

Introduction

NCSA Telnet for the Macintosh® Version 2.6 provides interactive access from a Macintosh to telnet hosts on TCP/IP networks. NCSA Telnet is an implementation of DARPA standard telnet. You can have simultaneous connections to numerous computers across the network, and a standard file transfer (FTP) server lets you transfer files to and from other remote machines and users.

This introduction presents an overview of the capabilities and features of NCSA Telnet for the Macintosh. The organization and use of this manual are described and notational conventions explained.

Special Features

Special features of NCSA Telnet include:

- VT102/VT220 emulation
- FTP client
- File transfer server (standard FTP)
- Simultaneous telnet connections to a number of computers
- Tektronix 4014 and 4105 emulation
- Color raster graphics capabilities
- Domain name lookup using MacTCP
- Scrollback with ability to print and copy
- User-defined macro keys
- Customized window arrangement facility
- Support for window contents of fewer or greater than 24 lines
- Support for any font, font size, or color
- Line-mode support (RFC 1184)
- Encrypted telnet sessions
- Authenticated telnet sessions

Differences between NCSA Telnet 2.5 and NCSA Telnet 2.6

The following are the features added in the 2.6 version:

- Encrypted sessions
- Authenticated sessions
- Support for the Cornell Kerberos driver
- Support for Translation Tables
- Graphical configuration
- Support for PAGE UP, PAGE DOWN, HOME, and END keys
- EMACS mode for arrow keys
- MacBinary II support
- Resizable TEK windows
- VT printing escape sequence support
- Support for "CDUP" FTP server command
- Optional inhibiting of TEK emulation
- Two paste modes, "quick" and "block"
- Directly specified answerback message
- Xterm "Change Window Title" sequence support
- Telnet functionality integrated into NCSA Telnet
- Default transfer directory for each FTP user
- Optional FTP ISO translation

2 > NCSA Telnet for the Macintosh®

User modification of default filetype and creator type for binary files

User modification of creator type of text files

Change window title

The following are the features from NCSA Telnet 2.5 that are no longer available in the Version 2.6:

Serial Connections

SLIP Connections via built in drivers

The NCSA TCP/IP drivers

Upgrade notes for NCSA Telnet 2.5 users

The most important difference between NCSA Telnet 2.5 and NCSA Telnet 2.6 is the removal of all external configuration files. All of the parameters of NCSA Telnet 2.6 can and must be configured from within the application. NCSA Telnet 2.6 maintains all of its configuration in the file "NCSA Telnet Preferences," which is stored in the Preferences folder of your System folder. This file is not in a user editable format. Although the config.tel file is no longer required, it is recommended that you retain a copy in the event you have to use an older version of NCSA Telnet.

Bugs fixed from NCSA Telnet 2.5

Many of the bugs present in NCSA Telnet 2.5 have been corrected in the 2.6 version. The bugs and problems that have been fixed include:

"Next Session" unnecessarily redrawing windows

Dropped connections ignoring don't go away option

Several memory leaks

System Requirements

To run NCSA Telnet for the Mac Version 2.6, you need a Macintosh with System software version 6.0 or later and MacTCP.

Installation Note

This manual assumes that NCSA Telnet for the Macintosh® Version 2.6 has been installed on your system by a system or network administrator who has assigned an IP address to your Macintosh.

Using This Manual

This section describes the scope and organization of this manual as well as the conventions and nomenclature used in developing it.

Before using NCSA Telnet for the Macintosh, you should know how to use the mouse, issue commands from menus, work with windows, and locate files using directory dialog boxes. If you are unfamiliar with the Macintosh user interface or need more detailed information regarding these procedures, please refer to your Macintosh user's guide.

Manual Contents

This manual is organized into the following chapters and appendices:

Chapter 1, "Getting Started," introduces the basic steps in using NCSA Telnet for the Macintosh: starting the program; opening and closing connections to a remote host; setting a terminal type; emulating the VT keyboard; copying, pasting, and printing; and quitting the program.

3 > NCSA Telnet for the Macintosh®

Chapter 2, "Configuration," describes changing the configuration settings, setting the characteristics of connection windows, using saved sets, defining macros, and customizing other NCSA Telnet operations.

Chapter 3, "Advanced Features," discusses working with multiple connections, telnet options, configuring authentication and encryption, and network-related commands.

Chapter 4, "File Transfer," explains how to transfer files between a Macintosh and any FTP host on the network.

Chapter 5, "Tektronix 4014 and 4105 Emulation," describes how to use the graphics capabilities of NCSA Telnet.

Chapter 6, "Interactive Color Raster Graphics," introduces the Interactive Color Raster (ICR) protocol and describes how you can use it to display color graphics with NCSA Telnet.

Appendix A, "Error Conditions," describes some of NCSA Talents error messages as well as their causes and solutions.

Appendix B, "VT Compatibility and Escape Sequences," contains information regarding NCSA Telnet's implementation of the VT series of terminals.

Appendix C, "Obtaining NCSA Software," describes how to get NCSA software via an anonymous FTP server, an archive server, or U.S. Mail.

Notational Conventions Used in This Manual

Material in this manual is presented in text, screen displays, or command-line notation. Different typefaces indicate different functions.

New concepts or terms are generally in italic type when they first occur in text to indicate that they are defined in the paragraph.

Cross references within this manual usually include the title of the referenced section or chapter enclosed in quotation marks (e.g., see Chapter 1, "Starting Quitting NCSA Telnet").

Boldface type represents characters you enter as shown (*literal expressions*).

Lowercase italic type represents a *variable*, a placeholder for the text you actually enter. A variable can consist of different characters each time you make the entry.

Throughout this manual, you may be instructed to enter specific characters on the keyboard. These entry instructions (*command lines*) are printed in Courier boldface type (e.g., dothis) and appear either within a paragraph or on a separate line. Command lines are normally entered in lowercase.

Helvetica boldface type (e.g., the **Cancel** button) represents boxes and buttons in dialog boxes, command names on pull-down menus, and menu names.

Keys that are labeled on your keyboard with more than once character, such as the RETURN key, are identified by all uppercase letters in normal font. Keys that you are to press simultaneously or in succession are linked with a hyphen (e.g., press SHIFT-OPTION-d).

Getting Started

This chapter introduces and describes the basic steps involved in using NCSA Telnet for the Macintosh® Version 2.6:

- invoking the program
- opening and closing a telnet connection
- copying, pasting, and printing the contents of session windows
- exiting the program

The chapter assumes that your system or network administrator has already installed NCSA Telnet on your system, assigned an IP address to your Macintosh, and given you a login name and password for the computer to which you want to connect. For information regarding installation and customization procedures, refer to Chapter 2, "Configuration."

It is also assumed that you already know how to click and drag using the mouse, move and resize windows, and select items from menus. If you are unfamiliar with the Macintosh user interface or need additional information regarding these procedures, please refer to your Macintosh user's guide.

Beginning a telnet Session

Invoke NCSA Telnet by double-clicking on the NCSA Telnet file or application icon. The NCSA Telnet application icon is shown below:

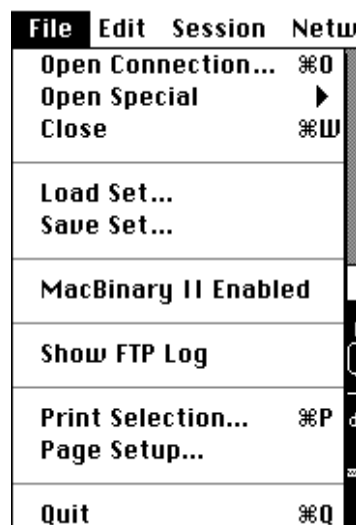


A "splash box" introducing NCSA Telnet appears on your screen, then disappears.

