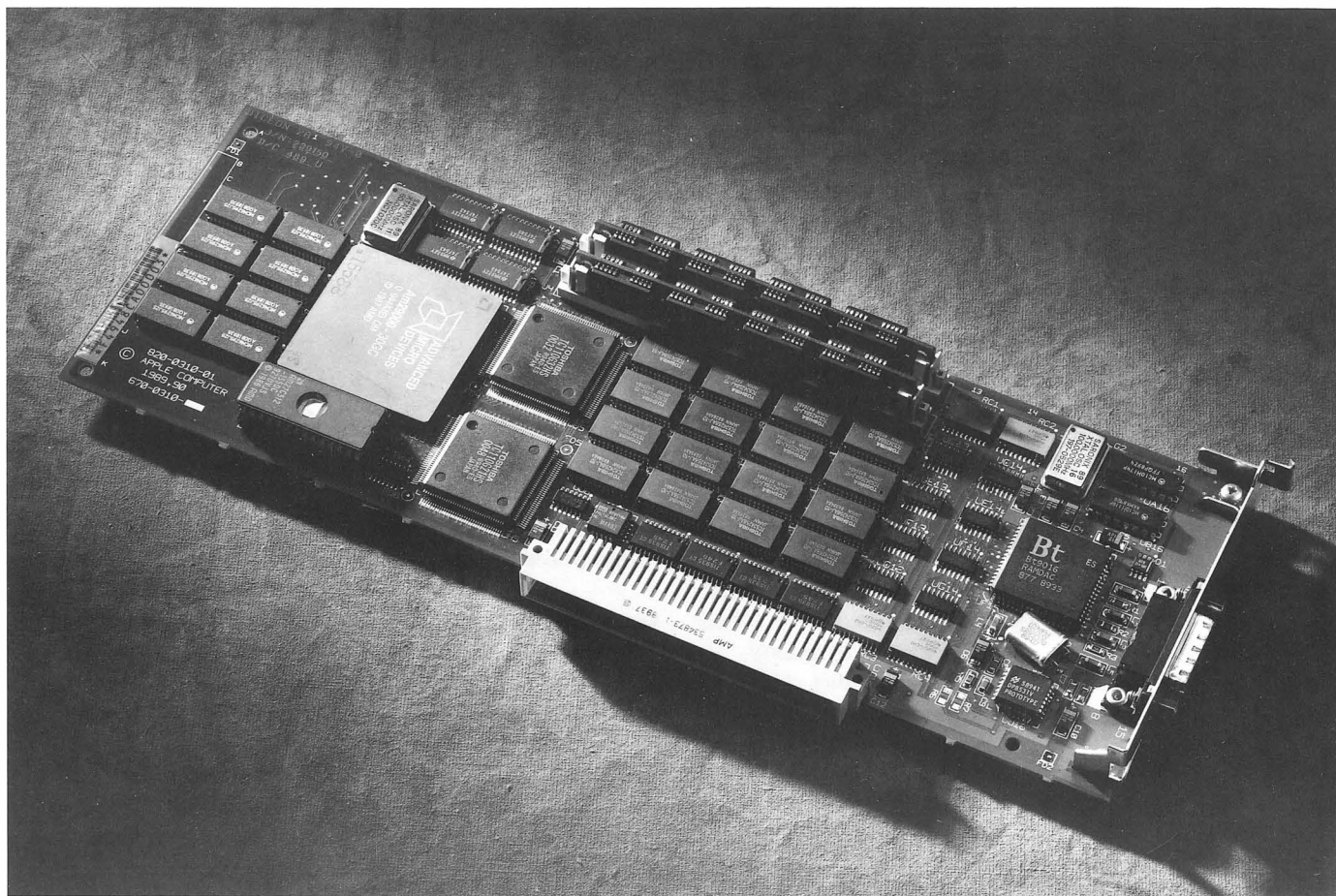
Macintosh II Video Card Expansion Kit*

Order No. M0213

With your order, you'll receive:

- ▶ Expansion Kit (consisting of 8 video RAM chips)

*Dealer installation of these chips is required.



Overview

The Macintosh® Display Card 8•24 GC combines the capabilities of a display card with the power of a dedicated graphics coprocessor, providing the Apple® Macintosh II family of personal computers with sophisticated graphics capabilities at significantly faster drawing speeds.

The Macintosh Display Card 8•24 GC contains an Am29000 RISC-based microprocessor that runs a version of QuickDraw™ that has been optimized for a coprocessing environment. The Am29000 and the Macintosh CPU work together to accelerate the QuickDraw environment, increasing the Macintosh drawing speed 5 to 30 times depending on the application. As a result, graphics-intensive applications work faster and more smoothly, especially when using full 24-bit color.

The Macintosh Display Card 8•24 GC supports all Apple displays to the maximum of their capabilities, including full 256-level true gray scale on all Apple displays. The card also supports full 24-bit true color on the AppleColor™ High-Resolution RGB Monitor, giving you the ability to display up to 16.7 million colors simultaneously to generate images of photographic quality. In addition to letting you display and work with photographic-quality images, true gray-scale and true color capabilities allow you to work with lifelike simulations, animations, and visual effects.

The card also supports RS-170 standard timing, for compatibility with interlaced video devices such as televisions and VCRs, and provides the highest-possible-quality

interlaced video through the use of Apple Convolution. A capability that is usually associated with much more expensive systems, Apple Convolution evaluates adjacent lines and pixels on interlaced video devices, then adjusts the image on the screen to provide smoother, more continuous images than could otherwise be generated.

In addition, the Macintosh Display Card 8•24 GC can be upgraded using the Macintosh Display Card DRAM Expansion Kit, which can improve the performance of applications that use larger off-screen bitmaps and other imaging methods.

The capabilities of the Macintosh Display Card 8•24 GC, combined with the power of Macintosh, enable you to produce powerful results.

Features

Benefits

▶ Combined display and graphics coprocessing capabilities with support for all Apple displays

▶ Provides support for a wide range of display types, both color and gray scale.
▶ Enables you to upgrade to color displays or to larger displays without replacing the card.
▶ Requires only one NuBus™ slot.

▶ On-board Am29000 RISC-based microprocessor running at 30 megahertz

▶ Enables graphics-intensive applications to run more quickly, and new types of applications to run, by boosting the performance of applications by as much as 30 times over normal Macintosh drawing speeds.
▶ Provides fast access to display memory.

▶ 24-bit true color and 256-level true gray-scale support

▶ Supports up to full 24-bit true color on the AppleColor High-Resolution RGB Monitor, and full 256-level gray scale on all Apple displays.
▶ Offers a comprehensive range of colors and gray levels for enhancing graphics, presentation materials, and other documents.

▶ Software downloading at system startup

▶ A single file placed in the Macintosh System Folder provides instructions to the Macintosh Display Card 8•24 GC.
▶ Provides a version of QuickDraw imaging software that is optimized for a coprocessing environment, as well as a Control Panel accessory.

▶ Auto-configuration and software-selectable display modes

▶ Streamlines operation by automatically determining which Apple display is attached and switching modes without user intervention.
▶ Lets you choose pixel depths to display 2, 4, 16, 256, or 16.7 million colors with a simple change on the computer's Control Panel.

▶ RS-170 timing and Apple Convolution

▶ Provides interlaced video output compatible with many types of video equipment.
▶ Apple Convolution improves the image quality on interlaced video devices; with the Macintosh Display Card 8•24 GC, up to 256 colors (8 bits per pixel) are supported.

▶ NuBus compatible

▶ Plugs easily into any Macintosh II slot.
▶ Supports NuBus master and slave block transfer modes for fast access to other cards installed in the computer.

▶ Optional Macintosh Display Card DRAM Expansion Kit

▶ Lets users add on-board dynamic RAM (DRAM) to boost the performance of applications that use off-screen bitmaps and other graphics techniques.

System Requirements

To use the Macintosh Display Card 8•24 GC, you'll need the following:

- ▶ A personal computer in the Macintosh II family with an available NuBus slot

- ▶ System Software Version 6.0.5 or later
- ▶ A minimum of 2 megabytes of memory

- ▶ For Macintosh II, IIx, and IIcx: The 32-bit QuickDraw software is needed to run 24-bit color applications.

Technical Specifications

Graphics coprocessor

- ▶ Advanced Micro Devices Am29000 RISC-based processor running at 30 megahertz

On-board memory

- ▶ 2 megabytes of DRAM used as display frame buffer and processor instruction memory
- ▶ 64 kilobytes of SRAM used as processor instruction cache
- ▶ Can be expanded via SIMM sockets with the Macintosh Display Card DRAM Expansion Kit to hold an additional 2 megabytes of DRAM, for processing of large off-screen graphics. Can be expanded to up to 8 megabytes via third-party SIMMs.

Display modes

- ▶ 1, 2, 4, 8, or 24 bits per pixel (2, 4, 16, 256, or 16.7 million colors)
- ▶ Software-selectable

Display resolution

- ▶ Up to 1,152 pixels horizontally by 870 pixels vertically, depending on display resolution

- ▶ Auto-configuring

Apple Convolution

- ▶ Convolution available for RS-170 interlaced video to up to 8 bits per pixel (256 colors)

Interface

- ▶ NuBus; plugs into any Macintosh II slot
- ▶ NuBus master and slave block transfer modes supported

Connector

- ▶ 15-pin D-style

Color lookup table

- ▶ In 24-bit mode, provides direct access to 16.7 million colors, driving 8-bit DACs (digital-analog converters) for each of the three RGB channels
- ▶ In other modes, provides a palette of up to 256 colors out of 16.7 million

Output signals

- ▶ Modes: RGB (analog) and gray scale

- ▶ Video: RS-343 standard. Supports RS-170 timing standard for interlaced video with overscan and underscan modes.
- ▶ Sync: Separate or composite depending on display resolution; negative-going; TTL

Raster rates

- ▶ Variable raster rates under software control
- ▶ Vertical refresh: 66.7 or 75 hertz depending on display resolution
- ▶ Dot clock: 12.2727, 30.24, 57.2832, or 100 megahertz depending on display resolution

Power consumption

- ▶ 20 watts
- (In systems with all NuBus slots utilized, the power requirements of all cards installed should be added together to ensure that the NuBus power draw is not exceeded. For more information, see the Macintosh owner's guide.)

Display Modes Supported

Display

Macintosh Display Card 8•24 GC

▶ Apple High-Resolution Monochrome Monitor

- ▶ 640 x 480 pixels
- ▶ 2, 4, 16, or 256 gray levels

▶ AppleColor High-Resolution RGB Monitor

- ▶ 640 x 480 pixels
- ▶ 2, 4, 16, 256, or 16.7 million colors

▶ Apple Macintosh Portrait Display

- ▶ 640 x 870 pixels
- ▶ 2, 4, 16, or 256 gray levels

▶ Apple Two-Page Monochrome Monitor

- ▶ 1,152 x 870 pixels
- ▶ 2, 4, 16, or 256 gray levels

▶ Interlaced video devices

- ▶ 640 x 480 pixels
- ▶ 2, 4, 16, 256, or 16.7 million colors (Apple Convolution enabled up to 256 colors)



Macintosh Display Card 8•24 GC

Ordering Information**Macintosh Display Card 8•24 GC**Order No.
M0122

With your order, you'll receive:

- ▶ Macintosh Display Card 8•24 GC
- ▶ Macintosh Display Card 8•24 GC software
- ▶ Owner's guide
- ▶ Limited warranty statement

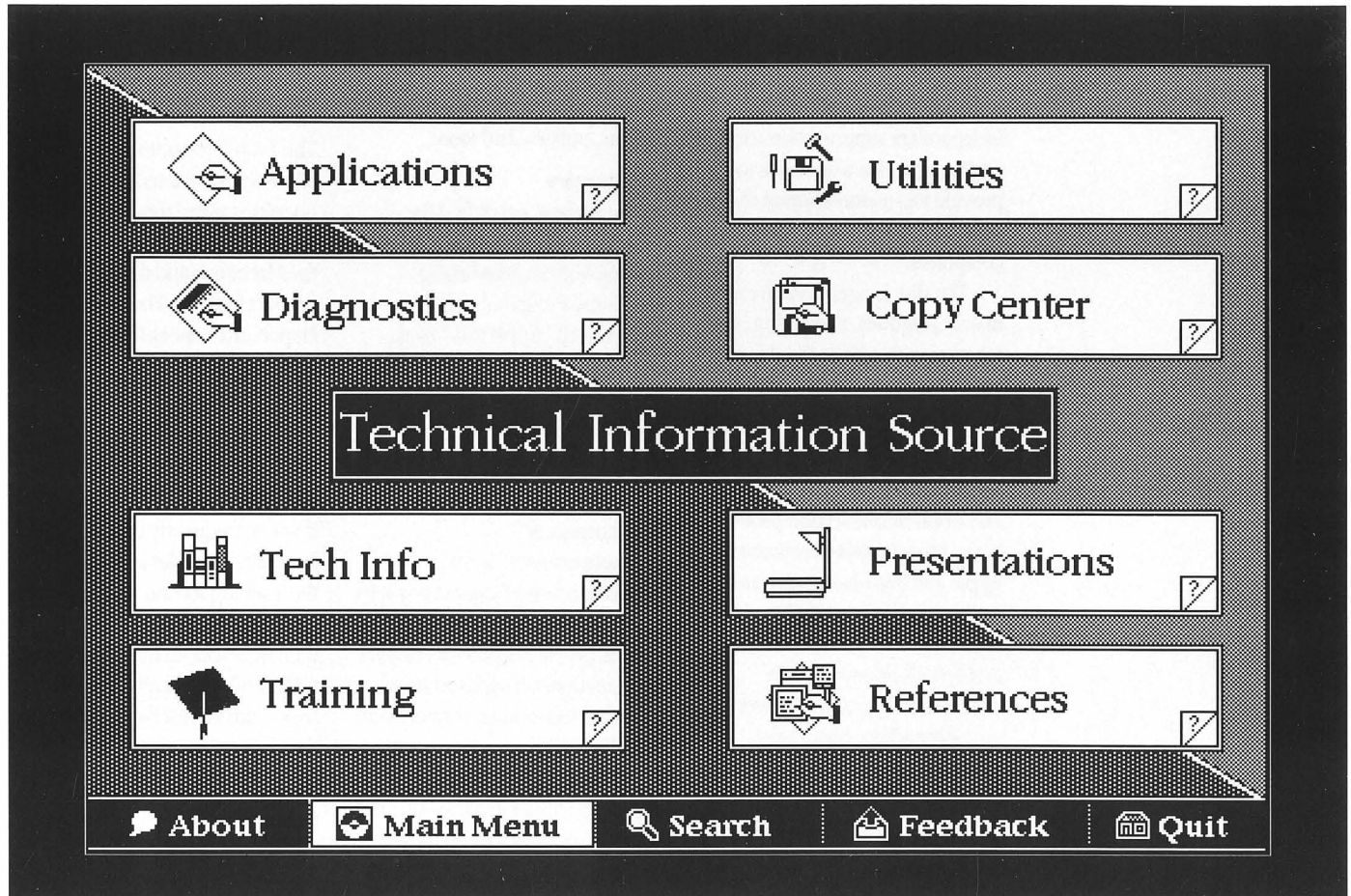
**Macintosh Display Card
DRAM Kit**Order No.
M0505LL/A

With your order, you'll receive:

- ▶ Two DRAM upgrade SIMMs

Apple Computer, Inc.20525 Mariani Avenue
Cupertino, CA 95014
(408) 996-1010
TLX: 171-576

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March 1990. Product specifications are subject to change without notice. Printed in the U.S.A.
M0657LL/A



Overview

The Technical Information Source CD-ROM provides fast, fingertip access to a wide range of support tools and information—all in one place. Contents include technical databases, frequently used system utilities and diagnostics, and support-oriented HyperCard® stacks.

The Technical Information Source compact disc is ideal for anyone who supports Apple® computer systems. By helping you work more efficiently, it enables you to provide faster and more accurate support to your users. In turn, the time you save allows you to offer a broader range of support services, resulting in even greater end-user satisfaction.

Features

- ▶ Broad range of software, tools, and information

- ▶ Distributed on CD-ROM (compact disc, read-only memory)

- ▶ HyperCard front end

- ▶ Can be configured as a volume on an AppleShare® file server

- ▶ Updated regularly

Benefits

- ▶ Supplies, all in one place, most of the tools and information you need to support your Macintosh® and Apple II personal computer users.

- ▶ Provides up to 550 megabytes of data on one convenient disc.
- ▶ Virtually eliminates the risk of the information's being accidentally erased or infected by a computer virus.

- ▶ Provides fast and intuitive navigation through everything on the disc.

- ▶ Lets everyone on a network share tools and information.
- ▶ Leverages your investment in the AppleCD SC® drive and the Technical Information Source.
- ▶ Decreases demands on support providers.

- ▶ Ensures that you have access to the latest software, tools, and information to keep all your systems operating at their best.



Apple Technical Information Source

Product Details

The Technical Information Source CD-ROM is ideal for resellers, in-house support organizations, independent support contractors, and anyone else who needs to provide top-quality support to users of Apple II and Macintosh computers.

The disc is organized in eight major categories. Everything is tied together with a HyperCard front end, allowing you to quickly browse through the entire disc and find the information you need.

Applications

The Applications section provides limited-functionality versions of Apple and third-party software, as well as "guided tours." The applications let you emulate users' problems for more effective troubleshooting, and assist you in providing advice on the best solutions for a prospective user's needs.

Copy Center

The Copy Center includes images of many of the 3.5-inch disks released by Apple. These disk images enable you to provide users with replacement disks quickly and easily, no matter what system they're using. Included are

current and historical versions of Macintosh, Apple IIgs®, and Lisa® system software, peripheral drivers, utilities, and more.

Diagnostics

In this section, you'll find the diagnostic programs often needed to troubleshoot networking problems. Programs include NodeCheck™, AppleTalk® Peek, and AppleTalk Poke. This collection does not include the hardware diagnostics used by authorized Apple Service Technicians.

Presentations

As a support provider, you probably receive frequent requests for technical presentations. This section provides Apple-developed presentations on such technical topics as networking, connectivity, and the A/UX® operating system. There are also building blocks—including clip-art images—that will help you put together your own presentations.

References

The References section offers a broad foundation of technical reference information about Apple products and solutions. It will help you prepare ahead of time to answer users' questions, and can

direct you to other sources of support information.

Tech Info

The Tech Info section is a database of answers to the technical questions asked most often by support providers. It covers both the Macintosh and the Apple II product families. The special HyperCard front end and a built-in search capability allow you to sift through the more than 4,000 articles quickly and efficiently to find the answer you need.

Training

If you're frequently called on to help new users get up to speed, the Training section will save you a lot of time. It provides self-paced training stacks on most Apple CPUs and peripherals, helping users train themselves so that your time is freed for more demanding support activities.

Utilities

The Utilities section provides the system utilities most often needed by support providers, including the Apple File Exchange, Font/DA Mover, and ResEdit™. They're brought together in one place so you'll always have the tool you need to solve a particular problem.

Additional Features

The Technical Information Source disc also provides a keyword search feature and an on-line user's guide and help files. In

addition, to make sure that future versions of this disc meet your expectations and needs, Apple has included a built-in feedback

feature, which lets you send in suggestions for design changes and content enhancements.

System Requirements

To use the Technical Information Source, you'll need:

► An Apple Macintosh computer with at least 1 megabyte of RAM (2 megabytes recommended)

► An AppleCD SC drive or compatible CD-ROM drive

Ordering Information

Apple Technical Information Source
Order No. M0772LL/A

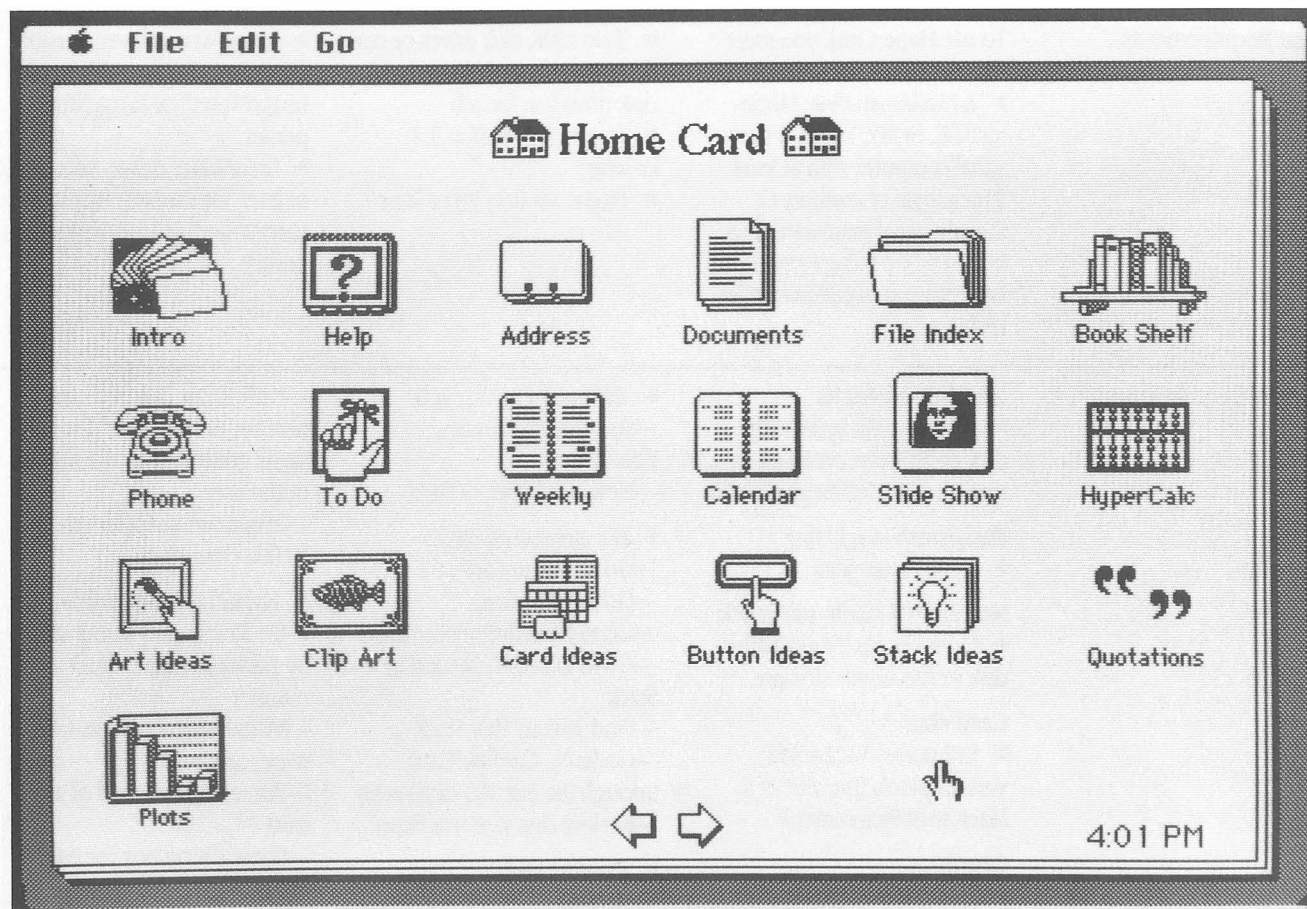
With your order, you'll receive:
► Apple Technical Information Source CD-ROM

► User's guide
► Multiuser software license
► Limited warranty statement

Apple Computer, Inc.

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April 1990. Product specifications are subject to change without notice. Printed in the U.S.A.
C0190LL/A



Overview

HyperCard® software for the Macintosh® family of personal computers lets you organize information much the way you do in your mind—by association and context. It lets you explore large amounts of information at exceptional speeds, or quickly zero in on exactly what you need. HyperCard is also the ideal tool for managing and creating information using virtually any type of media, including video, animation, and sound.

HyperCard uses as a metaphor a nearly universal method for storing information: the index card. Text, graphics, and sounds are stored

on cards that appear on the Macintosh screen. A group of these cards is called a “stack.” You can make notes, type, or draw on them just as you might on paper index cards. You can sort cards, browse among them, or quickly find specific information by pointing and clicking on “buttons.”

Buttons do specific tasks, such as connecting one card to another. Buttons can also do many other things, such as dialing a phone, printing a report—even launching other applications. You can simply cut and paste the buttons that come with HyperCard and use them in your stacks. There’s even a powerful English-like scripting

language, HyperTalk™, built into HyperCard. HyperTalk lets you write your own scripts to give directions to buttons. Developers can extend HyperTalk to control external devices such as videodisc players, on-line information services, and CD-ROM drives.

HyperCard is a powerful new medium for creating and exchanging information. It is an extension of Macintosh technology that puts new power into the hands of all Macintosh users. With this power, people without special training in programming can create entirely new uses for the Macintosh.

Features

Benefits

▶ Information organized by association and context as well as by hierarchy

▶ Gives more intuitive and efficient access to information.

▶ High speed, high capacity

▶ Provides rapid access to an extremely large amount of information.

▶ Powerful tools to manipulate graphics, text, and buttons

▶ Allows you to customize stacks and templates using the familiar Macintosh interface.

▶ Built-in stacks and templates

▶ Enables you to get started immediately with hundreds of ready-to-use stacks, such as an address file, a datebook, "To Do" lists, calendars, clip art, and filing systems. There are also templates and card designs to help you make your own stacks.

▶ HyperTalk scripting language

▶ Lets you expand and customize the function of buttons, cards, and stacks.

▶ Complete on-line help system

▶ Gives you immediate reference information and assistance.

▶ Platform for interactive multimedia presentations

▶ Enriches definition of information beyond text and graphics to include video, sound, voice, and animation.

▶ Supports read-only access

▶ Allows stacks to be stored on CD-ROMs.
▶ Permits multiuser access over the AppleShare® file server.
▶ Allows stacks to be stored on locked floppy disks.
▶ Lets users lock files from the Finder™ or from within the HyperCard program.

System Requirements

To use HyperCard, you must have:

- ▶ A Macintosh Plus, Macintosh SE, or Macintosh II personal computer with at least 1 megabyte of memory (2 megabytes of memory are required when using HyperCard with other applications under MultiFinder™)

- ▶ Two 800K disk drives or one 800K disk drive and one hard-disk drive (preferred)
- ▶ System file Version 3.2 or later
- ▶ Finder Version 5.3 or later

- ▶ ImageWriter driver, Version 2.6 or later, for use with Apple® ImageWriter® or ImageWriter II printer
- ▶ LaserWriter driver, Version 4.0 or later, for use with Apple LaserWriter® or LaserWriter Plus printer

Technical Specifications

Number of stacks

- ▶ Limited only by available disk or file-server storage—each stack is one Macintosh disk file

Maximum stack size

- ▶ 4,096 megabytes

Number of cards per stack

- ▶ Limited only by available disk or file-server storage

Card size

- ▶ 512 horizontal by 342 vertical pixels (the size of a Macintosh Plus screen)

Graphics

- ▶ Black-and-white bitmaps with opaque and transparent areas

Number of text fields per card

- ▶ Unlimited

Maximum amount of text per field

- ▶ 30,000 characters

Number of buttons and links per card

- ▶ Unlimited

Number of variables

- ▶ Unlimited

User interface

- ▶ File menu commands—Standard Macintosh File menu (HyperCard automatically saves changes)
- Print Card, Stack, or Report

- ▶ Edit menu commands

—Standard Macintosh Edit menu
—New Card, Delete Card

- ▶ Go menu commands

—Go to Home Card
—Go to Help Card
—Go to Next or Previous Card
—Go to First or Last Card in Stack
—Find Text in This Stack
—Go Back, Card by Card, through the last 100 cards seen
—Review Last 42 Cards Seen

- ▶ Painting tools

—MacPaint tools on a “tear off” menu
—Import and export graphics from and to other files
—Draw transparent or opaque graphics
—Lighten and darken filled-in areas
—Draw regular polygons
—Select the last object drawn

- ▶ Authoring commands

—Create, delete, or change styles of fields and buttons
—Edit any script
—Search or print a script (HyperTalk commands can be executed immediately)

- ▶ HyperTalk

—Object-oriented and message-passing
—Any button, field, card, background, or stack can have a script

—Each script can have any number of “handlers” for messages generated by the system or the user

—Maximum script length: 30,000 characters

- ▶ HyperTalk commands

—Go to any card in any stack, by position, name, or ID number

—Visual effects such as fade, wipe, or scroll

—Put text in any field of any card

—Show dialog box for user input

—Perform numeric calculations

Control structures

- ▶ Repeat until condition
- ▶ Repeat with loop counter
- ▶ If/then/else conditionals
- ▶ Exit loop or procedure
- ▶ Pass message/send message

Data types

- ▶ Strings of unlimited length
- ▶ Conversion to SANE® numerics (9-place accuracy)
- ▶ Conversion to date and time

Variables

- ▶ Contents of any field
- ▶ Dynamically created local variables
- ▶ Global variables



Macintosh HyperCard 1.2 Software

Ordering Information**HyperCard 1.2**

Order No. M0556/A

With your order, you'll receive:

- ▶ HyperCard & Stacks disk
- ▶ HyperCard Help stacks
- ▶ HyperCard Ideas stack
- ▶ User manual
- ▶ Quick Reference Card

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(408) 996-1010
TLX: 171-576

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M2305/A



Overview

The Apple® Scanner enables Apple Macintosh® personal computer users to import graphics and images into a variety of software applications. This flatbed scanner and its accompanying AppleScan™ software give you a better and more intuitive way of scanning graphics and images, allowing you to create the best possible scanned images quickly and efficiently.

The Apple Scanner works with other Apple products—the Macintosh computer, the AppleFax™ Modem, and the LaserWriter® family of printers—to provide a powerful image-processing system.

The scanner was carefully designed to integrate not only with Apple products, but also with sophisticated third-party page layout and graphics programs.

The scanner and AppleScan software streamline the scanning process, greatly reducing the time needed to get an image to print the way you want it to look. For example, you don't need to re-scan the image every time you make setting adjustments. Also included with the scanner is HyperScan™ software, which enables you to create high-quality scanned images and incorporate them into HyperCard® stacks.

The Apple Scanner has a full range of enhancing controls, which let you adjust the contrast, brightness, gray map, and halftone pattern of the scanned image. It supports three composition modes: line art, halftone, and gray scale. You can scan images at 75, 100, 150, 200, and 300 dots per inch. Together, these features give you complete control over the final appearance of the scanned image.

And when it's time to print the scanned image, you can rest assured you'll get the best possible output, because the scanner is compatible with all Apple printers.

Features

Benefits

Hardware

-
- | | |
|---|---|
| ▶ Flatbed design | ▶ Lets you scan a range of document sizes: letter (8.5 by 11 inches), A4, and legal (8.5 by 14 inches).
▶ Enables you to scan documents from bound originals, without having to alter the originals.
▶ Eliminates the need to line up your document as you would with a feed-through device.
▶ Reduces distortion in the scanned image because it prevents the original document from sliding during the scanning process. |
| ▶ Variable scanning resolution—75, 100, 150, 200, and 300 dots per inch | ▶ Lets you match the scanned image to the resolution of your Apple printer and AppleFax Modem. |
| ▶ Three composition modes: gray scale, line art, and halftone | ▶ Lets you scan original documents of all composition types, producing the highest-quality results.
▶ Supports the display gray-scale capabilities of Macintosh II monitors.
▶ Ensures high-quality images for use in desktop publishing applications. |
| ▶ Gray-scale scanning | ▶ Creates gray-scale images that can be processed using other applications with gray-scale capabilities.
▶ Provides high-quality images for display on Macintosh II monitors. |
| ▶ Full AppleFax Modem support | ▶ When teamed with AppleScan software and an AppleFax Modem, provides a link to the worldwide installed base of facsimile machines. |
| ▶ Removable lid | ▶ Lets you scan bulky documents that don't fit under the scanner's lid. |
| ▶ Industry-standard Small Computer System Interface (SCSI) | ▶ Allows high-speed data transfer between the Apple Scanner and the Macintosh.
▶ Lets you daisy-chain as many as six additional SCSI devices. |

Features

Benefits

Software

- | | |
|--|--|
| ▶ Preview scan | ▶ Allows you to select a portion or portions of an original document, eliminating the need to rescan the entire document each time you make an adjustment.
▶ Streamlines the scanning process and saves you time. |
| ▶ Settings dialogue | ▶ Lets you sample the effects of changes to an image, so you can choose the desired settings before the entire image is scanned. |
| ▶ Brightness and contrast controls, choice of halftone patterns, and gray-map settings | ▶ Allows you to be creative by giving you complete control over how the scanned image appears on the screen and how it looks when printed. |
| ▶ Selectable and user-definable halftone patterns | ▶ Lets you control how the computer interprets, displays, and prints continuous-tone information, such as photographs. |
| ▶ Reduction/Enlargement capability | ▶ Lets you enlarge or reduce an image to fit a desired field size. |
| ▶ Images stored in virtual memory | ▶ Allows you to scan and manipulate images even if their file size exceeds the amount of memory available in the Macintosh. |
| ▶ Support for PICT, TIFF, and MacPaint file formats | ▶ Ensures compatibility with graphics, painting, drawing, and page layout programs. |
| ▶ Bit editing | ▶ Allows precise editing of highly detailed images. |
| ▶ Gray-map setting | ▶ Allows you to enhance details of light or dark originals. |



Apple Scanner

System Requirements

To use the Apple Scanner and AppleScan software, you will need the following:

- ▶ A Macintosh Plus, Macintosh SE, or Macintosh II computer with at least 1 megabyte of memory. (You can increase the performance of the Apple Scanner by using it with a Macintosh that has more than 1 megabyte of memory.)
- ▶ A hard disk drive
- ▶ System file version 6.0 or later
- ▶ Appropriate SCSI cabling

Technical Specifications

Characteristics

- ▶ Scanner type: flatbed
- ▶ Maximum document size: 8.5 by 14 inches
- ▶ Interface: SCSI
- ▶ Dropout color: green
- ▶ Scanning speed: 20.4 seconds for a 300-dot-per-inch scan measuring 8.5 by 11 inches
- ▶ Scan mode selections: line art, halftone, gray scale
- ▶ Gray scale: 16 levels (4 bits per pixel)
- ▶ Scaling: from 25 percent to 400 percent, depending on output resolution

- ▶ Output resolution: 75, 100, 150, 200, and 300 dots per inch
- ▶ Contrast levels: up to 8 (specified by user)
- ▶ Brightness levels: up to 16 (specified by user)
- ▶ Threshold values: up to 16 (specified by user)
- ▶ Gray-map settings: more light detail, normal detail, more dark detail
- ▶ Halftone techniques: spiral, bayer, 2 x 2, line, user-definable patterns, and adaptive dithering to gray-scale data that has been scanned into the Macintosh

Environmental requirements

- ▶ Operating temperature: 32° to 104° F (0° to 40° C)
- ▶ Storage temperature: -40° to 149° F (-40° to 65° C)
- ▶ Relative humidity: 5% to 95% noncondensing

Electrical requirements

- ▶ Line voltage: 120 volts AC ± 10%
- ▶ Frequency: 58 to 62 hertz

Size and weight

- ▶ Height: 4.4 in. (11.2 cm)
- ▶ Width: 13.6 in. (34.5 cm)
- ▶ Depth: 21.8 in. (55.4 cm)
- ▶ Weight: 20.0 lbs. (9.1 kg)

Ordering Information

Apple Scanner

Order No. A9M0337

With your order, you'll receive:

- ▶ Apple Scanner
- ▶ One Macintosh Apple Scanner disk including
 - AppleScan application program
 - AppleScan Resource utility
 - LaserWriter Resource utility
- ▶ One disk containing the HyperScan HyperCard stack
- ▶ Your Tour of the Apple Scanner disk
- ▶ User's guide
- ▶ Power cord
- ▶ Sample photograph
- ▶ Limited warranty statement



Overview

The AppleCD SC™ drive offers Macintosh® and Apple® II computer owners a convenient and cost-effective way to access and explore tremendous amounts of information. Each 12-centimeter CD-ROM disc can hold over 550 megabytes of information—the equivalent of seven hundred 800K floppy disks, or more than 270,000 typewritten pages.

The AppleCD SC drive provides access to text, graphics, and sound stored on digitally recorded CD-ROM discs. You can copy and paste the data for use in other applications. When paired with Apple's HyperCard™ software, the AppleCD SC drive lets you quickly access and present information from the disc.

The AppleCD SC drive supports the Apple II, Macintosh, and industry-standard High Sierra file systems, giving users access to a broad range of CD-ROM titles.

The AppleCD SC also has audio capabilities. Utilizing the AppleCD SC drive's headphone jacks or RCA jacks, the user can listen to audio CDs when not working with CD-ROM discs.

Features

Benefits

-
- | | |
|--|---|
| ▶ Front-loading CD-ROM slot | ▶ Makes it easy to insert and retrieve CD-ROM discs.
▶ Lets you stack the drive on top of or underneath your computer, saving desk space. |
| ▶ 64K RAM buffer | ▶ Offers improved data transfer. |
| ▶ High Sierra compatibility | ▶ Lets you play discs, using either the Apple II or Macintosh computer, that are pressed in an industry-standard file format. |
| ▶ AppleShare® file server support | ▶ Lets users on a network access information stored on a shared AppleCD SC drive attached to an AppleShare file server.
▶ Lowers the cost of the drive per user. |
| ▶ CD Caddy | ▶ Protects discs, guarding the integrity of the recorded information.
▶ Provides a convenient way to store discs. |
| ▶ Universal power supply | ▶ Ensures compatibility with worldwide electrical standards. |
| ▶ CD Audio Chip set and CD Remote desk accessory | ▶ Lets you play audio CDs when not working with CD-ROMs—even while you are working in other applications. |
| ▶ RCA jacks (two) | ▶ Provides audio connectors for external amplified speakers.
▶ Lets you listen to stereophonic audio information stored on the disc. |
| ▶ Headphone jack | ▶ Lets you listen privately to stereophonic audio information stored on the disc. |

System Requirements

To use the AppleCD SC drive with a Macintosh computer, you'll need the following:

- ▶ Appropriate SCSI cabling*

To connect the AppleCD SC to an Apple II Plus, Apple IIe, or Apple IIgs® computer, you must have:

- ▶ An Apple II SCSI Interface Card with Rev. C (or later) ROMs
- ▶ Appropriate SCSI cabling

*Connection to a Macintosh is made via the computer's DB-25 SCSI port.

Technical Specifications

Playback medium

- ▶ 12-centimeter optical disc installed in a CD Caddy (any CD-ROM or audio compact disc is compatible)

Capacity

- ▶ Data capacity
 - Mode 1: 656 megabytes
 - Mode 2: 748 megabytes
- ▶ Recording surfaces: 1
- ▶ Data block (available to user)
 - Mode 1: 2,048 bytes
 - Mode 2: 2,336 bytes
- ▶ Blocks per disc: more than 270,000

Audio playback

- ▶ Playing time: more than 1 hour
- ▶ Frequency response: 20 to 20,000 hertz

Characteristics

- ▶ Access time (including latency)
 - Average: less than 600 milliseconds (500 ms, typical)
 - Maximum (first to last block): less than 1.2 seconds (800 ms, typical)
- ▶ Data-streaming rate
 - Mode 1: 150 K/second
 - Mode 2: 171 K/second
- ▶ Block rate: 75 blocks/second
- ▶ SCSI bus transfer rate: approximately 800K/second
- ▶ Rotational speed: approximately 230 to 530 rpm (variable)
- ▶ Startup time: 5 seconds (typical; media-dependent)
- ▶ Spin-down time: 2 seconds (typical)

Electrical requirements

- ▶ Line voltage: 85 to 270 volts AC
- ▶ Frequency: 47 to 64 hertz
- ▶ Maximum power: 40 watts

Environmental requirements

- ▶ Operating temperature: 50° to 104° F (10° to 40° C)
- ▶ Storage temperature: -22° to 122° F (-30° to 50° C)
- ▶ Operating relative humidity: 10% to 90% noncondensing
- ▶ Operating altitude: -1,000 to 15,000 feet
- ▶ Transportation/Storage altitude: -1,000 to 40,000 feet

Size and weight

- ▶ Height: 3.31 inches (84 mm)
- ▶ Width: 9.69 inches (246 mm)
- ▶ Depth: 10.47 inches (266 mm)
- ▶ Weight: 8.8 lbs. (4 kg)



AppleCD SC

Ordering Information

AppleCD SC
Order No. M2700

With your order, you'll receive:

- ▶ AppleCD SC
- ▶ Owner's Guide
- ▶ Apple CD Caddy
- ▶ One 3.5-inch Macintosh CD Setup disk

- ▶ One 5.25-inch Apple II CD Setup disk
- ▶ One 3.5-inch Apple II CD Setup disk
- ▶ Power cord
- ▶ Limited warranty statement

**Apple CD Caddy
(box of 5)**

Order No. M2705

Apple SCSI System Cable

Order No. M0206

**Apple SCSI Cable
Terminator**

Order No. M0209

**Apple SCSI Peripheral
Interface Cable**

Order No. M0207

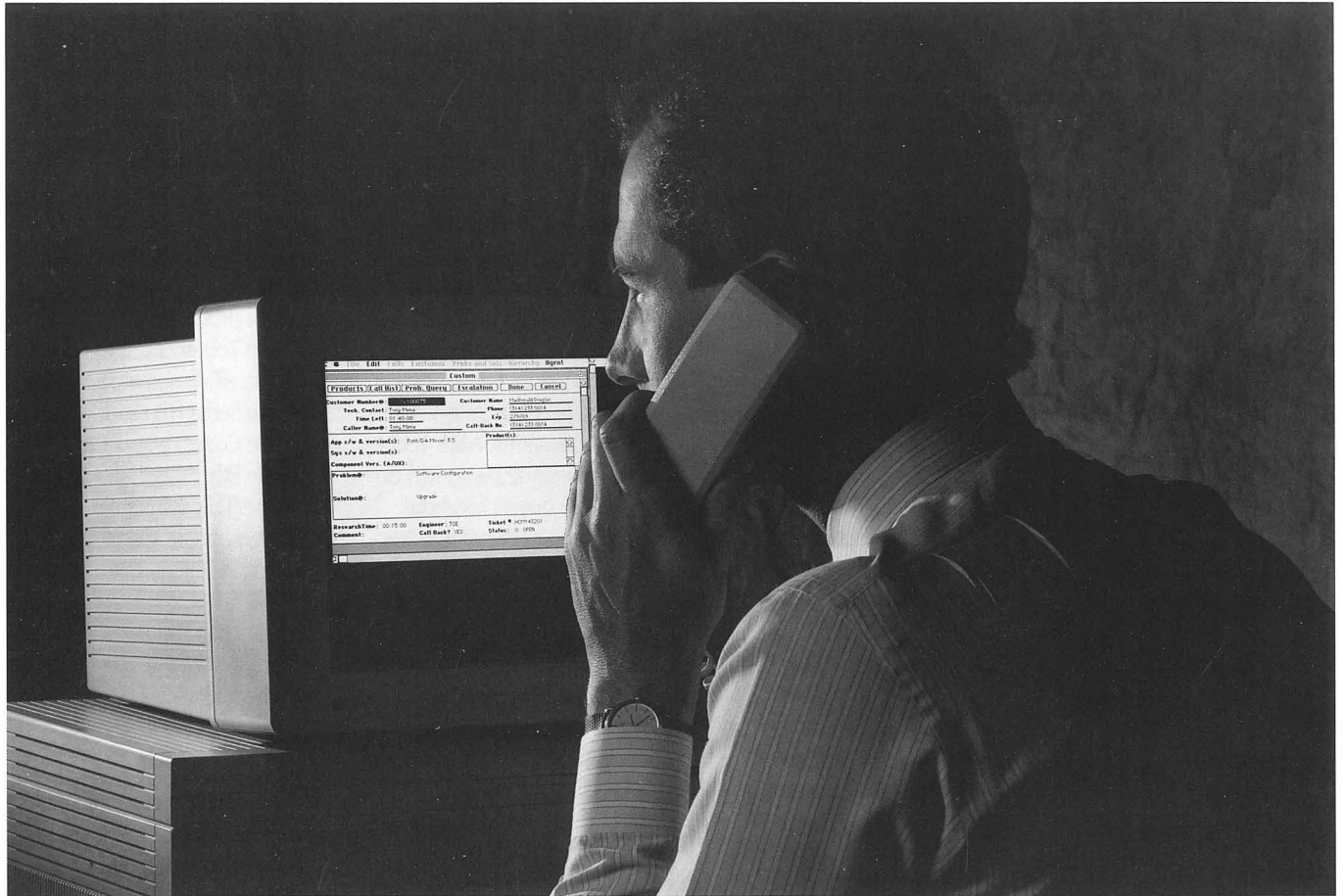
**Apple SCSI Cable
Extender**

Order No. M0208

**Apple II SCSI
Interface Card**

Rev. C (or later) ROMs

Order No. A2B2087



Overview

Apple is committed to providing long-term support that will help you maximize your investment in our products. We've created the Apple Technical Answerline to give you direct access to Apple support engineers for technical assistance with high-end Macintosh® computer products.

A single yearly fee lets you make unlimited toll-free calls for answers to your most difficult questions on networking, communications, and (optionally) the Apple® A/UX® operating system. Quarterly call reports help you accurately track your organization's support needs.

Features

- ▶ Toll-free direct access to expert Apple support engineers
- ▶ Convenient annual fee
- ▶ Flexible subscription options
- ▶ Quarterly call activity report
- ▶ Advanced support technology

Benefits

- ▶ Gives you immediate solutions to your complex networking and communications problems.
- ▶ Makes it possible to quickly return your computer installation to full productivity.
- ▶ Allows you to budget for an entire year's support needs.
- ▶ Lets you choose the type of support you need: networking and communications only, A/UX only, or both.
- ▶ Gives you detailed information on the number and content of your organization's recent Technical Answerline calls.
- ▶ Helps you pinpoint problem areas so you can improve in-house training and support.
- ▶ Helps Apple support engineers quickly pinpoint your problem and find a solution.



