



PATHWORKS™ for Macintosh®

MacX™ User's Guide



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MacX™ User's Guide

Apple Computer, Inc.

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Preface

The *PATHWORKS for Macintosh: MacX User's Guide* describes how to use MacX™, an X Window System server developed by Apple Computer for the Macintosh® family of computers. The Preface summarizes what you'll find in the *MacX User's Guide*, gives suggestions for using the guide, and presents a road map that shows how the different parts of the guide fit together. The Preface also tells you how to find more information about the X Window System, DECwindows™, programming in the X environment, and using MacX with different operating systems.

About this guide

The *PATHWORKS for Macintosh: MacX User's Guide* is a special edition of the *MacX User's Guide* distributed by Apple Computer. This special edition was created for the PATHWORKS™ for Macintosh product and is an adaptation (for use in the DECwindows environment) of the general version of the *MacX User's Guide*.

Although the MacX software sold by Apple is virtually identical to the MacX software provided as a part of PATHWORKS for Macintosh (the only differences being the set of fonts provided, the communications software provided, and the default connection method), the two manuals differ in many places. Most importantly, the PATHWORKS for Macintosh version of the guide provides instructions and examples for using DECwindows applications, as opposed to other types of X clients.

If you are using MacX to connect to X environments running under a UNIX operating system, or using TCP/IP connections, you may want to refer to the general version of the *MacX User's Guide*. See also "For More Information" later in this Preface.

What you need to know

The MacX User's Guide is intended for Macintosh users who may or may not be familiar with Digital Equipment Corporation computers. A basic understanding of computer networks will be helpful to you. If you need an overview of network terms and concepts, you may want to read Appendix A in the *PATHWORKS for Macintosh: Network Services User's Guide*.

If you are new to the Macintosh computer, see your owner's guide for information on setting up your computer. You may also want to use the tutorial disk that came with your Macintosh to learn how the Macintosh operates. You should be familiar with basic Macintosh techniques such as clicking, double-clicking, and dragging with the mouse; working with windows; pulling down menus and choosing commands; and using the Clipboard to store information. For information on Macintosh terms and techniques, see the *Macintosh System Software User's Guide*.

This guide explains how to use MacX to gain access to DECwindows applications. If you have never used X programs before, you need to learn a little about the X environment before you use this guide. You should know how to use DECwindows applications and how to interact with the operating system under which the DECwindows applications run. For example, if you are connecting to DECwindows running under the VMS™ operating system, you should be familiar with Digital Command Language (DCL) commands, which let you interact with VMS. Consult the *VMS User's Manual*, the *VMS DECwindows User's Guide*, and the guides for the particular DECwindows applications that you want to use.

For information on installing MacX and other Macintosh software components for PATHWORKS for Macintosh, see the *Installation* part of the *Network Services User's Guide*.

How to use this guide

Your experience with the X Window System (also known as *X*), computers, and networks will determine the way in which you use this guide. This section suggests two basic approaches—one for beginners and one for experienced users. The road map in the next section should also help you determine the best way to use this guide.

For the beginner

If you're not familiar with the X Window System, read the guide in the following order:

1. Read Chapter 1, which briefly covers what X is and how it works. This chapter explains how MacX differs from traditional implementations of X and contains a summary of MacX features.
2. Read Chapter 2, which explains the essentials that you need to know to run clients on a Macintosh computer. You may also need to refer to one of the modules in the *Connection Tools Reference* in this binder when reading Chapter 2.
3. Browse through the other chapters at your convenience to learn about other useful features. For descriptions of the other chapters and appendixes, see the "Summary of Contents," later in this Preface.

For help with network terms and concepts, refer to Appendix A in the *Network Services User's Guide*.

For the experienced user

If you have a technical background or extensive X experience, you have a couple of options.

- You can go directly to Chapter 3 for instructions on creating remote commands. Chapter 3 gives an expanded version of the information in Chapter 2 (which is a tutorial), except for the sections on starting MacX and on quitting MacX. You might want to read those sections in Chapter 2.
- You can read "Introducing MacX" in Chapter 1 to learn how MacX differs from standard X implementations.

Basically, you can get the introductory information that you need from the first two chapters and then concentrate on the other chapters and appendixes, where specific features are documented in detail. The *Connection Tools Reference* in this binder provides information on the connection tools that you use with MacX.

Summary of contents

The following list describes what's covered in the *MacX User's Guide*:

- Chapter 1, “MacX Overview,” briefly describes the X Window System, introduces MacX, and presents an overview of MacX features. This chapter also describes differences in the way that the mouse and keyboard function when you use MacX.
- Chapter 2, “Getting Started,” covers basic information that you need in order to use MacX in the DECwindows environment. It describes how to start MacX, create a remote command to start the Session Manager, close applications, and exit from MacX.
- Chapter 3, “Using Remote Commands,” describes how to create, execute, and edit remote commands by using the Remote menu and the Remote Command dialog box. It also covers MacX security features.
- Chapter 4, “Working with Windows,” explains how to move and resize windows, select window styles, convert windows to icons on the screen, and change the icons back to windows. This chapter also discusses the use of root windows.
- Chapter 5, “Managing Fonts and Color,” tells you how to use fonts and color in MacX. It tells you how to perform various tasks with the Font Director and Color Namer—for example, adding and removing fonts and colors, creating aliases for font names, and so on.
- Chapter 6, “Troubleshooting,” offers suggestions for correcting problems that you may encounter while using MacX.
- Appendix A, “MacX Versus Other X Servers,” explains the differences between MacX and conventional X servers.
- Appendix B, “The MacX Window Manager,” covers some technical aspects of the MacX Window Manager.
- Appendix C, “Bitmap Distribution Format 2.1,” contains the X Consortium document that describes the format of BDF files.

- Appendix D, “X Logical Font Description Conventions,” contains the X Consortium document that specifies the format of X font names.
- Appendix E, “Character Conversion Charts,” shows the hexadecimal equivalent for each character in the ISO Latin 1 and Macintosh extended ASCII character sets. The appendix also contains two character-mapping charts.
- The *Connection Tools Reference* describes the connection tools that let you establish communications with X clients.
- The *User Update* is where you can put late-breaking and supplemental information for the *MacX User’s Guide*.

Visual conventions used in this guide

The `Courier` font is used to indicate computer commands and text that you type.

Terms that have a special meaning in relationship to Macintosh or Digital computers, or to networks, appear in **boldface** at first mention or when first defined in the text. These terms are defined in the glossary.

The *MacX User’s Guide* includes special text elements to highlight important or supplemental information:

- ◆ **Note** Text set off in this manner presents additional information or interesting sidelights. ◆
- △ **Important** Text set off in this manner—with *Important*—presents important information or instructions. △

For more information

This section lists manuals that offer basic information about DECwindows and about running clients under a UNIX operating system; references for X programmers; manuals on X11 for A/UX®, MacX for UNIX, MacX for A/UX. This section also describes a Usenet news group offering information about the X Window System.

Basics

For information about DECwindows applications, refer to these manuals:

- *VMS DECwindows User's Guide*. Digital Equipment Corporation, October 1989. (VMS Version 5.3.)
- *VMS DECwindows Desktop Applications Guide*

Also see the manual provided by Digital for each DECwindows application.

For a tutorial on starting a server and running standard clients under a UNIX operating system (such as ULTRIX™), read the following manual:

- *X Window System User's Guide, Volume Three*. O'Reilly & Associates, Inc., 1988.

X programming

For information on X programming, see the following manuals:

- Scheifler, Robert W., James Gettys, and Ron Newman *X Window System: C Library and Protocol Reference*. Digital Press.
- *Xlib Programming Manual*, Volume 1. O'Reilly & Associates, Inc.
- *Xlib Reference Manual*, Volume 2. O'Reilly & Associates, Inc.
- *X Toolkit Programmer's Guide*. O'Reilly & Associates, Inc.

Programmers may also find the following documents useful. You may order them directly from the Massachusetts Institute of Technology (MIT); contact information follows.

- *Using the X Toolkit*
- *X Toolkit Widget*
- *X Toolkit Intrinsics*
- *Inter-Client Communications Conventions Manual.*

MIT Software Center
Technology Licensing Office
77 Massachusetts Avenue
Cambridge, MA 02139

Digital Equipment Corporation publishes a set of volumes that cover similar topics from a DECwindows perspective:

- *DECwindows Programming Volume 1A*
 - VMS DECwindows XUI Style Guide
 - VMS DECwindows Guide to Application Programming
 - VMS DECwindows User Interface Language Reference Manual
- *DECwindows Programming Volumes 1B and 1C*
 - VMS DECwindows Toolkit Routines Reference Manual, Part I
 - VMS DECwindows Toolkit Routines Reference Manual, Part II
- *DECwindows Programming Volume 2A*
 - VMS DECwindows Xlib Programming Volume
- *DECwindows Programming Volumes 2B and 2C*
 - VMS DECwindows Xlib Routines Reference Manual, Part I
 - VMS DECwindows Xlib Routines Reference Manual, Part II
- *DECwindows Programming Volume 3*
 - VMS DECwindows Device Driver Manual
 - VMS DECwindows Server Manual

Contact your local Digital representative for information on how to order these documents.

X11 for A/UX

A/UX is a System V–based version of the UNIX operating system for the Macintosh. See the following Apple documents for information about the A/UX version of X:

- *X11 User's Guide for A/UX*.
- *X11 Reference for A/UX*
- *Getting Started with X Window System for A/UX*

For a complete description of A/UX manuals, as well as part numbers and ordering information, see the *Road Map to A/UX Documentation* published by Apple Computer.

MacX for UNIX

The *PATHWORKS for Macintosh: MacX User's Guide* (this manual) is an adaptation of the general *MacX User's Guide* published by Apple Computer. The general version of the guide describes how to use MacX to access X clients running on UNIX machines. The *MacX User's Guide* is packaged with the MacX program from Apple.

MacX for A/UX

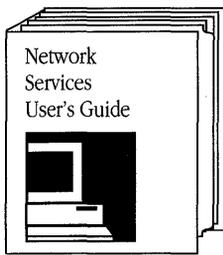
If you are interested in running MacX under A/UX, you will need the *MacX for A/UX Supplement* to the general version of the *MacX User's Guide*. The supplement explains how to start MacX under A/UX and describes different or additional features. Ask your Apple representative or an authorized Apple dealer for details about obtaining MacX for A/UX.

Usenet

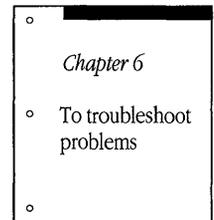
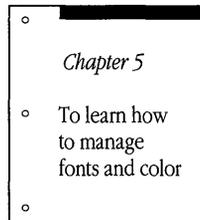
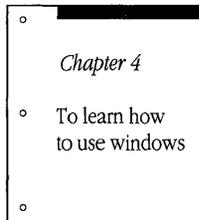
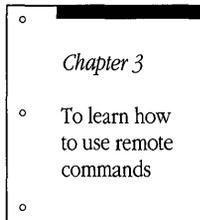
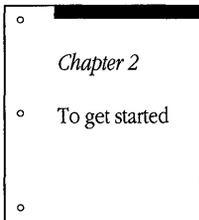
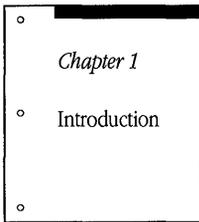
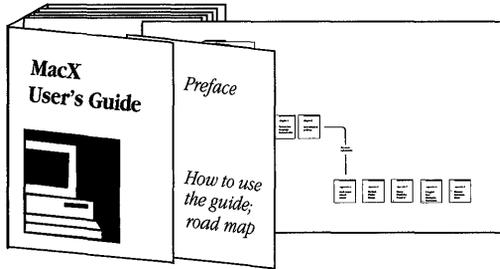
Subscribers to Usenet can join or monitor the news group, comp.windows.x, an on-line forum for news and discussion of the X Window System. Ask your network administrator for information about Usenet.

Road map to the MacX User's Guide

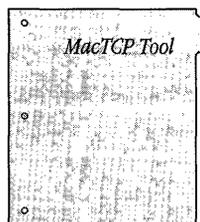
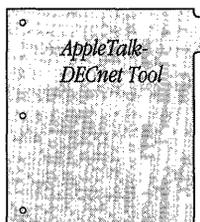
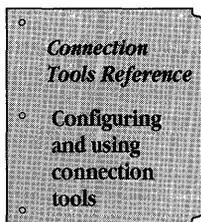
The road map that follows shows how the parts of the *MacX User's Guide* fit together. The road map indicates that the instructions for installing MacX are located in the companion guide, *PATHWORKS for Macintosh: Network Services User's Guide*.



For installation instructions, using file services, print services, terminal services, and DECwindows applications



For more information





*For more
information*

Appendix A

- MacX versus other X servers

Appendix B

- The MacX window manager

Appendix C

- Bitmap distribution format 2.1

Appendix D

- X Logical font description conventions

Appendix E

- Character conversion charts



1 MacX Overview

This chapter introduces the X Window System and gives an overview of MacX™ Apple Computer's version of the X server.

What is the X Window System?

In May 1983, Project Athena and the Laboratory for Computer Science at the Massachusetts Institute of Technology (MIT) embarked on a project that would let people work with computers in an entirely new way. The goal was to design a system that would allow students to run microcomputer applications, such as spreadsheet and word-processing programs, while simultaneously running programs on different hosts in remote locations. The system would also have the ability to display graphics.

With input from major computer manufacturers, the team at MIT devised an innovative solution in just three years. The result—the X Window System, version 10 release 4—was introduced in 1986.

In January 1988, MIT formed a consortium with most of the leading computer and workstation companies to continue development of the X Window System and to have it adopted as an American National Standards Institute (ANSI) standard. In November 1988, the consortium distributed version 11 release 3 of the X Window System.

The X Window System, or X for short, is a network-based graphics system designed to create an enhanced computing environment using the capabilities of desktop computers. X draws graphics, creates **windows** to display and run several applications simultaneously, and lets you access X applications over a network from different makes of computers without being affected by incompatible hardware or operating systems.

X is also called a *window system* or *windowing environment* because it displays applications in windows on your **screen**, as shown in Figure 1-1. Essentially, X converts your screen into a lot of miniature screens in which you can perform many activities rather than just one at a time. You can move, resize, and stack these windows, as well as reduce them to icons—a way to set aside windows without closing the applications in them.

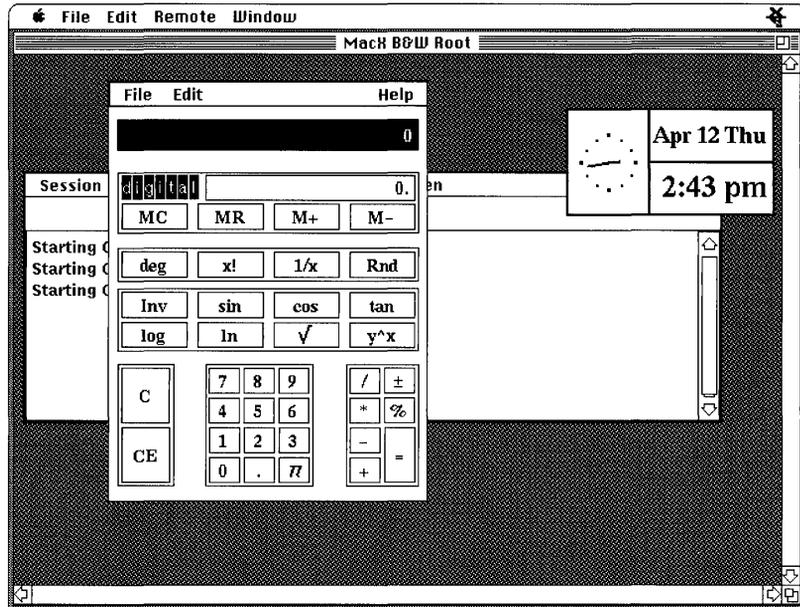


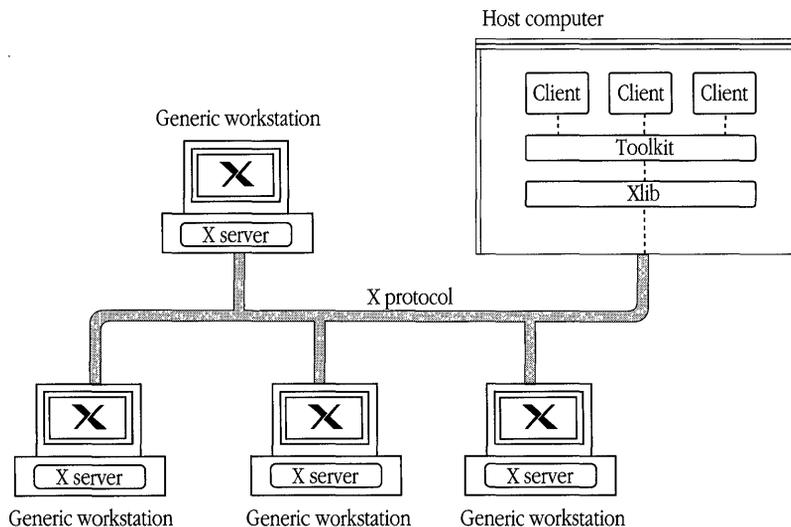
Figure 1-1 Some typical X windows

The primary reason for using X is that it lets you access programs remotely, over a network. X overcomes the incompatibilities of different hardware architectures and operating systems, allowing different kinds of computers to communicate with each other. Thus the same X program can run on any make of workstation on the network, and you can run an application on one machine and display the results on another. The X Window System is a great advance for programmers because it frees them from having to rewrite programs in order to transfer them from one type of computer to another.

The designers of X realized these enhanced capabilities through a design that assigns the major functions of X to individual components. X functions well in a network environment because these components are distributed between your Macintosh® and the remote host computers on which the client applications reside. This concept is called the client/server model. Knowing something about the different parts of X and how they work together will give you a clearer picture of what happens when you run an X application. The following section describes the various components of X.

X Window System structure

X is composed of two separate but interrelated groups of software that communicate according to the X protocol. One group of programs supports **clients** (X applications), and the other controls the desktop computer on which the clients are displayed. These programs can work together on the same system if clients are installed on the machine that displays them, or they can be separated over a network if the clients are located on different hosts. Figure 1-2 illustrates the relationship of these different components, formally referred to as the client/server model.



As depicted in the illustration, the X server is always located on a workstation (or **display**), whereas the two application libraries—Xlib and the X toolkit—reside with the clients: either on different hosts or in your own computer. At first glance, this arrangement seems backwards to people who view workstations as the *clients* of a *server*, such as the file server that contains all the programs that they use. The file server allows multiple workstations to share the same application simultaneously. In X, however, the workstation contains the server so that a person can run multiple clients simultaneously by displaying each one in a window on the screen. In effect, the clients are *sharing* the workstation.

The following paragraphs briefly describe the main functions of the basic components of X.

X protocol

The X Window System protocol, or **X protocol**, is a graphics description language that the clients and the X server in your desktop computer use to exchange information. This protocol defines how the clients and server compose and transmit the packets of instructions used to draw graphic images, windows, and text, to specify colors and fonts, and so on.

X server

An X server, such as MacX, is a program that runs on your computer and controls the flow of information to and from the keyboard, mouse, and screen (or screens). The server acts as a switchboard, relaying information from clients to the appropriate windows on your screen and from your computer to the appropriate client. The language used in this information exchange is the X protocol.

In addition to routing messages, the server performs other communications-related services, such as maintaining communications links with each client and interpreting network messages. The server also draws graphic images and windows; installs fonts; tracks the cursor and maintains its color, size, and shape; maintains a map of color values; and requests services from the operating system.

X library

The X library (also known as **Xlib**) is a library of C routines—program segments written in the C programming language. Each routine performs a particular task when called by a client program. For example, Xlib routines allow a client to communicate with a server, request that a window be created, draw graphics, respond to output from the keyboard or mouse, and so forth. Xlib routines are translated to X protocol requests before being transmitted to the server.

Window manager

A **window manager** is a client application that controls the layout of windows on your workstation's screen(s). Window managers let you move, resize, and stack windows; create new windows; and shrink windows to icons. Some window managers enforce a **layout policy**, which specifies the sizes and positions allowed for windows and icons.

X toolkit

An X **toolkit** is a library of subroutines that employs several Xlib drawing routines and other functions to produce larger graphic objects, such as menus and scroll bars. Programmers use these objects, called **widgets**, to create the images you see on your desktop. Other toolkit subroutines manage and destroy widgets. A toolkit also furnishes tools called **intrinsic**s, used to create new widgets.

A brief look at how X works

In order to display clients on your screen, you must first start up the X server. When the server starts up, in a standard X configuration, it creates a background, or **root window**, that covers the entire screen. Typically, your *.login* or *.profile* file will contain a command to start up the window manager; if it does not, you must start the manager yourself.

Once the window manager is running, you can issue commands to run clients on your own machine, or you can log on to other host computers and issue remote commands to run clients. When you issue such a command, the client responds by sending X protocol packets to the X server, requesting that it draw a window of a certain size in a certain location. The X server interprets these requests and relays them to the window manager. If the window manager approves, a window appears on your screen, and you can use the client application. By following this procedure, you can display as many clients as your computer will accommodate.

Windows and their hierarchy

In an X environment, windows operate according to a hierarchy, with the root window at the top. In traditional X systems, the root window is always visible and covers the entire screen. (X supports workstations with multiple screens—if you have more than one screen connected, a root window appears in each one.) All other windows are subordinate to the root window.

Occupying the second level of the hierarchy are the top-level client windows—the windows that appear when you start up a client. For example, in Figure 1-1, the Clock and the Calculator clients are displayed in second-level windows. You can resize these windows, move them around, and manipulate them in other ways, according to the rules of the window manager.

At the third and lower levels of the hierarchy are windows created by clients. The clients control these windows. In Figure 1-1, the keys on the calculator are third-level windows.

◆ **Window disguises** Windows don't always have to look like windows. In X, a window is a rectangular object that is sensitive to a mouse pointer. Clients often draw tiny subwindows that look like menus, buttons, scroll bars, and other shapes. When the mouse pointer enters or the mouse is clicked in one of these subwindows, the client that created the window receives the feedback. ◆

Another important point about the window hierarchy is that higher-level windows impose restrictions on lower-level ones. A window is subordinate to the window that created it (parent window). A subordinate (child) window always remains within the boundaries of its parent window. Even though a child window can be larger than its parent, you will see only the part bounded by the dimensions of the parent window.

The rest of this chapter describes MacX, Apple's X Window display server for a Macintosh running the Macintosh Operating System.

Introducing MacX



Application icon

The MacX application is an X server for the Macintosh. By permitting a Macintosh to run X applications, MacX combines the advantages of X with the advantages of the Macintosh computer and its easy-to-use software. For example, MacX lets you cut and paste text between Macintosh and X applications. MacX also offers features not included in the standard X environment and streamlines operations such as changing fonts and adding new colors.

MacX fully conforms to the standards published in the *Inter-Client Communications Conventions Manual* (ICCCM) and to version 11, release 3 of X, with some release 4 enhancements.

What you get with MacX

In addition to the X server, MacX software includes the following components:

- **MacX Window Manager**

The MacX Window Manager allows you to create and use X windows as you would Macintosh windows. It supplies a selection of five window styles and lets you convert windows into icons. This window manager handles windows in **rootless** style, a style in which the root window is invisible. MacX provides the option to display or hide the root window.

- **MacX Font Director**

The Font Director displays and sorts X and Macintosh fonts and compiles Adobe Bitmap Distribution Format (**BDF**) files into X fonts. It also permits you to assign **aliases** to long, unwieldy font names.

- **MacX Fonts folder**

This folder contains a number of files, each of which contains a different font. For example, one file might contain Courier 12-point bold, and another file might contain Courier 14-point bold. MacX includes the entire set of DECwindows fonts as well as the standard set of MIT fonts.

- **MacX Colors file**

This file contains an array of colors available for use with MacX. You can add, modify, or delete colors by using the MacX Color Namer.

X with a Macintosh flair

MacX is designed to blend in with your Macintosh working environment, adding another dimension to your desktop without impeding or limiting Macintosh facilities. While MacX is running, you can use **MultiFinder**[®] and your desk accessories. You can run Macintosh applications and various clients simultaneously, as shown in Figure 1-3.

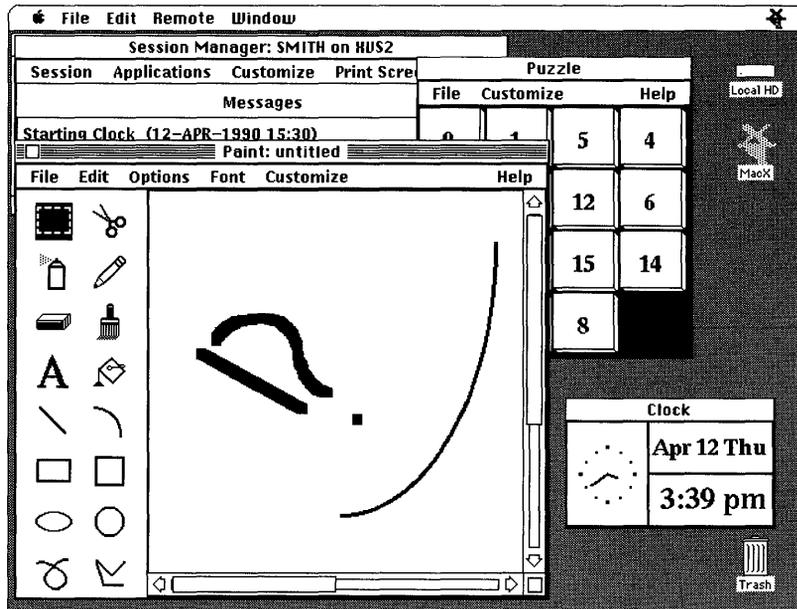


Figure 1-3 Clients and windows on a typical desktop

Functions such as cut, paste, save, and quit operate the same way in MacX that they do in most Macintosh applications. You can cut and paste text and graphics between Macintosh and X applications.

MacX uses the Macintosh method for handling windows. It also gives you the option to use a different window manager.

MacX supplies a variety of colors and fonts, and makes them easier to use than those in standard X environments. For instance, the Color Namer shows an example of each available color, so that you don't have to imagine what a color looks like. You can create and remove colors, change color names, and copy color names into X commands in client windows.

With the MacX Font Director, you can use Macintosh and X fonts interchangeably and assign aliases to long, cumbersome font names. The Font Director also provides a variety of methods for sorting fonts.



Sample
MacX settings
document

Each time you start up MacX, it creates a **settings document**. The settings document stores the details of the working environment that you set up—every remote command that you create, every preference that you specify, and so forth. When you quit, MacX will prompt you to name and save your settings document. If you save the settings document, then you can return to that environment whenever you like, by double-clicking the document's icon. Settings documents let you customize environments for different hosts, clients, types of tasks, and working styles.

What you see on the screen

MacX displays each DECwindows™ application that you open in its own window. In effect, MacX converts your screen into a number of miniature screens so that you can perform many activities rather than just one at a time. You can move, resize, and stack these windows, and reduce them to icons—a convenient way to set aside windows without closing the applications in them. Each application can also create its own windows; the application controls how they are manipulated, and they must remain within the boundaries of the application's window.

MacX offers two different ways to display windows: rooted and rootless. To conform with the traditional X environment, MacX creates a root window. The root window acts as a “desktop” upon which the other windows are displayed. The windows operate according to a hierarchy, with the root window at the top. At the second level are the windows that appear when a user starts up client applications. At the third level are windows created and controlled by the clients. (MacX actually creates two root windows—one for color clients and one for black-and-white clients.)

Figure 1-4 shows a typical black-and-white MacX root window with two client applications open. The Calculator and Clock clients are displayed in second-level windows. The keys on the Calculator are third-level windows, created by the Calculator application.

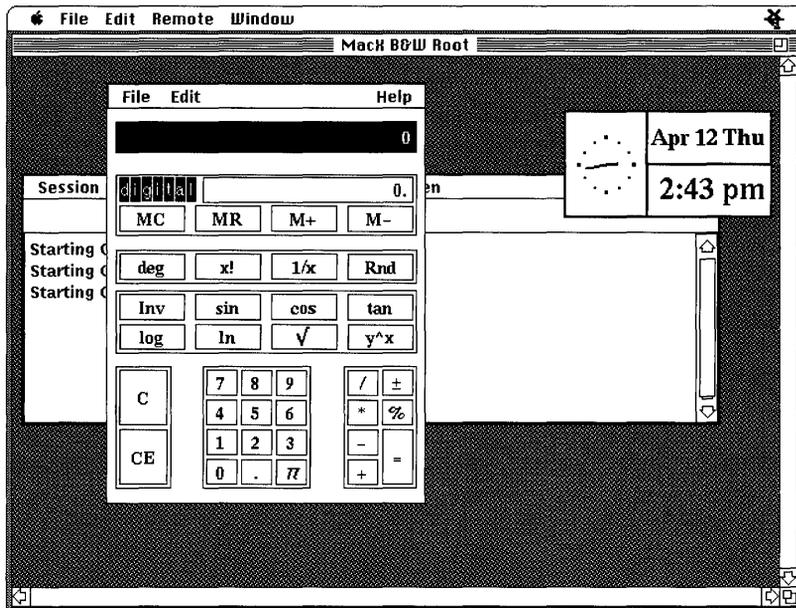


Figure 1-4 MacX windows in rooted style

By using a menu command, the MacX user can choose to hide or show the root window. Because the root window is at the top level of the window hierarchy, hiding the root window makes all of the second- and third-level windows invisible as well. Displaying clients in this manner, with a root window at the top of the window hierarchy, is known as the **rooted** style of operation. For more information on using a visible root window, see “About Root Windows” in Chapter 4.

MacX, however, also takes advantage of the Macintosh computer’s existing, sophisticated graphical interface. MacX can display X clients in standard Macintosh windows, independent of the root window. Displaying clients in this manner is known as the rootless style of operation. When you work in the rootless style, the top level of the window hierarchy comprises the windows that appear when you start up client applications. At the second level are windows created and controlled by the clients.

Figure 1-5 shows client applications open in rootless style.

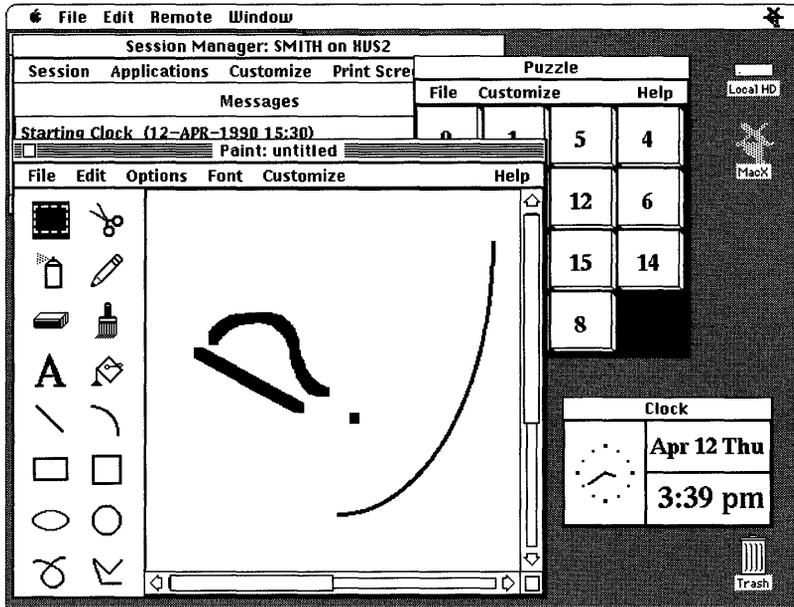


Figure 1-5 MacX windows in rootless style

For each DECwindows application that you start, MacX offers you the choice of working in the rootless or rooted style. If you are familiar with the traditional X environment, you may be more comfortable working in the rooted style. You may also want to specify the rooted style if you want the convenience of hiding all of the client application windows by simply hiding the root window.

Clients that you open in the rootless style are managed by the MacX Window Manager, which runs on your Macintosh computer. It is the MacX Window Manager that lets you move windows, resize them, and so on. If you open a client in the rooted style, the window management functions for that client are handled by a remote window manager, such as the DECwindows Window Manager.

Using multiple screens

In accordance with X specifications, MacX supports single or multiple screens. You can use any combination of color, gray scale, or monochrome screens. Figure 1-6 illustrates a multiple-screen setup.

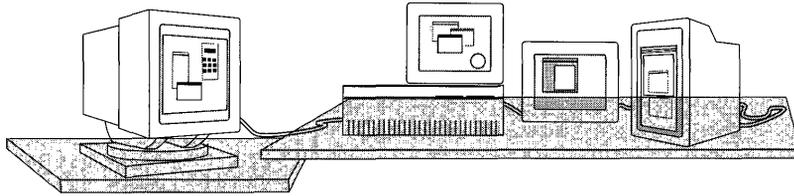


Figure 1-6 A Macintosh with multiple screens attached

Multiple screens on a Macintosh, however, work differently from multiple screens on a typical X workstation, where each screen is completely separate from the others. If you are familiar with using multiple screens on a Macintosh, you know that when you move a window halfway between two screens nothing in the middle of the window gets lost, despite the physical separation between the screens. The screens act as if they are continuous because the Macintosh Operating System joins multiple screens edge-to-edge into one big screen.

To see what this arrangement looks like, open the Control Panel from the Apple menu (🍏) and click the Monitors icon. You will see a diagram similar to the one in Figure 1-7. The screens in the Control Panel should be arranged like the monitors on your desk, except with no spaces between them.

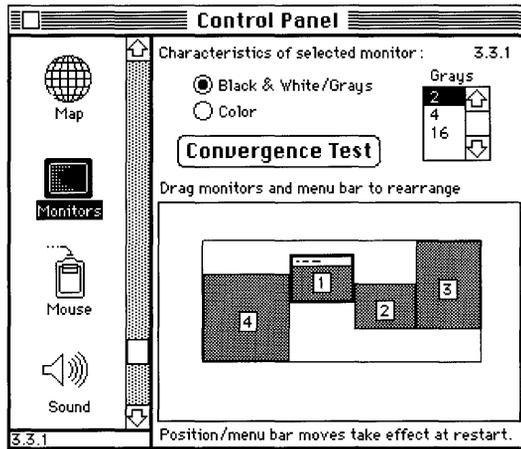


Figure 1-7 A Control Panel diagram of multiple screens

Now imagine a rectangle drawn around all of the screens in your Control Panel, like the teal-colored one in Figure 1-7. You will notice some blank areas if the screens are different sizes. MacX treats the entire contents of this rectangle, *including the blank areas*, as one continuous screen on which it can display windows. That's why part of a window can disappear when you move it from a taller screen to a shorter one. For example, if you moved a window from the top of screen 3 in Figure 1-7 straight across to the blank area above screen 2, which is shorter, part of the window would not appear until you pulled it down into screen 2.

Overview of MacX features

This section introduces you to the functions available in the MacX menus. Besides supplying all the tools found in standard X products, MacX enhances many of them by extending their capabilities or by making them simpler to use.

Remote commands

A remote command is an instruction that you send to a host computer to start an X client or to perform some other function in the X environment. Figure 1-8 shows the Remote menu, which lets you create and edit remote commands, display command output, and determine access control. The menu also gives a list of the remote commands in the currently open settings document.



Figure 1-8 The Remote menu

To run DECwindows applications and display them on your Macintosh screen, you must issue a remote command to the VAX™ host computer(s) where the applications reside. Choosing New Command from the Remote menu brings up the Remote Command dialog box in which you type your command, user name, password and other options. Figure 1-9 shows the Remote Command dialog box.

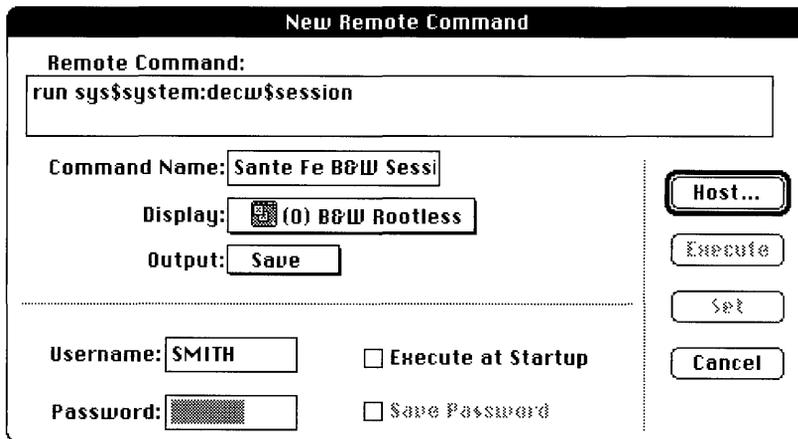


Figure 1-9 The Remote Command dialog box

After entering a remote command, you have the option to execute, set, or cancel it. Clicking Execute or Set enters the command in the Remote Command list (which you display by choosing the Edit Command item in the Remote menu) and at the bottom of the Remote menu. Commands are listed alphabetically. Clicking the Execute button also causes MacX to execute the remote command.

The next menu item, Edit Command, lets you change an existing command. Edit Command is dimmed if no commands exist. The Command Output submenu presents a list of commands that are currently running or that have command output. Choosing a command in the output list displays an output window that shows any information generated by or about the command. The checked menu command, Access Control, is a security precaution that prevents surreptitious access to your MacX server. For basic information about remote commands and step-by-step instructions, read Chapter 2, “Getting Started.”

For advanced information about remote commands, read Chapter 3, “Using Remote Commands.”

Window management

Figure 1-10 shows the MacX Window menu.

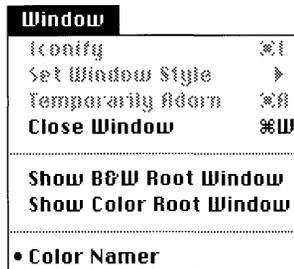
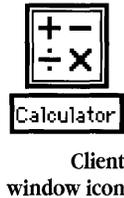


Figure 1-10 The Window menu

You can use the Window menu to shrink client windows to icons, to choose a different style for a client window from the five shown in Figure 1-11, and to move or resize a window that doesn't have a title bar or size box. To learn more about these features, read “Using Windows in MacX” in Chapter 4.



Figure 1-11 MacX window styles



Client window icon

Choosing Iconify from the Window menu lets you shrink a client window into an icon in order to move it out of the way. Iconifying does not kill a client or suspend its operations. Double-clicking the icon returns the client window to its normal size and position.

Temporarily Adorn allows you to move and resize a window that does not have a title bar or a size box by temporarily converting the window to the style that has these elements (see the second window from the left in Figure 1-11). You have one opportunity to either move or resize the window, after which it reverts to its former style.

The Close Window command changes depending on the type of window that is in the foreground (what is called *active* in the Macintosh environment). Close Window closes a MacX window, such as the Remote Command dialog box or the Color Namer dialog box, if it is frontmost. If a client window is the frontmost window, the Window menu displays the Kill Client command. Since this command causes an abrupt disconnection, read “Killing Clients and Closing Windows” in Chapter 4 before you kill a client.

When windows open, their names appear in alphabetical order at the bottom of the Window menu. A bullet identifies the window that is active. For example, the Window menu on the previous page shows that the Color Namer dialog box is both active and the only window open. When more than one name appears in this list, you can make another window active by selecting its name with the mouse.

The last two commands in the Window menu let you show or hide a black-and-white or color root window. When a root window is visible, the word *Show* changes to *Hide*. Hiding a root window also hides any client windows running in it.

Editing commands

The Edit menu, shown in Figure 1-12, provides the standard Macintosh Undo and editing commands. The menu also lets you open the Font Directory and Color Namer dialog boxes. The commands at the bottom of the menu let you specify certain preferences for how MacX works.

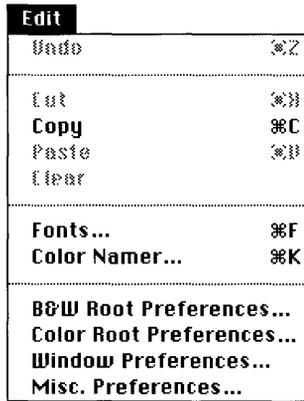


Figure 1-12 The Edit menu

MacX lets you cut, copy, and paste text between a Macintosh application or desk accessory and a MacX window that contains text, such as a Remote Command dialog box or a DECterm™ window. Similarly, MacX allows you to cut, copy, and paste graphics in **PICT** format as well. As in any other Macintosh application, these functions are located in the Edit menu and perform the same way. Because clients have their own commands for cutting, copying, and pasting, you cannot use Macintosh commands (Command-X, Command-C, Command-V) in a client window. However, MacX does track when a client cuts or copies text and records the selection in the Clipboard. Once something is in the Clipboard, you can paste it into any Macintosh file or document, such as a MacWrite® document, for example. To paste text or graphics from a Macintosh file to a client window, use the client's command for pasting or inserting (not Command-V). MacX transfers the contents of the Clipboard to a cut/paste buffer, the equivalent of a Clipboard in the X world, and then to the point selected in the client document.

The Edit menu also contains Undo and Clear, which perform their normal Macintosh functions. Undo undoes the last change but functions only with desk accessories. MacX does not otherwise support it. Clear erases a selected item without saving it to the Clipboard.

See the next section for an explanation of the preference items at the end of this menu.

Preferences

A list of preferences, located at the bottom of the Edit menu (shown in Figure 1-12), lets you select default settings for the root-window size, client window styles, passwords, animation, mouse movement, and arrow keys.

Choosing either of the first two preference items displays a Rooted Screen Setup dialog box, which allows you to set the size of the root window.

Normally, most people do not need to alter the default root-window preferences. Unless you are an experienced user of X or plan to run memory-intensive color clients on machines with 2 megabytes of **RAM** or less, you would be better off not changing the default root-window size. However, those who need more information should read “Root Window Preferences” in Chapter 4.

Window Preferences, the next item, permits you to choose a default window style for client windows from the ones shown in Figure 1-11. The next time you start a client, its window will appear in the chosen style. One remaining choice, called *Client Specified*, is not actually a window style but lets the client indirectly influence the window style selected. If you choose Client Specified, MacX will convert a client’s border-width request into one of the five window styles. See “Window Styles” in Chapter 4 for a further explanation of this case. The window styles in Figure 1-11 apply only to client windows in rootless style. In rooted style, different window managers control the style, or **adornment**, of client windows.

Figure 1-13 shows the dialog box that appears when you choose the last entry in the Edit menu, Miscellaneous Preferences. The Miscellaneous Preferences dialog box contains five options. Clicking the first check box saves passwords entered in Remote Command windows so that you don’t have to retype your password every time you execute a remote command. The passwords are saved in the settings document and are encrypted to provide an extra measure of security adequate for most business needs. In cases where passwords aren’t saved in remote commands, clicking the second check box will cause MacX to prompt you for these passwords when you execute such commands.

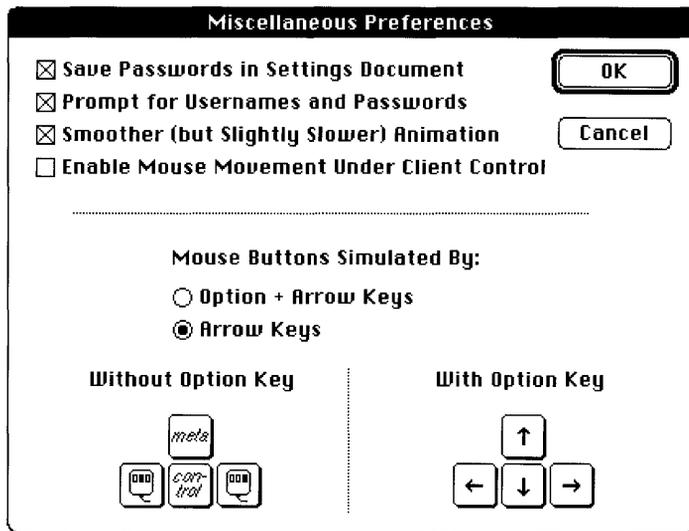


Figure 1-13 The Miscellaneous Preferences dialog box

The next option—for smoother animation—should be checked if you are using clients that have animation. It slows down the display, however, so for other clients you might want to uncheck it. See Appendix A for information on this option and the one for enabling mouse movement. The last option lets you choose whether to use the Option key with the Arrow keys to do scrolling or to simulate extra mouse buttons and modifier keys. See “Mouse Differences,” later in this chapter, for an explanation.

Fonts

Choosing Fonts from the Edit menu brings up the Font Director dialog box pictured in Figure 1-14. This window displays a list of all the fonts available for use with clients. These can be either X fonts (including DECwindows fonts) or Macintosh fonts, which are distinguished by a little icon at the beginning of the font name. The Font Director also allows you to create aliases as substitutes for font names. Since X and DECwindows font names tend to be long and unwieldy, you can create aliases that are shorter and easier to remember. Aliases also have a distinguishing icon. Chapter 5 provides more details on fonts and aliases.

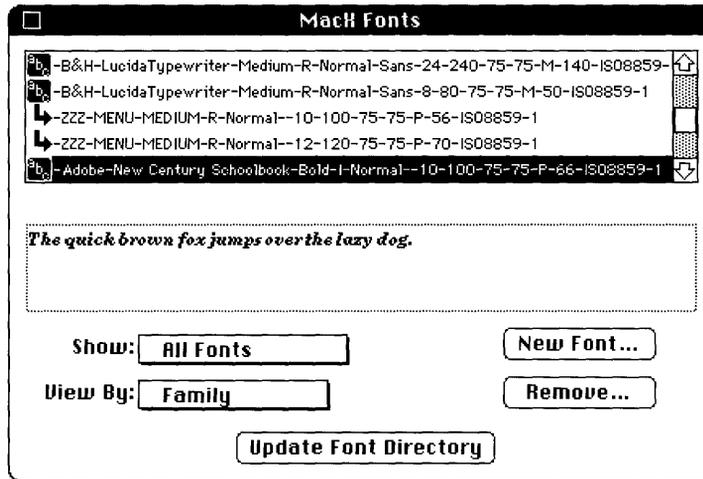


Figure 1-14 The Font Director dialog box

The Font Director also allows you to sort fonts in a variety of ways. In Figure 1-14, the field labeled View By is actually a pop-up menu containing a list of sorting methods, as shown in Figure 1-15.



Figure 1-15 The View By pop-up menu

Simply select an item from the list and the Font Director will re-sort the fonts accordingly. The Font Director can also compile fonts from Adobe Bitmap Distribution Format (BDF). For more information about the Font Director and compiling BDF files, read Chapter 5, “Managing Fonts and Color.”

Color Namer

Choosing Color Namer from the Edit menu displays the Color Namer dialog box depicted in Figure 1-16. This dialog box displays a sample of every color in the MacX Colors file, providing you with a complete visual inventory of the colors you can use with color clients. Each color has a name that you can modify or copy to a command in a client window. You can also create new colors and remove existing colors. When you do, the Color Namer automatically re-sorts the colors by name, so that they remain in alphabetical order. See Chapter 5 for more information about using the Color Namer.

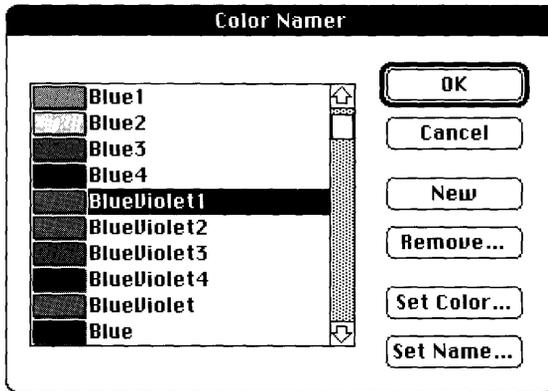


Figure 1-16 The Color Namer dialog box

File menu commands

Like the Edit menu, the File menu, shown in Figure 1-17, contains a number of commands that function in the normal Macintosh way.



Figure 1-17 The File menu

The New command creates a new settings document in which you can create and save new commands and preference settings. Open allows you to open an existing settings document, provided that one is not currently open. The Close command closes the document currently open. If the file is new, the name “Untitled” appears. Click Save to save your settings or Save As to save your settings and name the file. However, should you forget and choose Close, a standard Macintosh dialog box inquiring “Do you want to save your changes?” appears. Read Chapter 2 for more information about the settings document. Chapter 2 also explains the procedure for quitting from MacX, the last command in the File menu.

Printing commands

The Page Setup and Print Clipboard commands in the File menu (shown in Figure 1-17) are used for printing. Print Clipboard is dimmed unless you have copied something to the Clipboard. Use Command-C (⌘-C) or Command-X (⌘-X) to copy or cut text or graphics from a Macintosh application or a MacX window (such as the Color Namer). In a client window, use the client’s method for copying and cutting. MacX intercepts these selections and pastes them into the Clipboard as well. Before printing, choose Page Setup and turn off Text and Graphics Smoothing. These options weren’t designed for bit maps and as a result degrade the appearance of the printed graphic image. Leave Font Substitution on, however, as it preserves spacing better and uses a more readable font (Courier versus Monaco 9). Choose Print Clipboard to print. MacX prints text or PICT-style graphics. When printing text, MacX includes spaces, carriage returns, and line feeds, but omits any formatting.

Mouse and keyboard differences

Before proceeding further, you should know about the differences between the Macintosh mouse and keyboard and the standard mouse and keyboard specified for X11.

Mouse differences

Because the Macintosh uses a one-button rather than a three-button mouse, you cannot issue commands with the mouse as you normally would in other X environments. As an alternative for the missing two buttons, use the arrow keys as shown in Figure 1-18.

Macintosh mouse button or key	MacX function
	Left mouse button
	Middle mouse button
	Right mouse button
	Alt (meta modifier)
	Control key

Figure 1-18 Substitute mouse buttons

To use the arrow keys for their normal purpose, hold down the Option key before pressing one of them.

◆ **Which mouse button?** References to the mouse button in this document (for example, “Press the mouse button...”) apply to the mouse button on the Macintosh mouse, which serves as the left mouse button in MacX. The other mouse buttons are specifically identified as the middle mouse button or the right mouse button. ◆

If you would rather reverse this procedure—that is, press the Option key together with an arrow key to get extra mouse buttons—you can select the Option + Arrow Keys button in the Miscellaneous Preferences dialog box, as shown at the top of Figure 1-19.

You’ll find Miscellaneous Preferences at the end of the Edit menu.

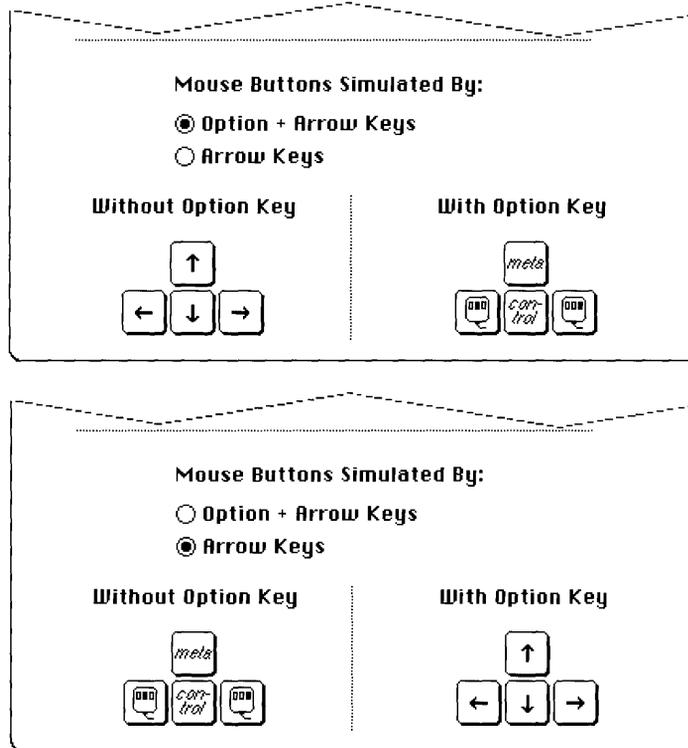


Figure 1-19 The arrow keys preference option

Keyboard differences

The Macintosh Plus keyboard has no Control key, so you must use the Command key (⌘) instead. As a result, you cannot use the Command key to select menu items from the keyboard, such as ⌘-X to cut and ⌘-V to paste, while MacX is running.

Substituting keys for mouse clicks

MacX has a variety of dialog and alert boxes that it displays when you select certain options or need to respond to a particular event. The Remote Command dialog box shown in Figure 1-9 is an example. These boxes contain a collection of fields, buttons, or both, which you must select or click. Sometimes pressing keys on the keyboard is more convenient than using the mouse to click a button, choose a field, or select the contents of a field. For such instances, Table 1-1 lists some substitute keys and the action each performs.