Opening a Connection

To open a connection to a host:

Select **Open Connection** from the **File** menu:

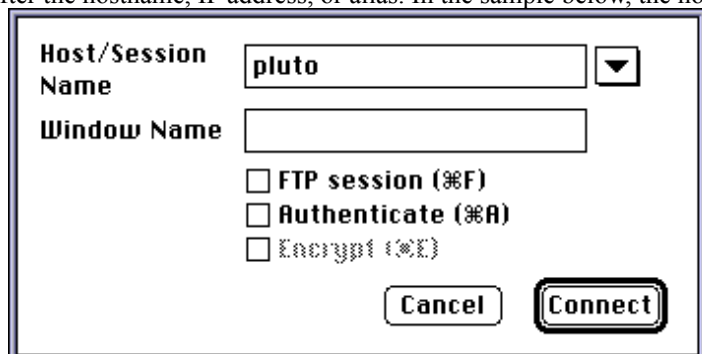


The Connection modal dialog box appears.

Fill out the Connection dialog box. In the **Host/Session Name** box, enter the name of the host to which you want to connect. The session name can be any hostname, IP address, or an alias. You may optionally append an alternate port number to connect

5 > NCSA Telnet for the Macintosh®

to after the hostname, IP address, or alias. In the sample below, the hostname is pluto:



The screenshot shows a dialog box with the following elements:

- Host/Session Name:** A text field containing "pluto" and a small downward-pointing arrow button to its right.
- Window Name:** An empty text field.
- FTP session (%F)**
- Authenticate (%A)**
- Encrypt (%E)**
- Buttons:** "Cancel" and "Connect" (the "Connect" button is highlighted with a thick border).

In the **Window Name** box, you may enter any name you wish for the connection's window. This optional feature is not necessary with single connections but is very useful when you open multiple connections. If you do not specify a window name, the connection's window title will be set to the contents of the **Host/Session Name** box, with a number appended.

If you want to connect as an FTP client, click the **FTP Session** box in the Connection dialog box. For information regarding the FTP client, see Chapter 4, "File Transfer."

If you want to start an authenticated or encrypted connection, click the **Authenticate** box in the Connection dialog box. **Authenticate** must be checked if you wish to use encryption. For information regarding authentication and encryption, see the section "Authentication and Encryption," in Chapter 3, "Advanced Features."

Click the **Connect** button in the Connection dialog box, or press the RETURN key on your keyboard.

NCSA Telnet attempts to connect to the host you specify, a process that generally takes only a few seconds. When a connection is established, a connection window appears. The Window Name you specify in the Connection dialog box appears both in the title bar of the connection window and in the **Connections** pull-down menu.

For alternative ways to open a connection, for session names other than the hostname, and for a discussion of aliases, see Chapter 2, "Configuration." For working with multiple sessions, see Chapter 3, "Advanced Features."

Logging on to Your Host

The connection's window indicates the name and type of your host machine and prompts you to enter your login name. For example, if you attempt to connect to a Sun system dubbed pluto, the login prompt may look like this:

SunOS UNIX (pluto)

login:

To log on:

Enter your login name at the login prompt and press RETURN. The host prompts you to enter your password.

Enter your password and press RETURN.

From this point on, NCSA Telnet operates as a VT102 or VT220 terminal remotely connected to the host.

NOTE: The response time of a host can vary. If the remote host is heavily loaded, a few minutes may elapse after the connection opens before the host prompts you to log on.

Setting the BACKSPACE/DELETE Key

6 > NCSA Telnet for the Macintosh®

NCSA Telnet automatically translates BACKSPACE/DELETE keypresses into delete codes, for compatibility with systems that prefer delete to backspace. If your backspaces are not accepted, the host you are using may accept only backspace codes.

To test this possibility, follow the instructions below to change the setting of the BACKSPACE/DELETE key to backspace. This steps reset the default translation so that the key sends a backspace code. If your backspaces are now accepted, the host prefers backspace codes.

To change the setting of the BACKSPACE/DELETE key, select the desired keycode to be sent (BACKSPACE or DELETE) from the top of the **Session** menu. For more information regarding the configuration of the BACKSPACE/DELETE key, see the section "Session Configuration Records" in Chapter 2, "Configuration."

Setting a Terminal Type

NCSA Telnet can emulate a VT102 or VT220 terminal. When you log on to a host, the host operating system does not always know what type of terminal you are using. For instructions on setting terminal type, consult the operating system manual for the host you are using.

Try setting the terminal type to VT100 or VT102. For systems that do not support VT102 (such as many UNIX systems), use VT100 or tab132 (which is compatible with VT102 emulators).

The following examples show how to set the terminal type for two popular operating systems and hosts, UNIX (using the C shell) and VAX/VMS.

For UNIX operating system using a C shell and VT100 terminal type:

```
pluto% set term=vt100;tset
```

For UNIX operating system using a C shell and VT220 terminal type:

```
pluto% set term=vt220;tset
```

For VAX/VMS operating system:

```
B$ set term /inq
```


Emulating the VT Terminal keyboard

When NCSA Telnet is running, your Macintosh appears to the host as a VT series terminal. Keystrokes for keys common to the Macintosh and VT series keyboards are transmitted by NCSA Telnet without modification. However, the VT series keyboard has some keys that the Macintosh keyboard does not have and also treats or labels other keys differently. In addition, many VT series keys have special meanings when they are transferred to the host.

You can use the Macintosh keyboard to provide full VT220 functionality. Macintosh key commands that correspond to key commands on a VT series terminal are listed below. Note that the numeric keypad on the Macintosh is identically positioned to that of the VT series terminal, although the labels differ. If you are accustomed to using a VT series keypad, you can ignore the Macintosh labels and enter as usual.

VT Series Key	Macintosh Plus Keyboard	Apple Desktop Bus Keyboard
Backquote-	-Backquote† -	-Backquote†
	OPTION-Backquote	OPTION-Backquote†
ESC††	Backquote	ESC <i>or</i> Backquote
DELETE†††	BACKSPACE	DELETE <i>or</i> DEL
BACKSPACE†††-	OPTION-BACKSPACE	OPTION-DELETE
LINE FEED	CONTROL-J	CONTROL-J
PF1	CLEAR on keypad	CLEAR on keypad
PF2	/ on keypad	/ on keypad
PF3	= on keypad	= on keypad
PF4	* on keypad	* on keypad
CONTROL-SPACEBAR(NUL)	OPTION-SPACEBAR	CONTROL-SPACEBAR
Keypad keys	Keypad keys	Keypad keys

7 > NCSA Telnet for the Macintosh®

† Using -Backquote is necessary if the "Remap Backquote to ESCape" option is on.

†† Use of the Backquote key as ESC is governed by the setting of the

Remap backquote to ESCape option in the Global Preferences modal dialog box.

††† See the discussion of the BACKSPACE/DELETE key above.

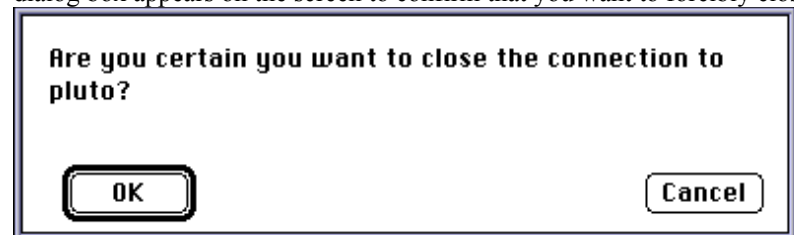
For more information regarding NCSA Telnet's emulation of the VT series of terminals, refer to Appendix B, "VT Compatibility and Escape Codes," and Chapter 2, "Configuration." Information regarding the VT220 function keys can also be found in Appendix B.

Closing a Connection

To close a connection to your host, use the logout procedure specific to that system. For example, on a UNIX system you enter the UNIX logout command at the command-line prompt:

```
pluto% logout
```

If you cannot log out in this manner, select **Close** from the **File** menu. A Close Connection modal dialog box appears on the screen to confirm that you want to forcibly close the connection.



Click on the **OK** button in the dialog box or press the RETURN key on your keyboard.