Apple Technical Answerline

Program Details

As networking, communications, and system software products for Macintosh computers become more complex, it's increasingly difficult for your organization's support personnel to be familiar with all of them—and with all of their possible combinations.

Help is now available directly from Apple Computer in the form of the Apple Technical Answerline. Your calls to the Technical Answerline go directly to a knowledgeable support engineer, not to an answering service for eventual referral. Answerline engineers are trained extensively on the latest Apple networking, communications, and A/UX products. They also have access to a specially equipped laboratory where these products can be tested in a multitude of configurations.

Answerline engineers handle questions on the following issues, with an emphasis on

products relating to networking and communications:

- ▶ Configuration
- ▶ Installation
- ▶ Compatibility
- ▶ Usage
- ▶ Administration
- ▶ Troubleshooting

The Answerline is designed for user-level questions. Developers should use other Apple support services for assistance with complex Macintosh development questions. Also, Technical Answerline personnel do not resolve questions about hardware or software that has been modified in any way.

In some instances, the problem you are experiencing is caused by another manufacturer's hardware or software; in such cases, you will need to contact that company for assistance. The Technical Answerline, however, can help to identify third-party product problems, which can save your company valuable time and productivity.

Networking and Communications option. If you choose this subscription, you'll receive assistance with products such

as those listed below. Additional products will be added to the program in the future as appropriate.

- ▶ AppleTalk products:
 - AppleShare® PC
 - AppleTalk® for VMS™
 - AppleTalk Internet Router
- ▶ IBM networking and connectivity products:
 - Apple TokenTalk® NB Card and TokenTalk software
 - Apple Serial NB Card
 - Apple Coax/Twinax Card
 - Apple EtherTalk® NB Card and EtherTalk software
- ▶ Integration products:
 - MacAPPC™
 - MacX25™
 - Macintosh Communications Toolbox
 - MacWorkStation™
 - CL/1™

A/UX option. If you choose this subscription, you'll receive assistance with the following A/UX products:

- ▶ X Window System
- ▶ MacX™
- ▶ AppleTalk for A/UX
- ▶ EtherTalk for A/UX
- ▶ A/UX Operating System

Program Operation

When you subscribe to the Apple Technical Answerline, you will designate two people from your organization to be your Answerline contacts. They are the only people who can use the service, although they can make an unlimited number of calls each year.

Details about your organization's previous calls will be kept on-line at the Answerline center. Support engineers can immediately view this information, saving your staff from having to repeat it.

Answerline support is available from 6:00 A.M. to 6:00 P.M. Pacific time, Monday through Friday, except for New Year's Eve, New Year's Day, Memorial Day, Independence Day, Labor Day, Thanksgiving and the day after, Christmas Eve, and Christmas Day.

Ordering Information

For more information on the Apple Technical Answerline, and for a Support Services

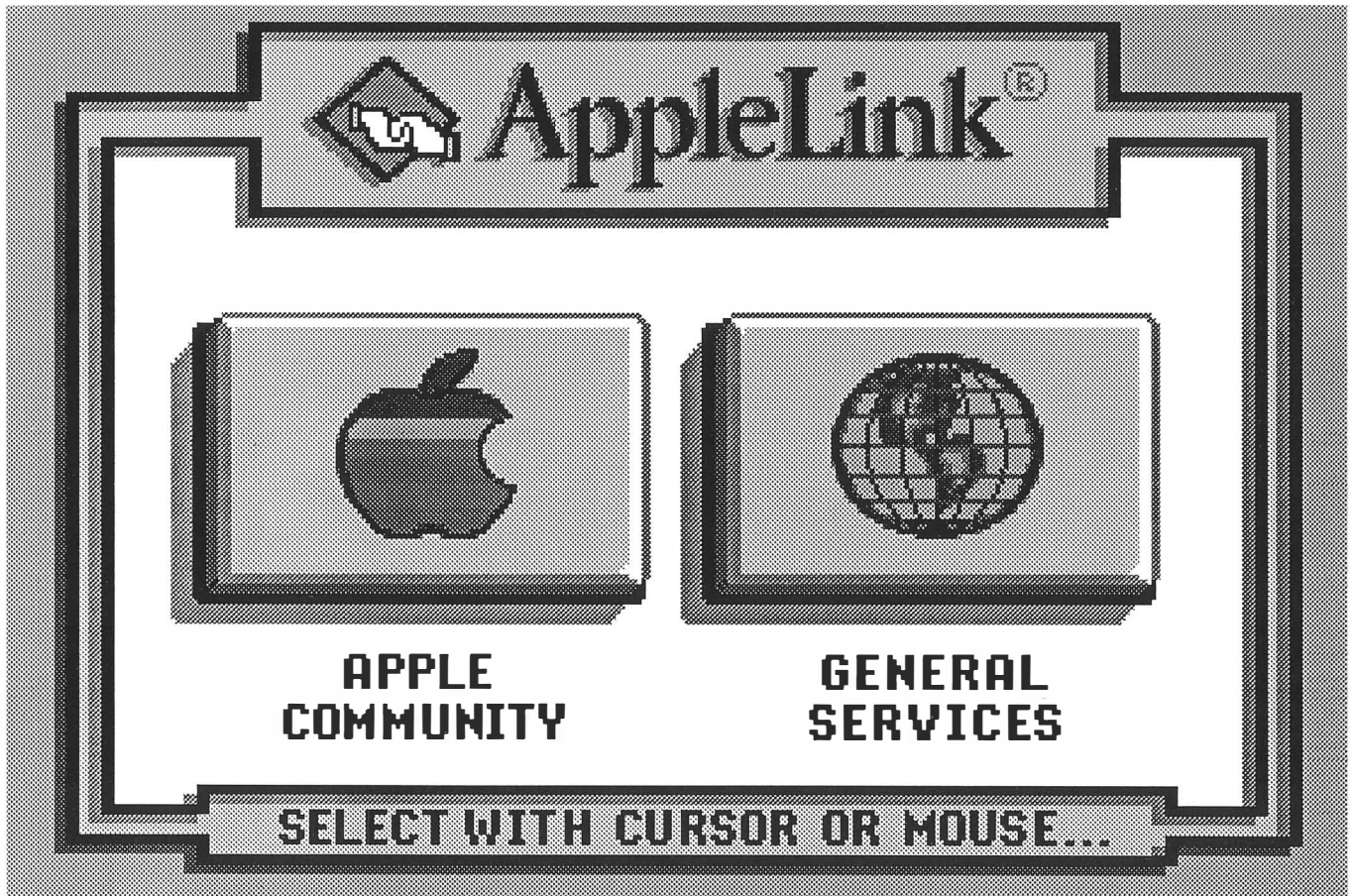
order form, contact your authorized Apple reseller or sales representative.

Networking and Communications option:
Order No. M0595LL/A
A/UX option:
Order No. M0594LL/A

Apple Computer, Inc.

20525 Mariani Avenue
Cupertino, CA 95014
(408) 996-1010
TLX: 171-576

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March 1990. Program specifications are subject to change without notice. Printed in U.S.A.
C0134LL/B



Overview

AppleLink®—Personal Edition is a unique on-line service designed especially for users of Apple® personal computers. It's your direct connection to the information and services you need to get the most from your Apple products. In addition, it offers a myriad of general-interest information, including news stories from around the world and the latest stock quotations.

With AppleLink—Personal Edition software, an Apple II or Macintosh® computer, and a modem, you can join a nationwide community of Apple owners on

this exciting, easy-to-use, and affordable service.*

AppleLink—Personal Edition has two main divisions. The Apple Community features Apple-specific information services. You can get the latest, most accurate product details directly from Apple and our developer partners. Download public-domain and demonstration software. Learn how to make the most effective use of your Apple hardware and applications. Take part in special-interest discussion groups, developer forums, and real-time conferencing with other Apple users.

But that's only half the story, because AppleLink also includes a General Services section that offers national and international news, stock quotations, airline schedules, on-line shopping, interactive games, general-interest clubs—even an electronic college.

In short, AppleLink—Personal Edition adds an exciting new dimension to your Apple personal computer. It's your one-stop source for Apple information and fun.

* Macintosh version scheduled for availability in Fall 1988.

Features

Benefits

-
- | | |
|--|--|
| ▶ Direct connection to Apple resources | ▶ Provides accurate, up-to-date information on Apple and Apple-compatible products. |
| ▶ On-line forums and conferences | ▶ Lets you exchange ideas with and get support from a nationwide community of Apple users and industry experts. |
| ▶ Real-time “chat” mode and private messaging | ▶ Connects you live with other AppleLink members, allowing you to participate in a group discussion or to have a private conversation. |
| ▶ Access to third-party developers | ▶ Provides information on Apple-compatible products.
▶ Gives you the opportunity to try out demonstration software. |
| ▶ Electronic mail | ▶ Lets you send an electronic letter or a fully formatted disk file to another subscriber—instantly. |
| ▶ One-step sign-on procedure | ▶ Eliminates the need to enter your password and connection information every time you access the system. |
| ▶ Preferences setup | ▶ Lets you preset a variety of options for easier, faster system use (such as shortcuts to the on-line areas you use most often). |
| ▶ Easy-to-use interface, including icons and pull-down menus | ▶ Allows easy navigation through all of the on-line areas. |
| ▶ Off-line work option | ▶ Reduces on-line charges by allowing you to compose mail, work with files, and do other work on the system before you sign on. |
| ▶ Up to five on-line screen names | ▶ Allows as many as five family members to share the same AppleLink account. |
| ▶ <i>AppleLink Update</i> ™ monthly guide | ▶ Provides detailed listings of nightly conferences and other on-line events.
▶ Keeps you informed about the latest AppleLink enhancements. |
| ▶ On-line help | ▶ Gives you the help you need, any time you need it. |
| ▶ Nationwide communications networks used, for local-call access from most areas | ▶ Provides easy and affordable access to AppleLink. |

Product Details

AppleLink—Personal Edition Services

Apple Community

- ▶ *Apple Reference Library.* Get detailed product information, or look up answers to your technical questions. Read contributed software reviews—and post your own. Find out about special-education software, the Apple Programmer's and Developer's Association (APDA™), and more.
- ▶ *Apple Forums.* Join with other users in discussions about Apple II and Macintosh products and

General Services

- ▶ *People Connection.* Chat with other AppleLink members all across the country. Attend a lecture, bid at an auction, or socialize at an on-line party. Play trivia games or be a contestant in a game show.
- ▶ *Financial District.* Read today's stock market summary; check out the latest quotations from the New York (NYSE), American (AMEX), and Over the Counter (OTC) stock exchanges.
- ▶ *Recreation Center.* Play interactive games with one or more partners anywhere in the country. Get the latest enter-

tainment and sports news. Find out which books are on the best-seller list—and share your own book and movie reviews.

- ▶ *Apple Software Center.* Download public-domain and shareware programs covering a variety of special-interest applications.
- ▶ *Apple Headquarters.* Connect to Apple's Customer Relations group to ask a question or offer an opinion. Read press releases on new products and promotional programs. Chat with Apple employees at the
- ▶ *Club House.* Make friends with people who share your interests, in subjects from photography to music.
- ▶ *Learning Center.* Get tutoring help with your homework. Learn a new subject by enrolling in an on-line course. Look up facts in seconds using a 20-volume encyclopedia that's updated regularly.
- ▶ *News Room.* Read the latest news and sports reports from

“Apple Café.” Purchase Apple T-shirts, mugs, and other specialty items.

- ▶ *Industry Connection.* Meet third-party Apple hardware and software developers. Try out demonstration versions of software, peruse product catalogs, and post questions to product-support message boards.
- ▶ *Apple University.* Enroll in on-line courses to learn more about Apple hardware, programming, and applications.

Reuters, the Associated Press, and United Press International. Debate current issues with people all around the nation.

- ▶ *The Mall.* Stroll through an on-line mall and shop for over 200,000 name-brand products at discount prices. Send flowers to someone special. Plan a complete business trip or vacation: Check for the lowest fares, then make flight, hotel, and rental car reservations.

The General Services section of AppleLink—Personal Edition is provided by Quantum Computer Services, Inc.

Accessing AppleLink

To use the AppleLink—Personal Edition information service, you'll need dedicated AppleLink software. Each software package contains a unique registration number and instructions on how to access the system.

During your first session, you'll enter your name, address, phone number, and billing information. On-line fees are charged directly to your credit card or checking account.

Each subscription (one per software package) can accommodate up to five users' names.

Access to AppleLink is via the Tymnet and Telenet communications networks, available by local phone call from most areas.



AppleLink—Personal Edition

System Requirements

To use AppleLink—Personal Edition software, you'll need:

- ▶ One of the following computer systems:
- An Apple IIe personal computer enhanced with 128K ROM and equipped with 80-column

text card, Super Serial Card, disk drive (3.5-inch or 5.25-inch), and monitor

- An Apple IIc personal computer and monitor
- An Apple IIGs® personal computer with disk drive (3.5-inch or 5.25-inch) and monitor

- An Apple Macintosh personal computer
- ▶ An Apple Personal Modem or any Hayes-compatible modem (300, 1200, or 2400 baud), plus appropriate cables
- ▶ A standard telephone line

Ordering Information

AppleLink—Personal Edition software (Apple II version)
Order No. A2D2004

With your order, you'll receive:

- ▶ One 3.5-inch AppleLink program disk
- ▶ One 5.25-inch AppleLink program disk
- ▶ *AppleLink User's Guide*

- ▶ *AppleLink Connect Guide* (contains information on compatible modems, local access numbers, and account registration)
- ▶ Price sheet (lists on-line service fees)
- ▶ Quick-reference card
- ▶ Registration certificate

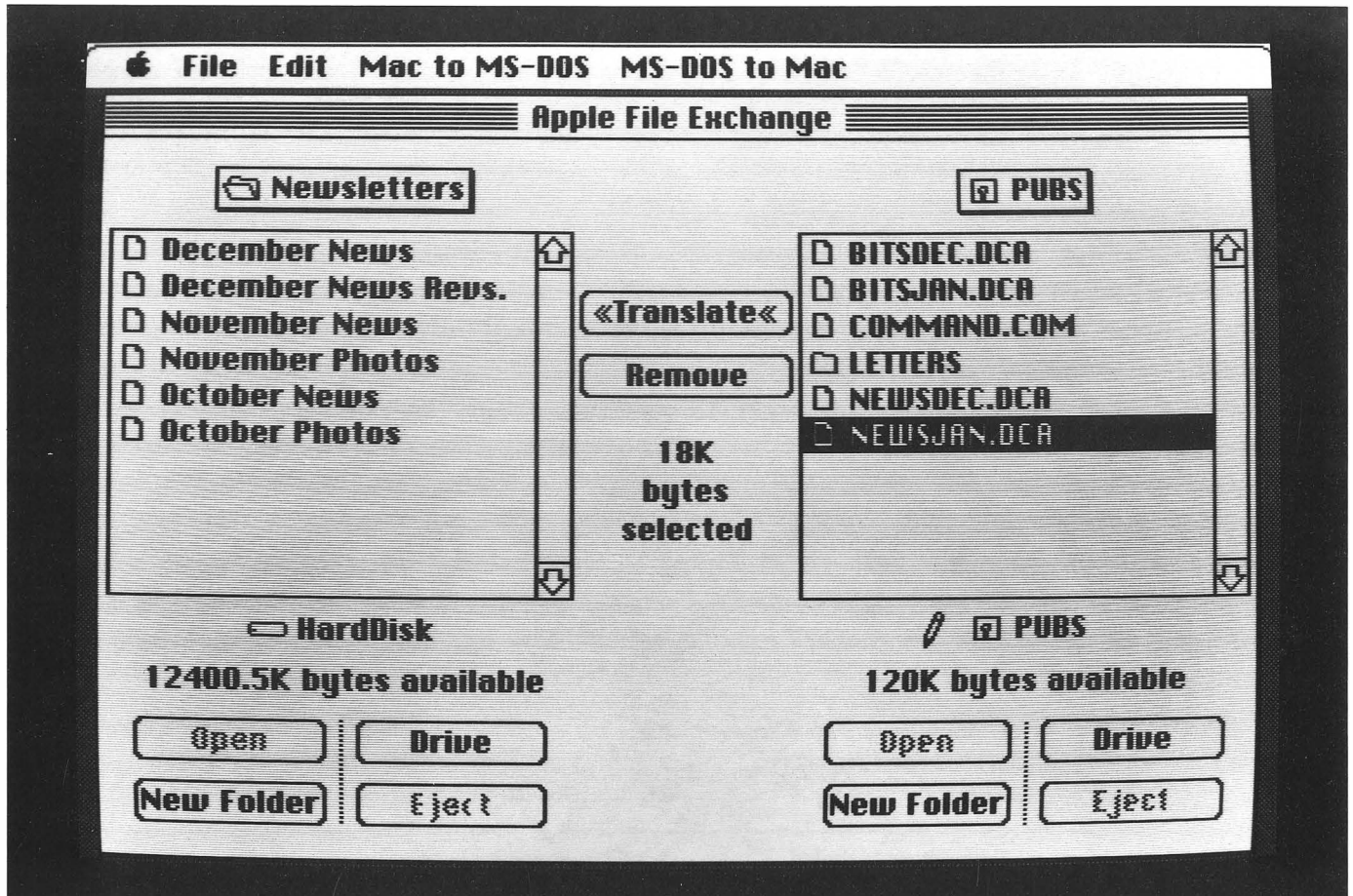
AppleLink—Personal Edition software (Macintosh version)*
Order No. M0533

With your order, you'll receive:

- ▶ One 3.5-inch AppleLink program disk
- ▶ *AppleLink User's Guide*
- ▶ *AppleLink Connect Guide* (contains information on compatible modems, local access numbers, and account registration)

- ▶ Price sheet (lists on-line service fees)
- ▶ Quick-reference card
- ▶ Registration certificate

* Macintosh version scheduled for availability in Fall 1988.



Overview

The Apple® File Exchange utility program allows a file or document created by one application to be translated into the format required by another application. When used with the Apple PC 5.25 Drive, it transfers and translates between Macintosh® and MS-DOS environments, or with a Macintosh 3.5-inch drive, it transfers and translates between Macintosh and ProDOS® formats. It can also be used with data files transferred to Macintosh disks via network or data communications links.

Features

- ▶ File conversion between applications
- ▶ Macintosh/MS-DOS and Macintosh/ProDOS transfers
- ▶ Batch translation
- ▶ Includes text, binary, and DCA-RFT/MacWrite translators that all work under a common user interface
- ▶ Standard framework for development of additional translators

Benefits

- ▶ Makes documents and files created with one application usable in others, allowing more versatile use of your information.
- ▶ Allows greater flexibility in data sharing, by providing a bridge between different operating environments.
- ▶ Automates the translation of large numbers of files—even documents from different applications.
- ▶ Handles a wide range of general file-translation needs.
- ▶ Offers easy-to-learn, easy-to-use file translation.
- ▶ Encourages development of specific application-to-application translators.



Apple File Exchange

Product Details

Translators

The Apple File Exchange program works with "translators" that control the conversion of file formats between dissimilar applications. The package includes translators to handle some common translations.

Many applications feature an import option that does translation. The binary translator included with Apple File Exchange allows documents

to be converted for use with these applications.

The text translator translates bidirectionally between plain text formats of the MS-DOS, Macintosh, and ProDOS operating systems.

The DCA-RFT/MacWrite translator translates bidirectionally between IBM Document Content Architecture Revisable Text Format and the MacWrite format.

Additional translators for use with Apple File Exchange are available from independent software developers such as DataViz, Inc. These follow the user and software interface standards set by Apple's translators.

Apple File Exchange can work with multiple translators simultaneously. Simply indicate the files you want translated, and the program selects the appropriate translator from the available set.

System Requirements

To use Apple File Exchange, you will need:

For data on Macintosh disks:
▶ A Macintosh Plus, Macintosh SE, or Macintosh II personal computer
▶ Any additional application-to-application translators

For data on 5.25-inch MS-DOS-formatted disks:

▶ A Macintosh SE or Macintosh II personal computer
▶ An Apple PC 5.25 Drive
▶ The appropriate controller card
▶ Any additional application-to-application translators

For data on 3.5-inch ProDOS-formatted disks:

▶ A Macintosh 512K Enhanced, Macintosh Plus, Macintosh SE, or Macintosh II
▶ Any additional application-to-application translators

Technical Specifications

Translators included:

▶ Text
▶ Binary
▶ DCA-RFT/MacWrite

Translators available from DataViz:

▶ DCA-RFT/MacWrite or Microsoft Word 3.0
▶ Lotus 1-2-3/Microsoft Excel
▶ MultiMate/MacWrite or Microsoft Word 3.0

▶ WordPerfect/MacWrite or Microsoft Word 3.0
▶ WordStar/MacWrite or Microsoft Word 3.0

Ordering Information

Apple File Exchange will be available in two ways:

1) Packaged with the Macintosh SE-Bus PC Drive Card (Order No. M5023) and the Macintosh II PC Drive Card (Order No. M5056).

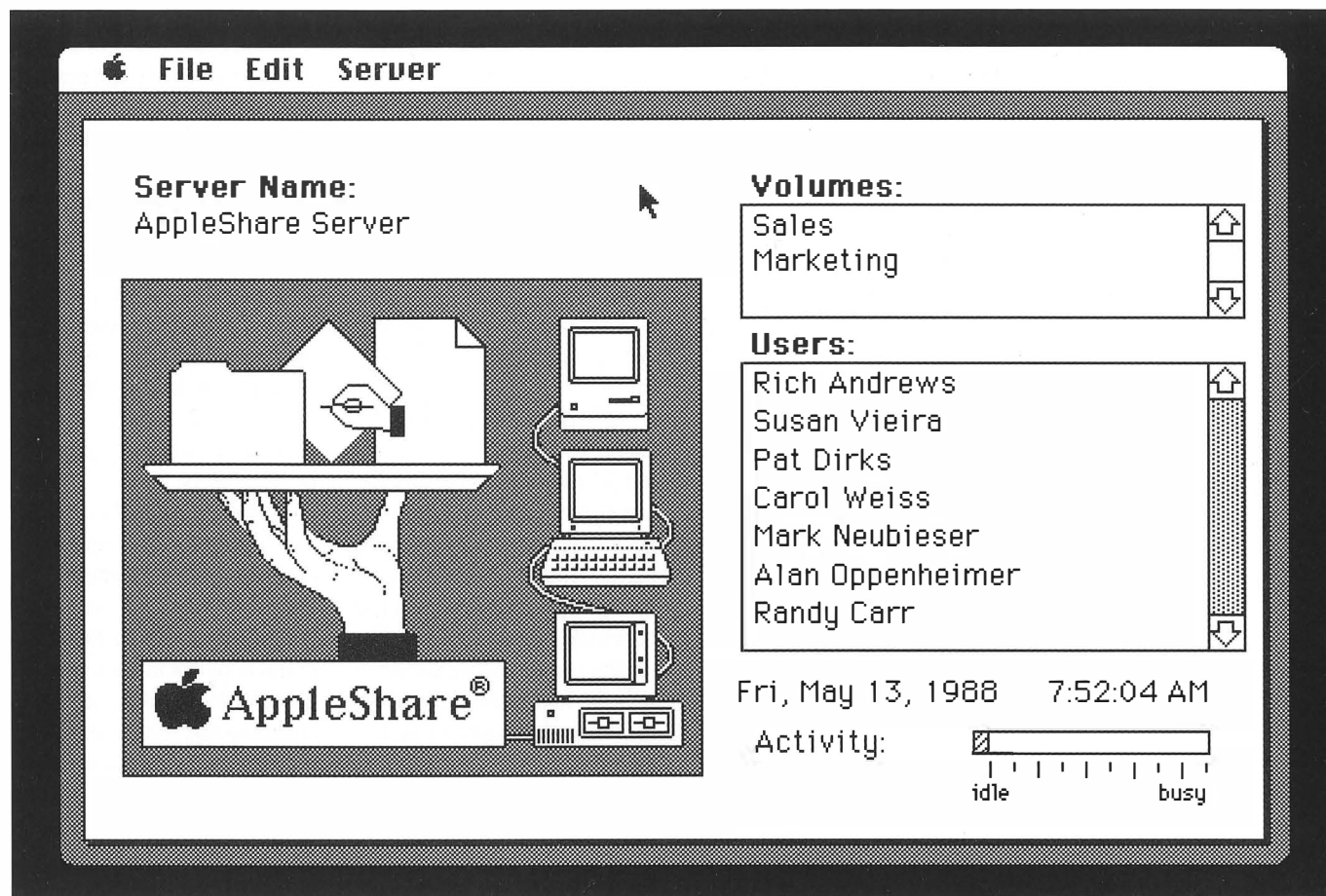
2) Included with the Macintosh system software. Contact your authorized Apple sales representative for further details.

Apple Computer, Inc.

20525 Mariani Avenue
Cupertino, CA 95014
(408) 996-1010
TLX: 171-576

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June 1988. Product specifications are subject to change without notice. Printed in U.S.A.
M2310/A



Overview

The AppleShare® File Server lets members of your workgroup use an AppleTalk® network system to share information quickly and easily. AppleShare turns a dedicated Macintosh® II, Macintosh SE, or Macintosh Plus personal computer with one or more hard disk drives into a central electronic filing cabinet. Here, everyone in your workgroup can

store documents in folders similar to the ones that are common to all Macintosh applications.

By giving everyone access to the same documents and applications, the AppleShare File Server simplifies and speeds up the work of the group—whether it involves creating budgets, updating data files, producing publications, or assembling reports. And

AppleShare has a powerful set of privacy features that let you control who has access to the information stored in each folder, and what type of access is allowed. AppleShare will greatly increase the productivity of any environment equipped with Macintosh, MS-DOS, and even Apple® II computers.

Features

Benefits

▶ Centralized electronic storage of data, documents, and applications

▶ Makes it easy for everyone in a workgroup to share information.
▶ Lets network users store applications and files in one convenient location.
▶ Permits document backup from a central location.

▶ Transparent access

▶ Allows users to access information stored on an AppleShare file server as if it were located on a local disk.

▶ Access by up to 50 users at a time (when the server is a Macintosh II) or up to 25 users at a time (when the server is a Macintosh SE or Macintosh Plus)

▶ Lets everyone in the group work with documents and multiuser applications at the same time.

▶ AppleTalk Filing Protocol (AFP) compatibility

▶ Provides compatibility with all software applications written to the AFP standard.

▶ Support for multiple operating systems

▶ Lets Macintosh, MS-DOS, and Apple II users share information stored on the file server.

▶ Support for up to seven SCSI hard disk or CD-ROM drives per server

▶ Provides reliable, virtually unlimited storage space.
▶ Offers a simple, economical growth path.

▶ Runs concurrently with AppleShare Print Server software

▶ Lets you use a single, dedicated Macintosh II, Macintosh SE, or Macintosh Plus computer to share files as well as to manage networked printers.
▶ Increases the return on your hardware investment.

▶ Copy protection

▶ Lets the network administrator copy-protect applications stored on the file server so that users cannot copy them.

▶ On-line administration

▶ Lets the network administrator perform administrative functions (such as adding users and creating groups of users) without shutting down services.

▶ Standard Macintosh hardware platform

▶ Preserves your investment in hardware: you can start with a Macintosh Plus or SE as the server, and then, as your needs expand, replace it with a Macintosh II and use the original Macintosh as a personal computer.

▶ Volume copy with full AppleShare access privileges retained

▶ Permits easy upgrading to larger volumes.

▶ "Super user" capability

▶ Allows the administrator to perform routine folder maintenance over the network.

Product Details

Simple administration

Administration of the AppleShare File Server requires no special skills. Administrative functions, such as adding new users and creating groups of users, are carried out using the familiar Macintosh user interface, including pull-down menus, dialog boxes, icons, and windows.

Access control

To ensure privacy, security, and control over information shared with others on the network, AppleShare lets individual users decide who can have access to information stored in folders they create on the server, and what type of access they can have.

The folder's owner can assign access privileges to three classes of users:

- The owner of the folder;
- A group of users; or
- Everyone on the network.

The folder's owner can also define which of three levels of access the owner and other users can have, namely, whether users can:

- See documents and applications stored in the folder;
- See other folders stored in the folder;
- Make changes to documents and applications stored in the folder.

As in other Macintosh applications, documents are stored in folders on an AppleShare file server, but folders on the server fall into several types depending on the type of access provided. For example, documents stored in *private folders* automatically remain private to their owner—only the folder's owner can see or change documents stored there.

Documents stored in *shared folders* can be seen and read by everyone in the group, but the folder's owner can choose the type of access people have. The folder's owner may specify that:

- The documents in the folder can be changed only by the owner (this is useful for storing forms that you want everyone on the network to be able to copy and use but not change), or that
- Documents can be changed by other users.

Documents stored in *"drop box" folders* can be seen and changed only by the owner. However, other users with the appropriate access to the server can copy documents into the drop box. This is useful for collecting and storing sensitive documents such as expense reports and personnel evaluations.



AppleShare File Server Version 2.0

System Requirements

To use the AppleShare File Server, you'll need:

- ▶ One dedicated Macintosh II, Macintosh SE, or Macintosh Plus computer to be used as the server
- ▶ One or more SCSI hard disks
- ▶ One Macintosh, ProDOS®, or MS-DOS computer for each user on the network
- ▶ Appropriate network cables and connectors for each workstation, server, printer, or other network device
- ▶ AppleShare PC (Order No. M0673) and a LocalTalk™ PC Card (Order No. M2313) for each MS-DOS computer connected to the network
- ▶ AppleShare IIGs® Workstation Software (Order No. A2D2060) for each Apple IIGs® computer connected to the network
- ▶ Apple II Workstation Card (Order No. A2B2088), which includes AppleShare IIe

Workstation software, for each Apple IIe computer connected to the network

Recommended

- ▶ External disk drive or hard disk at each workstation
- ▶ The Network Administrators Course (a two-day seminar on the fundamentals of network administration, including file service, backup, electronic mail, and utilities)

Optional equipment

- ▶ Additional or larger hard disks
- ▶ Concurrent service applications, such as AppleShare Print Server or electronic-mail service
- ▶ One or more CD-ROM drives, such as the AppleCD SC™
- ▶ AppleTalk bridges and gateways, such as:
 - InterBridge (from Hayes Microcomputer Products, Inc.)
 - or NetBridge (from Shiva Corporation) for connecting multiple LocalTalk networks

—FastPath (from Kinetics, Inc.) for connecting an Apple EtherTalk™ network with a LocalTalk network

—Solana R Server (from Solana Communications) or NetModem (from Shiva Corporation) for remote connection to an AppleTalk network

Cabling systems for AppleTalk

- ▶ Apple LocalTalk cabling system (shielded twisted-pair)
- ▶ LANSTAR from Northern Telecom (telephone wire/unshielded twisted-pair)
- ▶ PhoneNET from Farallon Computing (telephone wire/unshielded twisted-pair)
- ▶ Apple EtherTalk (standard or thin wire Ethernet coaxial, and unshielded twisted-pair)
- ▶ Fiber Optic LAN System (standard fiber-optic cable) from Du Pont Electronics

Ordering Information

AppleShare File Server Software

Order No. M0548/B

With your order, you'll receive:

- ▶ *AppleShare File Server Administrator's Guide*
- ▶ *AppleShare File Server User's Guide*
- ▶ *AppleShare File Server Administrator's Supplement for Apple II Workstations*
- ▶ One AppleShare File Server administration disk
- ▶ One AppleShare File Server server installer disk

- ▶ One AppleShare File Server Apple II setup disk
- ▶ One AppleShare File Server workstation installer disk for use with Macintosh II, SE, and Plus computers
- ▶ One AppleShare File Server workstation installer disk for use with Macintosh 512K Enhanced computers

AppleShare File Server User's Guide 5-Pack

Order No. M0559/A

With your order, you'll receive:

- ▶ Five copies of the *AppleShare File Server User's Guide*

AppleShare File and Print Server Manuals

Order No. M0565

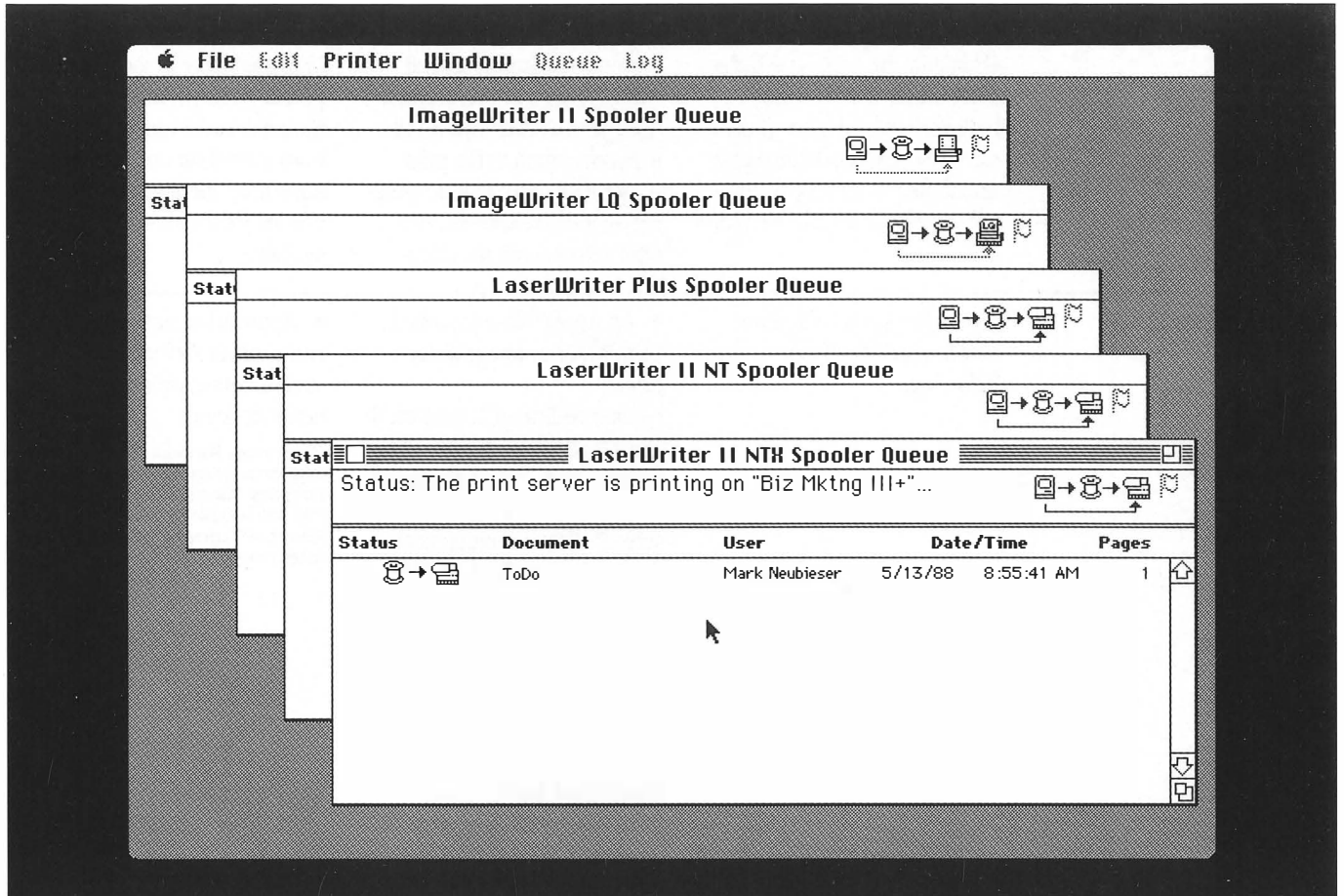
With your order, you'll receive:

- ▶ *AppleShare File Server User's Guide*
- ▶ *AppleShare File Server Administrator's Guide*
- ▶ *AppleShare File Server Administrator's Supplement for Apple II Workstations*
- ▶ *AppleShare Print Server Administrator's Guide*

Apple Computer, Inc.

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TLX: 171-576

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Overview

With the AppleShare® Print Server, you can continue working on your Macintosh®, Apple® IIe, Apple IIgs®, or MS-DOS computer while your documents are being printed on an AppleTalk®-networked LaserWriter® or ImageWriter® printer. The AppleShare Print Server runs on a dedicated Macintosh II, Macintosh SE, Macintosh Plus, or Macintosh 512K Enhanced computer, and will increase the productivity of any workgroup that makes frequent use of LaserWriter or ImageWriter printing.

Features

- ▶ Print spooling
- ▶ Simultaneous support for up to five printers
- ▶ Runs concurrently with AppleShare File Server software
- ▶ Print-queue management
- ▶ Compatibility with all standard applications
- ▶ Power failure recovery

Benefits

- ▶ Improves workgroup productivity; users can continue working while their documents are being printed.
- ▶ Eliminates waiting because it accepts documents from multiple users at the same time, even while the printer is busy.
- ▶ Assures a growth path: makes it easy to add printers as your needs change.
- ▶ Lets you use a single, dedicated Macintosh II, Macintosh SE, or Macintosh Plus computer to share files and applications as well as to manage networked printers.
- ▶ Increases the return on your hardware investment by eliminating the need for a second dedicated server.
- ▶ Lets the system administrator manage up to five networked printers from a single location.
- ▶ Eliminates the need for special training.
- ▶ Saves documents waiting to be printed, even after a power failure.



AppleShare Print Server Version 2.0

Product Details

How spooling works

Ordinarily the user's computer must wait while a document is being printed—the computer can't be used for anything else. And if the printer is busy, the user must wait for it to become

free. The AppleShare Print Server saves time in several ways. As soon as users send a document over an AppleTalk network system to the print server, they can continue working on their computers. The print server sends the docu-

ments along to the LaserWriter or ImageWriter as soon as the printer is ready. And because the print server can accept files from more than one user at the same time, there's never any waiting for the server to be available.

System Requirements

To use the AppleShare Print Server, you'll need the following:

- ▶ An AppleTalk-networked LaserWriter or ImageWriter printer
- ▶ One dedicated Macintosh II, Macintosh SE, Macintosh Plus, or Macintosh 512K Enhanced computer to be used as the server.* (When running both the AppleShare Print Server and AppleShare File Server software on the same system, a Macintosh II, Macintosh SE, or Macintosh Plus is required.)
- ▶ One Macintosh, Apple IIe (equipped with an Apple II Workstation Card), Apple IIgs, or MS-DOS computer (equipped with a LocalTalk™ PC Card) for each user on the network

- ▶ Appropriate network cables and connectors for each workstation, server, printer, or other network device

*When using a Macintosh 512K Enhanced computer as the server, or when using a 1-megabyte Macintosh computer (Plus, SE, or II) with both File Server and Print Server software, you can spool to two printers simultaneously.

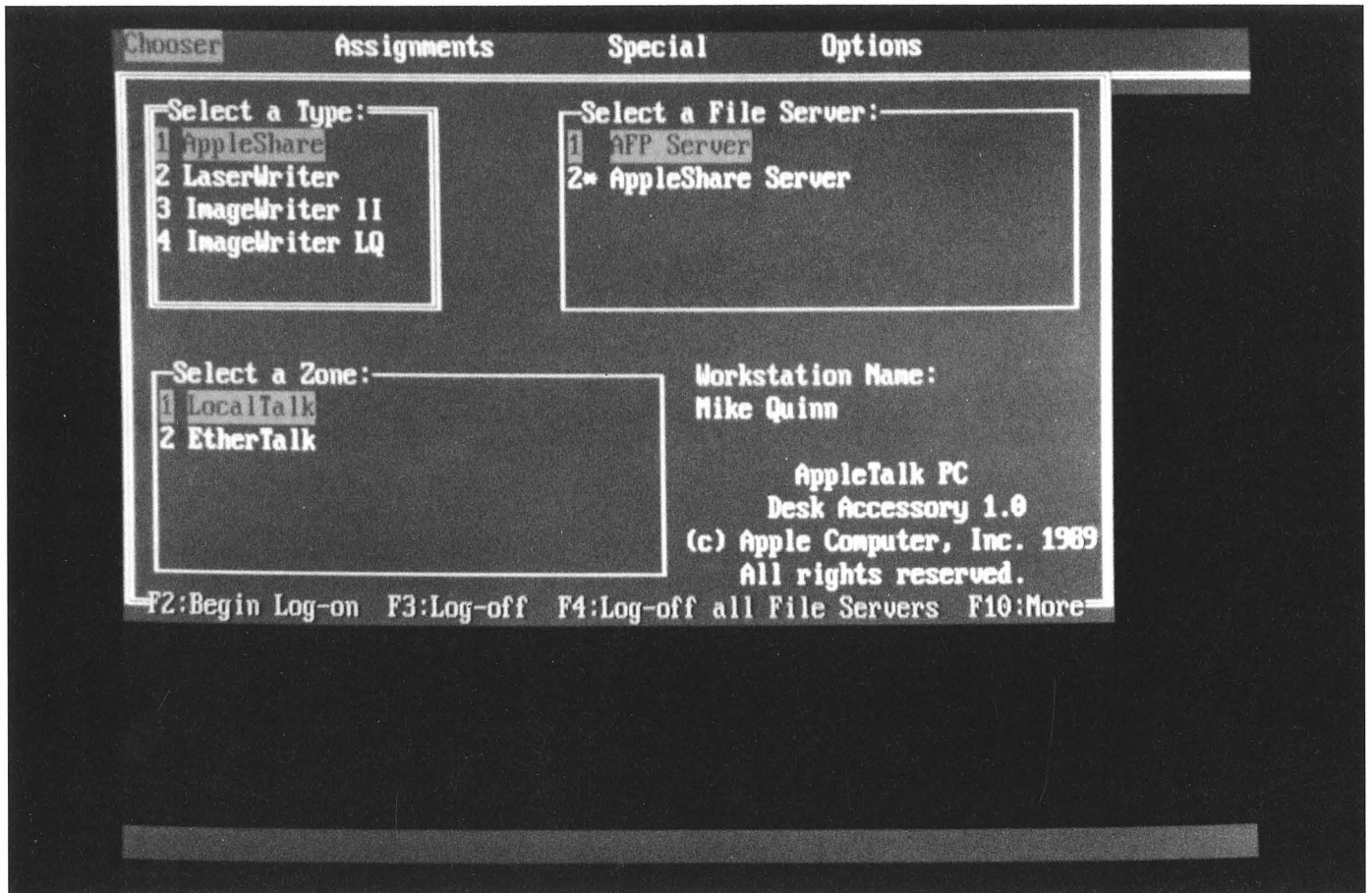
Ordering Information

AppleShare Print Server Software
Order No. M0576

With your order, you'll receive:

- ▶ One AppleShare Print Server installer disk for use with Macintosh II, Macintosh SE, and Macintosh Plus computers
- ▶ One AppleShare Print Server installer disk for use with Macintosh 512K Enhanced computers

- ▶ One AppleShare Print Server Workstation installer disk
- ▶ *AppleShare Print Server Administrator's Guide*
- ▶ Limited warranty statement



Overview

AppleShare® PC software provides users of MS-DOS personal computers with access to the full range of services available on the AppleTalk® network system. With AppleShare PC, users of MS-DOS and Macintosh® personal computers can communicate with one another, share data files stored on an AppleShare file server, and enjoy transparent access to Apple® LaserWriter® and ImageWriter® network printers.

MS-DOS personal computer users select network resources through an intuitive menu system modeled after the Macintosh Chooser. Once selected, file and print resources are automatically available every time users turn on their machines. And using the AppleShare server from an MS-DOS system is as easy as using a local disk drive.

AppleShare PC Version 2.0 is compatible with AppleTalk

Phase 2 and is data-link independent. It offers advanced capabilities such as extended AppleTalk addressing, which provides support for networks of up to 16 million nodes.

AppleShare PC is ideally suited to the requirements of users who work in environments utilizing both Macintosh and MS-DOS personal computers.

Features

Benefits

▶ MS-DOS access to the AppleShare file server

- ▶ Allows MS-DOS and Macintosh users to access information stored on the same AppleShare file server.
- ▶ Lets MS-DOS users and Macintosh users share information created by applications that use a common file format (for example, Lotus 1-2-3 for the IBM PC and Microsoft Excel for the Macintosh, or dBASE III for the IBM PC and dBASE Mac for the Macintosh).
- ▶ Lets AppleShare PC users share MS-DOS applications stored on AppleShare file server volumes. (The software license must specifically allow application sharing.)

▶ MS-DOS access to networked printers

- ▶ Gives MS-DOS users full access to the power of LaserWriter printers—including dozens of type styles and sizes and full-page, high-resolution graphics—through MS-DOS applications that support the PostScript® page description language.
- ▶ Performs Epson LQ2500 emulation when working with older MS-DOS applications that don't support PostScript.
- ▶ Gives MS-DOS users access to networked ImageWriter dot-matrix printers.

▶ Data file mapping

- ▶ Allows data files created with MS-DOS applications to be mapped to Macintosh applications that share the same file format. (For example, WK1 files created with Lotus 1-2-3 and stored on the AppleShare file server can appear as Microsoft Excel data files, and double-clicking on an Excel data file launches the Excel application.)

▶ Data-link independence

- ▶ Lets AppleShare PC work with any network interface card that is compliant with the MLI (Multiple Link Interface) driver specification, including drivers that support the Apple LocalTalk™ PC Card, 3Com EtherLink II and EtherLink MC, and IBM Token-Ring.

▶ Controlled access to directories (folders) stored on AppleShare servers

- ▶ Provides privacy and personal control over information shared with others on the network.
- ▶ Lets the directory's owner choose to limit access in the following ways:
 - To keep the directory private;
 - To give access privileges to a predefined group of users; or
 - To give access privileges to everyone on the network.