Table 1-1 Keyboard substitutes for mouse clicks and selections

Key(s)	Purpose
Y, O	Either the Y or the O key can be used to specify <i>yes</i> or <i>OK</i> in a dialog box or alert box that contains no text or scrollable fields. If the box has text fields, the letter is interpreted as text rather than as a command and is entered into the field that has the cursor in it. If the box has scrollable fields, the letters select a position in the field.
Return, Enter	Either the Return or the Enter key can be used to simulate clicking the default (outlined) button in any dialog box or alert box, including those with text fields.
N, C	Either the N or the C key can be used to specify <i>no</i> or <i>cancel</i> in a dialog box or alert box that has no text fields. If the box has text fields, the number or letter is interpreted as text rather than as a command and is entered into the field that has the cursor in it.
Command-.	The Command-Period can be used to specify <i>no</i> or <i>cancel</i> in any dialog box or alert box, including those with text fields.
Esc	The Escape key can be used to select the cancel button in any dialog box or alert box, including those with text fields.
Fwd Del	 The Forward Delete key can be used to delete text to the right of the cursor. (The forward delete key appears only on extended keyboards.)
Tab	The Tab key can be used to tab to the next text field.
Arrows	The Up, Down, Left, and Right arrow keys can be used to move the cursor and to scroll vertically and horizontally in text fields. Fields can contain a maximum of 255 characters. The arrow keys will also move the cursor to a different insertion point.
Home, Page Up	Either the Home or Page Up key can be used to scroll to the beginning of a text field or to the top of a list. (These keys appear only on the extended keyboard.)
End, Page Down	Either the End or Page Down key can be used to scroll to the end of a text field or to the bottom of a list. (These keys appear only on the extended keyboard.)

◆ **Using letters and numbers to scroll** The Color Namer and the Font Director, two features described in Chapter 5, won't interpret letters or numbers as *yes*, *no*, *OK*, or *cancel* actions. Instead, they interpret any letters or numbers typed as scrolling instructions. See Chapter 5 for more information. ◆

2 Getting Started

Before reading this chapter, you should install MacX and your communications software. Follow the instructions in the *Installation* part of the *PATHWORKS for Macintosh: Network Services User's Guide*.

This chapter gives the basic information that you need to access DECwindows applications with MacX. This chapter tells you how to start MacX, start a DECwindows Session Manager, run DECwindows applications, quit DECwindows applications, and quit MacX.

Once you feel comfortable with these fundamentals, you can use the rest of this guide to customize your X environment and learn about more advanced features. However, please note that some operations and techniques, such as using fonts, require technical expertise. To avoid problems, consult your resident X expert when you are not sure what to do.

Starting MacX



To start MacX, double-click the MacX application icon or click the icon once and choose Open from the File menu. After you start MacX, your desktop should look similar to the one shown in Figure 2-1. You should see the four MacX menu headings in the menu bar at the top of your screen and, if MultiFinder is active, the MacX icon at the far right.

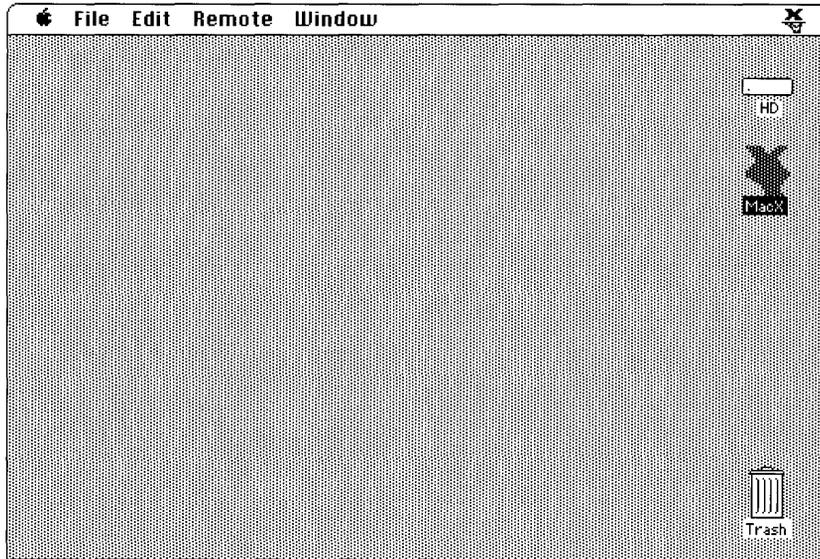


Figure 2-1 The Macintosh desktop after starting MacX under MultiFinder

Although you don't see a window for it, MacX always opens a new settings document when it starts up. The settings document stores the details of the working environment that you set up—every remote command that you create, every preference that you specify, and so forth. When you quit, MacX will prompt you to name and save your settings document. If you save the settings document, then you can return to that environment whenever you like, by double-clicking the document's icon.



Sample

MacX settings
document

Settings documents let you customize environments for different hosts, clients, types of tasks, and working styles. For example, you could create an environment for doing budgets—in which a spreadsheet client automatically opens in the middle of your screen and a calculator appears in the upper-right corner—and save it in a settings document called Budget.

Making a fast exit

If you want to exit from MacX and you haven't made any changes that you want to save, such as creating a remote command, simply choose Quit from the File menu or press Command-Q (**⌘-Q**) and MacX will close. If you have made changes, the dialog box "Save changes before closing?" appears. For further information, see "Quitting MacX," later in this chapter.

Starting the Session Manager

The **Session Manager** provides a convenient way to enter the DECwindows environment. The Session Manager is a DECwindows application that lets you perform the following tasks:

- Start the DECwindows Window Manager.
- Access the VMS™ operating system (by using **DECterm**, a terminal emulator).
- Print the contents of a display screen.
- Customize your working environment.
- Run other DECwindows applications, such as FileView.

Figure 2-2 shows the Session Manager window with the Applications menu pulled down. After you start the Session Manager, you can run other DECwindows applications simply by choosing their names from the Applications menu.

◆ **Customizing the Applications menu** The Session Manager is preconfigured to show a specific set of names in the Applications menu. If the application you want to use does not appear in the menu, you'll have to add the application's name to the menu by using the Customize menu. For instructions, see the *VMS DECwindows User's Guide*. ◆

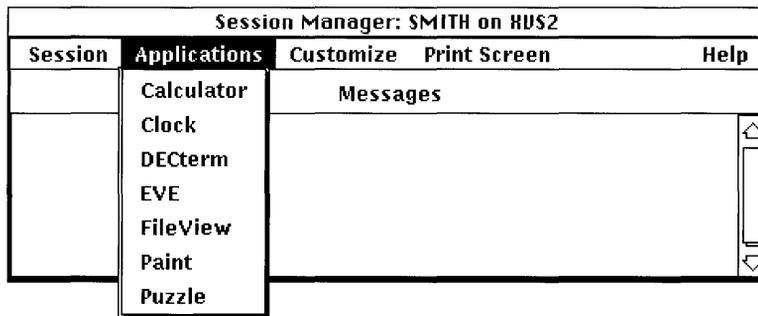


Figure 2-2 The Session Manager window with Applications menu pulled down

To start the Session Manager from MacX, you must configure and execute a Remote Command dialog box. The Remote Command dialog box lets you enter a remote command, which is an instruction that can start an X client on a host computer. In the procedures that follow, the remote command is defined to start the DECwindows Session Manager. In the Remote Command dialog box, you'll also have to indicate the type of display you want for the Session Manager, enter your user name and password, and set other options. Finally, you must specify the host computer and a connection method.

About connection methods

The steps that you perform to start the Session Manager depend on the connection method that you use. Connection method refers to the way in which your Macintosh and MacX are connected to a DECwindows client and the communications protocols

used in the connection. (For an explanation of communications protocols, as well as other networking terms and concepts, see Appendix A in the *Network Services User's Guide*.)

You can connect your Macintosh to an X client using the following three methods:

- AppleTalk-DECnet (also known as an ADSP connection)
- TCP/IP
- DECnet

Other connection methods may also be available to you. The method that you use depends on your particular network environment.

By choosing a connection method in the Connection Settings dialog box, you are really choosing a **connection tool**. Connection tools define the type of connection that is established between your Macintosh and another computer. Connection tools are one type of communications tool. **Communications tools** are pieces of software that manage specific communications tasks for a communications application such as MacX.

The AppleTalk-DECnet connection method is the only method that allows you to execute a remote command to start an X client in the DECwindows environment. This section, therefore, describes how to make a connection with the AppleTalk-DECnet Connection Tool.

The **AppleTalk-DECnet Connection Tool** establishes a connection to a DECwindows application through the AppleTalk/DECnet Transport Gateway. (The *AppleTalk-DECnet Connection Tool* reference module, in the *Connection Tools* part of this guide, provides information about the gateway as well as about the AppleTalk-DECnet Connection Tool.)

Before configuring the Remote Command dialog box to use the AppleTalk-DECnet connection, you may need to select a network, and you must select a gateway through which to connect to the network. Proceed as follows:

- If your Macintosh is connected to more than one network, you must select the network that contains the VAX computer running the DECwindows application(s) that you want to use. See the next section, "Selecting a Network Connection." Then go on to "Selecting a Gateway."
- If your Macintosh is connected to only one network, you need only select a gateway from the Chooser. Skip to "Selecting a Gateway."

Selecting a network connection

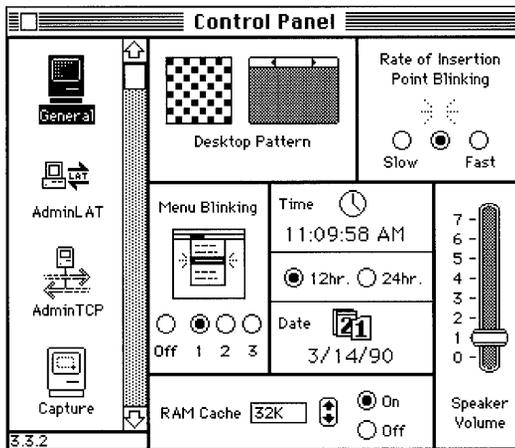
If your Macintosh is connected to more than one network, follow the procedure in this section to make sure that the correct network is selected. If your Macintosh is *not* connected to more than one network, you may skip this section and proceed directly to “Selecting a Gateway.”

If your Macintosh is connected to multiple networks, only one network can be active at a time. You use the Network device in the Control Panel to select the active network.

To select a network connection:

1 Choose Control Panel from the Apple () menu.

The Control Panel window appears.



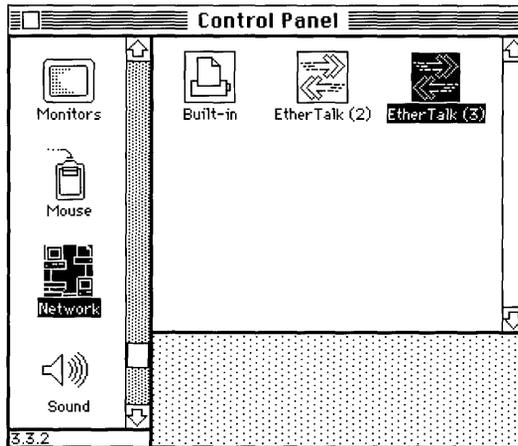
2 Select the Network icon from the group of icons on the left side of the Control Panel window.

You may have to scroll through the list to find the Network icon.

3 Select the icon for the network connection that you want to use.

A separate icon represents each network to which your Macintosh is connected. If you are attached to a LocalTalk® network, that connection is usually made through the printer port, and its icon is labeled *Built-in*.

You may also have connections to Ethernet environments, through Ethernet cards (such as the Apple® EtherTalk®NB Card) installed in your Macintosh. Each icon for an Ethernet connection is labeled *EtherTalk*. If you have more than one Ethernet connection, each icon's label includes a number in parentheses indicating the slot into which the Ethernet card is installed.



4 Close the Control Panel window.

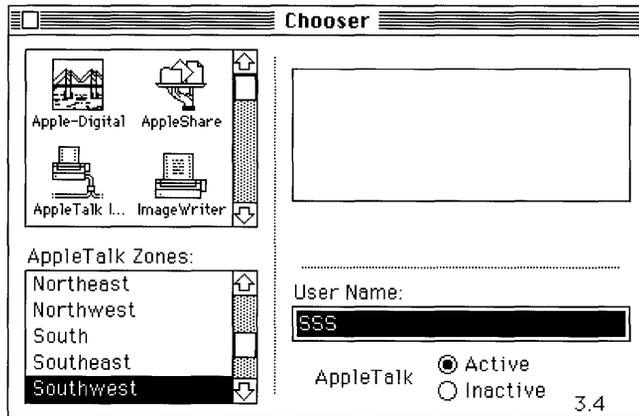
Selecting a gateway

The Macintosh Operating System remembers your gateway selection for future sessions. After you've selected a gateway once, you only need to repeat this procedure if you want to select a different gateway.

To select a gateway:

1 **Open the Chooser from the Apple () menu**

The Chooser window appears.

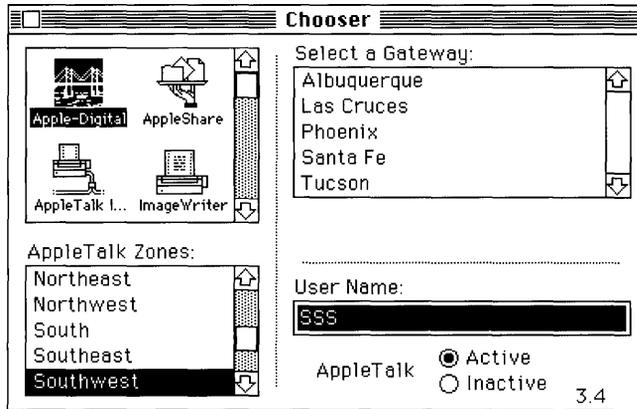


2 **Make sure that your Macintosh is physically connected to the network, and select the Active option for AppleTalk®, in the lower-right corner of the window.**

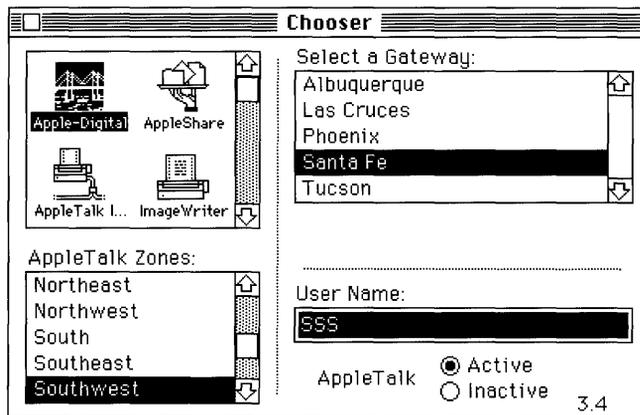
3 **If your network is divided into zones, select the zone that contains the gateway that you want to use.**

The list of available zones appears in the lower-left corner of the window.

- 4 Select the **Apple-Digital** icon from the group of icons in the upper-left area of the **Chooser** window.



- 5 Select the gateway that you want to use from the list in the upper-right part of the window.



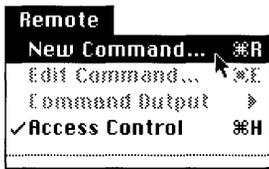
- 6 Close the **Chooser** window.

Configuring and executing the remote command dialog box

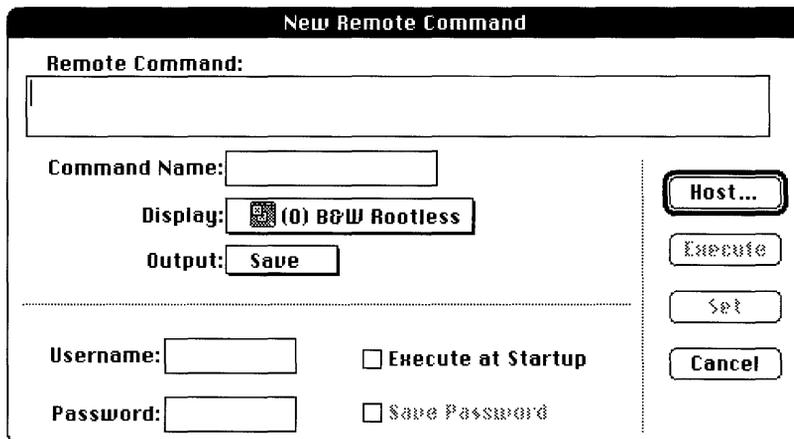
This section tells you how to create a remote command to start the DECwindows Session Manager through an AppleTalk-DECnet connection. In the Remote Command dialog box, you also set certain options and specify the host computer and a connection method.

To configure and execute the remote command dialog box:

- 1 **Choose New Command from the Remote menu or press Command-R.**

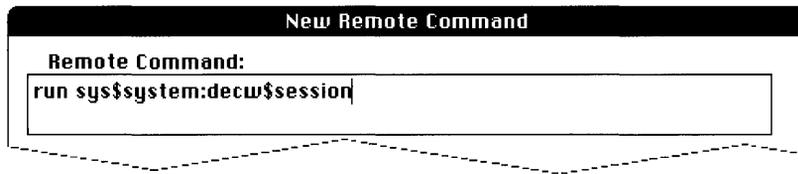


The New Remote Command dialog box appears.



2 Enter the command to start the Session Manager.

Type the command `run sys$system:decw$session` in the Remote Command field.



3 Fill in the rest of the New Remote Command dialog box.

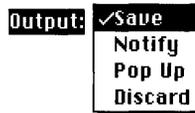
Command Name: Enter an abbreviated name for your command. This name will appear at the bottom of the Remote menu so that you can choose it in future sessions when you want to execute the command. The name will also appear in the Edit Remote Commands dialog box and in the Command Output submenu so that you can edit the command or view command output.

Display: This pop-up menu contains a list of the four types of screens on which you can display your remote command. (On monochrome systems, only the first two types of screens appear in the menu.)



Choose the style (rooted or rootless) in which you want to use MacX. (See “About Root Windows” in Chapter 4 for details.)

Output: Select Save or Notify from the Output pop-up menu to retain any system or error messages generated if the command doesn't work or gets interrupted by a problem with the host or the network.



The Notify option triggers a beep and causes a small, flashing MacX icon to appear at the left end of the menu bar when MacX receives output from the host. See “Creating New Commands” in Chapter 3 for an explanation of the other output options.

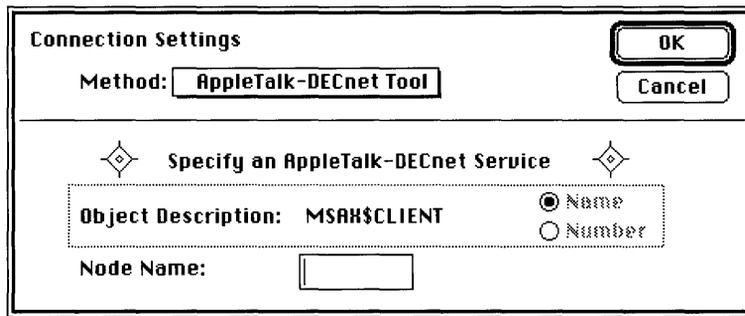
Username: Enter the user name assigned to you by your system administrator.

Password: Enter the password assigned to you by your system administrator. Each character typed appears as a dimmed, gray box for security purposes.

Save Password: This check box should be dimmed. If not, leave it unchecked for now. For more information, see “Saving Passwords” in Chapter 3.

Execute at Startup: Check this box to automatically start the Session Manager in the future whenever you open your MacX settings document. If you want to bypass this option later, hold down the Option key while MacX is starting up. After the MacX startup window disappears, you may release the key and no Session Manager window will appear.

Host: Click the Host button to display the Connection Settings box. At the top left side of the box, a pop-up menu labeled Method contains a list of connection tools that allow you to use DECwindows applications. You should accept the AppleTalk-DECnet connection method, which is the default connection method for the PATHWORKS™ for Macintosh® version of MacX.



Notice that when you select a different connection tool, the lower part of the Connection Settings dialog box changes. Each connection tool has a different set of options for you to configure.

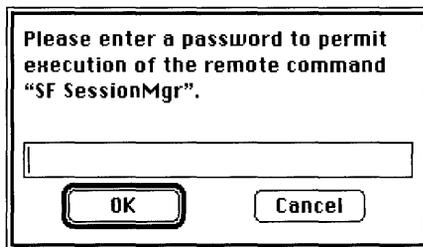
In the field labeled Node Name, enter the node name of the VAX running the DECwindows applications that you want to use. Ask your system administrator if you don't know the node name.

4 Click the OK button.

The Connection Settings dialog box disappears.

5 In the New Remote Command dialog box, click the Execute button or press the Return or Enter key to execute your command.

If you didn't enter a password in the Remote Command dialog box, MacX prompts you with the dialog box in the following figure.



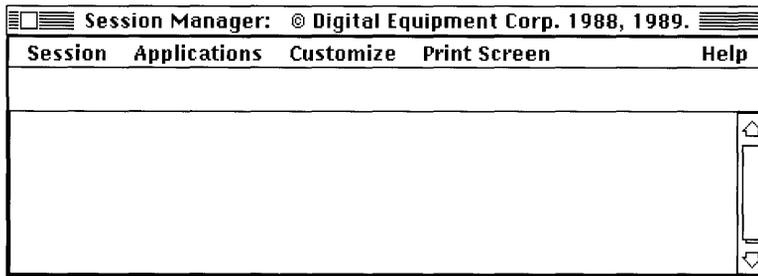
After a brief pause, MacX may display the alert box shown in the next figure. If this optional security measure is active, the alert appears in response to any attempt to connect with your MacX server. It prevents others from surreptitiously accessing MacX from another terminal without your knowledge or approval.



6 **Because this warning has appeared at this time in response to your own remote command, click the OK button.**

This first alert signals a test connection that MacX sets up to make sure everything is working correctly. A few moments later, you'll get a second, identical alert that signals that the DECwindows application is establishing a permanent connection for your session.

Within a few moments, the Session Manager window similar to the one shown here should appear on your screen.



Because Session Managers are usually configured to open the FileView application automatically, a third alert will probably appear, indicating that FileView is attempting to attach to your server. **FileView** is a graphical interface to the VMS operating system. (You can select other applications to start up automatically with the Session Manager by using the Autostart command in the Customize menu. See the *DECwindows User's Guide* for details.)

If nothing appears after a minute or so, you may have made an error typing the command, your user name, or your password. For other types of problems, such as network malfunctions, alert boxes will appear on your screen to inform you of the type of error. See Chapter 6, “Troubleshooting,” if you need more help.

Running DECwindows applications

You can always start an application from the Remote Command dialog box, just as you started the Session Manager. However, the Session Manager and FileView provide simpler methods.

As mentioned earlier, the Session Manager lets you start another DECwindows application by choosing its name from the Applications menu. You can use the same method from FileView, which contains a similar menu. Figure 2-3 shows the Session Manager window with the Applications menu pulled down and the Calculator application chosen.

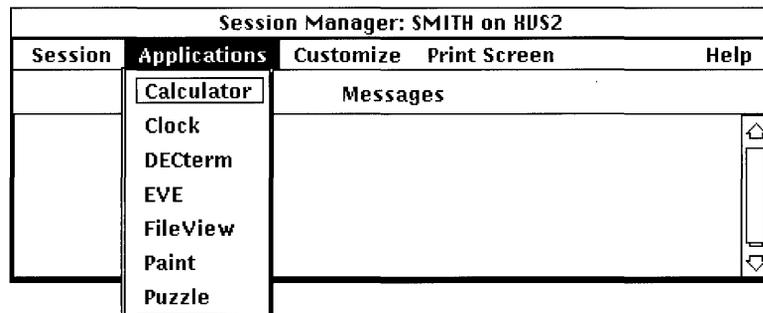


Figure 2-3 Starting an application from the Session Manager

In both the Session Manager and FileView, you may need to customize the Applications menu if the menu does not contain the names of the applications that you want to run. You can add names to the Applications menu by using commands in the Customize menu. The *VMS DECwindows User's Guide* gives details on customizing the Session Manager, FileView application, and other parts of your DECwindows environment.

You can also start applications from the DECterm terminal emulator. DECterm is a DECwindows application that emulates a VT320™ terminal, giving you direct, command-line-oriented access to the VMS operating system. To start an application, you enter Digital Command Language (DCL) commands in a DECterm window.

You may find it convenient to start applications through the terminal emulator if you are used to interacting directly with the VMS operating system. Of course, the VMS operating system and DCL commands provide many other powerful capabilities. See the *VMS User's Manual* for complete information on using the DCL.

Starting DECterm

To start DECterm and create a terminal window, you choose DECterm from the Session Manager's Applications menu, as shown in Figure 2-4.

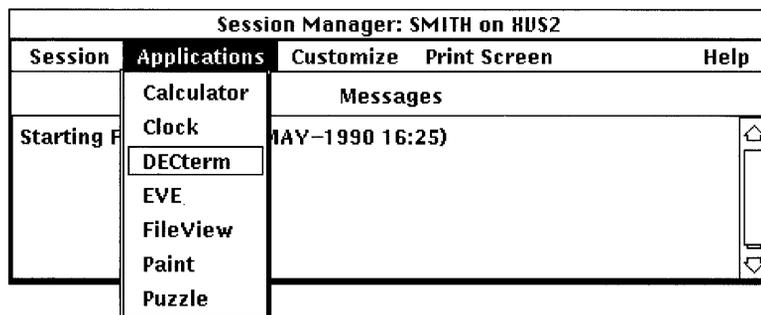


Figure 2-4 Starting DECterm

Refer to the *VMS DECwindows Desktop Applications Guide* for more information about starting and using DECterm.

Running the DECwindows Window Manager

When you work in the rootless style, windows are managed by the MacX Window Manager, which runs on your Macintosh computer. It is the MacX Window Manager that lets you move windows, resize them, and so on.

If you choose to work in the rooted style, the DECwindows Window Manager, which runs on a VAX computer, takes over the window management functions. Thus, if you are working in the rooted style, you'll want to start the DECwindows Window Manager as described in this section. If you are working in the rootless style, you can skip this section.

You start the Window Manager just as you would any other DECwindows application. Choose Window Manager if the name is listed in the Applications menu of the Session Manager or FileView. Otherwise, you'll need to issue the following command line from the Customize menu, from a DECterm window, or from the Remote Command dialog box:

```
run sys$system:decw$winmgr
```

When starting the Window Manager from the Remote Command dialog box, be sure to choose either screen 1 (B&W Rooted) or screen 3 (Color Rooted) from the Display pop-up menu.

Quitting DECwindows applications

All DECwindows applications have a Quit or Exit command available from one of their menus, usually the File menu. You should always close a DECwindows application by saving your files and then choosing the Quit or Exit command, so that you don't lose any of the work that you have done. If you are using DECterm, you should log out of the VMS operating system before you quit.

Do not use the Kill Client command; it is designed to disconnect clients, such as most standard X clients, that do not have a Quit or Exit command. Using Kill Client could mean losing the unsaved data with which you were working.

Quitting MacX

This section gives the procedure for quitting the MacX application.

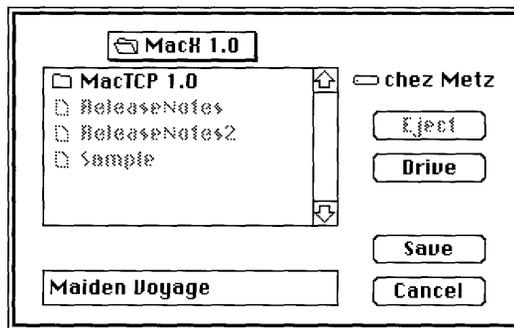
To quit MacX:

1 Quit the DECwindows applications that you are using.

If you're using DECterm, first log out of the VMS operating system so that you don't lose any work that you've done.

2 Choose Save As from the File menu.

The Save As dialog box appears.



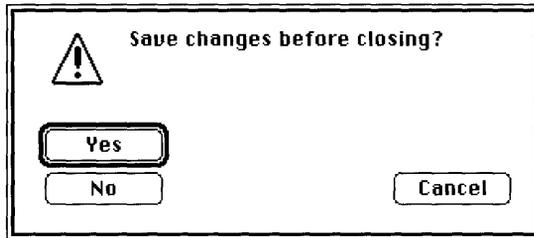
As discussed earlier in this chapter, MacX has created a settings document to preserve your remote command and the rest of your X environment. Unless you save the settings document, MacX will discard your settings information.

3 Name your settings document.

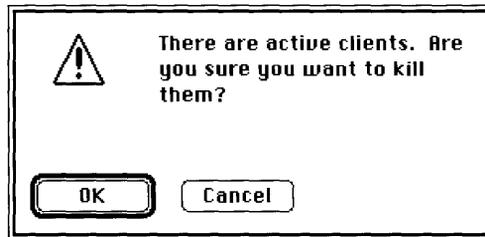
The document is currently labeled *Untitled*. Enter another name in the highlighted field and either press the Return key or click the Save button. (The preceding figure shows the name *Maiden Voyage* entered in this field.) MacX creates a document icon labeled with the name that you entered. Later, you can click the icon and return to the same environment that you just created.

4 Choose Quit from the File menu or press Command-Q to exit from MacX.

Should you forget to save your document before quitting, MacX will display an alert box asking whether you want to save your changes. Click the Yes button to display the Save As dialog box, and fill it in as described in the preceding step.



If DECwindows applications are still running when you quit MacX, the following alert box appears.



Since clicking OK abruptly disconnects all applications and jeopardizes any unsaved work, you should not quit in this way. Instead, click Cancel. Quit the DECwindows applications as described in the preceding section, and then quit MacX again.

Closing a settings document without quitting MacX

To leave the environment in which you are currently working without quitting MacX, quit any X clients you are using and then choose Save from the File menu.

If you haven't previously saved your settings document, the Save As dialog box appears. Rename and save your untitled settings document.

Close your settings document by choosing Close from the File menu. The MacX application remains open. To continue working, open an existing MacX settings document or create a new document by choosing New from the File menu.



3 Using Remote Commands

This chapter describes the commands in the Remote menu and gives detailed information on creating, editing, and executing remote commands. It also tells you how to view command output. In MacX, the primary purpose of remote commands is to start a DECwindows application, such as a DECwindows Session Manager.

When you create a remote command, you enter a Digital Command Language (DCL) command in a MacX Remote Command dialog box. Although this chapter provides sample commands that are likely to be useful to you, you may need to refer to the *VMS User's Manual* for details on using DCL commands and interacting with the VMS operating system.

The Remote menu

To issue commands to a remote host, you use the Remote menu, shown in Figure 3-1. Notice that the menu is divided into two parts by a dotted line. The area above the line contains MacX commands; the area below the line displays the remote commands that you create. You can quickly execute an existing remote command by choosing its name from the menu.



Figure 3-1 The Remote menu

Choosing New Command from the menu causes the Remote Command dialog box to appear. You can use the dialog box to type a new command and execute or save it.

Choosing Edit Command displays a list of existing commands that you can edit, execute, or remove. Choosing the Command Output submenu displays a list of commands that are currently executing. To see the output and status of a particular command, choose its name from the list. For more information on using the Edit command and the Command Output submenu, read “Editing Remote Commands” and “Executing Remote Commands” at the end of this chapter.

Next in the menu is the Access Control command. It prevents individuals and programs from connecting to MacX without your knowledge or permission. “Security Features,” later in this chapter, gives more information about this command.

◆ **Use remote commands sparingly** Remote commands are a time-consuming and memory-intensive way of starting up clients. For quicker results, rather than using remote commands, start up a client—such as the Session Manager—that provides a more convenient method for starting other clients. ◆

Creating new commands

To create a new command, choose New Command from the Remote menu. The Remote Command dialog box appears. As shown in Figure 3-2, this dialog box contains a number of text fields and pop-up menus. If you have not previously edited a command, the fields will be blank. Otherwise, they will contain information from the last command that you edited.

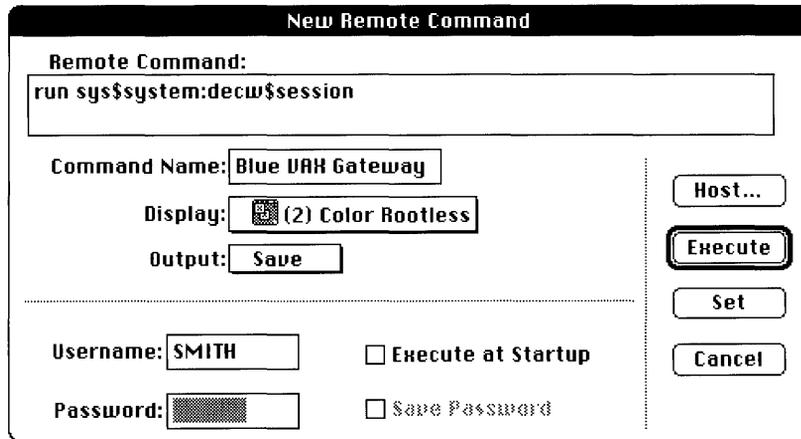


Figure 3-2 The Remote Command dialog box

Text fields in any MacX dialog box or window hold up to 255 characters. In addition, all text fields scroll up and down and from left to right. To scroll through them, drag with the mouse or use the arrow keys. (You can use certain keys as substitutes for mouse clicks; see Table 1-1 in Chapter 1.)

An explanation of each field and menu command follows.

- **Remote Command**

This field scrolls so that you can enter a lengthy command or more than one command. Type the DCL command(s) the way you normally would, using the syntax given in the *VMS User's Manual*.

- **Command Name**

Assign a command name for the command that you're creating, so that you can choose it later from the Edit Command or Command Output submenus.

- **Display**

The Display pop-up menu contains a list of four types of screens on which your application can be displayed. (The pop-up menu lists only two types of screens if your system does not support color.)

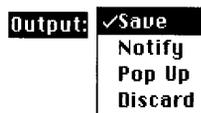


The screen number (0 through 3) preceding each screen type represents a style (rooted or rootless) and a type of screen (color or black and white). In the previous illustration, the display chosen is number zero (0), which specifies a black-and-white screen in which the root window does not appear (rootless). MacX will display the client window on the largest video monitor that fits the screen type selected.

- ◆ **For TCP/IP connections** If you specify an IP address in your command, you must append a display station and screen number to the address. The display station number for a Macintosh computer is always zero. See the next section, “Specifying Screen Numbers,” for a complete explanation and a table of screen numbers. ◆

- **Output**

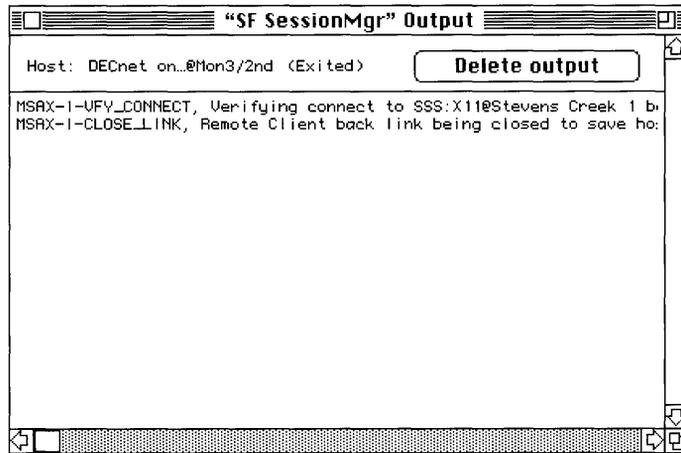
The Output pop-up menu allows you to choose from among four ways to be notified of output generated by your command when it is executed. Unless you choose the Discard option, MacX will put this output in the command’s Output window as it arrives.



Notify: Choosing Notify causes your Macintosh to beep and display a small, blinking MacX icon at the left end of the menu bar when command output arrives.



To cancel the notification and see the command output, choose the command name (or names) marked with a diamond from the Command Output menu. A Macintosh window displaying the output appears, as shown in the following figure. Simply click the close box to close the window.



Pop Up: Choosing Pop Up causes the Output window to automatically appear on the screen when command output arrives. If you are using MultiFinder and MacX is in the background, the Output window also appears in the background, so if you don't see it pop up, it might be concealed behind a foreground window.

Save: If you want to save command output but not be notified, choose Save. When you want to see the output, choose the command name from the Remote menu.

Discard: Choose Discard if you don't want to be notified of or save command output. This option is useful when you expect the output to be a process ID number or similar system information that does not interest you.

- **Username**

Enter the user name assigned to you on the host that will be receiving your command.

- **Password and Save Password**

Enter the password assigned to you on the host that will be receiving your command. For security purposes, each character that you type appears as a gray box.

If you have chosen “Save Passwords in Settings Document” in the Miscellaneous Preferences dialog box, the Save Password check box in the Remote Command dialog box will be activated. (See “Saving Passwords,” later in this chapter, for instructions on setting this preference.) Check the Save Password box if you want to save your password for this command in the settings document. When you execute the command, MacX automatically sends the password to the host. MacX encrypts all passwords in the settings document, thus ensuring a measure of security suitable for most business purposes. However, be careful not to give away copies of settings documents that contain saved passwords, because the recipients will gain unauthorized access to the corresponding host accounts.

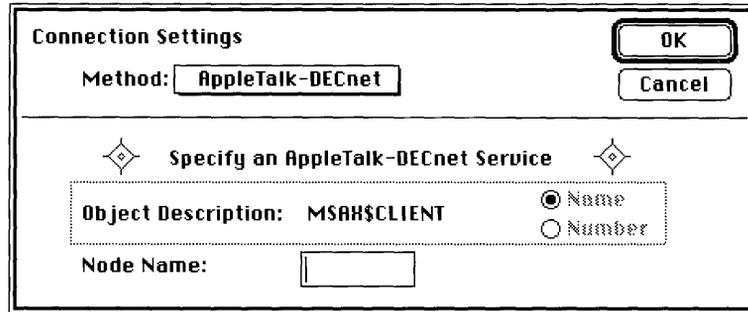
If you don’t check the Save Password check box, the Password field will always be empty and you will have to enter your password every time you execute the command. In the latter case, MacX displays a Password dialog box so that you can enter your password—as long as the “Prompt for Usernames and Passwords” option is checked in the Miscellaneous Preferences dialog box. If this option is not checked, MacX sends an empty password to the host, causing an error if the host requires a password. See “Saving Passwords,” later in this chapter, for more information about this option.

- **Execute at Startup**

Check this box if you want your command to execute automatically when you open the settings document in which it is saved. This option takes effect the next time you open the document. To temporarily override this option when you open the settings document, hold down the Option key until the pointer changes from a wristwatch to an arrow.

■ Host

Click this button to display the Connection Settings dialog box illustrated in the following figure. At the upper-left side of the dialog box, the pop-up menu labeled Method contains a list of connection tools that allow you to communicate with hosts. Choose a tool that can establish a connection with the VAX computer to which you intend to send your remote command. If you don't know which connection method to select, contact the system administrator who maintains the host to which you want to connect.



MacX dims any connection tools in the Method pop-up menu that cannot establish duplex, reliable byte-stream connections. This does not imply that all of the remaining, undimmed connection tools will work in every case, however. The host receiving the remote command must support the protocol for the connection tool you've chosen.

◆ **MacTCP Tool** Before issuing a remote command that specifies MacTCP® as the connection method, contact your system administrator or consult your host documentation to verify whether an entry identifying your Macintosh needs to be recorded on the host. (For UNIX hosts, this entry is often recorded in the /etc/hosts file.) In some cases, without this entry, the host will refuse to establish a connection with your Macintosh, yet it will not be able to send you an error message. ◆

In the preceding figure, the connection method chosen is AppleTalk-DECnet. The AppleTalk-DECnet Connection Tool lets MacX connect to DECwindows clients through the AppleTalk/DECnet Transport Gateway. When you choose a different connection tool, different settings appear in the lower part of the connection settings option. That's because each connection tool has a different way of selecting hosts, and requires different settings information.

For example, when you choose AppleTalk-DECnet from the Method pop-up menu, the dialog box displays the Object Description and Node Name fields. MacX fills in the Object Description field, so you need only supply the name of the VAX node to which you want to connect. (If you don't know what to enter in the Node Name field, ask your system administrator.) For information about the connection settings for each connection tool, see the reference module for the tool in the *Connection Tools Reference* part of this binder.

- **Action buttons**

Clicking any of these buttons on the right side of the Remote Command dialog box causes MacX to do the following:

Execute: Enters the command in the Remote Commands list (which you display by choosing the Edit Commands item in the Remote menu), enters the command at the bottom of the Remote menu, executes the command, and closes the Remote Command dialog box.

Set: Enters the command in the Remote Commands list, enters the command at the bottom of the Remote menu, and closes the Remote Command dialog box.

Cancel: Closes the Remote Command dialog box without entering the command in the Remote Commands list or Remote menu.

When executing commands, MacX may display an alert box inquiring whether you want to permit a connection by a new X client. See "Security Features," later in this chapter, for an explanation.

Specifying screen numbers

As explained in Chapter 1, MacX supports both traditional rooted X client windows and Macintosh-style rootless windows. In addition, MacX supports both monochrome and color screens. (To use MacX in color, you must have a Macintosh computer with Color QuickDraw™.) Four combinations of screen characteristics are possible. Each combination is referred to as a *screen*, and the screens are numbered 0 through 3, as shown in Table 3-1.

Table 3-1 Screen numbers

Screen number	Description
0	Monochrome screen, rootless style
1	Monochrome screen, rooted style
2	Color screen, rootless style
3	Color screen, rooted style

◆ **Noncolor machines** Machines that don't have Color QuickDraw—for example, the Macintosh Plus and Macintosh SE—do not support screen numbers 2 and 3. ◆

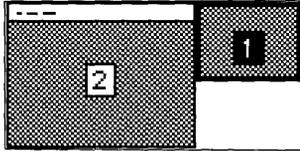
When starting a client from the Remote Command dialog box, you specify screen type by selecting the screen number from the Display pop-up menu. (See “Creating New Commands,” earlier in this chapter.)

When starting a client from a terminal emulator such as DECterm, you may specify the screen by typing the following command (substituting *n* with the screen number):

```
$ SET DISPLAY/SCREEN=n.
```

To specify the screen type when starting a client from the Applications menu of the Session Manager or FileView application, you must first configure the application (by using the Customize menu) to prompt you for the screen number when starting a client. (See your DECwindows documentation for information on customizing the Session Manager or FileView applications.)

◆ **Screen and monitors** In traditional X environments (which support only rooted client windows), screen numbers correspond directly to video display devices (monitors). The Macintosh environment, however, presents a unique situation. When you connect more than one monitor to a Macintosh computer, the Macintosh desktop traverses the monitors as if the desktop were one large area, with each individual monitor providing a view of only part of the larger desktop. In the following figure, the teal-colored box indicates the area of the virtual display.



In the Macintosh world, therefore, there is no direct relation between physical display devices and screen numbers. Screen numbers refer to the type of window (rooted or rootless, color or monochrome). See “How Windows are Positioned” in Chapter 4 for more information about how windows are positioned. ◆

Security features

Through passwords and the Access Control command, MacX protects itself and your accounts on remote hosts from unauthorized or surreptitious access. Learning about these features and taking some simple precautions will, in most cases, afford you more than adequate protection.

Saving passwords

If you would rather not type your password every time you issue a remote command, you can have MacX save them in the settings document. To save passwords, choose Miscellaneous Preferences from the Edit menu. When the Miscellaneous Preferences dialog box appears (as shown in Figure 3-3), click the “Save Passwords in Settings Document” check box and click the OK button. The corresponding Save Password check box in every Remote Command dialog box will be activated so that you can check it. If any Remote Command dialog boxes are open when you set this preference, MacX will also check their Save Password check boxes.

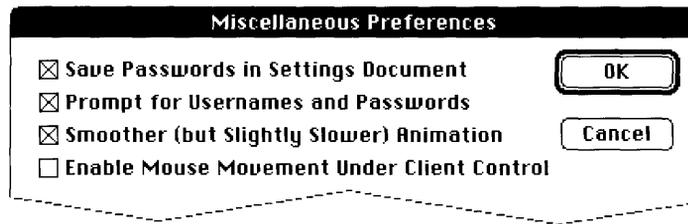


Figure 3-3 The Miscellaneous Preferences dialog box

MacX encrypts all passwords in the settings document, providing a level of security sufficient for the needs of most businesses. Taking additional precautions to protect secret or sensitive information, however, is a wise practice.

- △ **Important** Be careful not to give away copies of settings documents that contain saved passwords, because the recipients will gain unauthorized access to the host accounts protected by those passwords. △

Unless you do not need passwords for one or more of the hosts you log in to, you should also check the second check box in the Miscellaneous Preferences dialog box, “Prompt for Usernames and Passwords.” This option ensures that MacX will prompt you for a password if you execute a remote command that has a blank password field. Selecting this option is especially important if you do not save passwords in your remote commands, because it will circumvent log-in failures on hosts that require you to have a password.

Access Control

Access Control prevents a person or program from connecting to MacX without your knowledge or approval. This security feature is active when a check mark appears next to its name in the Remote menu. Simply choose the Access Control command from the menu to remove the check mark and turn this feature off. Pressing Command-H also turns Access Control on or off.

When activated, Access Control displays the alert box shown in Figure 3-4 whenever an X client attempts to connect to your server. Access Control also displays the alert box when you execute remote commands. If this warning appears just after you have issued a command to start a client, click OK. Otherwise, take whatever precautions you think necessary.

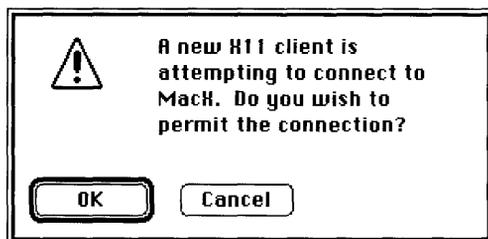


Figure 3-4 The Access Control alert box

Editing remote commands

The Remote menu provides two ways to edit existing commands:

- Hold down the Option key while choosing a command name from the bottom of the Remote menu. This method is the quickest.
- Choose Edit Command from the Remote menu.

When you choose Edit Command from the Remote menu, MacX displays the dialog box shown in Figure 3-5. The list at the left side of the dialog box contains the names of the remote commands that you have created. To edit a command, simply double-click its name in the list.

You can also select a command name and click one of the buttons on the right to edit, remove, or execute that command. When you click the Edit button, the dialog box for the selected command appears and you can edit or execute it. When you click the New button, MacX displays either a blank Remote Command dialog box, in which you can enter a command, or the Remote Command dialog box with a copy of the last command edited, which you can modify.

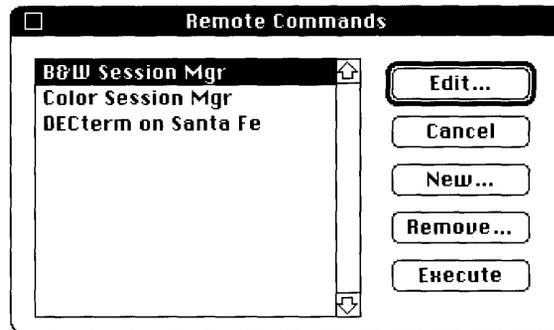


Figure 3-5 The Edit Command dialog box

Executing remote commands

The names of the remote commands that you have created are listed at the bottom of the Remote menu, below the dashed line. For example, the Remote menu in Figure 3-6 contains three remote commands. Choosing a name from this list automatically executes the command without displaying its Remote Command dialog box.

You can also execute a command from the Remote Command dialog box, described in the preceding section. Select the command from the list at the left side of the dialog box and click the Execute button.

The next section describes how to display the output of a command that is executing.

Viewing a command's output

The Output window displays information generated by a command (or about a command) while the command is executing. To open the Output window, select a command name from the Command Output submenu, shown in Figure 3-6. The submenu lists the command names in the order of command execution, so that the name of the most recently executed command appears at the top of the list.



Figure 3-6 An example of the Command Output submenu

If you have chosen to discard command output (by selecting the Discard option in the Remote Command dialog box), the Output window will appear, but it will be empty.

To make the Output window appear as soon as the command or the host executing the command generates output, select the Pop Up option in the Remote Command dialog box. As long as MacX is in the foreground, the Output window appears in front of any other windows on your screen. MacX is always in the foreground unless you are running MultiFinder and working in a different application.

In the Command Output submenu, a symbol may precede some of the command names. These symbols indicate whether an Output window contains new information or information you have already read, as explained in Table 3-2. The absence of a symbol means that the window contains no command output.

Table 3-2 Command Output submenu symbols

Symbol	Meaning
◇	Output window contains unread command output.
✓	Output window contains output that you have already read.
blank	Output window contains no command output.

Because you can issue the same remote command more than once—for instance, you could issue *DECTerm on Santa Fe* two times and have two DECTerm windows on your screen—these symbols help you keep track of which command output applies to which client window.

Figure 3-7 shows an example Output window. The name of the host on which the command is running appears on the left, in this case *Santa Fe*. A word indicating the status of the command appears in the middle, in parentheses: either *Opening*, *Running*, or *Exited*.

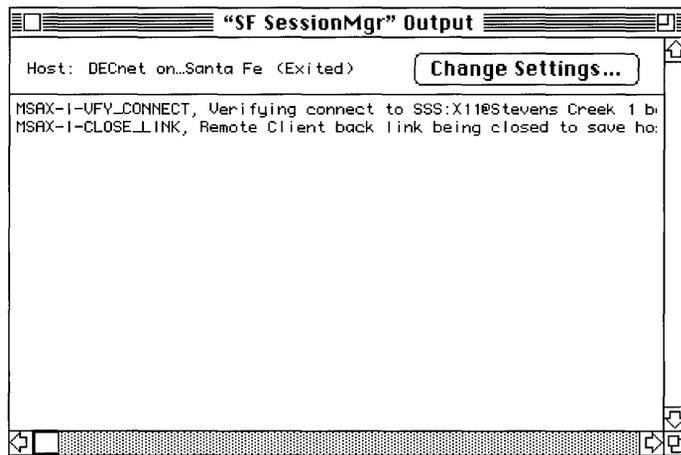


Figure 3-7 An example Output window

Clicking the Change Settings button on the right lets you change the output status of your command.

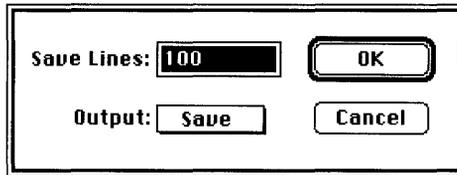


Figure 3-8 The Change Settings dialog box

The Output pop-up menu is like the one in the Remote Command dialog box—the menu lets you choose how MacX notifies you of command output. In the Save Lines field, you can enter the number of lines of command output that you want to save, up to a maximum of 5,000 lines. The Output window will contain no more than the number of lines that you specify here. MacX discards any additional output by erasing from the beginning so that the most recent command output is retained.

Clicking either of the two buttons on the right will close the Change Settings dialog box. Click OK to save your changes and close the dialog box. Click Cancel to close the dialog box without saving your changes.

4 Working With Windows

This chapter describes the commands in the MacX Window menu and explains how to position, move, and size rootless- and rooted-style client windows. It explains how to convert these windows to icons (called *iconifying*), how to restore icons to windows, and how to close the windows. This chapter also discusses working with a visible root window. For a brief introduction to the rooted and rootless styles, see Chapter 1.

When you use MacX, the X client applications can run in windows that look and act like Macintosh windows. If you're familiar with the Macintosh computer, you already know a lot about using windows, and you may not need to read the entire chapter. However, MacX provides several unique features that you may want to read about, such as a selection of five different window styles and the ability to set aside windows by shrinking them to icons.

The Window menu

To work with windows, you use the Window menu, shown in Figure 4-1. With the exception of the Show B&W Root Window and Show Color Root Window commands, all of the commands on this menu are dimmed until you have an active client window on your screen. The menu in Figure 4-1 shows one active client, Clock. For instructions on starting up a client, consult Chapter 2, “Getting Started,” or Chapter 3, “Using Remote Commands.”



Figure 4-1 The Window menu

MacX lists the titles of open windows in alphabetical order at the bottom of the Window menu, below the second dotted line. The menu lists rootless client windows and MacX windows such as the Color Namer dialog box. If you are working with a visible root window, its title also appears in this list, but those of its client windows do not appear, as they are under the control of a different window manager.

MacX lets you have more than one window with the same title open at the same time. To distinguish each of these windows, MacX appends a number to its title. The first time that you start up a client, MacX appends no number to its title; however, if a duplicate of that window title appears, MacX adds a (1) to the original client window’s title and a (2) to the duplicate window’s title. Once issued, these numbers remain in the menu even when the original window is closed. In Figure 4-1, the title *Clock (2)* indicates that a second Clock is running. The absence of a *Clock (1)* title indicates that the first Clock has ceased operating. The bullet preceding *Clock (2)* means that this window is active, or frontmost.

How windows are positioned

The position in which a DECwindows client window appears when you open it is preset. Usually the client window appears approximately in the middle of the screen. Occasionally, in the preset position only part of the window might be visible, or the window might not be visible at all. This situation might occur if you have more than one monitor connected to your Macintosh.

In the Macintosh environment, the desktop extends across all monitors connected to the same workstation. Because of the different sizes of monitors and the ways in which they can be positioned relative to one another (using the Monitors utility in the Control Panel), the Macintosh desktop can have portions that are not visible. Figure 4-2 shows two monitors; the teal-colored box indicates the Macintosh desktop.

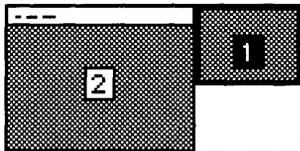


Figure 4-2 Multiple monitors and the Macintosh desktop

When DECwindows attempts to position a window in the nonvisible part of the desktop, the MacX Window Manager takes over and places the window near the desktop's point of origin (the upper-left corner). If more than one window needs to be placed, MacX positions the windows in a cascading sequence. MacX automatically places a window on the largest monitor best-suited to display it; for example it puts a color window on the largest color monitor available.