After you log out, the connection's window disappears. You can now safely quit the NCSA Telnet application.

Copying, Pasting, and Printing

NCSA Telnet lets you copy, paste, and print the contents of your connection windows. Before doing any of these operations, first select (*highlight*) a region of text from the window.

To *copy* highlighted text of a window *as is*, choose **Copy** from the **Edit** menu.

To *copy* highlighted text of a window *as a table*, choose **Copy Table** from the **Edit** menu. White spaces in the highlighted text are replaced by tabs, according to the setting of the Copy Table Threshold in the Global Preferences dialog box, so you can paste the table into a word-processing program such as Microsoft Word or into a spreadsheet program such as Microsoft Excel.

To *paste* the contents of the Clipboard into a session window, choose **Paste** from the **Edit** menu.

To *print* highlighted text:

Choose **Page Setup** from the pull-down **File** menu, specify the desired printing parameters in the Print dialog box that appears, and click the **OK** button in the dialog box or press the RETURN key on your keyboard.

Choose **Print Selection** from the **File** menu. Specify the number of copies, printer feed, and other parameters in the Print dialog box that appears, then click the **OK** button or press the RETURN key on your keyboard.

For more information regarding the **Page Setup** or Print dialog boxes, refer to your Macintosh user's guide.

8 > NCSA Telnet for the Macintosh®

NOTE: Copying and pasting are also discussed in Chapter 5, "Tektronix 4014 and 4105 Emulation," and Chapter 6, "Interactive Color Raster Graphics." The **Copy Table Threshold** settings are discussed in the "Global Preferences" section of Chapter 2, "Configuration."

Quitting NCSA Telnet

To exit NCSA Telnet, select **Quit** from the **File** menu.

NOTE: NCSA Telnet for the Mac lets you quit the application at any time during the program's execution; however, to avoid loss of data or other complications, whenever possible you should close connections to each system *before* quitting NCSA Telnet. If you do attempt to quit the application before closing current connections, a dialog box appears to confirm that you want to forcibly close the connections. If you do, click the **OK** button in the dialog box or press the RETURN key on your keyboard; if you do not want to forcibly close connections, click the **Cancel** button in the dialog box.

Configuration

NCSA Telnet for the Macintosh® allows you to customize the environment to suit special needs and habits. This chapter describes the configuration system used by NCSA Telnet for sessions, the use of saved sets, and the several global preferences.

Configuration of the file transfer related services is described in Chapter 4, "File Transfer."

Configuration Overview

NCSA Telnet has several preference options that effect every session or the operation of NCSA Telnet in general. Those preferences are described in the section "Global Preferences."

NCSA Telnet 2.6 utilizes an entirely new configuration system. Previously, NCSA Telnet required an external text file named config.tel. That file contained several keywords that specified the user's preferences. The configuration system for NCSA Telnet 2.6 is entirely graphical in nature and does not require any external user-editable files.

Connection Preferences System Rationale and Overview

NCSA Telnet's configuration system for connections is comprised of two parts, "Sessions" and "Terminals". Ideally, all of the configuration options for a connection would be combined into one entity. However, due to the great number of options for each connection, the options have been divided into the aforementioned categories. The "terminal" configuration record contains the options that pertain primarily to the terminal emulation done by NCSA Telnet. The "session" configuration record contains the remaining options. Each session configuration record has a terminal configuration record associated with it. The terminal record associated with a given session record is entirely up to the user.

The <Default> Session and Terminal Configuration Records

The <Default> terminal and session configuration records are set to reasonable defaults when NCSA Telnet is launched for the first time. The user may change the preferences in the <Default> records, but the <Default> records may not be deleted.

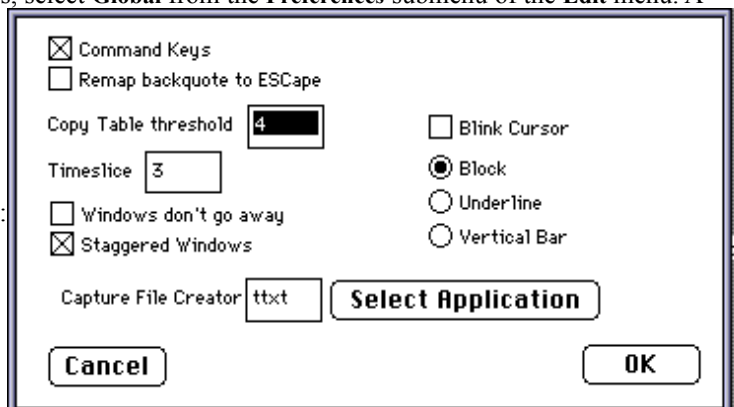
The <Default> session and terminal records are used when the user enters a hostname in the open connection dialog box. The preferences contained in the <Default> records are used as the defaults for any connection that does not have a preconfigured session or terminal record. The <Default> records are also used to set the initial values of any new terminal or session configuration records the user may define.

Global Preferences

10 > NCSA Telnet for the Macintosh®

To edit the Global Preferences, select **Global** from the **Preferences** submenu of the **Edit** menu. A

modal dialog box will appear:



Each of these options are described in the following sections.

Command Keys

When **Command Keys** is checked, the menus are configured to accept command key equivalents.

Note: When NCSA Telnet is running on a Macintosh that has no control key, NCSA Telnet will remap the key to the control key if **Command Keys** is not checked. If **Command Keys** is checked on such machines, the user will have no way to generate control key characters.

Remap Backquote to ESCape

When **Remap backquote to ESCape** is checked, NCSA Telnet sends the ESCape character to the remote host when the ``` key is pressed. This is useful for users with the original Macintosh or Macintosh Plus keyboards. This option, however, is available to users regardless of their keyboard type. Pressing -` will always produce a backquote character, regardless of the setting of this option.

Copy Table Threshold

The **Copy Table Threshold** value determines the number of spaces which, at a minimum, are replaced by tabs when the user issues the **Copy Table** command from the **Edit** menu or press -T. Instead of using the standard **Copy** command, the user can use the **Copy Table** command to copy tables of data from the NCSA Telnet screen onto the Clipboard.

When the user uses the **Copy Table** command, all strings of contiguous spaces that are greater than the threshold are turned into tabs before being placed on the Clipboard. This produces a format that can be pasted into most spreadsheet and graphing programs without losing data or requiring additional formatting.

Timeslice

The **Timeslice** value determines how much time NCSA Telnet gives to other applications that may be running. Increasing this value reduces NCSA Telnet's responsiveness, but improves the performance of the applications in the background. The value is measured in sixtieths of a second.

Windows Don't Go Away

When **Windows Don't Go Away** is checked, session windows remain open after their associated connections have terminated. The window title is placed within parenthesis to signify that the associated connection has closed. To close such a window, click in the window's close box, or select **Close** from the **File** menu.

11 > NCSA Telnet for the Macintosh®

This feature allows the user to view, copy, and print text that is in a window whose connection has been closed. It is also useful for reading connection error messages that occur with hosts which may close connections immediately after they are established due to an error.

Staggered Windows

When the user selects the **Staggered Windows** option, the program staggers multiple windows by a whole title bar, allowing the user to see each window's title. Otherwise, NCSA Telnet only staggers each new window by a few pixels.

Blink Cursor

If **Blink Cursor** is checked, NCSA Telnet periodically blinks the cursor present in session windows.