Features

Benefits

- ▶ Controlled nature of access, based on directory type

- ▶ Documents stored in *private directories* can be seen or changed only by the directory's owner.
- ▶ Documents stored in *shared directories* can be seen and read by everyone on the network; a directory's owner can specify that
 - The documents can be changed only by the owner. (This is useful for storing forms that you want everyone on the network to be able to copy and use but not change.)
 - Or that
 - The documents can be changed by others on the network.
- ▶ Documents stored in one-way "*drop box*" directories (much like one-way mail slots) can be seen and changed only by the owner. However, anyone on the network can copy documents into the drop box. (This is useful for collecting and storing sensitive documents such as expense reports and personnel evaluations.)

-
- ▶ Transparent functionality

- ▶ Lets MS-DOS users work with information on AppleShare servers as if it were located on a local MS-DOS disk.
- ▶ Makes accessing applications and information simple and efficient.
- ▶ Allows users to access AppleShare servers located on other AppleTalk networks, through add-on bridges such as the Hayes InterBridge and the Kinetics FastPath.
- ▶ Lets users connect to servers, change access privileges, and execute DOS utilities from within an application, through pop-up menus.
- ▶ Lets MS-DOS users access network printers as if they were connected locally.

-
- ▶ Command-line interface

- ▶ Allows construction and editing of batch files for automatic log on and other tasks.



AppleShare PC Version 2.0

Product Details

AppleShare volumes

AppleShare volumes appear to MS-DOS users as logical DOS drives and are accessed using standard DOS commands. Most applications and documents can be stored and used on the server with no modification.

Access procedures

Accessing information is simple and efficient; users need only remember one password. Once a user has logged on to a server, the server automatically manages access to all directories.

Printing

Through AppleShare PC, users of MS-DOS applications that support PostScript (such as Microsoft Word and WordPerfect) can take full advantage of the power of Apple LaserWriter printers. This includes producing documents in a wide range

of type styles and sizes, and with full-page, high-resolution graphics. For users of older MS-DOS applications that do not support PostScript, AppleShare PC provides an emulation of an Epson LQ2500 printer.

Macintosh/MS-DOS compatibility

With AppleShare PC, both MS-DOS users and Macintosh users have access to documents created using either of the two operating systems. In addition, AppleShare PC provides file extension mapping that allows MS-DOS users to easily assign a Macintosh icon type and application appropriate to a data file.

Privacy

AppleShare PC fully supports the AppleShare file server's

powerful privacy system. Users control information by selectively granting access to the directories they have created on the file server volumes. Setting access privileges allows a directory's owner to keep information private, share it within a workgroup, or make it available to everyone on the network. Additionally, users can control the type of access others have to the contents of a directory.

Installation

The procedure consists of installing AppleShare PC software on a startup disk; adding a LocalTalk PC Card to an IBM PC or PC-compatible computer, and connecting the computer to an AppleTalk network system equipped with an AppleShare server and a networked printer.

System Requirements

To use AppleShare PC, you will need:

- ▶ An MS-DOS computer with at least 384K of RAM
- ▶ Two floppy disk drives

- ▶ MS-DOS Version 3.1 or later (including Version 4.0)
- ▶ A LocalTalk PC Card or another MLI driver-compliant interface card

- ▶ A LocalTalk Locking Connector Kit (DB9) (Order No. M2065)

- Recommended equipment:
- ▶ A hard disk

Ordering Information

AppleShare PC

Order No. M0098LL/A

With your order, you'll receive:

- ▶ One 3.5-inch and two 5.25-inch installer disks

- ▶ *AppleShare PC User's Guide*
- ▶ Limited warranty statement

AppleShare PC Bundle

Order No. B0040LL/A

With your order, you'll receive:

- ▶ A LocalTalk PC Card
- ▶ Two 360-kilobyte, 5.25-inch floppy disks (a startup disk and an application disk)

- ▶ One 3.5-inch disk (includes both startup and application)
- ▶ *LocalTalk PC Card Owner's Guide*
- ▶ Limited warranty statement

LocalTalk Locking Connector Kit (DB9)

Order No. M2065

With your order, you'll receive:

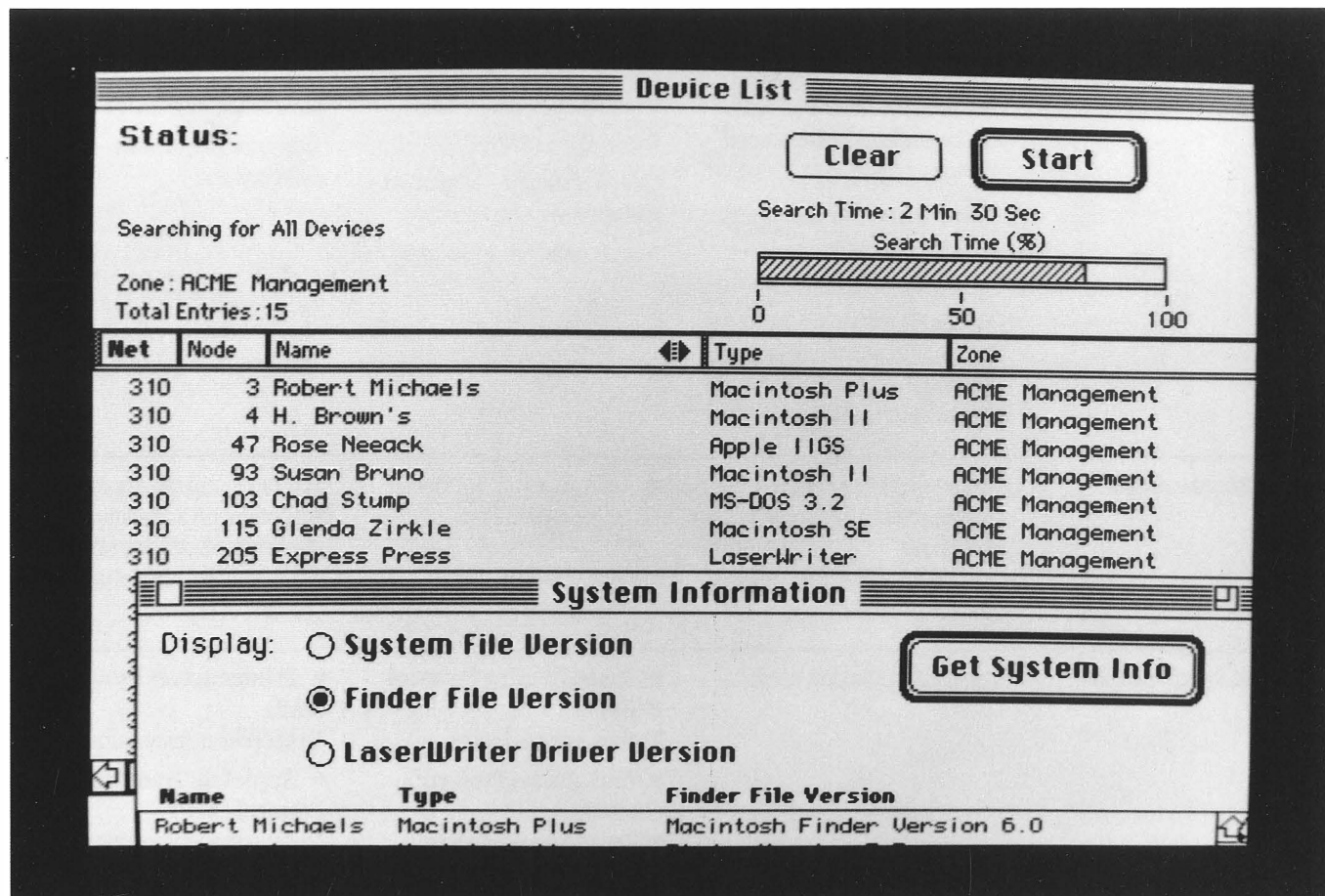
- ▶ LocalTalk locking connector (DB9)

- ▶ Two-meter cable
- ▶ Cable extender
- ▶ Setup guide

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June 1989. Product specifications are subject to change without notice. Printed in the U.S.A. M2302/B



Overview

The Inter•Poll™ Network Administrator's Utility contains tools an AppleTalk® network administrator can use to implement a network support program. These tools cover network mapping, troubleshooting methods, selective searches for active devices, network-link integrity tests, and version reporting for workstation system software. Together, these tools help the AppleTalk network administrator eliminate many network problems before they adversely affect users.

Features

- ▶ Selective lists of active network devices
- ▶ Network mapping tools
- ▶ Integrity test of network path to a targeted device
- ▶ System software version reporting
- ▶ Full internetwork support
- ▶ Intuitive user interface
- ▶ Support for Macintosh®, Apple® II, MS-DOS, and DEC VAX™ computers

Benefits

- ▶ Allows the network administrator to monitor a specified group of active devices.
- ▶ Assists the network administrator in creating and updating network diagrams for use in solving network problems.
- ▶ Saves time by helping the network administrator isolate and locate network problems.
- ▶ Helps avoid problems caused by running incompatible versions of system software on the same network.
- ▶ Can be used in small, medium-size, and large AppleTalk systems.
- ▶ Is more effective to use because it is easy to learn.
- ▶ Lets the network administrator support a multivendor AppleTalk network with a single utility.



Inter•Poll Network Administrator's Utility

Product Details

▶ Test Packets

Echo—Tests link integrity between the Inter•Poll workstation and any active named device.

Printer status—Returns printer status information.

System information—Queries Macintosh personal computers running AppleTalk Responder software (included) for the system software version numbers.

▶ Device Lists

Search criteria—By zone, network number, device name, device type, or unnamed device

Search duration—In minutes and seconds, or continuous

Search interval—In seconds

▶ Reports

Supported printers—Apple LaserWriter® and ImageWriter®

Supported file formats—Tab-delimited text

System Requirements

To run the Inter•Poll Network Administrator's Utility, you must have:

▶ A Macintosh II, Macintosh SE, or Macintosh Plus.

You can install the AppleTalk Responder on a Macintosh II, Macintosh SE, Macintosh Plus, or Macintosh 512K Enhanced personal computer.

Technical Specifications

AppleTalk protocols used:

▶ Name Binding Protocol (NBP)

To find named devices

▶ Link Access Protocol (LAP)

To find unnamed devices

▶ Echo Protocol (EP)

To determine link integrity and performance

▶ Printer Access Protocol (PAP)

To get printer status information

▶ AppleTalk Transaction Protocol (ATP)

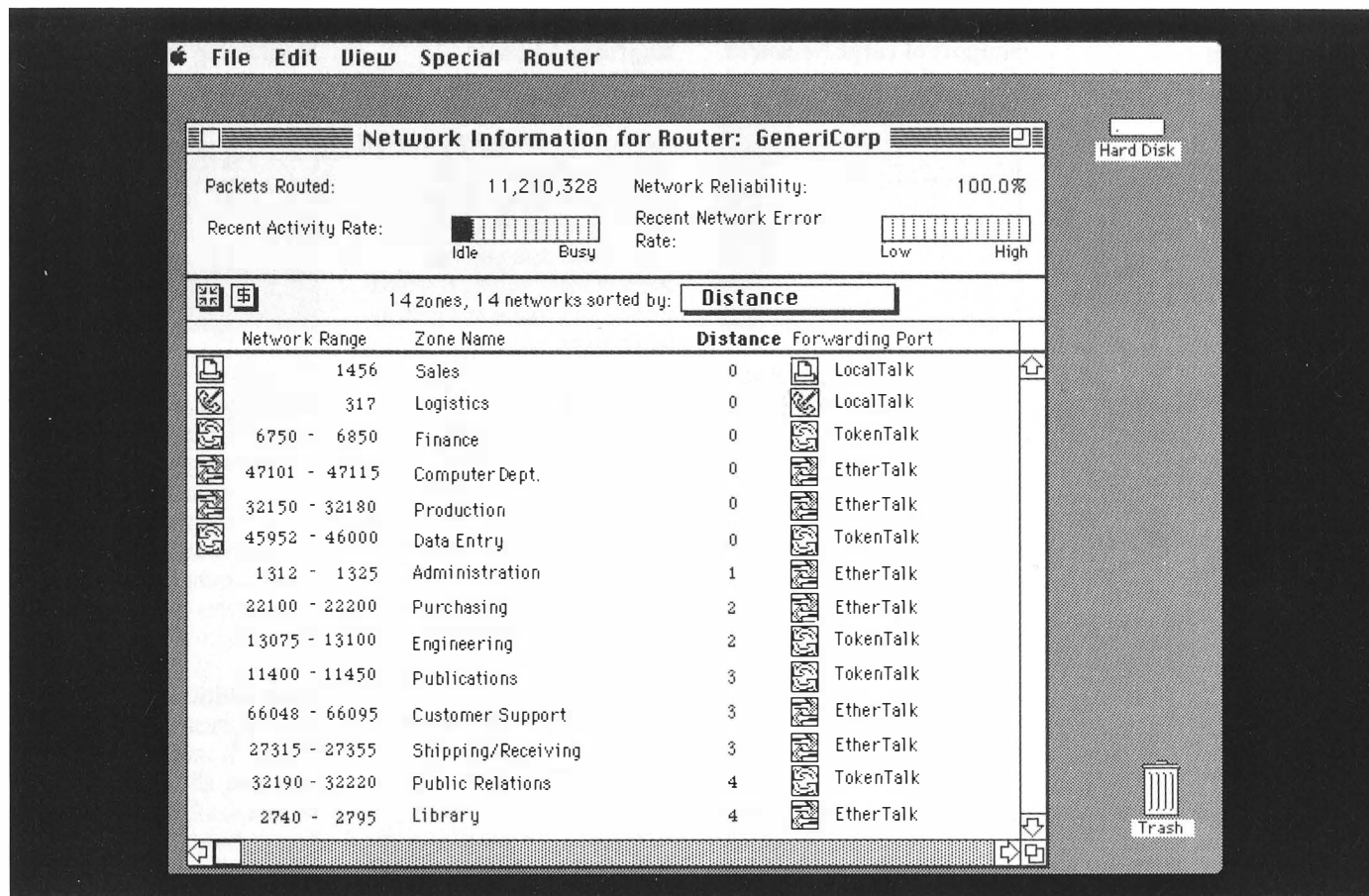
To get system information

Ordering Information

Inter•Poll Network Administrator's Utility
Order No. M0697

With your order, you'll receive:

- ▶ Inter•Poll Network Administrator's Application disk
- ▶ Inter•Poll Workstation Installer disk (800K)
- ▶ Inter•Poll Workstation Installer disk (400K)
- ▶ *Inter•Poll Network Administrator's Guide*
- ▶ Limited warranty statement



Overview

The AppleTalk® Internet Router lets you increase the size and improve the performance and manageability of your AppleTalk network system. It allows AppleTalk networks such as LocalTalk™, EtherTalk™, and TokenTalk™ to be interconnected to form an internet. The router moves data from one network to another transparently so that the

internet functions like a single network. This means that users can share files and printers across the internet, as well as send and receive mail, in the same way that they access these resources on a single network.

A key component of the AppleTalk network system, the AppleTalk Internet Router offers room to grow for even the largest networking installations. Features

such as extended addressing and improved zone-based access to internet resources let network professionals build for the future. As with other Apple® Macintosh® products, the AppleTalk Internet Router is easy to use. Even a network novice can have it running in minutes and begin to make use of its powerful features.

Features

Benefits

-
- | | |
|---|---|
| ▶ Background routing capability | ▶ Allows the Macintosh running the router software to run other services in the foreground. |
| ▶ Up to eight network ports per router | ▶ Allows interconnection of up to eight networks per Macintosh, enabling flexible network topologies and optimum use of the Macintosh serving as a router. |
| ▶ Up to 1,024 networks per internet | ▶ Provides room for growth for even the largest network systems. |
| ▶ Extended network addressing of up to 16 million nodes | ▶ Supports large network systems that use data link bridges for local and wide area networking. |
| ▶ Zone naming on a per-node basis | ▶ Streamlines the use of the Chooser in large networks. |
| ▶ Network independent | ▶ Supports LocalTalk, EtherTalk, and TokenTalk.
▶ Lets you choose the best network for each environment and then connect multiple networks to form an integrated network system. |
| ▶ Monitoring of router traffic and errors | ▶ Provides an effective internetwork management tool. |
| ▶ Easy setup and operation | ▶ Lets even novice network users benefit from this powerful software. |
| ▶ Dynamic internet route maintenance | ▶ Requires no additional administration after setup. |
| ▶ Isolation of local traffic | ▶ Increases internet performance by keeping local traffic at the local network level—isolating it from the internet. |
| ▶ Redundant topologies | ▶ Allows AppleTalk internets to use alternate routes automatically in the event of a failure in the primary route. |
| ▶ Report facility | ▶ Allows router statistics and routing tables to be printed and logged for network management purposes. |



AppleTalk Internet Router

System Requirements

To use the AppleTalk Internet Router, you'll need:

- ▶ A Macintosh Plus, SE, SE/30, II, IIX, or IICX personal computer

- ▶ Macintosh System Software Version 6.0.3 or later

- ▶ All necessary network interface cards, cabling, and software for each network connection

Ordering Information**AppleTalk Internet Router**

Order No. M0705

With your order, you'll receive:

- ▶ AppleTalk Internet Router software
- ▶ Macintosh System Software 6.0.3
- ▶ *AppleTalk Internet Router Administrator's Guide*



Bear Cal

Bear•Cal Reservation System

Passenger:
Destination:
Depart: **Return:**

Address:
City: **State:**
Zip: **Phone:**

Incidentals: <input type="checkbox"/> Smoking <input checked="" type="checkbox"/> Dinner <input checked="" type="checkbox"/> Movie <input checked="" type="checkbox"/> Rental Car	Class: <input checked="" type="radio"/> First <input type="radio"/> Business <input type="radio"/> Coach	Seating: <input type="radio"/> Window <input type="radio"/> Center <input checked="" type="radio"/> Aisle	Payment: <input type="checkbox"/> Super Card <input checked="" type="checkbox"/> Credit Card
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Overview

MacWorkStation™ is a collection of high-level Toolbox routines that allow host programs running over any supported communications protocol to utilize the standard user-interface, file-management, and printing features of the Apple® Macintosh® personal computer. It gives programmers full access to and control over windows, pull-down menus, dialog boxes, and other features of the Macintosh user interface—without requiring

them to learn the details of a traditional Macintosh programming environment.

MacWorkStation provides two primary benefits: high-level access to the Macintosh Toolbox and a framework for building cooperative Macintosh-to-host applications. MacWorkStation allows programmers not familiar with programming the Macintosh to easily build Macintosh-style interfaces for their host applications. (Without MacWorkStation, developing a Macintosh interface

to a host application requires extensive work and detailed knowledge of the Macintosh.)

This combination of features allows corporate MIS departments, software developers, value-added resellers, and systems integrators to enhance their existing host-based applications, and to use their existing programming staffs to create applications with the characteristics of the Macintosh interface.

Features

Benefits

▶ MacWorkStation

- ▶ Brings the benefits of the graphics-based Macintosh interface to host applications.
- ▶ Requires minimal Macintosh programming experience, allowing host programmers to concentrate on functional application issues on the host itself.
- ▶ Integrates well into existing host environments without disrupting current practices or processes.

▶ Presentation Directors

- ▶ Allows the host application to easily access the standard Macintosh user interface, including dialog boxes, pull-down menus, alerts, graphics, and windows.

▶ File Directors

- ▶ Allows the host application to use the Macintosh file-management and printing features.

▶ Exec Modules

- ▶ Allows MIS and commercial developers to extend the MacWorkStation tools.

▶ Communications Connection Language (CCL)

- ▶ Provides a sophisticated method for accessing host applications over a variety of network paths.

▶ Communications Modules

- ▶ Allows MacWorkStation to be used with many communications protocols.

Product Details

Message Protocols

The heart of MacWorkStation, these are messages that are received from or sent to a host. Messages are either commands or events; commands are messages sent from the host requesting an action on the Macintosh, and events are messages sent from the Macintosh informing the host of a significant change of state.

Directors

These act as a high-level toolbox that interprets commands from the host to build and maintain a Macintosh interface. Directors use the underlying Macintosh Toolbox managers to support a consistent environment between host and local applications. These Directors include Alert, Dialog, Graphics, Window, Cursor, Menu, List, and File. Additional Directors can be added.

Exec Modules

These constitute a Macintosh code resource that can be created from any high-level Macintosh programming language and added to the MacWorkStation application or document file.

One or more Exec Modules can be launched locally (or by the host) and may perform any programming task. These Exec Modules run simultaneously and can trap events or interact with the host or user while MacWorkStation is running. This provides a very powerful way of extending and customizing MacWorkStation to fit a wide range of cooperative processing needs.

Exec Modules also have the capability of using MacWorkStation commands to perform any user-interface, printing, or file-management functions. This reduces the amount of knowledge that even an Exec Module programmer needs in order to perform Macintosh programming.

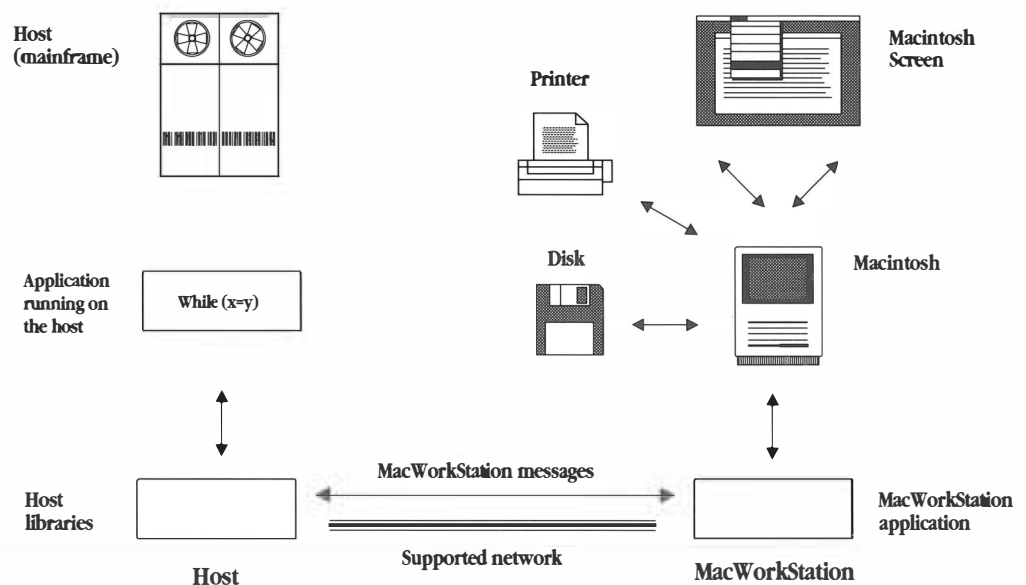
Communications Connection Language (CCL)

This is a powerful scripting language built specifically to help access remote applications. The CCL script can be lengthy and complex or it can be very short, depending on how the user is accessing the remote application. Once the host application is reached, the CCL script transfers control of the session to the appropriate Communications Module.

Communications Modules

These are Macintosh code segments that may be written and added to MacWorkStation. They are responsible for ensuring that MacWorkStation functions entirely independently, without regard to the type of network the communication with the host application is taking place on. This allows MacWorkStation to work over a wide range of communications protocols.

Data Flow Diagram





MacWorkStation

Implementation

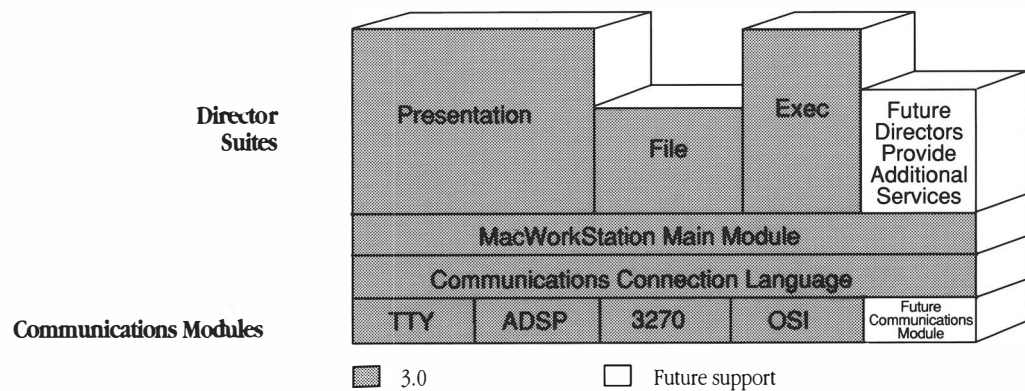
Utilizing MacWorkStation to develop a Macintosh interface on a host application requires that the host software be modified. This modification can take one of two forms. If the application has been written with a separate module to manage the terminal or user-interface inter-

action, then a Macintosh interface module can be written to manage the interaction between the host application and MacWorkStation. If the application has been written to include the terminal-handling function as an integral part, then the application must be modified directly to support MacWorkStation.

In a typical application, MacWorkStation could be used as a front-end for the following:

- ▶ An office automation system (mail, calendar handling, and other tasks)
- ▶ A transaction entry system
- ▶ A database system
- ▶ An executive information system

MacWorkStation Architecture



System Requirements

MacWorkStation can be used with a Macintosh 512K Enhanced, Macintosh Plus, Macintosh SE, or Macintosh II personal computer.

Communications Modules for TTY (Asynchronous), AppleTalk®, and AppleLine™ 3270 are provided with the initial package.

Additional Communications Modules will be available from Apple and third parties.

Product Support

Support is available through Apple's developer services organization. Apple direct accounts and MIS developers

also have access to Apple's Technical Communications support group.

Availability

Apple Software Licensing
20525 Mariani Avenue, M/S 28B
Cupertino, CA 95014
(408) 973-4667

Ordering Information

MacWorkStation
Order No. M0684

With your order, you'll receive:

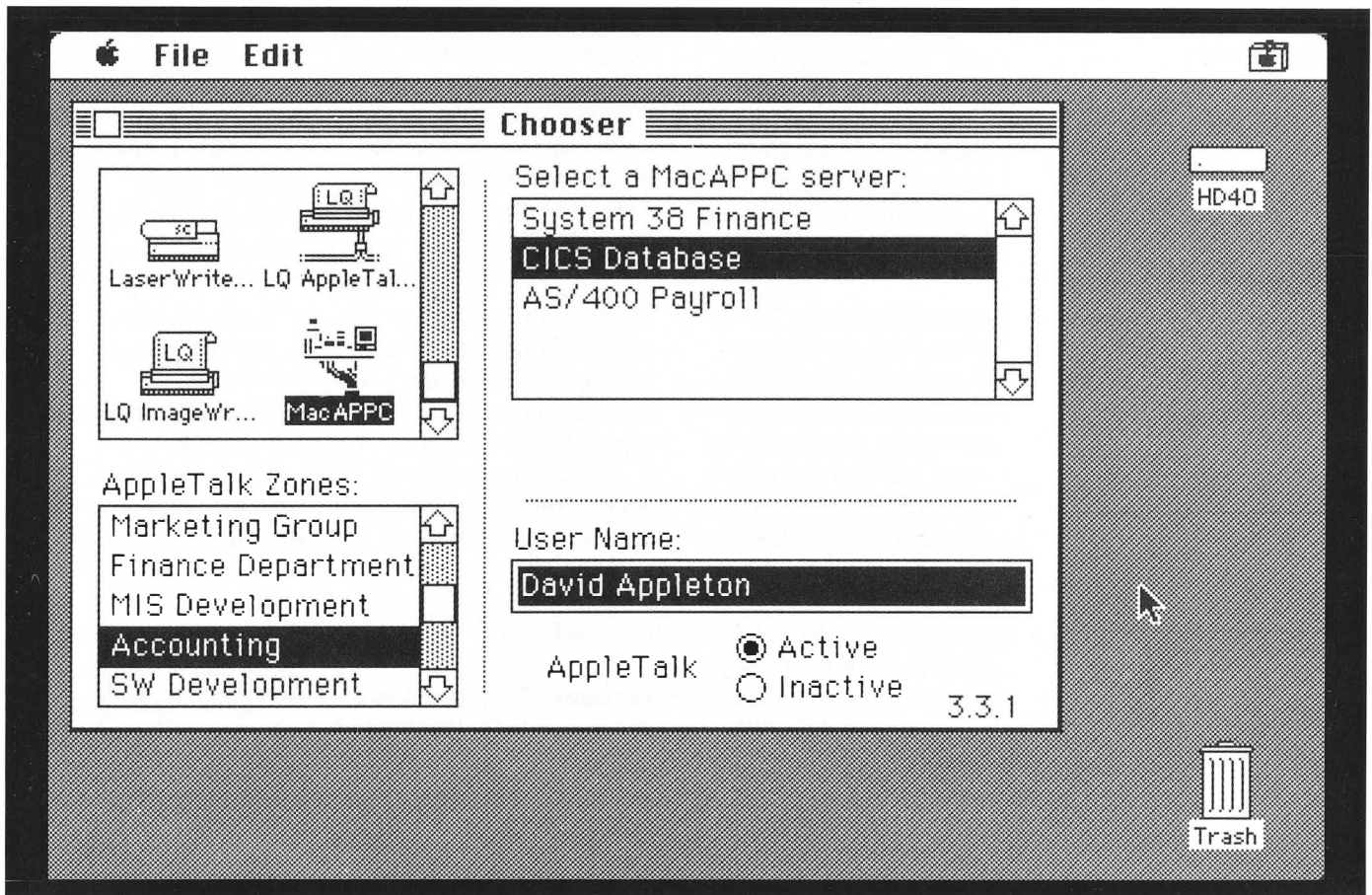
- ▶ MacWorkStation Program disk
- ▶ Test Host Program disk
- ▶ MacWorkStation programmer's guide

- ▶ MacWorkStation programmer's reference
- ▶ Macintosh user-interface guidelines

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January 1988
Product specifications are subject to change without notice.



Overview

MacAPPC™ software is one of a family of connectivity products that let the Apple® Macintosh® personal computer function in mainstream IBM Systems Network Architecture (SNA) environments. It provides programmers with the necessary software tools to support communications services between Macintosh and SNA networks.

MacAPPC provides a complete implementation of the SNA Logical Unit 6.2 (LU 6.2) peer-to-peer protocol. It is a modular

extension to Macintosh system software, ensuring its availability on all members of the Macintosh family, as well as its compatibility with other networks (such as AppleTalk®) and software that may already be installed.

MacAPPC makes it possible to develop commercial applications that provide access to other Macintosh and non-Macintosh environments using the services of the LU 6.2 protocol. It also allows for the development of applications that tightly integrate

Macintosh personal computers with established environments that support LU 6.2.

MacAPPC software provides the tools to create powerful, sophisticated distributed applications that provide transparent access to information—regardless of its location or the type of system on which it resides. And because it is a Macintosh tool, MacAPPC makes this remote information accessible through the familiar Macintosh user interface.

Features

Benefits

▶ Implementation of IBM SNA Logical Unit 6.2 (LU 6.2)/Physical Unit 2.1 (PU 2.1) protocols

▶ Facilitates development of Macintosh applications that are compatible with SNA and other networks that support advanced SNA protocols.

▶ Support for peer-to-peer communications between Macintosh and other SNA/LU 6.2-based systems via IBM's Advanced Program-to-Program Communications (APPC) facilities

▶ Enables Macintosh applications to dynamically exchange information with IBM-based applications.

▶ Macintosh Toolbox extension

▶ Makes it easier to develop consistent, easy-to-use Macintosh applications for end users.

▶ Hardware independence

▶ Supports present and future hardware operating environments.
▶ Allows users to choose the means of connection that best meets their needs (for example, Token Ring, SDLC, or X.25).

▶ Chooser compatibility

▶ Features integration with the Macintosh user interface, for easy setup and access by the end user.

▶ AppleTalk communications server

▶ Provides transparent connectivity to SNA through existing AppleTalk networks.

▶ Standard programmatic interface

▶ Provides developers with a common application program interface. This toolbox, known as a protocol boundary in the IBM environment, provides the full set of LU 6.2 functionality.

Technical Notes

MacAPPC is implemented in a client-server configuration. The server code resides on a Macintosh Coprocessor Platform™ communications card plugged into one of the NuBus expansion slots of any member

of the Macintosh II family. The toolbox portion (the client) exists as a set of device drivers on the same Macintosh and/or on one or more Macintosh computers connected to the server via AppleTalk. Because

the Macintosh Coprocessor Platform is providing the services and using only the resources found on the card, MacAPPC offers LU 6.2 connectivity without requiring a dedicated Macintosh system.

LU 6.2 Device Driver Notes

Protocol Boundary: The LU 6.2 device driver conforms to the standard Macintosh device driver format and acts as the programmatic interface for the toolbox. The well-defined and documented programmatic interface defines the LU 6.2 protocol boundary for MacAPPC. The protocol boundary is designed to follow as closely as possible the verb definition, parameter names, and syntax used in the IBM protocol boundary, with which developers may already be familiar.

Support for the LU 6.2-defined basic conversation,

mapped conversation, and control operator verbs, a set of node operator verbs, and transaction program verbs is provided in the toolbox.

Interface files for the LU 6.2 device drivers are available for the following languages:

- ▶ MPW™ 68000 Assembler
- ▶ MPW C
- ▶ MPW Pascal

Functions: The LU 6.2 device drivers provide the following functions:

- ▶ Mapped conversation verbs
- ▶ Type-independent conversation verbs (except SyncPoint and Backout)

- ▶ Basic conversation verbs
- ▶ Control operator CNOS verbs
- ▶ Control operator session control verbs
- ▶ Control operator LU definition verbs
- ▶ Node operator control verbs
- ▶ Node operator definition verbs
- ▶ Transaction program connection verbs
- ▶ Transaction program utility verbs
- ▶ PU 2.1 support
- ▶ Parallel sessions



MacAPPC

System Requirements

Server requirements:
Any member of the Macintosh II family and an intelligent

NuBus plug-in communications card that adheres to the Macintosh Coprocessor Platform architecture

Client requirements:
Macintosh Plus, Macintosh SE, Macintosh SE/30, or any member of the Macintosh II family

Availability

Apple Software Licensing
20525 Mariani Avenue, M/S 28B
Cupertino, CA 95014
(408) 974-4667

Additional Technical Documentation (documentation only)
Apple Programmers and Developers Association (APDA™)
Apple Computer, Inc.
20525 Mariani Avenue, M/S 33G
Cupertino, CA 95014-6299
U.S.A.

Ordering Information**MacAPPC**

Order No. M0698

With your order, you'll receive:
▶ Four 800K disks with MacAPPC code and sample applications, including source code for sample applications, plus HyperCard® examples
▶ Documentation on MacAPPC

MacAPPC Documentation

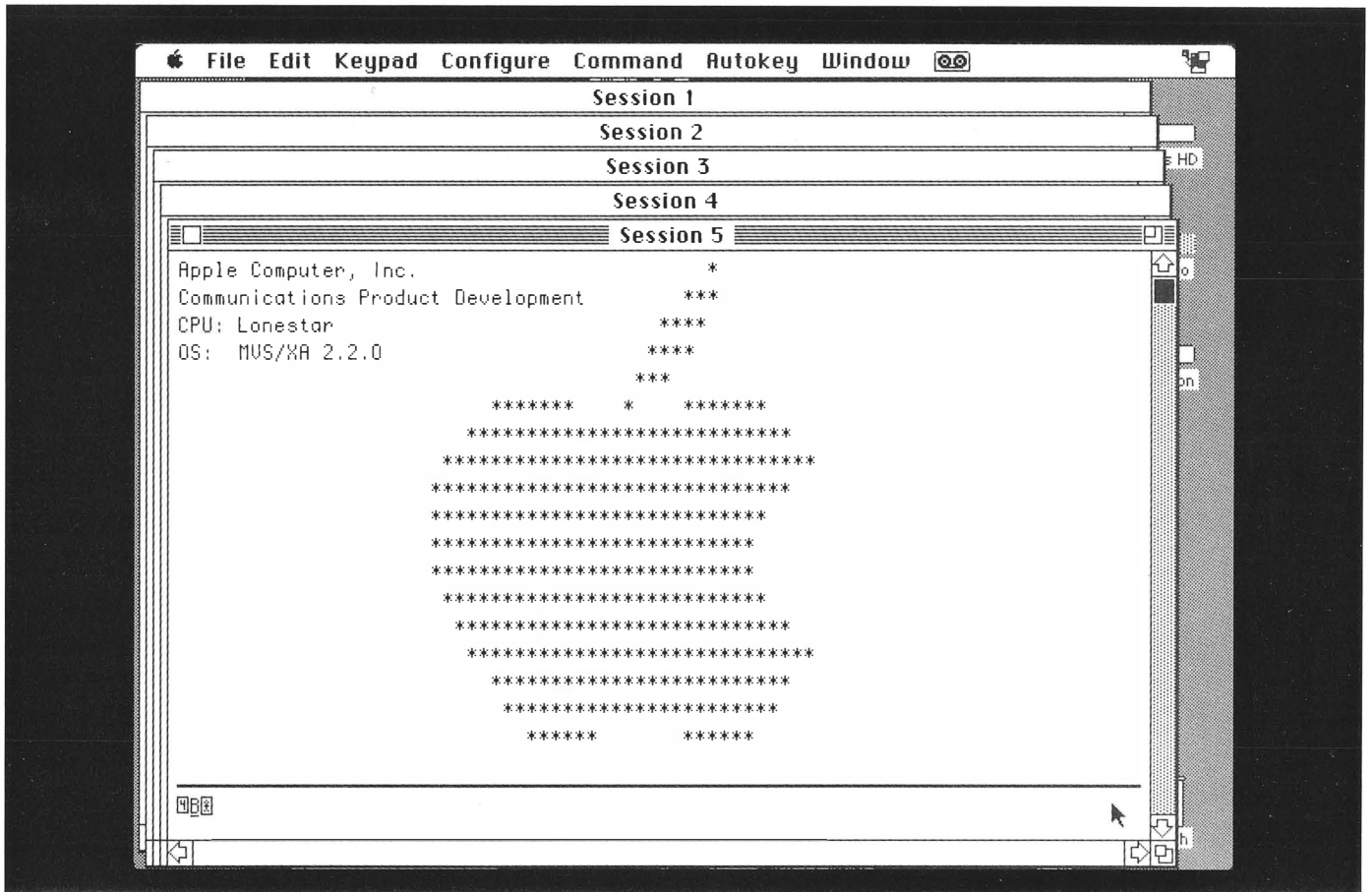
Order No. M0701

With your order, you'll receive:
▶ Documentation on MacAPPC

MacAPPC Single-User Evaluation Kit

Order No. M0218LL/A

With your order, you'll receive:
▶ Single-user evaluation copy of the complete MacAPPC software package, including documentation



Overview

MacDFT™ is a full-function 3270 terminal emulation program that enables personal computers in the Macintosh® II family of systems to communicate with IBM mainframes. This application provides both Control Unit Terminal (CUT) and Distributed Function Terminal (DFT) emulation of IBM 3270 Information Display Systems.

The MacDFT application software works with the Apple® Coax/Twinax Card to allow single-session CUT emulation or up to five-session DFT 3270 emulation. Files can be transferred to or from mainframes running VM/CMS or MVS/TSO using the IBM IND\$FILE package. MacDFT supports text, binary, and MacBinary file transfers.

MacDFT stays active in the background under MultiFinder.™ Copy and paste functions between the Macintosh and mainframe applications are supported using the Clipboard. This allows the user to transfer data easily between an application on the mainframe and a local application on the Macintosh desktop.

Features

Benefits

▶ 3270 Information Display Systems emulation

▶ Allows access to 3270 applications and data on IBM mainframes.

▶ Support for 3270 screen formats 2, 3, 4, and 5

▶ Supports standard application screen layouts.

▶ Distributed Function Terminal (DFT) support

▶ Displays up to five separate 3270 sessions simultaneously.

▶ Integrated file transfer between Macintosh II systems and IBM mainframes running VM/CMS or MVS/TSO

▶ Permits transfer of files between Macintosh II computers and IBM mainframes (file transfer based on IBM's IND\$FILE).

▶ Keyboard remapping

▶ Enables users to assign function keys to 3270 applications.

▶ Keystroke record and playback

▶ Allows definition of a string of frequently used keystrokes.

▶ Supports both the Apple Coax/Twinax Card and the Apple TokenTalk™ NB Card

▶ Provides software portability between coax and Token-Ring connections for Macintosh II systems.

Apple 3270 API

Overview

The Apple 3270 API, a high-level application programming interface, gives application developers a consistent platform for developing customized 3270 applications.

Because the Apple 3270 API is based on the IBM 3270 PC High-Level Language Application Programming Interface (HLLAPI), application programmers can apply their knowledge of HLLAPI to develop Macintosh-to-mainframe applications.

The API is designed to allow terminal emulators, file-transfer programs, and other Macintosh applications and tools, such as CL/1™ and MacWorkStation,™ to use the 3270 services without being aware of the physical network connection details of coax, Token-Ring, and SDLC.

The Apple 3270 API establishes and terminates sessions with a mainframe, maintains context separation between multiple mainframe sessions, and sends 3270 keystrokes to the mainframe.

Features

▶ The 3270 application programming interface

.....

▶ Mapped to IBM's HLLAPI

.....

▶ Support for the Apple Coax/Twinax Card and the Apple TokenTalk NB Card

Benefits

▶ Enables third-party developers and information systems application programmers to provide consistent Macintosh-to-IBM value-added applications.

.....

▶ Allows developers to leverage 3270/SNA expertise.

.....

▶ Allows applications written to the API to be portable across key IBM standard data links.



MacDFT and Apple 3270 API

System Requirements

To use MacDFT, you'll need:

- ▶ A personal computer in the Macintosh II family of systems

- ▶ System Software Version 6.0.3 or higher
- ▶ An Apple Coax/Twinax Card or an Apple TokenTalk NB Card

On the IBM host, you must have one of the following IBM file-transfer software products:

- ▶ 5665-311 (MVS/TSO)
- ▶ 5664-281 (VM/CMS)

Ordering Information

MacDFT

Order No. M0695

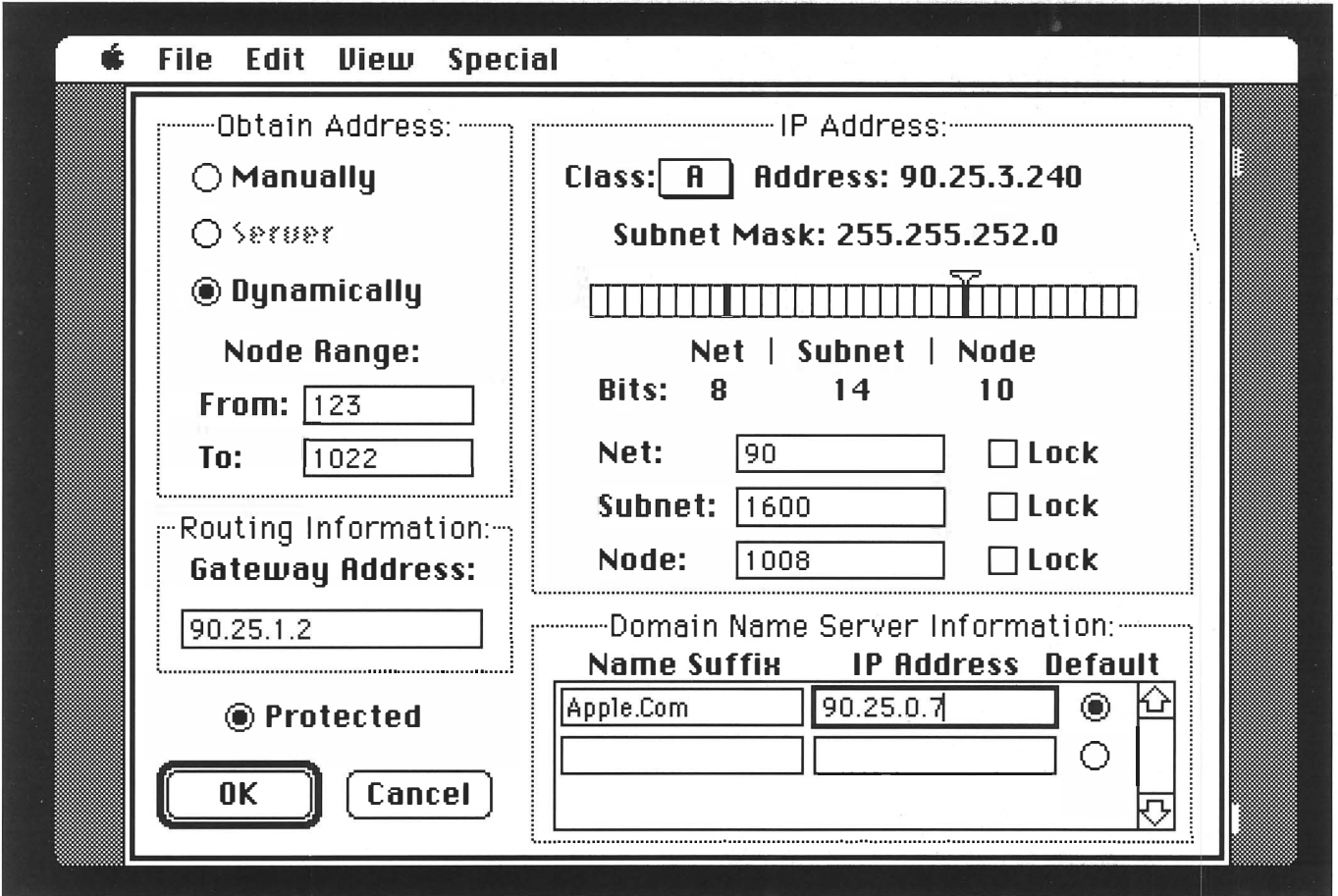
With your order, you'll receive:

- ▶ MacDFT software
- ▶ *MacDFT User's Guide*
- ▶ Limited warranty statement

Apple 3270 API

- ▶ The Apple 3270 API package, which includes header files, code, and reference manual, is available from:

Apple Computer, Inc.
Apple Software Licensing
10431 North De Anza Blvd.
Cupertino, CA 95014
(408) 974-4667



Overview

With MacTCP™ software, developers now have a way to create Apple® Macintosh® applications for network environments that use TCP/IP protocols—a widely used standard for networking heterogeneous systems. Licensed to third-party developers, MacTCP includes TCP, UDP, and IP protocols and conforms to Internet RFCs and MIL-STDs, thus ensuring interoperability with systems on the TCP/IP Internet. MacTCP runs over both Ethernet and LocalTalk™-compatible cabling systems and is co-resident with AppleTalk® protocols. It can be installed on a Macintosh II, Macintosh SE, Macintosh Plus, or Macintosh 512K Enhanced computer.