For information on moving windows yourself, see "Moving and Sizing Windows," later in this chapter.

Using windows in MacX

This section describes techniques for using both rootless- and rooted-style client windows. You can start a client in either rootless or rooted style, and you may have both styles of client windows on your screen at the same time. Client windows that you open in rootless style are controlled by the MacX Window Manager. Those that you open in rooted style are controlled by remote window managers, such as the DECwindows Window Manager. For more information about working in rooted style with a visible root window, see “About Root Windows,” later in this chapter.

Making windows active

When you are working with rootless-style clients, you can make a window active in one of two ways:

- Select its title from the Window menu.
- If the window is already on the screen, click its title bar.

Avoid clicking in a client window to make it active. Taking this precaution prevents the client from receiving the mouse click and performing some action that you don't expect or don't want.

An active window in rootless style has **keyboard input focus** and **colormap focus**. These X terms simply mean that the client in the active window receives characters typed from the keyboard and controls the colors displayed on your screen.

When you are working with rooted-style clients, the method for making a window active or assigning input focus depends on the window manager that you are using. Again, avoid clicking in a client window to make it active, as the mouse click may have an unexpected result.

In the Window menu, a bullet in front of a window's title indicates that the window is currently frontmost (or active). (See Figure 4-1.)

Styling and manipulating windows

Although MacX allows you to treat rootless client windows like regular Macintosh windows, MacX has no control over windows that open within a client window. According to X protocol convention, these subordinate windows are controlled by the client itself—MacX simply relays the information to your screen.

On the other hand, the client and the host on which it runs have no control over the type of window that MacX creates for the client. They can make requests, called *hints*, but the MacX Window Manager, guided by your preferences, determines what is possible when placing windows on the screen.

Window styles

When you open a rootless client, it appears in a Macintosh-style window. This window style includes a title bar across the top of the window and a size box in the lower-right corner. You can change the window style by following these steps:

1. Bring to the front the window that you want to restyle.
2. Choose Set Window Style from the Window menu to display the five window styles.

The style currently in effect will have a check mark next to it. Choose the style that you want. Figure 4-3 shows the five window styles.



Figure 4-3 Styles for rootless client windows

Remember that a title bar lets you move a window, and a size box lets you resize a window. If you select a window style without a title bar or a size box, you can move or resize the window by choosing Temporarily Adorn from the Window menu. (You can also move a rootless window by holding down the Option key and dragging the window.) For more information, see “Moving and Sizing Windows,” later in this chapter.

Setting a default window style

You can set a default window style for rootless-style client windows by following these steps:

1. Choose Window Preferences from the Edit menu to open the Window Preferences dialog box.
2. Choose a style from the Default Window Style pop-up menu.

Figure 4-4 shows the Default Window Style pop-up menu. (The window styles are illustrated in Figure 4-3.) The default window style that you choose takes effect the next time you start a rootless-style client.

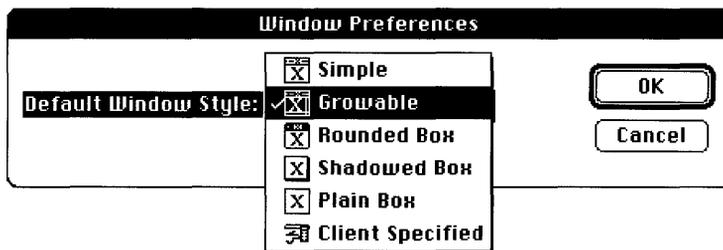


Figure 4-4 The Default Window Style pop-up menu

The last item in the Default Window Style menu, Client Specified, allows MacX to convert client border-width hints into one of the five MacX window styles. If your client does not provide a way to set border widths, then choose one of the other options.

Moving and sizing windows

Before moving or sizing a rootless client window, make sure that it is active (in the foreground). If the window has a title bar and size box, you can use them to move and size the window as you would any Macintosh window.

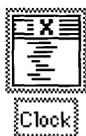
If the window has no title bar or size box, you can use one of the following techniques:

- You can use the Temporarily Adorn command to move or resize a window. Make sure that the window is active. Choose Temporarily Adorn from the Window menu. Your window acquires a temporary title bar and size box, giving you one opportunity to move or size it like any Macintosh window. When you release the mouse button after moving or sizing the window, the window reverts to its former style. If you aren't satisfied with its new location or size, choose Temporarily Adorn again.
- You can use the Option key to move a window. Move the mouse pointer into the window. Hold down the Option key while you drag the window to its new position. Pressing the Option key changes the pointer to this icon : .

◆ **Stacking windows** MacX permits you to stack client windows and maintains the contents of windows concealed in the stack so that they reappear as you left them. In other words, MacX refreshes the window's contents when you uncover it so that you don't have to wait for a client to refresh the window, which would take longer. ◆

MacX allows you to move and resize a root window displayed on your screen just as you would a client window, because this so-called root window is actually a Macintosh window. For more information, see "About Root Windows," later in this chapter.

Converting windows to icons



Client window
icon

When client windows get in your way, you can clear a space in two different ways. You can move the windows, or you can **iconify** them—that is, convert them into icons on your screen. The client can determine what the icon looks like, but if it doesn't specify anything, MacX displays a miniature Macintosh window.

You can move an iconified window with the mouse pointer, just as you would any icon on your desktop. You can change the icon back to a window by double-clicking it or by clicking it and choosing Uniconify from the Window menu.

MacX provides two ways to iconify a client window:

- Click in the window to make it active and choose Iconify from the Window menu.
- Click in the window to make it active and press Command-I.

While the window is iconified, any commands, calculations, or other processes currently operating will continue to execute. When you double-click the icon to restore the window to its original size and appearance, the client redraws the contents of the window.

Killing clients and closing windows

Close Window and Kill Client are two commands that appear in the same location in the Window menu, depending on what type of window is active.

When MacX first starts up, before any windows have opened, the Window menu displays a dimmed Close Window command. When a MacX window becomes active, choosing Close Window closes the window. Using this command is an alternative to clicking the window's close box or Cancel button.

The Kill Client command appears only when a rootless client window is active. It is designed to disconnect clients that provide no way to issue commands to them directly. It is also useful to programmers who want to stop a runaway program. However, Kill Client is not the preferred way to close a DECterm or other terminal emulator window because it causes an abrupt disconnection. Any unsaved data in the window would probably be lost unless the host has some way of retaining it.

- △ **Important** DECwindows applications have a Quit or Exit command available from one of their menus. It is better to use one of these commands to stop an application than to disconnect by using the Kill Client command. △

Fortunately, when you choose Kill Client, MacX does not immediately execute the command. An alert box appears first, inquiring whether you really want to kill the client. (See Figure 4-5.) In addition, the client window displays a moving, dashed outline so that you can clearly see which client will be killed.

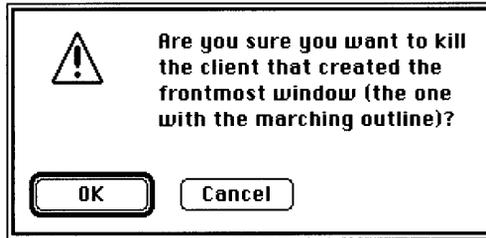


Figure 4-5 The Kill Client warning

Note that clicking the close box at the left end of a client window's title bar is equivalent to choosing Kill Client.

About root windows

MacX creates a visible root window if one of your clients requests one. In addition, you can show or hide the black-and-white or color root window at any time by choosing a command from the Window menu. Figure 4-6 shows what your desktop looks like with the root window visible, assuming that your Macintosh has just one screen attached. Usually the root window covers the entire screen when it first appears, although you can set a preference to change its size.

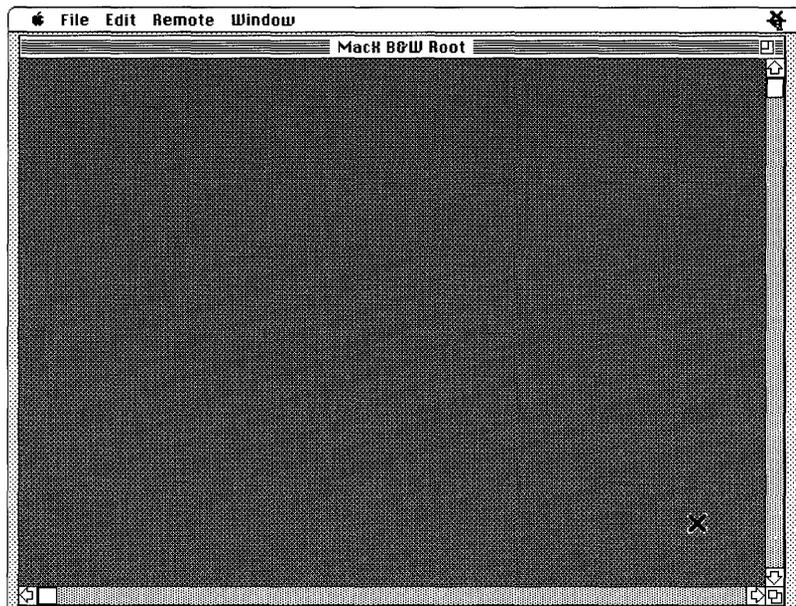


Figure 4-6 MacX on the desktop with the root window visible

You'll notice that the window in Figure 4-6 has a size box in the lower-right corner. Though labeled *root*, this window is actually a Macintosh window that reveals all or part of an off-screen **bitmap**—a virtual root window stored in memory. This arrangement enables you to manipulate the root-viewing window without disturbing clients running in the underlying virtual root window.

Figure 4-7 illustrates this concept. Notice that the root-viewing window displays part of a larger bitmap on which three clients are running. In this case, you see parts of the Clock, Calculator, and DECterm application windows. Scrolling reveals other parts of the client windows.

Naturally, the root-viewing window can be smaller, but never larger, than the dimensions of the virtual root window. When it is smaller, the scroll bars become active so that you can scroll through the entire root window.

Alternatively, you can use the hand cursor for faster scrolling: Change the pointer to a hand icon () by holding down the Option and Command keys. Now position the pointer in the root-view window, hold down the mouse button, and move the mouse to change your view of the root window.

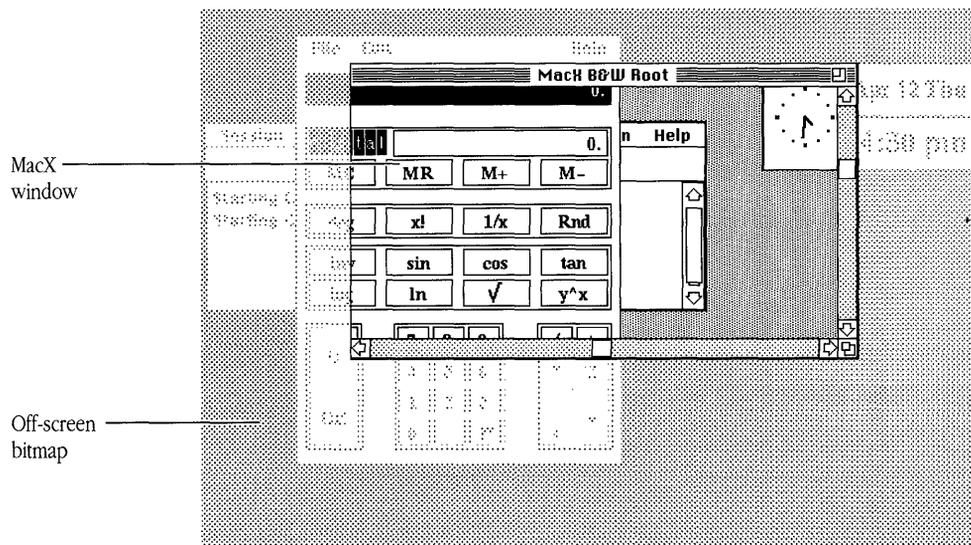


Figure 4-7 Viewing the off-screen bitmap

In traditional X implementations, the root window never moves or changes size, so clients are not designed to accommodate such changes. Accordingly, MacX will not let you resize the virtual root window while any clients—whether rooted or rootless—are running. For more information on resizing the virtual root window, read “Root Window Preferences,” later in this chapter.

Starting rooted clients

Before you can move and resize rooted client windows, you’ll need to start a remote window manager such as the DECwindows Window Manager. (You can’t use the MacX Window Manager in a root window because it controls only rootless windows.) Although it’s not necessary to start a window manager before starting a client in rooted style, it’s usually convenient to do so.

You start the DECwindows Window Manager just as you do any other DECwindows application. For more information, see “Running DECwindows Applications” in Chapter 2.

Because the root window covers all or part of your desktop, you might find that it occasionally gets in the way of something else that you want to see. If this situation occurs, you can always hide the root window, even with clients running in it, as described in the next section.

◆ **Trouble starting color clients?** Some color clients, such as DECwrite, require a lot of memory to run. If MacX tells you that it does not have enough memory to execute a command or warns you that memory is running low, you should allocate MacX a larger block of memory. See “Memory-Related Problems” in Chapter 6 for instructions. ◆

Showing and hiding the root window

MacX does not allow you to iconify a visible root window, but it does give you a way to make it disappear for as long as you like, even when it is displaying client windows. By choosing one of two commands in the Window menu, you can hide the black-and-white or color root window. When you hide the root window, the command in the Window menu changes from *Hide* to *Show* so that you can make the root window reappear at a later time. Figure 4-1 illustrates these two commands.

Root window preferences

The B&W and Color Root Preferences commands, located at the end of the Edit menu, allow you to modify the default settings for a monochrome or color root window, respectively. When you select either of these commands, a Rooted Screen Setup dialog box appears. Figure 4-8 shows the monochrome version; the format for the color root window preference is the same.

Both preferences commands let you change the size of the virtual root window stored in memory by using your mouse to drag the small, black square in the setup dialog box. The setup dialog box also displays an outline of the screens attached to

your Macintosh. These outlines show you how big a root window you are creating. For example, in Figure 4-8, the setup dialog box shows an outline for one large and one small screen. The virtual root window is slightly smaller than the large screen.

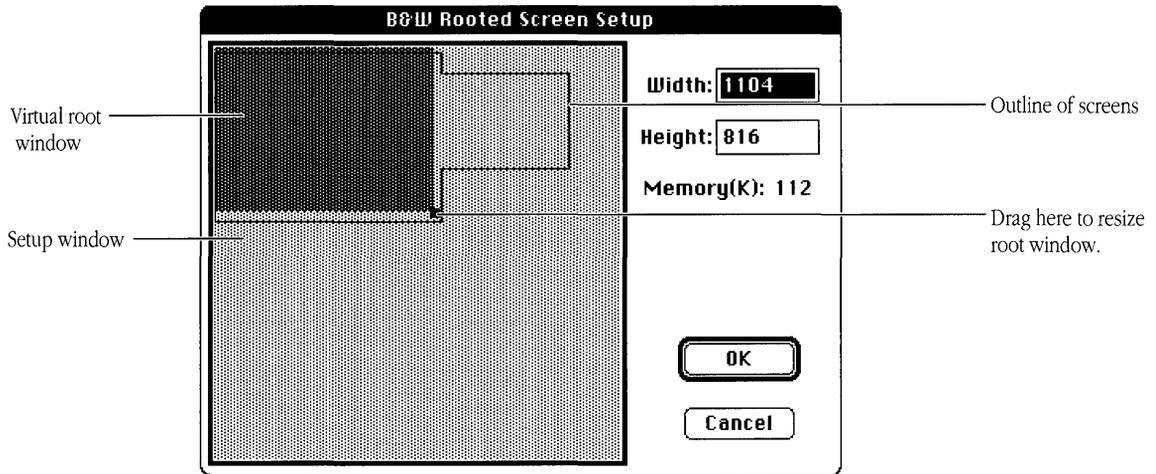


Figure 4-8 The B&W Rooted Screen Setup dialog box

You shouldn't attempt to resize a root window when clients—rooted or rootless—are running. If you do, MacX displays the alert box shown in Figure 4-9.

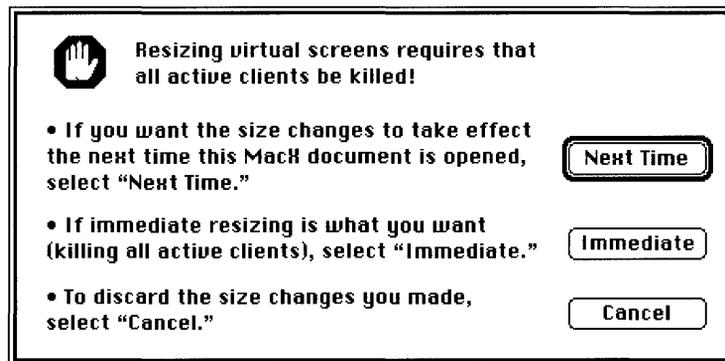


Figure 4-9 The root window warning message

You can defer your changes until later, or you can discard them altogether if you would rather not kill your clients in order to resize the root window immediately.

5 Managing Fonts and Color

This chapter describes in detail the Font Director and summarizes the X convention for specifying font names. It also tells you how to use the Color Namer.

Programmers who want to create fonts should refer to Appendix D, which contains the *X Logical Font Description Conventions, Standard V1.2*. For those interested in compiling fonts from Adobe Bitmap Distribution Format files, Appendix C provides the *Bitmap Distribution Format 2.1* standard for your reference.

Although most of the color and font features are easy to use, the procedures for compiling fonts and creating new fonts can be complicated unless you have an understanding of the X font standards and some programming experience. If you don't have this background, consult with someone who does before attempting to compile or create fonts.

Using fonts in MacX

Fonts are implemented in MacX by means of three basic components designed for convenience and efficiency: a MacX Fonts folder, the Font Directory file, and the Font Director. The MacX Fonts folder holds the X font files, the Font Directory file contains a list of these fonts, and the Font Director lets you view and use the fonts.

The MacX Fonts folder



The MacX Fonts folder holds files that contain the standard set of X fonts. These files are organized by font family in subfolders labeled Times, Helvetica, and so forth. Each file contains one variation of a font. For example, one file contains Helvetica 18-point bold, a variation of the Helvetica font family.



MacX stores a list of these fonts in the Font Directory file, also located in the MacX Fonts folder. Because the font names in this file must conform to the format specified in the *X Logical Font Description Conventions*, they are too long to serve as filenames. Consequently, files in the Font folder have shorter names like *helvB12*.

◆ **DECwindows fonts** In addition to the standard set of MIT X fonts, the MacX supplied with PATHWORKS for Macintosh includes the full set of DECwindows fonts. ◆

The purpose of the Font Directory file is to supply the Font Director with a current list of X fonts, any Macintosh fonts you have chosen to use in MacX, and any font aliases that you have created to act as substitutes for font names or other font aliases. MacX updates this file every time you start up a settings document or click the Update Font Directory button in the Font Director dialog box. Turning on the RAM cache in the Control Panel speeds the updating process significantly.

The MacX Fonts folder belongs either in your System Folder or in the same folder as your MacX application. To avoid complications, keep just one MacX Fonts folder on your disk.

The Font Director

The Font Director eliminates many of the time-consuming aspects of dealing with fonts in a conventional X environment. To see what a font looks like, you do not have to run font clients or type commands with long, cryptic font names in them. Instead, you can display the Font Director dialog box (shown in Figure 5-1), click a font name, and see a sample of the typeface.

In addition to viewing fonts, you can sort fonts in a variety of ways, assign aliases to font names, and compile fonts from Bitmap Distribution Format (BDF) files in a straightforward manner by clicking buttons in the Font Director dialog box.

To use the Font Director, choose Fonts from the Edit menu or press Command-F on the keyboard.

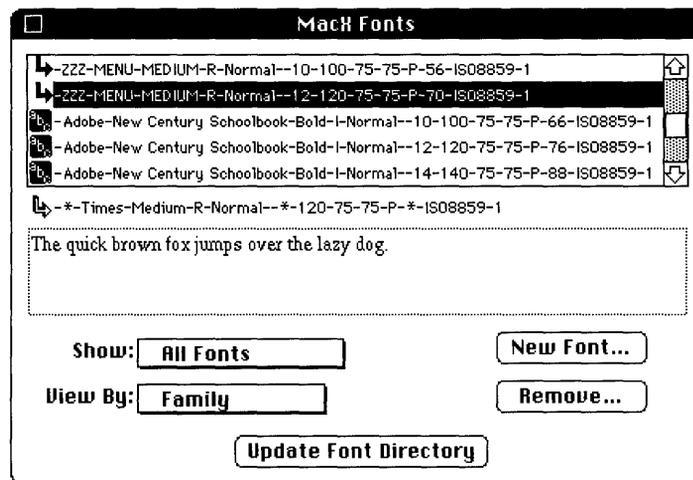


Figure 5-1 The Font Director dialog box

The list of fonts in the Font Director dialog box includes all the fonts in the MacX Fonts folder, any Macintosh fonts that you have added, and any X font aliases that you have created. An icon precedes each item in the list to indicate whether it is an X font, a Macintosh font, or an X font alias, as shown in Figure 5-2.



Figure 5-2 Font Director icons

To make it easier to find font names in a long list, the Font Director supports all the standard Macintosh scrolling methods. Besides responding to the scroll bar and arrows, the Font Director scrolls to the font element in the list that matches a letter, word, or number typed at the keyboard. The View By pop-up menu displays the font element for which the Font Director searches.

For example, if the font element displayed is Family, typing `s` causes the Font Director to scroll to the first font family beginning with `s`. Typing `Times` causes the Font Director to scroll to the first font in the Times family. Similarly, typing a number produces the first font family starting with that number. However, if none of the Family elements begins with a number, the Font Director scrolls to the top of the list. When it searches, the Font Director ignores case and blank spaces but not diacritical marks.

If the Font Director cannot open a font file, it displays cross-hatched lines in the Font Director dialog box instead. If the file contains a reverse-character font—one that prints to the left rather than to the right—the display line for the font appears blank.

The X format for font names

In Figure 5-1, the long strings of characters listed in the Font Director dialog box are font names. Font names comprise a collection of font elements or properties separated from each other by hyphens, a format required by the *X Logical Font Description Conventions*. A font name always begins with a hyphen in MacX because the name does not include the Registry element (explained in Table 5-1). A pair of hyphens in a font-name string indicates that a font element has been omitted, not because it is optional, but because it does not apply to that particular font.

Table 5-1 summarizes the format of a font name's registry and suffix as specified by the *X Logical Font Description Conventions*. The table lists the font elements in the order of their appearance in the font-name string, starting from the left side. For more information, refer to Appendix D.

Table 5-1 The X logical font-name format

Element	Definition
Registry	The registration authority that owns the font (its syntax and semantics).
Foundry	The type foundry that digitized and supplied the font shape or metric information.
Family name	The name of a typeface, including all its style variations, such as bold or italic.
Weight name	A name identifying a font's typographic weight—for example, bold or medium.
Slant	A one or two-letter code indicating the posture of the font—for example, <i>R</i> for Roman, <i>I</i> for italic.
Set-width name	One or two words designating the width of a font—for example, Normal, Condensed, Double Wide.
Add style name	A term that identifies additional type-style information—for example, serif, sans serif. If a typeface doesn't have additional style information, this field is empty.
Pixel size	The number of pixels required to display a particular point size. The pixel size is usually equivalent to or close to the point size.
Point size	A number representing the height of the font in tenths of a point. For example, 8 points would be expressed as 80.
X resolution	A number representing the horizontal resolution of a font, measured in dots per inch (dpi).
Y resolution	A number representing the vertical resolution of a font, measured in dots per inch (dpi).
Spacing	A letter that indicates the escapement class or pitch of a font—for example, <i>M</i> for monospacing, <i>P</i> for proportional spacing.
Average width	A number, measured in tenths of a pixel, that represents the unweighted arithmetic-mean width of all characters in a font.
Character-set registry	A name or string of alphanumeric characters identifying the organization that owns a typeface character set.
Character-set encoding	The character set used to associate each character in a font with its glyph or image.

The format for Macintosh font names

Macintosh font names appearing in the MacX Font Director dialog box have a much briefer format than that described in the preceding section. The format begins with the Macintosh name for the font. The name is followed by a hyphen, the point size in decimal format, and, optionally, one or more of the following letters:

b	Bold	u	Underline
s	Shadow	e	Extend
i	Italic	c	Compress
o	Outline	m	Monospaced

For example, the Font Director would display the font name for 18-point Geneva bold shadowed italic as Geneva–18bsi.

Adding a Macintosh font to the Font Director list

Initially, the Font Director does not list any Macintosh fonts because listing all of the variations in each font family would make the font-name list too long. As an alternative, the Font Director provides a way for you to add the Macintosh fonts that you frequently use.

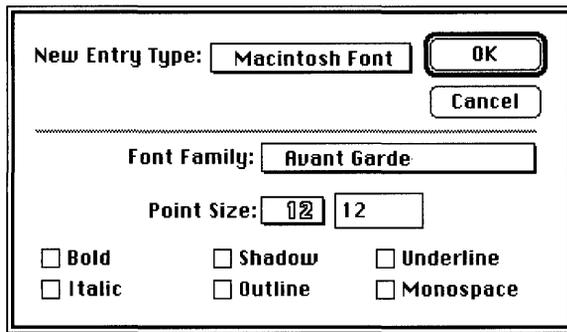
To add a Macintosh font to the Font Director lists:

1 Choose Fonts from the Edit menu.

The Font Director dialog box appears.

2 Click the New Font button.

When the New Font dialog box appears, the New Entry Type pop-up menu should display the words *Macintosh Font*.



3 Choose a font family, point size, and other font properties.

Click the Font Family and Point Size pop-up menus to choose a font name and point size. Click the check boxes to select other properties, such as bold or outline.

4 Click OK to add the font to the font-name list.

In the font list, as explained earlier in this chapter, Macintosh fonts are distinguished from X fonts by a different icon and font-name format. The location of Macintosh fonts in the font list depends on the font element selected from the View By pop-up menu. However, when the font list is set to show all fonts, Macintosh font names usually appear after X font names. For more information about sorting, see “Sorting Fonts,” later in this chapter.

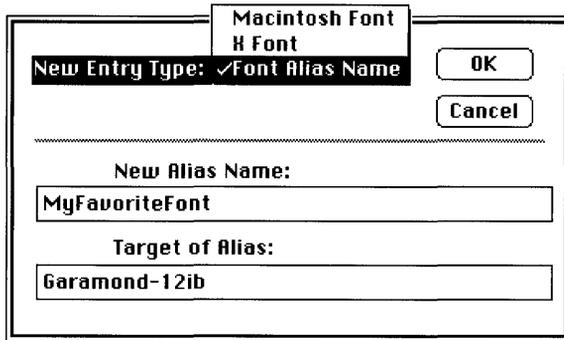
Assigning aliases to font names

If you find the long X font names too cumbersome or puzzling, you can create aliases for them. An alias is simply another name for a font.

To assign an alias to a font name:

1 Select a font name in the Font Director dialog box and click the New Font button.

The New Font Alias dialog box appears. The font name that you selected appears in the Target of Alias field.



- 2 **Click the New Entry Type pop-up menu and choose Font Alias Name.**
- 3 **Type any combination of words, letters, or numbers in the New Alias Name field and click OK.**

The Font Director inserts the alias, along with any other aliases you create, into the font-name list. Aliases are sorted, along with other font names, according to the font element that you chose from the View By pop-up menu. For more information about this process, see “Sorting Fonts,” later in this chapter.

Copying and pasting font names

You can use the Copy command in the Edit menu, just as you would in any standard Macintosh application, to copy a font name to the Clipboard and paste it into a remote command or a client window. Remember to enclose multiple-word font names in quotation marks before executing your command. Use straight rather than curly quotation marks.

Once a font name is on the Clipboard, you can also paste it into a client command or file by using that client’s paste or insert command. For example, you could paste the font name into a command in a DECterm window by pressing the Left Arrow key, the Macintosh equivalent of the middle mouse button on a three-button mouse.

Removing fonts and font aliases

The Remove button in the Font Director dialog box lets you remove an X font from the MacX Fonts folder. It also lets you delete font names and font aliases from the Font Directory file and the font-names list in the Font Director dialog box. Simply deleting a font name does not delete the aliases associated with it, however.

To remove a font or alias, select its name in the Font Director dialog box and click the Remove button. A dialog box appears, asking whether you really want to remove the font. (See Figure 5-3.) Click OK to remove the font, or click Cancel to retain it.

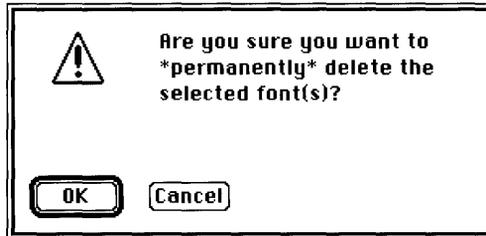


Figure 5-3 Removing a font

◆ **Can't remove cursor and fixed fonts** Since MacX needs the cursor and fixed fonts to display cursor shapes and text, these fonts cannot be removed. ◆

Sorting fonts

Figure 5-4 shows the View By pop-up menu for sorting font names as they appear in the Font Director dialog box. The View By menu lets you choose the element for the first-level (initial) sort. For example, if you choose Family, MacX first sorts the font names by the Family element. MacX continues the process by sorting on each of the remaining elements, starting with the leftmost element and moving to the right. (Because MacX font names do not include the Registry element, the leftmost element is Foundry.)

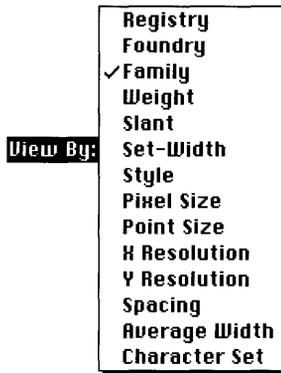


Figure 5-4 The View By pop-up menu

The way that the sort is performed depends on whether the element chosen for the first-level sort is alphabetic or numeric. All elements are alphabetic with the following exceptions:

- Pixel Size
- Point Size
- X Resolution
- Y Resolution
- Average Width

If the initial sort element is alphabetic, then the sorting on all elements is alphabetic, even if the element is numeric. This means that numeric elements will appear to sort out of order because an alphabetic sort compares the elements character-by-character. In comparing 8 to 10, 10 comes first because alphabetically, 1 comes before 8. The following example shows font names sorted initially by the Family element (an alphabetic element):

```
-adobe-times-bold-i-normal--12-120-  
-adobe-times-bold-i-normal--14-140-  
-adobe-times-bold-i-normal--22-220-  
-adobe-times-bold-i-normal--8-80-
```

If the initial sort element is numeric, then all other numeric elements are also sorted numerically. Alphabetic elements continue to be sorted alphabetically. When sorted numerically, numeric elements appear in their proper order because the elements are compared as whole numbers. Thus *8* comes before *10*. The same names shown above, sorted initially by the Pixel Size element (a numeric element), appear as follows:

```
-adobe-times-bold-i-normal--8-80-  
-adobe-times-bold-i-normal--12-120-  
-adobe-times-bold-i-normal--14-140-  
-adobe-times-bold-i-normal--22-220-
```

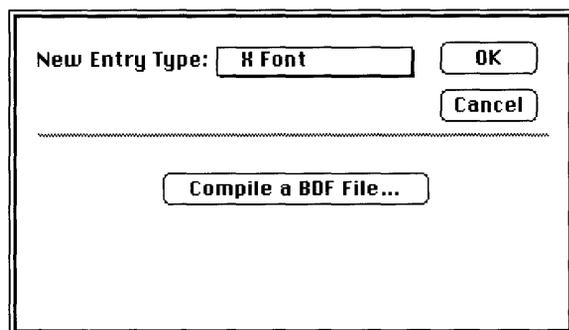
Compiling fonts from BDF files

The Font Director enables you to compile BDF files into fonts without quitting MacX. After compiling a font file, click the Update Font Directory button to update the Font Directory file and include the new font in the Font Director dialog box. If you do not click this button, the Font Directory file will not be updated until the next time you start MacX.

To compile a font:

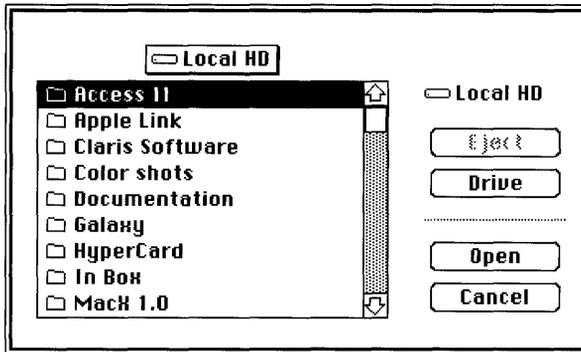
1 Click the New Fonts button in the Font Director dialog box.

When the New Entry dialog box appears, choose X Font from the New Entry Type pop-up menu. The layout of the box changes, as shown in the following figure.



2 Click the Compile a BDF File button.

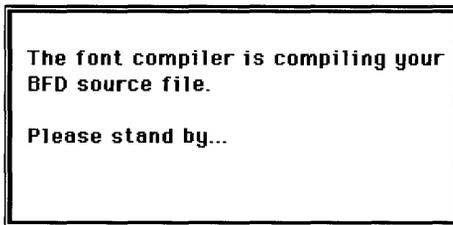
A directory dialog box appears.



3 Locate and open the folder containing the BDF files that you want to compile.

4 Select the name of a BDF file and click Open, or double-click the filename.

A message appears, advising you that the font compiler is compiling your BDF source file. When the box disappears, the compiled font file will be in your folder.



5 Repeat steps 2 through 4 for as many files as you want to compile. When you finish, drag the files into the MacX Fonts folder.

6 Click the Update Font Directory button on the Font Director dialog box.

MacX updates the Font Directory file. As soon as this file is updated, the newly compiled fonts appear in the Font Director dialog box.

Using color in MacX

Unlike other X servers, which represent colors in numeric form only, MacX offers a visually oriented approach to specifying colors. Traditionally, the differing amounts of red, green, and blue that constitute colors are expressed as sets of three numeric values. In MacX, these sets of numbers are stored with corresponding color names in the MacX Colors file. MacX converts these values into colors and displays them in a dialog box called the **Color Namer**. You can also specify a broader range of color values in MacX. Macintosh color values for red, green, and blue range from 0 to 65,535, whereas MIT RGB values range from 0 to 255.

This section explains how to create, modify, and delete individual colors using the Color Namer. For information on displaying clients that use these colors, see “Specifying Screen Numbers” in Chapter 3.

The Color Namer

The Color Namer eliminates the chore of reproducing colors in X. Instead of having to visualize the color you want and experiment with numerical red, green, and blue values until you hit upon the correct combination, you can simply open the Color Namer dialog box, shown in Figure 5-5, and browse through a long list of color samples until you find the one you want. If the color isn't in the list, you can create a new one or modify an existing color. In addition, you can remove colors, change color names, and copy color names to client commands.

To display the Color Namer dialog box, choose Color Namer from the Edit menu. If the Color Namer command is dimmed, you can't choose it. In this case, your Macintosh does not support Color QuickDraw, a utility that the Color Namer requires. The Macintosh Plus, Macintosh SE, and Macintosh Portable computers do not support Color QuickDraw, so the Color Namer won't work on these computers.

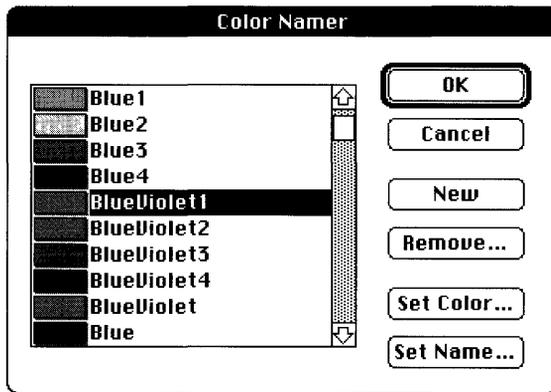


Figure 5-5 The Color Namer dialog box

Sorting, scrolling, saving, and canceling

Sorting color names Any time you make a change that adds, removes, or modifies color names, the Color Namer re-sorts the color list alphabetically. The sorting method used ignores case and blank spaces. Any numbers at the end of a color name are sorted numerically, as whole values. For example, the color *Gray8* would appear before the color *Gray10*.

Scrolling To expedite the task of finding colors in a long list, the Color Namer supports all of the standard Macintosh scrolling methods. Besides responding to the scroll bar and the arrows, the Color Namer scrolls to names in the list that match a letter, word, or number typed at the keyboard.

For example, to scroll to colors beginning with *s*, type *s* when the Color Namer dialog box is visible. Type *gray* and the Color Namer scrolls to the first color named *gray* in the list. Similarly, typing *50* produces the first color name starting with that number. When it searches, the Color Namer ignores case and blank spaces but not diacritical marks.

Saving or canceling changes When you finish using the Color Namer, click OK to save your changes and close the Color Namer dialog box. Click Cancel to close the dialog box without saving your changes. For example, if you've made a color change that you don't like, you can click Cancel to prevent it from taking effect (thus discarding any other changes that you made as well). Before closing the Color Namer, MacX displays an alert box that asks whether you really want to discard your changes.

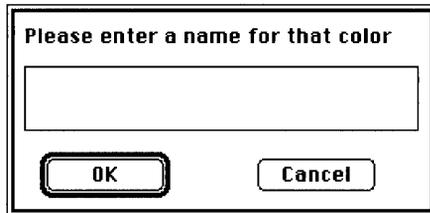
Adding new colors

MacX allows you to specify new colors by using the Color Namer dialog box.

To add a new color:

1 Click New in the Color Namer dialog box.

A dialog box appears, requesting that you enter a name for the new color.



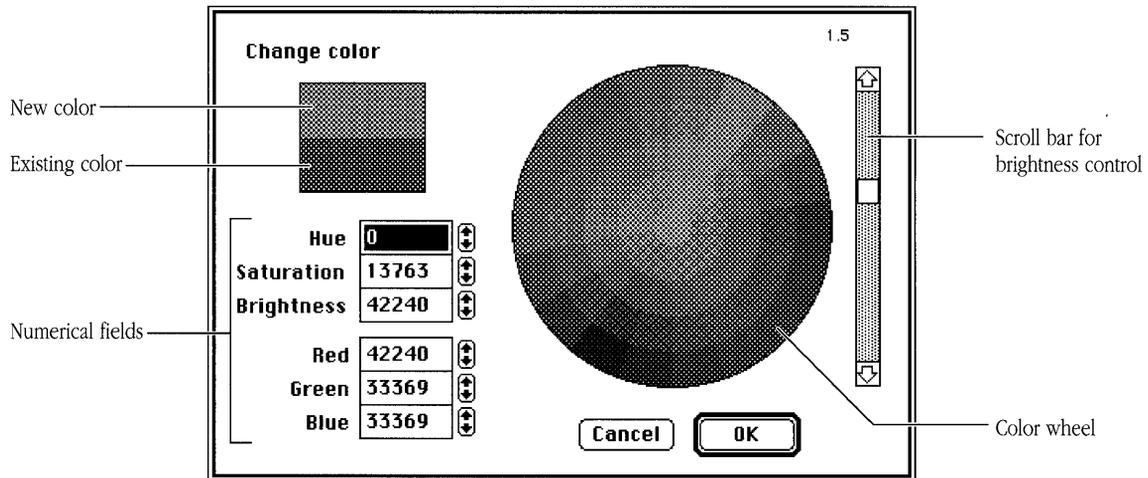
2 Type a name for the color and click the OK button.

The Color Wheel dialog box appears.

3 Click in the color wheel to select the color you want, then click OK.

When you click in the color wheel, the selected color appears in the top half of the display box, below the legend *Change color*. If the color that you want does not appear, keep clicking in the color wheel until it does. The color name will appear in alphabetical order in the Color Namer dialog box.

If you have RGB values for a particular color, you can enter them in the numerical fields shown in the following figure. Click OK, and your color will appear in the Color Namer dialog box.



The scroll bar to the right of the color wheel controls color brightness. Dragging the scroll box down makes colors darker; dragging the scroll box up makes them brighter. For more information on the color wheel, see the *Macintosh System Software User's Guide, Version 6.0* or the *Macintosh Reference*.

Removing colors

To remove a color, click its name and then click the Remove button in the Color Namer dialog box. (See Figure 5-5.) A warning box appears, asking if you are sure that you want to remove the color. Click OK to remove the color, or click Cancel to retain it.

Changing colors and color names

MacX allows you to change colors by using the Color Wheel dialog box. This procedure is similar to adding a new color.

To change a color:

- 1 Double-click the color sample that you want to change, or click the color sample and then click the Set Color button.**

The Color Wheel dialog box appears. At the upper left, the sample color box displays the existing color.

- 2 Click in the color wheel to find the color that you want.**

As you click the color wheel, the top half of the box reflects the color choices you have made, while the bottom half retains the original color so that you can compare them.

- 3 When you find the color that you want, click OK.**

The Color Namer dialog box reappears, showing the changed color.

If, for some reason, you want the original color back, click Cancel to close the Color Namer dialog box and discard the changes you have made. Alternatively, if you remember the original color's numerical values for red, green, and blue—or for hue, saturation, and brightness—you can type these numbers in the appropriate fields in the Color Wheel dialog box to restore the color.

To change a color name, select the name by double-clicking or using the Set Name button. The Color Namer then displays a dialog box that lets you enter another name.

Copying and pasting color names

You can use the Copy command in the Edit menu, just as you would in any standard Macintosh application, to copy a color name to the Clipboard and paste it into a remote command or a client window.

Once a color name is on the Clipboard, you can also paste it into a client command or file by using that client's paste or insert command.



6 Troubleshooting

Consult this chapter when MacX displays an error message and you aren't sure what to do. Often the problem is easy to fix. In some cases, the problem may involve your network or the host that you are trying to reach, rather than MacX itself. If the problem does involve MacX and you aren't able to find a solution in this chapter, consult your system administrator.

This chapter describes the following types of problems:

- problems that may occur when you first start MacX
- problems that may occur when you are trying to connect to an X client by executing a remote command
- problems related to the connection tools that you use with MacX
- problems that may be caused by the clients to which you're trying to connect
- problems related to the Font Directory file or to using X fonts
- problems related to using the keyboard with MacX
- problems that may occur when trying to print while using MacX
- problems that may occur when you try to save a MacX settings document
- problems that arise if you do not have enough memory in your computer available for use by MacX
- problems that may be caused by the connection between your Macintosh and the network or by the network itself

About alert messages

MacX displays different types of alert messages, depending on the type and severity of the problem. If the problem involves a malfunction of MacX, the Macintosh hardware, or the operating system, MacX displays an alert box containing the phrase “Sorry—an internal error has occurred.” Figure 6-1 illustrates this type of alert box.

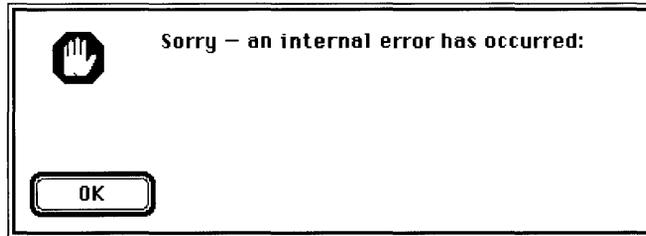


Figure 6-1 An alert box for an internal error

Usually, you can do nothing to fix this kind of problem yourself. Any time MacX displays an internal error message, call your system administrator.

Another kind of error causes MacX to quit or prevents MacX from starting up. The phrase identifying this type of error is “An unexpected error has occurred.” Figure 6-2 illustrates the alert box displayed in this case.

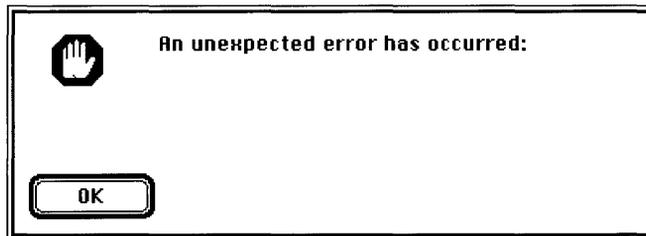


Figure 6-2 An alert box for an unexpected error

Frequently, you can recover from an error of this type. If you get this type of error, refer to the section in this chapter that covers the problem that you have encountered.

The third type of error message that MacX might display is a warning, such as the one shown in Figure 6-3. Warnings normally advise you of minor problems, such as a field you forgot to fill in, but do not cause MacX to quit.

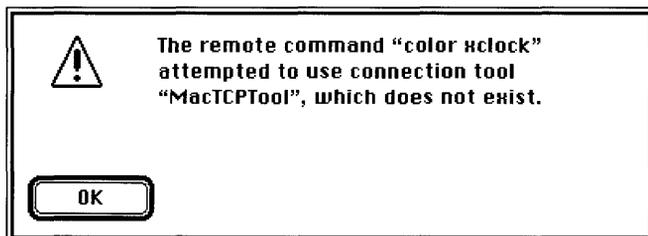


Figure 6-3 A warning box

For assistance with warnings, refer to the section in this chapter that covers the type of warning you encounter.

Under certain circumstances an error can occur without your being notified by MacX. This type of error can happen if you make a mistake typing a remote command, your user name, or your password and you have selected the Save or Notify command output option in the Remote Command dialog box.

If you selected the Save option, MacX saves any information from the host about your command that appears in the command's Output window, but you are not otherwise notified that a problem has occurred.

If you selected the Notify option, your Macintosh beeps and displays a small, blinking MacX icon in the menu bar when MacX receives command output.

In both cases, the intent is to spare you from having to deal immediately with every bit of information generated by the host. When something goes wrong, however, you have to display the Output window yourself to discover what system or error messages the host transmitted. If, instead, you prefer immediate notification, choose the Pop Up option from the Output menu. See "Creating New Commands" in Chapter 3 for information about this option.

Problems starting MacX

The following messages describe errors that prevent the MacX application from starting or a MacX settings document from opening. Except where indicated, these errors appear in the unexpected-error alert box shown in Figure 6-2.

Communications Toolbox not initialized because no connection tools installed

The message “An unexpected error has occurred: the Communications Toolbox could not be initialized because there are no connection tools installed” indicates that the Communications Folder in your System Folder has no connection tools in it.

If you forgot to install any connection tools, see the *Installation* part of the *Network Services User's Guide*.

If you inadvertently dragged your connection tool (or tools) out of the Communications Folder, drag it (or them) back in.

Could not open the default cursor font

A special font, called *cursor*, comprises all of the cursors used in X. MacX will not start up if it cannot open the cursor font. This message appears in this situation: “An unexpected error has occurred: could not open the default cursor font ‘cursor.’ Did you install the MacX Fonts?” Follow these steps:

1. Verify that the cursor font file is in the MacX Fonts folder or one of its subfolders.
Reinstall the font file by dragging a copy from the Misc folder in the MacX Fonts folder in the MacX application folder from the *PATHWORKS V1.0* volume on your VAXshare file server.
2. Verify that you have only one MacX Fonts folder, either in the System Folder or in the same folder as your MacX application.
3. Restart your computer and try opening your MacX application or settings document again.

Could not open the default font “fixed”

MacX uses a special font, called *fixed*, when writing text in a client window if the client has not specified a font for this purpose. MacX will not start up if it cannot open this font. This message appears in this situation: “An unexpected error has occurred: could not open the default font ‘fixed.’ Did you install the MacX Fonts?” Follow these steps:

1. Verify that the fixed font file is in the MacX Fonts folder or one of its subfolders.
Reinstall the font file by dragging a copy from the Misc folder in the MacX Fonts folder in the MacX application folder from the *PATHWORKS V1.0* volume on your VAXshare file server.
2. Verify that you have only one MacX Fonts folder, either in the System Folder or in the same folder as your MacX application.
3. Restart your computer and try opening your MacX application or settings document again.

Error opening or reading a settings document

If your settings document is damaged, MacX displays this warning: “An error occurred when opening or reading your settings document—a new (Untitled) one will be used instead.” The document is probably unusable. The message advises you that MacX has opened a new settings document since it could not open the one you specified. Be sure to throw the damaged document away.

Initialization of the Communications Toolbox failed

An error may occur when MacX tries to open the Macintosh Communications Toolbox. This message appears: “An unexpected error has occurred: Initialization of the Macintosh Communications Toolbox failed (error code *n*).” If this error message appears when you start up MacX, verify that the Communications Folder is in your System Folder. If no Communications Folder exists, see the *Installation* part of the *Network Services User’s Guide*.

MacX requires that the Communications Toolbox be installed

Before MacX can start, the Communications Toolbox must be installed in your System Folder. If it is not installed, the following message appears when you start MacX: “An unexpected error has occurred: MacX requires that the Macintosh Communications Toolbox be installed.” See if there is a Communications Folder in your System Folder. If no Communications Folder exists, see the *Installation* part of the *Network Services User's Guide*.

No connection tools are working at the moment

The full text of this warning is as follows: “None of the connection tools are working at the moment—check that they are properly installed and restart MacX. Until this is done, no incoming X client connections can be accepted.” If you see this warning when starting up MacX, check for these conditions:

1. Is the network working?

Check with your network administrator to verify that the network is working. If it is, go to step 2.

2. Does your Communications Toolbox contain connection tools capable of supporting the X protocol (such as the AppleTalk-DECnet Connection Tool)?

Some connection tools, such as the Serial Connection Tool and the Apple Modem Connection Tool, cannot supply the duplex, reliable byte-stream communications service that MacX needs to set up host connections. If you're not sure which tool(s) to use, check with your system administrator. However, if you already have the right connection tools, go to step 3.

3. Are these connections tools installed correctly?

Consult the installation procedures for your duplex, reliable byte-stream tool(s) to verify that they are installed correctly. (Your system administrator can help.) If everything is in order, restart your Macintosh and try starting MacX again. If the same message appears, call your system administrator or authorized Apple dealer for further assistance.

Not enough memory for MacX to run

If the memory allocated to MacX is less than the suggested memory size in the Get Info dialog box, this error message appears: “There is not enough memory for MacX to run. At LEAST *mmK* more is required.” (The *mm* in the message equals the number of kilobytes of memory required.) See “Memory-Related Problems,” later in this chapter, for instructions on increasing the memory allocation for MacX.

Not enough memory to start MacX

If you are running under MultiFinder and the amount of random-access memory (RAM) available to run MacX is less than the MacX application memory size, this warning appears: “There is not enough memory to open ‘MacX’... Do you want to open it using the available memory?” Usually, you can free more RAM by quitting from another application.

MacX can run in less than its assigned application memory size if this amount is adequate to handle the types of activities that you perform. If not, MacX may run out of memory while you are performing an operation and display an error message to that effect. For more information, see “Memory-Related Problems,” later in this chapter.

Problems with remote commands

This section describes errors that prevent remote commands from executing. Some of these errors involve problems with the host or network specified in the command. Others result from lack of sufficient memory. Unless identified as errors, these messages are warnings that appear in the alert box illustrated in Figure 6-3.

The word *cmdname* appearing in any of the following error messages represents the name of the remote command in question. The word *toolname* represents the name of the connection tool in question.

Auto Execute commands could not be started

The full text of this warning is as follows: “One or more ‘Auto Execute’ commands could not be started.” This warning usually appears after other warnings that better identify the source of the problem. Normally, this error occurs when the host that you are trying to reach is not available or the connection tool that you are using is improperly installed. If you’re not sure what the problem is, call your system administrator first to verify the status of the host. If the host is available, consult the documentation for the connection tool to verify that it is properly installed, or ask your system administrator for assistance.

Creation of remote command stream failed

When MacX doesn’t have enough memory to build a connection to the host, it displays this warning: “The remote command ‘*cmdname*’ could not be executed via the tool ‘*toolname*.’ Creation of the remote command stream failed.”

<Connection tool error string appears here.>

As indicated, MacX also displays an error message or warning from the connection tool that should provide more information about the specific problem. For suggested ways to free memory, see “Memory-Related Problems,” later in this chapter. Also see the troubleshooting section of your connection tool documentation for more information about the error or warning that the tool generated.

Not enough memory

MacX displays one of three warnings when it runs out of memory while processing a command:

- “Remote command did not succeed: there was not enough memory to perform the operation.”
- “There is not enough memory to store the remote command in the MacX document.”
This warning appears when you attempt to save or execute a remote command that you have just edited or created and MacX does not have enough memory to store it.
- “There was not enough free memory to create a new remote connection.”
This warning appears when you execute a remote command and MacX does not have enough memory to set up a connection with the host.

To make more memory available, follow the suggestions in “Can’t Use a MacX Feature,” later in this chapter.

Remote command tried to use connection tool that does not exist

If you see the warning “The remote command ‘*cmdname*’ attempted to use connection tool ‘*toolname*,’ which does not exist,” the remote command named in the error message specifies a connection tool that you discarded or renamed sometime after you created the remote command. To correct the problem, edit your remote command and select a different connection tool from the Connection Settings dialog box.

Problems with connection tools

This section describes problems with connection tools. These problems prevent remote commands from executing.

Setup options rejected by the connection tool

This error message appears if you haven’t configured the setup options correctly or if you’ve placed a different version of the connection tool used to set up the current options in the remote command that you tried to execute: “The setup options you specified in the Connection Setup dialog were rejected by the connection tool. The default setup for the tool has been substituted.” Consult your connection tool documentation to find out which setup options are appropriate, and re-create the remote command with the current version of the connection tool.