Cursor Selection

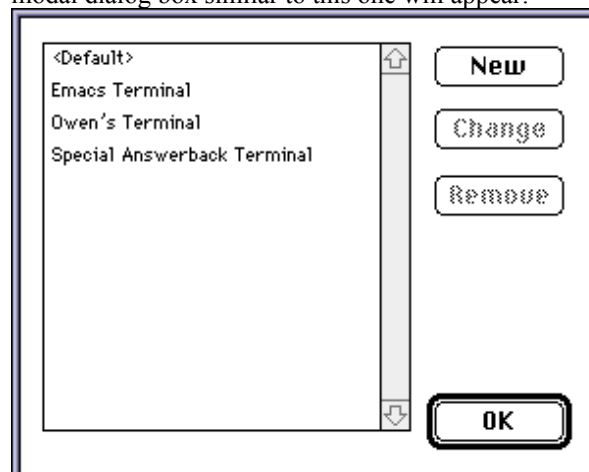
Clicking the appropriate radio button: **block**, **underscore**, or **vertical bar** selects the type of cursor used by NCSA Telnet for the cursor present in session windows.

Capture File Creator

Every file on the Macintosh has a filetype and file creator type. The filetype specifies the type of file (e.g. text file, word processing document, saved set). The file creator type tells the Finder which application to launch when a user double-clicks on a file. NCSA Telnet lets the user specify the creator type given to the files in which NCSA Telnet saves captured text from sessions. If the user knows the four letter creator type for the application the user wishes to specify, type it in the **Capture File Creator** field. If the user does not know the four letter creator type, click the **Select Application** button. NCSA Telnet will present the user with a standard open file dialog box. Double click on the application the user wishes to find the creator type for. NCSA Telnet will then enter the four letter creator type in the **Capture File Creator** field for the user.

Editing Session or Terminal Configuration Records

When the user selects **Terminals** or **Sessions** from the **Preferences** sub-menu of the **Edit** menu, a modal dialog box similar to this one will appear:



To add a new session or terminal, click on **New**. To change an existing terminal or session record click on **Change**. To remove an existing terminal or session record click on **Remove**. The **<Default>** records can not be removed.

Session Configuration Records

12 > NCSA Telnet for the Macintosh®

When the user creates a new session configuration record or change an existing record, the following modal dialog box is used:

The dialog box contains the following fields and options:

- Alias: boom
- Hostname: bonham.zeppelin.com
- Port: 23
- TEK: Inhibit, 4014, 4105
- Paste Method: Quick, Block, 120
- Delete Sends: Delete, Backspace
- Forcesave
- Berkeley 4.3 CR mode
- Allow linemode
- TEK page clears screen
- Half duplex
- Show low level errors
- Authenticate
- Encrypt
- Local Echo
- Interrupt: []
- Suspend: ^S
- Resume: ^Q
- Terminal: <Default>
- Translation Table: None
- Buttons: Cancel, OK

These fields and options are described in the following sections:

Alias

The **Alias** field specifies the name of the session configuration record. Typing the text contained in this box in the **Host/Session Name** field of the **Open Connection** dialog will make NCSA Telnet use the configuration information contained in this session configuration record, as well as the information contained in the terminal configuration record specified by the **Terminal** popup menu in the session configuration record dialog box. **NOTE:** Spaces are not allowed in alias names.

When editing the <Default> session configuration record, the **Alias** field is disabled, as the <Default> records cannot be renamed.

Hostname

The **Hostname** field contains the text passed to MacTCP's Domain Name Resolver (DNR). The Domain Name Resolver translates a host's domain name into an IP address.

Port

The **Port** field specifies the port on which NCSA Telnet will attempt to connect to the remote machine.

TEK Options

There are three choices for Tektronix emulation in NCSA Telnet. **Inhibit** prevents NCSA Telnet from using any Tektronix emulation for this session. **4014** and **4105** select Tektronix 4014 emulation or Tektronix 4105 emulation, respectively.

Paste Method

NCSA Telnet can use two different methods when pasting data into a session. If **Quick** is selected, NCSA Telnet sends all of the data to be pasted to the remote host at once. This method works well for small amounts of text and for sessions involving hosts that are close to the user on the network. For pasting large amounts of text, or when the user is connected to a machine that is slow to respond, the **Block** paste method is recommended. When the Block method is selected, NCSA Telnet sends the data to be

13 > NCSA Telnet for the Macintosh®

pasted to the remote host in sections, or blocks of text. The size of the blocks is determined by the number entered in the field next to the **Block** radio button.

The Delete Key

Some hosts expect the delete character for deleting, others expect the backspace character. Selecting **Delete** or **Backspace** determines what character NCSA Telnet will send to the remote host when the user presses the DELETE character on the user's keyboard.

Forcesave

Forcesave forces NCSA Telnet to always save the contents of the screen to the scrollbar buffer. This option is only for users of full screen VMS environments such as DEC All-In-One.

Berkeley 4.3 CR Mode

This is a special compatibility option for 4.3 BSD UNIX. There is an official UNIX bug fix for this problem, but some hosts may still want CR-NULL to be used as the end-of-line character.

Allow linemode

When **Allow linemode** is checked, NCSA Telnet will negotiate and use linemode with hosts that support it. If this option is not checked, NCSA Telnet will refuse to use linemode.

TEK Page clears screen

When this option is on, NCSA Telnet's Tektronix emulation will clear the current Tektronix window when a Tektronix clear screen command is received. If this option is off, NCSA Telnet will create a new window for the new Tektronix image. Each new screen created in this way has as its name the session name and time. For more information regarding Tektronix drawing mode and the clear screen code, refer to Chapter 5, "Tektronix 4014 and 4105 Emulation."

Half Duplex

This option only applies to hosts that negotiate non-echoing mode but do not expect local line editing. If checked, all character keys are sent and echoed to the screen immediately, otherwise the characters are echoed locally and queued until a RETURN or CONTROL character is sent. This parameter has no effect when local echo is off.

Show low level errors

Turning this option on tells NCSA Telnet to display minor error conditions it normally would not. This can be useful when the user is trying to diagnose a problem with NCSA Telnet.

Interrupt, Suspend, and Resume

NCSA Telnet uses certain key combinations for the telnet functions Interrupt, Suspend, and Resume. The default key assignments for the Interrupt, Suspend, and Resume functions correspond to the traditional interpretation of ASCII characters.

The Interrupt, Suspend, and Resume telnet functions and their default key assignments are discussed below.

Interrupt (CONTROL-C) Function

The Interrupt function sends a telnet interrupt process character that is equivalent to the Interrupt Process command in the **Network** menu (see "Network-Related Commands" section in Chapter 3, "Advanced Features"). The host implementation of telnet is required to listen for and interrupt the current application when this option is received.

14 > NCSA Telnet for the Macintosh®

Interrupt also does a *timing mark* operation. In many implementations of telnet, the user presses CONTROL-C and can wait several minutes before the text stops scrolling on the user's screen. This occurs because the TCP protocol has buffered up to 16K or even 32K bytes of data, which is waiting in the pipeline to be delivered even before the user presses CONTROL-C. To avoid this, NCSA Telnet initiates a process known as timing mark flush when the user issues an interrupt command.

To do timing mark processing, NCSA Telnet sends to the host a special character, which the host echoes back. While waiting for the host to echo, all characters for that session are thrown away. The session appears to pause for up to 15 seconds and then resumes as usual. During the pause NCSA Telnet is throwing away all of the buffered data so that the user does not have to wait for it to be displayed.

Suspend (CONTROL-S) Function

The Suspend function instantly interrupts all output coming from the network. The current session does not produce any more characters on the screen until the user issues the Resume command.

Resume (CONTROL-Q) Function

The Resume function allows character printing to resume to the current session. Resume does nothing unless a Suspend command is in effect.

Terminal Popup Menu

The **Terminal** popup menu selects which terminal configuration record will be used when the alias identifying this session configuration record is used to open a session.