Features

- ▶ TCP/IP protocol driver implementation
- ▶ Compatible with Macintosh II, SE, Plus, and 512K Enhanced computers
- ▶ Concurrent TCP/IP and AppleTalk operation
- ▶ Both C and assembly language interfaces
- ▶ Address configuration via the Control Panel
- ▶ Apple-supported driver

Benefits

- ▶ Provides a standard platform for developing applications and solutions.
- ▶ Supports multiple TCP/IP services concurrently.
- ▶ Lets third-party developers create applications that can run on a range of Macintosh computers.
- ▶ Preserves full access to AppleTalk services. For example, users can run MacTCP while printing to an Apple LaserWriter® printer over LocalTalk cabling.
- ▶ Provides developers with a familiar development environment.
- ▶ Simplifies installation and setup procedures for end users and network administrators.
- ▶ Makes technical assistance available for Apple Certified Developers.



MacTCP

System Requirements

To use MacTCP for a Macintosh computer with a LocalTalk-compatible cabling system, you'll need the following:

- ▶ A Macintosh II, Macintosh SE, Macintosh Plus, or Macintosh 512K Enhanced computer

- ▶ Appropriate LocalTalk-compatible cable connectors
- ▶ A router with AppleTalk and TCP/IP support, such as the Kinetics FastPath

To use MacTCP for a Macintosh computer on Ethernet, you'll need:

- ▶ A Macintosh II with an Ethernet interface card such as the Apple EtherTalk™ Interface Card, or a Macintosh SE with an Ethernet interface card such as the Kinetics EtherPort SE card

Product Details

MacTCP consists of object code libraries and associated files for both C and assembly language development. Libraries include TCP and UDP interfaces along with a name-to-address resolver. A programmer's reference guide and an administrator's guide are provided.

MacTCP implements the following protocols:

- IP (RFCs 791, 894; MIL-STD 1777)
- UDP (RFC 768)
- TCP (RFC 793, MIL-STD 1778)
- ARP (RFC 826)
- RARP (RFC 903)
- ICMP (RFC 792)

- BootP (RFCs 951, 1048)
- RIP (IDEA004)
- DNR (RFCs 1034, 1035)
- Internet Subnetting (RFC 950)
- Internet Assigned Numbers (RFC 1010)

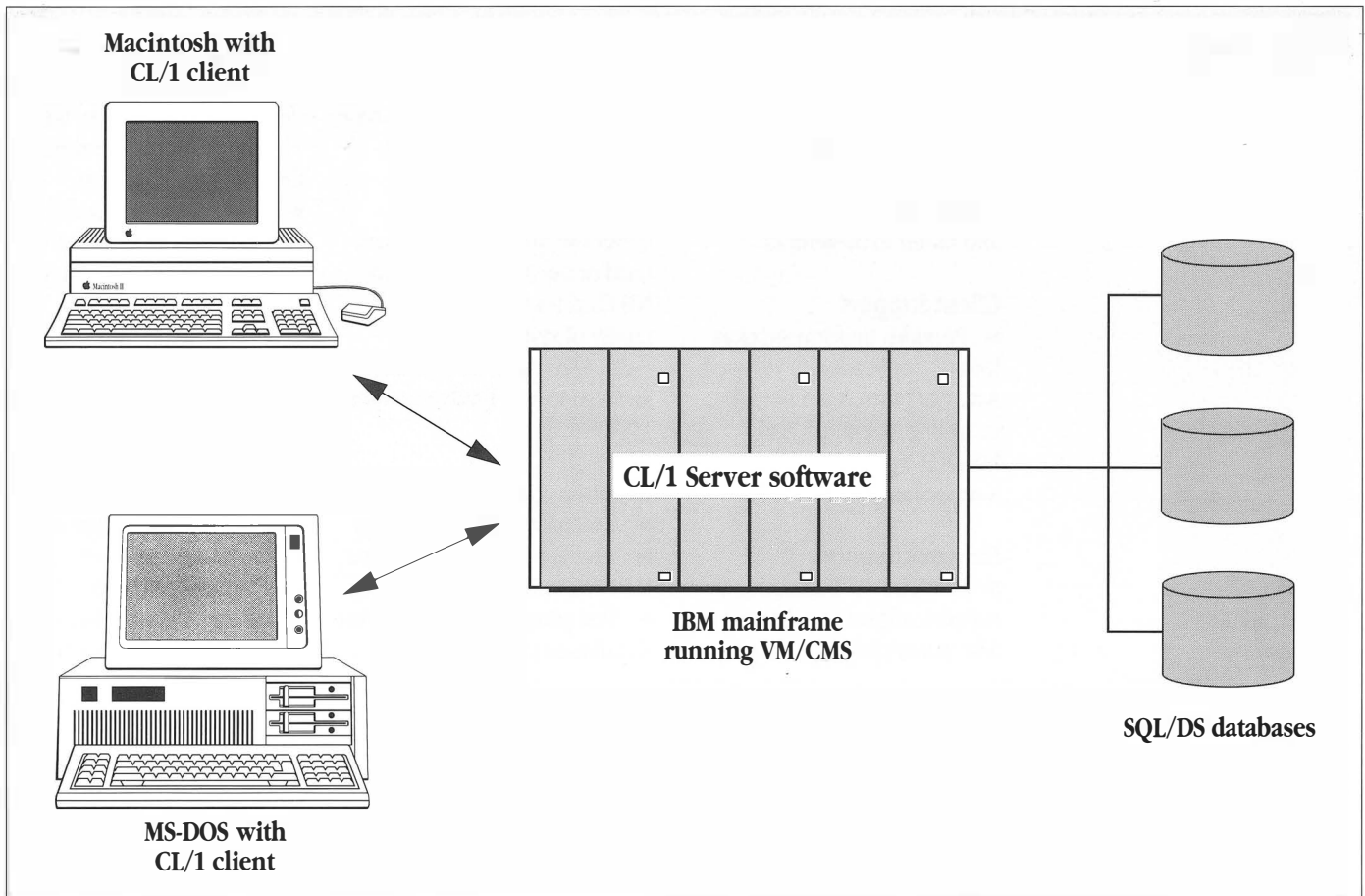
Throughput is 3.0 megabits per second memory-to-memory (on a Macintosh II over Ethernet).

Ordering Information

MacTCP

MacTCP is a site-licensed product. To order MacTCP, contact:
Software Licensing Department
Apple Computer, Inc.
10431 De Anza Blvd., M/S 38I
Cupertino, CA 95014

MacTCP comes with a programmer's reference guide and a network administrator's guide.



Overview

The CL/1™ Server for VM/CMS is a networking software product that provides CL/1 access to the Structured Query Language/Data System (SQL/DS) on a VM/CMS host system. Running on the VM/CMS host, the CL/1 Server works cooperatively with personal computer applications that support CL/1, such as spreadsheets, databases, and word processors running on Apple® Macintosh® computers and MS-DOS-compatible computers.

A total connectivity solution for VM/CMS includes a client personal computer running an application with embedded CL/1 support, and a VM/CMS host with the CL/1 Server. The CL/1 Server receives requests from the personal computer application, carries them out against SQL/DS, and sends the desired data back to the application for desktop processing.

The CL/1 Server for VM/CMS provides uniform support for CL/1-based applications, regardless of the type of personal computer used. It works with existing SQL/DS databases, operating under standard VM and SQL/DS security. As a result, personal computer users receive seamless, transparent access to the SQL/DS data that they have been authorized to access.

Features

Benefits

▶ Server operates as a CMS task under standard VM username/password security

▶ Maintains the security and integrity of VM and SQL/DS.

▶ Eliminates the need for new system administration procedures for VM or SQL/DS.

▶ Uniform support for CL/1 clients

▶ Allows one server to support all personal computers running CL/1-compatible applications, including Macintosh and MS-DOS applications.

▶ Standard VM installation procedures

▶ Makes installation quick and easy.

▶ Asynchronous operation

▶ Allows the user to continue other work while the CL/1 Server performs a connectivity request.

▶ Incremental compiler implementation

▶ Improves performance for repetitive requests.

▶ Reduces the client system processing load.

▶ Support for the Apple 3270 API (application program interface)

▶ Supports Apple's standard connectivity platform for communications between Macintosh computers and IBM mainframes.

Product Details

Database Support

- ▶ Provides access to SQL/DS databases
- ▶ Provides standard database naming, data types, system catalog structure, error codes, and buffer management

Client Support

- ▶ Provides uniform support for any application developed with CL/1 developer's toolkits, including Macintosh and MS-DOS applications, using a supported network

Network Support

- ▶ Provides 3270 datastream support; allows SNA or non-SNA connection

- ▶ The client must have the supported 3270 hardware and software to emulate a 3278-type device operating in Control Unit Terminal (CUT) mode:
 - MacDFT™ software and either the Apple Coax/Twinax Card or the Apple TokenTalk™ NB Card for the Macintosh II family of systems
 - PC 3270 entry-level emulator and supporting hardware under MS-DOS

Resource Usage

- ▶ 1 megabyte of disk storage
- ▶ 1-megabyte virtual machine for each active user
- ▶ Test program verifies correct installation and usage

Language Specifications

CL/1 is a complete language for describing connectivity tasks. The CL/1 language consists of these statement groups:

- ▶ Host connection statements: Establish and terminate a connection to a host system in the network
- ▶ Data manipulation statements: Offer complete, SQL-based data access to host databases
- ▶ Program structure statements: Support testing, looping, and procedure calls within a CL/1 program
- ▶ Output statements: Generate output messages from the CL/1 program, which are processed by the client application

System Requirements

To use the CL/1 Server for VM/CMS, you'll need the following:

- ▶ Host environment: VM/CMS

- ▶ Personal computer clients running CL/1-compatible Macintosh or MS-DOS applications

- ▶ Any supported version of SQL/DS
- ▶ Appropriate networking hardware and software



CL/1 Server for VM/CMS

Ordering Information

To order the CL/1 Server for VM/CMS, contact:

Network Innovations Corporation
20863 Stevens Creek Blvd.
Cupertino, CA 95014
(408) 257-6800
AppleLink:® D0978
Fax: (408) 257-7982

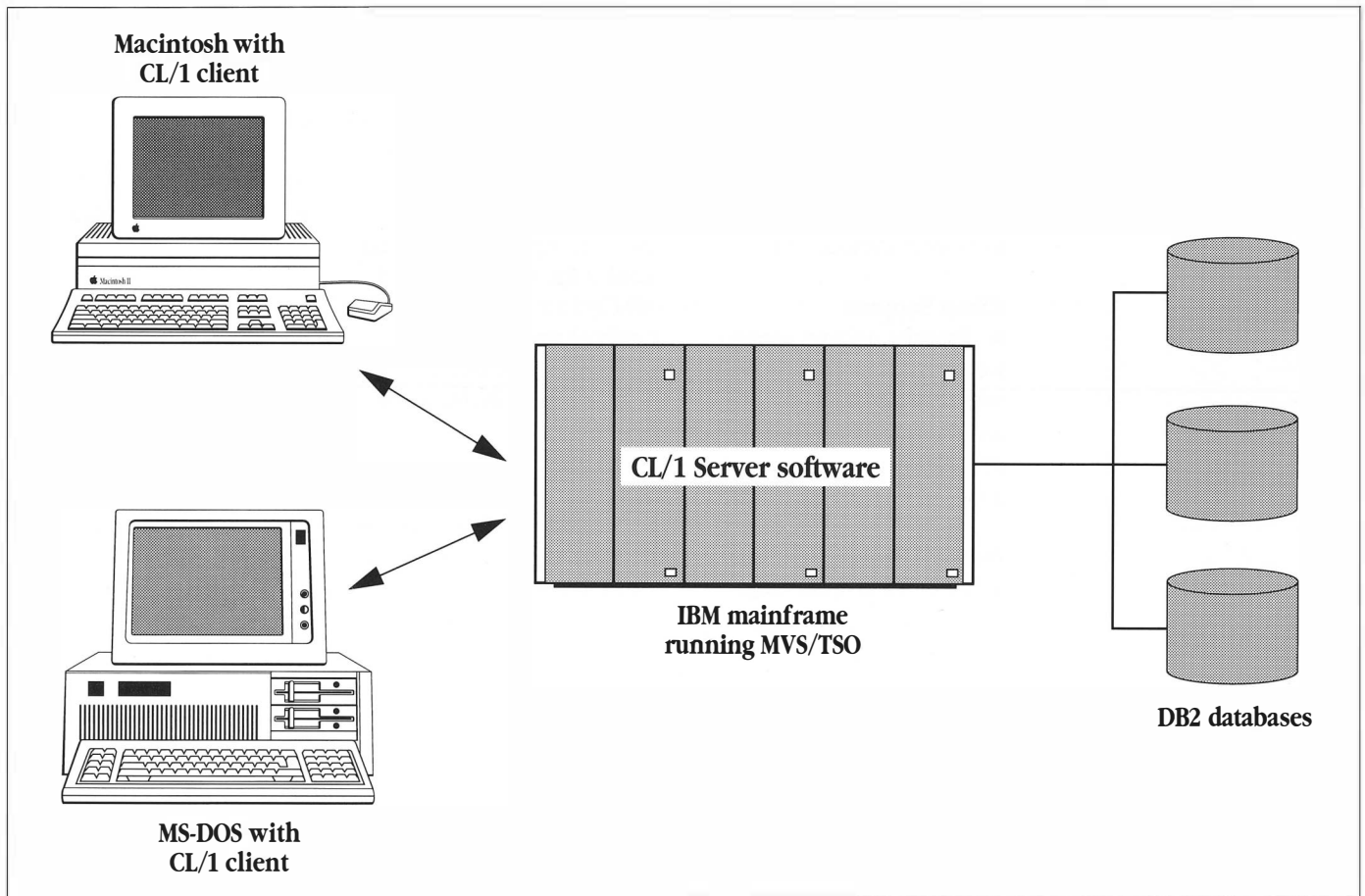
With your order, you'll receive:

- ▶ A 9-track, 1600-bpi tape containing the CL/1 Server software and the installation and configuration programs
- ▶ Installation manual
- ▶ 90 days of software technical support
- ▶ CL/1 Connectivity Language Description

Apple Computer, Inc.

20525 Mariani Avenue
Cupertino, CA 95014
(408) 996-1010
TLX: 171-576

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June 1989. Product specifications are subject to change without notice. Printed in the U.S.A.
M0249LL/A



Overview

The CL/1™ Server for MVS/TSO is a networking software product that provides CL/1 access to IBM Database 2 (DB2) databases on an MVS/TSO host system. Running on the MVS/TSO host, the CL/1 Server works cooperatively with personal computer applications that support CL/1, such as spreadsheets, databases, and word processors running on Apple® Macintosh® computers and MS-DOS-compatible computers.

A total connectivity solution for MVS/TSO includes a client personal computer running an application with embedded CL/1 support, and an MVS/TSO host with the CL/1 Server. The CL/1 Server receives requests from the personal computer application, carries them out on MVS against DB2, and sends the desired data back to the application for desktop processing.

The CL/1 Server for MVS/TSO provides uniform support for CL/1-based applications, regardless of the type of personal computer used. It works with existing DB2 databases, operating under standard TSO and DB2 security. As a result, personal computer users receive seamless, transparent access to the DB2 data that they have been authorized to access. CL/1 also provides concurrent access to multiple DB2 subsystems from within one desktop application.

Features

Benefits

▶ Server operates as an MVS task under standard TSO username/password security

▶ Maintains the security and integrity of MVS, TSO, and DB2 systems.
▶ Eliminates the need for new system administration procedures for MVS, TSO, or DB2.

▶ Uniform support for CL/1 clients

▶ Allows one server to support all personal computers running CL/1-compatible applications, including Macintosh and MS-DOS applications.

▶ Standard MVS utilities for installation

▶ Makes installation quick and easy.

▶ Asynchronous operation

▶ Allows the user to continue other work while the CL/1 Server performs a connectivity request.

▶ Incremental compiler implementation

▶ Improves performance for repetitive requests.
▶ Reduces the client system processing load.

▶ Support for the Apple 3270 API (application program interface)

▶ Supports Apple's standard connectivity platform for communications between Macintosh computers and IBM mainframes.

Product Details

Database Support

- ▶ Provides access to DB2 databases
- ▶ Provides standard database naming, data types, system catalog structure, error codes, and buffer management

Client Support

- ▶ Provides uniform support for any application developed with CL/1 developer's toolkits, including Macintosh and MS-DOS applications, using a supported network

Network Support

- ▶ Provides 3270 datastream support; allows SNA or non-SNA connection

- ▶ The client must have the supported 3270 hardware and software to emulate a 3278-type device operating in Control Unit Terminal (CUT) mode:
 - MacDFT™ software and either the Apple Coax/Twinax Card or the Apple TokenTalk™ NB Card for the Macintosh II family of systems
 - PC 3270 entry-level emulator and supporting hardware under MS-DOS

Resource Usage

- ▶ 1 megabyte of disk storage
- ▶ 1-megabyte virtual machine for each active user
- ▶ Test program verifies correct installation and usage

Language Specifications

CL/1 is a complete language for describing connectivity tasks. The CL/1 language consists of these statement groups:

- ▶ Host connection statements: Establish and terminate a connection to a host system in the network
- ▶ Data manipulation statements: Offer complete, SQL-based data access to host databases
- ▶ Program structure statements: Support testing, looping, and procedure calls within a CL/1 program
- ▶ Output statements: Generate output messages from the CL/1 program, which are processed by the client application

System Requirements

To use the CL/1 Server for MVS/TSO, you'll need the following:

- ▶ Host environment: MVS/TSO

- ▶ Personal computer clients running CL/1-compatible Macintosh or MS-DOS applications

- ▶ Any supported version of DB2
- ▶ Appropriate networking hardware and software



CL/1 Server for MVS/TSO

Ordering Information

To order the CL/1 Server for MVS/TSO, contact:

Network Innovations Corporation
20863 Stevens Creek Blvd.
Cupertino, CA 95014
(408) 257-6800
AppleLink® D0978
Fax: (408) 257-7982

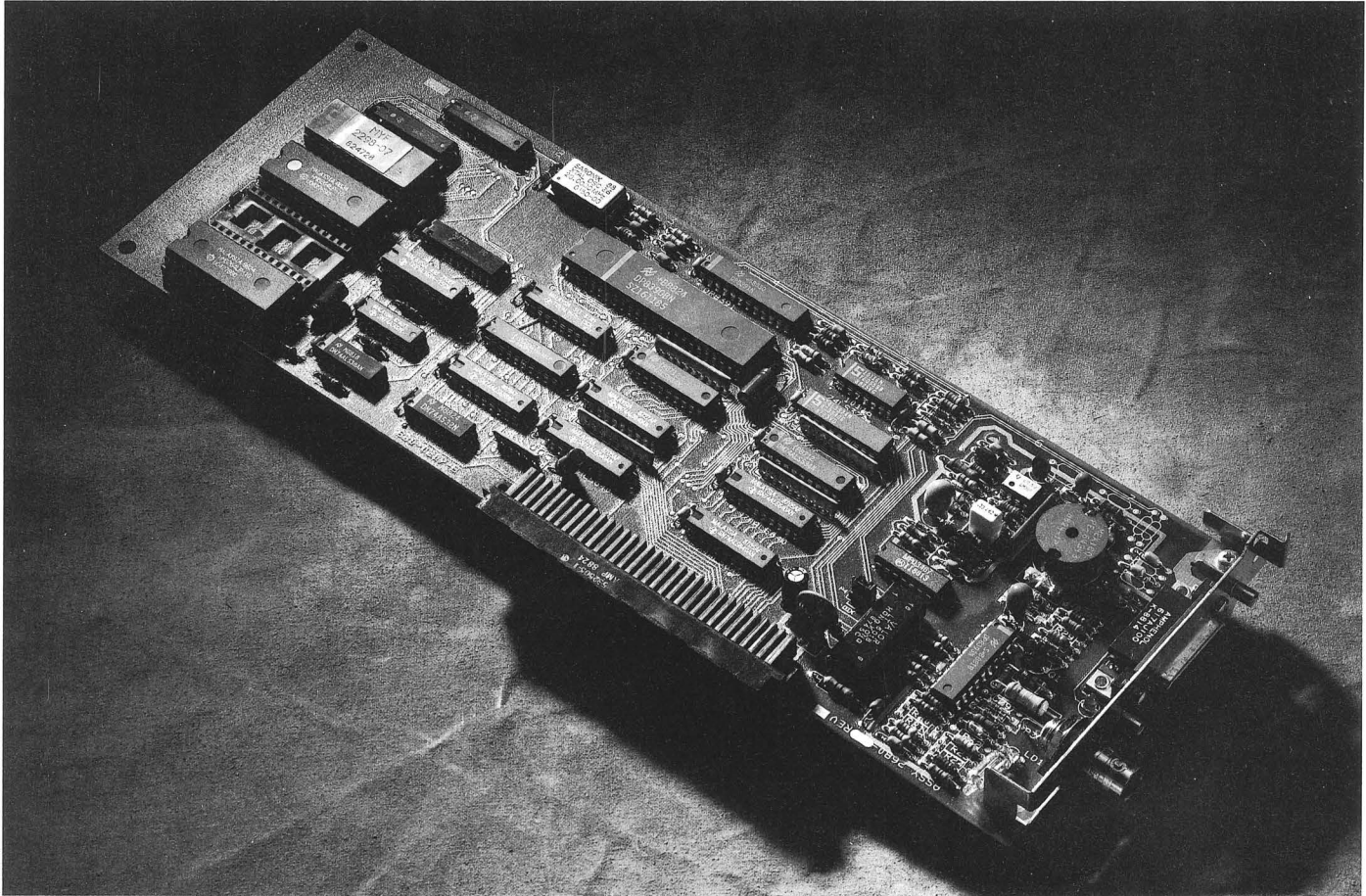
With your order, you'll receive:

- ▶ A 9-track, 1600-bpi tape containing the CL/1 Server software and the installation and configuration programs
- ▶ Installation manual
- ▶ 90 days of software technical support
- ▶ CL/1 Connectivity Language Description

Apple Computer, Inc.

20525 Mariani Avenue
Cupertino, CA 95014
(408) 996-1010
TLX: 171-576

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June 1989. Product specifications are subject to change without notice. Printed in the U.S.A.
M0251LL/A



Overview

The Apple® EtherTalk™ NB Card provides direct connectivity to 802.3 Ethernet networks for the Macintosh® II family of personal computers. This easy-to-install card lets you use the computer with a variety of networking protocols, including the AppleTalk® network system and TCP/IP.

Features

- ▶ Compliance with IEEE 802.3 standards
- ▶ Includes EtherTalk software (AppleTalk Phase 2 protocol support for users of the Macintosh operating system)
- ▶ A/UX® local area networking support
- ▶ On-board transceiver
- ▶ NuBus™ compatible
- ▶ User installable

Benefits

- ▶ Allows Macintosh II computers to connect to industry-standard Ethernet networks.
- ▶ Provides users on the AppleTalk network system with a higher-performance cabling alternative that can support single networks of more than 64,000 nodes and internets of more than 16 million nodes.
- ▶ When used with Apple's A/UX operating system, provides a complete solution for connecting into common UNIX® operating system-based local area network environments, including TCP/IP and the Network File System (NFS).
- ▶ Allows the use of "thin" Ethernet coaxial cabling without expensive external transceivers.
- ▶ Plugs into a NuBus expansion slot in any computer in the Macintosh II family.
- ▶ Installs in minutes.



Apple EtherTalk NB Card

Product Details

The Apple EtherTalk NB Card provides physical and link-level access to data communications networks meeting the IEEE 802.3 and 802.2 Logical Link Control (LLC) standards. Any of a number of networking protocols can be used with the EtherTalk NB card. The table outlines configurations provided by Apple.

Operating System	Protocol	Product	Ordering Information
Macintosh	AppleTalk	EtherTalk software	Included with EtherTalk NB card
Macintosh	TCP/IP	MacTCP™	Available through Apple Software Licensing
A/UX	AppleTalk	EtherTalk for A/UX	Available through A/UX dealers
A/UX	TCP/IP and NFS	B-NET	Included with A/UX

Other operating system/protocol configurations are available from independent (third-party) developers.

System Requirements

In addition to the Apple EtherTalk NB Card and accompanying software, the following are required to connect a

Macintosh II personal computer to Ethernet:

- ▶ One available NuBus slot in the computer
- ▶ Macintosh or A/UX operating system

- ▶ Thin coaxial Ethernet cabling, or a transceiver cable and transceiver for thick coaxial, twisted-pair, or fiber-optic cabling

Technical Specifications

Connectors

- ▶ BNC connector for thin Ethernet (RG-58) cabling
- ▶ AUI (15-pin D-style) connector for connecting external transceivers

Transmit/Receive data rate

- ▶ 10-megabit-per-second maximum data rate
- ▶ On-board thin Ethernet transceiver (jumper-selectable)

Packet buffering

- ▶ 64 kilobytes of dual-ported local RAM for packet buffering
- ▶ 32 kilobytes of ROM

Power dissipation

- ▶ +5 volts: 6.5 watts maximum
- ▶ +12 volts: 3.6 watts maximum

Environmental requirements

- ▶ Operating temperature: 32° to 131° F (0° to 55° C)
- ▶ Humidity: 10% to 90% noncondensing

Ordering Information

Apple EtherTalk NB Card

Order No. M0410LL/A

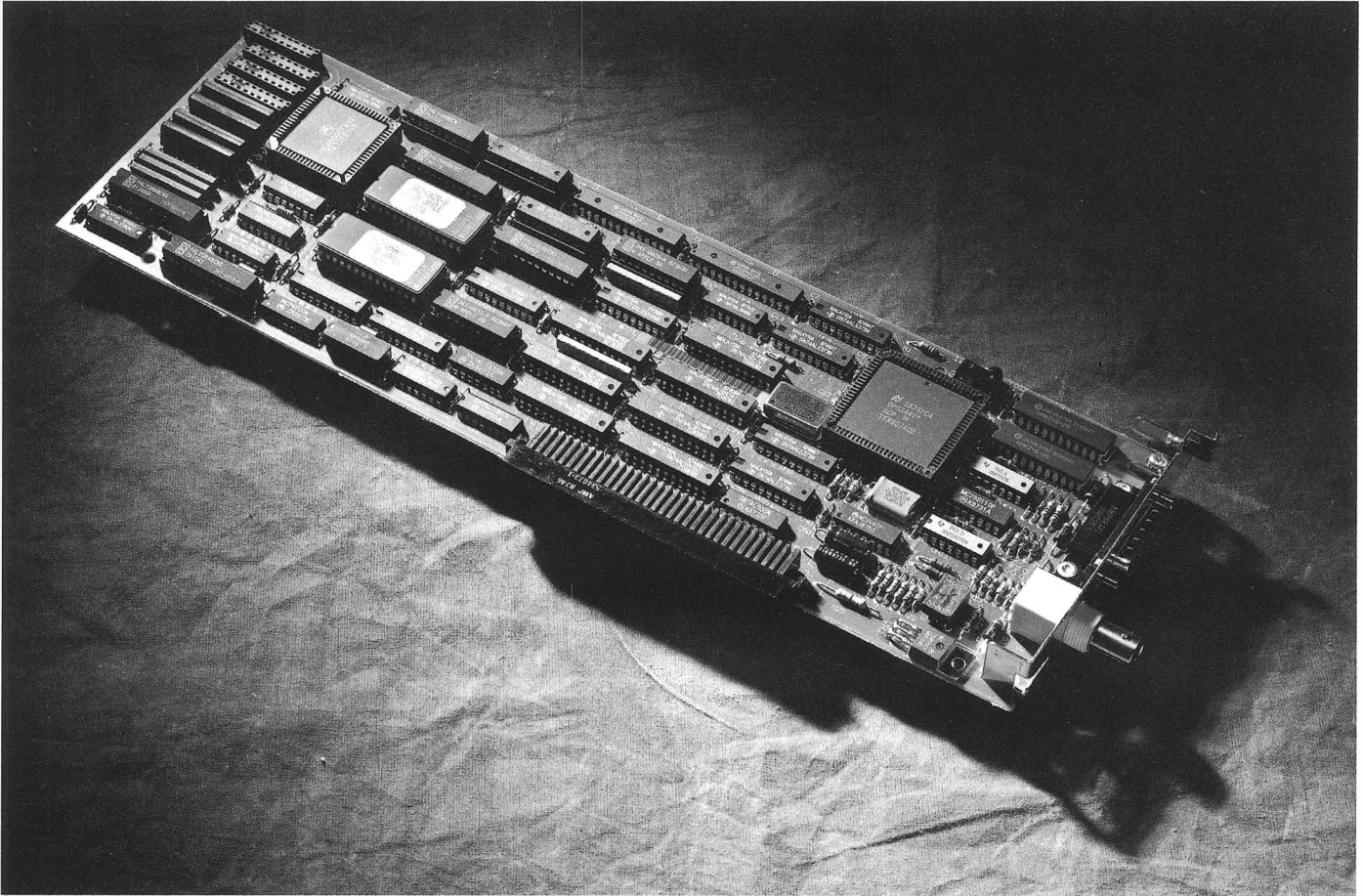
With your order, you'll receive:

- ▶ Apple EtherTalk NB Card
- ▶ T-connector for thin Ethernet cabling
- ▶ Clip and screws for AUI connector
- ▶ EtherTalk software
- ▶ EtherTalk NB User's Guide
- ▶ Limited warranty statement

Apple Computer, Inc.

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Cupertino, CA 95014
(408) 996-1010
TLX: 171-576

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June 1989. Product specifications are subject to change without notice. Printed in U.S.A.
M2300/B



Overview

The Apple® Coax/Twinax Card is an expansion card that allows personal computers in the Macintosh® II family of systems to connect to an IBM SNA network as 3270 Information Display Systems, via industry-standard coax cabling. The card allows users to access mainframe-based 3270 applications in the same manner as they would from a terminal, while enjoying all of the benefits of Macintosh technology for their local applications. The Apple Coax/Twinax Card also has a twinax connector for future 5250 terminal emulation support.

This intelligent NuBus™ interface card has its own 68000

microprocessor, memory, and multitasking operating system. Operating independently of the main Macintosh II processor, the Apple Coax/Twinax Card supports the execution of communications protocols with minimal access to the Macintosh II processor and operating system. And because all of the communications processing is done on the card, Macintosh applications can run more effectively under MultiFinder.™

The MacDFT™ application software works with the Apple Coax/Twinax Card to allow single-session Control Unit Terminal (CUT) emulation or

up to five-session Distributed Function Terminal (DFT) 3270 emulation. Files can be transferred to or from mainframes running VM/CMS or MVS/TSO using the IBM IND\$FILE package.

The Apple 3270 API, a high-level application programming interface, gives application developers a consistent platform for developing customized 3270 applications.

The Apple Coax/Twinax Card offers Macintosh customers Apple support for Macintosh-to-IBM 3270 mainframe applications.



Apple Coax/Twinax Card

Features and Benefits

Features

- ▶ Connection to SNA networks
- ▶ Based on the Macintosh Coprocessor Platform™
- ▶ 512K of RAM, expandable to 1 megabyte

Benefits

- ▶ Allows access to applications and data on IBM mainframes.
 - ▶ Handles all SNA communications processing for the Macintosh II.
 - ▶ Provides support for multiple protocols.
-

System Requirements

To use the Apple Coax/Twinax Card, you'll need:

- ▶ A personal computer in the Macintosh II family of systems
 - ▶ System Software Version 6.0.3 or higher
 - ▶ MacDFT application software
-

Technical Specifications

Connector

- ▶ BNC (coax) and 15-pin D-style (twinax)

Interface

- ▶ NuBus; plugs into any Macintosh II computer

Processor

- ▶ Motorola 68000 running at 10 megahertz

Memory

- ▶ 512K of RAM, expandable to 1 megabyte

Application programming interface

- ▶ Apple 3270 API

Coax support

- ▶ Category A

Power dissipation

- ▶ 10 watts
-

Ordering Information

Apple Coax/Twinax Card

Order No. M0261

With your order, you'll receive:

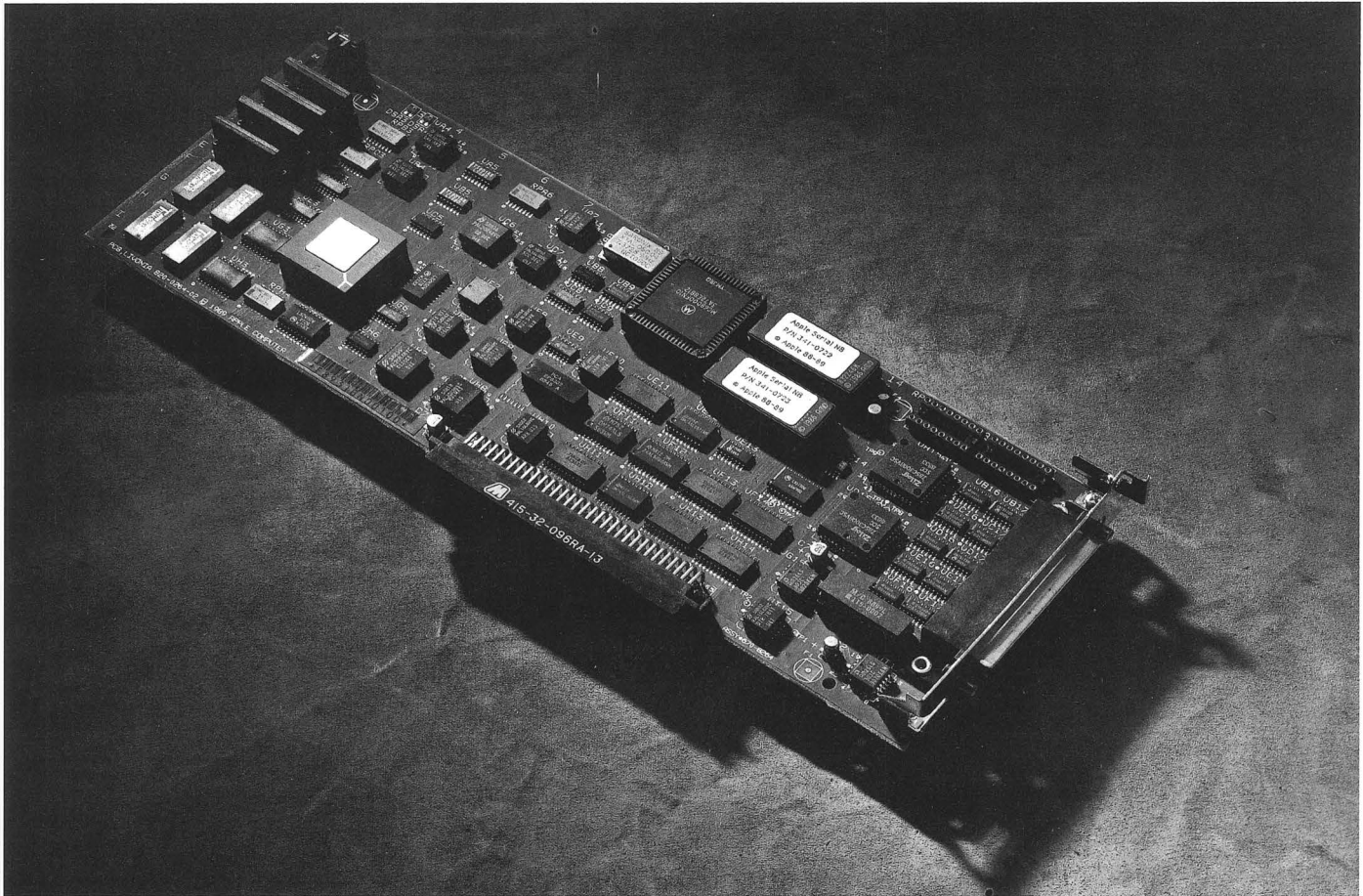
- ▶ Apple Coax/Twinax Card
- ▶ MacDFT application software (included with the Apple Coax/Twinax Card). Please refer to the MacDFT data sheet (M0064LL/A) for features and product details.
- ▶ *MacDFT User's Guide*
- ▶ Limited warranty statement

Apple Computer, Inc.

20525 Mariani Avenue
Cupertino, CA 95014
(408) 996-1010
TLX: 171-576

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June 1989. Product specifications are subject to change without notice. Printed in U.S.A.
M0063LL/A

Apple Serial NB Card



Overview

The Apple® Serial NB Card is an expansion card that allows personal computers in the Macintosh® II family of systems to connect to remote systems via a variety of industry-standard serial communications protocols. The card includes four serial ports that support RS-232, RS-422, X.21, or V.35 communications.

An intelligent NuBus™ card, the Apple Serial NB has its own 68000 microprocessor, memory,

and multitasking operating system. Operating independently of the main Macintosh II processor, the Serial NB Card supports the execution of communications protocols with minimal access to the Macintosh II processor and operating system. And because all of the communications processing is done on the card, Macintosh applications can run more effectively under MultiFinder™.

When used with Apple's MacAPPC™ software, the Serial NB Card provides a complete SDLC solution, at the physical and data-link layers, for connectivity in the IBM Systems Network Architecture (SNA) environment.



Apple Serial NB Card

Features and Benefits**Features****Benefits**

- ▶ Based on the Macintosh Coprocessor Platform™
- ▶ Four serial ports, two of which can be configured for high-speed communications

- ▶ Handles all communications processing for the Macintosh II.
 - ▶ Can be configured for use as RS-232, RS-422, X.21, or V.35 communications ports.
-

System Requirements

To use the Apple Serial NB Card, you'll need:

- ▶ A personal computer in the Macintosh II family of systems
 - ▶ Macintosh System Software Version 6.0.3 (or greater)
-

Technical Specifications**Connector**

- ▶ DB-62 connector—for multiple-port connectivity (cables available separately from Apple Computer)

Interface

- ▶ NuBus—plugs into any computer in the Macintosh II family

Processor

- ▶ Motorola 68000 running at 10 megahertz

Memory

- ▶ 512K of RAM, expandable to 1 megabyte

Power dissipation

- ▶ 12.5 watts

Transmit/Receive data rates

- ▶ 19.2 kilobits per second
 - ▶ 64 kilobits per second using the specified DMA-backed ports
-

Ordering Information**Apple Serial NB Card**

Order No. M0264

With your order, you'll receive:

- ▶ Apple Serial NB Card
 - ▶ Installation guide
 - ▶ Limited warranty statement
-

MacAPPC

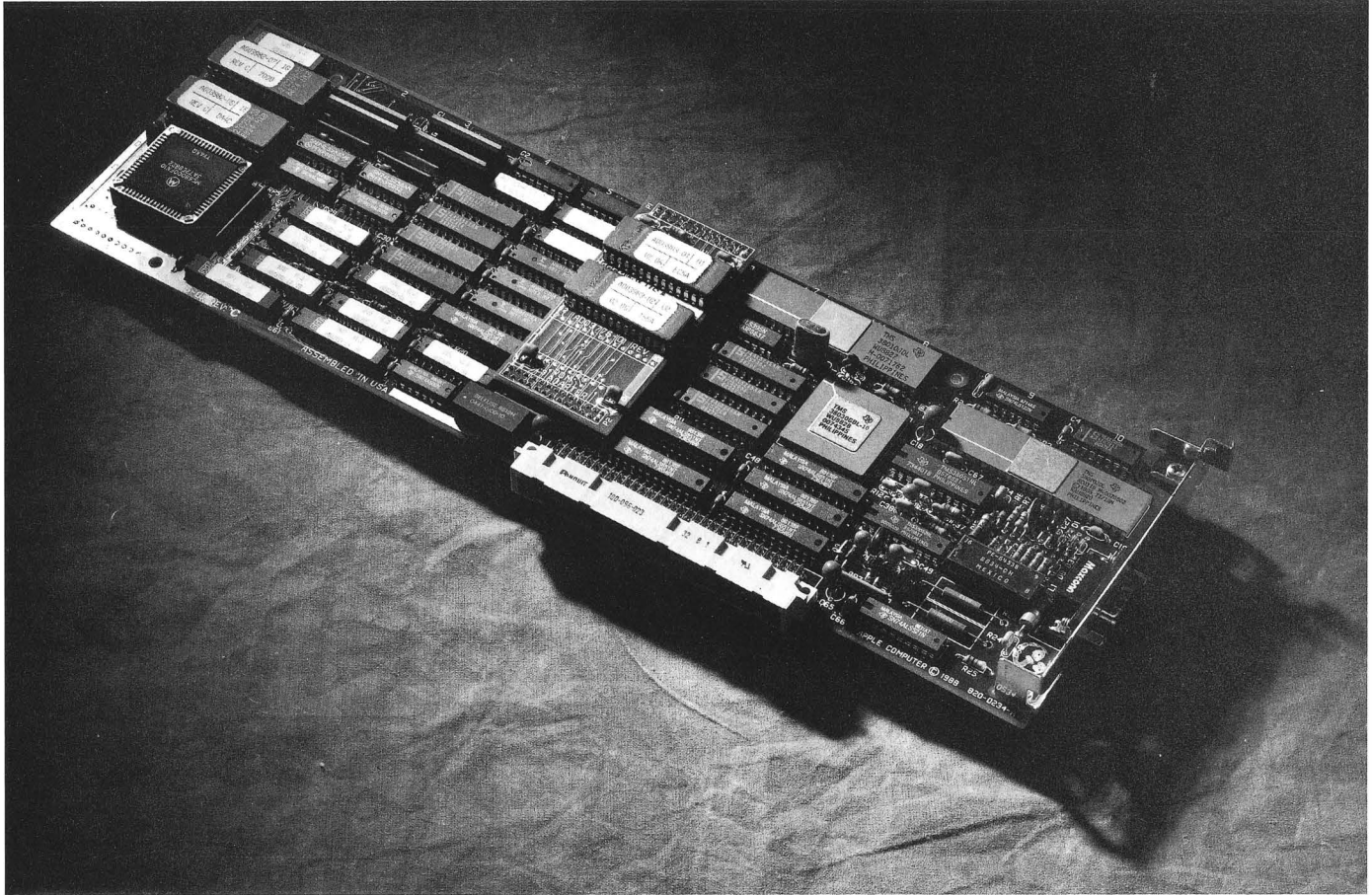
(available separately from Apple Computer)

Order No. M0698

With your order, you'll receive:

- ▶ Four 800K disks with MacAPPC code and sample applications
- ▶ Documentation on MacAPPC

Apple TokenTalk NB Card



Overview

The Apple® TokenTalk™ NB Card is an expansion card that allows personal computers in the Macintosh® II family of systems to connect to IBM and IBM-compatible Token-Ring networks. Because the card supports a variety of network environments, including AppleTalk®, 3270, APPC, and SMB, users can access local area network (LAN) and mainframe-based services connected to the Token-Ring.

The Apple TokenTalk NB Card is an intelligent NuBus™ interface card that has its own

68000 microprocessor, memory, and multitasking operating system. Operating independently of the main Macintosh II processor, the card supports the concurrent execution of multiple networking protocols with minimal access to the Macintosh II processor and operating system. It incorporates the industry-standard Texas Instruments TMS 380 chip set for all Token-Ring access functions. And because all the communications processing is done on the card, your Macintosh II is free to run other Macintosh applications.

The Apple TokenTalk NB Card is compatible with the IEEE 802.5 Media Access Control (MAC) standard for Token-Ring networks, as well as the IEEE 802.2 Logical Link Control (LLC) standard for higher-level software access to 802.5 facilities. The card transmits and receives data at 4 megabits per second, and interoperates with other IEEE 802-compatible Token-Ring interface cards at the physical and data link layers.

Features

Benefits

▶ Connection to IEEE 802.5 and 802.2 industry-standard Token-Ring networks

▶ Provides Macintosh access to network-based applications, services, and data.
▶ Supports the IBM cabling system.

.....

▶ Support for AppleTalk protocols and services

▶ Allows access to network-based services via a single cabling system.
▶ Provides access to AppleTalk services at 4 megabits per second.

.....

▶ Texas Instruments' TMS 380 Token Ring chip set

▶ Ensures compatibility with the IEEE and IBM Token-Ring standards.

.....

▶ Based on the Macintosh Coprocessor Platform™

▶ Handles all communications processing for the Macintosh II.
▶ Allows concurrent execution of multiple networking protocols.

.....

▶ Support for Apple and third-party network services

▶ Enables the user to choose from a range of network environments.

TokenTalk Software and SMB File Transfer Utility (included with Apple TokenTalk NB Card)

TokenTalk Software

Apple's TokenTalk software, which is compatible with AppleTalk Phase 2, brings the advantages of the AppleTalk network system to standard Token-Ring networks. Personal computers in the Macintosh II family of systems can be connected to virtually any size Token-Ring network or internetwork while retaining access to all AppleTalk-based resources, such as Apple LaserWriter® printers and AppleShare® file and print servers.