The X client cannot connect to MacX

A frequent cause of this problem is the presence in your Connection Folder of more than one connection tool that supports the same network protocol (connection method). For example, if you have two copies of the AppleTalk-DECnet Connection Tool (saved with different names) in your Connection Folder, neither tool may work properly.

Problems with clients

This section describes problems that might occur while you are running X clients.

The X client cannot connect to MacX

A frequent cause of this problem is the presence in your Connection Folder of more than one connection tool that supports the same network protocol (connection method). For example, if you have two copies of the AppleTalk-DECnet Connection Tool (saved with different names) in your Connection Folder, neither tool may work properly.

Client windows suddenly disappear

When dialog or alert boxes appear on your screen, MacX stops responding to requests from active clients and waits for your reply. MacX also waits in this manner while you are working in a large Macintosh application, such as MacDraw®, that requires all the system resources to perform tasks such as updating the screen.

After about ten minutes, clients that haven't received any responses to their requests will quit running, a condition called *timing out*. However, the client windows will remain on the screen until you release MacX by closing the dialog or alert box, or until the operating system finishes updating your other application. MacX will then detect which clients have timed out and close their windows without explanation.

To prevent this sudden disappearance of clients from your screen, respond to dialog and alert boxes as soon as possible and try not to monopolize system resources on a single task for more than a few minutes.

All client windows appear in black and white on a Macintosh that supports color

For clients that you want to appear in color, make sure that you've specified that the client is displayed on one of the color screens (either 2 or 3). Table 6-1 lists the screen numbers along with their descriptions.

Table 6-1 Screen numbers

Screen number	Description
0	Monochrome screen, rootless style
1	Monochrome screen, rooted style
2	Color screen, rootless style
3	Color screen, rooted style

Note: Machines that don't support Color QuickDraw, namely the Macintosh Plus and Macintosh SE, do not support screen numbers 2 and 3.

For more information, see “What You See on the Screen” in Chapter 1 and “Specifying Screen Numbers” in Chapter 3.

The alert “Are you running another window manager?” appears

MacX comes with a built-in window manager for its rootless screens (0 and 2). If you run a remote window manager and specify that it should manage either of these screens, or if the remote window manager manages all screens by default, this message may appear. It is not possible to override the MacX Window Manager on rootless screens. Use rooted screens if you need a separate window manager.

Using the Pause feature of the DECwindows Session Manager causes MacX to run out of memory

The Pause feature of the DECwindows Session Manager should not be used with MacX. The Pause feature creates a single window large enough to completely cover all of the screens attached to your X server. Because MacX actually simulates four screens (on Macintosh computers that support color), the Session Manager must allocate a large amount of memory to windows large enough to cover the entire Macintosh desktop. A low-memory condition may result.

Problems with fonts

This section describes errors that prevent MacX from updating the Font Directory file or that prevent you from using a font. Figure 6-3 depicts the type of alert box in which these warnings appear. The word *fontname* in any of the following commands represents the name of the font in question. The expression “(n)” represents an error code.

Could not open the default cursor font

A special font, called *cursor*, comprises all of the cursors used in X. MacX will not start up if it cannot open the cursor font. This message appears in this situation: “An unexpected error has occurred: could not open the default cursor font ‘cursor.’ Did you install the MacX Fonts?” Follow these steps:

1. Verify that the *cursor* font file is in the MacX Fonts folder or one of its subfolders. Reinstall the font file by dragging a copy from the Misc folder in the MacX Fonts folder in the MacX application folder from the *PATHWORKS V1.0* volume on your VAXshare file server.
2. Verify that you have only one MacX Fonts folder, either in the System Folder or in the same folder as your MacX application.
3. Restart your computer and try opening your MacX application or settings document again.

Could not open the default font “fixed”

MacX uses a special font, called *fixed*, when writing text in a client window if the client has not specified a font for this purpose. MacX will not start up if it cannot open this font. The following message appears in this situation: “An unexpected error has occurred: could not open the default font ‘fixed.’ Did you install the MacX Fonts?” Follow these steps:

1. Verify that the *fixed* font file is in the MacX Fonts folder or one of its subfolders.
Reinstall the font file by dragging a copy from the Misc folder in the MacX Fonts folder in the MacX application folder from the *PATHWORKS V1.0* volume on your VAXshare file server.
2. Verify that you have only one MacX Fonts folder, either in the System Folder or in the same folder as your MacX application.
3. Restart your computer and try opening your MacX application or settings document again.

Error getting information about MacX Fonts folder

The full text of this error message is as follows: “An unexpected error has occurred: Error (*n*) getting information about the ‘MacX Fonts’ folder. Did you forget to install the MacX Fonts?” If the message does not occur for the reason stated, it means that your fonts folder has been damaged by a disk error, power surge, or some other rare mishap. To solve the problem, throw away the existing MacX Fonts folder and reinstall the font file by dragging a copy from the MacX Fonts folder in the MacX application folder from the *PATHWORKS V1.0* volume on your VAXshare file server.

Error updating Font Directory file

The full text of this warning is as follows: “The ‘Font Directory’ file (in your ‘MacX Fonts’ folder) needs to be updated, but an error (*n*) occurred when it was being written. MacX can continue, but problems may be encountered when opening new fonts.” You will probably not be able to open new fonts until the Font Directory file can be updated. After following these steps to discover and correct the problem or problems, start MacX or open a settings document to automatically update the Font Directory file.

1. Is the Font Directory file locked?
Find the Font Directory file in the MacX Fonts folder. Click the file icon, choose Get Info from the File menu, and make sure that the box labeled *Locked* in the upper-right corner of the Get Info box is not checked.

2. Does MacX have sufficient RAM?

Some operations in MacX, such as displaying color windows, use a lot of memory. Running several X clients simultaneously also takes a lot of memory. To ensure that MacX has enough memory to update the Font Directory file, try the suggestions in “Can’t Use a MacX Feature,” later in this chapter. Then try updating the Font Directory file again by starting MacX or opening a settings document. If you get the same error message, go to step 3.

3. Is the MacX Fonts folder on a disk to which you can’t write?

Make sure the disk isn’t write-protected. If it is a floppy disk, verify that you *cannot* see through the square hole on the upper-left side of the disk. Otherwise, slide the black locking tab down so that the hole is blocked. If the MacX Fonts folder is on a file server, click the file-server icon, choose Get Privileges from the File menu, and verify that you have the privilege to make changes. Repeat this procedure to check the MacX Fonts folder itself and any folder in which it is stored.

4. Is your disk full?

Check the upper-right corner of your disk directory folder for the amount of available free disk space.

5. Is the disk you are using defective?

Run the Macintosh utility called Disk First Aid™ or an equivalent to ensure that your disk is not damaged. The *Macintosh Utilities User’s Guide* and the *Macintosh Reference* contain instructions for using Disk First Aid.

Font Directory file has been damaged.

The text of this warning is as follows: “The ‘Font Directory’ file has been somehow damaged. A new ‘Font Directory’ file will be created from scratch to be used instead.” Probably a disk error, power surge, or similar accident has corrupted the file. Since the new file will not have the aliases or Macintosh fonts that you added, consider restoring an old version of the Font Directory file if you have one.

Font property could not be loaded

If a font file is corrupted, MacX displays this warning: “For some reason, the FONT property of the font file *fontname*’ couldn’t be loaded. This font will be left out of the Font Directory list and thus will be unavailable for use.” When this error occurs, drag the corrupted font file to the trash and get a new copy of the file from your MacX distribution disk or compile a new font file. After dragging the file into the appropriate folder in the MacX Fonts folder, click the Update Font Directory button in the Font Director dialog box to insert the font in the Font Directory list. See Chapter 5 for instructions for compiling fonts.

Font file is malformed

The warning “The font file *fontname*’ is malformed and could not be opened” means that the file for the font that you selected is missing or damaged. Reinstall the font file by dragging a copy from the MacX Fonts folder in the MacX application folder from the *PATHWORKS V1.0* volume on your VAXshare file server.

Not enough memory to add font name to the list of known fonts

Receiving the warning “Unable to allocate enough memory to add the font name *fontname*’ to the list of known fonts” means that MacX has run out of memory to perform this operation. Close any unnecessary windows, clients, or applications to release the memory dedicated to them and try your command again. Also, see “Can’t Use a MacX Feature,” later in this chapter, for more suggestions on how to increase the amount of available memory.

One or more fonts could not be matched against the pattern *fontname*

If you receive the warning “Due to a memory allocation failure, one or more font names could not be matched against the pattern *fontname*’ during the servicing of a client request,” MacX does not have enough memory available to display the font that you requested. Close any unnecessary windows, clients, or applications to release the memory dedicated to them and try your command again. Also, see “Can’t Use a MacX Feature,” later in this chapter, for more suggestions on how to increase the amount of available memory.

Unable to delete the selected font

MacX displays one of two warnings when it cannot delete a font:

- “Unable to delete the selected font because you do not have sufficient access privileges to delete the font file.”

This warning occurs when the font file(s) in question are locked, the MacX Fonts folder is on a disk or in a folder to which you don't have write-access, or the Font Directory file is locked. Perform these steps, in the order given, until you discover the source of your problem. Then try removing the fonts again.

1. Is the font file or the Font Directory file locked?

Find the font file in the MacX Fonts folder. Click the file icon, choose Get Info from the File menu, and make sure that the box labeled *Locked* in the upper-right corner of the Get Info box is not checked. If the font file is not locked, use the same procedure to see if the Font Directory file is locked.

2. Is the MacX Fonts folder on a disk or in a folder to which you cannot write?

Make sure the disk or folder isn't write-protected. If it is a floppy disk, verify that you *cannot* see through the square hole on the upper-left side of the disk.

Otherwise, slide the black locking tab down so that the hole is blocked. If the MacX Fonts folder is on a file server, click the file-server icon, choose Get Privileges from the File menu, and verify that you have the privilege to make changes. Repeat this procedure to check the MacX Fonts folder itself, and any folder in which it is stored.

- “Unable to delete the selected font, error code *n*.”

The *n* represents an error code number. This warning occurs very rarely. If it appears, record the error code number and call Technical Support at Apple Computer. Ask one of the technicians to interpret the error code for you and explain how to solve the problem.

Problems with the keyboard

This section describes problems related to using the keyboard.

You have problems inserting text with a MacroMaker script

You cannot use MacroMaker to insert text keystroke by keystroke into X client windows. MacroMaker never issues key-release events to MacX, so MacX acts as if the keys are being held down continuously. This problem may also occur with other keyboard macro utilities.

MacX beeps when you enter some international and special-symbol characters

To conform to the X protocol, MacX must translate your typing into a predefined set of X key symbols. This predefined set contains the **ISO Latin-1** character set plus a number of special-purpose keys, such as the Return key. If you enter a character that cannot be translated from its Macintosh representation into one of the X symbols, MacX beeps to inform you that the character is unavailable.

Problems with printing

If you get a warning stating that an error occurred when attempting to print, you most likely forgot to select a printer name. Instructions in the following section explain how to identify and correct such problems. If the error concerns opening the printer driver, read the subsequent printer driver section for troubleshooting instructions.

Error occurred when attempting to begin printing or to print a page

The two warnings “An error occurred when attempting to begin printing” and “An error occurred when attempting to print a page” are triggered by the same events. Perform these steps to discover the source of the problem. Then try printing again.

- Is the printer driver installed correctly?
Verify that an icon for a printer, such as a LaserWriter® or ImageWriter®, appears in the upper-left list in the Chooser window. If no printer icon appears, you must install one. For instructions, see “Using the Chooser With Devices on AppleTalk” in the chapter on desk accessories in the *Macintosh System Software User’s Guide, Version 6.0*.
- Did you select a printer?
To check, open the Chooser, click a printer icon, and verify that a printer name is highlighted. (See Figure 6-4.)

Error occurred when attempting to open your printer driver

The warning “An error occurred when attempting to open your printer driver” means that the driver software for your printer is either malfunctioning or not installed. To fix this problem, open the Chooser from the Apple menu.

When the Chooser window appears, verify that an icon for a LaserWriter, ImageWriter, or other printer appears in the upper-left list, as shown in the Figure 6-4.

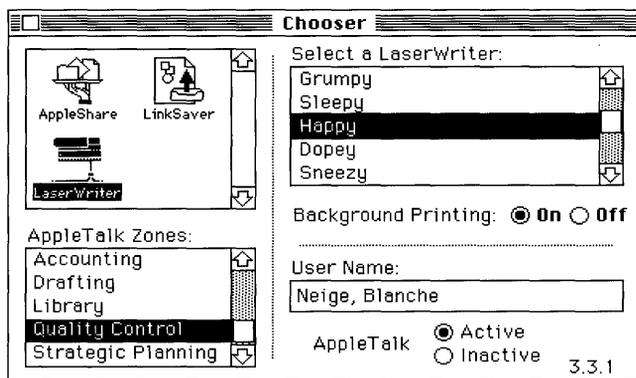


Figure 6-4 The Chooser window

If no printer icon appears, you must install one. For instructions, see “Using the Chooser With Devices on AppleTalk” in the chapter on desk accessories in the *Macintosh System Software User’s Guide, Version 6.0*, or see Chapter 8 in the *Macintosh Reference*. If you do see a printer icon, click it and select a printer name from the list that appears on the right. Now close the Chooser and try choosing Print Clipboard again.

Problems saving a settings document

This section describes problems that may occur while saving a settings document.

Error occurred while saving document

Several types of errors can prevent MacX from saving a settings document. Each of these errors generates the warning “An error occurred while saving your settings document; the document could not be saved.” Perform these steps until you solve the problem:

- Does MacX have sufficient memory?

Some operations in MacX, such as displaying color windows, use a lot of memory. Running several X clients simultaneously also takes a lot of memory. Follow the suggestions in “Can’t Use a MacX Feature,” later in this chapter, to make memory available, and then try to save your settings file again.

- Is the disk that you are using defective?

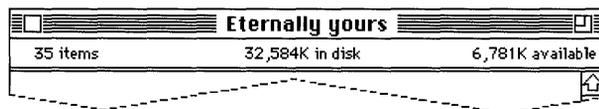
Use the Save As command to save your document to a floppy disk (or another hard disk if you have one). Then, run the Macintosh utility called Disk First Aid or an equivalent to ensure that your disk is OK. The *Macintosh Utilities User’s Guide* contains instructions for using Disk First Aid.

- Is your settings document on a disk to which you don’t have write-access?

Make sure you have write-access to the disk. If it is a floppy disk, verify that you cannot see through the square hole on the upper-left side of the disk. Otherwise, slide the black locking tab down so that the hole is blocked. If the settings document is on a file server, click the file-server icon, choose Get Privileges from the File menu, and verify that you have the privilege to make changes. Repeat this procedure to check any folder in which the settings document is stored.

- Is your disk full?

Check the upper-right corner of your disk directory folder for the amount of available disk space. For example, the following figure shows 6,781 K available.



Settings document is corrupted or created by very old version of MacX

The full text of this warning is as follows: “The settings document is corrupt or was created by a very old version of MacX. A new (Untitled) one will be used instead.” This warning means that your document is corrupted (damaged) or is incompatible with the version of MacX that you are using.

Memory-related problems

Not having enough memory can prevent you from either (1) starting MacX or opening a MacX settings document or (2) using a feature in MacX after the application is open. Because it’s sometimes difficult to know how much memory certain X clients and operations require, MacX alerts you when memory is low so that you can avoid major disruptions to your work. This section explains the low-memory warning system and suggests several ways to free memory so that you can avoid memory-related problems in the future.

Low-memory warning system

MacX attempts to keep 128K of memory in reserve at all times. When it must dip into this memory reserve, MacX notifies you that its memory supply is low by beeping once and alternating a caution symbol () with the apple icon () at the top of the Apple menu. If you are running under MultiFinder and MacX is not in the foreground, a diamond appears next to the entry for MacX in the list of open applications at the bottom of the Apple menu.

Choosing About MacX from the menu displays the About MacX window shown in Figure 6-5. On the lower right side of the window, a bar graph displays how much memory MacX has left. At minimum, MacX should have 128K of memory free. However, if you plan to run a lot of clients, especially color clients, allowing MacX a few hundred kilobytes of free memory is more realistic.

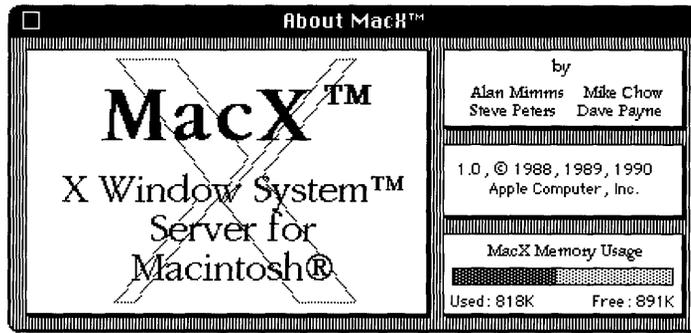


Figure 6-5 The About MacX window

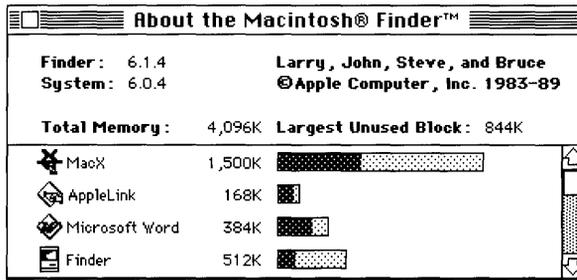
When MacX displays the caution symbol, you can quickly free more memory by closing any MacX windows or clients that you don't currently need. If you release enough memory to replenish the memory reserve, MacX cancels the memory alert and the caution symbol disappears. However, if MacX is constantly notifying you of memory shortages, closing windows is not a good, long-term solution for your memory problems. You should probably increase MacX's application memory size, add more memory (RAM) to your machine, or both. If the caution symbol appears as soon as MacX begins running, you should definitely quit and increase MacX's application memory size. Read the next two sections, "Can't Start MacX" and "Can't Use a MacX Feature," for further instructions.

Can't start MacX

If you get an alert stating that there is not enough memory to start MacX, the problem may be that there isn't a large enough block of *contiguous* memory available. This situation can arise when you are running under MultiFinder and you open, close, and reopen a number of applications. The unused memory in your Macintosh may be divided into blocks too small to run MacX or other applications. Follow these steps to solve the problem.

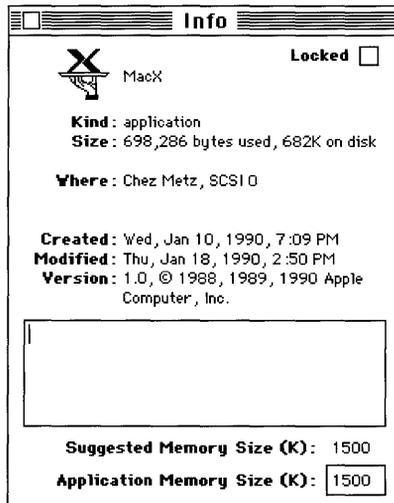
1. Check your system's total memory to see if it has sufficient RAM.

Choose About the Finder from the Apple menu and check the Total Memory field to see how much RAM your Macintosh has. (In the following figure, the total memory available is 4 megabytes.) If your system is running MultiFinder, it should have at least 2 megabytes to operate smoothly; otherwise, restart your Macintosh under the Finder™ and try running MacX again.



2. Check MacX's application memory size.

If your system has plenty of memory available to support MultiFinder, you still may not have enough memory left over to run MacX. You'll know that this is the case if MacX displays a blinking caution symbol in the menu bar. To find out, choose About MacX from the Apple menu and see how much free memory remains. If the memory available is less than 128K, quit MacX if it's running, click the MacX icon, choose Get Info from the File menu, and check the field labeled Application Memory Size (K).



If the amount shown is larger than the amount shown in the Largest Unused Block field in the About the Finder window, free some memory as described in step 3.

If the application memory size is *smaller* than the suggested memory size, MacX is probably being assigned less memory than the minimum required for it to operate. To increase the allocation, enter a larger number in the Application Memory Size field of the Get Info window.

3. Increase the size of the largest unused block.

If the amount in the Largest Unused Block field in the About the Finder window is too small, save, quit, and reopen all the applications currently running. This exercise causes the system to restart the applications in contiguous blocks of memory so that any unused memory occupies one contiguous block rather than being broken into unusable fragments.

However, if the largest unused block is still too small to run MacX, you have a number of alternatives:

- Close other applications running under MultiFinder. In the figure shown in Step 1, AppleLink® and Microsoft Word could be closed to free more memory.
- Remove unnecessary initialization resources (INITs), Control Panel devices, fonts, and desk accessories from your System Folder. Simply drag the INITs and Control Panel devices that you don't need out of your System Folder. To remove fonts and desk accessories, use the Font/DA Mover. In both cases, restart your Macintosh to make these changes take effect.
- Choose the Control Panel from the Apple menu and turn the RAM cache off or reduce the amount of RAM set aside for it.
- Decrease the application memory size for MacX below the size of the largest unused block. MacX requires a minimum of 1024K to operate. MacX should not be locked—that is, the box labeled *Locked* in the upper-right corner of the Get Info window should not be checked. If it is, you won't be able to make this change.

As a last resort, if none of these alternatives is a good solution in your case, consider buying more RAM for your computer.

Can't use a MacX feature

Some operations in MacX, such as displaying color windows, use a lot of memory. Running several X clients simultaneously also takes a lot of memory. When you see an error message stating that there isn't enough memory to perform an operation, try the following suggestions to free memory:

- Close any color, rooted, or large windows that you don't need to use presently.
- If you are using numerous connection tools to run several sessions, close some of these connections.
- Close clients that are using large **pixmaps**. Some color clients require these.
- Reduce the number of different fonts being used at the same time.
- Delete the remote command output for commands that have finished executing. To delete this output, select the Command Output submenu from the Remote menu.
- Close the Remote Command dialog box, Font Director dialog box, and other MacX dialog boxes and windows if they are open.
- Increase the application memory size of MacX as described in step 2 in "Can't Start MacX," earlier in this chapter.

Critical requirement for memory could not be satisfied

When a memory shortage is particularly grave, MacX has just enough memory to display the message "An unexpected error has occurred: A critical requirement for memory could not be satisfied" and quit. If this message appears when MacX is starting up, increase the application memory size for MacX, as described in step 2 of "Can't Start MacX," earlier in this chapter. In most cases, increasing the application memory size is the best solution, especially if you are going to frequently perform the operation that generated this error.

Not enough memory to resize window or show root window

These warnings indicate that MacX has run out of enough memory to perform the stated operation: "There is not enough memory to resize the window '*title*' right now" and "There is not enough memory to show the '*title*' root window right now." See the suggestions in "Can't Use a MacX Feature," earlier in this chapter, to make more memory available. (The word *title* stands for the title of the window that generated the warning.)

Serious memory allocation failure killed X11 client

MacX displays this warning when it does not have enough memory to execute a remote command and display a client: “A serious memory allocation failure has forced an X11 client application to be killed.” If you have other clients and windows open, you can close some of them and try your command again. However, if this command was the first that you tried to execute (and nothing else was running), quit MacX and increase its application memory size, as described in step 2 of “Can’t Start MacX,” earlier in this chapter.

Network-related problems

If one of the scenarios in the following list describes a problem that you’re having, the problem could be related to the network hardware or software that you’re using.

The Control Panel is missing.

The Control Panel is present on all startup disks unless you have removed it with the Font/DA Mover. If you’re using more than one startup disk, your Macintosh may switch to a disk without the Control Panel installed. The icon of the current startup disk is in the upper-right corner of the desktop.

Use the Installer application from the *System Tools* disk (version 6.0.4 or a later version) to update your System file. The Installer automatically reinstalls the Control Panel.

The Network icon is missing from the Control Panel.

In this case, one of the following problems exists:

- You don’t have the EtherTalk 2.0 software installed correctly on your startup disk. See the documentation for the Ethernet card that you are using.
- The Network icon has been moved from your System Folder. You must reinstall the EtherTalk 2.0 software. See the documentation for the Ethernet card that you are using.

- Your startup disk has the wrong version of the Control Panel. You must use version 3.1 or a later version. (The version number appears in the lower-left corner of the Control Panel). Use the Installer application from the *System Tools* disk (version 6.0.4 or a later version) to update your System file. The Installer automatically reinstalls the Control Panel.

You can't select the Network icon in the Control Panel. You get a message advising you that the network package has not been installed correctly.

The EtherTalk 2.0 software has not been installed properly on your startup disk. See the documentation for the Ethernet card that you are using.

The EtherTalk icon doesn't appear in the Control Panel after you click the Network icon.

One of the following problems exists:

- You don't have the EtherTalk 2.0 software installed correctly on your startup disk. See the documentation for the Ethernet card that you are using.
- The EtherTalk icon has been moved from your System Folder. You must reinstall the EtherTalk 2.0 software. See the documentation for the Ethernet card that you are using.
- There is no Ethernet card in your Macintosh, or the card is not working properly. If a card is installed, see its documentation.

Two or more EtherTalk icons appear in the Control Panel when you click the Network icon.

One of the following conditions exists:

- You have multiple Ethernet cards installed. The number in parentheses next to each icon's name identifies the slot containing the card.
- Earlier versions of EtherTalk software exist on your startup disk. Earlier versions are identified by single-arrow icons; icons for version 2.0 (or later versions) are identified by double arrows. PATHWORKS for Macintosh requires that you use EtherTalk version 2.0. See the documentation for the Ethernet card that you are using.

If you want to remove the previous version of EtherTalk, find its icon in the System Folder and drag it to the Trash.

You can't select the EtherTalk icon in the Control Panel. You get a message advising you that an error occurred while trying to install EtherTalk.

You did not start your Macintosh with an EtherTalk startup disk, or the disk that you used has become damaged. Try reinstalling the EtherTalk 2.0 software. See the documentation for the Ethernet card that you are using.

You are unable to select an EtherTalk icon in the Control Panel to switch the network connection. You get a message that the connection cannot be changed now, or that doing so will disrupt a critical service that your computer provides (such as an AppleShare® file server or a router).

If you can't switch the network connection, quit all applications and try switching the network connection again. If you still can't switch network connections, and you don't mind disrupting services that your computer provides or is using, shut down your Macintosh. Then restart your computer, using a startup disk that permits network-connection changes. Finally, try switching the network connection again.

Your Macintosh computer *hangs* (does not respond to the mouse and keyboard actions).

Your Macintosh may hang for a minute or so when you select an EtherTalk icon or when you start up your computer. The computer can hang if it is not correctly connected to the Ethernet cable or the Ethernet card is not configured correctly. See the documentation for the Ethernet card that you are using.

The Connection Settings dialog box does not list any network services or does not list the service that you want.

- If no network services appear, check the physical connection between your Macintosh and the network. See the suggestions later in this section for checking your network.
- If you switched the network connection in the Control Panel (as described earlier in this chapter) while the Connection Settings dialog box was open, the services listed in the dialog box may not have been updated. Close the Connection Settings dialog box and reopen it to view the services on the newly selected network.

You can't select devices connected to the printer port of your Macintosh.

If the Chooser does not let you select an ImageWriter printer or other device connected to the printer port while the EtherTalk network connection is selected, you probably have an old version of the Chooser on your Macintosh. You must have Chooser version 3.4 (or a later version) to select a device on the printer port. Use the Installer application from *System Tools* disk (version 6.0.4 or a later version) to update your System file. The Installer automatically updates the Chooser.

Here's a checklist to consult whenever you're having trouble with Ethernet:

- Are all cables secure?

Make sure that the network cable to your Ethernet card is secure at all connections. Also check the network cable to the service that you're trying to use. Contact your system administrator if you are uncertain about cable configuration.

- Is the problem really related to the network?

Sometimes a problem that seems to be related to the network is actually related to the device or application program that you're using. The manual for the device or application may be helpful.

- Is your Ethernet card installed and set correctly?

Shut down your Macintosh and make sure that the Ethernet card is firmly seated in its slot. Also, make sure that any jumpers and switches are set properly. See the documentation for your Ethernet card.

- Is the application that you want to use available on your network?

You may have more than one network to which you can connect. Use the Control Panel to select the proper network connection. See "Selecting a Network" in Chapter 2 for instructions.



Appendix A: MacX Versus Other X Servers

This appendix explains the difference between MacX and conventional X servers. This appendix also describes the miscellaneous preference for slower but smoother animation. Programmers should find this information useful.

Client incompatibilities

MacX handles the requests and clients named in this section differently than conventional X servers.

Backward compatibility

MacX tolerates some types of erroneous GrabPointer and ChangeWindowAttributes protocol requests so that older clients that don't adhere to X11R4 specifications can operate without receiving error messages. Some X11R4 servers have an extension that allows people to turn this backward-compatibility concession on or off. However, MacX does not support this extension, so backward compatibility is always in effect.

Cursor size and movement

MacX supports cursors up to 16 by 16 pixels in size. It truncates larger cursors to the upper-left 16-by-16 area and forces the cursor's **hotspot** into that area.

Most X servers have the capability to constrain movement of the mouse pointer, but this feature is disabled in MacX. Essentially, MacX ignores the ConfineTo field of GrabPointer and GrabButton requests so that it never prevents the cursor from moving in any way. This minor deviation enables people to move their mouse cursors to the menu bar and to windows of other Macintosh applications.

Printing images of rootless windows

The Print Screen menu commands in the DECwindows Session Manager do not work with clients displayed in a rootless style. The Print Screen commands normally work by printing all or part of the root window. Because there is no root window for rootless clients, there is nothing to print.

Standard colormaps

MacX contains the functionality of *xstdcmap*, the X11R4 client that creates standard colormaps that perform color translation. Accordingly, MacX creates all the standard colormaps for screens 2 (color, rootless) and 3 (color, rooted), so that you don't have to run this client.

Other differences

This section identifies various features and procedures that are unique to MacX or that MacX handles differently than conventional X servers.

Animation and mouse-movement preferences

MacX has a miscellaneous preference option, Smoother (but Slightly Slower) Animation, that improves animation on a Macintosh screen. This option directs MacX to refresh the screen image of the off-screen bitmap after every X request that causes graphics changes in any window. If the preference is off, MacX updates the screen either when it is waiting to service an X11 request or when a quarter of a second has elapsed since the last screen update. Checking this preference eliminates delays between screen image updates.

Another miscellaneous preference, Enable Mouse Movement Under Client Control, implements mouse **warping** when checked. However, clients can warp the mouse only in the part of the window that appears on the screen, not in any areas that are scrolled-off the screen nor in areas that extend beyond the screen boundaries. To find these two preferences, choose Miscellaneous Preferences from the Edit menu.

Color-related differences

If the Macintosh Clipboard contains a PICT object, MacX converts that object to a standard X bitmap selection. However, MacX cannot convert color objects to pixmap selections, so these graphics are converted to monochrome bitmaps.

MacX supports six visuals on both color screens (2 and 3). These visuals are 8-bit PseudoColor, 8-bit DirectColor, GrayScale, StaticGray, StaticColor, and TrueColor. In addition, MacX tries to display clients that require more than 8-bit color as well as possible. A visual is a structure that defines a method of using color resources on a screen.

Font-path searching

In order to reduce the complexity of handling fonts and to maintain a Macintosh-like user interface, MacX does not support the X font-path search function. It ignores font-path search requests from clients. The only impact on the person using fonts in MacX is that all X Fonts must be kept in the MacX Fonts folder or one of its subfolders.

Resetting the server

MacX performs a complete server reset operation whenever the user opens a new settings document or resizes the root window. This operation frees all existing properties on windows, all existing atoms, and all existing storage owned by the server. It is analogous to quitting from MacX and restarting it.

Screen definitions

Normally, a video display device can display one X screen: either a monochrome root window or a color root window. On video display devices capable of displaying both types of screens, the screens are mutually exclusive. Moreover, each video display device is assigned a unique screen number. In contrast, a Macintosh running MacX supports four screens (0 through 3) on one or more display devices. These screen numbers represent different root and window styles (rooted, rootless, monochrome, color) rather than individual video display devices, because the Macintosh views all display devices attached to it as one large, continuous desktop.

Typing international characters

MacX conforms to the standard Macintosh method for typing international characters, that is, holding down the Option key and pressing another character to obtain diacritical marks, such as grave accent (˘), circumflex (ˆ), and tilde (~). For example, on the U.S. keyboard, pressing the Option key and the *i* key together and then typing another letter produces a circumflex over that character. Use the Key Caps desk accessory to see what keys to press on your keyboard to obtain these marks. For more information, consult your *Macintosh System Software User's Guide* or the *Macintosh Reference*.

Appendix E contains a matrix indicating the hexadecimal equivalents for ISO Latin 1 and Macintosh extended ASCII characters. These characters do not always have the same character-code value when translated from one character set to the other.



Appendix B: The MacX Window Manager

The MacX Window Manager controls the appearance and manipulation of windows in rootless mode, extending the Macintosh look and feel to the conventional X environment. This appendix explains the more technical aspects of some of its features.

Transferring text and graphics between clients

In conformance with the ICCCM, the MacX Window Manager enables you to cut, copy, and paste text and graphic objects in PICT format from one client to another. To transfer text or graphics, use the client's method to perform the cut, copy, or paste operation. MacX is advised of a cut or copy event and places the selected item in the Clipboard. When you indicate where you want to paste the item, by issuing the appropriate command within the client you want to receive it, MacX transfers the contents of the clipboard to that client. For example, to paste your selection in a terminal emulator window, you would press the left arrow key, the equivalent in MacX to pressing the middle mouse button.

As discussed in Chapter 1, the MacX Window Manager also enables you to cut, copy, and paste text and graphic objects in PICT format from Macintosh applications to X11 clients. If the Macintosh Clipboard contains a PICT object, MacX converts that object to a standard X11 bitmap selection. Note that MacX does not support conversion of color PICTs to pixmap or colormap selections. Color Clipboard objects are converted to monochrome bitmap selections.

MacX can also copy and paste text, such as font or color names, from MacX dialog windows (the Remote Command window, Font Director window, and Color Namer) to clients using substantially the same operation. See the section "Editing Commands" in Chapter 1 for a summary of these procedures.

Window positioning

The MacX Window Manager automatically positions a window if its coordinates would otherwise position it completely off of any screen, if the command to create it specifies no geometry option, or if the x - y coordinates specified in the geometry option are 0,0. MacX positions such windows in a cascading sequence starting from the upper-left corner of the screen that is most appropriate to display the window. Color windows are automatically positioned in a sequence on color screens and monochrome windows are automatically positioned on monochrome screens. If no appropriate screen exists for a window, it is automatically positioned on the screen containing the MacX menu bar.

The point of origin of rootless-style windows is the left corner on the inside edge of the border, so you should account for the height of title bars when specifying the y coordinate.



Appendix C: Bitmap Distribution Format 2.1

This appendix contains a copy of the document, *Bitmap Distribution Format 2.1*, written by Adobe Systems, Inc. It is provided as a reference to programmers who want to compile fonts from BDF files.

Bitmap Distribution Format 2.1

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1. Introduction

This document describes Bitmap Distribution Format (BDF), version 2.1. BDF is an X Consortium standard for font interchange, intended to be easily understood by both humans and computers.

2. File Format

Character bitmap information will be distributed in an USASCII encoded, human readable form. Each file is encoded in the printable characters (octal 40 through 176) of USASCII plus carriage return and linefeed. Each file consists of a sequence of variable-length lines. Each line is terminated by a carriage-return (octal 015) and line-feed (octal 012), or by just a line-feed.

The information about a particular family and face at one size and orientation will be contained in one file. The file begins with information pertaining to the face as a whole, followed by the information and bitmaps for the individual characters.

A font bitmap description file has the following general form, where each item is contained on a separate line of text in the file. Items on a line are separated by spaces.

1. The word **STARTFONT** followed by a version number indicating the exact file format used. The version described here is number **2.1**.
2. One or more lines beginning with the word **COMMENT**. These lines may be ignored by any program reading the file.
3. The word **FONT** followed by either the **XLFD** font name (as specified in the X Logical Font Description Conventions standard) or some private font name. Creators of private font name syntaxes are encouraged to register unique font name prefixes with the X Consortium to prevent naming conflicts. Note that the name continues all the way to the end of the line, and may contain spaces.
4. The word **SIZE** followed by the **point size** of the characters, the **x resolution**, and the **y resolution** of the device for which these characters were intended.
5. The word **FONTBOUNDINGBOX** followed by the **width in x**, **height in y**, and the **x** and **y** displacement of the lower left corner from the **origin**. (See the examples in section 3).
6. Optionally the word **STARTPROPERTIES** followed by the number of properties (**p**) that follow.
7. Then come **p** lines consisting of a word for the **property name** followed by either an integer or string surrounded by double-quote (octal 042). Internal double-quotes characters are indicated by using two in a row.
8. Properties named **FONT_ASCENT**, **FONT_DESCENT**, and **DEFAULT_CHAR** should be provided to define the logical font-ascent and font-descent and the default-char for the font. These properties will be removed from the actual font properties in the binary form produced by a compiler. If these properties are not provided, a compiler may reject the font, or may compute (arbitrary) values for these properties.
9. The property section, if it exists, is terminated by **ENDPROPERTIES**.

10. The word CHARS followed by the number of character segments (c) that follow.
11. Then come **c** character segments of the form:
 - a. The word STARTCHAR followed by up to 14 characters (no blanks) of descriptive **name** of the glyph.
 - b. The word ENCODING followed by one of the following forms:
 - i. <n> - the glyph index, i.e. a positive integer representing the character code used to access the glyph in X requests, as defined by the encoded character set given by the CHARSET_REGISTRY-CHARSET_ENCODING font properties for XLFD conforming fonts. If these XLFD font properties are not defined, then the encoding scheme is font-dependent;
 - ii. -1 <n> - equivalent to form above. This syntax is provided for backwards compatibility with previous versions of this specification, and is not recommended for use with new fonts;
 - iii. -1 - an unencoded glyph. Some font compilers may discard unencoded glyphs, but in general the glyph names may be used by font compilers and X servers to implement dynamic mapping of glyph repertoires to character encodings as seen through the X protocol.
 - c. The word SWIDTH followed by the **scalable width** in x and y of character. Scalable widths are in units of 1/1000th of the size of the character. If the size of the character is p points, the width information must be scaled by $p/1000$ to get the width of the character in printer's points. This width information should be considered as a vector indicating the position of the next character's origin relative to the origin of this character. To convert the scalable width to the width in device pixels, multiply SWIDTH times $p/1000$ times $r/72$ where r is the device resolution in pixels per inch. The result is a real number giving the ideal print width in device pixels. The actual device width must of course be an integral number of device pixels and is given in the next entry. The SWIDTH y value should always be zero for a standard X font.
 - d. The word DWIDTH followed by the width in x and y of the character in device units. Like the SWIDTH, this width information is a vector indicating the position of the next character's origin relative to the origin of this character. Note, that the DWIDTH of a given "hand-tuned" WYSIWYG glyph may deviate slightly from its ideal device-independent width given by SWIDTH in order to improve its typographic characteristics on a display. The DWIDTH y value should always be zero for a standard X font.
 - e. The word BBX followed by the **width** in x (BBw), **height** in y (BBh) and x and y displacement ($BBox$, $BBoy$) of the lower left corner from the **origin** of the character.
 - f. The optional word ATTRIBUTES followed by the attributes as 4 **hex-encoded** characters. The interpretation of these attributes is undefined in this document.
 - g. The word BITMAP.

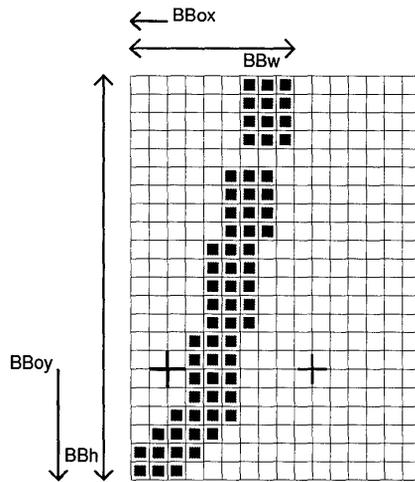
h. *h* lines of **hex-encoded bitmap**, padded on the right with zero's to the nearest byte (i.e., multiple of 8).

i. The word ENDCHAR.

12. The file is terminated with the word ENDFONT.

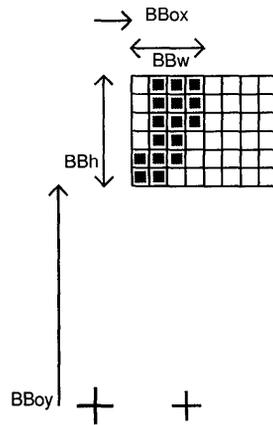
3. Metric Information

Figures 3-1 and 3-2 best illustrate the bitmap format and character metric information.



BBw = 9, BBh = 22, BBox = -2, BBoy = -6
DWIDTH = 8 0
SWIDTH = 355 0
“+” = character origin and width

Figure 3-1: An example of a descender



BBh = 6, BBw = 4, BBox = +2, BBoy = +12
DWIDTH = 5 0
SWIDTH = 223 0

Figure 3-2: An example with the origin outside the bounding box

4. An Example File

The following is an abbreviated example of a bitmap file containing the specification of two characters (the j and quoteright in 3).¹

```

STARTFONT 2.1
COMMENT This is a sample font in 2.1 format.
FONT -Adobe-Helvetica-Bold-R-Normal--24-240-75-75-P-65-ISO8859-1
SIZE 24 75 75
FONTBOUNDINGBOX 9 24 -2 -6
STARTPROPERTIES 19
FOUNDRY "Adobe"
FAMILY "Helvetica"
WEIGHT_NAME "Bold"
SLANT "R"
SETWIDTH_NAME "Normal"
ADD_STYLE_NAME ""
PIXEL_SIZE 24
POINT_SIZE 240
RESOLUTION_X 75
RESOLUTION_Y 75
SPACING "P"
AVERAGE_WIDTH 65
CHARSET_REGISTRY "ISO8859"
CHARSET_ENCODING "1"
MIN_SPACE 4
FONT_ASCENT 21
FONT_DESCENT 7
COPYRIGHT "Copyright (c) 1987 Adobe Systems, Inc."
NOTICE "Helvetica is a registered trademark of Linotype Inc."
ENDPROPERTIES
CHARS 2
STARTCHAR j
ENCODING 106
SWIDTH 355 0
DWIDTH 8 0
BBX 9 22 -2 -6
BITMAP
0380
0380
0380
0380
0000
0700
0700
0700
0700
0700
0E00
0E00
0E00
0E00
0E00
0E00
1C00
1C00
1C00
1C00
1C00
2C00
7800
F000

```

¹Helvetica® is a registered trademark of Allied Corporation.

```
E000
ENDCHAR
STARTCHAR quoteright
ENCODING 39
SWIDTH 223 0
DWIDTH 5 0
BEX 4 5 2 12
ATTRIBUTES 01C0
BITMAP
70
70
60
E0
C0
ENDCHAR
ENDFONT
```




Appendix D: X Logical Font Description Conventions

This appendix contains a copy of the document, *X Logical Font Description Conventions*, written by Jim Flowers at Digital Equipment Corporation. It is provided as a convenience for those who need to refer to the X font-name standard. Table 5-1 in Chapter 5 provides a summary of the X font-name format sufficient for interpreting the font names in the MacX Font Director window.

X Logical Font Description Conventions

Version 1.3

MIT X Consortium Standard

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Bitstream Amerigo is a registered trademark of Bitstream Inc.

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3.2.7. PIXEL_SIZE : CARD32	11
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1. Introduction

It is a requirement that X client applications must be portable across server implementations, with very different file systems, naming conventions, and font libraries. However, font access requests, as defined by the X Window System Protocol, Version 11, do not specify server-independent conventions for font names, nor provide adequate font properties for logically describing typographic fonts.

X clients must be able to dynamically determine fonts available on any given server, in what sizes, styles, etc., so that understandable information can be presented to the user, or that intelligent font fallbacks can be chosen. It is desirable that the most common queries could be accomplished without the overhead of opening each font and inspection of font properties, i.e., through simple **ListFonts** requests. (E.g., if a user selected a Helvetica typeface family, a client application should be able to query the server for all Helvetica fonts and present only those setwidths, weights, slants, point sizes, character sets available for that family).

This document gives a standard logical font description (XLFD) and conventions to be used in the X protocol so that clients can query and access screen type libraries in a consistent manner across all X servers. In addition to completely specifying a given font via its **FontName**, the XLFD also provides for a standard set of key **FontProperties** that describe the font in more detail.

The XLFD provides an adequate set of typographic font properties, such as CAP_HEIGHT, X_HEIGHT, RELATIVE_SETWIDTH, for publishing and other applications to do intelligent font matching or substitution when handling documents created on some foreign server using potentially unknown fonts. In addition, this information is required by certain clients to automatically place subscripts, determine small capital heights, recommended leading, wordspace values, etc.

Examples are for illustrative purposes only.

2. Requirements and Goals

This specification meets the short and long-term goals to have a standard logical font description which:

- provides unique, descriptive font names that support simple pattern matching;
- supports multiple font vendors, arbitrary character sets and encodings;
- is X server and operating/file system independent;
- provides adequate descriptive font information for arbitrarily complex font matching/substitution;
- is extensible.

2.1. Unique, Descriptive Font Names

It should be possible to have font names that are long enough and descriptive enough to have a reasonable probability of being unique without inventing a new registration organization. Resolution/size-dependent font masters, multi-vendor font libraries, etc., must be anticipated and handled by the font name alone.

The name itself should be structured to be amenable to simple pattern matching and parsing, allowing X clients to restrict font queries to some subset of all possible fonts in the server.

2.2. Support Multiple Font Vendors and Character Sets

The font name and properties should distinguish between fonts that were supplied by different font vendors but that possibly share the same name. We anticipate a highly competitive font market where users will be able to buy fonts from a number of sources according to their particular requirements.

A number of font vendors deliver each font with all glyphs designed for that font, where char- set mappings are defined by encoding vectors. Some server implementations may force these mappings to proprietary or standard charsets statically in the font data, while others may desire to perform the mapping dynamically in the server. Provisions must be made in the font name which allows a font request to specify/identify specific charset mappings in server environ- ments where multiple charsets are supported.

2.3. Server, Operating and File System Independent

X client applications that require a particular font should be able to use the descriptive name, without knowledge of the file system or other repository in use by the server. However, it should be possible for servers to translate a given font name into a file name syntax that it knows how to deal with, without compromising the uniqueness of the font name. This algo- rithm should be reversible (exactly how this translation is done is implementation dependent).

2.4. Supports Arbitrarily Complex Font Matching/Substitution

In addition to the font name, the XLFD should define a standard list of descriptive font proper- ties with agreed upon fallbacks for all fonts, so that client applications can derive font-specific formatting/display data, perform font matching/substitution when asked to handle potentially unknown fonts, as required.

2.5. Extensible

The XLFD must be extensible so that new and/or private descriptive font properties can be added to conforming fonts without obsoleting existing X client or server implementations.

3. X Logical Font Description

XLFD is divided into two basic components: the **FontName**, which gives all font information needed to uniquely identify a font in X protocol requests (e.g., **OpenFont**, **ListFonts**, etc.) and a variable list of optional **FontProperties** that describe a font in more detail.

The **FontName** is used in font queries and returned as data in certain X protocol requests. The **FontName** is also specified as the data value for the **FONT** item in the X Consortium Character Bitmap Distribution Format specification (BDF V2.1).

The **FontProperties** are supplied on a font-by-font basis, and are returned as data in certain X protocol requests as part of the **XFontStruct** data structure. The **FontProperties** names and associated data values may also appear as items of the **STARTPROPERTIES..ENDPROPERTIES** list in the BDF V2.1 specification.

3.1. FontName

The **FontName** is logically composed of two strings: a **FontNameRegistry** prefix, followed by a **FontNameSuffix**. The **FontNameRegistry** is an x-registered-name that identifies the regis- tration authority that owns the specified **FontNameSuffix** syntax and semantics.

All font names that conform to this specification are to use a **FontNameRegistry** prefix defined to be the string “-”, i.e., ISO 8859-1 HYPHEN (Column/Row 02/13). All **FontNam- eRegistry** prefixes of the form “+version-”, where *version* is the version of some future XLFD specification, are reserved by the X Consortium for future extensions to XLFD font names. If required, extensions to the current XLFD font name shall be constructed by append- ing new fields to the current structure, each delimited by the existing field delimiter. The avail- ability of other **FontNameRegistry** prefixes or fonts that support other registries is server implementation dependent.

In the X protocol specification, the **FontName** is required to be a string; hence, numeric field values are represented in the name as string equivalents. All **FontNameSuffix** fields are also defined as **FontProperties**, in which case numeric property values are represented as signed or unsigned integers as appropriate.

3.1.1. FontName Syntax

The **FontName** is a structured, parsable string (X data type STRING8) whose Backus-Naur Form syntax description is as follows:

```

FontName ::= XFontNameRegistry XFontNameSuffix | PrivFontNameRegistry
            PrivFontNameSuffix
XFontNameRegistry ::= XFNDelim | XFNextPrefix Version XFNDelim
XFontNameSuffix ::= FOUNDRY XFNDelim FAMILY_NAME XFNDelim WEIGHT_NAME
                   XFNDelim SLANT XFNDelim SETWIDTH_NAME XFNDelim ADD_
                   STYLE_NAME XFNDelim PIXEL_SIZE XFNDelim POINT_SIZE
                   XFNDelim RESOLUTION_X XFNDelim RESOLUTION_Y XFNDelim
                   SPACING XFNDelim AVERAGE_WIDTH XFNDelim CHARSET_
                   REGISTRY XFNDelim CHARSET_ENCODING
Version ::= STRING8 – the XLFDF version that defines an extension to the font
            name syntax (e.g., “2.0”)
XFNextPrefix ::= OCTET – the value of ISO8859-1 PLUS (Column/Row 02/13)
XFNDelim ::= OCTET – the value of ISO8859-1 HYPHEN (Column/Row 02/13)
PrivFontNameRegistry ::= STRING8 – other than those strings reserved by XLFDF
PrivFontNameSuffix ::= STRING8

```

Field values are constructed as strings of ISO8859-1 graphic characters, excluding the following:

- HYPHEN (02/13), the XLFDF font name delimiter character;
- QUESTION MARK (03/15) and ASTERISK (02/10), the X protocol fontname wildcard characters.

Alphabetic case distinctions are allowed, but are for human readability concerns only. Conforming X servers will perform matching on font name query/open requests independent of case. The entire font name string must have no more than 255 characters. It is recommended that clients construct font name query patterns by explicitly including all field delimiters to avoid unexpected results. Note, that SPACE is a valid character of a **FontName** field; e.g., a **FAMILY_NAME** might be ITC Avant Garde Gothic.

3.1.2. FontName Field Definitions

3.1.2.1. FOUNDRY : x-registered-name

FOUNDRY is an x-registered-name, the name or identifier of the digital type foundry that digitized and supplied the font data, or if different, the identifier of the organization that last modified the font shape or metric information.

The reason this distinction is necessary is that a given font design may be licensed from one source (e.g., ITC) but digitized and sold by any number of different type suppliers. Each digital version of the original design will in general be somewhat different in metrics and shape from the idealized original font data, as each font foundry, for better or for worse, has its own standards and practices for tweaking a typeface for a particular generation of output technologies, or has its own perception of market needs.

It is up to the type supplier to register with the X Consortium a suitable name for this **FontName** field, according to the registration procedures defined by the Consortium.

The X Consortium shall define procedures for registering foundry names, and shall maintain and publish in a timely manner a registry of such registered names for use in XLFDF font names and properties.

3.1.2.2. FAMILY_NAME : string

FAMILY_NAME is a string that identifies the range or “family” of typeface designs that are all variations of one basic typographic style. This must be spelled out in full, with words separated by spaces as required. This name must be human-understandable and suitable for presentation to a font user to identify the typeface family.

It is up to the type supplier to supply and maintain a suitable string for this field and font property, to secure the proper legal title to a given name, and to guard against the infringement of other’s copyrights or trademarks. By convention, FAMILY_NAME is not translated. FAMILY_NAME may include an indication of design ownership if considered a valid part of the typeface family name (see examples below).

Examples of FAMILY_NAMES:

```
Helvetica
ITC Avant Garde Gothic
Times
Times Roman
Bitstream Amerigo
Stone
```

3.1.2.3. WEIGHT_NAME : string

WEIGHT_NAME is a string that identifies the font’s typographic weight, i.e., the nominal blackness of the font, according to the FOUNDRY’s judgement. This name must be human-understandable and suitable for presentation to a font user.

The interpretation of this field is somewhat problematic, as the typographic judgement of weight has traditionally depended on the overall design of the typeface family in question (i.e., it is possible that the DemiBold weight of one font could be almost equivalent in typographic feel to a Bold font from another family).

WEIGHT_NAME is captured as an arbitrary string since it is an important part of a font’s complete human-understandable name, but it should not be used for font matching/substitution. X client applications should use the weight-related font properties (RELATIVE_WEIGHT and WEIGHT) that give the coded relative weight, and the calculated weight, respectively, for this purpose.