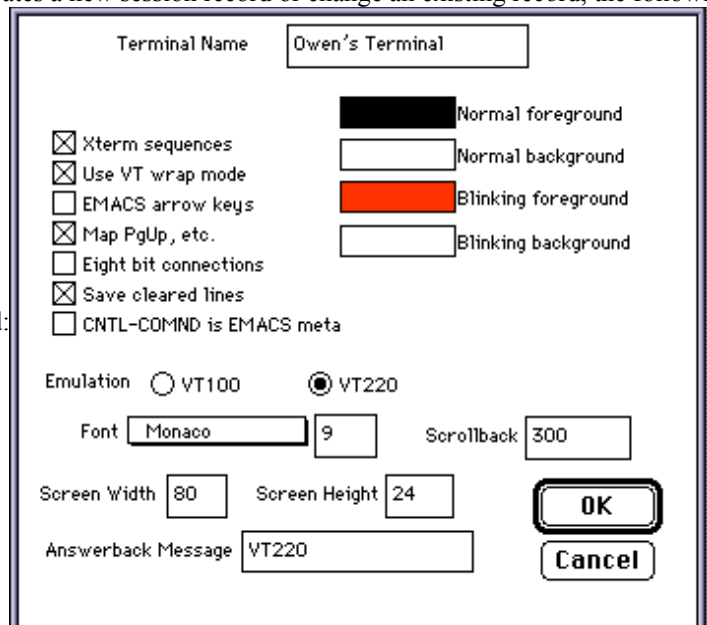
Translation Table Popup Menu

The **Translation Table** popup menu selects which translation table will be initially selected for this session.

Terminal Configuration Records

When the user creates a new session record or change an existing record, the following modal

dialog box is used:



The dialog box is titled "Terminal Configuration" and contains the following fields and options:

- Terminal Name: Owen's Terminal
- Color selection:
 - Normal foreground: Black swatch
 - Normal background: White swatch
 - Blinking foreground: Red swatch
 - Blinking background: White swatch
- Options (all checked):
 - Xterm sequences
 - Use VT wrap mode
 - EMACS arrow keys
 - Map PgUp, etc.
 - Eight bit connections
 - Save cleared lines
 - CNTL-COMND is EMACS meta
- Emulation: VT100 VT220
- Font: Monaco, 9
- Scrollbar: 300
- Screen Width: 80, Screen Height: 24
- Answerback Message: VT220
- Buttons: OK, Cancel

These fields and options are described in the following sections.

Terminal Name

15 > NCSA Telnet for the Macintosh®

This is the name of the terminal that will appear among the other terminal configuration records in the **Terminal** popup menu of the session configuration record dialog. When editing the <Default> terminal record, this field is hidden.

Xterm sequences

When **Xterm sequences** is checked, NCSA Telnet will recognize the Xterm escape sequences for changing window and icon titles. NCSA Telnet will change the title of the session's window in response to those sequences.

Use VT wrap mode

When this option is on, NCSA Telnet will set the VT emulator to use auto-wrap mode by default.

The VT terminal maintains an internal setting to determine whether characters printed off the right hand side of the screen cause the terminal to wrap or not. If the user sets the terminal to wrap, the new characters appear on the next line of the screen and the screen is scrolled if necessary. If the user disables wrap mode, each new character replaces the last character on the current line and the cursor neither moves right nor onto the next line. Whenever the user selects the **Reset Terminal** command in the **Session** menu, wrap mode is disabled.

EMACS arrow keys

When this option is on, the arrow keys will send the appropriate control codes for moving around in the EMACS editor. When this option is off, NCSA Telnet sends the VT codes for the arrow keys. This option also affects the codes sent when the option mouseclick feature is used. See the section "Cursor Positioning with the Mouse" in Chapter 3, "Advanced Features" for more information.

Mapping the PageUp, PageDown, Home, and End Keys

When **Map PgUp, etc.** is checked, NCSA Telnet will use the PAGE UP, PAGE DOWN, HOME, and END keys to move the position in the session's scrollbar buffer, rather than sending the VT codes for these keys to the remote host.

Eight bit connections

When this option is on, NCSA Telnet does not strip the eighth bit from the data it receives.

Save cleared lines

When this option is on, NCSA Telnet saves the screen in the scrollbar buffer before clearing the screen when a VT clear screen code is received. Otherwise, the data on the screen is lost.

CNTL-COMMAND is EMACS meta

When this option is on, pressing CONTROL, COMMAND, and a key is equivalent to pressing Meta and that key on a keyboard that has a Meta key. This option does not allow the sending of Meta Control keys since the CONTROL key is needed to activate this sequence. This option will be changed in the future to better support simulating Meta key sequences.

Emulation

The **VT100** and **VT220** radio buttons select VT100 or VT220 emulation for this connection, respectively.

Font and Size

16 > NCSA Telnet for the Macintosh®

The **Font** popup menu and the size field to the right of the **Font** popup menu allow the user to specify the font and font size to be used for this connection.

Screen Size

The **Screen Height** and **Screen Width** fields allow the user to specify the initial size of the VT emulation screen.

Scrollbar

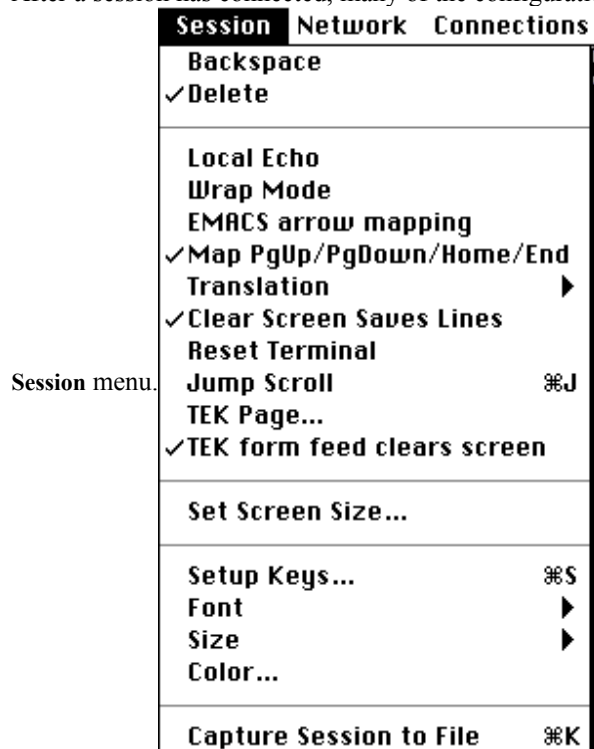
The **Scrollbar** field determines the size, in lines, of the scrollbar buffer.

Screen Colors

The four fields used for setting the foreground and background colors for normal and blinking mode are only visible on color equipped Macintosh computers. When they are present, clicking on any of the boxes will present the standard Color Wheel modal dialog box. The boxes are filled with the current color selection. For additional information on using the Color Wheel modal dialog box, refer to the Macintosh System Software User's Guide.

Changing Configuration After the Session Has Been Created

After a session has connected, many of the configuration parameters can be changed by using the



Each of the items is described in the following sections.

Backspace and Delete

When **Backspace** is checked, the DELETE key sends a backspace character when pressed. If Delete is checked, the DELETE key sends a delete character when pressed.

Local Echo

17 > NCSA Telnet for the Macintosh®

When linemode is not being used, NCSA Telnet can operate in two different echo modes: local and remote. In local echo mode, characters are copied to the screen immediately as the user types them. In remote echo mode, the characters are sent to the host, which sends them back to be printed. When **Local Echo** is checked, NCSA Telnet enters local echo mode.

Wrap Mode

Enables or disables the wrap mode of the VT terminal emulator. Refer to "Use VT Wrap mode" in the section "Terminal Configuration Records" for further explanation.

EMACS arrow mapping

When **EMACS arrow mapping** is checked, the arrow keys send codes appropriate for moving around in the EMACS editor. When **EMACS arrow mapping** is not checked, NCSA Telnet sends the VT codes for the arrow keys.

Map PgUp, PgDown, Home, End

When **Map PgUp/PgDown/Home/End** is checked, NCSA Telnet will use the PAGE UP, PAGE DOWN, HOME, and END keys to move the position in the session's scrollbar buffer, rather than sending the VT codes for these keys to the remote host.



The **Translation** submenu allows the user to choose which translation table will be used for this session. In the case above, no translation is desired.