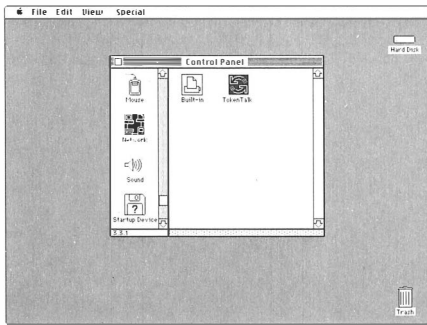
As part of the AppleTalk network system, TokenTalk is com-

pletely transparent to the Macintosh user. After the user installs TokenTalk via a simple Macintosh program, AppleTalk services appear as they would on any AppleTalk network. Through the Control Panel desk accessory, the user can easily establish a link to the TokenTalk network. The Chooser desk accessory is then used to select AppleTalk network services.

The TokenTalk software provides the extended features of AppleTalk Phase 2. AppleTalk Phase 2 permits users to build single networks of more

than 64,000 Macintosh personal computers, and internetworks of more than 16 million Macintosh computers. And the TokenTalk software delivers AppleTalk network services concurrently with other Token-Ring services, such as MacDFT or MacAPPC.

Using network routers, such as the AppleTalk Internet Router, TokenTalk also allows easy user access to services on LocalTalk™ and EtherTalk™ networks.



Features

- ▶ Support for AppleTalk Phase 2 protocols running over 802.5 Token-Ring networks
- ▶ Integration into the Macintosh desktop environment
- ▶ Support for source-routing bridges
- ▶ User-installable

Benefits

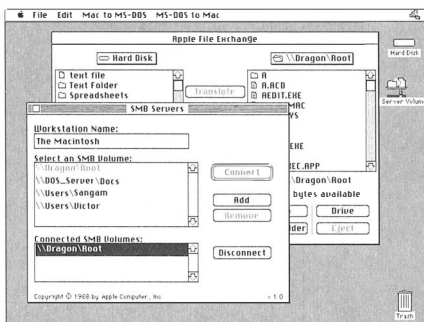
- ▶ Brings AppleTalk services to Macintosh users in Token-Ring environments.
- ▶ Provides consistency in network installation, connection, and access.
- ▶ Allows TokenTalk users to leverage their investment in IBM Token-Ring bridges.
- ▶ Installs quickly and easily.

SMB File Transfer Utility

The SMB File Transfer Utility software allows users of Macintosh and IBM-compatible personal computers to exchange files to share information in their workgroups. Apple Macintosh II systems attached to a Token-Ring

network can access information on IBM PC LAN Program SMB (Server Message Block) file servers. Users can mount SMB volumes and transfer files between their Macintosh II systems and the mounted volumes. The SMB File

Transfer Utility uses the Apple File Exchange application (included) to transfer and translate files between Macintosh and MS-DOS formats.



Features

- ▶ SMB protocols
- ▶ The Apple File Exchange application
- ▶ A desk accessory for accessing files on the SMB server

Benefits

- ▶ Allows Macintosh computers to access IBM PC LAN Program SMB file servers.
- ▶ Runs concurrently with TokenTalk software and other Token-Ring services.
- ▶ Makes it easier to share data between different operating environments.
- ▶ Allows files to be translated into an application-specific format during transfer.
- ▶ Allows easy mounting and dismounting of SMB server volumes.



Apple TokenTalk NB Card

System Requirements

To use the Apple TokenTalk NB Card, you'll need:

- ▶ A personal computer in the Macintosh II family of systems
- ▶ One or more of the following applications:
 - TokenTalk software (AppleTalk services over Token-Ring)

- SMB File Transfer Utility software (file transfer to and from SMB servers)
- MacDFT™ software (3270 emulation over Token-Ring)
- MacAPPC™ software (APPC support over Token-Ring)

TokenTalk software and SMB File Transfer Utility software are included with the Apple TokenTalk NB Card. MacDFT software and MacAPPC software are available separately from Apple.

Technical Specifications

Connectors

- ▶ DB-9 connector for attaching to the IBM cabling system
- ▶ External adapter (available from other suppliers) for use with Type 3 cabling

Interface

- ▶ NuBus; plugs into any Macintosh II computer

Processor

- ▶ Motorola 68000 running at 10 megahertz

Memory

- ▶ 512K of RAM

Application interface

- ▶ AppleTalk, Apple 3270 API, APPC

Power dissipation

- ▶ 15 watts

Transmit/Receive data rate

- ▶ 4-megabit-per-second on-board transceiver

Ordering Information

Apple TokenTalk NB Card

Order No. M0237

With your order, you'll receive:

- ▶ Apple TokenTalk NB Card
- ▶ User Confidence Test disk
- ▶ TokenTalk Installer disk
- ▶ *TokenTalk User's Guide*
- ▶ SMB File Transfer Utility disk
- ▶ *SMB File Transfer Utility Software User's Guide*

Other platforms supported by the Apple TokenTalk NB Card

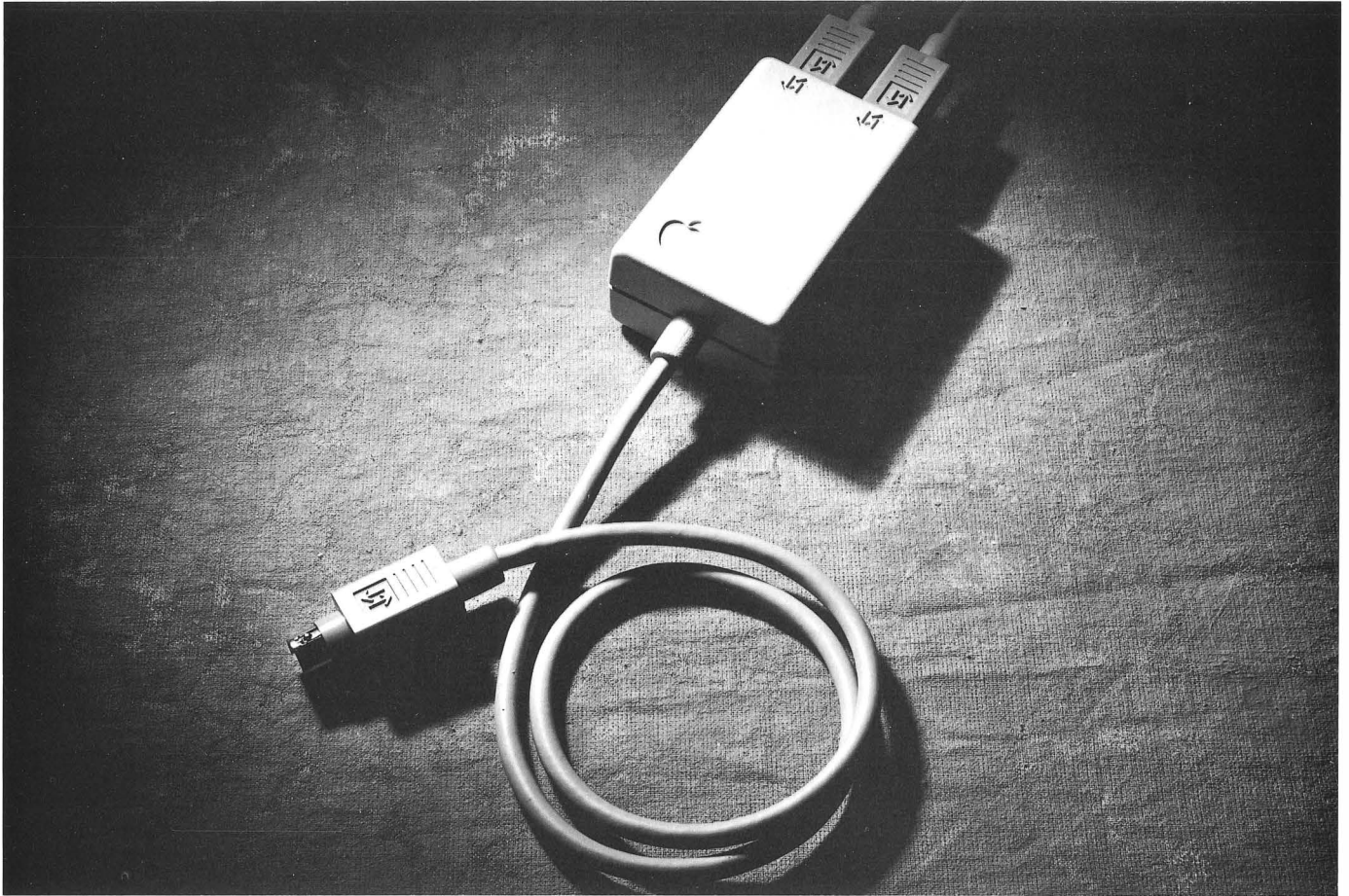
To run five-session 3270 emulation on the Apple TokenTalk NB Card, you'll need to order the MacDFT software.

To run MacAPPC over Token-Ring, you'll need the MacAPPC software.

Please refer to the following product sheets for descriptions of features and ordering

information about these Apple products:

- ▶ Apple Coax/Twinax Card (M0063LL/A)
- ▶ MacDFT (M0064LL/A)
- ▶ MacAPPC (M0238LL/A)



Overview

The LocalTalk™ Cabling System is a reliable, user-configurable cabling option for linking computers and peripheral devices in an AppleTalk® Network System. When used with the AppleShare™ file server, it gives you efficient access to information from other users' computers, and allows you to share peripherals

such as the Apple® LaserWriter® printer cost-effectively.

Unlike traditional networking systems, LocalTalk requires no complicated installation procedures. Because LocalTalk capability is already built into every Macintosh® and Apple IIGS® computer, and the LaserWriter printer, you can set up a LocalTalk Cabling System in minutes.

You can also connect IBM PCs and other MS-DOS-compatible systems to LocalTalk, using the AppleTalk PC Card.

The LocalTalk Cabling System features cables and connectors with locking mechanisms that prevent accidental disconnections.

Features

Benefits

-
- | | |
|--|--|
| ▶ Easy-to-use modular design | ▶ Snaps together in minutes. |
| ▶ Locking connectors | ▶ Prevent cables from becoming accidentally disconnected from connector drop boxes. |
| ▶ No complicated configuration rules | ▶ Lets you set up a network, add or remove users, and make other changes quickly and easily. |
| ▶ Capacity of 32 nodes per network | ▶ Allows an entire workgroup to exchange information, access multiuser applications, and share peripherals. |
| ▶ Multiple networks can be linked | ▶ Allows workgroups to be extended. |
| ▶ Low per-station cost | ▶ Provides an economical networking solution. |
| ▶ Based on AppleTalk Network System standard | ▶ Works with a variety of computers, including the Macintosh family, the Apple IIGS, and MS-DOS computers such as the IBM PC.*
▶ Encourages development of a wide range of Apple and third-party products that adhere to this standard. |
| ▶ Cost-effective printer sharing | ▶ Lets dozens of users share an Apple LaserWriter, ImageWriter® II, or ImageWriter LQ printer.*
▶ Works with the Apple LaserShare™ print spooler to give you even greater printing efficiency. |
| ▶ Powerful information access | ▶ With the AppleShare file server, gives simultaneous access to applications and data files.
▶ Works with other useful data communications products such as disk servers and electronic mail programs. |
| ▶ Expandability and versatility | ▶ Lets you add additional products to create bridges between AppleTalk networks or gateways to other networking environments (such as SNA or Ethernet). |
-

* MS-DOS computers as well as ImageWriter II and ImageWriter LQ printers require appropriate interface cards.

System Requirements

To use the LocalTalk Cabling System, you'll need one of the following systems:

- ▶ At least one Apple Macintosh or Apple IIGs personal computer, or an MS-DOS computer with AppleTalk PC Card, plus a shared system resource (such as an Apple LaserWriter printer)

- ▶ At least two Macintosh or Apple IIGs personal computers, or MS-DOS computers with AppleTalk PC Cards

Technical Specifications**Topology**

- ▶ Serial bus

Wiring

- ▶ Shielded
- ▶ Twisted-pair

Signaling standard

- ▶ EIA standard RS-422, balanced voltage

Signaling speed

- ▶ 230.4 kilobits/second

Signal encoding

- ▶ FM0 (biphase space)

Frame format

- ▶ SDLC (Synchronous Data Link Control)

Maximum number of connections per network segment

- ▶ 32

Node identification

- ▶ Self-configuring; no user action required

Architecture

- ▶ Open

Connection

- ▶ Passive drops

Access method

- ▶ Carrier-sense multiple-access with collision avoidance (CSMA/CA)



LocalTalk Cabling System

Ordering Information

**LocalTalk Locking
Connector Kit—DIN-8**
Order No. M2068

For use with the Macintosh Plus, Macintosh SE, Macintosh II, Apple IIGs, and some network peripherals

With your order, you'll receive:

- ▶ 1 LocalTalk connector with mini-circular 8-pin plug
- ▶ 2 meters of LocalTalk cable
- ▶ 1 cable-extender plug
- ▶ Installation and operating manual
- ▶ Limited warranty statement

**LocalTalk Locking
Connector Kit—DB-9**
Order No. M2065

For use with the Macintosh 128K, Macintosh 512K, Macintosh 512K Enhanced, and some network peripherals

With your order, you'll receive:

- ▶ 1 LocalTalk connector with DB-9 plug
- ▶ 2 meters of LocalTalk cable
- ▶ 1 cable-extender plug
- ▶ Installation and operating manual
- ▶ Limited warranty statement

**LocalTalk Locking
Cable Kit—10 Meter**
Order No. M2066

With your order, you'll receive:

- ▶ 10 meters of LocalTalk cable
- ▶ 1 cable-extender plug
- ▶ Limited warranty statement

**LocalTalk Locking
Cable Kit—25 Meter**
Order No. M2069

With your order, you'll receive:

- ▶ 25 meters of LocalTalk cable
- ▶ 1 cable-extender plug
- ▶ Limited warranty statement

**LocalTalk Custom
Wiring Kit**
Order No. M2070

With your order, you'll receive:

- ▶ 100 meters of LocalTalk cable
- ▶ 20 preassembled plugs
- ▶ 20 cable-splicing mechanisms
- ▶ 4 cable-extender plugs
- ▶ Installation instructions
- ▶ Limited warranty statement

**ImageWriter II/LQ
AppleTalk Option**
Order No. A9B0313

To connect an ImageWriter II or ImageWriter LQ printer to a LocalTalk network

With your order, you'll receive:

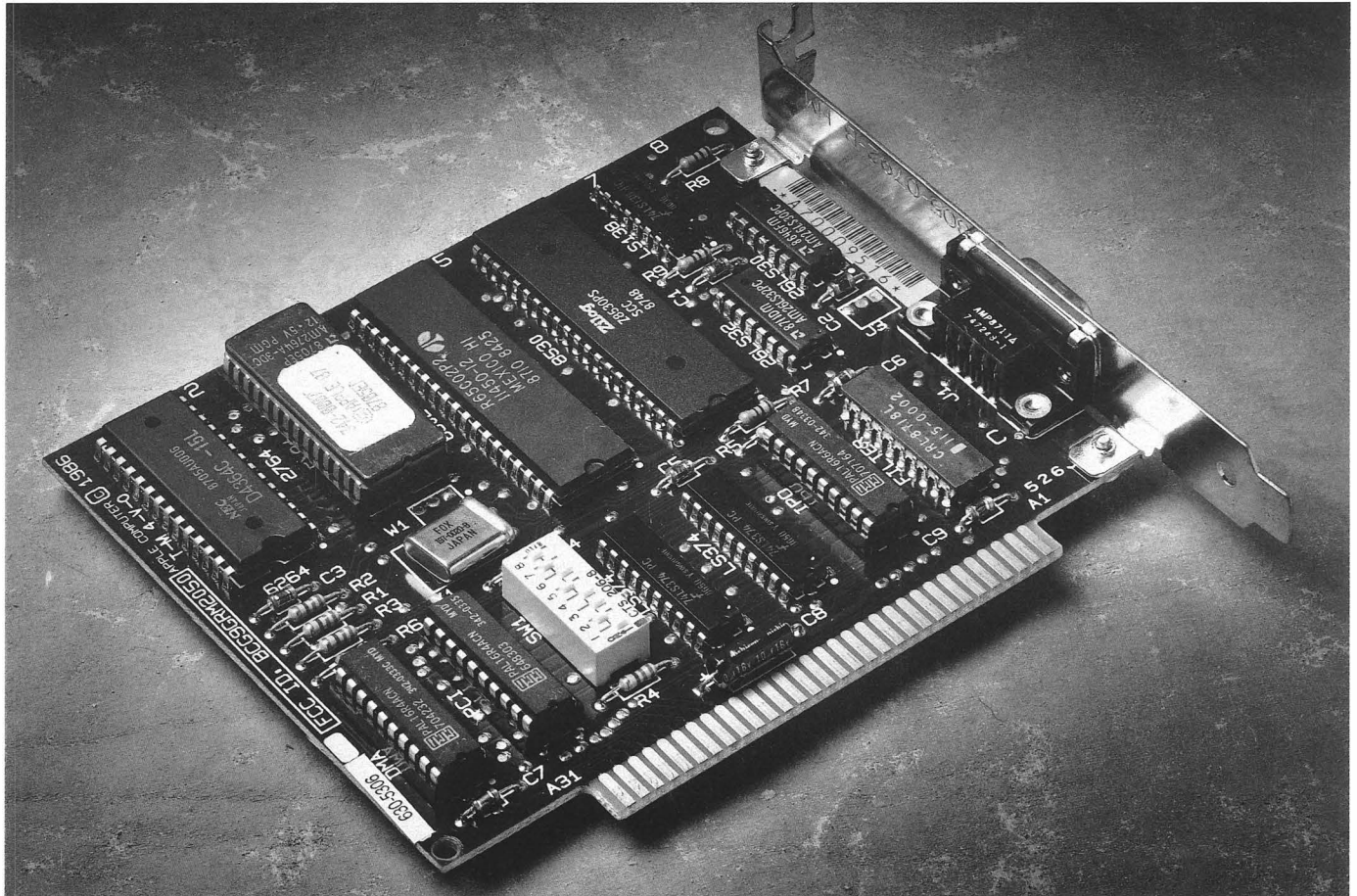
- ▶ ImageWriter II/LQ AppleTalk Option Card
- ▶ 1 disk (printer drivers)
- ▶ User's guide
- ▶ Limited warranty statement

AppleTalk PC Card
Order No. M2050

To connect an IBM PC or other MS-DOS computer to a LocalTalk network

With your order, you'll receive:

- ▶ AppleTalk PC Card
- ▶ 2 disks (1 startup, 1 program)
- ▶ Installation and operating manual
- ▶ Limited warranty statement



Overview

LocalTalk™ PC Card, a half-size card for the PC expansion bus, allows users of MS-DOS computers to share the unique benefits of the AppleTalk® Network System—including the ability to print professional-quality documents on networked Apple® LaserWriter® printers. The LocalTalk PC Card also provides the foundation for other network services, such as electronic mail, print service, and file and peripherals sharing. For example, with the addition of AppleShare® PC software, MS-DOS users can share information with Macintosh® users on the network through an AppleShare file server, and take full advantage of the power of the LaserWriter printer.

Features

- ▶ LaserWriter printing for PC-compatible computers using PC LaserWriter program
- ▶ Attaches to LocalTalk Cabling System
- ▶ Information sharing between Macintosh and MS-DOS systems

Benefits

- ▶ Brings professional-quality printing to documents produced on PC-compatible computers.
- ▶ Gives MS-DOS users access to the LaserWriter printer's wide range of type styles and sizes, and graphics capabilities.
- ▶ Lets Macintosh and PC-compatible computers share information, using software such as AppleShare PC.
- ▶ Allows integration of MS-DOS information into Macintosh applications such as desktop-publishing programs.
- ▶ Connects PC-compatible computers to the fastest-growing workgroup network.



LocalTalk PC Card

System Requirements

To use the LocalTalk PC Card, you will need:

- ▶ An IBM PC, PC XT, PC AT, PS/2 (Model 25 or Model 30), or a compatible computer
- ▶ A minimum of 256K RAM with either two double-sided floppy disk drives or one hard disk drive and one floppy disk

drive, and MS-DOS Version 3.1 or later (or a compatible operating system)

- ▶ An AppleTalk network that uses the LocalTalk cabling system
- ▶ A LocalTalk Locking Connector Kit (DB9)

Recommended equipment:

- ▶ An Apple LaserWriter, LaserWriter Plus, LaserWriter II_{NT}, or LaserWriter II_{TX} printer
- ▶ Appropriate LocalTalk network cables for all additional computers on the network
- ▶ AppleShare File Server and Print Server software
- ▶ AppleShare PC workstation software

Technical Specifications

▶ AppleTalk protocol support

- ▶ LAP, DDP, ATP, NBP, ZIP, EP, PAP, RTMP, ASP

Driver interface

- ▶ Accessed through software interrupt with parameter block

Processor

- ▶ 65C02; 1.8-megahertz clock speed

Memory

- ▶ 8 kilobytes RAM, 8 kilobytes ROM

AppleTalk communications controller

- ▶ Zilog 8530 SCC

Interfaces

- ▶ RS-422 serial port (230.4-kilobaud data transfer rate); DMA interface to host PC

Configuration

- ▶ Selectable Interrupt Request (IRQ), DMA Request and Acknowledge (DRQ and DACK), and I/O Address; default configuration corresponding to PC COM2 device

Power consumption

- ▶ 4 watts at 5 volts DC (typical)

Size

- ▶ PC half-size card (5 in. long by 4.5 in. high)

Applications supported

- ▶ Lotus 1-2-3, MultiMate, and WordStar (directly from PC LaserWriter program menu)
- ▶ dBASE II, III, and III Plus; DisplayWrite 3; Framework I and II; Microsoft Word 3.0; MultiMate Advantage; PC-Write; Perfect Writer; RBase 5000; Symphony; SideKick; WordPerfect; and WordStar and WordStar 2000 (through ASCII menu option)

Print-file formats supported

- ▶ PostScript®
- ▶ Diablo 630
- ▶ ASCII

Printer utilities functions

- ▶ Select LaserWriter
- ▶ Rename LaserWriter
- ▶ Send test page

Accessible fonts

- ▶ Courier, Helvetica®, and Times® Roman (directly from PC LaserWriter program menu)
- ▶ All LaserWriter fonts (using PostScript commands)

PostScript programming access

- ▶ PostScript programming additions may be made directly within the text of a file, or indirectly by modifying the PC LaserWriter program dictionary files so that programming additions can be made available to all documents.

Ordering Information

LocalTalk PC Card

Order No. M2313

With your order, you'll receive:

- ▶ LocalTalk PC Card
- ▶ Two 360-kilobyte, 5.25-inch floppy disks (a startup disk and an applications disk)

- ▶ One 3.5-inch disk (includes both startup and application)
- ▶ *LocalTalk PC Card Owner's Guide*
- ▶ Limited warranty statement

LocalTalk Locking Connector Kit (DB9)

Order No. M2065

AppleShare PC Software

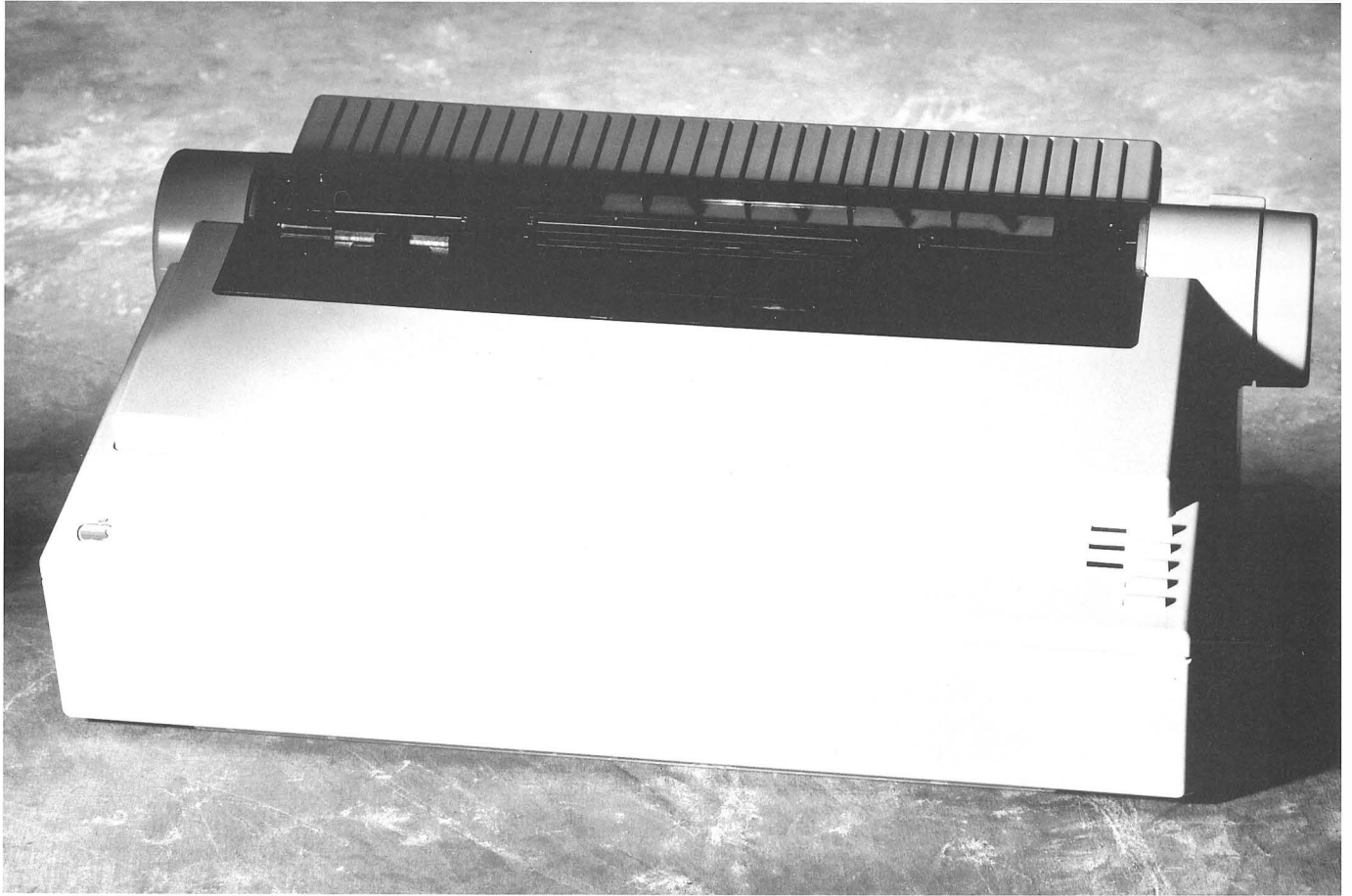
Order No. M0673

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June 1988. Product specifications are subject to change without notice. Printed in U.S.A.
M2245/A

Apple ImageWriter II



Overview

The Apple® ImageWriter® II printer can enhance the quality of all your printed communications. It works with any Apple personal computer to create high-quality text and graphics in black or—with a color ribbon and appropriate software—in color. You can print up to 2½ pages per minute (250 characters per second), or choose the “near-

letter-quality” mode for documents with a professional look.

This is a printer that will grow with your needs. Add the ImageWriter II SheetFeeder for effortless cut-sheet printing. An AppleTalk® card allows up to 31 users to share an ImageWriter II over the AppleTalk Personal Network. Or add a 32K Memory Option printing buffer (works with

Apple II computers only) so you can continue working while your document is being printed.

For any application—from word processing and business graphics to accounting and artwork—you’ll find the Apple ImageWriter II the right printer for your current and future needs.

Features

Benefits

▶ Complete Apple compatibility	▶ Works with any Apple personal computer system.
▶ Three speeds and resolutions	▶ Lets you choose the speed and output quality you need at any moment—from fast drafts to near-letter-quality finals.
▶ Choice of paper	▶ Accepts continuous-form computer paper as well as single sheets such as letterhead and labels.
▶ Simple paper loading	▶ Loads single sheets and continuous-form paper at the push of a button—or add the optional SheetFeeder for automatic loading of up to 100 pages of cut-sheet paper.
▶ Quiet operation	▶ Prints quietly enough for use in any office or schoolroom.
▶ Variety of text enhancements	▶ Supports boldface, superscript, subscript, underlining, and proportional text.
▶ Optional AppleTalk interface	▶ Allows access by as many as 31 users for cost-effective printing.
▶ Color capability	▶ With the ImageWriter II color ribbon, prints text and graphics in vibrant colors.
▶ Buffer option for the Apple II family	▶ With the 32K Memory Option, stores your document in memory so you can continue working without waiting for printing to finish.
▶ Multiple carbon-copy capability	▶ Lets you print up to four sheets simultaneously.

System Requirements

To use the Apple ImageWriter II, you'll need one of the following systems:

- ▶ An Apple IIgs™, Apple IIc, Apple III, or Macintosh™ 128K, 512K, or 512K Enhanced, Macintosh Plus, Macintosh SE, Macintosh II, Macintosh XL, or Lisa® personal computer

- ▶ An Apple IIe, Apple II Plus, or Apple II personal computer with an Apple Super Serial Card (or other compatible interface)
- ▶ The appropriate connector cable for your system

Technical Specifications

Print method

- ▶ Impact dot matrix

Print modes/speeds

- ▶ Draft: 250 characters per second (cps) at 10 characters per inch (2½ pages per minute)
- ▶ Standard: 180 cps (2 pages per minute)
- ▶ Near-letter-quality: 45 cps (½ page per minute) (Actual throughput will vary depending on computer and software.)

Character format

- ▶ Fixed alphanumeric symbols
 - Draft mode: Up to 12 by 8 dot matrix
 - Standard mode: Up to 7 by 8 dots
 - Near-letter-quality mode: Up to 16 by 16 dots
 - ▶ Custom (downloaded) characters
 - Variable width, up to 16 by 8 dots

Character pitches

- ▶ Draft, standard, and near-letter-quality: 9 to 17 characters per inch (72 to 136 characters per line), through use of normal and double-width modes
 - ▶ Proportional text: 144 or 160 dots per inch

Built-in character sets

- ▶ American, Italian, Danish, British, German, Swedish, French, and Spanish
- ▶ Selectable by using dip switches or appropriate software

Graphic densities

- ▶ 72, 80, 96, 107, 120, 136, 144, and 160 dots per inch (maximum dots per line: 1,280)

Line spacing

- ▶ 6 or 8 lines per inch, or user programmable in increments of 1/44 inch (up to 9/44 inch)

Maximum line-feed rate

- ▶ 4 inches per second

Paper requirements

- ▶ Format: Cut sheet or fanfold continuous
- ▶ Width: 3 to 10 inches (on pin-feed paper, hole centers must be spaced between 4.0 and 9.5 inches)
- ▶ Thickness: 0.05 to 0.28 mm

Maximum number of copies

- ▶ Original plus three

Ribbons

Type: Fabric; continuous loop

- ▶ Available colors:
 - Black (typical life: 2 million characters)
 - Four-color (magenta, cyan, yellow, black) (typical life: 1 million characters per color)

Interface

- ▶ Type: RS-422/RS-232 (serial)
- ▶ Buffer: 2 kilobytes
- ▶ Baud rate: 300, 1200, 2400, or 9600 (user selectable)
- ▶ Connector: mini-circular 8-pin

Size and weight

- ▶ Height: 5.0 in. (127.0 mm)
- ▶ Width: 17.0 in. (431.8 mm)
- ▶ Depth: 12.0 in. (304.8 mm)
- ▶ Weight: 25 lbs. (11.36 kg)

Power requirements

- ▶ 120 volts AC (± 10%); 60 hertz



Apple ImageWriter II

Ordering Information

Apple ImageWriter II
Order No. A9M0320

With your order, you'll receive:

- ▶ Apple ImageWriter II printer
- ▶ Power cord

- ▶ Ribbon cassette (black)
- ▶ User's guide
- ▶ Limited warranty statement

You will also need one of the following connector cables:

- ▶ **Macintosh Plus Peripheral-8 Cable**
(for a Macintosh Plus, Macintosh SE, Macintosh II, or Apple IIGS)
Order No. M0197

- ▶ **Macintosh Peripheral-8 Cable**
(for a Macintosh 128K, 512K, or 512K Enhanced)
Order No. M0196

- ▶ **Apple IIc Peripheral-8 Cable**
(for an Apple IIc)
Order No. A2C4313

- ▶ **Apple IIe Printer-8 Cable**
(for an Apple IIe, Apple II Plus, or Apple II)
Order No. A2C0314

- ▶ **Apple IIe Modem-8 Cable**
(for a Macintosh XL, Lisa, or Apple III*)
Order No. A2C0312

- ▶ **AppleTalk System Connector Kit**
(for use over an AppleTalk network with the ImageWriter AppleTalk Option installed)
Order No. M2052

* If you wish to use an Apple Super Serial Card to interface alternately with both the ImageWriter II and a modem, you'll need to use the Apple IIe Modem-8 Cable. For standard Apple II configurations, use the Apple IIe Printer-8 Cable.

Optional Accessories

ImageWriter II SheetFeeder
Order No. A9G0432

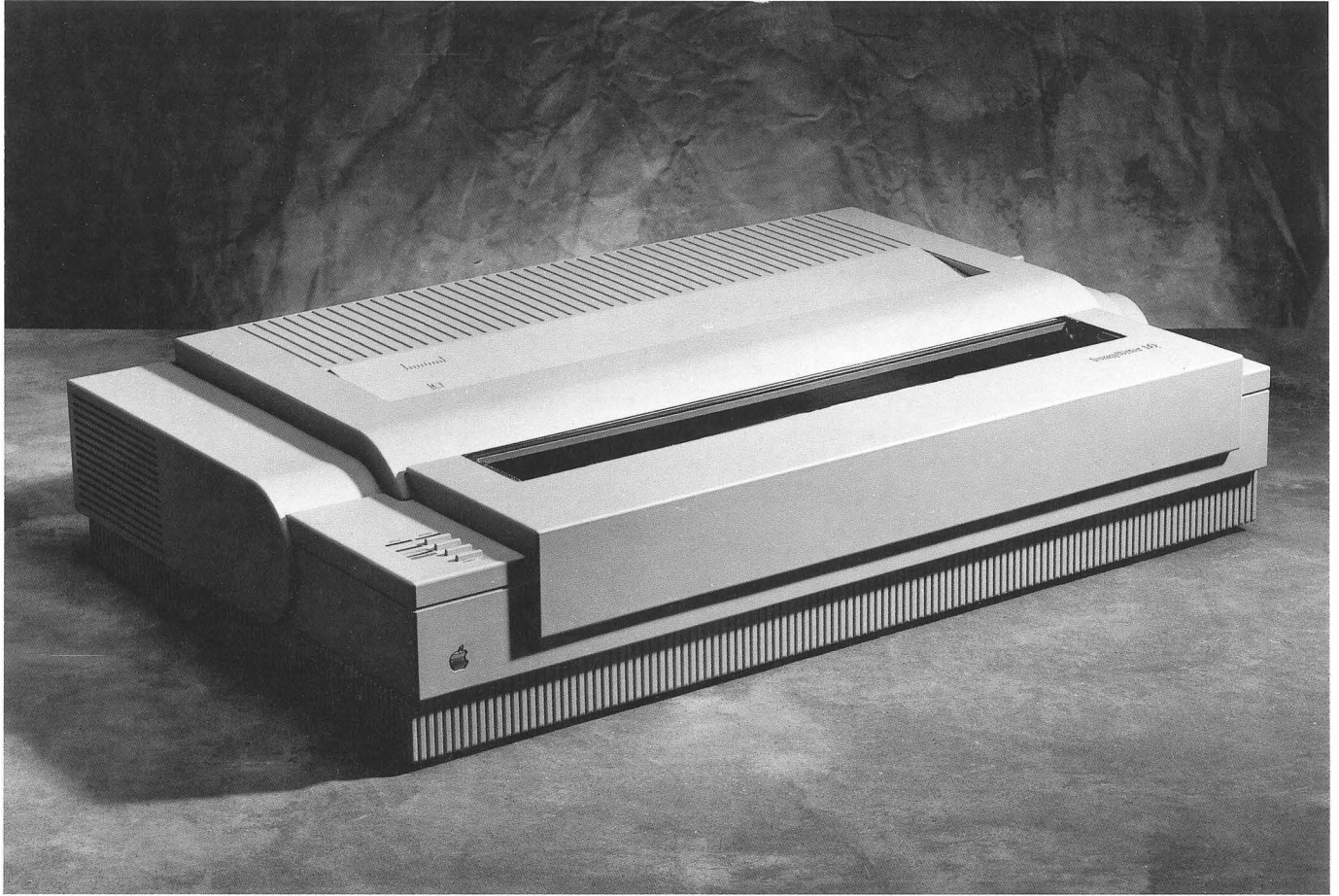
32K Memory Option
Order No. A9B0312

ImageWriter II AppleTalk Option
Order No. A9B0311

ImageWriter II Black Ribbon
Order No. A2M0077

ImageWriter II Color Ribbon
Order No. A9G0331

ImageWriter II Reference Manual
(available from Addison-Wesley Publishing Company)



Overview

The Apple® ImageWriter® LQ is ideal for users who need a versatile dot-matrix printer to handle a broad range of office printing tasks. Besides producing letter-quality text and graphics, the ImageWriter LQ offers paper handling, color, and networking capabilities.

Compatible with both Macintosh® and Apple II personal computers, the ImageWriter LQ is designed to print virtually any

type of document on almost any type of paper, with ease and clarity.

Exceptionally flexible paper-handling features—including a single push/pull tractor, a bottom feed, and an optional cut-sheet feeder—let you effortlessly print multipart forms, heavy-gauge paper, envelopes, and labels in addition to standard reports or correspondence. A 15-inch-wide carriage lets you print financial spreadsheets and, with the addition of the ImageWriter LQ

Color Ribbon, you can use color to highlight reports or presentation graphics. What's more, with the addition of the ImageWriter AppleTalk® Option, up to 31 users on an AppleTalk network can share an ImageWriter LQ, for cost-effective printing.

The ImageWriter LQ is designed for any task—from word processing and business graphics to accounting and artwork—and any office.

Features

Benefits

-
- | | |
|---|---|
| ▶ Unique 27-pin print head prints up to 216 dots per inch (dpi) | ▶ Delivers outstanding letter-quality text and graphics. |
| ▶ Three speeds and resolutions | ▶ Lets you choose the speed and output quality you need for any document—fast draft, near-letter-quality (NLQ) or letter-quality (LQ). |
| ▶ Variety of Macintosh typefaces and type sizes | ▶ Prints a wide range of type sizes in the most popular typefaces: Times®, Helvetica®, Courier, and Symbol. |
| ▶ Apple II text enhancements | ▶ Supports boldface, superscript, subscript, underlining, and proportional text. |
| ▶ Flexible paper-handling mechanism | ▶ Accepts continuous-form computer paper, single sheets such as letterhead, labels, envelopes, heavy-gauge paper, and multipart forms. |
| ▶ 15-inch-wide carriage | ▶ Accepts spreadsheets and forms that exceed standard 8½-inch page widths. |
| ▶ Multiple-carbon-copy capability | ▶ Lets you print multiple-part forms of as many as five sheets each. |
| ▶ Single tractor with push or pull mode | ▶ Eliminates the need for multiple tractors for different printing tasks, and allows choice of tractor mode. |
| ▶ Bottom feed | ▶ Simplifies feeding of multipart forms, labels, and heavy-gauge papers.
▶ Prevents the jamming that's commonly associated with top-through feeding. |
| ▶ Optional sheet feeder with up to three bins | ▶ Permits automatic loading of up to 100 pages of cut-sheet paper per bin.
▶ Permits envelope feeding with the use of an optional envelope attachment. |
| ▶ Optional AppleTalk interface | ▶ Allows access by as many as 31 users, for cost-effective printing.
▶ Permits higher-speed printing. |
| ▶ Color capability | ▶ With the ImageWriter LQ color ribbon, prints text and graphics in vibrant colors. |
| ▶ Software compatibility | ▶ Offers compatibility with most Apple II and Macintosh software*. |
-

* See your authorized Apple dealer or software supplier for details.

System Requirements

To use the Apple ImageWriter LQ printer, you will need:

- ▶ An Apple IIGS®, Apple IIc, Macintosh Plus, Macintosh SE, or Macintosh II computer; or an Apple IIe computer with an

Apple Super Serial Card (or other compatible interface)
▶ The appropriate connector cable for your system

Technical Specifications

Print method

- ▶ 27-pin impact dot matrix

Print modes/speeds* (using internal ROM fonts)

- ▶ Draft: 250 characters per second (cps) at 10 characters per inch (cpi)
- ▶ Near-letter-quality (NLQ): 90 cps at 10 cpi; 140 cps at 144 dots per inch (dpi) (proportional)
- ▶ Letter quality (LQ): 115 cps at 216 dpi (proportional)

Print resolutions (using internal ROM fonts)

- ▶ Draft: 72 dpi horizontal x 72 dpi vertical
- ▶ NLQ: 144 dpi (H) x 216 dpi (V)
- ▶ LQ: 216 dpi (H) x 216 dpi (V)

Character pitches (using internal ROM fonts)

- ▶ Draft and NLQ fixed pitch: 9 to 17 cpi
- ▶ Draft proportional: 144 or 160 dpi (using half-dot technique)
- ▶ NLQ proportional: 144 or 160 dpi
- ▶ LQ proportional: 216 dpi

** Calculated using Shannon text. Actual speed will vary depending on computer and software.*

Macintosh fonts (on disk)

- ▶ Times, Helvetica, Courier, and Symbol typefaces in 9-, 10-, 12-, 14-, 18-, and 24-point sizes

Character sets (built-in)

- ▶ American, British, Italian, Danish, German, Swedish, French, and Spanish
- ▶ Selectable by using dip switches or appropriate software

Line spacing

- ▶ 6 or 8 lines per inch, or user programmable in increments of $\frac{1}{144}$ inch (up to $\frac{99}{144}$ inch)

Maximum line-feed rate

- ▶ 4 inches per second

Paper options

- ▶ Format: cut sheet or fanfold continuous, envelopes, labels, multipart forms
- ▶ Width: 3.5 to 15 inches (plus pin-feed margins)
- ▶ Thickness: .05 to .55 millimeters

Multipart form capability

- ▶ Up to 5 pages thick

Ribbons

- ▶ Type: fabric, continuous loop
- ▶ Available colors
—Black (typical life: 4 million characters)
—Four-color (magenta, cyan, yellow, black) (typical life: 1 million characters per color)

Interface

- ▶ Type: RS-422/RS-232 (serial)
- ▶ Buffer: 5 kilobytes
- ▶ Baud rate: 300, 1200, 2400, 9600, or 19,200 (user selectable)
- ▶ Connector: minicircular 8-pin

Size and weight

- ▶ Height: 5 $\frac{1}{8}$ in. (130 mm)
- ▶ Width: 23 in. (590 mm)
- ▶ Depth: 15 $\frac{1}{4}$ in. (380 mm)
- ▶ Weight: 38 lb. (17 kg)

Power requirements

- ▶ 120 volts AC ($\pm 10\%$; 60 hertz)



Apple ImageWriter LQ

Ordering Information

Apple ImageWriter LQ

Order No. A9M0340

With your order, you'll receive:

- ▶ Apple ImageWriter LQ printer
- ▶ Power cord
- ▶ Ribbon (black)

▶ Printer resource and Macintosh fonts on 800K disks

- ▶ User's guide
- ▶ Limited warranty statement

You will also need one of the following connector cables:

▶ **Apple System Peripheral-8 Cable** (for a Macintosh Plus, Macintosh SE, Macintosh II, or Apple IIGS)
Order No. M0197

▶ **Macintosh Peripheral-8 Cable** (for a Macintosh 512K Enhanced)
Order No. M0196

▶ **Apple IIc Peripheral-8 Cable** (for an Apple IIc)
Order No. A2C4313

▶ **Apple II Printer-8 Cable** (for an Apple IIe)
Order No. A9C0314

▶ **LocalTalk Locking Connector Kit DIN-8** (for use over an AppleTalk network with the ImageWriter AppleTalk Option installed)
Order No. M2068

Optional Accessories

ImageWriter II/LQ AppleTalk Option

Order No. A9B0313

ImageWriter LQ Black Ribbon

Order No. A9G0335

ImageWriter LQ Color Ribbon

Order No. A9G0336

ImageWriter LQ Cut Sheet Feeder (primary bin)

Order No. A9G0340

ImageWriter LQ Expansion Bin (for use with A9G0340)

Order No. A9G0341

ImageWriter LQ Envelope Attachment (for use with A9G0340)

Order No. A9G0343

ImageWriter LQ Reference (available from Addison-Wesley Publishing Company)



Overview

The Apple® LaserWriter® IIsc is Apple's entry-level, single-user laser printer for the Macintosh® personal computer. It brings the individual Macintosh user full-page, high-resolution (300 dpi) text and graphics print capability at an affordable price.

With the LaserWriter IIsc printer, Macintosh system users can produce near-typeset-quality documents—from correspondence, proposals, and presentations to price lists, spreadsheets, and forms—while saving both time and money.

The LaserWriter IIsc comes with four font families: Times®, Helvetica®, Courier, and Symbol.

Features

Benefits

▶ Full-page, high-resolution text and graphics	▶ Provides 300-dot-per-inch resolution over the entire page, for high-quality documents.
▶ Motorola 68000 processor	▶ Allows high-performance printing at up to 8 pages per minute.
▶ Variety of Macintosh typefaces and type sizes	▶ Prints a wide range of type sizes in the most popular typefaces: Times, Helvetica, Courier, and Symbol.
▶ SCSI interface	▶ Transfers data at high speeds for fast printing. ▶ Allows daisy-chaining of up to six additional peripheral devices.
▶ Background printing	▶ With the MultiFinder™ software, allows you to continue work on your Macintosh computer while printing.
▶ LaserWriter family print engine	▶ Uses the second-generation engine common to all LaserWriter II models, offering a logical upgrade path.
▶ Versatile paper handling	▶ Comes with choice of face-down or face-up output trays. ▶ Offers adjustable manual feed for labels and envelopes. ▶ Features interchangeable paper trays for different paper sizes.
▶ Print-media versatility	▶ Lets you print on almost any material—including standard photocopy paper, letterhead, labels, envelopes, and transparency film—for maximum flexibility in meeting your printing needs.
▶ Improved toner system	▶ Offers darker blacks and longer life than previous LaserWriter cartridges.