3.1.2.4. SLANT : code-string

SLANT is a code-string that indicates the overall posture of the typeface design used in the font. The encoding is as follows:

Code	English Translation	Description
“R”	Roman	Upright design
“I”	Italic	Italic design, slanted clockwise from vertical
“O”	Oblique	Obliqued upright design, slanted clockwise from vertical
“RI”	Reverse Italic	Italic design, slanted counter clockwise from vertical
“RO”	Reverse Oblique	Obliqued upright design, slanted counter clockwise from vertical
“OT”	Other	Other

The SLANT codes are for programming convenience only, and usually are converted into their equivalent human-understandable form before being presented to a user.

3.1.2.5. SETWIDTH_NAME : string

SETWIDTH_NAME is a string that gives the font's typographic proportionate width, i.e., the nominal width per horizontal unit of the font, according to the FOUNDRY's judgment.

As with WEIGHT_NAME, the interpretation of this field or font property is somewhat problematic, as the designer's judgment of setwidth has traditionally depended on the overall design of the typeface family in question. X client applications should use the RELATIVE_SETWIDTH font property which gives the relative coded proportionate width, or calculate the proportionate width, for purposes of font matching or substitution.

Examples of SETWIDTH_NAMES:

- Normal
- Condensed
- Narrow
- Double Wide

3.1.2.6. ADD_STYLE_NAME : string

ADD_STYLE_NAME is a string that identifies additional typographic style information not captured by other fields, but needed to uniquely identify the font.

ADD_STYLE_NAME is not a typeface classification field, and is only used for uniqueness. Its usage, as such, is not limited to typographic style distinctions.

Examples of ADD_STYLE_NAMES:

- Serif
- Sans Serif
- Informal
- Decorated

3.1.2.7. PIXEL_SIZE : integer-string

PIXEL_SIZE is an unsigned integer-string typographic metric in device pixels which gives the body size of the font at a particular POINT_SIZE and RESOLUTION_Y. PIXEL_SIZE normally incorporates additional vertical spacing considered part of the font design. (Note, however, that this value is not necessarily equivalent to the height of the font bounding box). PIXEL_SIZE is in the range zero to a "very-large-number".

PIXEL_SIZE would normally be used by X client applications that need to query fonts according to device-dependent size, regardless of the point size or vertical resolution the font was designed for.

3.1.2.8. POINT_SIZE : integer-string

POINT_SIZE is an unsigned integer-string typographic metric in device-independent units which gives the body size the font was designed for. This field normally incorporates additional vertical spacing considered part of the font design. (Note, however, that POINT_SIZE is not necessarily equivalent to the height of the font bounding box). POINT_SIZE is expressed in decipoints (where points are as defined in the X protocol or 72.27 pts = 1 inch) in the range zero to a "very-large-number".

POINT_SIZE and RESOLUTION_Y would be used by X clients to query fonts according to device-independent size, to maintain constant text size on the display regardless of the PIXEL_SIZE used for the font.

3.1.2.9. RESOLUTION_X : integer-string**3.1.2.10. RESOLUTION_Y : integer-string**

RESOLUTION_X and RESOLUTION_Y are unsigned integer-strings, the horizontal and vertical resolution that the font was designed for, measured in pixels/dots per inch (dpi). Horizontal and vertical values are required since a separate bitmap font must be designed for displays with very different aspect ratios (e.g., 1:1, 4:3, 2:1, etc.).

The separation of pixel/point size and resolution is necessary because X allows for servers with very different video characteristics (e.g., horizontal and vertical resolution, screen and pixel size, pixel shape, etc.) to potentially access the same font library. The font name, then, must differentiate between a 14 point font designed for 75 dpi (body size of about 14 pixels) or a 14 point font designed for 150 dpi (about 28 pixels), etc. Further, in servers that implement some or all fonts as continuously scaled outlines, POINT_SIZE and RESOLUTION_Y will help the server to differentiate between potentially separate font masters for text, title, and display sizes or for other typographic considerations.

3.1.2.11. SPACING : code-string

SPACING is a code-string that indicates the escapement class of the font, i.e., monospace (fixed pitch), proportional (variable pitch), or charcell (a special monospaced font that conforms to the traditional data processing character cell font model).

Code	English Translation	Description
"P"	Proportional	A font whose logical character widths vary for each glyph. Note that no other restrictions are placed on the metrics of a proportional font.
"M"	Monospaced	A font whose logical character widths are constant (i.e., all char widths of the font are = max_bounds.width). No other restrictions are placed on the metrics of a monospaced font.
"C"	CharCell	A monospaced font which follows the standard typewriter character cell model (i.e., the glyphs of the font can be modeled by X clients as "boxes" of the same width and height which are imaged side by side to form text strings, or top to bottom to form text lines. By definition, all glyphs have the same logical character width, and no glyphs have "ink" outside of the character cell—there is no kerning (i.e., on a per char basis with positive metrics: 0 <= left-bearing <= right-bearing <= width; with negative metrics: width <= left-bearing <= right-bearing <= 0)—and the vertical extents of the font do not exceed the vertical spacing (i.e., on a per char basis: ascent <= font-ascent and descent <= font-descent). The cell height = font-descent + font-ascent, and width = AVERAGE_WIDTH.

3.1.2.12. AVERAGE_WIDTH : integer-string

AVERAGE_WIDTH is an unsigned integer-string typographic metric value giving the unweighted arithmetic mean width of all glyphs in the font, measured in 1/10th pixels. Note, for monospaced and character cell fonts, this is the width of all glyphs in the font.

3.1.2.13. CHARSET_REGISTRY : x-registered-name

3.1.2.14. CHARSET_ENCODING : registered-name

The character set used to encode the glyphs of the font (and implicitly the font's glyph repertoire), as maintained by the X Consortium character set registry. CHARSET_REGISTRY is an x-registered-name that identifies the registration authority that owns the specified encoding. CHARSET_ENCODING is a registered-name that identifies the coded character set as defined by that registration authority.

Although the X protocol does not explicitly have any knowledge about character set encodings, it is expected that server implementers will prefer to embed knowledge of certain proprietary or industry standard charsets into their font library for reasons of performance and convenience. The CHARSET_REGISTRY and CHARSET_ENCODING fields/properties allow an X client font request to specify a specific charset mapping in server environments where multiple charsets are supported. The availability of any particular character set is font and server implementation dependent.

To prevent collisions when defining character set names, it is recommended that CHARSET_REGISTRY/CHARSET_ENCODING name pairs be constructed according to the following conventions:

```

CharSetRegistry ::= StdCharSetRegistryName | PrivCharSetRegistryName
CharSetEncoding ::= StdCharSetEncodingName | PrivCharSetEncodingName
StdCharSetRegistryName ::= StdOrganizationId StdNumber | StdOrganizationId StdNumber Dot Year
PrivCharSetRegistryName ::= OrganizationId STRING8
StdCharSetEncodingName ::= STRING8--numeric part # of referenced standard
PrivCharSetEncodingName ::= STRING8
StdOrganizationId ::= STRING8--the registered name or acronym of the referenced standard
                        organization
StdNumber ::= STRING8--referenced standard number
OrganizationId ::= STRING8--the registered name or acronym of the organization
Dot ::= "."--ISO 8859-1 FULL STOP (Column/Row 2/14)
Year ::= STRING8--numeric year (for example, 1989)

```

The X Consortium shall maintain and publish in a timely manner a registry of such character set names for use in X protocol font names and properties as specified in XLFD.

The ISO Latin 1 character set shall be registered by the X Consortium as the CHARSET_REGISTRY-CHARSET_ENCODING value pair: "ISO8859-1".

3.1.3. Examples

The following examples of font names are derived from the screen fonts shipped with the R3 server.

Font	X FontName
75dpi Fonts	
Charter 12pt	-Bitstream-Charter-Medium-R-Normal--12-120-75-75-P-68-ISO8859-1
Charter Bold 12pt	-Bitstream-Charter-Bold-R-Normal--12-120-75-75-P-76-ISO8859-1
Charter BoldItalic 12pt	-Bitstream-Charter-Bold-I-Normal--12-120-75-75-P-75-ISO8859-1C
Charter Italic 12pt	-Bitstream-Charter-Medium-I-Normal--12-120-75-75-P-66-ISO8859-1
Courier 8pt	-Adobe-Courier-Medium-R-Normal--8-80-75-75-M-50-ISO8859-1
Courier 10pt	-Adobe-Courier-Medium-R-Normal--10-100-75-75-M-60-ISO8859-1
Courier 12pt	-Adobe-Courier-Medium-R-Normal--12-120-75-75-M-70-ISO8859-1
Courier 14pt	-Adobe-Courier-Medium-R-Normal--14-140-75-75-M-90-ISO8859-1
Courier 18pt	-Adobe-Courier-Medium-R-Normal--18-180-75-75-M-110-ISO8859-1
Courier 24pt	-Adobe-Courier-Medium-R-Normal--24-240-75-75-M-150-ISO8859-1

Font	X FontName
Courier Bold 10pt	-Adobe-Courier-Bold-R-Normal--10-100-75-75-M-60-ISO8859-1
Courier BoldOblique 10pt	-Adobe-Courier-Bold-O-Normal--10-100-75-75-M-60-ISO8859-1
Courier Oblique 10pt	-Adobe-Courier-Medium-O-Normal--10-100-75-75-M-60-ISO8859-1
100dpi Fonts	
Symbol 8pt	-Adobe-Symbol-Medium-R-Normal--11-80-100-100-P-61-Adobe-FONTSPECIFIC
Symbol 10pt	-Adobe-Symbol-Medium-R-Normal--14-100-100-100-P-85-Adobe-FONTSPECIFIC
Symbol 12pt	-Adobe-Symbol-Medium-R-Normal--17-120-100-100-P-95-Adobe-FONTSPECIFIC
Symbol 14pt	-Adobe-Symbol-Medium-R-Normal--20-140-100-100-P-107-Adobe-FONTSPECIFIC
Symbol 18pt	-Adobe-Symbol-Medium-R-Normal--25-180-100-100-P-142-Adobe-FONTSPECIFIC
Symbol 24pt	-Adobe-Symbol-Medium-R-Normal--34-240-100-100-P-191-Adobe-FONTSPECIFIC
Times Bold 10pt	-Adobe-Times-Bold-R-Normal--14-100-100-100-P-76-ISO8859-1
Times BoldItalic 10pt	-Adobe-Times-Bold-I-Normal--14-100-100-100-P-77-ISO8859-1
Times Italic 10pt	-Adobe-Times-Medium-I-Normal--14-100-100-100-P-73-ISO8859-1
Times Roman 10pt	-Adobe-Times-Medium-R-Normal--14-100-100-100-P-74-ISO8859-1

3.2. FontProperties

All font properties are optional, but will generally include the font name fields, and on a font-by-font basis any other useful font descriptive/usage information that may be required to use the font intelligently. The XLF D specifies an extensive set of standard X font properties, their interpretation and fallback rules when the property is not defined for a given font. The goal is to provide client applications with enough font information to be able to make automatic formatting/display decisions with good typographic results.

Additional standard X font property definitions may be defined in the future and private properties may exist in X fonts at any time. Private font properties should be defined to conform to the general mechanism defined in the X protocol to prevent overlap of name space and ambiguous property names, i.e., private font property names are of the form: ISO8859-1 UNDERSCORE (Column/Row 05/15), followed by the organizational identifier, followed by UNDERSCORE, and terminated with the property name.

The Backus-Naur Form syntax description of X Font Properties is:

```

Properties ::= OptFontPropList
OptFontPropList ::= NULL | OptFontProp OptFontPropList
OptFontProp ::= PrivateFontProp | XFontProp
PrivateFontProp ::= STRING8 | Underscore OrganizationId Underscore STRING8

```

```

XFontProp ::=  FOUNDRY | FAMILY_NAME | WEIGHT_NAME | SLANT |
                SETWIDTH_NAME | ADD_STYLE_NAME | PIXEL_SIZE |
                POINT_SIZE | RESOLUTION_X | RESOLUTION_Y | SPACING |
                AVERAGE_WIDTH | CHARSET_REGISTRY |
                CHARSET_ENCODING | QUAD_WIDTH | RESOLUTION |
                MIN_SPACE | NORM_SPACE | MAX_SPACE | END_SPACE |
                SUPERSCRIPT_X | SUPERSCRIPT_Y | SUBSCRIPT_X |
                SUBSCRIPT_Y | UNDERLINE_POSITION |
                UNDERLINE_THICKNESS | STRIKEOUT_ASCENT |
                STRIKEOUT_DESCENT | ITALIC_ANGLE | X_HEIGHT | WEIGHT |
                FACE_NAME | COPYRIGHT | AVG_CAPITAL_WIDTH |
                AVG_LOWERCASE_WIDTH | RELATIVE_SETWIDTH |
                RELATIVE_WEIGHT | CAP_HEIGHT | SUPERSCRIPT_SIZE |
                FIGURE_WIDTH | SUBSCRIPT_SIZE | SMALL_CAP_SIZE |
                NOTICE | DESTINATION
Underscore ::=  OCTET-the value of ISO8859-1 UNDERSCORE character
                (Column/Row 05/15)
OrganizationId ::=  STRING8-the registered name of the organization

```

3.2.1. FOUNDRY : ATOM

As defined in the **FontName**, except the property type is ATOM.

FOUNDRY can not be calculated or defaulted if not supplied as a font property.

3.2.2. FAMILY_NAME : ATOM

As defined in the **FontName**, except the property type is ATOM.

FAMILY_NAME can not be calculated or defaulted if not supplied as a font property.

3.2.3. WEIGHT_NAME : ATOM

As defined in the **FontName**, except the property type is ATOM.

WEIGHT_NAME can be defaulted if not supplied as a font property, as follows:

```

if (WEIGHT_NAME undefined) then
    WEIGHT_NAME = ATOM("Medium")

```

3.2.4. SLANT : ATOM

As defined in the **FontName**, except the property type is ATOM.

SLANT can be defaulted if not supplied as a font property, as follows:

```

if (SLANT undefined) then
    SLANT = ATOM("R")

```

3.2.5. SETWIDTH_NAME : ATOM

As defined in the **FontName**, except the property type is ATOM.

SETWIDTH_NAME can be defaulted if not supplied as a font property, as follows:

```

if (SETWIDTH_NAME undefined) then
    SETWIDTH_NAME = ATOM("Normal")

```

3.2.6. ADD_STYLE_NAME : ATOM

As defined in the **FontName**, except the property type is ATOM.

ADD_STYLE_NAME can be defaulted if not supplied as a font property, as follows:

```
if (ADD_STYLE_NAME undefined) then
  ADD_STYLE_NAME = ATOM(“”)
```

3.2.7. PIXEL_SIZE : CARD32

As defined in the **FontName**, except the property type is CARD32.

X clients requiring pixel values for the various typographic fixed spaces (EM space, EN space and THIN space), can use the following algorithm for computing these values from other properties specified for a font:

```
DeciPointsPerInch = 722.7
EMspace = ROUND ((RESOLUTION_X * POINT_SIZE) / DeciPointsPerInch)
ENspace = ROUND (EMspace / 2)
THINspace = ROUND (EMspace / 3)
```

Note that a “/” denotes real division, “*” denotes real multiplication, and “ROUND” denotes a function that rounds its real argument “a” up/down to the next integer, according to $x = \text{FLOOR}(a + 0.5)$, where FLOOR is a function that rounds its argument down to an integer. PIXEL_SIZE can be approximated if not supplied as a font property, according to the algorithm:

```
DeciPointsPerInch = 722.7
if (PIXEL_SIZE undefined) then
  PIXEL_SIZE = ROUND ((RESOLUTION_Y * POINT_SIZE) / DeciPointsPerInch)
```

3.2.8. POINT_SIZE : CARD32

As defined in the **FontName**, except the property type is CARD32.

X clients requiring device-independent values for EMspace, ENspace and THINspace, can use the following algorithm:

```
EMspace = ROUND (POINT_SIZE / 10)
ENspace = ROUND (POINT_SIZE / 20)
THINspace = ROUND (POINT_SIZE / 30)
```

Design POINT_SIZE can not be calculated or approximated.

3.2.9. RESOLUTION_X : CARD32

As defined in the **FontName**, except the property type is CARD32.

RESOLUTION_X cannot be calculated or approximated.

3.2.10. RESOLUTION_Y : CARD32

As defined in the **FontName**, except the property type is CARD32.

RESOLUTION_Y cannot be calculated or approximated.

3.2.11. SPACING : ATOM

As defined in the **FontName**, except the property type is ATOM.

SPACING can be calculated if not supplied as a font property, according to the definitions given above for the **FontName**.

3.2.12. AVERAGE_WIDTH : CARD32

As defined in the **FontName**, except the property type is CARD32.

AVERAGE_WIDTH can be calculated if not provided as a font property, according to the following algorithm:

```
if (AVERAGE_WIDTH undefined) then
  AVERAGE_WIDTH = ROUND (MEAN (all glyph widths in font) * 10)
```

where MEAN is a function that returns the arithmetic mean of its arguments.

X clients requiring values for the number of characters per inch (pitch) of a monospaced font can use the following algorithm using the AVERAGE_WIDTH and RESOLUTION_X font properties:

```
if (SPACING not proportional) then
  CharPitch = (RESOLUTION_X * 10) / AVERAGE_WIDTH
```

3.2.13. CHARSET_REGISTRY : ATOM

As defined in the **FontName**, except the property type is ATOM.

CHARSET_REGISTRY can not be defaulted if not supplied as a font property.

3.2.14. CHARSET_ENCODING : ATOM

As defined in the **FontName**, except the property type is ATOM.

CHARSET_ENCODING can not be defaulted if not supplied as a font property.

3.2.15. MIN_SPACE : CARD32

MIN_SPACE is an unsigned integer value that gives the recommended minimum wordspace value to be used with this font.

MIN_SPACE can be approximated if not provided as a font property, according to the algorithm:

```
if (MIN_SPACE undefined) then
  MIN_SPACE = ROUND(0.75 * NORM_SPACE)
```

3.2.16. NORM_SPACE : CARD32

NORM_SPACE is an unsigned integer value that gives the recommended normal wordspace value to be used with this font.

NORM_SPACE can be approximated if not provided as a font property, according to the following algorithm:

```
DeciPointsPerInch = 722.7
if (NORM_SPACE undefined) then
  if (SPACE glyph exists) then
    NORM_SPACE = width of SPACE
  else NORM_SPACE = ROUND((0.33 * RESOLUTION_X * POINT_SIZE) /
    DeciPointsPerInch)
```

3.2.17. MAX_SPACE : CARD32

MAX_SPACE is an unsigned integer value that gives the recommended maximum wordspace value to be used with this font.

MAX_SPACE can be approximated if not provided as a font property, according to the following algorithm:

```

if (MAX_SPACE undefined) then
    MAX_SPACE = ROUND(1.5 * NORM_SPACE)

```

3.2.18. END_SPACE : CARD32

END_SPACE is an unsigned integer value that gives the recommended spacing at the end of sentences.

END_SPACE can be approximated if not provided as a font property, according to the following algorithm:

```

if (END_SPACE undefined) then
    END_SPACE = NORM_SPACE

```

3.2.19. AVG_CAPITAL_WIDTH : INT32

AVG_CAPITAL_WIDTH is an integer value that gives the unweighted arithmetic mean width of all the capital glyphs in the font, in 1/10th pixels (applies to Latin and non-Latin fonts). For Latin fonts, capitals are the glyphs A-Z. Normally used for font matching/substitution.

AVG_CAPITAL_WIDTH can be calculated if not provided as a font property, according to the following algorithm:

```

if (AVG_CAPITAL_WIDTH undefined) then
    AVG_CAPITAL_WIDTH = ROUND (MEAN (capital glyph widths) * 10)

```

Note that MEAN is a function that returns the arithmetic mean of its arguments.

3.2.20. AVG_LOWERCASE_WIDTH : INT32

AVG_LOWERCASE_WIDTH is an integer value that gives the unweighted arithmetic mean width of all the lower case glyphs in the font in 1/10th pixels. For Latin fonts, lower case are the glyphs a-z. Normally used for font matching or substitution.

Where appropriate, AVG_LOWERCASE_WIDTH can be approximated if not provided as a font property, according to the following algorithm:

```

if (AVG_LOWERCASE_WIDTH undefined) then
    if (lower case exists) then
        AVG_LOWERCASE_WIDTH = ROUND (MEAN (lower case glyph widths) * 10)
    else AVG_LOWERCASE_WIDTH undefined

```

3.2.21. QUAD_WIDTH : INT32 (DEPRECATED)

QUAD_WIDTH was incorrectly defined in the X protocol, and is redundant since all typographic fixed spaces (EM, EN and THIN) are constant for a given font size (i.e., they do not vary according to setwidth). X clients requiring these properties are encouraged to discontinue usage of QUAD_WIDTH and compute these values from other font properties. X clients requiring a font-dependent width value should use either the FIGURE_WIDTH or one of the average character width font properties (AVERAGE_WIDTH, AVG_CAPITAL_WIDTH or AVG_LOWERCASE_WIDTH) for this purpose.

See also PIXEL_SIZE, FIGURE_WIDTH, AVERAGE_WIDTH, AVG_CAPITAL_WIDTH and AVG_LOWERCASE_WIDTH font property definitions.

3.2.22. FIGURE_WIDTH : INT32

FIGURE_WIDTH is an integer typographic metric that gives the width of the tabular figures and the dollar sign, if suitable for tabular setting (all widths equal). For Latin fonts, these tabular figures are the arabic numerals 0-9.

FIGURE_WIDTH can be approximated if not supplied as a font property, according to the following algorithm:

```

if (numerals and DOLLAR sign are defined & widths are equal) then
    FIGURE_WIDTH = width of DOLLAR
else FIGURE_WIDTH property undefined

```

3.2.23. SUPERSCRIP_T_X : INT32

SUPERSCRIP_T_X is an integer value that gives the recommended horizontal offset in pixels from the position point to the X origin of synthetic superscript text. If the current position point is at [X,Y], then superscripts should begin at [X + SUPERSCRIP_T_X, Y - SUPERSCRIP_T_Y].

SUPERSCRIP_T_X can be approximated, if not provided as a font property, according to the following algorithm:

```

if (SUPERSCRIPT_X undefined) then
    if (TANGENT(ITALIC_ANGLE) defined) then
        SUPERSCRIPT_X = ROUND((0.40 * CAP_HEIGHT) / TANGENT(ITALIC_ANGLE))
    else SUPERSCRIPT_X = ROUND(0.40 * CAP_HEIGHT)

```

Note that TANGENT is a trigonometric function that returns the tangent of its argument (in degrees scaled by 64).

3.2.24. SUPERSCRIP_T_Y : INT32

SUPERSCRIP_T_Y is an integer value that gives the recommended vertical offset in pixels from the position point to the Y origin of synthetic superscript text. If the current position point is at [X,Y], then superscripts should begin at [X + SUPERSCRIP_T_X, Y - SUPERSCRIP_T_Y].

SUPERSCRIP_T_Y can be approximated, if not provided as a font property, according to the following algorithm:

```

if (SUPERSCRIPT_Y undefined) then
    SUPERSCRIPT_Y = ROUND(0.40 * CAP_HEIGHT)

```

3.2.25. SUBSCRIP_T_X : INT32

SUBSCRIP_T_X is an integer value that gives the recommended horizontal offset in pixels from the position point to the X origin of synthetic subscript text. If the current position point is at [X,Y], then subscripts should begin at [X + SUBSCRIP_T_X, Y + SUBSCRIP_T_Y].

SUBSCRIP_T_X can be approximated, if not provided as a font property, according to the following algorithm:

```

if (SUBSCRIPT_X undefined) then
    if (TANGENT(ITALIC_ANGLE) defined) then
        SUBSCRIPT_X = ROUND((0.40 * CAP_HEIGHT) / TANGENT(ITALIC_ANGLE))
    else SUBSCRIPT_X = ROUND(0.40 * CAP_HEIGHT)

```

3.2.26. SUBSCRIP_T_Y : INT32

SUBSCRIP_T_Y is an integer value that gives the recommended vertical offset in pixels from the position point to the Y origin of synthetic subscript text. If the current position point is at [X,Y], then subscripts should begin at [X + SUBSCRIP_T_X, Y + SUBSCRIP_T_Y].

SUBSCRIP_T_Y can be approximated, if not provided as a font property, according to the following algorithm:

```
if (SUBSCRIPT_Y undefined) then
    SUBSCRIPT_Y = ROUND(0.40 * CAP_HEIGHT)
```

3.2.27. SUPERSCRIP_T_SIZE : CARD32

SUPERSCRIP_T_SIZE is an unsigned integer value that gives the recommended body size of synthetic superscripts to be used with this font, in pixels. Note that this will generally be smaller than the size of the current font; i.e., superscripts are imaged from a smaller font, offset according to SUPERSCRIP_T_X and SUPERSCRIP_T_Y.

SUPERSCRIP_T_SIZE can be approximated if not provided as a font property, according to the following algorithm:

```
if (SUPERSCRIP_T_SIZE undefined) then
    SUPERSCRIP_T_SIZE = ROUND(0.60 * PIXEL_SIZE)
```

3.2.28. SUBSCRIPT_SIZE : CARD32

SUBSCRIPT_SIZE is an unsigned integer value that gives the recommended body size of synthetic subscripts to be used with this font, in pixels. As with SUPERSCRIP_T_SIZE, this will generally be smaller than the size of the current font; i.e., subscripts are imaged from a smaller font, offset according to SUBSCRIPT_X and SUBSCRIPT_Y.

SUBSCRIPT_SIZE can be approximated if not provided as a font property, according to the algorithm:

```
if (SUBSCRIPT_SIZE undefined) then
    SUBSCRIPT_SIZE = ROUND(0.60 * PIXEL_SIZE)
```

3.2.29. SMALL_CAP_SIZE : CARD32

SMALL_CAP_SIZE is an integer value that gives the recommended body size of synthetic small capitals to be used with this font, in pixels. Small capitals are generally imaged from a smaller font, of slightly more weight. No offset [X,Y] is necessary.

SMALL_CAP_SIZE can be approximated if not provided as a font property, according to the following algorithm:

```
if (SMALL_CAP_SIZE undefined) then
    SMALL_CAP_SIZE = ROUND(PIXEL_SIZE * ((X_HEIGHT
        + ((CAP_HEIGHT - X_HEIGHT) / 3)) / CAP_HEIGHT))
```

3.2.30. UNDERLINE_POSITION : INT32

UNDERLINE_POSITION is an integer value that gives the recommended vertical offset in pixels from the baseline to the top of the underline. If the current position point is at [X,Y], the top of the baseline is given by [X, Y + UNDERLINE_POSITION].

UNDERLINE_POSITION can be approximated if not provided as a font property, according to the following algorithm:

```
if (UNDERLINE_POSITION undefined) then
    UNDERLINE_POSITION = ROUND(max_bounds.descent / 2)
```

3.2.31. UNDERLINE_THICKNESS : CARD32

UNDERLINE_THICKNESS is an unsigned integer value that gives the recommended underline thickness, in pixels.

UNDERLINE_THICKNESS can be approximated if not provided as a font property, according to the following algorithm:

```
CapStemWidth = average width of the stems of capitals
if (UNDERLINE_THICKNESS undefined) then
    UNDERLINE_THICKNESS = CapStemWidth
```

3.2.32. STRIKEOUT_ASCENT : INT32

STRIKEOUT_ASCENT is an integer value that gives the vertical ascent for boxing or voiding glyphs in this font. If the current position is at [X,Y] and the string extent is EXTENT, the upper-left corner of the strikeout box is at [X, Y - STRIKEOUT_ASCENT] and the lower-right corner of the box is at [X + EXTENT, Y + STRIKEOUT_DESCENT].

STRIKEOUT_ASCENT can be approximated if not provided as a font property, according to the following algorithm:

```
if (STRIKEOUT_ASCENT undefined)
    STRIKEOUT_ASCENT = max_bounds.ascent
```

3.2.33. STRIKEOUT_DESCENT : INT32

STRIKEOUT_DESCENT is an integer value that gives the vertical descent for boxing or voiding glyphs in this font. If the current position is at [X,Y] and the string extent is EXTENT, the upper-left corner of the strikeout box is at [X, Y - STRIKEOUT_ASCENT] and the lower-right corner of the box is at [X + EXTENT, Y + STRIKEOUT_DESCENT].

STRIKEOUT_DESCENT can be approximated if not provided as a font property, according to the following algorithm:

```
if (STRIKEOUT_DESCENT undefined)
    STRIKEOUT_DESCENT = max_bounds.descent
```

3.2.34. ITALIC_ANGLE : INT32

ITALIC_ANGLE is an integer value that gives the nominal posture angle of the typeface design, in 1/64 degrees, measured from the glyph origin counterclockwise from the three o'clock position.

ITALIC_ANGLE can be defaulted if not provided as a font property, according to the following algorithm:

```
if (ITALIC_ANGLE undefined) then
    ITALIC_ANGLE = (90 * 64)
```

3.2.35. CAP_HEIGHT : CARD32

CAP_HEIGHT is an unsigned integer, the nominal height of the capital letters contained in the font, as specified by the FOUNDRY or typeface designer. Where applicable, it is defined to be the height of the Latin upper case letter X.

CAP_HEIGHT is required by certain clients to compute scale factors and positioning offsets for algorithmically generated glyphs where this information or designed glyphs are not explicitly provided by the font (e.g., small capitals, superiors, inferiors, etc.). Capital height is also a critical factor in font matching and substitution.

CAP_HEIGHT can be approximated if not provided as a font property, according to the following algorithm:

```

if (CAP_HEIGHT undefined) then
  if (Latin font) then
    CAP_HEIGHT = XCharStruct.ascent[glyph X]
  else if (capitals exist) then
    CAP_HEIGHT = XCharStruct.ascent[some capital glyph]
  else CAP_HEIGHT undefined

```

3.2.36. X_HEIGHT : CARD32

X_HEIGHT is a unsigned integer, the nominal height above the baseline of the lower case glyphs contained in the font, as specified by the FOUNDRY or typeface designer. Where applicable, it is defined to be the height of the Latin lower case letter x.

As with Capital height, X_HEIGHT is required by certain clients to compute scale factors for algorithmically generated small capitals, where not explicitly provided by the font resource and is a critical factor in font matching and substitution.

X_HEIGHT can be approximated if not provided as a font property, according to the following algorithm:

```

if (X_HEIGHT undefined) then
  if (Latin font) then
    X_HEIGHT = XCharStruct.ascent[glyph x]
  else if (lower case exists) then
    X_HEIGHT = XCharStruct.ascent[some lower case glyph]
  else X_HEIGHT is undefined

```

3.2.37. RELATIVE_SETWIDTH : CARD32

RELATIVE_SETWIDTH is an integer that gives the coded proportionate width of the font, relative to all known fonts of the same typeface family, according to the type designer's or FOUNDRY's judgement.

The possible values are:

Code	English String	Description
0	undefined	Undefined or unknown
10	UltraCondensed	Lowest ratio of average width to height
20	ExtraCondensed	
30	Condensed	Condensed, Narrow, Compressed, ...
40	SemiCondensed	
50	Medium	Medium, Normal, Regular, ...
60	SemiExpanded	SemiExpanded, DemiExpanded, ...
70	Expanded	
80	ExtraExpanded	ExtraExpanded, Wide, ...
90	UltraExpanded	Highest ratio of average width to height

RELATIVE_SETWIDTH can be defaulted if not provided as a font property, according to the following algorithm:

```

if (RELATIVE_SETWIDTH undefined) then
  RELATIVE_SETWIDTH = 50

```

X clients that wish to obtain a calculated proportionate width of the font (i.e., a font-independent way of identifying the proportionate width across all fonts and all font vendors) can use the following algorithm:

$$\text{SETWIDTH} = \text{AVG_CAPITAL_WIDTH} / (\text{CAP_HEIGHT} * 10)$$

Note that SETWIDTH is a real with 0 being the “narrowest” calculated setwidth.

3.2.38. RELATIVE_WEIGHT : CARD32

RELATIVE_WEIGHT is an integer that gives the coded weight of the font, relative to all known fonts of the same typeface family, according to the type designer’s or FOUNDRY’s judgement.

The possible values are:

Code	English String	Description
0	undefined	Undefined or unknown
10	UltraLight	Lowest ratio of stem width to height
20	ExtraLight	
30	Light	
40	SemiLight	SemiLight, Book, ...
50	Medium	Medium, Normal, Regular,...
60	SemiBold	SemiBold, DemiBold, ...
70	Bold	
80	ExtraBold	ExtraBold, Heavy, ...
90	UltraBold	UltraBold, Black, ..., the highest ratio of stem width to height

RELATIVE_WEIGHT can be defaulted if not provided as a font property, according to the following algorithm:

```
if (RELATIVE_WEIGHT undefined) then
    RELATIVE_WEIGHT = 50
```

3.2.39. WEIGHT : CARD32

Calculated WEIGHT is an unsigned integer, the calculated weight of the font, computed as the ratio of capital stem width to CAP_HEIGHT, in the range 0 to 1000, where zero is the “lightest” weight.

WEIGHT can be calculated if not supplied as a font property, according to the following algorithm:

```
CapStemWidth = average width of the stems of capitals
if (WEIGHT undefined) then
    WEIGHT = ROUND ((CapStemWidth * 1000) / CAP_HEIGHT)
```

A calculated value for weight is necessary when matching fonts from different families because both the RELATIVE_WEIGHT and the WEIGHT_NAME are assigned by the typeface supplier, according to its tradition and practice, and therefore somewhat subjective. Calculated WEIGHT provides a font-independent way of identifying the weight across all fonts and all font vendors.

3.2.40. RESOLUTION : CARD32 (DEPRECATED)

Independent horizontal and vertical design resolution components are required to accommodate displays with nonsquare aspect ratios and are given by the RESOLUTION_X and RESOLUTION_Y font name fields/properties. The units of the original definition of RESOLUTION are also in conflict with these new properties. X clients are encouraged to discontinue

usage of RESOLUTION and to use the appropriate X,Y resolution properties as required.

3.2.41. FACE_NAME : ATOM

FACE_NAME is a human-understandable string that gives the full device-independent typeface name, including the owner, weight, slant, set, etc., but not the resolution, size, etc. Normally used as feedback during font selection.

FACE_NAME can not be calculated or approximated if not provided as a font property.

3.2.42. COPYRIGHT : ATOM

COPYRIGHT is a human-understandable string that gives the copyright information of the legal owner of the digital font data.

This information is a required component of a font but is independent of the particular format used to represent it (i.e., it cannot be captured as a comment that could later be "thrown away" for efficiency reasons).

COPYRIGHT can not be calculated or approximated if not provided as a font property.

3.2.43. NOTICE : ATOM

NOTICE is a human-understandable string that gives the copyright information of the legal owner of the font design, or if not applicable, the trademark information for the typeface FAMILY_NAME.

Typeface design and trademark protection laws vary from country to country, the USA having no design copyright protection currently, while various countries in Europe offer both design and typeface family name trademark protection. As with COPYRIGHT, this information is a required component of a font but is independent of the particular format used to represent it.

NOTICE can not be calculated or approximated if not provided as a font property.

3.2.44. DESTINATION : CARD32

DESTINATION is an unsigned integer code that gives the font design destination, i.e., whether it was designed as a screen proofing font to match printer font glyph widths (WYSIWYG), as an optimal video font (possibly with corresponding printer font) for extended screen viewing (VideoText), etc.

The font design considerations are very different, and at current display resolutions, the readability and legibility of these two kinds of screen fonts are very different. DESTINATION allows publishing clients that use X to model the printed page, and Video Text clients such as on-line documentation browsers, to query for X screen fonts that suit their particular requirements.

The encoding is as follows:

Code	English String	Description
0	WYSIWYG	A font optimized to match the typographic design and metrics of an equivalent printer font
1	Video Text	A font optimized for screen legibility and readability

3.3. Built-in Font Property Atoms

The following font property atom definitions were predefined in the initial Version 11 of the X protocol:

Font Property	Property Type
---------------	---------------

Font Property	Property Type
MIN_SPACE	CARD32
NORM_SPACE	CARD32
MAX_SPACE	CARD32
END_SPACE	CARD32
SUPERSCRIPT_X	INT32
SUPERSCRIPT_Y	INT32
SUBSCRIPT_X	INT32
SUBSCRIPT_Y	INT32
UNDERLINE_POSITION	INT32
UNDERLINE_THICKNESS	CARD32
STRIKEOUT_ASCENT	INT32
STRIKEOUT_DESCENT	INT32
FONT_ASCENT	INT32
FONT_DESCENT	INT32
ITALIC_ANGLE	INT32
X_HEIGHT	INT32
QUAD_WIDTH	INT32 – deprecated
WEIGHT	CARD32
POINT_SIZE	CARD32
RESOLUTION	CARD32 – deprecated
COPYRIGHT	ATOM
FACE_NAME	ATOM
FAMILY_NAME	ATOM
DEFAULT_CHAR	CARD32

4. Affected Elements of Xlib and the X Protocol

The following X protocol requests must use the font naming conventions:

- **OpenFont** – for the name parameter
- **ListFonts** – for the pattern parameter
- **ListFontsWithInfo** – for the pattern parameter

In addition, the following Xlib functions must use the font naming conventions:

- **XLoadFont** – for the name parameter
- **XListFontsWithInfo** – for the pattern parameter
- **XLoadQueryFont** – for the name parameter
- **XListFonts** – for the pattern parameter

5. BDF Conformance

The bitmap font distribution and interchange format adopted by the X Consortium (BDF V2.1) provides a general mechanism for identifying the font name of an X font and a variable list of font properties, but does not mandate the syntax/semantics of the font name or the semantics of the font properties that might be provided in a BDF font. This section identifies the requirements for BDF fonts that conform to XLFD.

5.1. XLFD Conformance Requirements

A BDF font conforms to the XLFD V1.3 specification if and only if the following conditions are satisfied:

- the value for the BDF item **FONT** conforms to the syntax and semantic definition of a XLF D **FontName** string;
- the **FontName** begins with the X **FontNameRegistry** prefix: “-”;
- all XLF D **FontName** fields are defined;
- any **FontProperties** provided conform in name and semantics to the XLF D **FontProperties** definitions.

A simple method of testing for conformance would entail first verifying that the **FontNameRegistry** prefix is the string “-”, that the number of field delimiters in the string and coded field values are valid, and that each font property name either matches a standard XLF D property name or follows the definition of a private property.

5.2. FONT_ASCENT, FONT_DESCENT and DEFAULT_CHAR

FONT_ASCENT, **FONT_DESCENT** and **DEFAULT_CHAR** are provided in the BDF specification as properties that are moved to the **XFontStruct** by the BDF font compiler in generating the X server-specific binary font encoding. If present, these properties shall comply with the following semantic definitions.

5.2.1. FONT_ASCENT : INT32

FONT_ASCENT is an unsigned integer that gives the recommended typographic ascent above the baseline, for determining interline spacing. Specific glyphs of the font may extent beyond this. If the current position point for line n is at $[X, Y]$, then the origin of the next line $n+1$ (allowing for a possible font change) is $[X, Y + \text{FONT_DESCENT}_n + \text{FONT_ASCENT}_{n+1}]$. **FONT_ASCENT** can be approximated if not provided as a font property, according to the following algorithm:

```
if (FONT_ASCENT undefined) then
    FONT_ASCENT = max_bounds.ascent
```

5.2.2. FONT_DESCENT : INT32

FONT_DESCENT is an unsigned integer that gives the recommended typographic descent below the baseline, for determining interline spacing. Specific glyphs of the font may extent beyond this. If the current position point for line n is at $[X, Y]$, then the origin of the next line $n+1$ (allowing for a possible font change) is $[X, Y + \text{FONT_DESCENT}_n + \text{FONT_ASCENT}_{n+1}]$.

The logical extent of the font is inclusive between the Y-coordinate values: $Y - \text{FONT_ASCENT}$ and $Y + \text{FONT_DESCENT} + 1$.

FONT_DESCENT can be approximated if not provided as a font property, according to the following algorithm:

```
if (FONT_DESCENT undefined) then
    FONT_DESCENT = max_bounds.descent
```

5.2.3. DEFAULT_CHAR : CARD32

DEFAULT_CHAR is an unsigned integer value that gives the default character to be used by the X server when an attempt is made to display an undefined or non-existent character in the font.

The **DEFAULT_CHAR** is a 16-bit character (not a two byte character). For a font using two byte matrix format, the **DEFAULT_CHAR** has byte1 in the most significant byte and byte2 in the least significant byte. If the **DEFAULT_CHAR** itself is undefined or specifies an undefined or non-existent character in the font, then no display is performed.

DEFAULT_CHAR can not be approximated if not provided as a font property.

Appendix E: Character Conversion Charts

Because the X Window System and the Macintosh use different character sets, MacX must translate any characters transmitted from one environment to the other. A conversion matrix, provided in this appendix, indicates the hexadecimal values for the Apple extended ASCII characters used in the Macintosh environment and the ISO Latin 1 characters used in the X environment. Another pair of charts show the equivalent ISO Latin 1 character for each Macintosh extended ASCII character and vice versa. This appendix furnishes the matrix and conversion charts as programming aids.

The matrix in Figure E-1 contains complete character sets for Macintosh extended ASCII and ISO Latin 1. Macintosh extended ASCII characters are at the top of each cell in teal and ISO Latin 1 characters are at the bottom in black.

To find the character associated with a hexadecimal number, use the column to find the high-order digit and the row to find the low-order digit. For example, B0 corresponds to an infinity symbol (∞) in extended ASCII and a degree sign ($^{\circ}$) in ISO Latin 1.

◆ **Italic characters** Characters in italic cannot be printed or displayed. They represent control characters. ◆

Certain characters in each character set have no equivalent in the other character set. To see what character is substituted in each case, refer to Figures E-2 and E-3.

Low order High order →

	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
0	NUL <i>Teal</i>	DLE <i>Macintosh Extended ASCII</i>	SP SP	0 0	@ @	P P	` `	p p	Ä ä	ê ê	† NBSP	∞ °	¿ À	- Ð	‡ à	Ⓐ ò
1	SOH	DC1	! !	1 1	A A	Q Q	a a	q q	Å å	ë ë	° i	± ±	¡ Á	— Ñ	· á	Ò ñ
2	STX	DC2	" "	2 2	B B	R R	b b	r r	Ç ç	í í	¢ ¢	≤ ²	¬ Â	“ Ò	, â	Û ò
3	ETX	DC3	# #	3 3	C C	S S	c c	s s	É é	ì ì	£ £	≥ ³	√ Ã	” Ó	„ ã	Û ó
4	EOT	DC4	\$ \$	4 4	D D	T T	d d	t t	Ñ ñ	î î	§ ∩	¥ ´	f Ä	‘ Ô	% ä	Û ô
5	ENQ	NAK	% %	5 5	E E	U U	e e	u u	Ö ö	ï ï	• ¥	μ μ	≈ Å	, Ö	Â â	ı õ
6	ACK	SYN	& &	6 6	F F	V V	f f	v v	Û ü	ñ ñ	¶ |	δ ¶	Δ Æ	÷ Ö	Ê æ	^ ö
7	BEL	ETB	' '	7 7	G G	W W	g g	w w	á á	ó ó	ß §	Σ ·	« Ç	◊ ×	Á ç	~ ÷
8	BS	CAN	( (	8 8	H H	X X	h h	x x	à à	ò ò	® "	Π ,	» È	ÿ Ø	Ë è	- ø
9	HT	EM	) )	9 9	I I	Y Y	i i	y y	â â	ô ô	© ©	π ₁	... É	ÿ Û	È é	~ ù
A	LF	SUB	* *	: :	J J	Z Z	j j	z z	ä ä	ö ö	™ _a	∫ _o	NBSP Ê	/ Ú	Í ê	· ú
B	VT	ESC	+ +	; ;	K K	[ [	k k	{ {	ã ã	õ õ	´ «	ª »	À Ë	∩ Û	Î ë	° û
C	FF	FS	, ,	< <	L L	\ \	l l	| |	ã á	ú ú	" ¬	º ¼	Ã Ì	< Û	Ï ì	¸ ü
D	CR	GS	- -	= =	M M	] ] ] ]	m m	} } } }	ç ç	ù ù	≠ -	Ω _{1/2}	Ö Í	> Ý	Ì í	" ý
E	SO	RS	. .	> >	N N	^ ^	n n	~ ~	é é	û û	Æ ®	æ ¾	Œ Î	f P	Ó î	ç p
F	SI	US	/ /	? ?	O O	_ _ _ _	o o	DEL DEL	è è	ü ü	Ø -	ø ¿	œ Ï	fl ß	Ô ï	˘ ÿ

Figure E-1 Character-conversion matrix

Figure E-2 shows the equivalent ISO Latin 1 character for a Macintosh extended ASCII character. Use the column to find the high-order digit and the row to find the low-order digit of an extended ASCII hexadecimal value. The cell at the intersection of these points contains the corresponding ISO Latin 1 character. For example, an A8 (®) in extended ASCII is converted to a ® (AE) in ISO Latin 1. Each cell in the chart also contains the hexadecimal value for each ISO Latin character.

Legend

Characters in italic cannot be printed or displayed. They represent control characters.

Middle dots displayed in teal indicate Macintosh extended ASCII characters for which there is no equivalent character in ISO Latin 1. MacX displays or prints these symbols in black. When you attempt to type an untranslatable character, your Macintosh beeps.

Low order High order →

	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
0	NUL 00	DLE 10	SP 20	0 30	@ 40	P 50	` 60	p 70	Ä C4	ê EA	· B7	· B7	¿ BF	SHY AD	· B7	· B7
1	SOH 01	DC1 11	! 21	1 31	A 41	Q 51	a 61	q 71	Å C5	ë EB	° B0	± B1	¡ A1	· B7	· B7	Ò D2
2	STX 02	DC2 12	" 22	2 32	B 42	R 52	b 62	r 72	Ç C7	í ED	¢ A2	· B7	¬ AC	" 22	' 27	Ú DA
3	ETX 03	DC3 13	# 23	3 33	C 43	S 53	c 63	s 73	É C9	ì EC	£ A3	· B7	· B7	" 22	" 22	Û DB
4	EOT 04	DC4 14	\$ 24	4 34	D 44	T 54	d 64	t 74	Ñ D1	î EE	§ A7	¥ A5	f 66	' 27	· B7	Ü D9
5	ENQ 05	NAK 15	% 25	5 35	E 45	U 55	e 65	u 75	Ö D6	ï EF	· B7	µ B5	· B7	' 27	Â C2	· B7
6	ACK 06	SYN 16	& 26	6 36	F 46	V 56	f 66	v 76	Ü DC	ñ F1	¶ B6	· B7	· B7	÷ F7	Ê CA	^ 5E
7	BEL 07	ETB 17	' 27	7 37	G 47	W 57	g 67	w 77	á E1	ó F3	ß DF	· B7	“ AB	· B7	Á C1	~ 7E
8	BS 08	CAN 18	(28	8 38	H 48	X 58	h 68	x 78	à E0	ò F2	® AE	· B7	» BB	ÿ FF	Ë CB	- AF
9	HT 09	EM 19	) 29	9 39	I 49	Y 59	i 69	y 79	â E2	ô F4	© A9	· B7	· B7	ÿ FF	È C8	· B7
A	CR 0D	SUB 1A	* 2A	: 3A	J 4A	Z 5A	j 6A	z 7A	ä E4	ö F6	· B7	· B7	NBSP A0	· B7	Í CD	· B7
B	VT 0B	ESC 1B	+ 2B	; 3B	K 4B	[5B	k 6B	{ 7B	â E3	õ F5	´ B4	ª AA	À C0	☐ A4	Î CE	· B7
C	FF 0C	FS 1C	, 2C	< 3C	L 4C	\ 5C	| 6C	| 7C	å E5	ú FA	¨ A8	º BA	Ã C3	< 3C	Ï CF	¸ B8
D	LF 0A	GS 1D	- 2D	= 3D	M 4D	] 5D	m 6D	} 7D	ç E7	ù F9	¬ AC	· B7	Û D5	> 3E	Ï CC	· B7
E	SO 0E	RS 1E	. 2E	> 3E	N 4E	^ 5E	n 6E	~ 7E	é E9	û FB	Æ C6	æ E6	· B7	· B7	Ó D3	· B7
F	SI 0F	US 1F	/ 2F	? 3F	O 4F	_ 5F	o 6F	DEL 7F	è E8	ü FC	Ø D8	ø F8	· B7	· B7	Ô D4	· B7

Legend:
Teal dots represent unmappable characters

Figure E-2 Macintosh extended ASCII to ISO Latin 1 character mapping chart

Figure E-3 shows the equivalent Macintosh extended ASCII character for an ISO Latin 1 character. Use the column to find the high-order digit and the row to find the low-order digit of an ISO Latin 1 hexadecimal value. The cell at the intersection of these points contains the corresponding Macintosh extended ASCII character. For example, an AE (®) in ISO Latin 1 is converted to a ® (A8) in extended ASCII. Each cell in the chart also contains the hexadecimal value for each Macintosh extended ASCII character.

Legend

Characters in italic cannot be printed or displayed. They represent control characters.

Apple symbols (🍏) displayed in teal indicate ISO Latin 1 characters for which there is no equivalent character in Macintosh extended ASCII. MacX displays or prints these symbols in black. When you attempt to type an untranslatable character, your Macintosh beeps.

Legend:
 i represents
 unmappable characters

	Low order							High order →								
	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
0	NUL 00	DLE 10	SP 20	0 30	@ 40	P 50	` 60	p 70	NUL 00	DLE 10	NBSP CA	° A1	À CB	Ⓜ F0	à 88	Ⓜ F0
1	SOH 01	DC1 11	! 21	1 31	A 41	Q 51	a 61	q 71	SOH 01	DC1 11	¡ C1	± B1	Á E7	Ñ 84	á 87	ñ 96
2	STX 02	DC2 12	" 22	2 32	B 42	R 52	b 62	r 72	STX 02	DC2 12	¢ A2	2 32	Â E5	Ò F1	â 89	ò 98
3	ETX 03	DC3 13	# 23	3 33	C 43	S 53	c 63	s 73	ETX 03	DC3 13	£ A3	3 33	Ã CC	Ó EE	ã 8B	ó 97
4	EOT 04	DC4 14	\$ 24	4 34	D 44	T 54	d 64	t 74	EOT 04	DC4 14	¤ DB	' AB	Ä 80	Ô EF	ä 8A	ô 99
5	ENQ 05	NAK 15	% 25	5 35	E 45	U 55	e 65	u 75	ENQ 05	NAK 15	¥ B4	µ B5	Å 81	Õ CD	å 8C	õ 9B
6	ACK 06	SYN 16	& 26	6 36	F 46	V 56	f 66	v 76	ACK 06	SYN 16	 7C	¶ A6	Æ AE	Ö 85	æ BE	ö 9A
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9	HT 09	EM 19) 29	9 39	I 49	Y 59	i 69	y 79	HT 09	EM 19	© A9	1 31	É 83	Û F4	é 8E	ù 9D
A	CR 0D	SUB 1A	* 2A	: 3A	J 4A	Z 5A	j 6A	z 7A	CR 0D	SUB 1A	ª BB	º BC	Ê E6	Ú F2	ê 90	ú 9C
B	VT 0B	ESC 1B	+ 2B	; 3B	K 4B	[5B	k 6B	{ 7B	VT 0B	ESC 1B	« C7	» C8	Ë E8	Û F3	ë 91	û 9E
C	FF 0C	FS 1C	, 2C	< 3C	L 4C	\ 5C	l 6C	| 7C	FF 0C	FS 1C	¬ C2	Ⓜ F0	Ï ED	Û 86	ì 93	ü 9F
D	LF 0A	GS 1D	- 2D	= 3D	M 4D	] 5D	m 6D	} 7D	LF 0A	GS 1D	- D0	Ⓜ F0	Í EA	Y 59	í 92	y 79
E	SO 0E	RS 1E	. 2E	> 3E	N 4E	^ 5E	n 6E	~ 7E	SO 0E	RS 1E	® A8	Ⓜ F0	Î EB	Ⓜ F0	î 94	ÿ F0
F	SI 0F	US 1F	/ 2F	? 3F	O 4F	_ 5F	o 6F	DEL 7F	SI 0F	US 1F	- F8	¿ C0	Ï EC	ß A7	ï 95	ÿ D8

Figure E-3 ISO Latin 1 to Macintosh extended ASCII character-mapping chart

Glossary

address mask A code used to identify three classes of TCP/IP networks. See also **TCP/IP**.

adornment The frame of a window, including, but not limited to, the title bar, size and zoom boxes, and borders. The window manager controls the adornment of windows in X.

ADSP See **AppleTalk Data Stream Protocol**.

ADSP driver A system file that provides ADSP on your Macintosh. See **AppleTalk Data Stream Protocol**.

alert box A box that appears on the screen to give a warning or to report an error message. The warning is accompanied by an alert sound.

alias A substitute name for something. Usually an alias is shorter and easier to remember than the original name, but it doesn't have to be.

AppleTalk Data Stream Protocol (ADSP) A connection-oriented communications protocol that provides a reliable, full-duplex, byte-stream service for AppleTalk networks. ADSP ensures in-sequence, duplicate-free delivery of data over its connections. See **AppleTalk network system, communications protocol**.