Clear Screen Saves Lines

This option toggles between saving lines and erasing lines when the VT clear screen code is received. If the user checks the option, all lines currently displayed on the screen are scrolled into the scrollbar region before the screen is cleared. If this option is not checked, the cleared lines are permanently disposed of when the screen is cleared.

Reset Terminal

Select **Reset Terminal** to reset the VT screen, for example when a host program accidentally sets VT graphics mode or fails to leave VT graphics mode. The **Reset Terminal** command resets all VT mode settings, disabling wrap mode, resetting VT graphics mode, resetting the keypad mode to the default, and resetting tabs to every eight spaces.

Jump Scroll

Select **Jump Scroll** to skip to the end of the local buffer.

The **Jump Scroll** option causes the screen to pause and then jump ahead over scrolling text. The text is placed into the scrollbar, but the screen update advances to the end of the local network buffer instead of printing every line on the screen.

The purpose of this feature is to save time. For example, when the user enters a command that produces a great deal of output, the user can use Jump Scroll to avoid waiting for the output to scroll by.

TEK Page

Select **TEK Page** to quickly create or clear a Tektronix emulation window without requiring intervention from host software.

18 > NCSA Telnet for the Macintosh®

Normally the emulation window appears automatically when the clear screen command sequence is received from the host. But the **TEK Page** command creates the window immediately. To clear the current session window, use the **TEK Page** command the same way the user would use the Page key on a real Tektronix terminal. For more information regarding the clear screen command and Tektronix emulation, refer to Chapter 3, "Advanced Features."

The **TEK Page** option is disabled if the user has selected **Inhibit** as the TEK Emulation in the session configuration record used to create this session. Refer to "TEK Options" in the section "Session Configuration Records" for more information.

TEK form feed clears screen

Setting this option forces NCSA Telnet's TEK emulation not to clear the screen when a form feed is encountered. Often TEK images include a form-feed command at the end of them which cause the TEK screen to be immediately cleared upon reaching the end of the image. However, this makes it hard to see the final image of the TEK file.

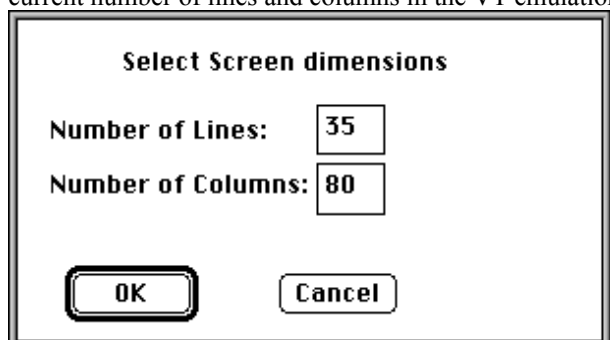
Set Screen Size

Select this option to change the size of the VT emulation screen.

NCSA Telnet's VT emulation screens contain 24 lines by default, because an actual VT terminal screen has room for exactly 24 lines of text. Some host systems allows the user to define a VT-like terminal type which has more or fewer than 24 lines. **NOTE:** The user may change this default by changing the terminal configuration record. Refer to "Screen Size" in the section "Terminal Configuration Records" for more information.

To increase or decrease the size of the VT emulation screen:

Select **Set Screen Size** from the Session menu. A modal dialog box appears, showing the current number of lines and columns in the VT emulation screen.



Change the value as desired.

Click **OK** or press RETURN to return to the user's session window or click **Cancel** to abort the change.

If the user changes the size of the VT emulation screen, the session window will resize to reveal the entire VT screen.

Shortcut

To quickly change the size of the VT emulation screen, hold down **OPTION** before adjusting the size of the window using the size box. As the window changes size, NCSA Telnet recalculates the number of lines in the window and displays the current dimensions in the upper left corner of the window. When the user releases the mouse button, the size of the VT emulation screen will be set. This method is equivalent to using the **Set Screen Size** command. **NOTE:** Resizing a session window without holding down **OPTION** only resizes the Macintosh window and does not change the size of the VT emulation screen.

WARNING: If the user does not have a good working knowledge of how the user's host system makes use of terminals with greater than 24 lines, you are recommended to use only 24-line windows. The following warnings and suggestions assume knowledge of

19 > NCSA Telnet for the Macintosh®

UNIX-based software to control the number of lines for the terminal. Consult your host system documentation or system administrator for more information.

Warnings and Suggestions

The termcap file, (found in UNIX systems only), is commonly located in `/etc/termcap`, and can be set up to include the number of lines on the terminal. The default VT100 termcap includes an explicit setting of 24 lines, so even if you enlarge your NCSA Telnet window, the host uses only the top 24 lines. You can create special termcap entries by editing the `/etc/termcap` file. Copy the VT100 entry to a new name and change the number of lines to your preferred screen size.

Berkeley UNIX-based systems have a special feature in the `stty` program. The number of rows in a session window can be set to any value, and applications programs such as `vi` learn your window size from the `stty` setting. The following command line sets the window size to 33 lines.

```
stty rows 33
```

Using the special macro variable `#`, you can create a macro that issues this command and automatically substitutes the number of lines for the current window. For example, you could define the macro for `⌘-0` as the following.

```
stty rows \#
```

Now, you can set the window size by pressing `⌘-0` and then RETURN. The sequence `\#` is replaced with the proper number of lines.

See the section "Defining Macros" in this chapter for information about creating and saving macros.

Some systems have a program installed called `resize`. `resize` sends a special sequence of VT control characters to NCSA Telnet's VT emulator to determine the size of the screen. If `resize` is available on your system, putting

```
resize > /dev/null
```

in your `.cshrc` or `.login` will automatically set your screen size correctly when you log in. For help using `resize` and determining if it is available at your site, contact your system administrator.

NAWS

NAWS, Negotiations About Window Size, is a relatively new option in the telnet standard. UNIX hosts that support NAWS allow NCSA Telnet to send information to the host regarding the VT window size. Consequently, when the user changes the VT screen size by using the **Set Screen Size** option, the new screen size is sent over the network to the host. In this case, the user does not need to perform the `stty rows` operation. The host knows how big the window is, which eliminates possible problems for screen-oriented applications such as `vi`. NOTE: NAWS is not supported by all UNIX machines. You can determine if the host you are connected to supports NAWS by changing the size of the VT emulation screen and then asking the remote host for the screen size. If the screen size the host responds with matches the new screen size you have just set, the host supports NAWS.

Setup Keys

Select **Setup Keys** to select which keys, if any, issue the telnet commands Interrupt, Suspend, and Resume (see "Interrupt, Suspend, and Resume" in the section "Session Configuration Records" in this chapter.)

Font Submenu

The **Font** submenu contains the fonts that you may use to display text in a session window. When you select a font from this submenu, the current window is resized to contain the text and the selected font is used to display all text in the current window.

NOTE: Fonts which are proportionally spaced (most fonts except Courier and Monaco) display slowly and appear spread out.

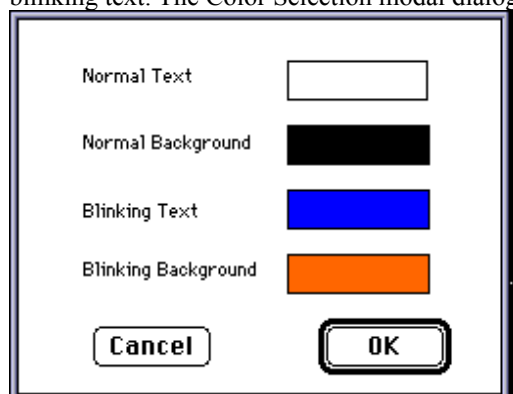
Size Submenu

This option allows you to change the size of text in the current window. The **Size** submenu contains the point sizes that you may use to display text in a session window. The submenu lists several sizes, displays a check-mark next to the current size, and outlines all sizes present in your system. When you select a size from this submenu, the current window is resized to contain all the resized text and the text is redrawn according to the specified point size.