Product Details**QuickDraw**

Built into every Macintosh computer is QuickDraw, a set of text and graphics routines. The LaserWriter IIsc relies on those routines to print.

Users

The LaserWriter IIsc is dedicated to single Macintosh Plus, SE, or II systems through the SCSI port. This connection also allows you to daisy-chain as

many as six additional SCSI devices, such as hard disks.

Upgrade Options

Your LaserWriter IIsc printer can be upgraded to a LaserWriter II π

or LaserWriter II π TX by your authorized Apple dealer.

System Requirements

To use the Apple LaserWriter IIsc printer, you must have a

Macintosh II, SE, or Plus computer, with System software 5.1 or greater.



LaserWriter IIsc

Technical Specifications

Marking engine

- ▶ Canon LBP-SX laser xerographic

Processor

- ▶ Motorola 68000 (7.45-megahertz clock speed)

Memory

- ▶ 16 kilobytes ROM; 1 megabyte RAM

Interfaces

- ▶ SCSI and Apple Desktop Bus™ (for future expansion) ports

Macintosh fonts (on disk)

- ▶ Times, Helvetica, Courier, and Symbol typefaces in 9-, 10-, 12-, 14-, 18-, and 24-point sizes. (For best results, these fonts should be installed in the System file of your Macintosh computer from the disks shipped with the LaserWriter IIsc.)

Speed

- ▶ 8 pages per minute maximum throughput (actual speed depends on images printed)

Print quality

- ▶ All text and graphics printed at 300 by 300 dots per inch, full page

Print materials

- ▶ Letter, legal, A4, and B5 sizes using 16- to 20-pound single-sheet photocopy bond, 8- to 34-pound letterhead and colored stock, or transparency overhead film. Envelopes, labels, and paper (up to 36-pound) supported via manual feed. Envelopes also supported via optional envelope tray.

Print capacities

- ▶ Paper cassettes hold 200 sheets of 20-pound paper.
- ▶ Optional envelope cassette holds 15 envelopes.

Printable surface

- ▶ Letter size: 8.0 by 10.5 inches; legal: 8.0 by 13.0 inches; A4: 7.41 by 10.86 inches; B5: 7.69 by 10.16 inches (actual printable area may vary depending on application)

Size and weight

- ▶ Height: 8.6 in. (21.8 cm)
- ▶ Width: 20 in. (50.8 cm) With letter tray attached, 26.4 in. (67.1 cm)
- ▶ Depth: 18.5 in. (47 cm)
- ▶ Weight: 45 lb. (20.25 kg)

Operating environment

- ▶ Temperature: 50° to 90° F (10° to 32° C)
- ▶ Humidity: 20 percent to 80 percent

Power requirements

- ▶ 90 to 126 volts AC; 50 to 60 hertz

Ordering Information

Apple LaserWriter IIsc

Order No. M6200

With your order, you'll receive:

- ▶ LaserWriter IIsc printer
- ▶ LaserWriter IIsc Fonts disk
- ▶ LaserWriter II Installation disk
- ▶ Letter cassette
- ▶ Toner cartridge
- ▶ Owner's guide
- ▶ Limited warranty statement



Overview

The Apple® LaserWriter® IINT, which combines high resolution with the ability to produce full-page text and graphics, is Apple's mainstream network laser printer for both individuals and work-groups.

The LaserWriter IINT printer offers individuals or users linked

through an AppleTalk® network the versatility needed to produce a wide variety of near-typeset-quality documents—from letters, memos, and reports to sophisticated text and graphics output, including artwork, illustrations, page layouts, and presentations. It features 11 font families (35 typefaces): Times®, Helvetica®,

Courier, and Symbol, along with ITC Avant Garde Gothic®, ITC Bookman®, New Century Schoolbook, Helvetica Narrow®, Palatino®, ITC Zapf Chancery®, and ITC Zapf Dingbats®.

Features

Benefits

-
- | | |
|--|--|
| ▶ Full-page, high-resolution text and graphics | ▶ Provides 300-dot-per-inch resolution over the entire page for high-quality documents. |
| ▶ Motorola 68000 processor | ▶ Allows high-performance printing at up to 8 pages per minute. |
| ▶ 2 megabytes of RAM | ▶ Improves performance when using multiple fonts.
▶ Provides flexibility for the addition of downloadable fonts. |
| ▶ Wide selection of built-in fonts | ▶ Features 11 type families in an unlimited range of sizes and styles. |
| ▶ PostScript® support | ▶ Offers virtually unlimited versatility in creating and manipulating text and graphics.
▶ Works with any software that outputs PostScript-compatible files, including virtually all Macintosh® applications, some Apple IIgs® programs, some MS-DOS and OS/2 applications, and many AT&T UNIX® programs (requires additional software).
▶ Provides an upgrade path for your documents; proof them on a LaserWriter II ^{NT} printer, then output the final masters on a PostScript typesetter without rekeying. |
| ▶ AppleTalk Network System interface | ▶ Allows access by up to 31 users for cost-effective printing.
▶ Allows printing from an Apple Macintosh (minimum 512K of RAM), an Apple IIgs, or an MS-DOS or OS/2 computer (using the LocalTalk™ PC Card). |
| ▶ Background printing | ▶ With the MultiFinder™ software, allows you to continue work on your Macintosh system while printing. |
| ▶ Diablo 630 emulation | ▶ Allows nearly any computer with an RS-232 interface to connect directly and produce high-quality text output. |
| ▶ LaserWriter family print engine | ▶ Uses the second-generation engine common to all LaserWriter II models, offering a logical upgrade path. |
| ▶ Versatile paper handling | ▶ Comes with choice of face-down or face-up output trays.
▶ Offers adjustable manual feed.
▶ Features interchangeable paper trays for different paper sizes. |
| ▶ Print-media versatility | ▶ Lets you print on almost any material—including standard photocopy paper, letterhead, labels, envelopes, and transparency film—for maximum flexibility. |
| ▶ Improved toner system | ▶ Offers darker blacks and longer life than previous LaserWriter cartridges. |

Product Details

PostScript

PostScript is an industry-standard "page description" language: it tells a printer precisely where to place text and graphics on the page, allowing fonts to appear in any size, style, and orientation, and offering virtually unlimited graphics capabilities. PostScript is one of the most powerful and versatile page-description languages available.

Virtually all software for the Apple Macintosh system creates PostScript-compatible output files. There are also PostScript-compatible applications for the Apple IIgs system and for MS-DOS or OS/2 compatibles. If you are working with AT&T UNIX, you can use the Transcript utility available from

Adobe Systems to convert files to PostScript format for printing on the LaserWriter II_{NT}.

When you require higher resolution or more pages per minute, or need to use larger or heavier paper stock than the LaserWriter II_{NT} can handle, you can print your documents on any typesetter that has PostScript capability, without retyping the text or re-creating the graphics.

Using a LaserWriter II_{NT} with MS-DOS or OS/2

There are several ways to print on a LaserWriter II_{NT} system from an MS-DOS or OS/2 compatible computer:

► *AppleTalk*. Adding a LocalTalk PC Card to an MS-DOS or OS/2 computer gives you access to all of the LaserWriter II_{NT} printer's text and graphics

capabilities over the AppleTalk Network System.

► *PostScript-compatible software*. An increasing number of MS-DOS or OS/2 applications support the PostScript page-description language. You can print on the LaserWriter II_{NT} from these applications simply by connecting your computer to the printer's RS-232 port.

► *Other MS-DOS or OS/2 software*. You can also print documents on the LaserWriter II_{NT} from other MS-DOS or OS/2 applications via RS-232 connection using Diablo 630 emulation mode. (See the LaserWriter II_{NT} and LocalTalk PC Card user's guides for further details on these options.)

Upgrade Options

Your LaserWriter II_{NT} can be upgraded to a LaserWriter II_{NTX} by your authorized Apple dealer.



LaserWriter II^{NT}

System Requirements

To use the Apple LaserWriter II^{NT} printer, you must have one of these systems:

- ▶ One or more Macintosh (minimum 512K of RAM) or Apple IIgs computers con-

nected via the LocalTalk Cabling System.

- ▶ An MS-DOS or OS/2 computer with a LocalTalk PC Card or an RS-232-C cable and appropriate software.

- ▶ Any other computer with an RS-232-C cable and appropriate software.

Technical Specifications

Marking engine

- ▶ Canon LBP-SX laser xerographic

Processor

- ▶ Motorola 68000 (12-megahertz clock speed)

Memory

- ▶ 1 megabyte ROM; 2 megabytes RAM

Interfaces

- ▶ AppleTalk, Apple Desktop Bus™ (for future expansion), and RS-232-C ports

Print quality

- ▶ All text and graphics printed at 300 by 300 dots per inch, full page

Built-in font families

- ▶ Times, Helvetica, Courier, Symbol, ITC Avant Garde Gothic, ITC Bookman, New Century Schoolbook, Helvetica Narrow, Palatino, ITC Zapf Chancery, and ITC Zapf Dingbats

Speed

- ▶ 8 pages per minute maximum throughput (actual speed depends on images printed)

Printing protocols

- ▶ PostScript and a subset of the Diablo 630 command set

Print materials

- ▶ Letter, legal, A4, and B5 sizes using 16- to 20-pound single-sheet photocopy bond, 8- to 34-pound letterhead and colored stock, or transparency overhead film. Envelopes, labels, and paper (up to 36-pound) supported via manual feed. Envelopes also supported via optional envelope tray.

Print capacities

- ▶ Paper cassettes hold 200 sheets of 20-pound paper.
- ▶ Envelope cassette holds 15 envelopes.

Printable surface

- ▶ Letter size: 8.0 by 10.5 inches; legal: 8.0 by 13.0 inches; A4: 7.41 by 10.86 inches; B5: 7.69 by 10.16 inches (actual printable area may vary depending on application)

Size and weight

- ▶ Height: 8.6 in. (21.8 cm)
- ▶ Width: 20 in. (50.8 cm)
- ▶ With letter tray attached, 26.4 in. (67.1 cm)
- ▶ Depth: 18.5 in. (47 cm)
- ▶ Weight: 45 lb. (20.25 kg)

Operating environment

- ▶ Temperature: 50° to 90° F (10° to 32° C)
- ▶ Humidity: 20 percent to 80 percent

Power requirements

- ▶ 90 to 126 volts AC; 50 to 60 hertz

Ordering Information

Apple LaserWriter II^{NT}

Order No. M6210

With your order, you'll receive:

- ▶ LaserWriter II^{NT} printer
- ▶ LaserWriter II^{NT}/NTX Fonts disk
- ▶ LaserWriter II Installation disk

- ▶ Letter cassette
- ▶ Toner cartridge
- ▶ Owner's guide
- ▶ Limited warranty statement

Apple Computer, Inc.

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(408) 996-1010
TLX: 171-576

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Overview

The Apple® LaserWriter® IINTX is a high-performance, expandable network laser printer for individuals and workgroups. Featuring the advanced Motorola 68020 processor, the LaserWriter IINTX prints significantly faster than previous LaserWriter printers. It also includes expansion options that enhance both performance and font capabilities in a variety of ways.

The LaserWriter IINTX offers unparalleled performance and flexibility for people who produce a high volume of printed materials or for people who need to produce documents containing sophisticated text and graphics. It can meet the most rigorous printing requirements of individuals or users linked through a network—from memos to proposals to overhead transparencies for presentations. And it can also handle

the most advanced desktop publishing needs, including page layout, artwork, and illustration.

The LaserWriter IINTX features 11 font families (35 typefaces): Times®, Helvetica®, Courier, and Symbol, along with ITC Avant Garde Gothic®, ITC Bookman®, New Century Schoolbook, Helvetica Narrow®, Palatino®, ITC Zapf Chancery®, and ITC Zapf Dingbats®.

Features

Benefits

▶ Full-page, high-resolution text and graphics

▶ Provides 300-dot-per-inch resolution over the entire page, for high-quality documents.

▶ Motorola 68020 processor

▶ Allows state-of-the-art performance in printing text and graphics.
▶ Prints up to four times faster than previous LaserWriter printers.

▶ 2 megabytes of RAM

▶ Improves performance when using multiple fonts.
▶ Provides flexibility for the addition of downloadable fonts.

▶ Expandable up to 12 megabytes of RAM

▶ Lets you customize the printer for heavy use of downloadable fonts.

▶ Font-expansion slot

▶ Lets you add optional Font Expansion Card for additional high-speed ROM-resident fonts.

▶ External SCSI port

▶ Lets you add as many as seven optional SCSI hard disks to store downloadable fonts, which improves performance when printing fonts in multiple styles and sizes.

▶ Wide selection of built-in fonts

▶ Features 35 typefaces in an unlimited range of sizes and styles.

▶ PostScript® support

▶ Offers virtually unlimited versatility in creating and manipulating text and graphics.
▶ Works with any software that outputs PostScript-compatible files, including practically all Macintosh® computer applications, some Apple IIgs® programs, some MS-DOS and OS/2 applications, and many AT&T UNIX® programs (requires additional software).
▶ Provides an upgrade path for your documents; proof them on a LaserWriter II_{TX} printer, then output the final masters on a PostScript-compatible typesetter without rekeying.

Features

Benefits

-
- | | |
|---------------------------------------|---|
| ▶ AppleTalk® Network System interface | ▶ Allows access by up to 31 users for cost-effective printing.
▶ Allows printing from an Apple Macintosh (minimum 512K of RAM), an Apple IIgs, or an MS-DOS or OS/2 computer (using the LocalTalk™ PC Card). |
| ▶ Background printing | ▶ With the MultiFinder™ software, allows you to continue work on your Macintosh system while printing. |
| ▶ Diablo 630 emulation | ▶ Allows nearly any computer with an RS-232 interface to connect directly and produce high-quality text output. |
| ▶ LaserJet Plus emulation | ▶ Offers compatibility with this widely used standard in MS-DOS and OS/2 environments. |
| ▶ LaserWriter II family print engine | ▶ Uses the second-generation engine common to all LaserWriter II models. |
| ▶ Versatile paper handling | ▶ Comes with a choice of face-down or face-up output trays.
▶ Offers adjustable manual feed for labels and envelopes.
▶ Features interchangeable paper trays for different paper sizes. |
| ▶ Print-media versatility | ▶ Lets you print on almost any material—including standard photocopy paper, letterhead, labels, envelopes, and transparency film—for maximum flexibility in meeting your printing needs. |
| ▶ Improved toner system | ▶ Offers darker blacks and longer life than previous LaserWriter cartridges. |

Product Details

PostScript

PostScript is an industry-standard "page description" language: it tells a printer precisely where to place text and graphics on the page, allowing fonts to appear in any size, style, and orientation, and offering virtually unlimited graphics capabilities. PostScript is one of the most powerful and versatile page-description languages available.

Virtually all software for the Apple Macintosh personal computer creates PostScript-compatible output files. There are also PostScript-compatible applications for the Apple IIgs computer and for MS-DOS or OS/2 compatibles. If you are working with AT&T UNIX, you can use the TranScript

utility from Adobe Systems to convert files to PostScript format for printing on the LaserWriter II_{NTX} printer.

When you require higher resolution or more pages per minute, or need to use larger or heavier paper stock than the LaserWriter II_{NTX} printer can handle, you can print your documents on any typesetter that has PostScript capability, without retyping the text or re-creating the graphics.

Using a LaserWriter II_{NTX} with MS-DOS or OS/2

There are several ways to print on a LaserWriter II_{NTX} from an MS-DOS or OS/2 compatible computer:

▶ *AppleTalk*. Adding a LocalTalk PC Card to an MS-DOS or OS/2 computer gives you

access to all of the LaserWriter II_{NTX} printer's text and graphics capabilities over the AppleTalk Network System.

▶ *PostScript-compatible software*. An increasing number of MS-DOS or OS/2 applications support the PostScript page-description language. You can print on the LaserWriter II_{NTX} from these applications simply by connecting your computer to the printer's RS-232 port.

▶ *Other MS-DOS or OS/2 software*. You can also print documents on the LaserWriter II_{NTX} from other MS-DOS or OS/2 applications via RS-232 connection using Diablo 630 emulation mode. (See the LaserWriter II_{NTX} and LocalTalk PC Card user's guides for further details on these options.)

Expandability Options

Your LaserWriter II_{NTX} printer can be expanded in three ways:

▶ By installation of additional RAM for storage of downloadable fonts.

▶ By filling the font-expansion slot with a Font Expansion Card for additional high-speed ROM-resident fonts.

▶ By adding as many as seven SCSI hard disks for greater capacity to store downloadable fonts.

System Requirements

To use the Apple LaserWriter II^{NTX} printer, you must have one of these systems:

▶ One or more Macintosh (minimum 512K of RAM) or Apple IIgs computers connected via the LocalTalk Cabling System.

▶ An MS-DOS or OS/2 computer with a LocalTalk PC Card or an RS-232-C cable and appropriate software.
▶ Any other computer with an RS-232-C cable and appropriate software.

Technical Specifications**Marking engine**

▶ Canon LBP-SX laser xerographic

Processor

▶ Motorola 68020 (16.67-megahertz clock speed)

Memory

▶ 1 megabyte ROM; 2 megabytes RAM

Interfaces

▶ SCSI, AppleTalk, Apple Desktop Bus™ (for future expansion), and RS-232-C ports

Expansion capabilities

▶ ROM expansion via font-expansion slot
▶ RAM expansion up to 12 megabytes
▶ External SCSI port for hard disk font storage
▶ Apple Desktop Bus for future expansion

Print quality

▶ All text and graphics printed at 300 by 300 dots per inch, full page

Built-in font families

▶ Times, Helvetica, Courier, Symbol, ITC Avant Garde Gothic, ITC Bookman, New Century Schoolbook, Helvetica Narrow, Palatino, ITC Zapf Chancery, and ITC Zapf Dingbats

Speed

▶ 8 pages per minute maximum throughput (actual speed depends on images printed)

Printing protocols

▶ PostScript, a subset of the Diablo 630 command set, and Hewlett-Packard LaserJet Plus emulation

Print materials

▶ Letter, legal, A4, and B5 sizes, using 16- to 20-pound single-sheet photocopy bond, 8- to 34-pound letterhead and colored stock, or transparency overhead film. Envelopes, labels, and paper (up to 36-pound) supported via manual feed. Envelopes also supported via optional envelope tray.

Print capacities

▶ Paper cassettes hold 200 sheets of 20-pound paper.
▶ Envelope cassette holds 15 envelopes.

Printable surface

▶ Letter size: 8.0 by 10.5 inches; legal: 8.0 by 13.0 inches; A4: 7.41 by 10.86 inches; B5: 7.69 by 10.16 inches (actual printable area may vary depending on application)

Size and weight

▶ Height: 8.6 in. (21.8 cm)
▶ Width: 20 in. (50.8 cm)
With letter tray attached, 26.4 in. (67.1 cm)
▶ Depth: 18.5 in. (47 cm)
▶ Weight: 45 lb. (20.25 kg)

Operating environment

▶ Temperature: 50° to 90° F (10° to 32° C)
▶ Humidity: 20 percent to 80 percent

Power requirements

▶ 90 to 126 volts AC; 50 to 60 hertz

Ordering Information

Apple LaserWriter II^{NTX}
Order No. M6215

With your order, you'll receive:

▶ LaserWriter II^{NTX} printer
▶ LaserWriter II^{NT}/II^{TX} Fonts disk

▶ LaserWriter II Installation disk
▶ Letter cassette
▶ Toner cartridge
▶ Owner's guide
▶ Limited warranty statement

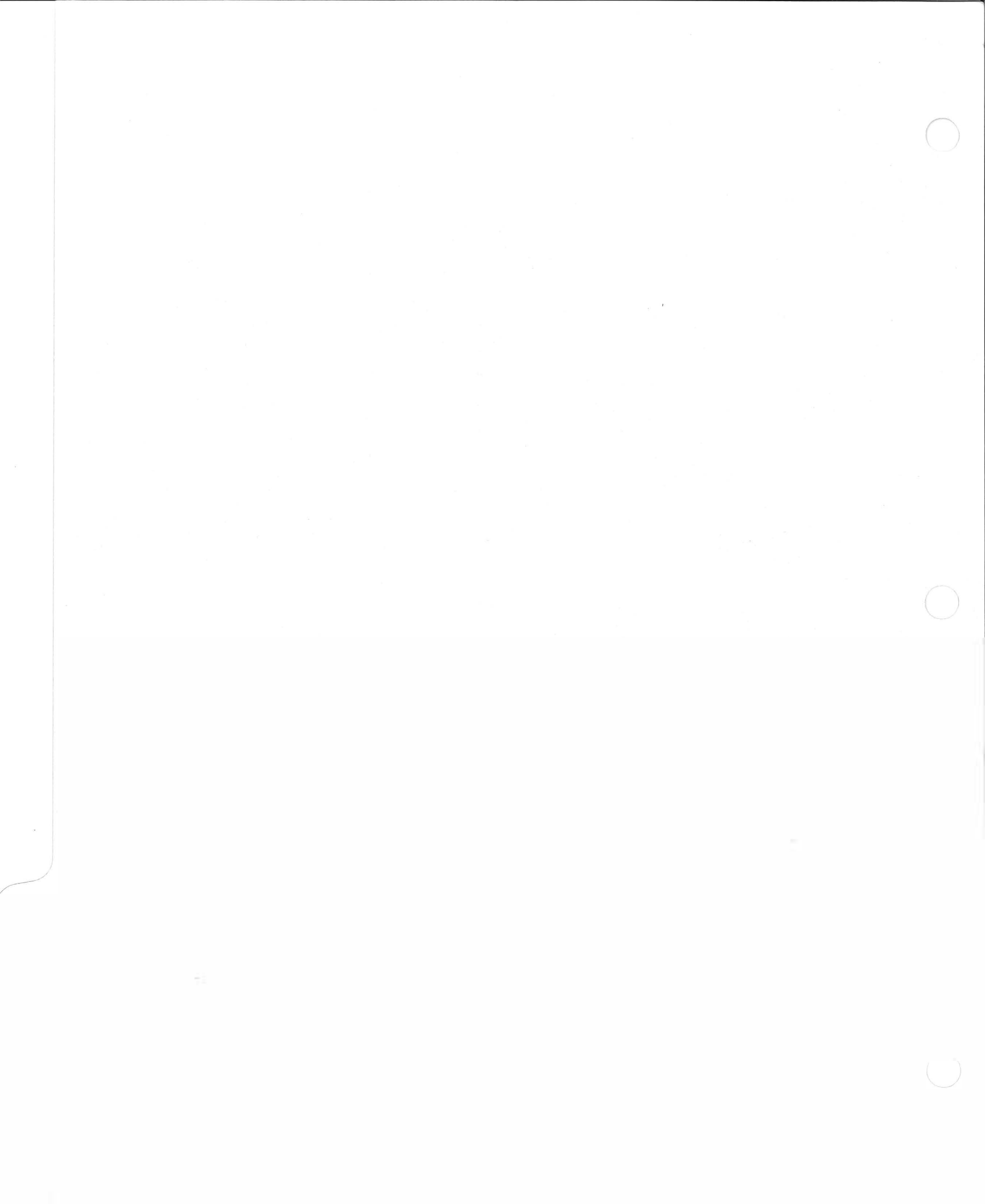


LaserWriter II^{TX}

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June 1988. Product specifications are subject to change without notice. Printed in U.S.A.
M3008/A





Overview

Small in size but large in power, the Apple® 3.5 Drive stores 800K of data on a single 3.5-inch disk. It's a flexible, economical choice for owners of Macintosh™ Plus, Macintosh SE, and Apple IIGS™ personal computers who want high-capacity storage at an affordable price.

Features

▶ Uses 800K double-sided, 3.5-inch floppy disks

▶ Easy Apple II system expandability

▶ In-use light

Benefits

- ▶ Provides over 2.5 times the capacity of on-line data storage available from 5.25-inch disks.
- ▶ Lets you hold large data files and applications on one disk, reducing the need to swap disks.
- ▶ Retrieves and stores data substantially faster than a 5.25-inch drive.
- ▶ Provides compatibility with 400K disks.
- ▶ Protects data, because disks are rugged and easy to carry.
- ▶ Allows Apple IIGS owners to run applications that come on 3.5-inch disks.

▶ Lets you add up to three additional disk drives (either 3.5-inch or 5.25 inch) to increase storage capacity as your needs change.

▶ Indicates when drive is running.



Apple 3.5 Drive

System Requirements

To use the Apple 3.5 Drive, you will need one of the following:

- ▶ A Macintosh Plus
- ▶ A Macintosh SE
- ▶ A Macintosh 512K Enhanced
- ▶ An Apple IIGs

Technical Specifications**Recording media**

- ▶ Disk diameter: 3.5 inches
- ▶ Recording surfaces: 2
- ▶ Tracks per inch: 80

Capacity

- ▶ Formatted data capacity: 800 kilobytes*
- ▶ Unformatted data capacity: 1,246 kilobytes

*Disks used in the Apple 3.5 Drive should contain certified double-sided media

▶ Drive characteristics

- ▶ Seek time (track to track): 6 milliseconds maximum
- ▶ Settle time: 30 milliseconds maximum
- ▶ Drive startup time: 600 milliseconds maximum

Head position accuracy

- ▶ ±0.035 mm

Interfaces

▶ Connects directly to the disk-drive port of the Macintosh 512K Enhanced, Macintosh Plus, Macintosh SE, or Apple IIGs. With the Apple IIGs, an additional drive can be daisy-chained to the first drive.

Electrical requirements

- ▶ +12 volts
 - Standby: 10 microamps
 - Typical: 120 milliamps
 - Peak: 600 milliamps (during eject only: 2-second maximum duration)
- ▶ +5 volts
 - Standby: 10 milliamps
 - Typical: 360 milliamps

Environmental requirements

- ▶ Operating temperature: 40° to 122° F (5° to 50° C)
- ▶ Storage temperature: -40° to 140° F (-40° to 60° C) with no condensation
- ▶ Relative humidity: 5% to 90% (with maximum wet bulb temperature of 85° F [29°C] and no condensation)

Size and weight

- ▶ Height: 2.01 in. (51 mm)
- ▶ Width: 4.72 in. (120 mm)
- ▶ Depth: 7.87 in. (200 mm)
- ▶ Weight: 2.8 lb. (1.3 kg)

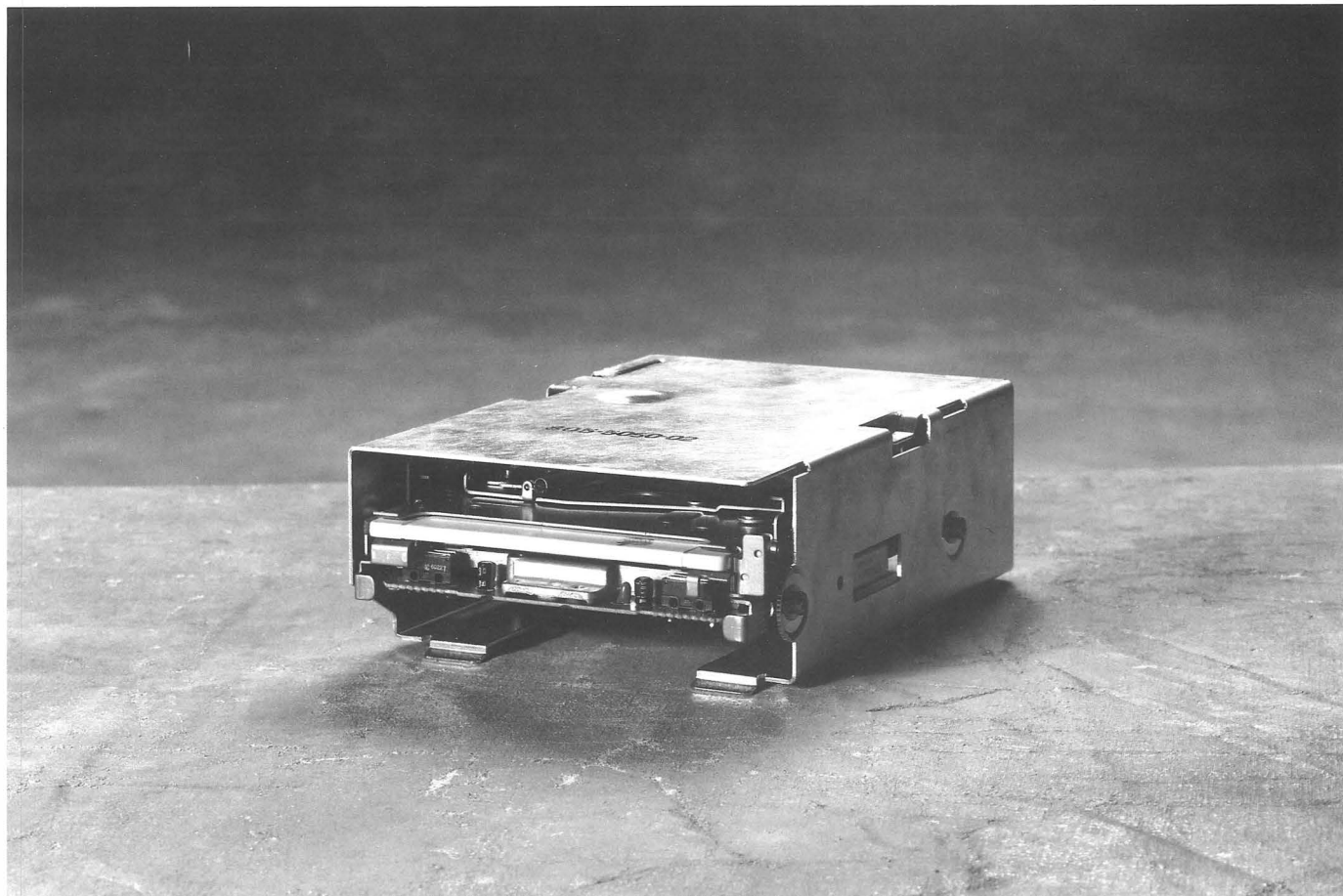
Ordering Information**Apple 3.5 Drive**

Order No. A9M0106

With your order, you'll receive:

- ▶ Apple 3.5 Drive
- ▶ Owner's guide
- ▶ Limited warranty statement

Macintosh Internal 800K Disk Drive



Overview

The Macintosh Internal 800K Disk Drive is ideal for owners of Macintosh II personal computers who want high-capacity storage at an affordable price. Designed to fit inside Macintosh II, the Macintosh Internal 800K Disk Drive requires no desk space and provides 800 kilobytes of highly-reliable, self-contained storage.

Features

- ▶ Internal drive
- ▶ Uses 800K double-sided, cased 3.5-inch floppy disks

Benefits

- ▶ Saves desk space.
- ▶ Provides over 2.5 times the capacity of on-line data storage available from 5.25-inch disks.
- ▶ Lets you hold large data files and applications on one disk, reducing the need to swap disks.
- ▶ Retrieves and stores data substantially faster than a 5.25-inch drive.
- ▶ Fully compatible with 400K disks.
- ▶ Protects data, because disks are rugged and easy to carry.



Macintosh Internal 800K Disk Drive

System Requirements

To use the Macintosh Internal 800K Disk Drive, you must have the following:

- ▶ Macintosh II personal computer.

Technical Specifications

Recording media

- ▶ Disk diameter: 3.5 inches
- ▶ Recording surfaces: 2
- ▶ Tracks per inch: 80

Capacity

- ▶ Formatted data capacity: 800 kilobytes*
- ▶ Unformatted data capacity: 1,246 kilobytes

*Disks used in the Apple 3.5 Drive should contain certified double-sided media

Drive characteristics

- ▶ Seek time (track to track): 6 milliseconds maximum
- ▶ Settle time: 30 milliseconds maximum
- ▶ Drive startup time: 600 milliseconds maximum

Head position accuracy

- ▶ ± 0.035 mm

Interfaces

- ▶ Connects to the Macintosh II via the internal serial connector

Electrical requirements

- ▶ +12 volts
 - Standby: 10 microamps
 - Typical: 120 milliamps
 - Peak: 600 milliamps (during eject only: 2-second maximum duration)
- ▶ +5 volts
 - Standby: 10 milliamps
 - Typical: 360 milliamps

Environmental requirements

- ▶ Operating temperature: 40° to 122° F (5° to 50° C)
- ▶ Storage temperature: -40° to 140° F (-40° to 60° C) (no condensation)
- ▶ Relative humidity: 5% to 90% (with maximum wet bulb temperature of 85° F [29° C] and no condensation)

Size

- ▶ Height: 2.01 in. (51 mm)
- ▶ Width: 4.72 in. (120 mm)
- ▶ Depth: 7.87 in. (200 mm)

Ordering Information

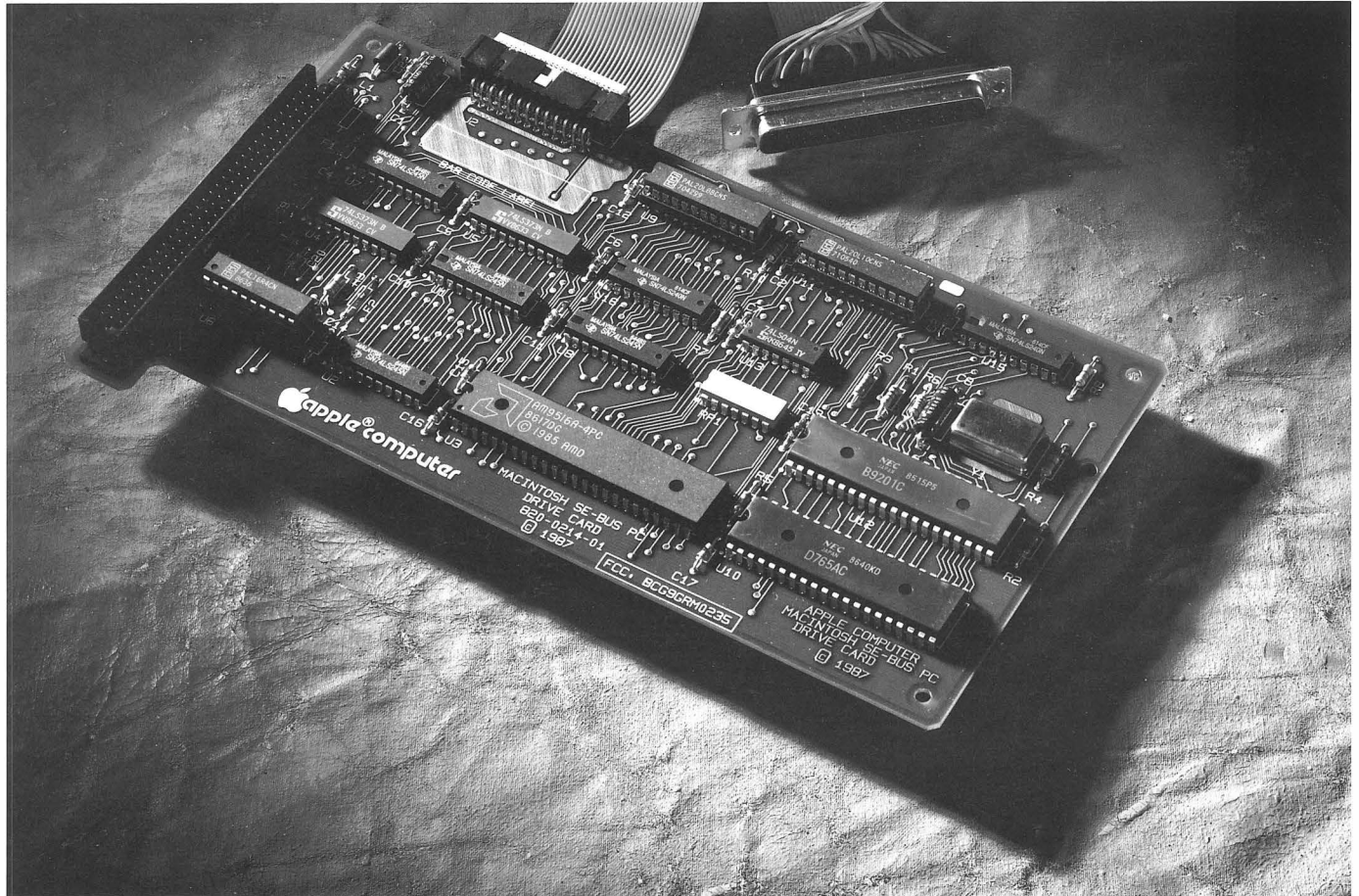
Macintosh Internal 800K Disk Drive

Order No. M0136

With your order, you'll receive:

- ▶ Macintosh Internal 800K Disk Drive
- ▶ Owner's guide
- ▶ Limited warranty statement

Macintosh SE-Bus PC Drive Card



Overview

The Macintosh® SE-Bus PC Drive Card provides the link between an Apple® Macintosh SE personal computer and the Apple PC 5.25 Drive. With this hardware and the Apple File Exchange program (included), you can convert many standard MS-DOS data files for use in Macintosh applications, and Macintosh files into the MS-DOS format.*

Features

- ▶ Direct interface between Macintosh SE and the Apple PC 5.25 Drive
- ▶ Apple File Exchange program included

Benefits

- ▶ In conjunction with the Apple File Exchange software, allows your Macintosh SE to convert files between the Macintosh and MS-DOS formats.
- ▶ Provides all the interfacing hardware and software you need for a complete data-conversion solution between the Macintosh and MS-DOS environments.

*See the Apple PC 5.25 Drive and Apple File Exchange data sheets for more information.



Macintosh SE-Bus PC Drive Card

System Requirements

To use the Macintosh SE-Bus PC Drive Card, you'll need the following:

- ▶ A Macintosh SE personal computer
- ▶ An Apple PC 5.25 Drive
- ▶ The Apple File Exchange software (included with the Macintosh SE-Bus PC Drive Card)

Technical Specifications

Interface

- ▶ Installs in the Macintosh SE-Bus expansion slot

Disk compatibility

- ▶ Apple PC 5.25 Drive (uses 360K disks)

Ordering Information

Macintosh SE-Bus PC Drive Card

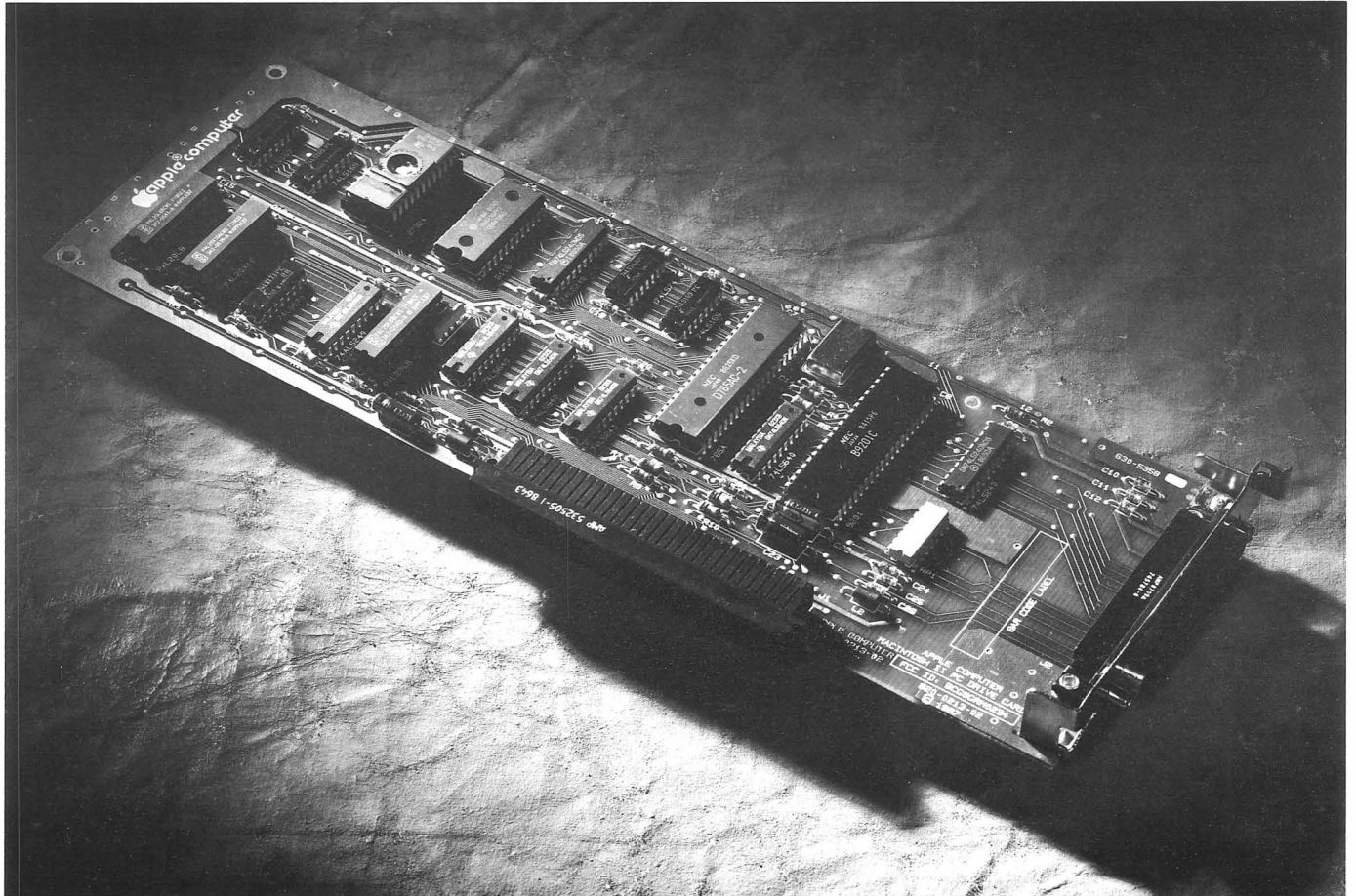
Order No. M5023/A

With your order, you'll receive:

- ▶ Macintosh SE-Bus PC Drive Card
- ▶ Installation kit*
- ▶ Apple File Exchange software and user's guide
- ▶ Limited warranty statement

*Dealer installation is required for this product.

Macintosh II PC Drive Card



Overview

The Macintosh® II PC Drive Card provides the link between an Apple® Macintosh II personal computer and the Apple PC 5.25 Drive. With this hardware and the Apple File Exchange program (included), you can convert many standard MS-DOS data files so they can be used in Macintosh applications.* You can also convert Macintosh files into the MS-DOS format.

Features

- ▶ Direct interface between Macintosh II and Apple PC 5.25 Drive
- ▶ User installable
- ▶ Apple File Exchange program included

Benefits

- ▶ In conjunction with Apple File Exchange software, allows your Macintosh II to convert files between the Macintosh and MS-DOS formats.
- ▶ Plugs in easily.
- ▶ Provides all the interfacing hardware and software you need for a complete data-conversion solution between the Macintosh and MS-DOS environments.

*See the Apple PC 5.25 Drive and Apple File Exchange software data sheets for additional information.



Macintosh II PC Drive Card

System Requirements

- ▶ A Macintosh II personal computer
- ▶ An Apple PC 5.25 Drive
- ▶ Apple File Exchange software (included with the Macintosh II PC Drive Card)

Technical Specifications**Interface**

- ▶ NuBus™; plugs into any Macintosh II slot

Disk Compatibility

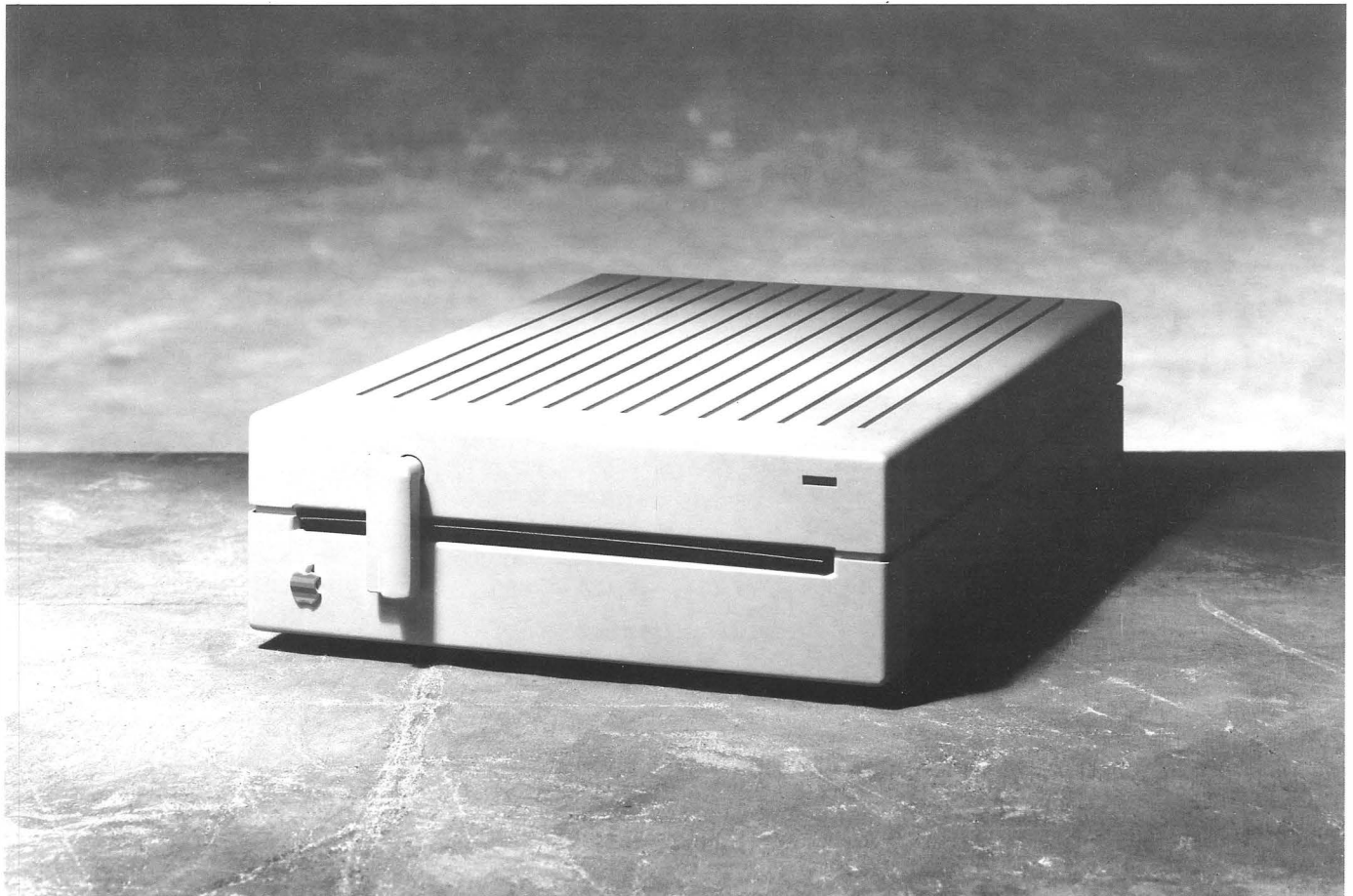
- ▶ Apple PC 5.25 Drive (uses 360K disks)

Ordering Information**Macintosh II PC Drive Card**

Order No. M5056

With your order, you'll receive:

- ▶ Macintosh II PC Drive Card
- ▶ Apple File Exchange software and user's guide
- ▶ Limited warranty statement



Overview

The Apple® PC 5.25 Drive is ideal for Macintosh® personal computer users who want to use data created with MS-DOS applications. Compatible with formatted MS-DOS 5.25-inch disks, the Apple PC 5.25 Drive allows Macintosh SE and Macintosh II users to exchange files between MS-DOS-formatted media and Macintosh-formatted media. And when a coprocessor or hardware emulator is installed in the system, the Apple PC 5.25 Drive can act as an MS-DOS drive, enabling users to actually load and run MS-DOS programs. This affordable, highly reliable data storage system is easily attached to a Macintosh disk-drive controller card.