AppleTalk-DECnet Connection Tool A connection tool that allows your Macintosh computer to communicate with VAX computers through the

AppleTalk/DECnet Transport Gateway. See also **AppleTalk/DECnet Transport Gateway, connection tools**.

AppleTalk/DECnet Transport Gateway A device that translates between AppleTalk and DECnet communications protocols on a network. Depending on the complexity of the network to which your Macintosh is connected, you may have access to more than one gateway. See also **AppleTalk network system, DECnet, gateway**.

AppleTalk network system A networking environment that includes computers and other devices, software applications, and AppleTalk protocols that govern the interactions between the components. The specification for the AppleTalk network system was created by Apple Computer, and Macintosh computers and LaserWriter printers have AppleTalk capabilities built in. Other Apple and non-Apple devices may also be able to use AppleTalk. For example, AppleTalk for VMS allows services and devices on VAX computers running the VMS operating system to communicate by means of AppleTalk protocols. See also **AppleTalk Phase 1, AppleTalk Phase 2, AppleTalk protocols**.

AppleTalk Phase 1 Components of the AppleTalk network system that predate the development of AppleTalk Phase 2. A network may run both AppleTalk

Phase 1 and AppleTalk Phase 2 at the same time. On such a network, a computer that has AppleTalk Phase 1 installed will be able to see only those network devices that use Phase 1—not those that use Phase 2. See also **AppleTalk network system, AppleTalk Phase 2.**

AppleTalk Phase 2 A new version of AppleTalk software that provides extensions to the AppleTalk network system, allowing it to support larger and more flexible networks. If your network uses both AppleTalk Phase 1 and AppleTalk Phase 2, and you have AppleTalk Phase 2 installed on your Macintosh, you will be able to see other network devices that use AppleTalk Phase 2 as well as those that use Phase 1. See also **AppleTalk network system, AppleTalk Phase 1.**

AppleTalk protocols The set of communication rules used in the AppleTalk network system. See also **communications protocol.**

BDF See **Bitmap Distribution Format.**

bitmap A grid of pixels (picture elements) that can be set to white or black to create an image.

Bitmap Distribution Format A source file that, when compiled, produces a font in a format usable by MacX. Since conventional X servers do not have this built-in capability, the BDFtoSNF program is normally used to compile BDF font files. The format was developed by Adobe Systems, Inc., and accepted as a standard by the X Consortium.

client (1) On a network, a combination of a computer and software that lets you access services offered by a server, such as printing (print server), access to shared files (file server), and so on. The computer that you use to access the services—usually your workstation—is sometimes referred to as the client, but there is always a client software component. In most cases, the client software is located on your workstation and the server resides on a remote computer. (2) In an X environment, an application that runs, in most cases, on a remote host computer, although it may run on your workstation. You access the client by means of an X server located on your workstation. Thus the server-client orientation is reversed

from the usual arrangement. A client can request the X server to display graphics and text and to change or report on the X server's state. See also **DECwindows application, server, X Window System.**

close box The small white box on the left side of the title bar of an active Macintosh-style window. Clicking it closes the window.

Color Namer A dialog box that MacX displays to let you specify colors.

colormap A set of color cells that define color values. Each cell contains three values specifying intensities of red, green, and blue. MacX uses the colormap to translate pixel values into the corresponding RGB values displayed on the screen.

colormap focus The client window whose colormap is currently installed and is being used to map pixel values to actual displayed colors.

communications protocol A set of rules that determine how information is transmitted and received by communicating devices. The communications protocols built into networking software perform tasks such as acquiring commands from the application that you are using, making sure devices are responding properly, controlling the connection to the network, and moving data between devices. See also **AppleTalk protocols and DECnet.**

Communications Toolbox See **Macintosh Communications Toolbox.**

communications tools Pieces of software that supply the communications functions that your Macintosh needs to communicate with another computer. Communications tools fall into three categories: connection tools, file-transfer tools, and terminal emulation tools. Each type of tool manages a different aspect of the communication process. See also **connection tools, file-transfer tools, terminal emulation tools.**

connection tools One of the three types of communications tools. A connection tool determines the

type of connection that is established between your Macintosh and the VAX computer or Digital network. Examples: Apple Modem Tool, LAT Tool, Serial Tool. See also **communications tools**.

DCL See **Digital Command Language**.

DECnet The set of network communications protocols most often used on Digital networks. See also **communications protocol**.

DECterm A DECwindows terminal emulation application. DECterm allows your Macintosh to emulate a VT320 terminal so that you can log in to the VMS operating system from the DECwindows environment and issue Digital Command Language commands. In PATHWORKS for Macintosh, you use MacX to access DECterm. See also **DECwindows application, Digital Command Language, MacX**.

DECwindows A version of the X Window System created by Digital Equipment Corporation. DECwindows runs under both the VMS and the ULTRIX operating systems. You use the MacX server on your Macintosh computer to access DECwindows applications running on VAX computers. See also **MacX, X Window System**.

DECwindows application An X client running on the VMS or ULTRIX operating system under DECwindows—Digital's implementation of the X Window System. In PATHWORKS for Macintosh, you access DECwindows applications by using the MacX server on your Macintosh computer. See also **MacX, ULTRIX, X Windows client, X Window System**.

DECwindows client See **DECwindows application**.

dialog box A box that contains a message requesting more information from you. Dialog boxes that contain warnings are called *alert boxes*.

Digital Command Language (DCL) The standard command interface to Digital's VMS operating system. When you log in to VMS, you use DCL commands to perform operations such as changing your password or displaying a directory of files on the VAX.

display (1) A set of one or more screens connected to a workstation that contains an X server, or (2) a set of one or more screens or workstations (comprising a screen, keyboard, and printing device) connected to a minicomputer that contains an X server. Compare **screen**.

domain A collection of nodes in a TCP/IP network for which a particular name server provides services. See also **TCP/IP**.

Ethernet A high-speed local area network system that uses a variety of cables, such as thick-wire, thin-wire, broadband, twisted pair, and so on. The Ethernet specification was developed by Digital Equipment Corporation, Intel Corporation, and Xerox Corporation.

Ethernet card A printed circuit board or interface card that connects a personal computer, such as a Macintosh, to Ethernet and serves as the communications controller between the computer and other devices in the Ethernet environment. A number of Ethernet cards are available for Digital, Apple, and other types of computers. Apple provides an Ethernet card called the *EtherTalk NB Card*. See also **Ethernet, EtherTalk**.

EtherTalk A high-performance AppleTalk connection. EtherTalk consists of an Ethernet interface card, AppleTalk software, and Ethernet cabling. EtherTalk enables you to use Ethernet cabling in an AppleTalk environment. See also **AppleTalk network system, communications protocol, Ethernet**.

EtherTalk NB card An Ethernet card provided by Apple Computer, Inc. See also **Ethernet, Ethernet card, EtherTalk**.

file-transfer tools One of the three types of communications software tools. A file-transfer tool ensures that files are transferred intact between your Macintosh and the VAX computer or Digital network. Examples: Text Tool, XMODEM Tool. See also **communications tools**.

FileView A DECwindows application that creates a graphical representation of the VMS operating system. FileView lets you see the files and directories of a VAX computer. The DECwindows Session Manager is preset to start FileView automatically. See also **DECwindows**, **Session Manager**.

gateway A device that translates between two communications protocols on a network. A gateway allows network services that use different protocols to communicate with each other. See also **AppleTalk/DECnet Transport Gateway**. Compare **router**.

graphics-based application An application whose user interface is composed of graphic elements, such as windows, menus, and buttons, as opposed to alphanumeric characters. Graphics-based applications require display devices with controlling hardware and software that enable the display of graphic elements.

hotspot The part of a pointer that represents its exact position on the screen.

iconify To convert a client window to an icon, a small symbol on the screen. Iconifying is a convenient way of creating more space on your desktop or temporarily setting aside a client without having to close it.

installation The process of adding or changing information on a Macintosh computer. For example, the Installer application provided with PATHWORKS for Macintosh installs communications and application software on your Macintosh. The Installer works with Installer script documents that define the software to be installed.

intrinsic A collection of software subroutines and data that simplify the process of creating **widgets**.

IP address: A binary number that identifies a host and a TCP/IP network on which the host resides. The IP address is used in data packets to specify their destination.

ISO Latin 1 A character set, based on ASCII, that the International Standards Organization has adopted. It is

the standard character set supported by the X protocol, X servers, and clients. Characters with values less than 128 (decimal) are identical to ASCII characters; those greater than 128 are completely different from Macintosh extended ASCII characters. See conversion charts in Appendix E.

keyboard input focus The client window designated to receive input from the keyboard.

LAN See **local area network**.

layout policy A set of rules that specify the allowable sizes and positions of windows and icons.

local area network (LAN) A group of computers and shared devices connected to the same transmission cables and located within a limited area, usually a single building.

LocalTalk A system of cables, cable extenders, and connector boxes that connect computers and network devices. LocalTalk is the cabling system most often used to connect Macintosh networks.

log in In the context of PATHWORKS for Macintosh, to open a connection to the VMS operating system. You log in to VMS with MacTerminal or, from MacX, by using DECterm.

log-in directory A directory created for you by the system administrator when your user name and password are assigned. It is the first directory that you see when you log in to VMS.

Macintosh Communications Toolbox A set of extensions to the Macintosh system software that provides Macintosh applications with standard communications services and a consistent interface for using those services. For example, MacTerminal uses the Communications Toolbox to let you connect to terminal services.

Macintosh extended ASCII An extended version of the American Standard Code for Information Interchange that contains codes for extra characters used by the Macintosh.

MacTCP Apple Computer's implementation of the TCP/IP family of communications protocols for the Macintosh Operating System. See also **TCP/IP**.

MacX An application supplied with PATHWORKS for Macintosh. MacX is Apple Computer's implementation for the Macintosh of the X Window System, providing an X server that takes advantage of the Macintosh user interface. MacX allows you to access DECwindows applications running on VAX computers. See also **DECwindows application, X Window server, X Window System**.

MultiFinder A multitasking operating system for Macintosh computers that enables several applications to be open at the same time. In addition, processes, like print spooling, can operate in the background so that you can perform one task while the computer performs another.

network A collection of interconnected, individually controlled computers, the hardware and software used to connect them, and the communications protocols that govern the exchange of information between the computers and other devices. A network allows users to share data and peripheral devices such as printers and storage media, to exchange electronic mail, and so on.

Network Services Protocol (NSP) One of the DECnet family of communications protocols. The AppleTalk/DECnet Transport Gateway translates between NSP and ADSP, one of the AppleTalk protocols, so that AppleTalk-based applications can communicate with DECnet-based services, such as DECwindows applications. See also **AppleTalk/DECnet Transport Gateway, AppleTalk Data Stream Protocol, DECnet, DECwindows application**.

NSP See **Network Services Protocol**.

operating system Software that controls the basic operations of a computer.

PICT Contraction of the word *picture*. A data format for storing graphics.

pixmap A three-dimensional array of bits or, in other words, a stack of two or more bit maps. Pixmap contains the extra pixel values required to represent gray-scale and color objects.

protocol See **communications protocol**.

protocol family A collection of related protocols that together define, for an entire network system, how communications are performed. For example, the combination of all AppleTalk protocols (such as ADSP) makes up the AppleTalk protocol family. See also **AppleTalk network system, communications protocol**.

RAM An acronym for *random-access memory*, the memory chips that store information temporarily while you're working on it. RAM can contain both application programs and your own information. Information in RAM is discarded when you switch the power off.

remote computer A computer other than your own but in communication with yours through communication links. A remote computer can be any distance from your computer, from right beside it to thousands of miles away.

root window The parent window for all other windows in X. In rooted style, MacX maintains the image of the root window and all of its subwindows in an off-screen bitmap.

rooted In MacX, a style of operation in which DECwindows application windows are displayed in the root window. See also **MacX, rootless, root window**.

rootless In MacX, a style of operation in which DECwindows application windows are displayed in Macintosh-style windows, independent of the root window. See also **MacX, rooted, root window**.

router A device used to link networks that use the same communications protocols—but possibly different connection media. For example, a router can link and allow data to cross between two AppleTalk networks, such as a LocalTalk network and an EtherTalk network. In Apple parlance, when networks are joined by a router,

the result is an *internet*. The original component networks of an internet can be addressed as separate entities. When data is transmitted over the internet, the router directs the data to its destination by the most efficient route. Compare **gateway**.

screen The part of a monitor where information is displayed, similar to the screen on a television. In MacX, a screen is defined by its video type (color or monochrome) and a window style (rooted or rootless). Compare **display**.

server (1) On a network, a combination of hardware and software that provides a particular service such as access to shared files (file server), printing (print server), and so on. The combination of computer and software that you use to access the services is called the *client*. In most cases, the client software is located on your workstation and the server resides on a remote computer. (2) In an X environment, a software component located on your workstation that lets you access (“serve up”) applications. These applications are known as clients, and in most cases they run on a remote computer. See also **client, MacX, X Window System**.

Session Manager A DECwindows application that lets you start other applications, lets you customize the DECwindows working environment, and provides status information about the interaction between your Macintosh computer and other DECwindows applications. See also **DECwindows application**.

settings document A Macintosh document that contains the remote commands, preference settings, connection-tool settings, and page-setup information that you specified to customize your MacX environment.

shell A UNIX term for a program that interprets commands and arranges for their execution.

size box: A box at the bottom-right corner of most active Macintosh windows that lets you resize the window.

subnet mask Bit values set in the IP address to distinguish host addresses from subnetwork addresses.

By using a subnet mask, the system administrator can divide a network into smaller subnetworks.

TCP/IP A family of communications protocols that lets different makes of computers communicate over a variety of different types of networks. See also **MacTCP**.

terminal emulation tools One of the three types of communications tools. The terminal emulation tool that you use determines the type of terminal that your Macintosh will emulate during the communications session. Examples: VT102 Tool, VT320 Tool. See also **communications tools**.

toolkit A collection of software subroutines and data that implements a set of user interface features (widgets), such as menus or command buttons, and that allows clients to manipulate these features. See also **widgets**.

troubleshoot To locate and correct an error, or the cause of a problem or malfunction, in hardware or software.

ULTRIX Digital’s proprietary version of UNIX—a full 32-bit operating system that takes advantage of the VAX system architecture.

VMS An interactive operating system that runs all of Digital’s VAX computers. While you are logged in to the computer, you and the system conduct a dialogue of command and response. You use the Digital Command Language (DCL) to communicate with VMS. VMS stands for Virtual Memory System.

warping A condition in which a client takes control of and moves the mouse cursor.

widgets Graphic objects, such as menus, buttons, and scroll bars, used as building blocks to create larger images, such as windows and dialog boxes.

window An area with distinct boundaries, typically rectangular in shape, that displays information on the screen. You view clients and documents through a window.

window manager A client that allows you to move, resize, and change the appearance of windows on the screen.

workstation A Macintosh or other computer connected to a network.

X protocol A low-level graphics description language that permits communications between clients and the X server in your desktop computer.

X Window client (X client) An application, running on a remote computer, that you access through an X server. For example, DECwindows applications are X clients that run on VAX computers; you access them with the MacX server on your Macintosh. See also

DECwindows application, X Window server, X Window System.

X Window environment A computing environment based on the X Window System. When you use MacX to access DECwindows applications, you are working in an X environment. See also **X Window System.**

X Window server (X server) The portion of the X Window System that controls the display, mouse, and keyboard—relaying mouse and keyboard input to clients and performing requests from clients to draw graphics on the screen. See also **X Window System.**

X Window System A network-based system of applications (called *clients*) and servers. The X Window System provides a graphical interface by which you can access X clients running on a remote computer from a server running on your computer. (A graphical interface displays graphical elements, such as windows, menus, and buttons, rather than alphanumeric characters.) For example, DECwindows is a version of the X Window System that is implemented on VAX computers. See also **DECwindows, MacX, X Window client, X Window server.**

Xlib A library of software subroutines used by clients to communicate with an X server. Xlib contains functions for connecting to a particular display server, creating windows, drawing graphics, and so forth.

zone A conceptual (rather than physical) grouping of devices and services on a network or internet that makes it easier to locate and access network services. Network

users, devices, and services residing in the same zone can be in separate buildings or even in different cities. The system administrator defines zones. To access a device or service, the user chooses the zone where the device resides. Because network devices and services are divided into logically related groups, users can locate a desired device or service by searching through relatively small lists rather than a single large list. In AppleTalk Phase 2, a single network can contain several zones, and a single zone can cross several networks.

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PATHWORKS™ for Macintosh®

Version 1.1

Update to MacX User's Guide

MacX version 1.1.7 has new features that work with PATHWORKS for Macintosh version 1.1. This update package describes those features and provides information on the following topics:

- MacX 1.1.7
- AppleTalk-DECnet Connection Tool
- MacTCP Connection Tool
- DECnet Connection Tool

Replace your existing update module and accompanying connection tools modules with the entire contents of this update package. This sheet can be recycled when you have finished.

For information on how to install MacX and other PATHWORKS for Macintosh components, refer to the *Installation* part of the *Network Services User's Guide*. The *Network Services User's Guide* tells you how to install MacX using system software version 6.0.x and version 7.0.

If you want to use the MacTCP program, you'll need to install the MacTCP Connection Tool and configure the MacTCP driver. For installation instructions, refer to the *Installation* part of the *Network Services User's Guide*. For information on configuring the MacTCP driver, see the MacTCP Connection Tool module included with this update package. The *MacTCP Administrator's Guide* provides complete information on the MacTCP driver; see your system administrator if you need help.

If you want to run MacX with A/UX software version 2.0 or later, use the version of MacX that came with that A/UX software package.

MacX™ User Update

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◆ **Note** MSAX\$MODMAP is adapted from the Massachusetts Institute of Technology (M.I.T.) xmodmap program written by Jim Fulton of the M.I.T. X Consortium. xmodmap provides keyboard mapping for X11 environments and is supplied in accordance with the following permission notice:

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New features in MacX 1.1.7

MacX version 1.1.7 has several new features that extend its functionality. With MacX version 1.1.7, you can perform the following operations:

- Copy and paste images on your desktop to the Macintosh® Clipboard.
- Compile directories of font files.
- Display nonrectangular windows created by client applications.

This section tells you how to use the new features.

Copying images to the Macintosh Clipboard

MacX version 1.1.7 lets you copy images appearing on your computer screen(s) to the Macintosh Clipboard. You can copy a window displayed by a client application, copy a specific area on your screen, or copy the entire desktop. You can then paste the image that you copied into other Macintosh and X applications.

To copy an image from your screen to the Clipboard while running MacX:

- 1 Start MacX by double-clicking its icon.**
- 2 Start a client application.**
- 3 Choose Copy Screen to Clipboard from the MacX Window menu, or press Command-B.**

The pointer changes from an arrow to a crosshair pointer.

4 Copy an image to the Clipboard, using one of the following techniques.

- To copy a screen displayed by a client application, position the pointer in the client application's window and click the mouse button.
The contents of the client application's window are copied to the Macintosh Clipboard. When you use this technique to copy a screen, the screen image does not include the Macintosh window borders.
- To copy an image of the desktop, position the pointer in the menu bar or on the desktop and click the mouse button.
An image of your entire desktop, including the menu bar, windows, and icons, is copied to the Macintosh Clipboard.
- To copy a specific area on your screen, position the pointer on the desktop, drag to create a selection box around the area you want to copy, and then release the mouse button.
An image of the selected area is copied to the Macintosh Clipboard.

△ **Important** Remember that the Macintosh Clipboard holds only one image at a time. If you copy one image to the Clipboard and then copy a second image, the second image replaces the first. △

You can paste an image from the Macintosh Clipboard into another Macintosh application by using the Paste command. You can also paste an image into another X application, if the application you're using supports this feature.

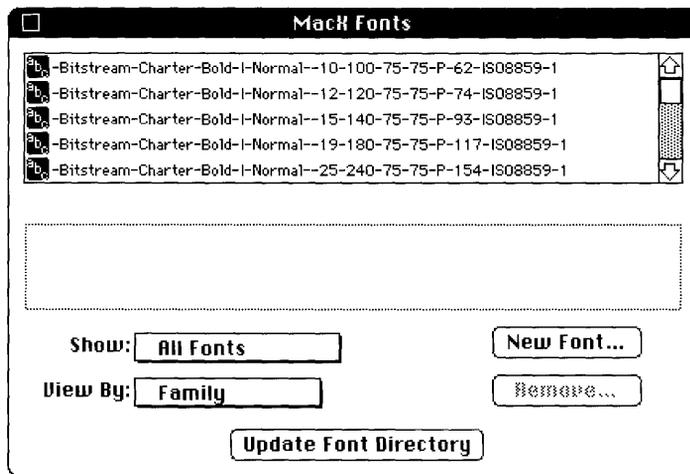
Compiling directories of font files

In MacX 1.1.7, you can translate an entire directory of bitmap distribution format (BDF) files to a MacX internal format. By translating the directory, you permit these fonts to be used by X11 clients. (For more information on BDF files, see the *MacX User's Guide*.)

To compile a directory of BDF files:

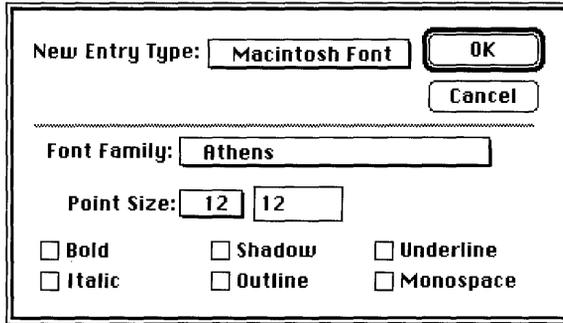
- 1 **Start MacX by double-clicking its icon.**
- 2 **Choose Fonts from the Edit menu, or press Command-F.**

The MacX Fonts window opens. This window lets you use the Font Director.



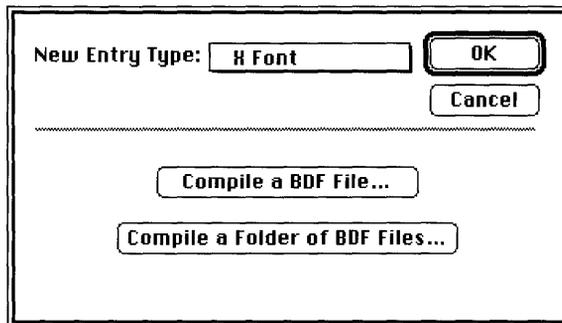
- 3 **Click the New Font button.**

A new-font dialog box appears, to let you create a new font.



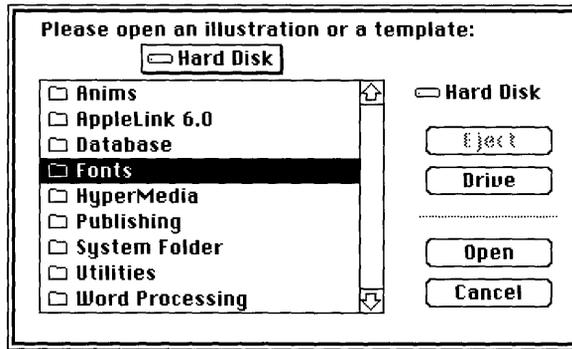
- 4 **Choose X Font from the New Entry Type pop-up menu, as shown in the following figure.**

The lower part of the dialog box changes to display two buttons, giving you the option of compiling a single BDF file or compiling a folder of BDF files.



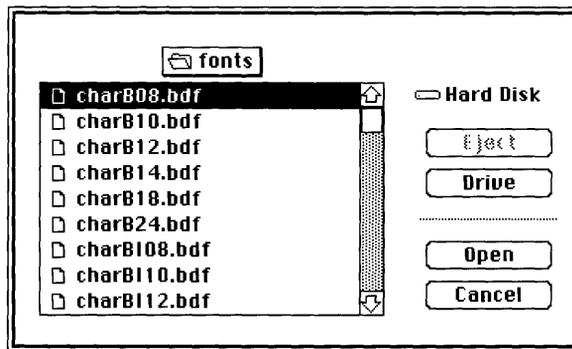
- 5 **Click the Compile a Folder of BDF Files button.**

An open-file dialog box appears, to let you open the folder where the BDF files are stored. In the following figure, the BDF files to be compiled are located in the "Fonts" folder on Hard Disk.



6 Locate and open the folder containing the BDF files you want to compile.

The dialog box shows the names of the font files inside the folder.



7 Select one of the font files in the dialog box and click the Open button.

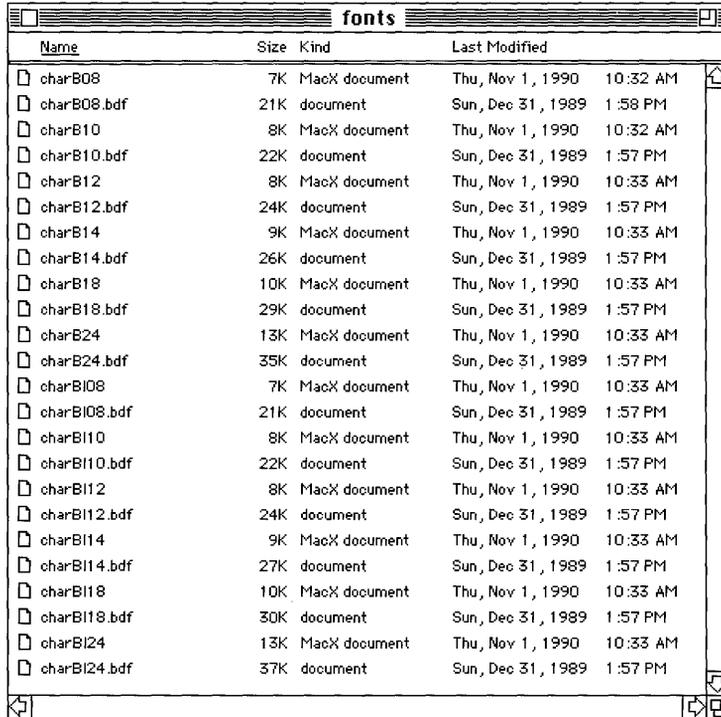
By selecting one of the font files, you are actually specifying that the entire folder of font files be compiled. An alert box appears, displaying the message

Compiling... Please stand by...while the font is being compiled (a few seconds).

The alert box disappears after the fonts are compiled.

8 Click the OK button in the new-font dialog box.

The new-font dialog box disappears. The newly compiled fonts appear in their original folder without the suffix `.bdf`. For example, the `charB10.bdf` font files appear in the fonts folder as `charB10`. The type of the newly compiled file is "MacX document." The following figure shows the new MacX font names in the fonts folder.



Name	Size	Kind	Last Modified
<input type="checkbox"/> charB08	7K	MacX document	Thu, Nov 1, 1990 10:32 AM
<input type="checkbox"/> charB08.bdf	21K	document	Sun, Dec 31, 1989 1:57 PM
<input type="checkbox"/> charB10	8K	MacX document	Thu, Nov 1, 1990 10:32 AM
<input type="checkbox"/> charB10.bdf	22K	document	Sun, Dec 31, 1989 1:57 PM
<input type="checkbox"/> charB12	8K	MacX document	Thu, Nov 1, 1990 10:33 AM
<input type="checkbox"/> charB12.bdf	24K	document	Sun, Dec 31, 1989 1:57 PM
<input type="checkbox"/> charB14	9K	MacX document	Thu, Nov 1, 1990 10:33 AM
<input type="checkbox"/> charB14.bdf	26K	document	Sun, Dec 31, 1989 1:57 PM
<input type="checkbox"/> charB18	10K	MacX document	Thu, Nov 1, 1990 10:33 AM
<input type="checkbox"/> charB18.bdf	29K	document	Sun, Dec 31, 1989 1:57 PM
<input type="checkbox"/> charB24	13K	MacX document	Thu, Nov 1, 1990 10:33 AM
<input type="checkbox"/> charB24.bdf	35K	document	Sun, Dec 31, 1989 1:57 PM
<input type="checkbox"/> charB108	7K	MacX document	Thu, Nov 1, 1990 10:33 AM
<input type="checkbox"/> charB108.bdf	21K	document	Sun, Dec 31, 1989 1:57 PM
<input type="checkbox"/> charB110	8K	MacX document	Thu, Nov 1, 1990 10:33 AM
<input type="checkbox"/> charB110.bdf	22K	document	Sun, Dec 31, 1989 1:57 PM
<input type="checkbox"/> charB112	8K	MacX document	Thu, Nov 1, 1990 10:33 AM
<input type="checkbox"/> charB112.bdf	24K	document	Sun, Dec 31, 1989 1:57 PM
<input type="checkbox"/> charB114	9K	MacX document	Thu, Nov 1, 1990 10:33 AM
<input type="checkbox"/> charB114.bdf	27K	document	Sun, Dec 31, 1989 1:57 PM
<input type="checkbox"/> charB118	10K	MacX document	Thu, Nov 1, 1990 10:33 AM
<input type="checkbox"/> charB118.bdf	30K	document	Sun, Dec 31, 1989 1:57 PM
<input type="checkbox"/> charB124	13K	MacX document	Thu, Nov 1, 1990 10:33 AM
<input type="checkbox"/> charB124.bdf	37K	document	Sun, Dec 31, 1989 1:57 PM

9 On the desktop, drag the newly created font files into the MacX Fonts folder on your hard disk.

The MacX Fonts folder is located in the MacX 1.1.7 folder that was created automatically when you installed MacX on your hard disk.

10 Click the Update Font Directory button in the MacX Fonts window.

MacX updates the Font Directory file. The new MacX font files appear in the MacX Fonts window.

You can also quit and restart MacX to update the Font Directory file.

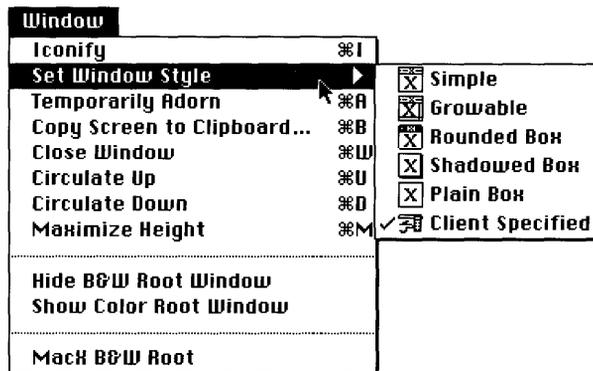
11 If you're done compiling fonts, close the MacX Fonts window.

Displaying nonrectangular windows

MacX version 1.1.7 allows client applications to display nonrectangular windows, such as the circular window displayed by the o'clock client application.

You can apply the Client Specified option on a per-window basis by using the Set Window Style submenu in the MacX Window menu. For example, say that you start the o'clock client application and then choose Client Specified from the Set Window Style submenu, as shown in the following figure. The o'clock window changes to the style defined by the client application: a round window. If you start more client applications, the windows will still appear in the standard rectangular form—regardless of the window styles defined within the clients—unless you select Client Specified as the default window style in the Preferences window.

For more information about setting window styles with the Set Windows Style submenu and the Preferences window, see Chapter 4, “Working With Windows,” in the *MacX User's Guide*.



MacX 1.1.7 hints

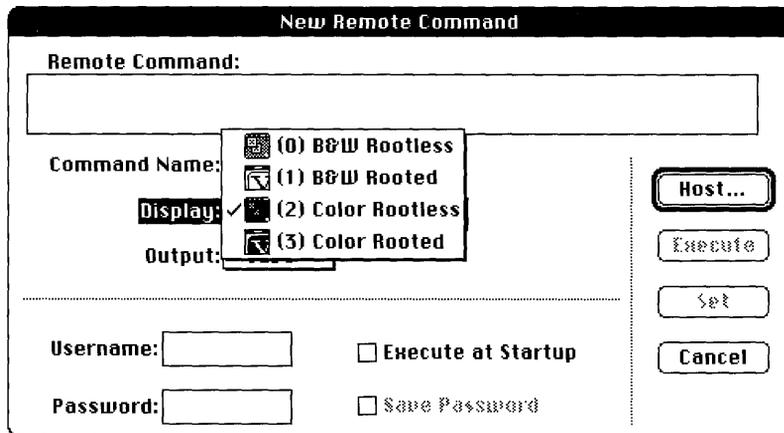
This section provides hints that help you display client applications on your monitor in color or on multiple monitors as quickly and clearly as possible. These procedures are also described in the *MacX User's Guide*. This section also tells you how to display motion-sensitive clients.

Displaying client applications in color

If you're using MacX version 1.1.7 on a color monitor, you can display client applications in color. Depending on how you open a client application, you can specify that its window appear in color by using either of the two methods described in this section.

Using the New Remote Command dialog box to display client applications in color

If you are using the New Remote Command dialog box, shown in the following figure, choose "(2) Color Rootless" or "(3) Color Rooted" from the Display pop-up menu. For more information about displaying client applications in color, see "Creating New Commands" in Chapter 3 of the *MacX User's Guide*. That guide also contains descriptions of MacX rooted and rootless modes.



Using the DECterm or MacTerminal command line to display client applications in color

You can open a client application in color from the command line displayed by DECterm™, the MacTerminal® program, or a compatible terminal emulation program. You specify the screen number within the command line. The following example is a command line you would enter in a MacTerminal window to display the xclock client application in color rootless mode—that is, (2) Color Rootless. To use this command, substitute the name of your Macintosh for *name*, and the transport method (for example, ADSP) for *transport*.

```
set display/create/screen=2/node=name/transport=transport
run sys$system:decw$clock
```

◆ **Note** The *name* parameter must be enclosed in double quotation marks if you're using ADSP. ◆

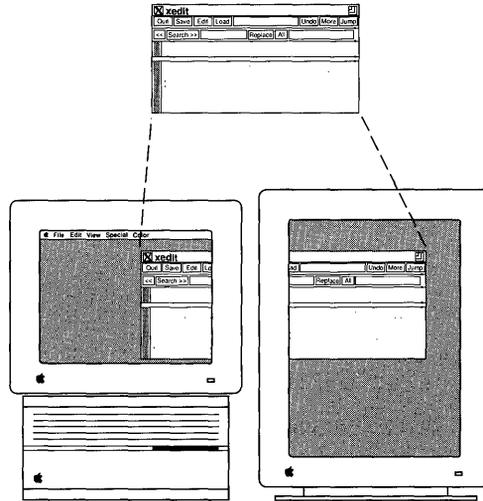
To display the xclock client application in color rooted mode—that is, (3) Color Rooted—you would enter the following command line, with these stipulations:

- Type the name of your computer in place of *name* to display the client's window on your computer screen.
- Type the transport method in place of *transport*.
 - If your transport method is ADSP, enclose *name* in straight double quotation marks. For example, if your transport method is ADSP, then the Macintosh name is "Chooser Name:X11@Zone" for system software version 6.0.x, or "Sharing Setup Name:X11@Zone" for version 7.0. Similarly, if the Chooser or Sharing Setup name is *Mill Pond*, you would enter "Mill Pond:X11@Zone".
 - If your transport method is DECnet™, the Macintosh name is the DECnet node name of the Macintosh.
 - If your transport method is TCP/IP, the Macintosh name is the TCP/IP node name of the Macintosh.

```
set display/create/screen=3/node=name/transport=transport
run sys$system:decw$clock
```

Optimizing the display of client applications on multiple monitors

MacX allows you to display client applications on multiple monitors connected to your computer. You can display a client application on one monitor and drag its window to another monitor. A client window can even “straddle” monitor boundaries, appearing on more than one monitor at the same time. For example, the Xedit window in the following figure straddles two monitors.



Suppose you have two monitors attached to your Macintosh computer. One monitor is set to a depth of 1 bit per pixel and the other monitor is set to a depth of 8 bits per pixel. You start MacX and create a remote command for the DECW\$CLOCK client application. You specify that DECW\$CLOCK will appear on the 8-bit color monitor, using either the color rooted screen or the color rootless screen. You run the command and DECW\$CLOCK appears in a window on your 8-bit color monitor.

MacX draws DECW\$CLOCK fastest on the 8-bit color monitor because you set DECW\$CLOCK to appear at 8 bits per pixel, using the X11 color display capability of MacX. If DECW\$CLOCK had been set to display in black and white at 1 bit per pixel, the optimal speed would have been achieved on the 1-bit monitor.

To optimize the speed with which MacX draws windows in a multiple-monitor setup, position the window on a screen of the same type (color or monochrome) and depth as the X11 screen on which MacX is drawing the client window.

For more information about displaying client applications on multiple monitors, see “Using Multiple Screens” in Chapter 1 of the *MacX User’s Guide*.

Displaying motion-sensitive client applications

Motion-sensitive client applications are applications designed to follow the movements of the pointer on the desktop when the application’s window is active. For example, the xeyes client application displays a pair of eyes that watch the pointer as you move it on the desktop. Motion-sensitive client applications may or may not actually follow the pointer, depending on the combination of applications appearing on your desktop and the type of screen on which you opened each application.

A motion-sensitive client responds to movements of the pointer only when the client is on the same X11 screen as the active X11 client window. If you display a motion-sensitive client window on one X11 screen and make active another client window that is displayed on a different X11 screen, the motion-sensitive window does not respond to the movements of the pointer.

Troubleshooting

This section provides possible solutions for problems that may occur when you are using MacX with PATHWORKS™ for Macintosh® version 1.1.

Client applications appear grainy on color screens.

If a client application of MacX appears grainy on the screen, the application is probably attempting to allocate more than the number of free colormap entries. A colormap is a set of colorcells that define color values. Each cell contains three values specifying intensities of red, green, and blue (RGB). MacX uses the colormap to translate pixel values into the corresponding RGB values displayed on the screen. MacX loads standard colormaps for the color rooted and color rootless screens.

These standard colormaps use a certain number of colormap entries, leaving the remaining entries free. Some client applications, such as xgif, attempt to allocate more than the number of free colormap entries, and appear grainy on the screen. The client application may display an error message.

Client applications will have this problem if they make use of all (or nearly all) the colormap entries in a standard default colormap. If you are an advanced X user or X programmer, you can modify client applications so that each one creates and sets the contents of its own colormap.

Low-memory warnings appear.

When performing some operations in MacX, your computer may run low on memory. The low-memory warning—a flashing “caution” symbol—may appear in your menu bar. You can correct this problem by increasing the application memory size of MacX. To increase the application memory size or to free memory used by the application, you use the Get Info window, as described in Chapter 6, “Troubleshooting,” in the *MacX User’s Guide*. It is difficult to predict the memory requirements of some operations, so don’t allow memory space to become critically low.

If MacX runs out of application memory, an alert box appears. You should save in a MacX settings document any modifications you have made and restart your computer as soon as possible to avoid a possible system crash or corruption of data.

Client applications can't connect to MacX.

If your DECwindows™ client application cannot connect to MacX, check the Communications Folder (system software version 6.0.x) or Extensions folder (version 7.0) in your System Folder. Make sure you have only one connection tool for each network protocol (TCP/IP, ADSP, and so on). If you have more than one connection tool for a particular network protocol, remove one of the tools from the Communications Folder or Extensions folder and restart MacX.

Blank spaces appear in sample text in the MacX fonts window.

Don't worry if blank spaces (or missing characters) appear in the MacX Fonts window when you display a sample of a font.

For example, if you select Geneva in the MacX Fonts window, the phrase *The quick brown fox jumps over the lazy dog* is usually displayed in the Geneva font. In some cases, however, blank spaces may appear instead of characters. The Font Director attempts to create a sample of the font you select, whether or not a character used in the sample actually exists in the selected font. For example, if you select the Cursor font, the Font Director attempts to display the phrase *The quick brown fox jumps over the lazy dog* in that font. If the character *T* does not exist in the Cursor font, a blank space appears in its place.

MacX keyboard mapping

Some DECwindows applications have features, such as keyboard equivalents for menu commands, that require keys not available on Macintosh keyboards. To permit MacX to work properly with such DECwindows applications, you must use a special DECwindows application that maps (translates) keys or combinations of keys on your Macintosh keyboard to keys available on a Digital LK201 keyboard. The application that provides this keyboard mapping for MacX is called MSAX\$MODMAP. This section tells you how to use the MSAX\$MODMAP application.

MSAX\$MODMAP modifies and displays mapping tables used by the X11 server to translate keystrokes to key symbols. A mapping table tells the X Window System—in this case, MacX—how to translate the keystrokes. The term *keysymbol* (or *keysym*) refers to the individual location of a key as defined by the software. MacX captures the signals generated by the keys specified in the mapping table and translates them to key symbols that can be recognized by X11 client applications. For example, suppose that the DECwindows application you are using requires that you press the Find key on a Digital keyboard. Macintosh keyboards do not have a Find key. MSAX\$MODMAP solves the problem (in one of its several mapping schemes) by mapping the Macintosh Help key to the Find key symbol. When you press Help on your Macintosh keyboard, the application you are using responds as if you had pressed the Find key on a Digital keyboard.

The *MacX Keyboard Mapping Quick Reference Card*, which comes with the *MacX User's Guide* binder, presents the four different keyboard mapping schemes provided by MSAX\$MODMAP:

- positional mapping for Apple (ADB) Extended Keyboard
- inscriptional mapping for Apple (ADB) Extended Keyboard
- Apple Standard (ADB) keyboard mapping
- Macintosh Plus Standard keyboard mapping

You can choose the mapping scheme for the kind of keyboard that you are using with your Macintosh computer. Use the scheme that best matches the way in which you use keyboards and remember the location of keys on a keyboard.

The positional and inscriptional mappings both work best with the Apple (ADB) Extended Keyboard. The positional mapping was designed for people who tend to remember the location of keys by their physical position on the keyboard. Therefore, the positional mapping reassigns the meaning of keys on the Extended Keyboard to match as closely as possible the location of the Digital keys that the remapped keys are to represent. For example, the Help key is mapped to the Find key, because the Find key on a Digital keyboard is located in approximately the same position as the Help key on the Apple (ADB) Extended Keyboard.

The inscriptional mapping was designed for people who tend to find keys by their names. Therefore, the inscriptional mapping reassigns keys on the Extended Keyboard according to their names. For example, the Page Up key on the Extended Keyboard is mapped to the Digital keyboard Prev Screen key, because their names have similar meanings.

Of course, for both of these mapping schemes, not every key can be mapped to a similar location or meaning. The *MacX Keyboard Mapping Quick Reference Card* provides two ways for you to find the mapped keys: a drawing of the Macintosh keyboard showing the mapped keys in teal-colored text, and a table listing the Digital LK201 keys and the corresponding Macintosh keys (or key combinations) to which they are mapped.

The Apple Standard (ADB) Keyboard and Macintosh Plus keyboard mapping schemes are provided for users who do not have the Extended Keyboard. Because the Apple Standard and Macintosh Plus keyboards have fewer keys than the Extended Keyboard, these mapping schemes rely heavily on Command-key combinations.

Using the MSAX\$MODMAP application

The MSAX\$MODMAP application allows you to issue commands from a remote command dialog box or from a terminal emulator such as DECterm. You can also create custom items for the Applications menu in the DECwindows Session Manager and FileView™ applications, which will run MSAX\$MODMAP. You invoke the MSAX\$MODMAP application by using Digital Command Language (DCL) commands. If you want to automatically remap your keyboard whenever you start the DECwindows Session Manager, you can put the commands in a session startup script. (For more information on using a session startup script, see the *DECwindows User's Guide*, published by Digital Equipment Corporation. For more information on using DCL commands, see the *VMS™ General User's Manual*, also published by Digital Equipment Corporation.)

In the example that follows, two DCL command lines are given. The first command identifies your Macintosh computer on the network and defines the type of connection you are using. (The first command line is needed *only* when you use MSAX\$MODMAP from a terminal emulator, such as MacTerminal, before you connect to the DECwindows environment with MacX.) The second command line executes MSAX\$MODMAP and specifies which of the keyboard mapping schemes to use. (You need only the second command line, and not the first, if you want to use MSAX\$MODMAP as a remote command.)

```
$ SET DISPLAY/CREATE/NODE=name/TRANSPORT=transport
$ MCR MSAX$MODMAP MSA$EXAMPLES:mapping
```

In the sample command lines, the words in italics represent parameters that you should replace with appropriate values, as described in Table 1.

◆ **Note** The *name* parameter must be enclosed in straight double quotation marks if you're using ADSP. ◆

Table 1 MSAX\$MODMAP command parameters

Parameter to replace	Value to enter
<i>name</i>	If you're using ADSP, enter your user name as it appears in the Chooser dialog box (version 6.0.x) or Macintosh Name in Sharing Setup (version 7.0). If you are communicating over DECnet, enter your Macintosh computer's DECnet node name. If you're using TCP/IP, enter your Macintosh computer's TCP/IP node name.
<i>transport</i>	The type of transport you are using: ADSP DECNET TCP/IP
<i>mapping</i>	One of the following names for the files that provide the specific mapping scheme*: MSAX\$POSITIONAL_EXTENDED_KEYBOARD.DAT MSAX\$INSCRIPTIONAL_EXTENDED_KEYBOARD.DAT MSAX\$STANDARD_KEYBOARD.DAT

* The MSAX\$POSITIONAL_EXTENDED_KEYBOARD.DAT file provides the positional mapping scheme for the Apple (ADB) Extended Keyboard. The MSAX\$INSCRIPTIONAL_EXTENDED_KEYBOARD.DAT file provides the inscriptional mapping scheme for the Apple (ADB) Extended Keyboard. The MSAX\$STANDARD_KEYBOARD.DAT file provides the mapping schemes for both the Apple Standard (ADB) Keyboard and the Macintosh Plus keyboard.

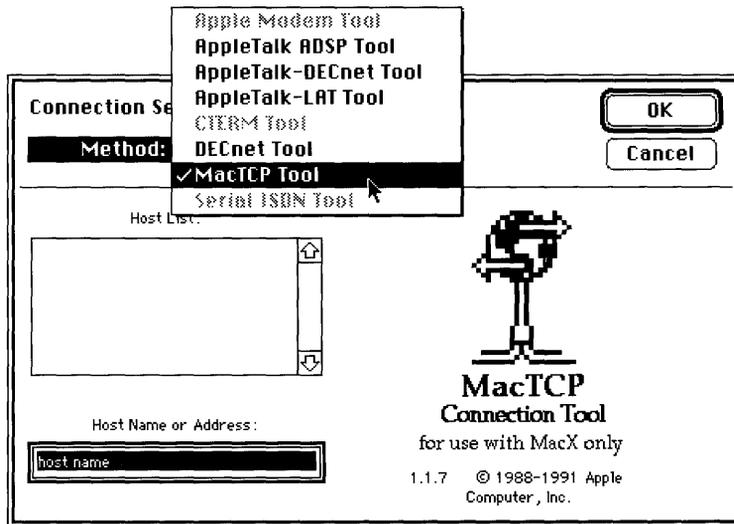
Limitations of MacX version 1.1.7

This section provides information about the following limitations of MacX version 1.1.7:

- dimmed connection tools in the Connection Settings dialog box
- conflicts between the X11 protocol and Macintosh keyboard characters
- macro software incompatibility
- conflicts between xclipboard and the Macintosh Clipboard
- limits to color-table animation

Dimmed connection tools in the Connection Settings dialog box

To create a remote command, you choose a connection tool from the Method pop-up menu in the Connection Settings dialog box. Some connection tools that may be listed in the Method pop-up menu, do not fully support the remote command facility in MacX. Connection tools whose names are dimmed in the Method pop-up menu, such as Apple Modem Tool, AppleTalk ADSP Tool, AppleTalk-DECnet Tool, AppleTalk-LAT Tool, CTERM Tool, and Serial ISDN Tool in the following figure, cannot be used with MacX.



Conflicts between the X11 protocol and Macintosh keyboard characters

In order to conform to the X11 protocol, MacX translates keypresses into a predefined set of X11 “keysyms.” The term *keysym* refers to the location of a key as defined by the software. The X11 keysym set contains the X11 character set (ISO Latin-1) and a number of special-purpose keys, such as the Return key. If you type a character on a Macintosh keyboard that MacX cannot translate into the X11 keysym set, MacX causes your Macintosh to beep to inform you that the character is unavailable in the MacX environment and has been ignored.

Macro software incompatibility

Keyboard macro programs that simulate keypresses but do not simulate key-releases, such as the MacroMaker™ program, should not be used to simulate keypresses in MacX. When MacX receives a keypress simulation and does not receive a subsequent key-release simulation, MacX acts as if the key is being pressed continuously.

Conflicts between xclipboard and the Macintosh Clipboard

MacX uses the built-in Macintosh Clipboard when you cut and paste text. If you run the xclipboard client application with MacX, the client application conflicts with the Clipboard. To prevent this problem, *do not* run xclipboard with MacX.

Limits to color-table animation

In MacX version 1.1.7, color-table animation works only on color monitors that display 8 bits per pixel and that are based on a color look-up table (CLUT).

DECwindows Motif

DECwindows Motif is Digital's implementation of the X Window System. This section tells you how to access DECwindows Motif with PATHWORKS for Macintosh. DECwindows Motif has the minimum memory requirements listed in Table 2.

Table 2 System requirements for DECwindows Motif

Monitor	Computer	CPU memory	MacX application memory
Monochrome	Macintosh Plus or later model	2 or more megabytes	1.5 or more megabytes
Color	Macintosh II family or later model	4 or more megabytes	2.5 or more megabytes

You can use DECwindows Motif with MacX as you would use it with any other X product. You can access DECwindows Motif with MacX in either of two ways:

- You can use a remote command to access the Session Manager, which lets you directly execute DECwindows clients such as FileView and Mail.
- You can enter your own remote command to access DECterm, and from there start other DECwindows applications, such as DECwindows Mail.

DECwindows Motif assumes that you are using a Digital three-button mouse. You can use the arrow keys on your Macintosh keyboard as equivalents for two of the buttons on a three-button mouse. For details on how the arrow keys translate to the mouse buttons, see Chapter 1 in the *MacX User's Guide*.

Starting the DECwindows Motif Session Manager

This section tells you how to start the DECwindows Motif Session Manager. When you start DECwindows Motif, you are given the option of running a tutorial to help you learn about the program.

To start the Session Manager:

- 1 **Start the MacX application.**
- 2 **Choose New Command from the Remote menu.**

The New Remote Command dialog box appears.

New Remote Command

Remote Command: _____

Command Name: _____

Display: (0) B&W Rootless

Output: **Save**

Username: _____ Execute at Startup

Password: _____ Save Password

Host...

Execute

Set

Cancel

- 3 **Start the Session Manager.**

Type the following command in the Remote Command field:

```
run sys$system:decw$session
```

The Session Manager provides a convenient way to enter the DECwindows environment. (Refer to Chapter 2 in the *MacX User's Guide* for details on the Session Manager.)

4 Fill in the rest of the fields in the New Remote Command dialog box.

Command Name: Enter a name for the command.

Display: Choose the item that matches the display environment you're using.

Output: Choose Save from the pop-up menu.

Username: Enter the user name assigned to you by your system administrator.

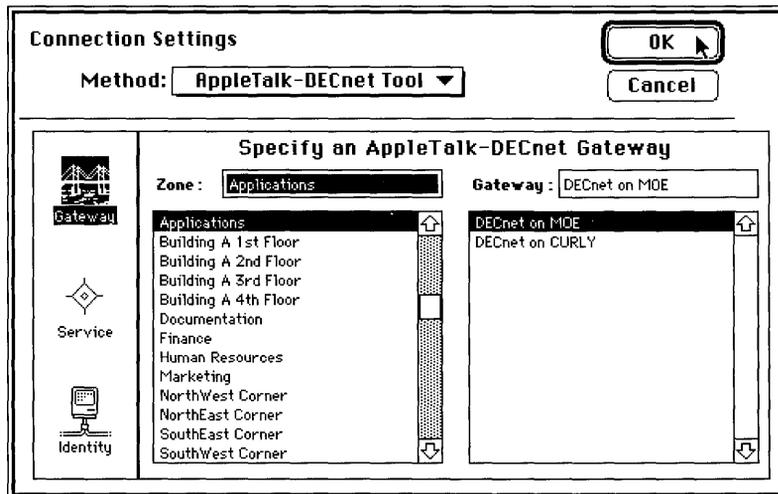
Password: Enter the password for the user name you just entered.

5 Click the Host button.

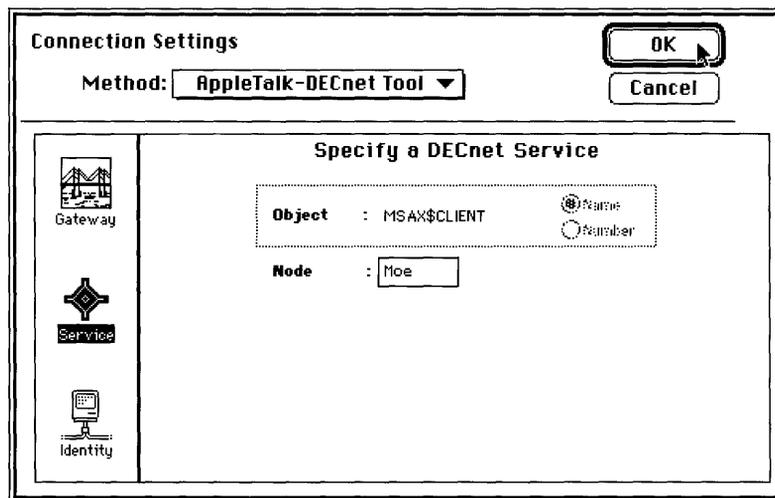
The Connection Settings dialog box appears.