NOTE: Sizes which do not appear outlined in the submenu must be scaled by the system software and therefore may be slow and not as sharply defined as the non-scaled sizes.

Color

The **Color** option only applies to Macintosh computers that are color-equipped. Select **Color** to change the foreground and background colors of the current window for both normal text and blinking text. The Color Selection modal dialog box appears.



To assign a color to text or the background of a session window:

Click the box next to the item to which you wish to assign a color: **Normal Text**, **Normal Background**, **Blinking Text**, or **Blinking Background**. This will bring up the Color Wheel modal dialog box.

Select a new color by clicking in the color wheel. The color you select appears in the top rectangle under the heading **Please Select New Color**.

Click **OK** or press RETURN to enable the color change and return to the Color Selection modal dialog box. The box next to the item you selected in Step 1 reflects the color you chose from the Color Wheel modal dialog box.

Repeat Steps 1 through 4 to assign colors to other items in the Color Selection dialog box.

Click **OK** when you have finished choosing colors. The colors you selected are applied to your current session window.

For additional information on using the color wheel dialog box, refer to your Macintosh System Software User's Guide.

Capture Session to file

NCSA Telnet is able to save the text from a session to a file. When **Capture Session to file** is selected, all normal text output that appears on the screen will also be saved to the file specified by the user in the standard save file dialog presented. This functionality turns on when the user selects this menu item, and turns off when the user again selects the menu item. As is standard with NCSA Telnet, a check will appear in the menu when this option is selected, to inform the user that the text from that session is being captured.

Saved Sets

NCSA Telnet makes it easy for you to begin multiple telnet sessions quickly. This allows you to log on and get right to work without resetting the special characteristics and configuration of a connection each time you start up. This is accomplished through saved sets.

A *set* is a snapshot of the open sessions and their current configuration. A set consists of current macro settings and each session's window location and size, connected host, window name, scrollbar setting, color, font, font size, backspace/delete settings, and all other configuration information.

Saving a Set

To save a set:

Log on to the desired host as instructed in Chapter 1, "Getting Started."

Customize the session by moving the session window to an ideal location on the screen, specifying a background or text color, choosing a font and font size, setting the desired number of scrollbar lines, and choosing the function for the BACKSPACE/DELETE key.

Select **Save Set** from the **File** menu.

A standard file dialog box appears and prompts you to name the set. After naming the set, click on the **Save** button in the dialog box to save the set.

Using a Saved Set

Using sets lets you bypass the start-up procedure described in Chapter 1, "Getting Started." Specifically, you do not need to select **Open Connection** from the **File** menu or press -**⌘**-**O** to open a connection, nor do you need to specify the connection host or window name. These operations are performed automatically when you load a set.

After you load a set, the session window automatically appears for the specified host at the specified location on the screen and with the specified window name, scrollbar setting, color and other characteristics. The following characteristics are saved in a set:

- session name
- hostname
- port number
- window size and location
- scrollback setting
- BACKSPACE/DELETE key setting
- macro definitions
- command key setting
- number of columns
- Tek clear screen setting
- font and font size
- color characteristics
- assigned keys for Interrupt, Suspend, and Resume functions
- CRMAP setting
- "Allow linemode" setting
- eightbit status
- translation table setting
- TEK emulation setting
- answerback message

Loading a set from the Finder

22 > NCSA Telnet for the Macintosh®

To load a set from the Finder and automatically invoke NCSA Telnet, doubleclick on the set icon

or file. The sample below shows the set icon for a set named Setup One.



Setup One

Loading a set from within NCSA Telnet

To load a set from within the NCSA Telnet application, select **Load Set** from the **File** menu. In the standard file dialog box that appears, select and open the set.

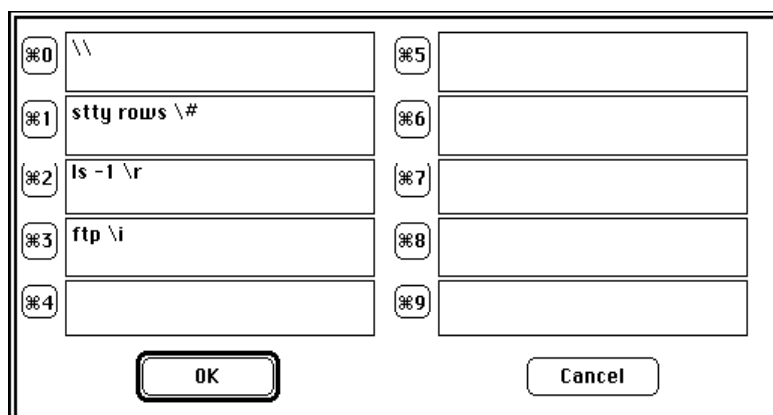
NOTE: You can edit a set datafile using any editor capable of editing files, even if the files are not of the operating system type TEXT. However, NCSA recommends that you do not rely on this feature, as it may not work with future versions of NCSA Telnet.

Defining Macros

NCSA Telnet lets you use the key combinations \mathbb{A} -0 through \mathbb{A} -9 as macro keys. You can program these keys to send from 0 to 255 characters.

To define a macro:

Select **Set Macros** from the **Edit** menu or press \mathbb{A} -M. The Macro Configuration modal dialog box below shows several sample macro definitions.



Click on the button of the command key you wish to define, or select the box next to that button.

Enter the appropriate macro key sequence as instructed in the following section.

Click on the **OK** button in the dialog box (or press the RETURN key) to activate the new macros, or click on the **Cancel** button to invalidate the additions or changes you made. Clicking either the **OK** or **Cancel** button returns to the application.

Reverting to the Previous Macro Definitions

While you are working in the Macro Configuration dialog box, you can undo changes you made to a macro and revert the associated command key to its previous setting by clicking on the button corresponding to that command key. For example, to undo changes to the definition for \mathbb{A} -2, click on the button labeled \mathbb{A} 2. To simultaneously abandon all changes you have made, click on the **Cancel** button.

Entering Macro Key Sequences

The key sequences used to generate special control characters in a macro may seem somewhat strange, unless you are familiar with the C programming language. To define a special character, you must first enter a backslash (\). Indicate nontypable control

23 > NCSA Telnet for the Macintosh®

characters with their equivalents in the octal numbering system. Below are some common macro key combinations you might want to enter:

Desired Character	Definition
Backslash (\)	\\
TAB	\t
ESC	\033
CONTROL-C	\003
CONTROL-D	\004
CONTROL-E	\005
CONTROL-H <i>or</i> BACKSPACE	\010
Size of current window†	\#
Internet address of this Macintosh††	\i

† Concerns setting the number of usable lines in a session window. See the "Using the Session Menu" section of this chapter.

†† See also the discussions of the **Show Network Numbers** command in the "Network-Related Commands" section of Chapter 3, "Advanced Features," and of the **Send IP Number** command in the "Transferring Files" section of Chapter 4, "File Transfer."

Saving Macros

Currently, the only way to save the macro settings is in a set file. See the section "Saved Sets" in this chapter for more information regarding sets. NCSA plans to extend the macro capability of NCSA Telnet in future versions.

Advanced Features

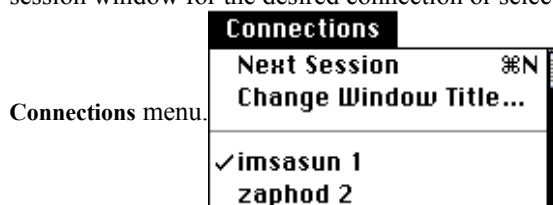
This chapter covers more advanced aspects of the working environment of NCSA Telnet for the Macintosh®. It describes how to open multiple sessions, change window titles, position the session cursor using the mouse, use authentication and encryption, and use telnet options and network-related commands.

Opening Multiple Connections

NCSA Telnet allows you to have multiple connections, either to a single host or to several different hosts. To open another connection, just repeat the procedure for opening a connection (presented in Chapter-1, "Getting Started") or load a set as instructed in the section "Saved Sets" in Chapter 2, "Configuration".