Features

- ▶ MS-DOS-format drive with a standard connector
- ▶ NEC controller chip

Benefits

- ▶ Provides easy data exchange between Apple and MS-DOS-formatted 360-kilo-byte, 5.25-inch disks.
- ▶ Acts as an MS-DOS drive when used with a system that includes a coprocessor.
- ▶ Provides compatibility with MS-DOS computers using a standard DB-37 connector.
- ▶ Provides the same data transfer rates as MS-DOS drives.
- ▶ Offers compatibility with copy-protected MS-DOS applications.



Apple PC 5.25 Drive

System Requirements

To use the Apple PC 5.25 Drive, you will need:

- ▶ A Macintosh SE personal computer with the Macintosh SE-Bus PC Drive Card or a Macintosh II personal computer with the Macintosh II PC Drive Card
- ▶ A compatible third-party drive connection such as the AST 256 Card

Technical Specifications

Recording media

- ▶ 5.25-inch removable floppy disks

Capacity

- ▶ Formatted capacity: 360 kilobytes per disk
- ▶ Recording surfaces: 2
- ▶ Tracks per surface: 40
- ▶ Tracks per inch: 48

Characteristics

- ▶ Average seek time: 19 milliseconds
- ▶ Transfer rate: 250 kilobits per second

- ▶ Rotational speed: 300 rpm
- ▶ Average startup time: 500 milliseconds

Power requirements

- ▶ 12 volts DC \pm 10%
 - Maximum: 0.6 amps/Peak
 - Typical: 0.36 amps
- ▶ 5 volts DC \pm 5%
 - Maximum: 0.65 amps
 - Typical: 0.5 amps

Interface

- ▶ Connects to Macintosh SE and Macintosh II computers via an internal drive card.

Environmental requirements

- ▶ Operating temperature: 50° to 104° F (10° to 40° C)
- ▶ Relative humidity: 20% to 80% noncondensing
- ▶ Maximum altitude: 10,000 ft. (3,048 m)

Size and weight

- ▶ Height: 2.9 in. (7.2 cm)
- ▶ Width: 6.37 in. (16.2 cm)
- ▶ Depth: 8.3 in. (20.7 cm)
- ▶ Weight: 4.78 lb. (2.17 kg)

Ordering Information

Apple PC 5.25 Drive

Order No. A9M0110

With your order, you'll receive:

- ▶ Apple PC 5.25 Drive
- ▶ Owner's guide
- ▶ Limited warranty statement

Macintosh SE-Bus PC Drive Card

Order No. M5023/A

Macintosh II PC Drive Card

Order No. M5056/A



Overview

Now Macintosh™, Apple® IIe, or Apple IIgs™ personal computer owners can boost disk storage capacity from a choice of high-performance external hard disks.

Providing 20, 40, or 80 megabytes of storage capacity, Apple Hard Disks are ideally suited to the growing requirements of business and professional users who want to store multiple applications programs and data files in one convenient location.

Besides offering ample storage (10,000 pages with the 20-megabyte disk), Apple Hard Disks let you access data up to six times faster than 3.5-inch floppy-disk drives.

Features

▶ 20, 40, or 80 megabytes of storage

▶ Fast data access:
—30 milliseconds with the 40SC
and 80SC Hard Disks
—85 milliseconds with the 20SC

▶ Industry-standard Small Computer System Interface (SCSI)

Benefits

▶ Provides space for data-intensive files, large documents, and sophisticated applications.
▶ Lets you build a powerful AppleShare™ system that can access up to 80 megabytes of information (when used with Apple's new file server software).
▶ Makes it easy to work in the AT&T UNIX® environment (when you use the Apple Hard Disk 80SC).

▶ Finds data significantly faster than the 3.5-inch floppy drives.

▶ Provides faster data transmission than a serial interface.
▶ Allows expansion with additional hard disks, tape backup systems, or other SCSI peripherals.
▶ Provides connection to the Apple Tape Backup 40SC for efficient file backup and restoration.
▶ Assures a growth path.

Apple Hard Disk 20SC

System Requirements

To use an Apple Hard Disk 20SC with a Macintosh personal computer, you must have:

- ▶ Apple SCSI System Cable
- > Apple SCSI Cable Terminator

To use an Apple Hard Disk 20SC with an Apple IIe or IIgs, you must have:

- ▶ Apple II SCSI Interface Card
- ▶ Apple SCSI System Cable
- ▶ Apple SCSI Cable Terminator

Product Details

▶ **SCSI Expansion**
SCSI expansion lets you connect as many as three addi-

tional SCSI devices to an Apple IIe or Apple IIgs, or as many as six to a Macintosh.

Technical Specifications

Recording Media

Two double-sided rigid fixed disks with two dual read/write heads

Capacity

Data capacity:	20 megabytes (formatted)
Data surfaces:	4
Heads/Surfaces:	1
Block size:	512
Total disk blocks:	39,360
Sectors/Tracks:	32

Characteristics

Average seek time:	85 milliseconds
Transfer rate:	
Macintosh Plus:	265,000 bytes per second
Macintosh SE:	660,000 bytes per second
Macintosh II:	937,000 bytes per second:
Rotational speed:	2,744 rpm
Startup time:	15 seconds
Spin-down time:	25 seconds

Interface

Connects directly to the Macintosh Plus, Macintosh SE, or Macintosh II via the external SCSI DB-25 connector.	Connects to the Apple IIe or Apple IIgs via the expansion port, using the Apple II SCSI Interface Card.
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Electrical requirements

Line voltage:	85 to 270 volts AC
Frequency:	47 to 64 hertz
Maximum power:	30 watts

Environmental requirements

Operating temperature:	50° to 104° F (10° to 40° C)
Storage temperature:	32° to 122° F (0° to 50° C)
Relative humidity:	20% to 80% (noncondensing)
Altitude:	0 to 10,000 ft. (0 to 3,048 m)

Size and weight

Height: 3.1 in. (78.5mm)	Depth: 10.5 in. (266 mm)
Width: 9.7 in. (246mm)	Weight: 9 lbs. (4kg)

Ordering Information

Apple Hard disk 20SC
Order No. M2620

With your order you'll receive:

- ▶ Apple Hard Disk 20SC
- ▶ Owner's Guide
- ▶ Setup Disk
- ▶ Power cord
- ▶ Limited warranty statement

Apple SCSI System Cable
Order No. M0206
Apple Cable Terminator
Order No. M0209
Apple II SCSI Interface Card
Order No. A2B2087

Apple Hard Disk 40SC

System Requirements

See the Apple Hard Disk 20SC for the Apple Hard Disk 40SC system requirements.

Product Details

► ProDos

ProDos 1.1 can only access 32 megabytes of storage, regardless of drive capacity

Future ProDos updates will allow full access to the 40 megabyte capacity

► SCSI Expansion

SCSI expansion lets you connect as many as three additional SCSI devices to an Apple IIe or Apple IIgs or as many as six to a Macintosh.

Technical Specifications

Recording Media

Two double-sided rigid fixed disks with two dual read/write heads

Capacity

Data capacity:	40 megabytes (formatted)
Data surfaces:	4
Heads/Surfaces:	1
Block size:	512
Total disk blocks:	78,246
Sectors/Tracks:	32

Characteristics

Average seek time:	30 milliseconds
Transfer rate:	
Macintosh Plus:	265,000 bytes per second
Macintosh SE:	660,000 bytes per second
Macintosh II:	937,000 bytes per second:
Rotational speed:	3,662 rpm
Startup time:	13 seconds
Spin-down time:	18 seconds

Interface

Connects directly to the Macintosh Plus, Macintosh SE, or Macintosh II via the external SCSI DB-25 connector.

Connects to the Apple IIe or Apple IIgs via the expansion port, using the Apple II SCSI Interface Card.

Electrical requirements

Line voltage:	85 to 270 volts AC
Frequency:	47 to 64 hertz
Maximum power:	60 watts

Environmental requirements

Operating temperature:	50° to 104° F (10° to 40° C)
Storage temperature:	32° to 122° F (0° to 50° C)
Relative humidity:	20% to 80% (noncondensing)
Altitude:	0 to 10,000 ft. (0 to 3,048 m)

Size and weight

Height:	3.1 in. (78.5mm)
Width:	9.7 in. (246mm)

Depth:	10.5 in. (266 mm)
Weight:	9 lbs. (4kg)

Ordering Information

Apple Hard disk 40SC

Order No. M2644

With your order you'll receive:

- Apple Hard Disk 40SC
- Owner's Guide
- Setup Disk
- Power cord
- Limited warranty statement

Apple SCSI System Cable

Order No. M0206

Apple Cable Terminator

Order No. M0209

Apple II SCSI Interface Card

Order No. A2B2087



Apple Hard Disk 80SC

System Requirements

See the Apple Hard Disk 20SC for the Apple Hard Disk 80SC system requirements.

Product Details

► ProDos

ProDos 1.1 can only access 32 megabytes of storage, regardless of drive capacity. Future ProDos updates will

allow full access to the 40 megabyte capacity

► SCSI Expansion

SCSI expansion lets you connect as many as three addi-

tional SCSI devices to an Apple IIe or Apple IIgs or as many as six to a Macintosh.

Technical Specifications

Recording Media

Three double-sided rigid fixed disks with two dual read/write heads

Capacity

Data capacity:	80 megabytes (formatted)
Data surfaces:	6
Heads/Surfaces:	1
Block size:	512
Total disk blocks:	156,370
Sectors/Tracks:	32

Characteristics

Average seek time:	30 milliseconds
Transfer rate:	
Macintosh Plus:	265,000 bytes per second
Macintosh SE:	660,000 bytes per second
Macintosh II:	937,000 bytes per second
Rotational speed:	3,662 rpm
Startup time:	13 seconds
Spin-down time:	18 seconds

Interface

Connects directly to the Macintosh Plus, Macintosh SE, or Macintosh II via the external SCSI DB-25 connector.	Connects to the Apple IIe or Apple IIgs via the expansion port, using the Apple II SCSI Interface Card.
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Electrical requirements

Line voltage:	85 to 270 volts AC
Frequency:	47 to 64 hertz
Maximum power:	60 watts

Environmental requirements

Operating temperature:	50° to 104° F (10° to 40° C)
Storage temperature:	32° to 122° F (0° to 50° C)
Relative humidity:	20% to 80% (noncondensing)
Altitude:	0 to 10,000 ft. (0 to 3,048 m)

Size and weight

Height: 3.1 in. (78.5mm)	Depth: 10.5 in. (266 mm)
Width: 9.7 in. (246mm)	Weight: 9 lbs. (4kg)

Ordering Information

Apple Hard disk 80SC
Order No. M2688

With your order you'll receive:

- Apple Hard Disk 80SC
- Owner's Guide
- Setup Disk
- Power cord
- Limited warranty statement

Apple SCSI System Cable

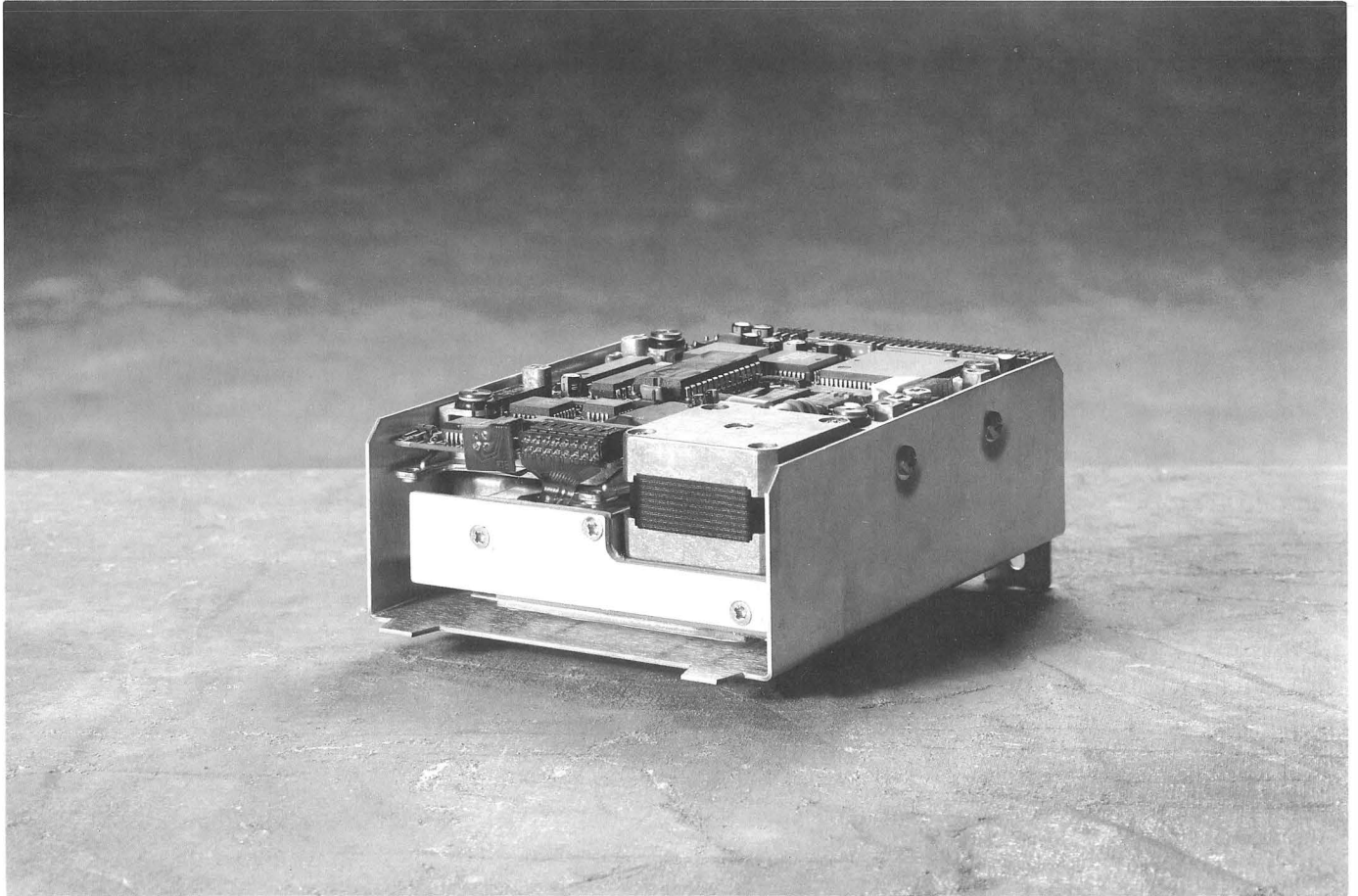
Order No. M0206

Apple Cable Terminator

Order No. M0209

Apple II SCSI Interface Card

Order No. A2B2087



Overview

Three Macintosh™ Internal Hard Disks—the 20SC, 40SC, and 80SC—provide access to high-performance storage and large-capacity solutions. The Macintosh Internal Hard Disk 20SC fits inside Macintosh SE and Macintosh II personal computers, and the 40SC or 80SC fit inside the Macintosh II. These disks require no desk space, and virtually eliminate disk swap—because they can accommodate multiple applications, lengthy documents, and large data bases, in one convenient location.

Besides providing up to 100 times the storage capacity of an 800K floppy disk, Macintosh Internal Hard Disks let you access data up to six times faster than 3.5-inch floppy-disk drives.

Features

- ▶ 20, 40, or 80 megabytes of internal disk storage
- ▶ Fast data access:
 - 30 milliseconds with the Macintosh Internal 40SC and 80SC Hard Disks
 - 85 milliseconds with the 20SC Hard Disk
- ▶ Industry-standard Small Computer System Interface (SCSI)

Benefits

- ▶ Provides space for data-intensive files, large documents, and bigger applications.
- ▶ Virtually eliminates disk swapping.
- ▶ Finds data significantly faster than 3.5-inch floppy drives.
- ▶ Provides faster data transmission than a serial interface.
- ▶ Provides connection to the Apple Tape Backup 40SC for efficient file backup and restoration.
- ▶ Lets you expand your system with up to six additional SCSI hard disks, tape backup drives, or other SCSI devices.

Macintosh Internal Hard Disk 20SC

System Requirements

To use an Macintosh Internal Hard Disk 20SC, you must have a Macintosh SE or Macintosh II personal computer.

Technical Specifications

Recording Media

Two double-sided rigid fixed disks with two dual read/write heads

Capacity

Data capacity:	20 megabytes (formatted)
Data surfaces:	4
Heads/Surfaces:	1
Block size:	512
Total disk blocks:	39,360
Sectors/Tracks:	32

Characteristics

Average seek time:	85 milliseconds
Transfer rate:	
Macintosh Plus:	265,000 bytes per second
Macintosh SE:	660,000 bytes per second
Macintosh II:	937,000 bytes per second
Rotational speed:	2,744 rpm
Startup time:	15 seconds
Spin-down time:	25 seconds

Interface

Connects directly to the Macintosh SE or Macintosh II via the internal SCSI 50-pin connector.

Electrical requirements

Line voltage:	85 to 270 volts AC
Frequency:	47 to 64 hertz
Maximum power:	60 watts

Environmental requirements

Operating temperature:	50° to 104° F (10° to 40° C)
Storage temperature:	32° to 122° F (0° to 50° C)
Relative humidity:	20% to 80% (noncondensing)
Altitude:	0 to 10,000 ft. (0 to 3,048 m)

Size and weight

Height: 3.1 in. (78.5mm)	Depth: 10.5 in. (266 mm)
Width: 9.7 in. (246mm)	Weight: 9 lbs. (4kg)

Ordering Information

**Macintosh Internal
Hard Disks 20SC**
Order No. M0216

With your order, you'll receive:

- ▶ Macintosh Internal Hard Disk (20 megabytes)
- ▶ Owner's Guide
- ▶ Macintosh utilities disk
- ▶ Macintosh utilities manual
- ▶ Power cord
- ▶ Limited warranty statement

Macintosh Internal Hard Disk 40SC

System Requirements

To use an Macintosh Internal Hard Disk 40SC, you must have a Macintosh SE or Macintosh II personal computer.

Technical Specifications

Recording Media	Two double-sided rigid fixed disks with two dual read/write heads	
Capacity	Data capacity:	40 megabytes (formatted)
	Data surfaces:	4
	Heads/Surfaces:	1
	Block size:	512
	Total disk blocks:	78,246
	Sectors/Tracks:	32
Characteristics	Average seek time:	30 milliseconds
	Transfer rate:	
	Macintosh II:	937,000 bytes per second:
	Rotational speed:	3,662 rpm
	Startup time:	13 seconds
	Spin-down time:	18 seconds
Interface	Connects directly to the Macintosh II via the internal SCSI 50-pin connector.	
Electrical requirements	Line voltage:	85 to 270 volts AC
	Frequency:	47 to 64 hertz
	Maximum power:	60 watts
Environmental requirements	Operating temperature:	50° to 104° F (10° to 40° C)
	Storage temperature:	32° to 122° F (0° to 50° C)
	Relative humidity:	20% to 80% (noncondensing)
	Altitude:	0 to 10,000 ft. (0 to 3,048 m)
Size and weight	Height: 3.1 in. (78.5mm)	Depth: 10.5 in. (266 mm)
	Width: 9.7 in. (246mm)	Weight: 9 lbs. (4kg)

Ordering Information

**Macintosh Internal
Hard Disks 40SC**
Order No. M0232

With your order, you'll receive:

- ▶ Macintosh Internal Hard Disk (40 megabytes)
- ▶ Owner's Guide
- ▶ Macintosh utilities disk
- ▶ Macintosh utilities manual
- ▶ Power cord
- ▶ Limited warranty statement



Macintosh Internal Hard Disk 80SC

System Requirements

To use an Macintosh Internal Hard Disk 80SC, you must have a Macintosh SE or Macintosh II personal computer.

Technical Specifications

Recording Media	Three double-sided rigid fixed disks with two dual read/write heads	
Capacity	Data capacity:	80 megabytes (formatted)
	Data surfaces:	6
	Heads/Surfaces:	1
	Block size:	512
	Total disk blocks:	156,370
	Sectors/Tracks:	32
Characteristics	Average seek time:	30 milliseconds
	Transfer rate:	
	Macintosh II:	937,000 bytes per second:
	Rotational speed:	3,662 rpm
	Startup time:	13 seconds
	Spin-down time:	18 seconds
Interface	Connects directly to the Macintosh II via the internal SCSI 50-pin connector.	
Electrical requirements	Line voltage:	85 to 270 volts AC
	Frequency:	47 to 64 hertz
	Maximum power:	60 watts
Environmental requirements	Operating temperature:	50° to 104° F (10° to 40° C)
	Storage temperature:	32° to 122° F (0° to 50° C)
	Relative humidity:	20% to 80% (noncondensing)
	Altitude:	0 to 10,000 ft. (0 to 3,048 m)
Size and weight	Height: 3.1 in. (78.5mm)	Depth: 10.5 in. (266 mm)
	Width: 9.7 in. (246mm)	Weight: 9 lbs. (4kg)

Ordering Information

Macintosh Internal Hard Disks 80SC
Order No. M0233

With your order, you'll receive:

- ▶ Macintosh Internal Hard Disk (80 megabytes)
- ▶ Owner's Guide
- ▶ Macintosh utilities disk
- ▶ Macintosh utilities manual
- ▶ Power cord
- ▶ Limited warranty statement

Macintosh Portable Internal 40SC Hard Disk



Overview

The Macintosh® Portable Internal 40SC Hard Disk provides fast, convenient access to high-performance storage and large-capacity applications. Only one inch high and weighing 1.1 pounds, the Macintosh Internal 40SC Hard Disk has been designed especially for use with the Apple® Macintosh Portable personal computer. It draws little power from your batteries, and virtually eliminates disk swapping because it can accommodate multiple applications, complex documents, and large databases in one convenient location.

Features

- ▶ 40 megabytes of internal disk storage
- ▶ Rapid data accessing
- ▶ Power-efficient design
- ▶ Rugged design
- ▶ Industry-standard Small Computer System Interface (SCSI)

Benefits

- ▶ Puts large documents and dozens of applications at your fingertips.
- ▶ Offers 50 times the capacity of an 800K floppy disk.
- ▶ Virtually eliminates disk swapping.
- ▶ Is conveniently portable; the disk fits inside the computer.
- ▶ Accesses data as quickly as most desktop disk drives of the same size.
- ▶ Extends the life of your portable battery.
- ▶ Lets you use your computer longer before recharging.
- ▶ Resists shock and impact.
- ▶ Protects your data.
- ▶ Transmits data faster than a serial interface, at up to 1.25 megabytes per second.
- ▶ Lets you expand your system with up to six additional SCSI hard disks, tape backup drives, or other SCSI devices.



Macintosh Portable Internal 40SC Hard Disk

System Requirements

To use a Macintosh Portable Internal 40SC Hard Disk, you will need a Macintosh Portable personal computer and System Software Version 6.0.4 (or later).

Technical Specifications

Capacity

- ▶ Data capacity: 40 megabytes (formatted)
- ▶ Data surfaces: 2
- ▶ Heads/surface: 1
- ▶ Block size: 512 bytes
- ▶ Total disk blocks: 82,080
- ▶ Blocks/track: 40

Characteristics

- ▶ Average seek time: 25 milliseconds
- ▶ Rotational speed: 3,557 rpm
- ▶ Startup time: 20 seconds (maximum)
- ▶ Typical startup time (from sleep): 6 seconds
- ▶ Spin-down time: 10 seconds (maximum)

- ▶ Typical spin-down time: 5 seconds
- ▶ Automatically retracks to the inner stop (nondata area) upon power down to protect data area during travel and startup

Interface

- ▶ Connects directly to the Macintosh Portable via the SCSI 34-pin connector (inside the case)

Electrical requirements (system)

- ▶ Line voltage: 70 to 270 volts AC
- ▶ Frequency: 40 to 70 hertz
- ▶ Maximum power: 15 watts

Environmental requirements (system)

- ▶ Operating temperature: 50° to 104° F (10° to 40° C)
- ▶ Storage temperature: -40° to 140° F (-25° to 60° C) (for a period not to exceed three days; storage for longer periods must be within operating temperature range)
- ▶ Relative humidity: 5% to 95% noncondensing
- ▶ Operating altitude: 0 to 10,000 ft. (0 to 3,048 m)

Size and weight

- ▶ Height: 1 in. (2.5 cm)
 - ▶ Depth: 5.75 in. (14.38 cm)
 - ▶ Width: 4 in. (10.0 cm)
 - ▶ Weight: 1.1 lbs. (0.5 kg)
-

Ordering Information

Macintosh Portable Internal 40SC Hard Disk*

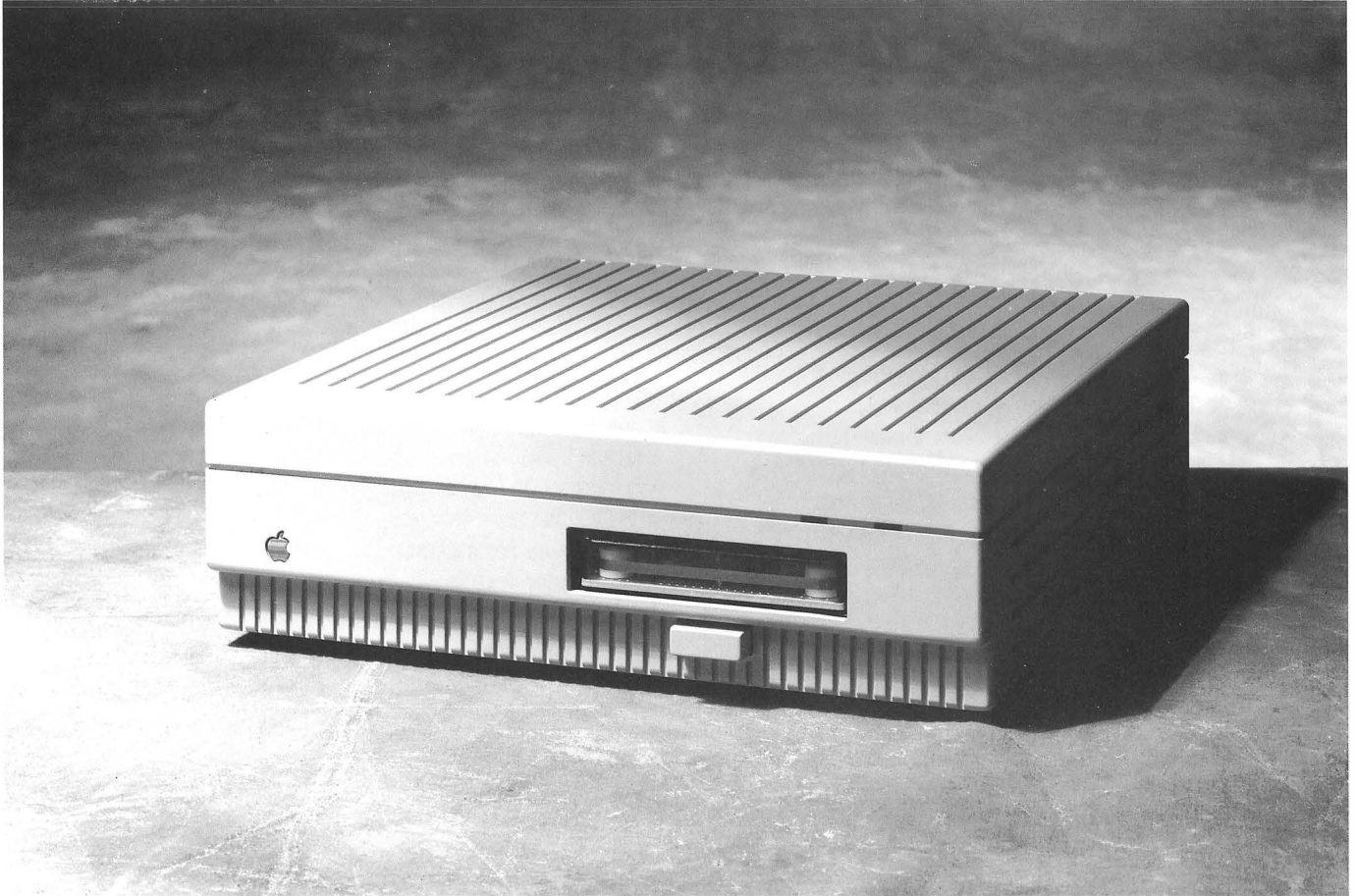
Order No. M0268

With your order, you'll receive:

- ▶ Macintosh Portable Internal 40SC Hard Disk
- ▶ Limited warranty statement
- ▶ Customer referral sheet

*Requires installation by an authorized Apple dealer.

Apple Tape Backup 40SC



Overview

With the Apple® Tape Backup 40SC, Macintosh™ personal computer owners now have a convenient, easy way to back up and restore critical data.

Since it uses removable tape cartridges—each of which provides 40 megabytes of backup storage—the Apple Tape Backup 40SC offers virtually unlimited

storage capacity. It is designed for use with all SCSI-based Macintosh systems that include a hard disk.

Features

Benefits

▶ 40 megabytes of backup storage per tape cartridge

▶ Offers virtually unlimited storage capacity for large quantities of data.

▶ Provides a more efficient backup method than using floppy disks.

▶ Furnishes 50 times the storage capacity of a single 800K disk.

▶ Flexible, easy-to-use program with Volume and File Backup/Restore options

▶ Lets you back up or restore all information in one simple operation.
▶ Lets you back up or restore individual files or small groups of files.
▶ Lets you back up hard disks unattended.

▶ Status dialog box

▶ Indicates volume, elapsed time, and percentage of backup complete.
▶ Lets you cancel the operation at any time.

▶ Preformatted QIC-100 ¼-inch cartridge tape

▶ Permits backup of an entire 20MB or 40MB hard disk in one operation.
▶ Saves up to 35 minutes in formatting time.

▶ Removable cartridges

▶ Improves data security.
▶ Provides archive storage for older files.

▶ Industry-standard Small Computer System Interface (SCSI)

▶ Offers compatibility with all Macintosh hard-disk-based systems.
▶ Lets you connect as many as six additional hard disks, tape backup systems, or other SCSI devices.
▶ Provides faster data transmission than a serial interface.

Technical Specifications

Recording media

- ▶ ¼-inch removable mini-cartridge (DC2000), preformatted

Capacity

- ▶ Formatted Capacity: 38.5 megabytes of fully-corrected data
- ▶ Block Size: 8,192 bytes
- ▶ Sectors/Tracks: 24; serpentine

Characteristics

- ▶ Data format: Industry-standard QIC-100 1/4-inch cartridge (8 kilobytes of user data, 4 kilobytes of data redundancy)
- ▶ Tape speed: 60 inches per second read or write; 90 inches per second search or rewind
- ▶ Transfer rate:
 - Burst mode: 1.25 megabytes per minute
 - Normal operation (volume mode): up to 1 megabyte per minute

- ▶ Volume backup time: Approximately 17 to 18 minutes per 20 megabytes

Backup software features*

- ▶ Volume (Image) backup: Allows users to back up an entire Hierarchical File System (HFS) disk volume.
- ▶ Volume (Image) restore: Restores an entire HFS disk volume from the tape containing a prior backup.
- ▶ File backup: Backs up individual files/folders. Includes option to back up only files that have changes since previous file backup.
- ▶ File restore: Restores files that have been backed up in File Backup mode.
- ▶ Formatting: Formats unformatted tape (35 minutes).
- ▶ Clear tape: Removes unnecessary files.

Interface

- ▶ Connects directly to the Macintosh Plus, Macintosh SE, or Macintosh II via system cable to a SCSI connector.

Electrical requirements

- ▶ Line Voltage: 85 to 270 volts
- ▶ Frequency: 47 to 64 hertz
- ▶ Maximum Power: 15 watts

Environmental requirements

- ▶ Operating Temperature: 50° to 90° F (10° to 35° C)
- ▶ Storing Temperature: -40° to 122° F (0° to 50° C)
- ▶ Relative Humidity: 20% to 80% (noncondensing)
- ▶ Altitude: 1,000 to 10,000 ft. (304 to 3,048 m)

Size and weight

- ▶ Height: 3.01 in. (78 mm)
- ▶ Width: 9.7 in. (246 mm)
- ▶ Depth: 10.5 in. (266 mm)
- ▶ Weight: 7.3 lbs. (3.3 kg)

* Compatible only with Macintosh's Hierarchical File System.



Apple Tape Backup 40SC

System Requirements

To use the Apple Tape Backup 40SC, you must have the following:

- ▶ A Macintosh Plus, Macintosh SE, Macintosh II
- ▶ An Apple Hard Disk 20SC, 40SC, or 80SC, or Macintosh Internal Hard Disk 20SC, 40SC, or 80SC

- ▶ A blank formatted tape cartridge (one is supplied with each Apple Tape Backup 40SC order)

You may also want to purchase a 5-pack of 40MB Tape Cartridges

Ordering Information

Apple Tape Backup 40SC

Order No. M2640

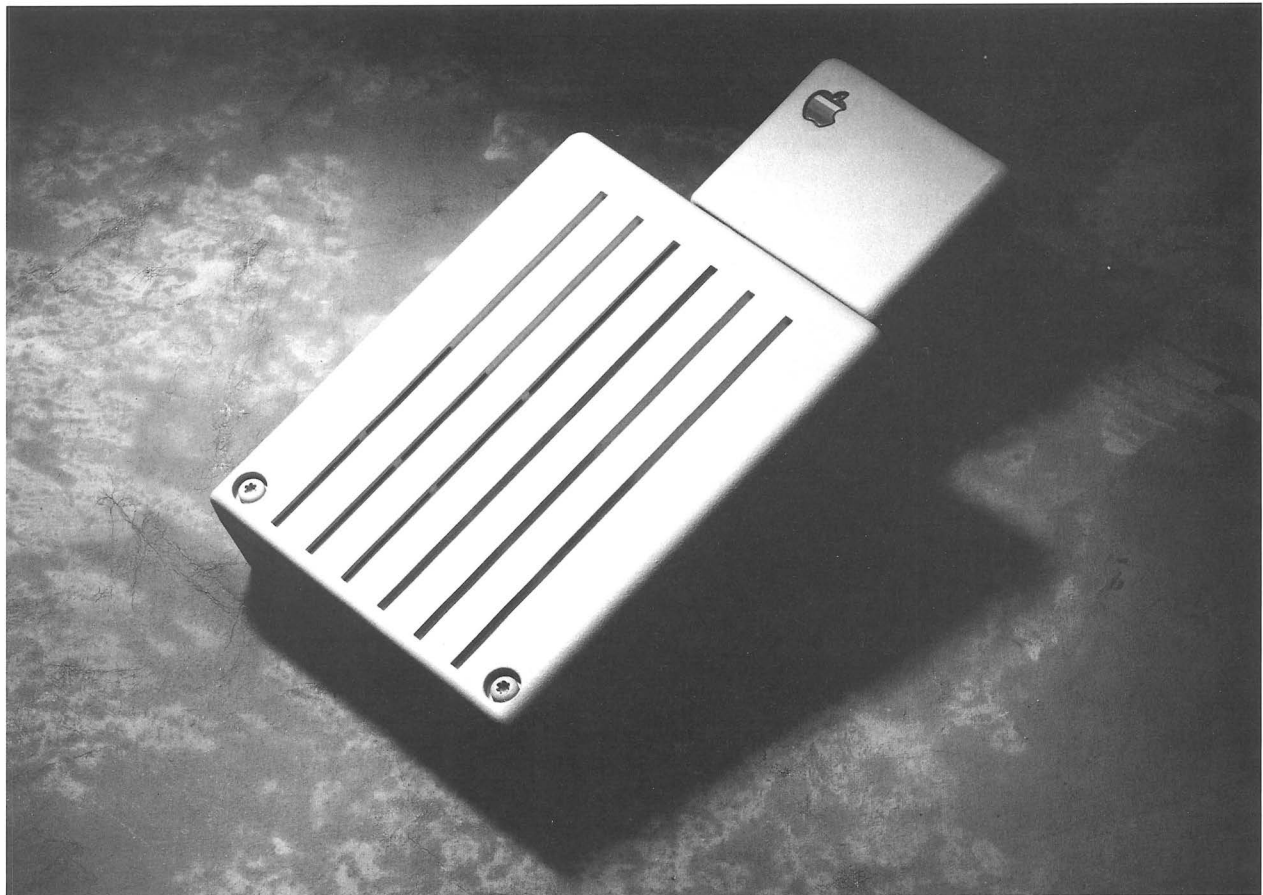
With your order, you'll receive:

- ▶ Apple Tape Backup 40SC
- ▶ One blank formatted tape cartridge
- ▶ Owner's guide
- ▶ Limited warranty statement

40MB Tape Cartridges

Order No. M0132

- ▶ 5-pack of tape cartridges



Overview

The Apple® Personal Modem is a compact, 1200/300-baud modem that provides a cost-effective data communications solution for any Apple personal computer system.

With the modem and appropriate software, your Macintosh™ or Apple II computer can communicate with other personal computers, minicomputers, and mainframes to send reports and graphs between offices, access data bases and commercial information services, find out the latest stock prices, or shop and bank from your own home.

Features

- ▶ Standard serial interface
- ▶ Compact design
- ▶ Compatibility with popular communications software
- ▶ Automatic dial, redial, and answer
- ▶ Variable transmission speeds
- ▶ Tone and pulse-phone compatibility
- ▶ Plain-language status messages

Benefits

- ▶ Works with any Apple system, or any other computer that has an RS-232 interface.
- ▶ Mounts directly onto a wall socket or power strip, saving valuable desk space.
- ▶ Packs into your luggage easily for convenient traveling.
- ▶ Works with MacTerminal™, Access II, and other Hayes-compatible programs.
- ▶ Saves time and effort.
- ▶ Operates at 1200 baud, or at any speed between 0 and 300 baud.
- ▶ Lets you get the information you need even when you don't have access to a tone-generating telephone system.
- ▶ Displays straight forward comments (such as "Connect," "Ringing," and "Busy, No Dial Tone") on your computer's screen; there's no need to consult a reference chart.



Apple Personal Modem

System Requirements

To use the Apple Personal Modem, you'll need one of the following systems:

- ▶ A Macintosh, Macintosh Plus, Macintosh SE, Macintosh II, Apple IIGs™, Apple IIc, Apple III, Macintosh XL, or Lisa® personal computer

- ▶ An Apple IIe, Apple II Plus, or Apple II personal computer with an Apple Super Serial Card (or other compatible serial interface)
- ▶ Any other computer with an RS-232 port

- ▶ The appropriate interface cable for your system
- ▶ A standard single-line telephone outlet with RJ-11 (modular) jack
- ▶ Appropriate communications software

Technical Specifications

Data format

- ▶ Protocol: Asynchronous
- ▶ Character length: 7 or 8 data bits; 1 or 2 stop bits
- ▶ Parity: Odd, even, mark, space, or none
- ▶ Mode: Full-duplex with echo back

Transmission speeds

- ▶ High: 1200 baud
- ▶ Low: 0 to 300 baud

Interface

- ▶ Type: RS-232-C
- ▶ Connector: Mini-circular 8-pin

Operating modes

- ▶ Auto or manual dial (including redial)
- ▶ Auto or manual answer

Receiver sensitivity

- ▶ -10 to -45 dBm

Transmitter level

- ▶ -10 dBm, fixed, as per FCC Part 68

Line monitoring

- ▶ Audible (volume is adjustable)
- ▶ Visual (prints status messages on computer's screen)

Connectors

- ▶ Two RJ-11 modular telephone jacks (one for phone line cable; one for optional telephone)
- ▶ One mini-circular 8-pin jack (for data cable)
- ▶ Detachable head with AC plug

Environmental requirements

- ▶ Operating temperature: 13° to 113° F (0° to 45° C)
- ▶ Storage temperature: -4° to 149° F (-20° to 65° C)

Size

Body

- ▶ Height: 4.25 in. (107.95 mm)
- ▶ Width: 3.25 in. (82.55 mm)
- ▶ Depth: 3.25 in. (82.55 mm)

Head

- ▶ Height: 1.75 in. (44.45 mm)
- ▶ Width: 2 in. (50.8 mm)
- ▶ Depth: .75 in. (19.05 mm)

Ordering Information

Apple Personal Modem

Order No. A9M0334

With your order, you'll receive:

- ▶ Apple Personal Modem
- ▶ Telephone cord with RJ-11 plugs
- ▶ "Solutions from Apple" packet (containing coupons for telecommunications products and services)
- ▶ Owner's guide
- ▶ "Tell Apple" response card
- ▶ Limited warranty statement

Apple System/ Peripheral-8 Cable

Order No. M0197

(for a Macintosh Plus, Macintosh SE, Macintosh II, or Apple IIGs)

Macintosh

Peripheral-8 Cable

Order No. M0196

(for a Macintosh 128K, 512K, or 512K Enhanced)

Apple IIc

Peripheral-8 Cable

Order No. A2C4313

(for an Apple IIc)

Apple IIe

Modem-8 Cable

Order No. A2C0312

(for an Apple IIe, Apple II Plus, Apple II, Apple III, Macintosh XL, Lisa, or other computer with an RS-232 port)



Macintosh Portable Data Modem 2400

System Requirements

To use the Macintosh Portable Data Modem 2400, you'll need the following:

- ▶ Macintosh Portable computer
- ▶ A standard single-line RJ-11 modular telephone jack
- ▶ Appropriate communications software, such as MacTerminal® (Consult your authorized Apple dealer for assistance in selecting the most appropriate application for your needs.)