6 Specify the connection tool that you want to use to connect to the VAX™ computer.

Choose a connection tool from the Method pop-up menu in the upper-left corner of the dialog box. You can use the MacTCP®, AppleTalk-DECnet, or DECnet Tool. When you choose a tool, the lower part of the dialog box changes to display the settings for that tool. Step 7 shows how to configure the AppleTalk-DECnet Tool. For information on configuring one of the other tools, see the reference module for that tool. See your system administrator if you're not sure which tool to use.



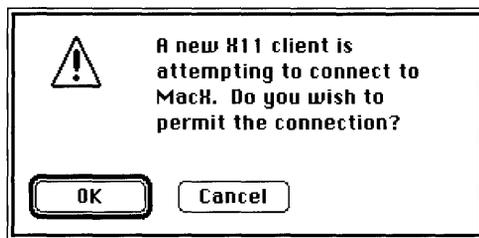
- 7 **If you are using the AppleTalk-DECnet Tool, perform the following steps.**
- Click the Gateway icon in the column of icons at the far left-side of the Connection Settings dialog box, if it is not already selected. The zone and gateway settings appear.
 - Click the name of the zone that contains the gateway to which you want to connect. The name you selected appears in the Zone box, and a list of gateways appears on the right side of the Connection Settings dialog box.
 - In the gateways list, click the name of the VAX gateway to which you want to connect. The gateway you select can be used to start DECwindows client applications either on the same node as the gateway or on a remote VAX. The name you select appears in the Gateway box. (You can also type the name of the gateway directly into the Gateway box.)
 - Click the Service icon in the column of icons at the far-left side of the Connection Settings dialog box. The lower part of the dialog box changes to let you specify the node where DECwindows Motif resides.



e. Type the node name of the VAX that is running DECwindows Motif, then click OK to close the Connection Settings dialog box. The New Remote Command dialog box reappears on your screen.

8 Click the Execute button in the New Remote Command dialog box.

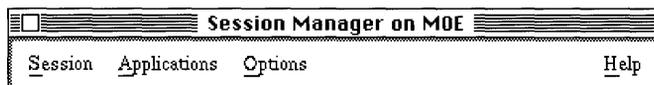
After a short time an alert box should appear, stating that a new X11 client is attempting to connect to MacX.



This message indicates that the VAX is testing its ability to connect to your Macintosh.

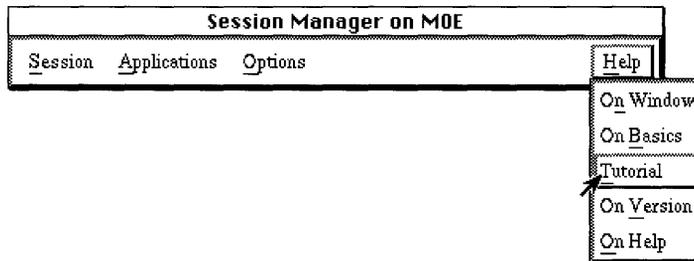
9 Click the OK button in the alert box.

Soon the same alert box should appear again, indicating that DECwindows Motif is connecting to your Macintosh. This message may appear several times. Click the OK button in the alert box each time it appears. Eventually, the DECwindows Session Manager appears.

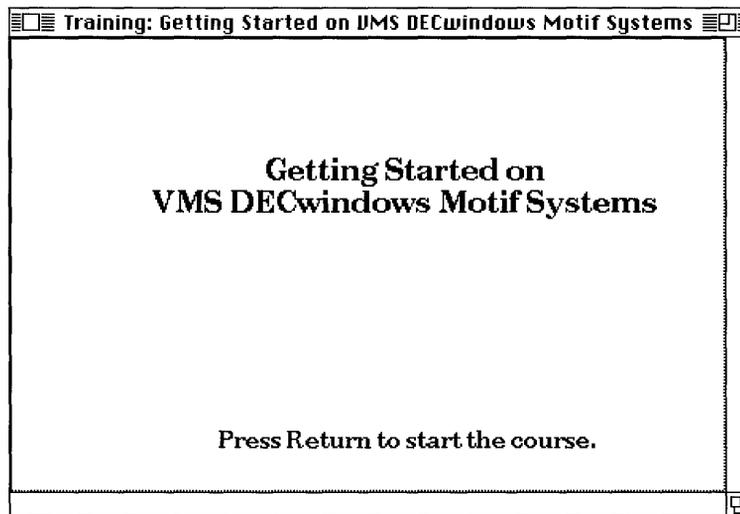


◆ **Note** You can suppress the alert boxes by deselecting Access Control in the Remote Menu. ◆

- 10 To learn about DECwindows Motif, run the tutorial by choosing Tutorial from the Help menu.



The tutorial window appears.



Starting DECwindows client applications with DECTerm

This section tells you how to start DECwindows applications using DECTerm.

To start DECwindows client applications with DECTerm:

- 1 **Start the MacX application.**
- 2 **Choose New Command from the Remote menu.**

The New Remote Command dialog box appears.

The dialog box titled "New Remote Command" contains the following elements:

- Remote Command:** A large empty text area for entering the command.
- Command Name:** A text input field.
- Display:** A dropdown menu currently showing "(0) B&W Rootless".
- Output:** A button labeled "Save".
- Username:** A text input field.
- Password:** A text input field.
- Execute at Startup**
- Save Password**
- Host...** button
- Execute** button
- Set** button
- Cancel** button

- 3 **Start a DECwindows client application with DECTerm.**

Type the following command in the Remote Command field.

```
create/terminal/detach
```

4 Fill in the rest of the fields in the New Remote Command dialog box.

Command Name: Enter a name for the command.

Display: Choose the item that matches the display environment you're using.

Output: Choose Save from the pop-up menu.

Username: Enter the user name assigned to you by your system administrator.

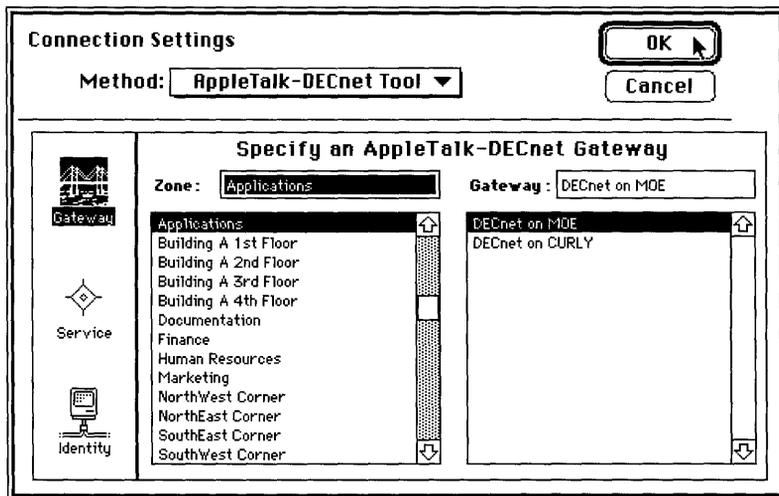
Password: Enter the password for the user name that you just entered.

5 Click the Host button.

The Connection Settings dialog box appears.

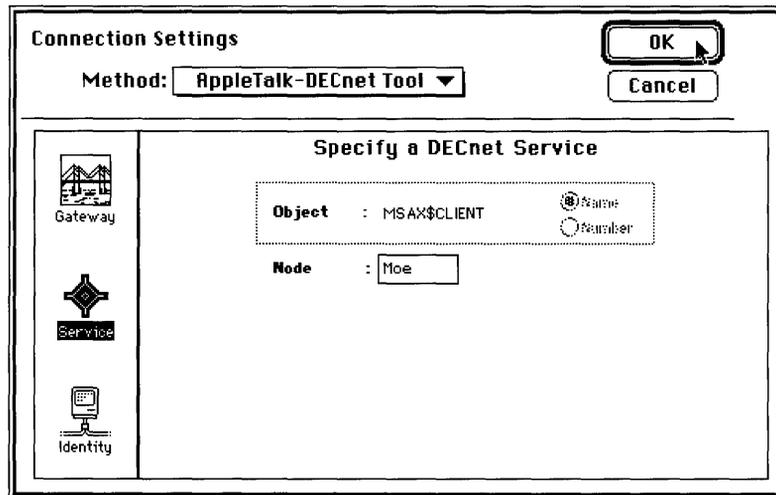
6 Specify the connection tool that you want to use to connect to the VAX computer.

Choose a connection tool from the Method pop-up menu in the upper-left corner of the dialog box. You can use the MacTCP, AppleTalk-DECnet, or DECnet Tool. When you choose a tool, the lower part of the dialog box changes to display the settings for that tool. Step 7 shows how to configure the AppleTalk-DECnet Tool. For information on configuring one of the other tools, see the reference module for that tool. See your system administrator if you're not sure which tool to use.



7 If you are using the AppleTalk-DECnet Tool, perform the following steps.

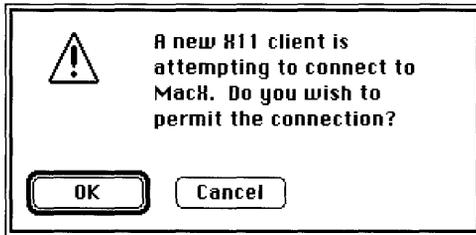
- a. Click the Gateway icon in the column of icons at the far-left side of the Connection Settings dialog box, if it is not already selected. The zone and gateway settings appear.
- b. Click the name of the zone that contains the gateway to which you want to connect. The name you selected appears in the Zone box, and a list of gateways appears on the right side of the Connection Settings dialog box.
- c. In the gateways list, click the name of the VAX gateway to which you want to connect. The gateway you select can be used to start DECwindows client applications either on the same node as the gateway or on a remote VAX. The name you select appears in the Gateway box. (You can also type the name of the gateway directly into the Gateway box.)
- d. Click the Service icon in the column of icons at the far-left side of the Connection Settings dialog box. The lower part of the dialog box changes to let you specify the node where DECwindows Motif resides.



e. Type the node name of the VAX that is running DECwindows Motif, then click OK to close the Connection Settings dialog box. The New Remote Command dialog box reappears on your screen.

8 Click the Execute button in the New Remote Command dialog box.

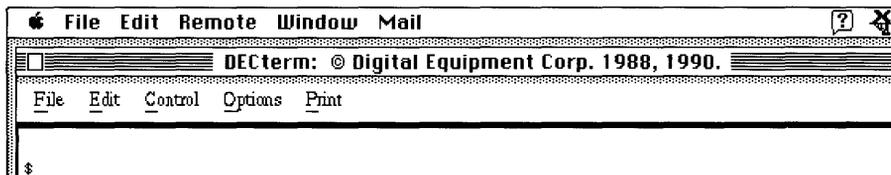
After a short time an alert box should appear, stating that a new X11 client is attempting to connect to MacX.



This message indicates that the VAX is testing its ability to connect to your Macintosh.

9 Click the OK button in the alert box.

Soon the same alert box should appear again, indicating that DECwindows Motif is connecting to your Macintosh. This message may appear several times. Click the OK button in the alert box each time it appears. Eventually, the DECTerm window appears.



◆ **Note** You can suppress the alert boxes by deselecting Access Control in the Remote Menu. ◆

10 **To learn about DECwindows Motif, run the tutorial.**

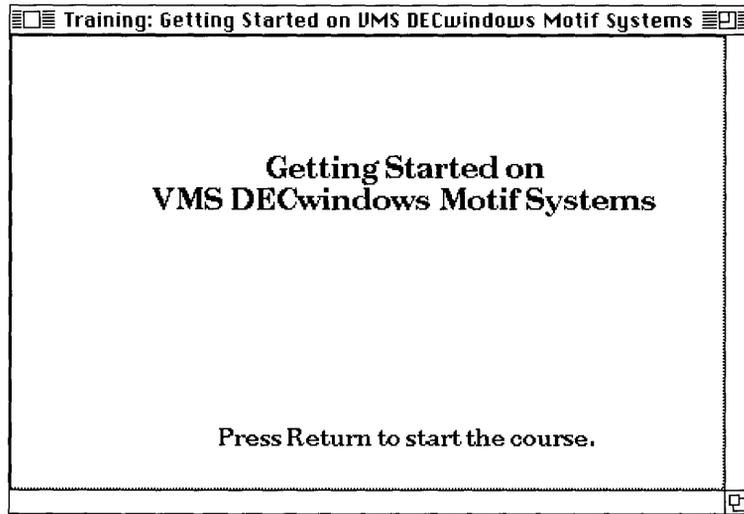
- a. Type the following command at the \$ prompt in the DECterm window.

```
run sys$system:decw$cbi
```

- b. Press Return.

- c. Click OK each time the familiar alert box appears, telling you that a new client is attempting to connect to MacX.

The DECwindows Motif tutorial window appears. Follow the instructions in the window to begin the tutorial.





PATHWORKS™ for Macintosh®

Version 1.1

Connection Tools Reference

Preface

PATHWORKS for Macintosh includes three connection tools that provide the full-duplex, reliable byte-stream communications that MacX requires to connect with X clients—in particular, with DECwindows applications. This part of the *MacX User's Guide* contains reference modules for these three connection tools:

- AppleTalk-DECnet Connection Tool
- MacTCP Connection Tool
- DECnet Connection Tool

Each module is an independent unit that provides reference material for its tool.

About connection tools

Connection tools, like all communications tools, work in conjunction with the Macintosh Communications Toolbox, an extension of the Macintosh system software. The Communications Toolbox manages communications tasks for Macintosh applications. If you're using system software version 6.0.x, the Communications Toolbox must be installed on your Macintosh before you can use the communications tools. The Communications Toolbox is built into version 7.0.

◆ **Note** There are two other types of communications tools, known as *terminal emulation tools* and *file-transfer tools*. MacX, however, uses only connection tools. The other types of tools are described in the *MacTerminal User's Guide*. ◆

The *Installation* part of the *PATHWORKS for Macintosh: Network Services User's Guide* provides complete installation instructions for the PATHWORKS for Macintosh software, including the Communications Toolbox and communications tools.

The connection tool you choose to use depends primarily on the operating system running on the VAX computer to which you are connecting. There are two operating systems commonly used on VAX computers: VMS and ULTRIX. The PATHWORKS for Macintosh software is designed to run under the VMS operating system, and therefore the *MacX User's Guide* is oriented toward using MacX to access X clients running under VMS. However, MacX can also access X clients running on VAX computers under the ULTRIX operating system. ULTRIX is Digital's version of UNIX.

If you are accessing X clients (DECwindows applications) running under VMS, you will need to use either the AppleTalk-DECnet Connection Tool or a DECnet connection tool. If you are accessing X clients running under ULTRIX, you will need to use the MacTCP Connection Tool or the DECnet Connection Tool.

AppleTalk-DECnet Connection Tool

Apple Computer, Inc.

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Simultaneously published in the United States and Canada.

The Apple Publishing System

AppleTalk-DECnet Connection Tool was written, edited, and composed on a desktop publishing system using Apple® Macintosh® computers, an AppleTalk® network system, and Microsoft® Word. Proof pages were created on the Apple LaserWriter® printers; final pages were printed on a Linotronic® 300. PostScript®, the LaserWriter page-description language, was developed by Adobe Systems Incorporated.

Text type and display type are Apple's corporate font, a condensed version of ITC Garamond®. Bullets are ITC Zapf Dingbats®.



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The AppleTalk®-DECnet™ Connection Tool allows you to connect the MacX™ application to DECwindows™ clients through the AppleTalk/DECnet Transport Gateway. The gateway is used only to start the DECwindows application.

The gateway, which runs on a VAX™ computer, performs translations between certain AppleTalk and DECnet communications protocols. AppleTalk and DECnet are the principle families of communications protocols used by Apple and Digital networks, respectively. Specifically, the gateway translates between the AppleTalk Data Stream Protocol (ADSP) and the Network Services Protocol (NSP). ADSP is part of the AppleTalk protocol stack; NSP is a DECnet protocol.

By translating from ADSP to NSP and from NSP to ADSP, the gateway allows AppleTalk-based applications to communicate with DECnet-based services (such as DECwindows applications) as if the services supported ADSP directly. At the same time, DECnet services can communicate with AppleTalk applications as if the latter supported DECnet.

This reference module explains how to select a gateway the first time that you use the AppleTalk-DECnet Connection Tool and how to change your gateway selection should you need to do so. This reference module also describes the connection settings for the AppleTalk-DECnet Connection Tool.

What you need

The *Installation* part of the *Network Services User's Guide* provides installation procedures for PATHWORKS™ for Macintosh® and describes all of the components, including those related to the AppleTalk-DECnet Connection Tool and ADSP driver. The following list summarizes the software components required for the AppleTalk-DECnet Connection Tool and indicates where each component must be installed.

- Macintosh Communications Toolbox—installed in the System file if you're using system software version 6.0.x. If you're using version 7.0, the Macintosh Communications Toolbox is installed automatically in your Macintosh system.
- AppleTalk-DECnet Connection Tool—installed in the Communications Folder (version 6.0.x) or the Extensions folder (version 7.0).
- ADSP driver—installed in the System Folder (version 6.0.x). If you're using version 7.0, the ADSP driver is installed automatically in your Macintosh system.

If you are connecting to a VAX computer through an Ethernet card installed in your Macintosh, you must also have support for AppleTalk Phase 2. If you are using the Apple EtherTalk® NB Card, you must install EtherTalk 2.0 software. If you are using some other Ethernet card, you must install the equivalent AppleTalk Phase 2 software. See the documentation accompanying your Ethernet card for instructions.

Selecting a network connection

If your Macintosh is connected to more than one network, you need to make sure that you've selected the network containing the VAX that you want to use. If your Macintosh is *not* connected to more than one network, skip this section and proceed directly to "AppleTalk-DECnet Connection Settings."

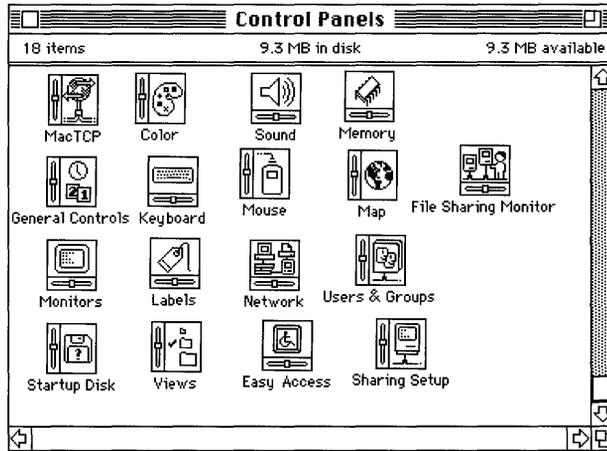
If your Macintosh is connected to multiple networks, only one network can be active at a time. You use the Network device in the Control Panel (if you have system software version 6.0.x) or the Network control panel (if you have version 7.0) to select the active network.

If you're using version 7.0

To select a network connection:

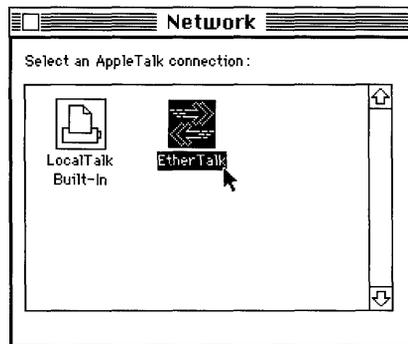
1 Choose Control Panels from the Apple (🍏) menu.

The Control Panels window opens.



2 Double-click the Network icon.

The Network control panel opens.



3 Select the icon for the network that you want to use.

The Network Control Panel displays an icon representing each network to which your Macintosh is connected. If your computer is attached to a LocalTalk® network, that connection is usually made through the printer port, and its icon is labeled LocalTalk Built-In.

You may also have connections to Ethernet environments through Ethernet cards (such as the Apple EtherTalk NB Card) installed in your Macintosh. Each icon for an Ethernet connection is labeled EtherTalk. If you have more than one Ethernet connection, each icon's label includes a number in parentheses, indicating the slot in which the Ethernet card is installed.

4 Close the Network control panel.

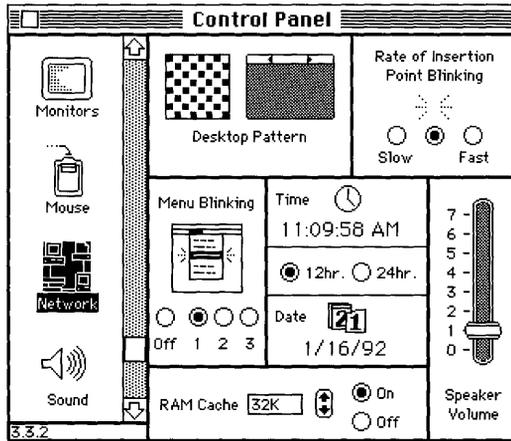
5 Close the Control Panels window.

If you're using version 6.0.x

To select a network connection:

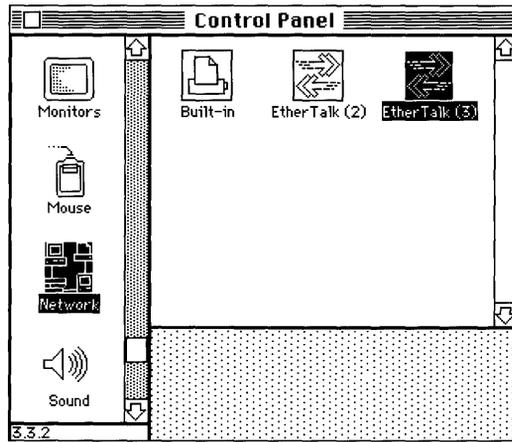
1 Choose Control Panel from the Apple () menu.

The Control Panel window opens.



2 Select the Network icon from the group of icons on the left side of the Control Panel window.

You may have to scroll through the list to find the Network icon.



3 Select the icon for the network that you want to use.

The Control Panel displays an icon representing each network to which your Macintosh is connected. If you are attached to a LocalTalk network, that connection is usually made through the printer port, and its icon is labeled Built-in.

You may also have connections to Ethernet environments through Ethernet cards (such as the Apple EtherTalk NB Card) installed in your Macintosh. Each icon for an Ethernet connection is labeled EtherTalk. If you have more than one Ethernet connection, each icon's label includes a number in parentheses, indicating the slot in which the Ethernet card is installed.

4 Close the Control Panel window.

AppleTalk-DECnet connection settings

To use the AppleTalk-DECnet Tool, you must select an AppleTalk/DECnet Transport Gateway and specify the VAX to which you want to connect. You use the Connection Settings dialog box to specify the gateway and VAX.

To access the Connection Settings dialog box, you click the Host button on the right side of the MacX New Remote Command dialog box. See your system administrator for the values you need to supply in the New Remote Command dialog box. (For information on the New Remote Command dialog box, see Chapter 3 in the *MacX User's Guide*.)

To specify a gateway and VAX:

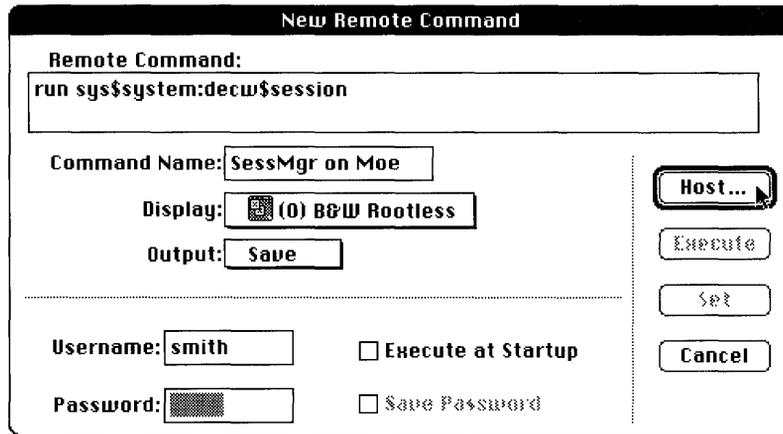
1 Start MacX and choose New Command from the Remote menu.

The New Remote Command dialog box appears.

The image shows a screenshot of the "New Remote Command" dialog box. The dialog has a title bar with the text "New Remote Command". Inside the dialog, there is a large text field labeled "Remote Command:". Below this field are three rows of controls: "Command Name:" followed by a text input field; "Display:" followed by a dropdown menu showing "(0) B&W Rootless"; and "Output:" followed by a dropdown menu showing "Save". A horizontal dotted line separates these controls from the bottom section. In the bottom section, there are two rows of controls: "Username:" followed by a text input field and a checkbox labeled "Execute at Startup"; and "Password:" followed by a text input field and a checkbox labeled "Save Password". On the right side of the dialog, there are four buttons: "Host...", "Execute", "Set", and "Cancel".

2 Fill in the New Remote Command dialog box with the settings your system administrator gave you.

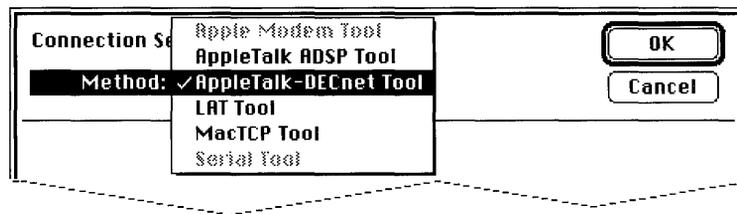
The settings include the type of command you use to connect to the VAX, how the data is displayed on your screen, your user name, and your password.



- 3 When you've finished entering the values in the New Remote Command dialog box, click the Host button.

The Connection Settings dialog box appears.

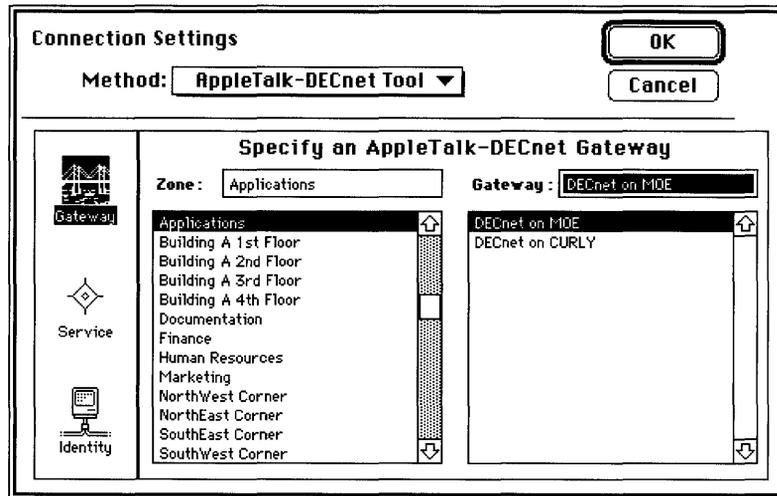
- 4 Choose AppleTalk-DECnet Tool from the Method pop-up menu in the upper-left corner of the dialog box.



- 5 Select a gateway.

- a. Click the Gateway icon in the column of icons at the far-left side of the Connection Settings dialog box, if it is not already selected. The zone and gateway settings appear.

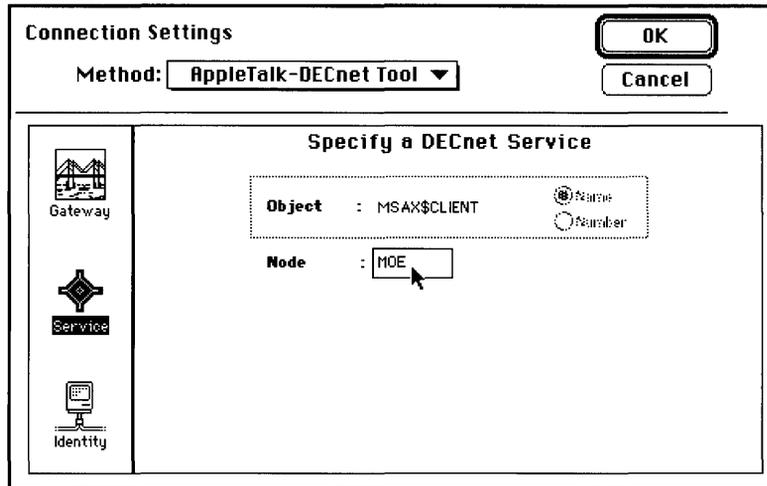
- b. *Click the name of the zone that contains the gateway to which you want to connect.*
The name you selected appears in the Zone box, and a list of gateways appears on the right side of the Connection Settings dialog box.
- c. *In the gateways list, click the name of the VAX gateway to which you want to connect.*
The gateway you select can be used to start DECwindows client applications either on the same node as the gateway or on a remote VAX. The name you select appears in the Gateway box. (You can also type the name of the gateway directly into the Gateway box.)



- 6 **Click the Service icon in the column of icons at the far-left side of the dialog box.**
The lower part of the Connection Settings dialog box changes to display settings that allow you to specify a DECnet service.

7 Specify the VAX that's running the DECnet service you want to access.

Type the VAX name into the node box. For example, if you want to use DECwindows Motif, type the name of the VAX on which DECwindows Motif is running.

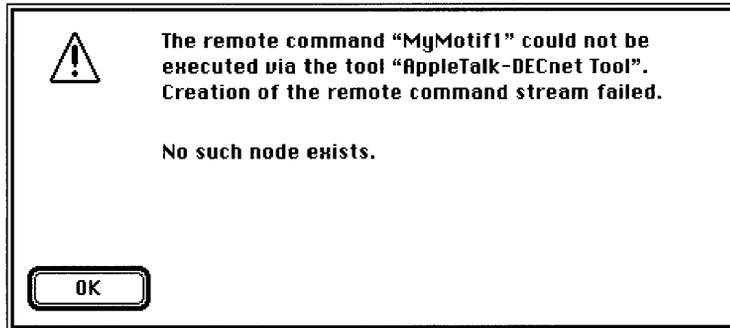


8 Click the OK button.

The Connections Settings dialog box disappears and you return to the New Remote Command dialog box.

Troubleshooting hints and alert messages

If problems arise while you are using the AppleTalk-DECnet Tool to communicate with a host on a DECnet network, the system displays one or more of the error messages listed in this section. Each message appears in an alert box, similar to the one shown in the following figure.



Problems can occur with the Macintosh Communications Toolbox, the AppleTalk connection, the AppleTalk/DECnet Transport Gateway, or the DECnet connection.

This section lists the alert messages that might appear, and suggests actions you can take to solve the problem. If you continue to have problems, you may need to reinstall the connection tool or contact your system administrator.

Communications Toolbox problems

If a problem occurs with the Macintosh Communications Toolbox, one of the alert messages listed in this section will appear.

The following alert messages may appear when you try to open a connection:

A timeout occurred while you were attempting to open a connection. Check that the computer you are trying to connect to is turned on and ready to accept your connection request.

When you executed a remote command in MacX, the Communications Toolbox sent a message to the service that you selected, asking to open a connection. Try executing the command again.

Open the Connection Settings dialog box and make sure that you've correctly entered the name of the host computer. If the name is correct, ask your system administrator if the host computer that you want to access is still available.

The open request was rejected.

Try opening the connection again.

An open or listen request was received for a connection that is already open or listening.

Use the open connection, or close it and open a new connection.

The following alert messages may appear while you are using the connection:

No connection is presently open and the operation requires an open connection.

Open a connection, then try the operation again.

A close, read, or write was attempted with no open connection.

Open a connection, then try the operation again.

Requested operation not supported.

Make sure that you've established a connection to the correct service, then try the operation again.

Requested operation canceled.

Try the operation again. If the operation is canceled again, try closing the current connection and opening a new connection.

If you see one of the following alert messages, contact your system administrator:

Generic (cmGenericError) error.

Generic (cmFailed) error.

Unknown error number.

AppleTalk connection problems

If a problem occurs with the AppleTalk connection, one of the alert messages listed in this section will appear.

The DECnet Gateway name cannot be found on the network.

The gateway that you selected cannot be located on the network. Open the Connection Settings dialog box and make sure that you have selected the correct zone and that the gateway is still available. You may also need to check the physical connection between your Macintosh computer and the network.

This computer's name cannot be registered because it is already in use by someone else.

The user name that you entered in the Chooser (version 6.0.x) or the Macintosh name that you entered in the Sharing Setup control panel (version 7.0) is being used by someone else. Open the Chooser (version 6.0.x), or Sharing Setup control panel (version 7.0), change the name, then restart MacX.

AppleTalk doesn't seem to be working. Check to see if AppleTalk is turned on in the Chooser.

Open the Chooser and make sure that AppleTalk is turned on; then restart MacX.

The ADSP driver doesn't seem to be installed. Check to see if the ADSP file is in your System Folder.

This message will appear only if you're using system software version 6.0.x.

The ADSP file must be in your System Folder. If it is not, place a copy in your System Folder and restart your computer. If the ADSP file is in your System Folder, then it may be damaged; replace it with a new copy of the file and restart your Macintosh.

A Read operation was canceled because the connection closed.

The connection closed while the AppleTalk-DECnet Tool was attempting the operation. Open a new connection and try again.

A Write operation was canceled because the connection closed.

The connection closed while the AppleTalk-DECnet Tool was attempting the operation. Open a new connection and try again.

There is not enough memory available.

Close any open connections or documents and try the operation again. If you are using MultiFinder®, you may need to quit the application and increase the application memory size by using the Get Info dialog box in the Finder.

Unable to establish a connection with the gateway.

A problem occurred while the AppleTalk-DECnet Tool was attempting to connect to the gateway. Try opening the connection again.

A connection open operation was canceled while in progress.

A problem occurred while the AppleTalk-DECnet Tool was attempting to open a connection. Try opening the connection again.

The open connection request was denied by the remote machine.

The VAX computer has denied your request to open a connection. Try opening the connection again. If the problem continues, ask your system administrator if the VAX is still available.

The remote machine did not respond to a request to open a connection.

Try opening the connection again. If the problem continues, ask your system administrator if the remote computer is still available.

A serious internal error has occurred. You should quit this application.

Save your work and quit the application immediately. Restart the application, open a connection, and try the operation again.

The application issued an overlapping I/O call. You should quit the application.

Save your work and quit the application immediately. Restart the application, open a connection, and try the operation again.

An unknown error occurred while trying to register your name on the network.

A problem has occurred with the user name specified in the Chooser (version 6.0.x), or the Macintosh name specified in the Sharing Setup control panel (version 7.0). Try opening the connection again. If this message reappears, make sure that your user or the Macintosh name is entered correctly.

An unknown error has occurred in the ADSP device driver.

This message will appear only if you're using system software version 6.0.x.

A problem has occurred with the ADSP file. Try opening the connection again. If this message reappears, the ADSP file in your System Folder may be damaged; replace it with a new copy of the file.

An unknown error has occurred in the AppleTalk-DECnet Connection Tool.

Try opening the connection again. If this message reappears, you may need to reinstall the connection tool.

AppleTalk/DECnet Transport Gateway problems

If a problem occurs with the AppleTalk/DECnet Transport Gateway, one of the alert messages listed in this section will appear.

Maximum number of sessions with the gateway was reached.

A system administrator can limit the total number of sessions that a gateway will support. If the gateway that you are using supports a limited number of sessions, then you can try to establish your connection later. Otherwise, try using another gateway if one is available.

If you receive one of the following alert messages, contact your system administrator:

An invalid function was requested of the gateway.

The gateway is not the same version.

An invalid length was supplied to the gateway.

An invalid type was supplied to the gateway.

Insufficient information was provided.

DECnet connection problems

If a problem occurs while the AppleTalk-DECnet Tool is establishing the DECnet portion of a connection, one of the alert messages listed in this section will appear.

No such node exists.

The DECnet node to which you are trying to connect could not be located. Open the Connection Settings dialog box and make sure that you've correctly entered the name of the host computer. Also check that you have selected the correct Ethernet card in the Control Panel (if you have system software version 6.0.x) or the Network control panel (if you have version 7.0), and the correct gateway. If everything is correct, ask your system administrator if the host computer that you want to use is still available.

No such object exists.

The service to which you are trying to connect could not be located on the DECnet node. Ask your system administrator to make the MSAX\$CLIENT service available.

The remote node could not recognize the log-in information.

The DECnet node to which you are trying to connect failed to recognize the log-in information that you provided in the Connection Settings dialog box. Open the Connection Settings dialog box and make sure that the host name, object description, user name, and password are correct.

User name or password, or both, were found to be invalid.

The user name, password, or user name and password that you entered in the Connection Settings dialog box are not correct. Open the Connection Settings dialog box and make sure that you've entered your user name and password correctly; then try opening the connection again. If the problem continues, ask your system administrator if you are using the correct user name and password.

The following alert messages may also appear while the AppleTalk-DECnet Tool is trying to establish a connection. Try establishing the connection later. If you still have problems, contact your system administrator.

There is not sufficient memory to complete the connection.

Insufficient system resources on the remote node.

No I/O channel is available on the gateway node.

No DECnet logical links are available.

The DECnet network's object rejected the connection.

The remote node is no longer accepting connections.

The remote node is currently unreachable.

There was a DECnet network protocol error.

The DECnet network's logical link was broken.

The DECnet network is no longer available.

The DECnet logical link was terminated by a third party.

The connection to the network object timed out or failed.

The DECnet network partner task aborted the logical link.

The DECnet network partner task disconnected the logical link.

The DECnet network partner task exited before confirming the logical link.

The path to the DECnet partner task node was lost.

MacTCP Connection Tool

Apple Computer, Inc.

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The MacTCP® product is Apple Computer's implementation of the TCP/IP family of protocols for the Macintosh® Operating System. Named after the two best-known protocols, Transmission Control Protocol and Internet Protocol, this protocol suite was developed by the Defense Department's Advance Research Projects Agency (DARPA). Over the years, the TCP/IP protocol stack has evolved into an efficient way to connect different makes of computers on diverse networks.

MacTCP is composed of two specialized software modules that enable your Macintosh computer to communicate over a TCP/IP network: a driver and a connection tool. The driver processes data passing to and from the Macintosh port connected to the TCP/IP network. The driver interfaces with the Macintosh Operating System, packaging outgoing data for the TCP/IP network and translating incoming data packets into a Macintosh format. The connection tool works in conjunction with the Macintosh Communications Toolbox—the software that manages communications tasks for Macintosh communications applications such as MacX™.

This reference module describes the connection settings for the MacTCP Connection Tool and tells you how to configure the MacTCP driver. You may need to obtain additional configuration information from your system administrator. This module also provides suggestions for solving connection problems.

- △ **Important** The way that MacTCP is implemented on your network depends on the layout of the network. This section provides as much information as possible to help you use MacTCP, but your system administrator may need to follow a different implementation scheme than the one described in this module. △

What you need

You must have the following software components installed to use the MacTCP Tool. For installation instructions, see the *Installation* part of the *Network Services User's Guide*.

- Macintosh Communications Toolbox—installed in the System file if you're using system software version 6.0.x. If you're using version 7.0, the Macintosh Communications Toolbox is installed automatically in your Macintosh system.
- MacTCP Connection Tool—installed in the Communications Folder (version 6.0.x) or Extensions folder (version 7.0).
- MacTCP driver—installed in the System Folder.

If you are connecting to a VAX™ computer through an Ethernet card installed in your Macintosh, you must also have support for AppleTalk® Phase 2. If you are using the Apple EtherTalk® NB Card, you must install EtherTalk Phase 2 software. If you are using some other Ethernet card, you must install the equivalent AppleTalk Phase 2 software. See the documentation accompanying your Ethernet card for instructions.

Configuring the MacTCP driver

Before you can use the MacTCP Connection Tool, you must configure the MacTCP driver. Ask your system administrator if arrangements have already been made to help you configure your MacTCP driver. For example, your system administrator may provide this service for you, or you may need to get configuration information that resides on your VAX. You may not need to use this section if your system administrator plans to configure the MacTCP driver in some other way.

- △ **For system administrators** The configuration instructions in this reference module address the needs of the network user who simply wants to connect a Macintosh to an existing TCP/IP network. If you are a system administrator or are installing a TCP/IP network, please consult the *MacTCP Administrator's Guide*. △

Configuring the driver involves performing the following tasks:

- opening the control panel to prepare for a link-level connection
- selecting your network type and verifying it with the system administrator
- specifying settings in the MacTCP administrator dialog box

Preparing for a link-level connection

This section tells you how to open the control panel in order to select a link-level connection for the MacTCP driver. The link-level connection defines the way you physically connect your Macintosh to the TCP/IP network. MacTCP supports three different kinds of connections between Macintosh computers and TCP/IP networks:

- LocalTalk®
- EtherTalk
- Ethernet

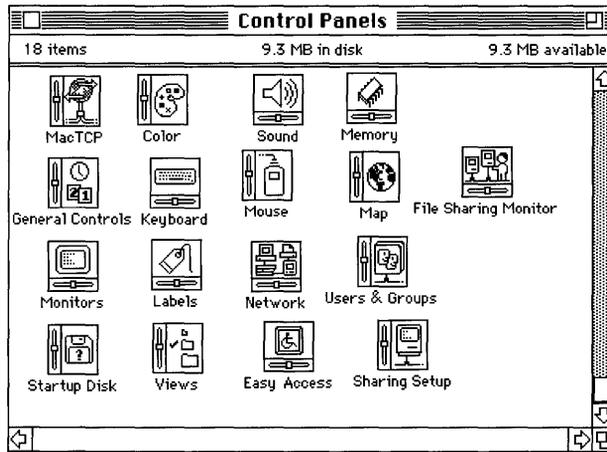
Each type of connection is represented by a unique icon in the control panel. (Throughout the rest of this module, the term *control panel* is used to refer to both the MacTCP control panel in system software version 7.0 and the Control Panel in system software version 6.0.x.) The procedure that you follow if you are using system software version 7.0 is slightly different from the procedure you follow if you are using version 6.0.x.

If you're using version 7.0

To begin selecting a link-level connection:

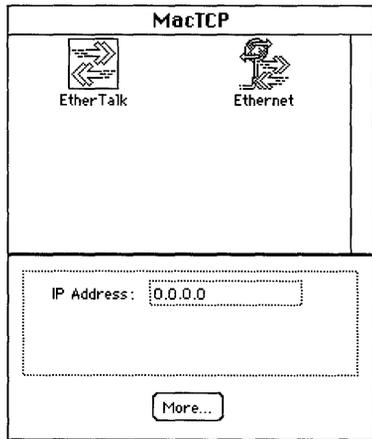
1 Choose Control Panels from the Apple () menu.

The Control Panels window opens.



2 Double-click the MacTCP icon.

The MacTCP control panel appears.



If your system administrator requires that you perform the full configuration, you use this control panel to set link information for your particular network.

- 3 **Go on to “Selecting Your Network Type,” later in this module, to complete the selection of your link-level connection.**

If you're using version 6.0.x

To begin selecting a link-level connection:

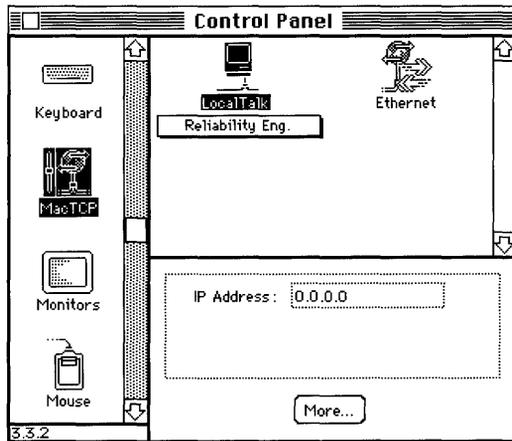
1 Choose Control Panel from the Apple () menu.

The Control Panel window opens.

2 Select the MacTCP icon from the column of icons at the far-left side of the window.

You may have to use the scroll bar to find the icon.

The upper part of the Control Panel window displays one or more icons labeled LocalTalk, EtherTalk, or Ethernet.



3 Go on to the next section, "Selecting Your Network Type," to complete the selection of your link-level connection.

Selecting your network type

This section explains what each kind of icon displayed in the control panel means. To select the right icon, you need to know the type of router through which your Macintosh will transmit data. If you are unsure which icon to select, your system administrator can help you select the one that will give you the best network performance.

LocalTalk

Selecting the LocalTalk icon connects your Macintosh to a LocalTalk network. LocalTalk usually transmits data at lower speeds than an EtherTalk or Ethernet network, so if your control panel also contains an EtherTalk or Ethernet icon, you're usually better off selecting that icon. Select LocalTalk if it's the only link-level icon displayed.

If you select LocalTalk, you need to use an AppleTalk-IP gateway to transmit data to hosts on a TCP/IP network. This gateway should be located in one of the zones listed in the pop-up menu below the LocalTalk icon in your control panel.

If your network uses an AppleTalk-IP gateway such as Shiva FastPath or Cayman GatorBox, click the LocalTalk icon. Otherwise, contact your system administrator for alternative connections.

◆ **Note** An AppleTalk-IP gateway (also called a *DDP-IP gateway*) translates the Datagram Delivery Protocol (DDP) packets sent by an AppleTalk network into the Internet Protocol (IP) packets sent by an Ethernet network so that computers and other devices on these two different networks can communicate. ◆

If your control panel displays a LocalTalk icon *only*, you must configure the MacTCP driver for a LocalTalk network. The section "If You're Using a LocalTalk Connection," later in this module, tells you how to specify settings for this type of network. If you want faster network performance, ask your system administrator about having an Ethernet card installed in your computer.

EtherTalk and Ethernet

This section can help you select the best network choice if you have the option of using either EtherTalk or Ethernet. Determine whether your network uses an AppleTalk-IP gateway, such as Shiva FastPath, or if it can directly access an IP host or router.

- If your network uses an AppleTalk-IP gateway, click the EtherTalk icon.
- If your network can access an IP host or router directly, click the Ethernet icon.

EtherTalk Selecting the EtherTalk icon connects your Macintosh to an EtherTalk network. If you are using system software version 6.0.x, the pop-up menu below the icon lists all the zones on your network. One of these zones contains the AppleTalk-IP gateway needed to translate the AppleTalk Datagram Delivery Protocol packets transmitted by your Macintosh into the Ethernet IP packets recognized by the TCP/IP network.

If two EtherTalk icons appear in the control panel, you have access to two different EtherTalk networks. Each network is identified by a number (in parentheses) that indicates the slot in your Macintosh that contains the Ethernet card. Select the EtherTalk icon representing the network that you want to use.

Ethernet Selecting the Ethernet icon connects your Macintosh to an Ethernet network. Ethernet provides much faster data transmission than EtherTalk. However, before you can use an Ethernet connection, you must verify that your Macintosh can transmit Ethernet Internet Protocol packets directly through an IP router. Otherwise, your Macintosh is probably part of an EtherTalk network, which uses a different packet format and consequently requires an AppleTalk router.

If two Ethernet icons appear in the control panel, you have access to two different Ethernet networks. Each network is identified by a number (in parentheses) that indicates the slot in your Macintosh that contains the Ethernet card. Select the Ethernet icon representing the network that you want to use.

Specifying settings in the administrator dialog box

Once you've selected your link-level connection, you're ready to specify settings in the MacTCP administrator dialog box. This section tells you how to fill in the dialog box for each of the three types of connections.

If you're using a LocalTalk connection

This section pertains to you only if you have selected the LocalTalk icon in the control panel, as described in the preceding section. To configure the MacTCP driver for a LocalTalk connection, you need to fill in the MacTCP administrator dialog box.

The MacTCP administrator dialog box appears when you click the More button in the control panel. Your system administrator may have configured the MacTCP administrator dialog box for you, or may have special instructions for performing the configuration, such as directing you to your VAX for the needed information.

To fill in the MacTCP administrator dialog box for a LocalTalk connection:

- 1 Click the More button at the bottom of the control panel.**

The administrator dialog box appears.

- 2 Specify each setting.**

You may have to consult with your system administrator to obtain the needed information. Brief descriptions of the settings follow. For details on the MacTCP administrator dialog box, see your system administrator or refer to the *MacTCP Administrator's Guide*.

The information that you enter in the administrator dialog box (Obtain Address, IP Address, Routing Information, and Domain Name Server Information) varies depending on the network in use.

Obtain Address:

Manually
 Server
 Dynamically

Routing Information:
Gateway Address:

IP Address:

Class: **A** Address: **90.25.0.0**
Subnet Mask: **255.255.252.0**

Net | Subnet | Node
Bits: 8 14 10

Net: Lock
Subnet: Lock
Node: Lock

Domain Name Server Information:

Domain	IP Address	Default
acct.bonzinicorn.com	111.25.13.3	<input checked="" type="radio"/>
<input type="text"/>	<input type="text"/>	<input type="radio"/>

OK Cancel

Obtain Address: Click the Server button in the Obtain Address area of the administrator dialog box. When you select Server, the IP address is assigned for you automatically.

Class: Use this pop-up menu to select a class. Ask your system administrator if you need to set the address class or subnet mask. (Ask for the subnet mask in dotted decimal notation.)

The address is a code used to identify three classes of networks. Each class specifies a maximum number of hosts permitted.

The subnet mask consists of bit values set in the IP address to distinguish host addresses from subnetwork addresses. By using a subnet mask, the system administrator can divide a network into smaller subnetworks. Drag the slider along the address bar until the correct subnet mask number appears above it.

Routing Information: Enter the gateway address supplied by your system administrator, then click OK. The default gateway address identifies individual networks within a group of interconnected networks (an internet).

Domain Name Server Information: A domain is a collection of nodes for which a particular name server provides services. If you can use more than one server, find out the default domain name first. An IP address is a binary number that identifies a host and the network on which it resides. The IP address is inserted in data packets to specify their destination.

Ask your system administrator for the default gateway address—in other words, the IP address of the IP router on your local network.

A Hosts file is a text file that lists hosts and domain servers and their TCP/IP addresses. This file is especially useful if you don't have access to a domain name server where this information is typically updated for you, and instead you have to update host information yourself. If you have the option of using a Hosts file, determine whether you should use it. If so, contact your system administrator for help in updating the Hosts file in your System Folder with the names of the hosts that you currently use. Unless you get an updated Hosts file, the Host List in your remote command's Connection Settings dialog box will be blank.

If your system administrator recommends using a Hosts file, update the one that you dragged into your System Folder, or replace it with one that your system administrator provides. Either you or your system administrator will have to update your Hosts file as you change the hosts that you use. (For information on creating a Hosts file, see your system administrator or Appendix A in the *MacTCP Administrator's Guide*.)

3 **Restart your Macintosh computer.**

Now you're ready to start MacX. See Chapter 2 in the *MacX User's Guide* for instructions. For an overview of the X Window System and MacX, read Chapter 1 as well.

If you're using an EtherTalk connection

This section pertains to you only if you have selected the EtherTalk icon in the control panel as described in “Selecting Your Network Type,” earlier in this module. To configure the MacTCP driver for an EtherTalk connection, you need to fill in the MacTCP administrator dialog box. The MacTCP administrator dialog box appears when you click the More button in the control panel. Your system administrator may have configured the MacTCP administrator dialog box for you, or may have special instructions for performing the configuration, such as directing you to your VAX for the needed information.

To fill in the MacTCP administrator dialog box for an EtherTalk connection:

- 1 Click the More button at the bottom of the control panel.**

The administrator dialog box appears.

- 2 Specify each setting.**

You may have to consult with your system administrator to obtain the needed information. Brief descriptions of the settings follow. For details on the MacTCP administrator dialog box, see your system administrator or refer to the *MacTCP Administrator's Guide*.

The information that you enter in the administrator dialog box (Obtain Address, IP Address, Routing Information, and Domain Name Server Information) varies depending on the network in use.

Obtain Address:

Manually
 Server
 Dynamically

Routing Information:
Gateway Address:

IP Address:

Class: Address:
Subnet Mask:

Net | Subnet | Node
Bits: 8 | 14 | 10

Net: Lock
Subnet: Lock
Node: Lock

Domain Name Server Information:

Domain	IP Address	Default
acct.bonzinicorp.com	111.25.13.3	<input checked="" type="radio"/>
<input type="text"/>	<input type="text"/>	<input type="radio"/>

OK Cancel

Obtain Address: Click the Manually radio button in the Obtain Address area of the administrator dialog box.

Class: Use this pop-up menu to select a class. Ask your system administrator if you need to set the address class or subnet mask. (Ask for the subnet mask in dotted decimal notation.)

The address is a code used to identify three classes of networks. Each class specifies a maximum number of hosts permitted.

The subnet mask consists of bit values set in the IP address to distinguish host addresses from subnetwork addresses. By using a subnet mask, the system administrator can divide a network into smaller subnetworks. Drag the slider along the address bar until the correct subnet mask number appears above it.

Routing Information: Enter the gateway address supplied by your system administrator, then click OK. The default gateway address identifies individual networks within a group of interconnected networks (an internet).

Domain Name Server Information: A domain is a collection of nodes for which a particular name server provides services. If you can use more than one server, find out the default domain name first. An IP address is a binary number that identifies a host and the network on which it resides. The IP address is inserted in data packets to specify their destination. Ask your system administrator for the default gateway address—in other words, the IP address of the IP router on your local network.