Technical Specifications

Communications standards

- ▶ 300 bps Bell 103
- ▶ 1200 bps Bell 212A
- ▶ 1200 bps CCITT V.22
- ▶ 2400 bps CCITT V.22bis

Transmission speeds

- ▶ 2400 bps, 1200 bps, 300 bps

Dialing capability

- ▶ Tone/Pulse (dial)

Data format

- ▶ Protocol: serial binary, asynchronous
- ▶ Character length:
 - 7 data bits, 1 or 2 stop bits
 - 8 data bits, 1 stop bit
- ▶ Parity: Odd, even, mark, space, no parity
- ▶ Mode: Full duplex

Command set

- ▶ Supports a subset of the AT command set

Receiver dynamic range

- ▶ -10dBm to -43dBm

Transmitter level

- ▶ -10dBm (± 1 dBm)

Automatic adaptive equalization on receiver channel

- ▶ 3dBm improvement on SNR

Frequency tolerance

- ▶ ± 7 Hz

Operating modes

- ▶ Auto dial
- ▶ Auto or manual answer

Registration/Certification

- ▶ FCC Part 68
- ▶ Canadian DOC

Environmental requirements

- ▶ Ambient temperature: 50° to 122° F (10° to 50° C)

Electrical requirements

- ▶ + 5.2V/-5V, $\pm 5\%$ supplied by Macintosh Portable rechargeable battery
- ▶ Power consumption:
 - Operational mode: 750 milliwatt maximum, 525 milliwatt typical
 - Macintosh Portable sleep mode: 3 milliwatt maximum

Size and weight

- ▶ Height: .75 in. (1.9 cm)
- ▶ Width: 3 in. (7.62 cm)
- ▶ Depth: 4.875 in. (12.38 cm)
- ▶ Weight: 4 oz. (.114 g)

Ordering Information

Macintosh Portable Data Modem 2400

Order No. M0250

With your order, you'll receive:

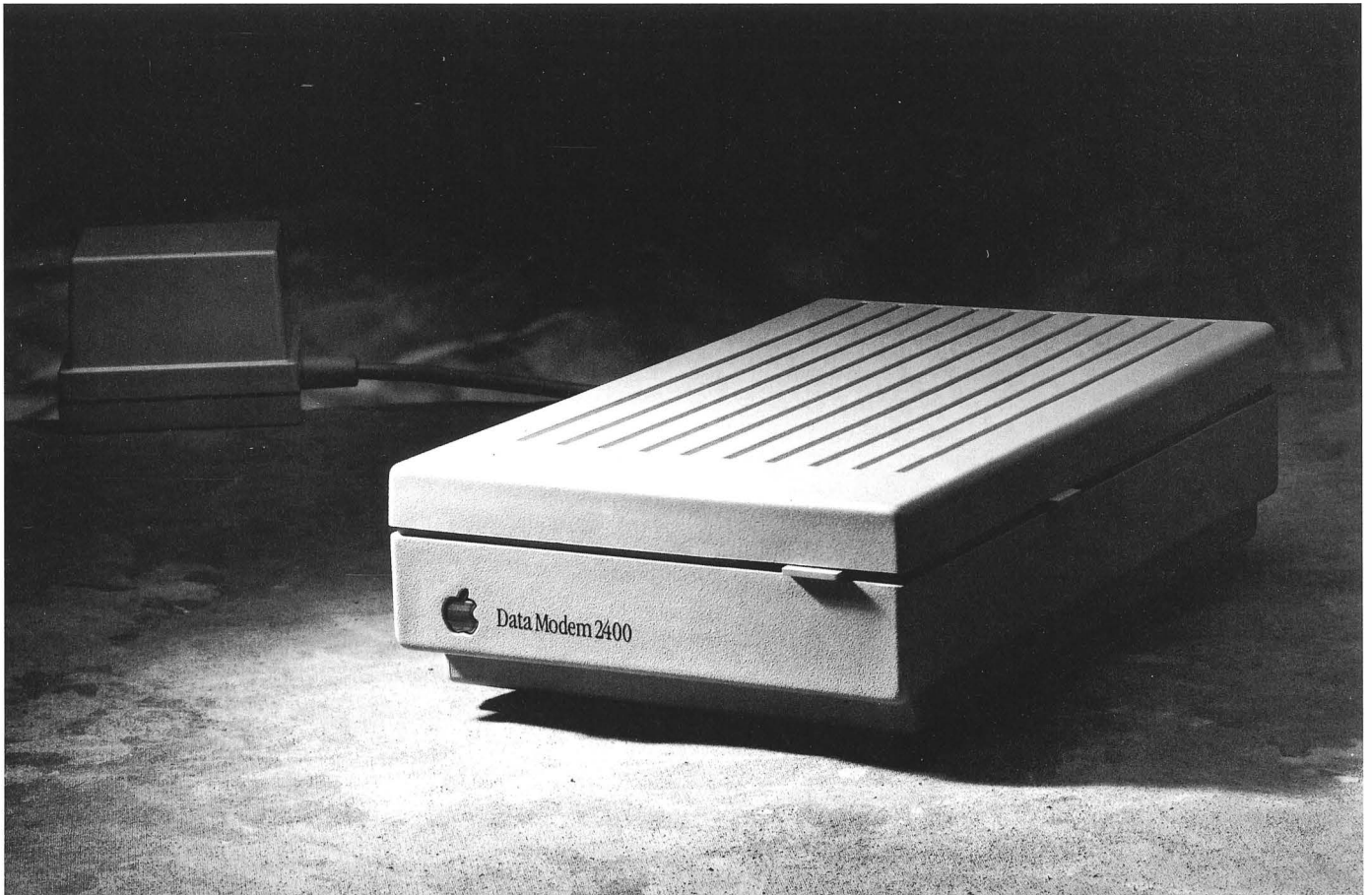
- ▶ Macintosh Portable Data Modem 2400
- ▶ Telephone cord with RJ-11 plug
- ▶ Owner's guide
- ▶ Limited warranty statement

Apple Computer, Inc.

20525 Mariani Avenue
Cupertino, CA 95014
(408) 996-1010
TLX: 171-576

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Apple Data Modem 2400



Overview

The Apple® Data Modem 2400 is a standard asynchronous 2400-bps modem that enables users to exchange information with other standard data modems. It can be used to communicate with other personal computers, mini-computers, and mainframes to send reports and graphs between offices; to access databases and

commercial information services; to find out the latest stock prices; or even to shop and bank from home.

The Apple Data Modem 2400 comes with a built-in feature called the Microcom Networking Protocol (MNP) Classes 1-4, which automatically corrects errors that occur while exchang-

ing information over the public telephone system. Its MNP capability allows the Apple Data Modem 2400 to provide fast and accurate data transmission, even over noisy or low-quality telephone lines, when communicating with another MNP-compatible modem.

Features

Benefits

▶ Standard modulation techniques: Bell 103, Bell 212A, CCITT V.22A/B, CCITT V.22bis

▶ Connects to any standard data modem.

▶ Error-correction protocol support: MNP Classes 1–4

▶ Guarantees error-free transmission when communicating with another MNP modem.

▶ Variable transmission speeds

▶ Automatically attempts to connect across a range of speeds—starting at 2400 bps, then moving to 1200 bps, and finally, to 300 bps.

▶ Supports Hayes AT command set with Microcom standard commands for controlling and customizing MNP

▶ Allows users to customize the performance of the modem.

▶ Speaker for monitoring call progress

▶ Allows the user to hear the dialing process and monitor the success or failure of the remote modem connection.

▶ Auto answer and dial

▶ Saves time and effort.

▶ Pass-through port

▶ Provides an expansion port for the connection of an additional serial device (such as a printer).

System Requirements

To use the Apple Data Modem 2400, you'll need the following:

- ▶ Any Macintosh® or Apple II computer (If you have an Apple II, Apple II Plus, or Apple IIe, you will also need an Apple Super Serial Card or other compatible serial interface.)

- ▶ The appropriate data cable to connect your modem to your Apple computer system
- ▶ A standard single-line RJ-11 modular telephone jack
- ▶ Appropriate communications software, such as MacTerminal® for Macintosh

systems or Access II for Apple II systems (Consult your authorized Apple dealer for assistance in selecting the most appropriate application for your needs.)

Technical Specifications

Communications standards

- ▶ 300 bps Bell 103
- ▶ 1200 bps Bell 212A
- ▶ 1200 bps CCITT V.22A/B
- ▶ 2400 bps CCITT V.22bis

Error control

- ▶ MNP Classes 1-4

Transmission speeds

- ▶ 2400 bps, 1200 bps, 300 bps

Dialing capability

- ▶ Tone/Pulse (dial)

Maximum serial speed

- ▶ 9600 bps (modem to computer)

Standard serial interface

- ▶ RS-422

Data format

- ▶ Protocol: Serial binary, asynchronous
- ▶ Character length: 7 or 8 bits; 1 or 2 stop bits
- ▶ Parity: Odd, even, no parity
- ▶ Mode: Full duplex

Command set

- ▶ Supports Hayes AT command set with Microcom standard commands for controlling and customizing MNP

Receiver dynamic range

- ▶ -10 dBm to -42 dBm

Transmitter level

- ▶ -10 dBm + 1 dBm

Registration/Certification

- ▶ FCC Parts 68 and 15J
- ▶ Canadian DOC

Frequency tolerance

- ▶ ± 7 Hz

Bit error rate

- ▶ Less than 1 in 10^6 on a 3002C line

Line monitoring

- ▶ Internal speaker with external volume control provided for monitoring call progress

Operating modes

- ▶ Auto or manual dial
- ▶ Auto or manual answer

Environmental requirements

- ▶ Temperature: 32° to 104° F (0° to 40° C)

Electrical requirements

- ▶ AC input (United States and Canada) 110V $\pm 10\%$, 60 Hz
- ▶ Power consumption: 7 watts maximum

Size and weight

- ▶ Height: 2 in. (5.1 cm)
- ▶ Width: 4.75 in. (11.6 cm)
- ▶ Depth: 8 in. (20.0 cm)
- ▶ Weight: ~1 lb. (.45 kg) excluding transformer



Apple Data Modem 2400

Ordering Information

Apple Data Modem 2400

Order No. C0002LL/A

With your order, you'll receive:

- ▶ Apple Data Modem 2400
- ▶ Telephone cord with RJ-11 plug
- ▶ AC adapter (power supply)
- ▶ Owner's guide
- ▶ Limited warranty statement

You will need to purchase appropriate communications software (consult your authorized Apple dealer) and one of the following:

Apple System/Peripheral-8 Cable (for the Macintosh family of personal computers (except the Macintosh 512K), and the Apple IIGs® and Apple IIc Plus computers)

Order No. M0197

Macintosh Peripheral-8 Cable (for Macintosh 512K computers)

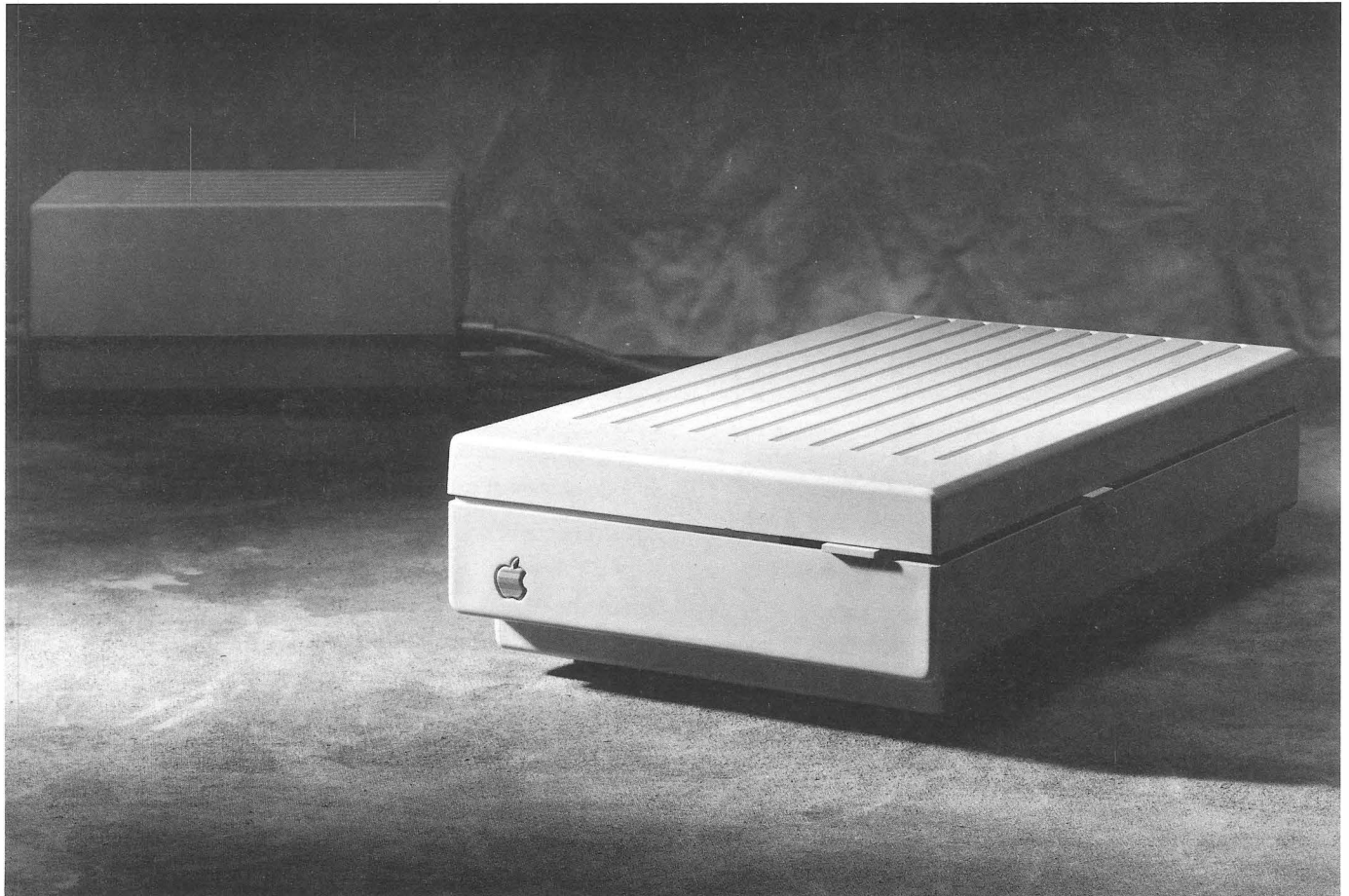
Order No. M0196

Apple IIc Peripheral-8 Cable (for Apple IIc computers)

Order No. A2C4313

Apple IIe Modem-8 Cable (for Apple II, Apple II Plus, and Apple IIe computers, including those that have had the Apple IIGs upgrade)

Order No. A2C0312



Overview

The AppleFax™ Modem is your personal link to the worldwide installed base of facsimile machines. Not only does it give you a convenient way to send fax files to—and receive them from—virtually any standard facsimile machine, it also lets you exchange data files with other Apple® Macintosh® computers equipped with AppleFax Modems—at speeds up to four times faster than standard 2400-baud modems.

Features

- ▶ Compatibility with Group 3 facsimile machines (virtually all installed fax machines)
- ▶ Rapid Macintosh file transfer (9600 bits per second)
- ▶ AppleFax Resource utility
- ▶ AppleFax application program that includes:
 - “Mail” and “envelope” desktop icons
 - Multiple file transmission
 - Address Book
 - Distribution List
 - Timed transmissions

Benefits

- ▶ Gives you a link to the growing worldwide network of more than three million facsimile machines.
- ▶ Lets you exchange Macintosh files with other Macintosh computers equipped with AppleFax Modems, up to four times faster than standard 2400-baud modems.
- ▶ Makes sending and receiving transmissions as easy as using your printer.
- ▶ Lets you send and receive transmissions with easy point-and-click commands.
- ▶ Lets you send multiple files to one address by simply adding files to an “envelope.”
- ▶ Lets you send one or more files to multiple locations as easily as sending a single envelope.
- ▶ Permits unattended transfer of fax files while application is running.



AppleFax Modem

Features/Benefits (continued)	▶ Letter-quality fonts	▶ Delivers higher-quality transmissions to facsimile machines than those originating from standard fax machines.
	▶ Pass-through port	▶ Lets you daisy-chain any peripheral device, such as the Apple Personal Modem, to a single serial port.

System Requirements	To use the AppleFax Modem, you will need:	▶ A Macintosh Plus, Macintosh SE, or Macintosh II computer	▶ A standard single-line telephone outlet with RJ-11 (modular) jack
		▶ An Apple System Peripheral-8 Cable (Order No. M0197)	

Technical Specifications	Data format	Operating modes	Connectors
	<ul style="list-style-type: none"> ▶ Protocol: asynchronous ▶ Compatible with Group 3 fax machines ▶ Character length <ul style="list-style-type: none"> —7 or 8 data bits —1 or 2 stop bits ▶ Parity: odd, even, or none ▶ Mode: half duplex 	<ul style="list-style-type: none"> ▶ Auto or manual dial ▶ Auto or manual answer 	<ul style="list-style-type: none"> ▶ Two RJ-11 modular telephone jacks (one for phone-line cable, one for optional telephone) ▶ Two minicircular 8-pin jacks (data cable and pass-through device)
	Transmission speeds	Receiver sensitivity	Environmental requirements
	<ul style="list-style-type: none"> ▶ 9600 bits per second (bps) ▶ 7200 bps ▶ 4800 bps ▶ 2400 bps (V.29 and V.27 ter) 	<ul style="list-style-type: none"> ▶ -10 to -40 dBm 	<ul style="list-style-type: none"> ▶ Operating temperature: 50° to 104° F (10° to 40° C) ▶ Storage temperature: -40° to 117° F (-40° to 47° C)
	Interface	Transmitter level	Size
	<ul style="list-style-type: none"> ▶ Connector: minicircular 8-pin 	<ul style="list-style-type: none"> ▶ -10 dBm, fixed as per FCC Part 68 	<ul style="list-style-type: none"> ▶ Height: 2.0 in. (5.0 cm) ▶ Width: 4.75 in. (12.0 cm) ▶ Depth: 7.875 in. (20.0 cm)
		Line monitoring	
		<ul style="list-style-type: none"> ▶ Audible (volume is adjustable) ▶ Visual (status messages printed on computer screen) 	

Ordering Information	AppleFax Modem Order No. M0177	With your order, you'll receive:	▶ AppleFax Resource utility
		<ul style="list-style-type: none"> ▶ AppleFax Modem ▶ Telephone cord with two RJ-11 jacks ▶ AppleFax application software 	<ul style="list-style-type: none"> ▶ Three LQ Fonts disks ▶ Owner's guide ▶ Limited warranty statement
	Apple System Peripheral-8 Cable	Order No. M0197	



Overview

If you want to find out how to get peak performance from your Apple® computer system, get together with the people who have the answers: Apple User Groups.

User groups are organizations of people who want to enhance their computer enjoyment and proficiency by sharing information, support, and insights. Wherever you are and whatever your interests, there's probably an Apple User Group nearby.

If you're already active in a user group—or want to start one—Apple can offer support through the User Group Connection, an organization dedicated exclusively to the Apple User Group community.

Features

- ▶ Wide variety of general-interest and specialized groups
- ▶ More than 1,000 groups in the United States
- ▶ Apple support
- ▶ Access to training and technical support
- ▶ Access to up-to-date product information

Benefits

- ▶ Meets the needs of nearly everyone—from novice to advanced users—including users in communities, universities, K-12 schools, government agencies, and corporations.
- ▶ Provides you with a wealth of experience in one convenient source.
- ▶ Makes it likely that there's a user group near you.
- ▶ Gives user groups the resources they need to help their members.
- ▶ Provides a conduit between you and the experts at Apple.
- ▶ Helps you maximize the use of your Apple computer.
- ▶ Keeps you informed about the newest and most popular hardware and software products.



Apple User Groups

Program Details

Shared Knowledge

The main benefit of Apple User Groups is that they provide an open forum for questions, answers, and ideas. Most user groups accomplish this by holding regular meetings and publishing newsletters. In addition to getting help with specific problems, you'll enjoy user group meetings for the sheer enthusiasm and mental stimulation members offer, and you'll learn how to use your Apple II or Macintosh® computer to its fullest.

User groups typically support special-interest groups, conduct seminars, provide public-domain software libraries, and maintain on-line bulletin board systems to answer members' questions and keep them apprised of the latest Apple-oriented news.

Many user groups have formed within corporations, government agencies, and universities. These groups usually cater to the specific work-related needs and interests of members.

User groups have a long-standing and well-deserved reputation as friendly havens for computer users of all skill levels. If you are a novice, and have questions about your new system, you can be sure that someone else has been through the same thing—and probably has the answer you need.

Software Resource

User groups are an excellent source of information about software. Publishers often demonstrate new products at user group meetings. More experienced users can give you advice about the best packages for your specific needs. And user groups generally maintain collections of demonstration software and public-domain (noncopyrighted) software.

Support from Apple

By registering with the Apple User Group Connection, your group will become eligible for the following valuable support services.

AppleLink. User groups have their own bulletin board on AppleLink®, Apple's electronic mail and information system. AppleLink has specific folders in which you can discuss questions about hardware, software, and peripherals with Apple, developers, and other user groups. Information about new Apple and third-party products is routinely uploaded to AppleLink. You'll also find conference announcements, classified ads, and much more.

Regular communications. Your user group will receive regular mailings from the User Group Connection, including such

items as data sheets for new products, technical notes, and development hints. The bimonthly *Quick Connect* newsletter and a quarterly videotape will keep you in touch with news from Apple and from other user groups.

System software updates. User groups can become licensed distribution agents for Apple system software, so your group's members will be able to get the latest Macintosh or Apple IIgs® system software easily.

Special purchase programs. Your user group will be eligible for discounts on select Apple products to enhance your group's services, such as producing a newsletter or maintaining an electronic bulletin board system.

Forums. Apple sponsors events that bring together user group leaders and members to discuss issues of importance to the user group community.

Speaker assistance. Registered Apple User Groups receive notices about Apple and third-party representatives who are available to speak about new products or other issues. You can also post requests for speakers on AppleLink.

Additional Information

To get more information about the Apple User Group nearest you, groups specializing in a certain subject, or how to start a new group, call 1-800-538-9696, extension 500. Or write to:

The Apple User Group Connection
Apple Computer, Inc.
20525 Mariani Avenue, M/S 36AA
Cupertino, CA 95014

Apple Computer, Inc.

20525 Mariani Avenue
Cupertino, CA 95014
(408) 996-1010
TLX: 171-576

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LF/FRY1 50K C0166LL/A

AppleCare and AppleCare Plus



Overview

AppleCare® is a flexible extended service agreement for your Apple® computer systems and peripheral products.

By purchasing AppleCare coverage, which takes effect after your initial limited warranty expires, you can obtain an unlimited

number of repairs (costs for both parts and labor are covered) on the designated equipment—at an annual cost typically less than that of one uncovered repair.

With the AppleCare Plus program, you'll also receive system software updates direct

from Apple Computer. AppleCare Plus is available only for Apple IIcs® computers and most members of the Macintosh® family of computers.



AppleCare and AppleCare Plus

Features and Benefits

Features

Benefits

- | | |
|---|--|
| ▶ Cost-effective | ▶ Costs less per year than the price of a typical single repair.
▶ Lets you lock in repair costs for up to three years at a time (up to one year with AppleCare Plus). |
| ▶ Comprehensive | ▶ Covers replacement parts and labor for an unlimited number of repairs during the coverage term. |
| ▶ Flexible | ▶ Allows you to cover exactly the equipment you designate; you don't have to buy more coverage than you need.
▶ Lets you purchase coverage for a period of 2 to 36 months (fixed 12-month periods with AppleCare Plus). |
| ▶ Convenient | ▶ Provides repair service at any authorized Apple dealer in the United States. |
| ▶ Coverage transferable to new owner | ▶ Increases the value of your used equipment. |
| ▶ System software updates (AppleCare Plus only) | ▶ Brings you the latest Apple IIgs or Macintosh system software for an entire year (renewable). |
| ▶ Volume purchase discounts | ▶ Saves money when you need to cover multiple systems. |

Product Details

AppleCare

AppleCare extended service coverage is available for all Apple systems and accessories. For instance, you can obtain service agreements for any Apple II, Apple III, Lisa,® and Macintosh system, as well as for accessories such as Apple printers, monitors, external disk drives, modems, scanners, and CD-ROM drives. (Internal devices are covered under the AppleCare agreement for the computer.)

You choose exactly what equipment will be covered. For instance, you might decide to obtain AppleCare coverage only

for heavily used peripherals such as shared printers or file-server hard disks.

A unique convenience feature of AppleCare is the stick-on label provided for each piece of covered equipment. This label contains all the information about your AppleCare agreement that your Apple reseller needs; you don't need to have any additional paperwork with you when you take an item in for servicing. This feature makes AppleCare especially easy to use if a problem comes up when you're traveling with your equipment.

AppleCare Plus

AppleCare Plus offers you the full benefits of AppleCare extended service coverage for your Apple hardware, and the convenience of receiving the latest system software as soon as it's released. This ensures that you'll always have the right software to get peak performance from your Apple systems.

AppleCare Plus is available only in conjunction with AppleCare coverage for Apple IIgs, Macintosh Plus, Macintosh SE, and Macintosh II computers.

Ordering Information

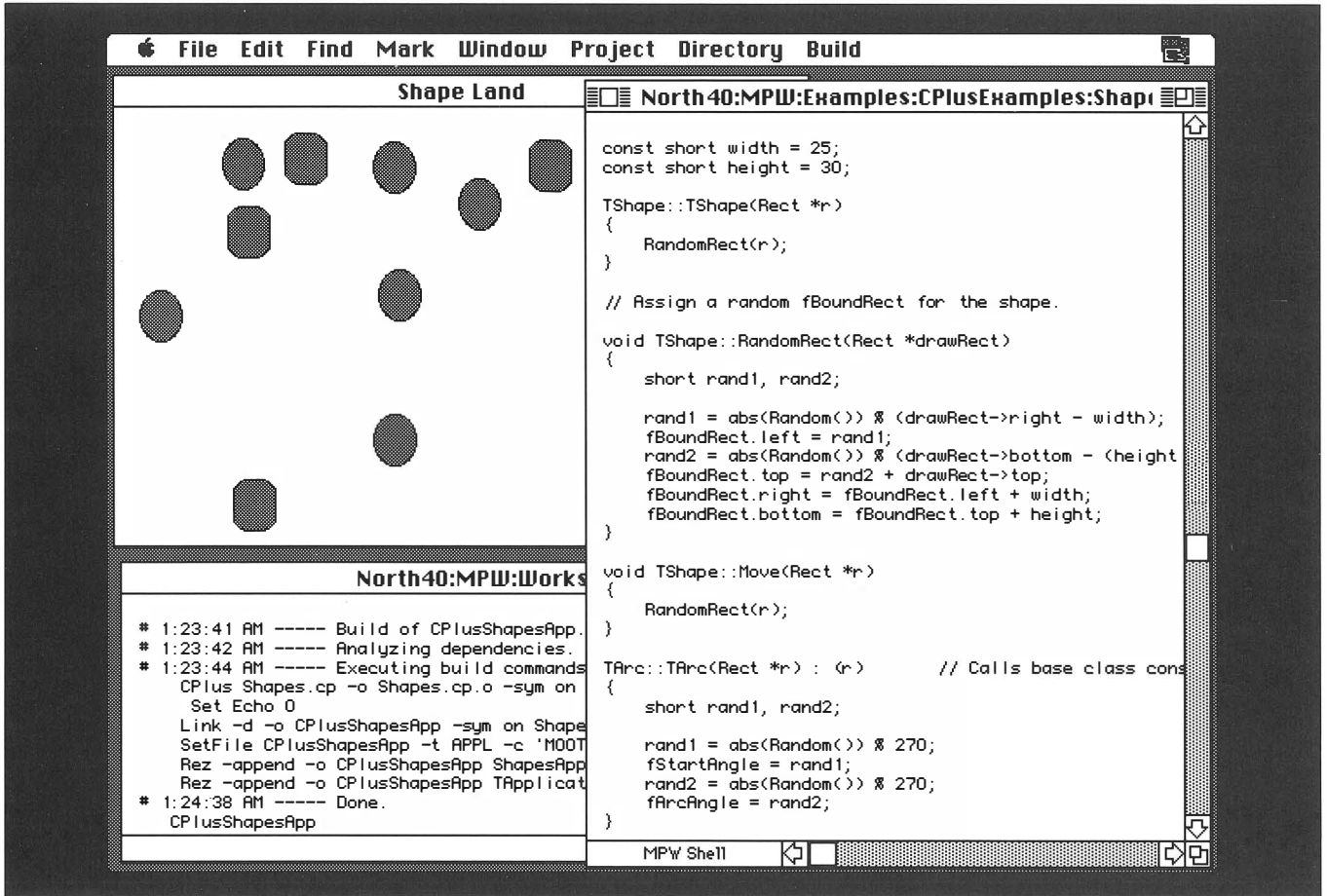
To order AppleCare or AppleCare Plus, see your authorized Apple reseller. To obtain the name of

your nearest reseller, call 1-800-538-9696.

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LF/FRY1 50K C0165LL/A



Overview

C++ is the latest object-oriented programming language available for use with the Macintosh® Programmer's Workshop (MPW™) development environment.

Apple's implementation fully supports the industry standard for object-oriented C as defined by AT&T's C++ Release 2.0. Apple has extended the language to support the Macintosh Toolbox

and operating system, Object Pascal-based functions and procedures (such as those found in MacApp®), and the Standard Apple Numerics Environment (SANE®). MPW C++ can be debugged at the C++ source level using Apple's Symbolic Application Debugging Environment (SADE™). Applications built using MPW C++ can be compiled to run on the complete line of Apple® Macintosh

personal computers, or to take advantage of the powerful hardware found in the high-end Macintosh models.

MPW C++ provides full support for object-oriented programming for C-based applications. The use of object-oriented programming techniques helps to reduce development time while increasing the reliability of the resulting applications.

Features

Benefits

▶ Support for object-oriented programming

- ▶ Reduces development time.
- ▶ Makes it easier to maintain applications.
- ▶ Increases the reliability of applications.
- ▶ Facilitates the creation of reusable code.
- ▶ Offers a better model for building applications than procedural programming can provide.

▶ Based on AT&T Release 2.0 C++

- ▶ Provides data abstraction, multiple inheritance, and message-passing capabilities.
- ▶ Offers operator overloading and protected variables within classes.
- ▶ Provides strong type-checking for C-based applications.

▶ Extensions for the Macintosh environment

- ▶ Supplies full access to the Macintosh Toolbox and operating system.
- ▶ Supports Object Pascal functions and procedures, for compatibility with MacApp.
- ▶ Provides access to SANE for numerical accuracy.
- ▶ Supports SADE for source-level debugging.
- ▶ Includes Apple's Commando interface for ease of use.

▶ CFront tool is integrated with MPW C

- ▶ Includes the MPW C scanner and preprocessor.
- ▶ Allows MPW C++ to produce tokenized C resulting in reduced build times.

▶ Support for multilingual Applications

- ▶ Lets you call Object Pascal functions and procedures from MPW C++.
- ▶ Allows C++ to be used with MacApp, further enhancing the programmer's productivity.

▶ Sample programs

- ▶ Provides examples of two stand-alone, MultiFinder-compatible applications.
- ▶ Provides an example of an MPW tool that is written in C++.
- ▶ Can be used as a learning aid or as the foundation for actual applications and tools.

Product Details

Object-Oriented Language Extensions

The MPW C++ system offers object-oriented programming to programmers using C. Multiple inheritance, operator overloading, and protected variables and members within classes are but a few of the object-oriented facilities of MPW C++.

C++ Translator

C++ source code is translated to C source code by the CFront tool. The resulting C source code is then compiled by MPW C. All of this is "automated" by CPlus, an MPW script provided with MPW C++. CPlus calls both CFront and MPW C, passing appropriate parameters. This results in a complete compilation of C++ source code.

MPW C++ uses the same preprocessor and scanner as MPW C. This allows MPW C++ to output tokenized C source code (as well as "standard" C source code), that reduces the build times typically associated with C++.

MPW C is available from the Apple Programmers and Developers Association (APDA™).

Source Level Debugging

MPW C++ works with Apple's Symbolic Application Debugging Environment (SADE). SADE can be used at either the source or the assembly level to debug

applications and MPW tools. During compilation, MPW C++ can create the symbol files that are needed by SADE to debug C++ applications at the C++ source code level. This allows the powerful scripting language of SADE to be harnessed by C++ programmers during the development cycle, to further increase application reliability and decrease development time.

SADE is available from APDA.

Libraries

MPW C++ includes libraries for complex math and I/O stream processing. Apple has completely redone the Complex library. It retains the functionality of AT&T's Complex library and expands on it, using SANE as the basis for superior numerical accuracy.

Unmangler

Error messages produced while linking C++-based files can be very cryptic. MPW C++ comes with a tool for converting these "mangled" error messages into messages that are much easier to read. Also included is a resource for use with the MacsBug that allows MacsBug debugger to unmangle C++ function names.

Sample Programs

Three sample programs are included with MPW C++. Two of them are complete Macintosh applications and the third is a counting tool for MPW. These samples make excellent starting points for the development of other applications and tools.

C++ and MacApp

MacApp provides an object-oriented framework that implements the standard Macintosh user interface, including scrollable, resizable windows and multipage printing. MacApp fosters development of robust, professional-quality applications by providing you with extensive memory management support, exception-handling mechanisms, support for "undo" commands, and a large body of ready-to-use, high-quality code that can be inherited by your application.

A future release of MacApp will allow programmers to use C++ in place of Object Pascal. This will be accomplished through the use of special C++ interface files, since MPW C++ can call Object Pascal-based procedures and functions. These special interface files will be offered separately.

For more information on MacApp, refer to the MacApp data sheet (order number M0243LL/A) or contact APDA.

Training and Support

Apple offers courses in C++ programming. For details, please contact:

Registrar
Apple Developer University
20525 Mariani Avenue, M/S 75-2B
Cupertino, CA 95014
(408) 974-6215
AppleLink®: DEVUNIV



Macintosh Programmer's Workshop C++

System Requirements

To use MPW C++ you will need the following:

- ▶ An Apple Macintosh Plus, Macintosh SE, or Macintosh II personal computer with at least 2 MB RAM (4 MB or more highly recommended). A 68020 or 68030 microprocessor is recommended.

- ▶ A hard disk
- ▶ Macintosh system software 6.0.2 or later
- ▶ MPW v.3.0 or later
- ▶ MPW C v.3.0 or later

Ordering Information

MPW C++ v.3.1B1
APDA Order No. M0346LL/A

With your order, you'll receive:

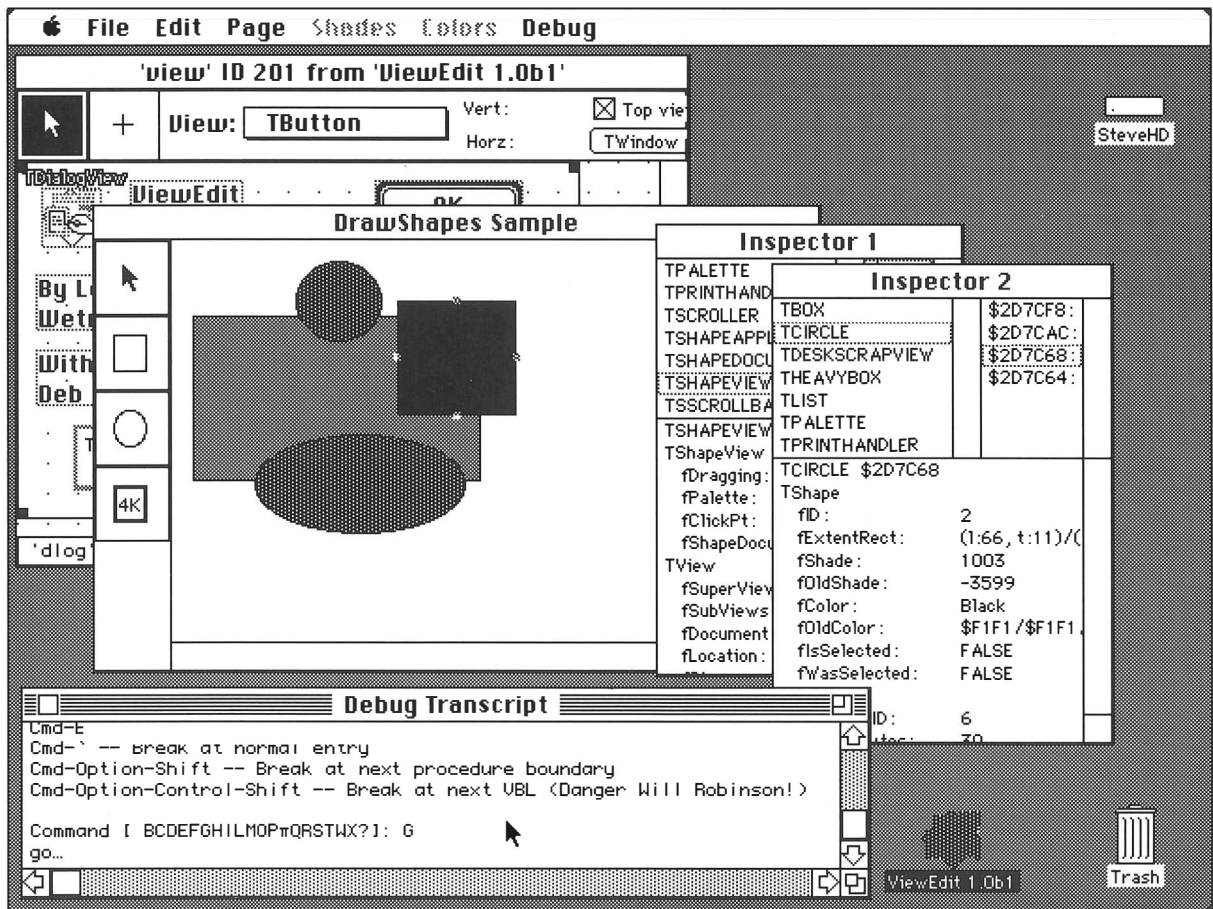
- ▶ Two disks containing the Macintosh Programmer's Workshop C++ translator, C++ interfaces and libraries, an unmangler for CFront error messages, and sample programs.

- ▶ *Macintosh Programmer's Workshop C++ Reference*
- ▶ *AT&T C++ Release 2.0 Product Reference*
- ▶ *AT&T C++ Release 2.0 Library Manual*
- ▶ *AT&T C++ Release 2.0 Selected Readings*

Apple Programmers and Developers Association

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AppleLink®: APDA
CompuServe: 766,2045
MCI: Postrom
Fax: (408) 562-3971
GEnie: A.DEVELOPER3



Overview

MacApp® Version 2.0B9—the beta release of Apple's second-generation object-oriented Macintosh® application framework—is ideal for programmers who wish to develop robust, user-friendly professional applications.

MacApp helps you work more productively. Your application can "inherit" the behavior of a standard Macintosh application directly from MacApp code and you can then override the parts you wish to customize. With MacApp and less than a page of your own code, you can have a

complete Macintosh application that creates windows, interprets mouse clicks, handles desk accessories, prints files, and supports every other standard feature a Macintosh application is likely to have.

The applications you create with MacApp can run on any Macintosh Plus, Macintosh SE, or Macintosh II computer. If the code you add follows Apple's compatibility guidelines, your applications will run under both the Macintosh and the A/UX® operating systems (and will provide MultiFinder™ compatibility under the Macintosh operating system).

MacApp has been used by companies such as Activision, Farallon, and Odesta to develop commercial applications for networking and communications, accounting, report generation, geographical data display, CAD, optical character recognition, knowledge engineering, and geology. The productivity and maintainability of MacApp application development have proven valuable to custom in-house software developers such as Peat Marwick Main & Co.

Features

Benefits

-
- | | |
|--|--|
| ▶ Standard Macintosh user interface | ▶ Manages menus.
▶ Supports “undo” commands.
▶ Provides extensive support for exception handling.
▶ Allows multipage printing.
▶ Supports desk accessories.
▶ Supports scrolling, zooming, and opening and closing of windows. |
| ▶ Strict adherence to Apple compatibility guidelines | ▶ Simplifies the task of creating applications that will be compatible with future hardware and system software. |
| ▶ MultiFinder support | ▶ Allows your MacApp applications to run in the background. |
| ▶ Improved “view” architecture | ▶ Offers a simple, powerful view class hierarchy.
▶ Uses view resources that can be created and edited with the new ViewEdit tool.
▶ Includes optional 32-bit view coordinates to let you work with large views. |
| ▶ New TGridView view class | ▶ Supports one-dimensional lists and two-dimensional grids of views (for use in applications such as spreadsheets). |
| ▶ Support tools | ▶ ViewEdit, the new WYSIWYG graphical window and dialog-box design tool, speeds design of your views.
▶ An integrated object-oriented debugger speeds debugging.
▶ A new Object Inspector lets you examine objects.
▶ An improved build tool makes building your program easier and faster. |
| ▶ Six sample programs | ▶ Can be used as learning aids or as the foundation for actual programs.
▶ Includes complete source code. |

Product Details

The MacApp object-oriented framework includes a class library, support tools, and sample MacApp programs. Manuals for beginners as well as experts are available separately.

MacApp provides a general structure that implements the standard Macintosh interface, including scrollable, resizable windows and multipage printing. MacApp fosters development of robust, professional-quality applications by providing you with extensive memory management support, exception-handling mechanisms, support for "undo" commands, and a large body of ready-to-use, high-quality code that can be inherited by your application.

MacApp code works with all current Macintosh hardware and system software, including MultiFinder and A/UX. The MacApp code adheres strictly to Apple's compatibility guidelines, so it greatly simplifies the task of ensuring that an application will be compatible with future hardware and system software products from Apple.

MacApp is already multi-lingual, and will become even more so in future releases. Applications using MacApp must be written at least partially in Object Pascal; this object-oriented code can call routines written in any MPW™ (Macintosh Programmer's Workshop) language, including standard Pascal, assembly language, and C. The next release of MacApp will allow programmers to use C++ in place of Object Pascal.

Note that MacApp is a framework for *applications* only. MacApp is not the appropriate tool for building other sorts of programs. It cannot be used to create device drivers, desk accessories, or HyperCard® XCMDs, for example.

The Class Library

MacApp 2.0 has 72 classes that together handle standard user-interface features of Macintosh applications in a manner that adheres strictly to Apple's user-interface guidelines. Features handled by MacApp include multiple documents, pull-down menus, desk accessory support, printing, and window manipulations such as scrolling, moving, resizing, and zooming. A framework is provided to make it easier for the programmer to support other standard user-interface features, such as undo, cut, copy, and paste. MacApp also contains an extensive error-handling system that presents detailed error messages to an application's user.

Support Tools

► *ViewEdit*. This MacApp utility program allows you to use a WYSIWYG editing environment to create windows and dialog boxes. ViewEdit allows you to draw, resize, and move your views using the standard Macintosh interface. It even creates and rearranges your view hierarchies as you go.

► *MABuild*. MABuild is an MPW tool that controls the building of an application from its source files. This latest version is faster, smarter, and more flexible than in previous releases. For example, it has many more defaults, so relatively simple applications (including most of the sample programs included with MacApp) no longer require an MPW "make" file.

► *MacApp debugger*. The MacApp debugger provides all the usual debugging features, such as breakpoints, stack crawl, trace, and single step. The MacApp Version 2.0 debugger provides faster tracing, built-in commands for controlling MPW performance-monitoring tools, and new context-sensitive on-line help. Now you can also

switch into MultiFinder to examine source code while your application is stopped in the debugger.

► *Object Inspector*. Debug versions of MacApp 2.0 applications allow you to open one or more Object Inspector windows. An Inspector window can display the current values of the fields of any object. Since you can have multiple Inspector windows open, you can inspect several objects at one time. The Object Inspector can display the contents of Macintosh Toolbox data structures as well as MacApp objects.

Sample Programs

Six sample programs are included with MacApp. These are complete Macintosh applications that demonstrate many features, including windows that users can move, resize, scroll, and zoom; multiple documents; the Clipboard; cut, copy, and paste; disk-based documents; font changes; multiple views; undo commands; modal and modeless dialog boxes; and printing. Many developers have used these samples as starting points for applications, modifying and expanding a sample until it evolves into a new application.

The six sample programs are as follows:

► *Nothing* has only 70 lines of code, yet it can open multiple windows, show the Clipboard, do manual and automatic scrolling, print, and support desk accessories.

► *Calc* demonstrates the use of the TGridView class in a simple spreadsheet application.

► *DemoText* demonstrates the use of styled text.

► *DemoDialogs* shows a variety of dialog boxes.

► *DrawShapes* is a simple drawing application.

► *Cards* is a note-card application that demonstrates the use of disk-based data.



MacApp

Product Details cont.

Training and Support

Apple offers a one-week course titled "MacApp and Object-Oriented Programming."

For details, please contact:

Apple Developer
University Registrar
20525 Mariani Avenue
M/S 51M
Cupertino, CA 95014
(408) 974-6215

AppleLink®: DEVUNIV
The independent MacApp Developer's Association offers

a number of useful products and a monthly newsletter. You can contact the group at:

MacApp Developer's Association
P.O. Box 23
Everett, WA 98206
(206) 252-6946
AppleLink: X0501

Licensing

To ship applications built using MacApp, you must obtain a license from Apple; an

application form is included with the product. After paying a nominal annual license fee, you may ship any quantity of any number of MacApp applications for use on the Macintosh.

For further information, please contact:

Apple Computer
Software Licensing
20525 Mariani Avenue
M/S 38I
Cupertino, CA 95014

System Requirements

To develop MacApp applications, you will need the following:

- ▶ An Apple® Macintosh Plus, Macintosh SE, or Macintosh II computer with at least 2 megabytes of RAM and 128K of ROM
- ▶ A hard disk

- ▶ Macintosh Programmer's Workshop Version 3.0
- ▶ Macintosh Programmer's Workshop Pascal Version 3.0
- ▶ Macintosh Programmer's Workshop Assembler Version 3.0

Ordering Information

MacApp and related products are available from the Apple Programmers and Developers Association (APDA™) at the address listed below.

- ▶ **MacApp Version 2.0B9.** Six disks containing MacApp library source code, sample programs, and support tools. APDA Order No. M7022/A
- ▶ **Introduction to MacApp 2.0 and Object-Oriented Programming.** Describes the concepts behind object-oriented programming and MacApp, and

- contains an overview of the structure of MacApp and instructions for using the MacApp tools. APDA Order No. M0300LL/A
- ▶ **MacApp 2.0 Tutorial.** Provides step-by-step instructions for installing MacApp and creating a functional sample program; source code for that program is included on an accompanying disk. APDA Order No. M0303LL/A

- ▶ **MacApp 2.0 Cookbook.** A collection of "recipes" for performing typical functions such as opening windows and creating documents. APDA Order No. M0299LL/A
- ▶ **MacApp 2.0B9 Source Listings.** Contains printed, cross-referenced listings of the MacApp v.2.0B9 source code, and listings of MacApp sample programs. APDA Order No. M6021/A

Auxiliary Products

The following products are also available from ADPA:

- ▶ **Object-Oriented Programming for the Macintosh,** by Kurt J. Schmucker. Published by Hayden Book Company, and available in many bookstores.

- ▶ **MacApp Browser.** A desk accessory created by the MacApp Developer's Association that allows you to browse through the source code in the MacApp class hierarchy, as well as any source code that you create.

- ▶ A selection of four disks (sold separately) from the MacApp Developer's Association. Contains complete sample applications, source code fragments, and MPW tools and shell scripts.

Apple Programmers and Developers Association

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GEnie: A.DEVELOPER3

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June 1989. Product specifications are subject to change without notice. Printed in U.S.A.
M0243LL/A