A Hosts file is a text file that lists hosts and domain servers and their TCP/IP addresses. This file is especially useful if you don't have access to a domain name server where this information is typically updated for you, and instead you have to update host information yourself. If you have the option of using a Hosts file, determine whether you should use it. If so, contact your system administrator for help updating the Hosts file in your System Folder with the names of the hosts that you currently use. Unless you get an updated Hosts file, the Host List in your remote command's Connection Settings dialog box will be blank.

If your system administrator recommends using a Hosts file, update the one that you dragged into your System Folder, or replace it with one that your system administrator provides. Either you or your system administrator will have to update your Hosts file as you change the hosts that you use. (For information on creating a Hosts file, see your system administrator or Appendix A in the *MacTCP Administrator's Guide*.)

3 Restart your Macintosh computer.

Now you're ready to start MacX. See Chapter 2 in the *MacX User's Guide* for instructions. For an overview of the X Window System and MacX, read Chapter 1 as well.

If you're using an Ethernet connection

This section pertains to you only if you have selected the Ethernet icon in the control panel as described in “Selecting Your Network Type,” earlier in this module. To configure the MacTCP driver for an Ethernet connection, you need to complete the MacTCP administrator dialog box. The MacTCP administrator dialog box appears when you click the More button in the control panel.

Your system administrator may have configured the MacTCP administrator dialog box for you, or may have special instructions for performing the configuration, such as directing you to your VAX for the needed information.

To fill in the MacTCP administrator dialog box for an Ethernet connection:

1 Click the More button at the bottom of the control panel.

The administrator dialog box appears.

2 Specify each setting.

You may have to consult with your system administrator to obtain the needed information. Brief descriptions of the settings follow. For details on the MacTCP administrator dialog box, see your system administrator or refer to the *MacTCP Administrator's Guide*.

The information that you enter in the administrator dialog box (Obtain Address, IP Address, Routing Information, and Domain Name Server Information) varies depending on the network in use.

Obtain Address:

Manually
 Server
 Dynamically

Routing Information:
Gateway Address:

IP Address:

Class: **A** Address: **90.25.0.0**
Subnet Mask: **255.255.252.0**

Net | Subnet | Node
Bits: 8 | 14 | 10

Net: Lock
Subnet: Lock
Node: Lock

Domain Name Server Information:

Domain	IP Address	Default
acct.bonzinincorp.com	111.25.13.3	<input checked="" type="radio"/>
<input type="text"/>	<input type="text"/>	<input type="radio"/>

OK Cancel

Obtain Address: Click the Manually radio button in the Obtain Address area of the administrator dialog box.

Class: Use this pop-up menu to select a class. Ask your system administrator if you need to set the address class or subnet mask. (Ask for the subnet mask in dotted decimal notation.)

The address is a code used to identify three classes of networks. Each class specifies a maximum number of hosts permitted.

The subnet mask consists of bit values set in the IP address to distinguish host addresses from subnetwork addresses. By using a subnet mask, the system administrator can divide a network into smaller subnetworks. Drag the slider along the address bar until the correct Subnet Mask number appears above it.

Routing Information: Enter the gateway address supplied by your system administrator, then click OK. The default gateway address identifies individual networks within a group of interconnected networks (an internet).

Domain Name Server Information: A domain is a collection of nodes for which a particular name server provides services. If you can use more than one server, find out the default domain name first. An IP address is a binary number that identifies a host and the network on which it resides. The IP address is inserted in data packets to specify their destination.

Ask your system administrator for the default gateway address—in other words, the IP address of the IP router on your local network.

A Hosts file is a text file that lists hosts and domain servers and their TCP/IP addresses. This file is especially useful if you don't have access to a domain name server where this information is typically updated for you, and instead you have to update host information yourself. If you have the option of using a Hosts file, determine whether you should use it. If so, contact your system administrator for help updating the Hosts file in your System Folder with the names of the hosts that you currently use. Unless you get an updated Hosts file, the Host List in your remote command's Connection Settings dialog box will be blank.

If your system administrator recommends using a Hosts file, update the one that you dragged into your System Folder, or replace it with one that your system administrator provides. Either you or your system administrator will have to update your Hosts file as you change the hosts that you use. (For information on creating a Hosts file, see your system administrator or Appendix A in the *MacTCP Administrator's Guide*.)

If you need to supply an Ethernet address, go to step 3. If not, go to step 4.

3 If you need to supply an Ethernet address, perform the following steps:

- a. Click the Server radio button in the Obtain Address area.
- b. Click the OK button to return to the control panel.
- c. Close the control panel.
- d. If you're running system software version 7.0, close the Control Panels window.

4 If you don't need to supply an Ethernet address, perform the following steps:

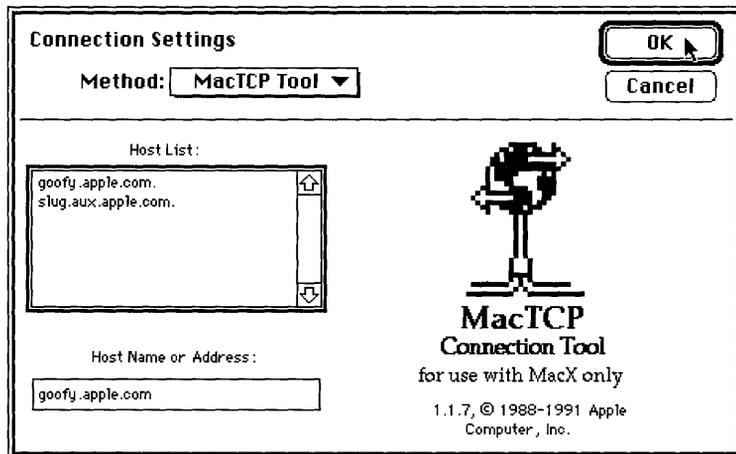
- a. Click the OK button to return to the control panel.
- b. Type the IP address for your computer in the IP Address field in the control panel.
- c. Close the control panel.
- d. If you're running system software version 7.0, close the Control Panels window.

5 Restart your Macintosh computer.

Now you're ready to start MacX. See Chapter 2 in the *MacX User's Guide* for instructions. For an overview of the X Window System and MacX, read Chapter 1 as well.

MacTCP connection settings

Once MacTCP is installed and the MacTCP driver is configured, you can establish a connection with a host computer on a TCP/IP network by selecting the host's name from the Host List in the MacTCP Connection Settings dialog box, shown in the following figure. In MacX, the dialog box appears when you click the Hosts button in a New Remote Command dialog box. (See Chapter 3 in the *MacX User's Guide* for information on using the New Remote Command dialog box.)

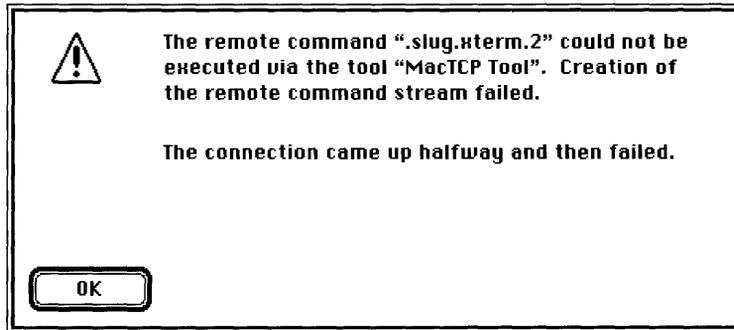


When the MacTCP Connection Settings dialog box appears on your screen, a list of host names should appear in the Host List. Double-click a name to select it. The selected name appears in the box labeled "Host Name or Address." You can also type a name or IP address directly into this box.

If you don't see a list of host names in the Host List, your System Folder probably does not contain a Hosts file. You can enter a host name or IP address in the "Host Name or Address" box, but when you quit your application, the entry is discarded. Using a Hosts file makes it unnecessary for you to continuously enter host names. Remember that this file must be updated when host addresses change or new hosts are added to the network.

Troubleshooting hints

If problems arise while you are using MacTCP to communicate with a host on a TCP/IP network, the system displays one or more of the error messages listed in this section. Each message appears in an alert box similar to the one shown in the following figure:



The MacTCP error string appears at the end of a message and is always preceded by an introductory phrase such as this one:

The MacTCP Tool tool error was:

Because most MacTCP error messages are short, this section explains the problems that might arise and how to recover from them.

- △ **Important** If you receive an error message that is not listed in this section, the error is a Macintosh system error. Write down the error message, save any work in progress, restart your computer, and report the error to your system administrator. Internal errors are not likely to occur unless you are developing or testing an application. △

Duplicate IP address or unable to obtain address from server.

Depending on how you set up MacTCP to obtain an IP address, your IP address is either incorrect or being used by another computer, or the server cannot provide one. Check the administrator dialog box to see how MacTCP obtains an IP address. (For information on the administrator dialog box, see “Specifying Settings in the Administrator Dialog Box,” earlier in this module.)

- If the Manually radio button is selected in the MacTCP administrator dialog box, verify that the IP address in the control panel is correct. If there is no address, obtain one from your system administrator. You should probably repeat the entire configuration procedure to be sure that it is correct. (Follow the instructions in “Configuring the MacTCP Driver,” earlier in this module.)
- If the Server radio button is selected in the MacTCP administrator dialog box, contact your system administrator. The BootP (Bootstrap Protocol) or RARP (Reverse Address Resolution Protocol) server cannot give you an address.

Error in MacTCP load.

While MacX was starting up, the MacTCP driver was unable to load itself into memory. This problem can occur because MacX doesn't have enough memory allocated to it, the operating system is malfunctioning, or MacTCP is corrupted. If, despite this error, MacX started up, choose About MacX from the Apple menu to see how much memory is available. If less than 100 kilobytes (K) is free, quit MacX, then click the MacX application icon once in the Finder™. From the Finder, choose Get Info from the File menu, and increase the MacX application memory size in the Get Info dialog box.

If MacX is not short of memory, try replacing the MacTCP driver in your System Folder with a known good driver. If the same error recurs, try reinstalling your system software as a last resort. Refer to the chapter on creating a startup disk in the *Macintosh User's Guide* for instructions. Remember to back up your current disk first and to install version system software 6.0.5 or a later version.

No gateway available to handle routing of packets to off-network destinations.

MacTCP cannot build a connection to the host to which you want to log in. Call your system administrator for assistance.

No name server can be found for the specified name string.

You have issued a remote command, but no domain name server can be associated with the domain name in the host name string. This string is the one you selected in the Connection Settings dialog box when you created the remote command. To display the Connection Settings dialog box, press and hold down the Option key, choose the remote command from the Remote menu, and click the Hosts button in the New Remote Command dialog box. Verify that the host name in the “Host Name or Address” box is spelled correctly. If it is, call your system administrator for assistance or try using the host’s IP address instead.

None of the known domain name servers is responding.

The domain name servers are not available, either because they are not working or because the network is down. Call your system administrator for assistance.

Not enough memory is available to issue the needed domain name resolver query or to build the DNR cache.

MacTCP does not have enough memory to look up the domain name string required to execute your remote command. Your Hosts file may contain too many names, or MacX may not have enough memory allocated to it. To find out if the Hosts file has too many names, quit MacX and check the size of the file in the Get Info box. You’ll find the Hosts file in your System Folder. Click it and choose Get Info from the File menu. If the application memory size is greater than 2,000 kilobytes (K), the file is probably too large. Open the Hosts file and delete any host names you don’t use.

If the Hosts file is not too large, start MacX again and choose About MacX from the Apple menu to see how much memory is available. If less than 100K is free, quit MacX, choose Get Info from the File menu, and increase the MacX application memory size in the Get Info dialog box. If MacX appears to have sufficient memory, check About MacX occasionally as you start up new clients. You may find that MacX needs more memory to run certain clients or to handle the number of clients that you typically run at the same time.

The connection came up halfway and then failed.

The remote host will not allow you to connect. Call your system administrator for assistance.

The destination host is not responding to address resolution requests.

Either the host to which you want to connect or an intervening gateway (or router) is down. Call your system administrator for assistance.

The dot-notation address has a syntax error.

The host IP address that you entered for your remote command is probably wrong. While holding down the Option key, choose that remote command from the Remote menu and click the Hosts button in the New Remote Command dialog box. When the Connection Settings dialog box appears, select MacTCP and check the IP address that you typed in the "Host Name or Address" box. If you're not sure whether the address is correct, see your system administrator.

The IP or LAP configuration resource is missing.

One of the AppleTalk network drivers, such as the EtherTalk or the TokenTalk® driver, is either not selected or improperly installed. To identify the problem, follow these steps:

1. Open the control panel and see which network icon is selected. (See “Configuring the MacTCP Driver,” earlier in this module, for detailed instructions.) If an icon is selected, go to step 2.

If no icon is selected, follow the instructions in “Selecting Your Network Type” to select the correct one. Next, follow the instructions in “Configuring the MacTCP Driver.” Now try starting MacX again. If the error recurs, see your system administrator.

If no icons appear in the control panel, then your System Folder does not contain any network drivers. To install the EtherTalk driver, consult the *Apple Ethernet NB User's Guide*. Next, install and configure the MacTCP driver as described earlier in this module.

2. If an icon is selected, its corresponding driver in your System Folder may have become corrupted or been improperly installed. Follow the instructions in the user's guide for that AppleTalk driver to reinstall it. For example, if you selected the EtherTalk driver, refer to the *Apple Ethernet NB User's Guide*. Be sure to use the installer program to reinstall the driver, rather than simply dragging a new driver into your System Folder. After reinstalling the driver, go to the control panel and select the network icon again.

The manually set address is configured improperly.

The IP address in the control panel is missing or incorrect. First, check the control panel to verify that an address exists. For instructions, see “Configuring the MacTCP Driver,” earlier in this module. Next, contact your system administrator either to get an IP address or to verify that the existing address is correct.

The specified command action was not completed within the timeout period.

Too much time has elapsed for your command to be performed. Probably the network was busy and took so long to transmit your command that MacTCP assumed that your connection had dropped. This condition is usually temporary, so try reissuing your command.

The TCP connection went down.

The communications path between you and your host computer has been broken. For example, the gateway to your host may have shut down, your host may have shut down, or the coaxial cable that connects your Macintosh to your Ethernet network may have come loose. Since the disconnection might be temporary, first try reconnecting to the host with which you lost contact. After trying to reissue your remote command a few times with no success, check the network cable at the back of your Macintosh to ensure that it is firmly attached. If it is, call your system administrator for further assistance. (Also see “Network-Related Problems,” later in this section.)

There are too many TCP and/or UDP streams open to open another.

You have opened the maximum number of TCP/IP connections (64) that can be established at the same time. In other words, you cannot open another host session until you close an existing connection. Close an existing connection (by logging off a host computer on the TCP/IP network, for example) if you want to establish a new connection.

This domain name does not exist.

The domain name server does not recognize the domain name specified in the MacTCP administrator dialog box. Verify that you have entered this name correctly; you may have misspelled it. (The section “Specifying Settings in the Administrator Dialog Box,” earlier in this module, explains how to display the MacTCP administrator dialog box.)

Unable to initialize the local network handler.

This error can occur for a variety of reasons. For example, you may have filled in the MacTCP administrator dialog box incorrectly, or there may be something wrong with your Ethernet connection. Make sure that you have configured the MacTCP driver according to the instructions given earlier in this module. Verify that your EtherTalk card and software are installed correctly and that the jumper on your EtherTalk card is set for the right type of cable. (Also see the next section, “Network-Related Problems.”)

Network-related problems

If one of the scenarios in the following list describes a problem that you're having, the problem could be related to the network hardware or software that you're using.

The Control Panel (version 6.0.x) or Control Panels folder (version 7.0) is missing.

The Control Panel or Control Panels folder is present on all startup disks. If you're using more than one startup disk, your Macintosh may switch to a disk without the Control Panel or Control Panels folder installed. The icon of the current startup disk appears in the upper-right corner of the desktop.

Use the Installer application from the *System Tools* disk (version 6.0.5 or a later version) to update your System file. The Installer automatically reinstalls the Control Panel or Control Panels folder.

The MacTCP icon is missing from the Control Panel (version 6.0.x) or Control Panels folder (version 7.0).

In this case, one of the following conditions exists:

- You don't have the EtherTalk 2.0 software installed correctly on your startup disk. See the documentation for the Ethernet card that you are using.
- The MacTCP icon has been removed from your System Folder. You must reinstall the MacTCP software. See the *Installation* part of the *Network Services User's Guide*.
- Your startup disk has the wrong version of the Control Panel or Control Panels folder. You must use version 3.1 or a later version. (The version number appears in the lower-left corner of the Control Panel in version 6.0.x.) Use the Installer application from the *System Tools* disk (version 6.0.5 or a later version) to update your System file. The Installer automatically reinstalls the Control Panel or Control Panels folder.

You can't select the MacTCP icon in the Control Panel (version 6.0.x) or Network panel (version 7.0). A message appears, advising you that the network package has not been installed correctly.

The EtherTalk 2.0 software has not been installed properly on your startup disk. See the documentation for the Ethernet card that you are using.

Neither the EtherTalk icon nor the Ethernet icon appears in the Control Panel (version 6.0.x) or Network panel (version 7.0) after you click the MacTCP icon.

One of the following conditions exists:

- You don't have the EtherTalk 2.0 software installed correctly on your startup disk. See the documentation for the Ethernet card that you are using.
- The EtherTalk file has been removed from your System Folder. You must reinstall the EtherTalk 2.0 software. See the documentation for the Ethernet card that you are using.
- There is no Ethernet card in your Macintosh, or the card is not working properly. If a card is installed, see its documentation.

Two or more EtherTalk or Ethernet icons appear in the Control Panel (version 6.0.x) or Network panel (version 7.0) when you click the MacTCP icon.

One of the following conditions exists:

- You have multiple Ethernet cards installed. The number in parentheses next to each icon's name identifies the slot containing the card.
- Earlier versions of EtherTalk software exist on your startup disk. Earlier versions are identified by single-arrow icons; icons for version 2.0 (or later versions) are identified by double arrows. PATHWORKS™ for Macintosh® requires that you use EtherTalk version 2.0. See the documentation for the Ethernet card that you are using.

If you want to remove the previous version of EtherTalk, find its icon in the System Folder and drag it to the Trash.

You can't select the EtherTalk or Ethernet icon in the Control Panel (version 6.0.x) or Network panel (version 7.0). A message appears, advising you that an error occurred while trying to install EtherTalk.

You did not start your Macintosh with an EtherTalk startup disk, or the disk that you used has become damaged. Try reinstalling the EtherTalk 2.0 software. See the documentation for the Ethernet card that you are using.

You are unable to select an EtherTalk or Ethernet icon in the Control Panel (version 6.0.x) or Network panel (version 7.0) to switch the network connection. A message appears, advising you that the connection cannot be changed now, or that doing so will disrupt a critical service that your computer provides (such as an AppleShare® file server or a router).

If you can't switch the network connection, quit all applications and try switching the network connection again. If you still can't switch network connections, and you don't mind disrupting services that your computer provides or is using, shut down your Macintosh. Then restart your computer, using a startup disk that permits network-connection changes. Finally, try switching the network connection again.

Your Macintosh computer "hangs" (does not respond to the mouse and keyboard actions).

Your Macintosh may hang for a minute or so when you select an EtherTalk or Ethernet icon, or when you start up your computer. The computer can hang if it is not correctly connected to the Ethernet cable or the Ethernet card is not configured correctly. See the documentation for the Ethernet card that you are using.

The Connection Settings dialog box does not list any network services or does not list the service that you want.

- If no network services appear, check the physical connection between your Macintosh and the network. See the suggestions later in this section for checking your network.
- If a particular service does not appear, the service may be in a different zone, malfunctioning, switched off, or disconnected from the network. There may also be trouble in the network cables between your Macintosh and the missing service. See the suggestions for checking your network in “Ethernet Troubleshooting Checklist,” later in this section. You can also contact your system administrator to find out if there are known problems with the network.
- If you switched the network connection in the Control Panel (version 6.0.x) or Network panel (version 7.0), as described earlier in this module, while the Connection Settings dialog box was open, the services listed in the dialog box may not have been updated. Close the Connection Settings dialog box and reopen it to view the services on the newly selected network.

Ethernet troubleshooting checklist

Here's a checklist to consult whenever you're having trouble with the Ethernet network:

- Are all cables secure?
Make sure that the network cable to your Ethernet card is secure at all connections. Also check the network cable to the service that you're trying to use. Contact your system administrator if you are uncertain about cable configuration.
- Is the problem really related to the network?
Sometimes a problem that seems to be related to the network is actually related to the device or application program that you're using. The manual for the device or application may be helpful.
- Is your Ethernet card installed and set correctly?
Shut down your Macintosh and make sure that the Ethernet card is firmly seated in its slot. Also, make sure that any jumpers and switches are set properly. See the documentation for your Ethernet card.
- Is the application that you want to use available on your network?
You may have more than one network to which you can connect. Use the Control Panel (version 6.0.x) or MacTCP control panel (version 7.0) to select the proper network connection. For instructions, see "Selecting a Network" in Chapter 2 of the *MacX User's Guide* part of this binder.

DECnet Connection Tool

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The DECnet™ Connection Tool allows you to make a connection between MacX™ and a DECwindows™ client by using the DECnet protocols.

This reference module tells you how to confirm that DECnet is properly configured and then describes the DECnet connection settings that allow you to use the DECnet Tool with MacX. This module also lists alert messages that may appear while you are using the DECnet Tool and provides possible explanations and solutions.

What you need

The *Installation* part of the *Network Services User's Guide* provides installation procedures for PATHWORKS™ for Macintosh and describes all of the components, including those related to the DECnet Connection Tool. The following list summarizes the software components required for the DECnet Connection Tool and indicates where each component must be installed.

- Macintosh Communications Toolbox—installed in the System file if you're using system software version 6.0.x. If you're using version 7.0, the Macintosh Communications Toolbox is installed automatically in your Macintosh system.
- DECnet Tool—installed in the Extensions folder (version 7.0) or Communications Folder (version 6.0.x).
- DECnet/Mac—installed in the Extensions folder (version 7.0) or Communications Folder (version 6.0.x).

Confirming your DECnet configuration

Before you can use the DECnet Tool with MacX, you must have DECnet properly configured as described in the *Network Services User's Guide*. Your system administrator has probably already provided all the information necessary to configure DECnet, such as assigning your computer a valid node number. However, you may have to establish many of the settings yourself by following the procedures in the *Network Services User's Guide*.

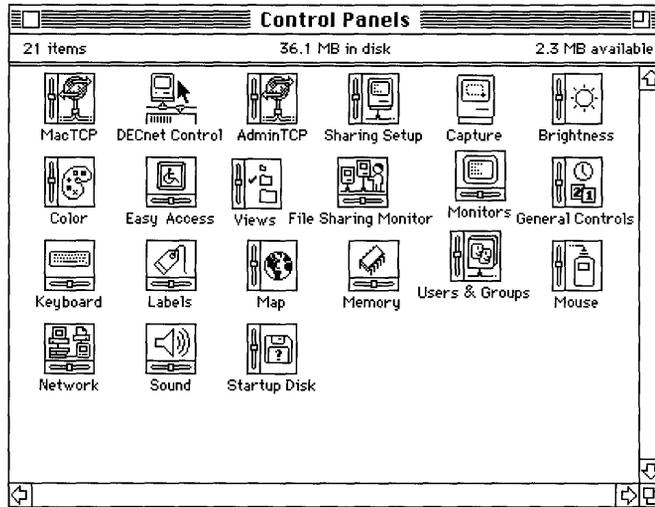
You can confirm the state of your DECnet configuration by opening the Control Panel (version 6.0.x) or DECnet control panel (version 7.0) and checking the settings displayed in its window.

If you're using version 7.0

To open the DECnet control panel:

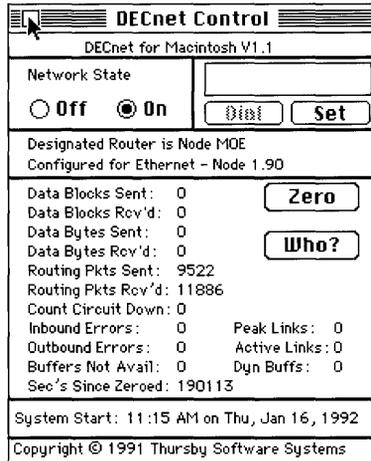
1 Choose Control Panels from the Apple (🍏) menu.

The Control Panels window opens.



2 Double-click the DECnet Control icon.

The DECnet control panel appears.



3 Confirm that the Network State is On and that other configuration information in the DECnet control panel is valid.

If DECnet does not seem to be properly configured or you have any questions about your configuration, ask your system administrator for help or see the *Network Services User's Guide* for more information.

4 Close the DECnet control panel.

5 Close the Control Panels window.

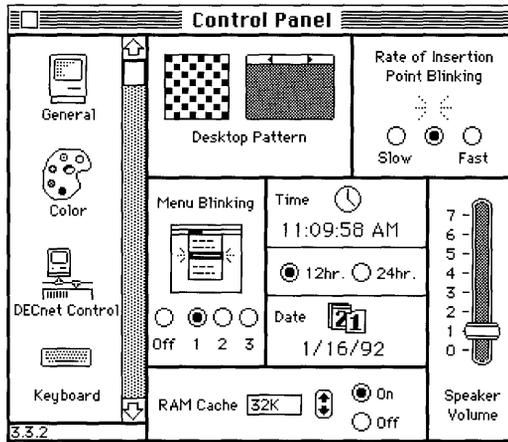
If DECnet is properly configured, go to “DECnet Connection Settings,” later in this module, to learn how to use the DECnet Tool with MacX.

If you're using version 6.0.x

To display the DECnet settings in the Control Panel:

1 Choose Control Panel from the Apple (🍏) menu.

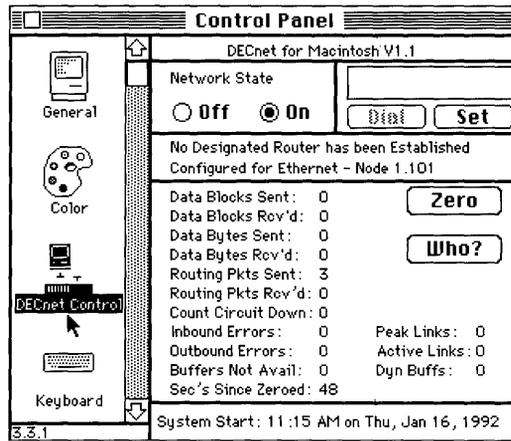
The Control Panel window opens.



2 Select the DECnet Control icon from the group of icons on the left side of the Control Panel window.

You may need to use the scroll bar to find the icon.

The Control Panel displays the DECnet Configuration settings.



3 Confirm that the Network State is On and that the other DECnet configuration information in the Control Panel is valid.

If DECnet does not seem to be properly configured or you have any questions about your configuration, ask your system administrator for help or see the *Network Services User's Guide* for more information.

4 Close the Control Panel window.

If DECnet is properly configured, go to the next section, "DECnet Connection Settings," to learn how to use the DECnet Tool with MacX.

DECnet connection settings

You can use the DECnet Tool to specify a connection to the VAX™ computer to which you want to connect.

To access the Connection Settings dialog box, you click the Host button on the right side of the MacX New Remote Command dialog box. See your system administrator for the values you need to supply in the New Remote Command dialog box. (For information on the New Remote Command dialog box, see Chapter 3 in the *MacX User's Guide*.)

To use the DECnet Tool:

1 Start MacX and choose New Command from the Remote menu.

The New Remote Command dialog box appears.

The screenshot shows the 'New Remote Command' dialog box with the following settings:

- Remote Command:** run sys\$system:decw\$session
- Command Name:** SessMgr on Moe
- Display:** (0) B&W Rootless
- Output:** Save
- Username:** smith
- Password:** (empty)
- Execute at Startup
- Save Password
- Buttons:** Host..., Execute, Set, Cancel

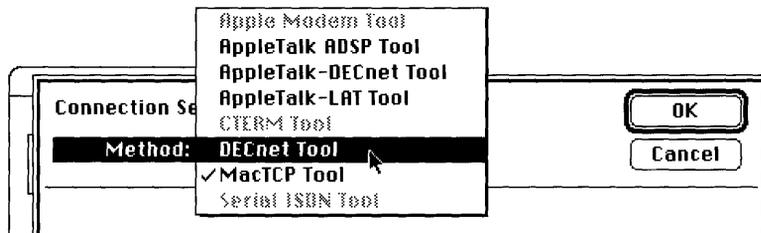
2 Fill in the New Remote Command dialog box with the settings your system administrator gave you.

The settings include the type of command you use to connect to the VAX, how the data is displayed on your screen, your user name, and your password.

- 3 When you've finished entering the values in the New Remote Command dialog box, click the Host button.

The Connection Settings dialog box appears.

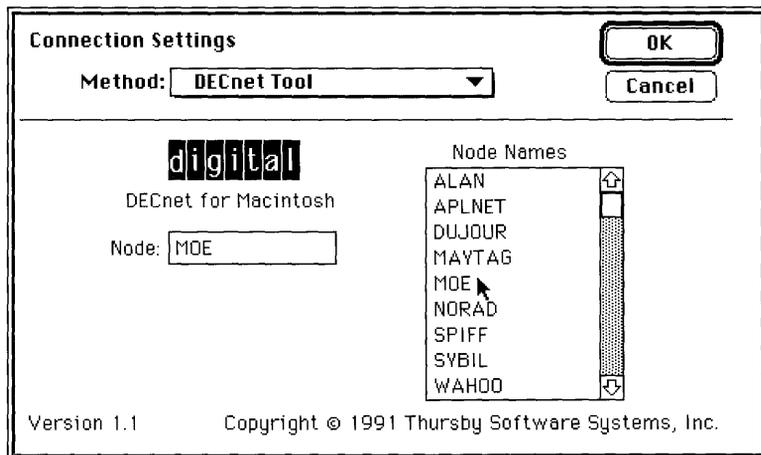
- 4 Choose DECnet Tool from the Method pop-up menu, in the upper-left corner of the dialog box.



The lower part of the dialog box changes to display the settings for the DECnet Tool.

- 5 In the Node Names list, select the name of the node that offers the service you want to use.

The name you selected appears in the Node box. (You can also type the node name directly into the Node box.)



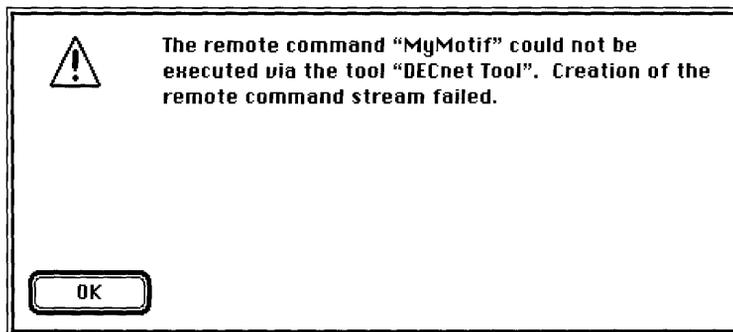
6 Click the OK button.

The Connections Settings dialog box disappears and you return to the New Remote Command dialog box.

7 In the New Remote Command dialog box, click the Execute button to start the connection.

Troubleshooting hints

If problems arise while you are using the DECnet Tool to communicate with a host on a DECnet network, your Macintosh displays one or more of the error messages listed in this section. Each message appears in an alert box similar to the one shown in the following figure.



Problems can occur in different places while you are making a DECnet connection. If your Macintosh is connected to a wide area network, many alert messages may appear. Some of the common messages, and solutions to the problems indicated by the messages, are listed in this section. In many cases, however, you will need to contact your system administrator for a description of the problem and a possible solution.

If one of the following alert messages appears while you are using the DECnet Tool, try opening a new connection. If you still have problems, contact your system administrator.

A third party has terminated your DECnet link.

An application or program that you are using, other than MacX or DECnet, broke the connection. Try again to make the connection.

An invalid username was specified for the DECnet connection.

The user name that you entered in the Connection Settings dialog box is not correct. Open the Connection Settings dialog box and make sure that you've entered your user name and password correctly. If you have, ask your system administrator if you are using the correct user name.

Either your username or password is incorrect.

The user name or password (or both) that you entered in the Connection Settings dialog box are not correct. Open the Connection Settings dialog box and make sure that you've entered your user name and password correctly; then try opening the connection again. If the problem persists, ask your system administrator if you are using the correct user name and password.

No resources for a new link.

The VAX to which you are trying to connect does not have enough resources, such as available memory, to establish a new link.

The DECnet link was disconnected.

The DECnet task name was not known at the remote node.

The task or service (such as VMS™ Mail) to which you are trying to connect could not be located. Open the Connection Settings dialog box and make sure that you've correctly entered the name of the task or service. (See "DECnet Connection Settings," earlier in this module.)

The remote DECnet application aborted your link.

The VAX computer you are connected to is using an application that in turn terminated the link.

The remote DECnet node has insufficient resources for this connection.

The VAX to which you are trying to connect does not have enough resources, such as available memory, to establish this connection. Try again to make the connection.

The remote DECnet node is not reachable.

The node to which a connect request has been sent is unreachable.

The remote DECnet node is shutting down.

The destination Session Control is in the *SHUT* or *RESTRICTED* state and therefore cannot handle incoming connect requests. *SHUT* and *RESTRICTED* refer to conditions imposed by the system administrator on incoming connections to the VAX.

The remote DECnet node terminated the link.

The remote DECnet user cancelled or aborted your connect request.

The user you are trying to connect with is having a problem establishing or maintaining a connection, thereby disrupting your connection request.

The remote DECnet user disconnected the link.

The user at the destination terminated the link. Try to make the connection later.

The remote DECnet user disconnected without giving a reason.

The remote DECnet user has insufficient resources for this connection.

The user you are trying to connect with does not have enough resources to establish this connection. Resources include the correct user name or password.

The remote system exceeded the available network links.

The destination system does not have sufficient resources to handle a new logical link.

Your DECnet connection was rejected because of an invalid username or password.

The user name or password (or both) that you entered in the Connection Settings dialog box are not correct. Open the Connection Settings dialog box and make sure that you've entered your user name and password correctly; then try opening the connection again. If the problem continues, ask your system administrator if you are using the correct user name and password.

Your DECnet connection was rejected because of an unacceptable account.

Your DECnet connect request contained unacceptable account information. This information helps administrators log time spent on the VAX for billing and other financial tracking. Account information generally consists of a user name, password, and some text name such as a project name that is specific to the account. Confirm that your account information is correct.

Your DECnet is turned off.

Your DECnet software is not running. Open the Control Panel (if you have system software version 6.0.x) or the DECnet control panel (if you have system software version 7.0) and make sure that the DECnet State is turned on.

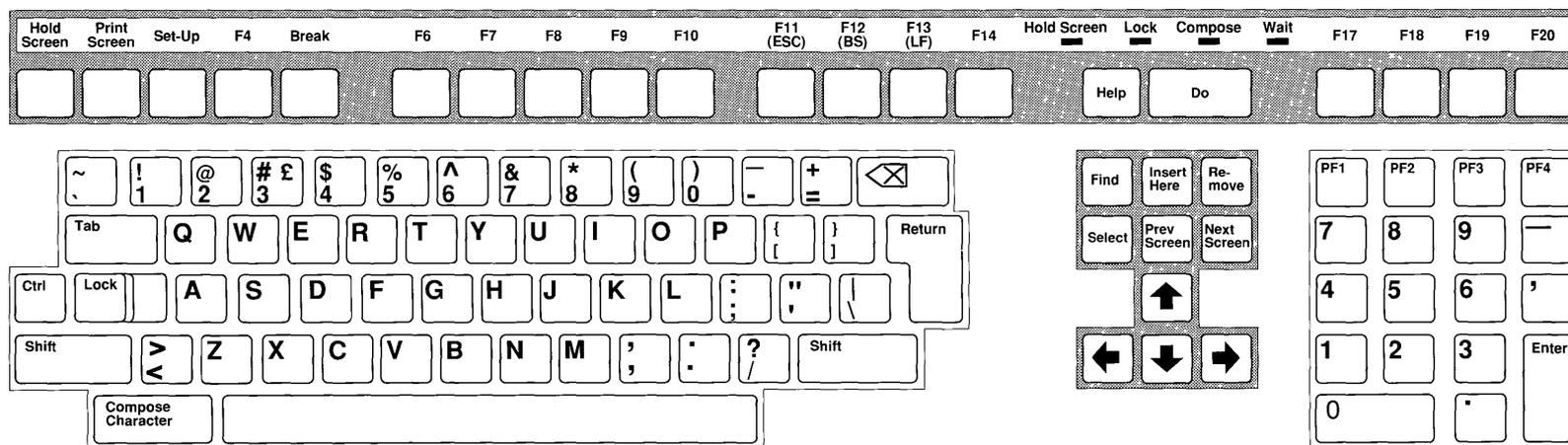


MacX™ Keyboard Mapping

Quick Reference Card

VT300™ Keyboard (North American/United Kingdom version)

Digital Equipment Corporation



This Quick Reference Card presents the different keyboard mappings available for use with MacX. Four different mappings are provided:

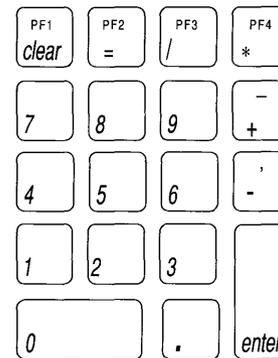
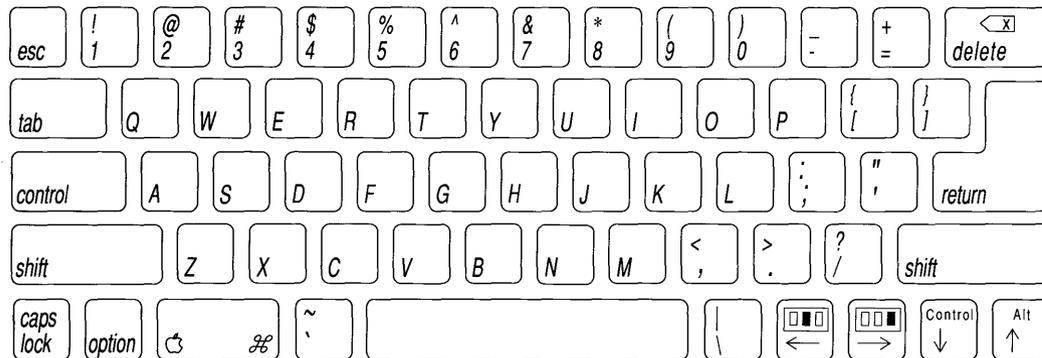
- Positional Mapping for Apple® (ADB) Extended Keyboard
- Inscriptional Mapping for Apple (ADB) Extended Keyboard
- Apple Standard (ADB) Keyboard Mapping
- Macintosh® Plus Standard Keyboard Mapping

Each of the mappings changes the meaning of certain keys on your keyboard to match keys on the VT300 keyboard. Two of the mappings—Positional and Inscriptional—reconfigure the Apple (ADB) Extended Keyboard.

The Positional mapping reassigns keys on the Apple (ADB) Extended Keyboard to match as closely as possible their *position* on the VT300 keyboard. The Inscriptional mapping reassigns keys on the Apple (ADB) Extended Keyboard to match their *meaning* as closely as possible to VT300 keys. The two mappings for the Standard keyboards reconfigure the Macintosh keyboards to perform VT300 functions when you use the Command key with keys on the numeric keypad.

See the *MacX User Update* for additional information, including how to install the keyboard mappings.

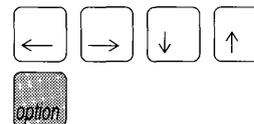
Apple Standard (ADB) Keyboard Mapping



DEC key	Macintosh	DEC key	Macintosh	DEC key	Macintosh
Find	0 *	F10	7 *	PF1	*
Select	. *	F11	8 *	PF2	*
Insert	←	F12	9 *	PF3	*
Prev Screen	↑	F13	+ *	PF4	*
Next Screen	↓	F14	4 *	subtract	*
Remove	→	F15 (Help)	5 *	comma	*
⌫		F16 (Do)	6 *	Alt	
F6	*	F17	- *	Control	
F7	= *	F18	1 *	Middle mouse button	
F8	/ *	F19	2 *	Right mouse button	
F9	* *	F20	3 *		

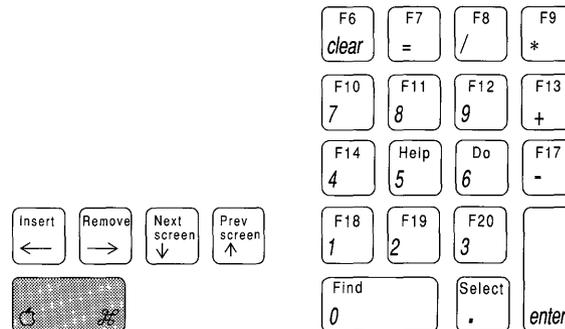
* Keys marked with an asterisk indicate keys on the numeric keypad.

Option with arrow keys

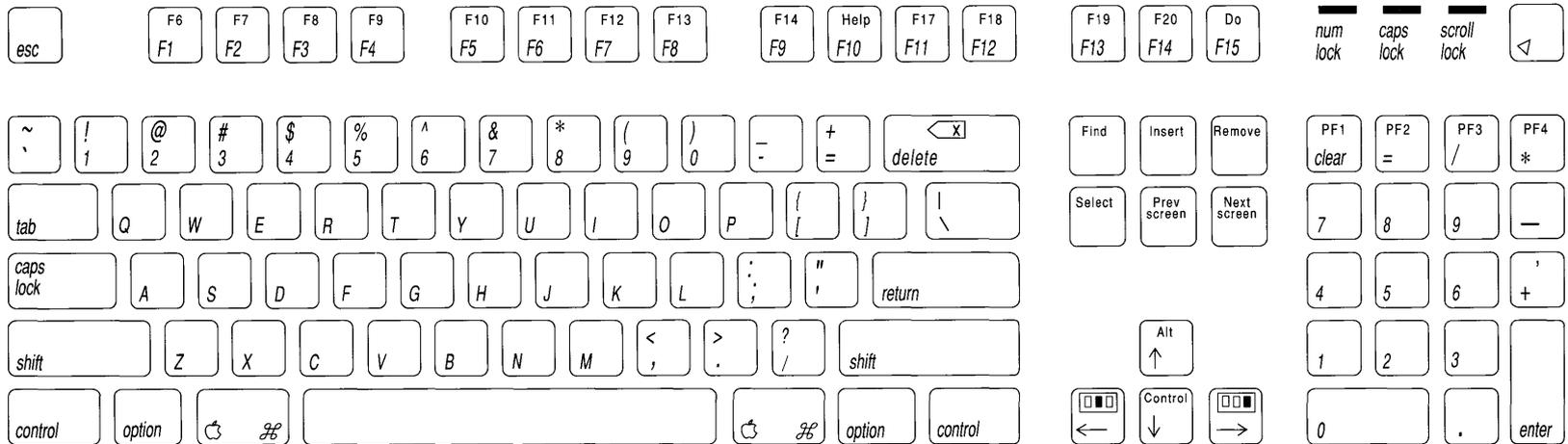


Note: This chart shows the default mappings for the arrow keys when used by themselves and when used with the Option key. See "Arrow Keys Mapping" on this card for additional information.

Command with arrow keys . . . and keypad



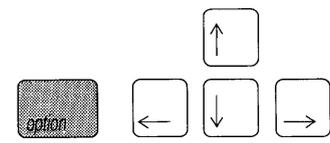
Positional Mapping for Apple (ADB) Extended Keyboard



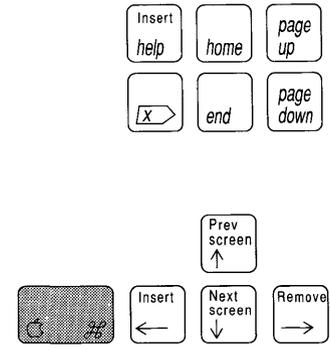
DEC key	Macintosh	DEC key	Macintosh	DEC key	Macintosh
Find		F10		PF1	*
Select		F11		PF2	*
Insert		F12		PF3	*
Prev Screen		F13		PF4	*
Next Screen		F14		subtract	*
Remove		F15 (Help)		comma	*
		F16 (Do)		Alt	
F6		F17		Control	
F7		F18		Middle mouse button	
F8		F19		Right mouse button	
F9		F20			

* Keys marked with an asterisk indicate keys on the numeric keypad.

Option with arrow keys

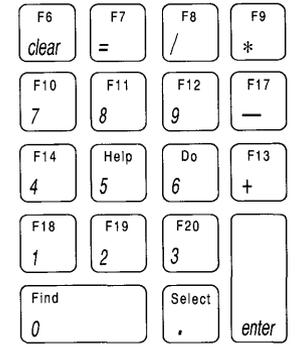


Command with Arrow Keys ...

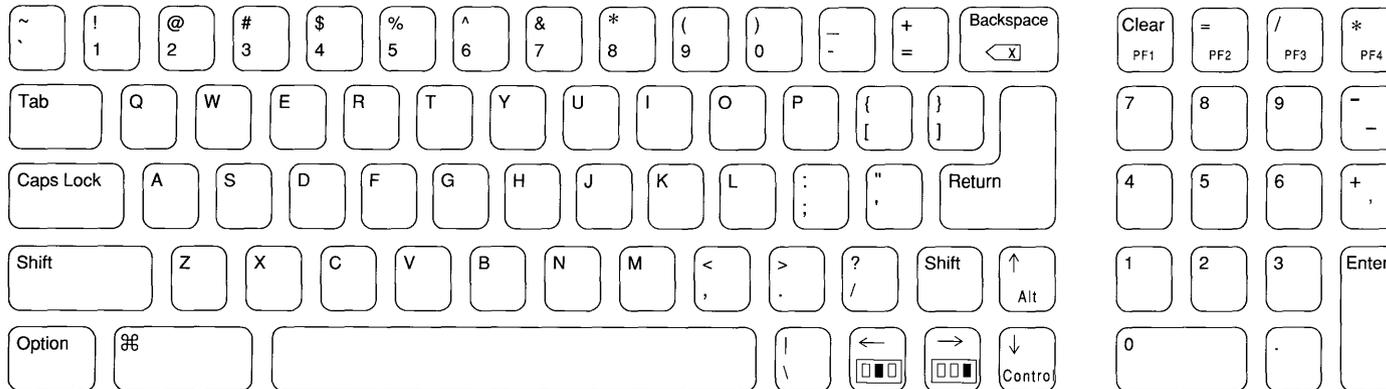


Note: This chart shows the default mappings for the arrow keys when used by themselves and when used with the Option key. See "Arrow Keys Mapping" on this card for additional information.

and keypad



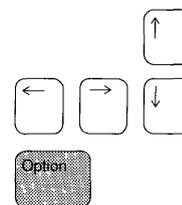
Macintosh Plus Standard Keyboard Mapping



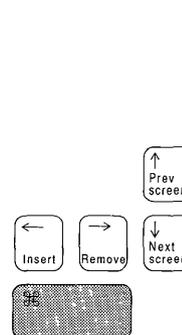
DEC key	Macintosh	DEC key	Macintosh	DEC key	Macintosh
Find	⌘ 0 *	F10	⌘ 7 *	PF1	Clear *
Select	⌘ . *	F11	⌘ 8 *	PF2	= *
Insert	⌘ ←	F12	⌘ 9 *	PF3	/ *
Prev Screen	⌘ ↑	F13	⌘ - *	PF4	* *
Next Screen	⌘ ↓	F14	⌘ 4 *	subtract	- *
Remove	⌘ →	F15 (Help)	⌘ 5 *	comma	+ *
⌘ X	Backspace	F16 (Do)	⌘ 6 *	Alt	↑
F6	⌘ Clear *	F17	⌘ * *	Control	↓
F7	⌘ = *	F18	⌘ 1 *	Middle mouse button	←
F8	⌘ / *	F19	⌘ 2 *	Right mouse button	→
F9	⌘ * *	F20	⌘ 3 *		

* Keys marked with an asterisk indicate keys on the numeric keypad.

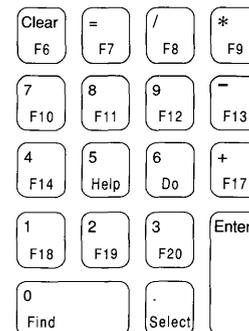
Option with arrow keys



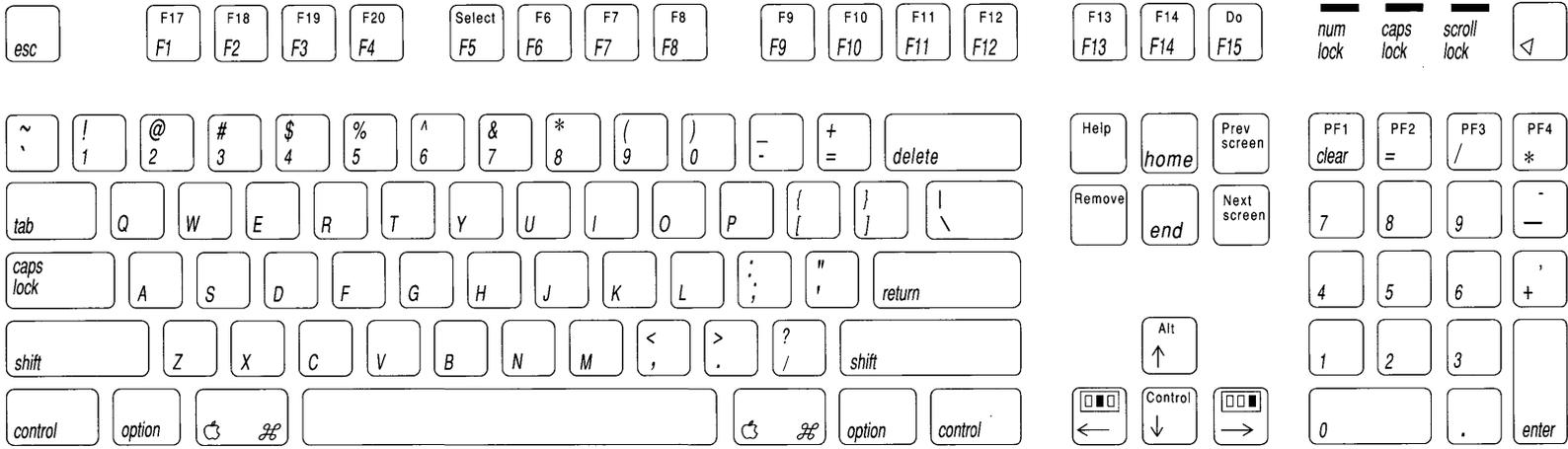
Command with arrow keys . . . and keypad



Note: This chart shows the default mappings for the arrow keys when used by themselves and when used with the Option key. See "Arrow Keys Mapping" on this card for additional information.



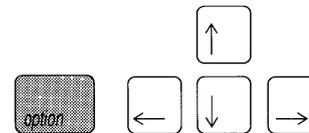
Inscriptional Mapping for Apple (ADB) Extended Keyboard



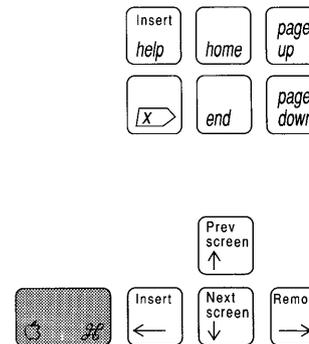
DEC Key	Macintosh	DEC Key	Macintosh	DEC Key	Macintosh
Find	0 *	F10		PF1	*
Select		F11		PF2	*
Insert	help	F12		PF3	*
Prev Screen		F13		PF4	*
Next Screen		F14		subtract	*
Remove		F15 (Help)	help	comma	*
		F16 (Do)		Alt	
F6		F17		Control	
F7		F18		Middle mouse button	
F8		F19		Right mouse button	
F9		F20			

* Keys marked with an asterisk indicate keys on the numeric keypad.

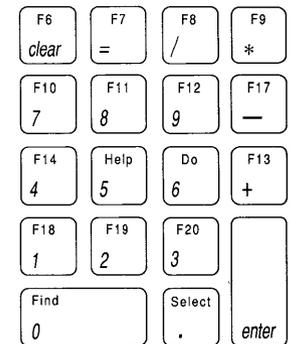
Option with Arrow Keys



Command with Arrow Keys . . . and keypad



Note: This chart shows the default mappings for the arrow keys when used by themselves and when used with the Option key. See "Arrow Keys Mapping" on this card for additional information.



Arrow Keys Mapping for All Macintosh Keyboards

Note: This chart shows the default mappings for the arrow keys when used by themselves (simulating the Alt [meta] key, control key, and middle and right buttons on a three-button mouse) and when used with the Option key (acting as regular arrow keys). By changing the Mouse Buttons Simulated By option in the Miscellaneous Preferences dialog box, you can reverse the mapping so that the arrow keys act as regular arrow keys *when used by themselves* and simulate the Alt (meta) key, control key, and middle and right buttons on a three-button mouse *when used with the Option key*. The relevant portion of the Miscellaneous Preferences dialog box appears to the right.



Represents middle button on a three-button mouse



Represents right button on a three-button mouse