The connection with which you are currently working is the *active* session. Generally, its session window appears frontmost on your desktop.

To switch between active sessions and place the active session window in front, either click on the session window for the desired connection or select the associated session name from the



To activate the next session, select **Next Session** from the **Connections** menu. If you are using command-key mode, press **⌘-N** (for next) to activate the session window directly beneath the current session window.

When opening multiple sessions, NCSA Telnet opens new windows on the screen relative to the number of windows currently opened. You can specify that these windows be staggered by just a few pixels or by the whole window title bar. For more information see the "Staggered Windows" subsection of the section "Global Preferences" in Chapter 2, "Configuration."

Rules for Session Names

When you have multiple connections to a single host, it is useful to specify session names (other than the hostname) for the connections. NCSA Telnet allows you to use any of the following for session names:

the host's full Internet address, such as 192.17.22.20.

any session configuration record alias (See the section "Session Configuration Records" in Chapter 2, "Configuration" for more information.)

any name, such as sri-nic.arpa, that can be resolved by the domain-based nameserver.

NOTE: Some systems, such as MFENET, do not use the standard telnet port number 23. If you need access via the telnet protocol to a different port number, in the Open Connection dialog box enter the port number after the session name; the session name and port number must be separated by one or more spaces. For example, to open a connection to port 23 of myhost.network.arpa, enter myhost.network.arpa in the text box labeled **Host/Session Name**. Similarly, to open a connection to port number 911 of the same host, enter myhost.network.arpa 911. Alternate port numbers may also be specified in session configuration records.

The Connections Menu

25 > NCSA Telnet for the Macintosh®

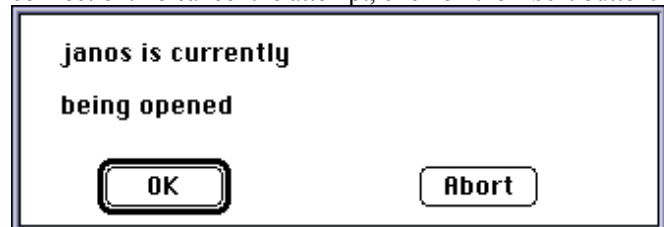
You can specify titles other than session names for your session windows. Doing so allows you to easily distinguish between multiple sessions and session windows.

To specify a window title, enter the name in the **Window Name** box in the Open Connection dialog box.

NOTE: If you leave the window name blank when you open a connection, NCSA Telnet automatically numbers the session. Each time you open a session, the number increases regardless of how many sessions are currently open.

The **Connections** menu contains the window names for current connections as well as the status of each session. A checkmark (☑) next to a window name indicates an active session, and a diamond (◆) or circle (●) next to a session name indicates an attempted connection that has not yet been successfully opened. More specifically, a diamond indicates that NCSA Telnet is checking the nameserver to find the session name or hostname; a circle means NCSA Telnet is trying to open the session. Once the connection is established, the diamond or circle next to the session name goes away and the session window appears.

NOTE: If you do not remember the meaning of the symbols used in the **Connections** menu, just select the connection in question from the Connections menu. The Connection Status dialog box appears to report the name and status of the connection. After reading the message, click on the **OK** button in the dialog box (or press RETURN on the keyboard) to proceed with opening the connection. To cancel the attempt, click on the **Abort** button.



Aborting Connection Attempts

To abort a connection attempt:

Select the desired connection from the **Connections** menu. The Connection Status dialog box appears, reporting the name and status of the connection.

Click on the **Abort** button in the Connection Status dialog box.

Changing a Window Title

By selecting **Change Window Title...** from the **Connections** menu, you may change the window title of the frontmost window.

Telnet Options

The five telnet options provided by NCSA Telnet are included in the **Network** menu:

Network Connections	
Send FTP Command	⌘F
Send IP Number	⌘I
Send "Are You There?"	⌘/
Send "Abort Output"	⌘A
Send "Interrupt Process"	⌘Y
Send "Erase Character"	⌘H
Send "Erase Line"	⌘U
Suspend Network	
Show Network Numbers...	

Send FTP Command

When you select this item, NCSA Telnet sends ftp w.x.y.z (where w.x.y.z is the IP address of your Macintosh) followed by a return character to the remote machine. If the FTP server is in anonymous mode, NCSA Telnet sends ftp -n w.x.y.z followed by a return character to the remote machine, unless the shift key is down. Holding the shift key down forces NCSA Telnet not to use the -n option. See Chapter 4, "File Transfer," for more information about FTP commands.

Send IP Number

After selecting this item, NCSA Telnet sends the IP address of the Macintosh you are using to the remote machine as if you had typed it in manually.

Send "Are You There?"

Every once in a while, perhaps because the host is bombarded with incoming information or tied up by a large number of users, it seems as if the host is not responding to your commands. When this happens and your terminal appears to have locked up, you can verify that you are still connected to the host by selecting **Send "Are You There?"** from the **Network** menu or by pressing --
⌘-/.

The host is supposed to respond, if able, with a readable message. Some machines answer [Yes]; others answer with more informative messages. Use this command whenever you are unsure whether the network and host are up.

Send "Abort Output"

The **Send "Abort Output"** command is supposed to throw away all output from the currently running process and then resume when there is a pause. Very few hosts implement this command correctly.

Send "Interrupt Process"

The Internet standard telnet protocol defines several special commands that NCSA Telnet supports. Each host telnet implementation treats these commands differently, so they may have no effect on some hosts.

Available on nearly every telnet host, the **Send "Interrupt Process"** command stops the current process and throws away all pending data for the connection. The **Interrupt Process** command is equivalent to pressing CONTROL-C on most UNIX systems. NCSA Telnet can also map CONTROL-C to the **Send "Interrupt Process"** command. You can change this key combination using the **Setup Keys** command in the **Session** menu, as described in the "Changing Configuration After the Session Has Been Created" section of Chapter 2, "Configuration."

Send "Erase Character" and "Erase Line"

When you enter commands you can erase the last character or the current line by issuing the **Send "Erase Character"** and **Send "Erase Line"** commands, respectively. Many hosts do not implement these commands, but use their own special characters instead.

Network-Related Commands

Two of NCSA Telnet's network-related commands (**Suspend Network**, and **Show Network Numbers**) appear in the **Network** menu.

Suspend Network Command

To temporarily suspend all network communications, select **Suspend Network** from the **Network** menu. This command disables all receive functions. All of your connections are kept alive, but you do not see any incoming text.

NOTE: Generally you should use the **Suspend** and **Resume** commands discussed in the "Interrupt, Suspend, and Resume" subsection of the section "Session Configuration Records" in Chapter-2, "Configuration," rather than the **Suspend Network** command.

Show Network Numbers Command

Since NCSA Telnet now uses MacTCP for all network communications, this item is largely unnecessary. However, for purposes of continuity, this item will display a dialog box with your Macintosh's IP address if selected. This command does not transmit your IP address. Click on the dialog box to remove it.

Cursor Positioning with the Mouse

You can use the mouse to position the session cursor when using a full screen editor that supports the arrow keys, such as vi. Holding **OPTION** down while the mouse cursor is over a session window will change the mouse cursor into a rectangle. Pressing the mouse button while the mouse cursor is in the session window and the **OPTION** key is held down will tell NCSA Telnet to send a sequence of arrow keys to move to that position on the screen. **NOTE:** If you are using **EMACS** rather than **vi**, you should set the option **EMACS arrow keys** in the session configuration record, or check the **EMACS arrow mapping** item in the **Session** menu.

Authentication and Encryption

To use Authentication or Encryption, you'll need to get the Kerberos Client extension and KConfig application from NCSA's FTP server. Please refer to Appendix C, "Obtaining NCSA Software" for more information regarding retrieving files from NCSA's FTP server.

NCSA Telnet uses Cornell's Kdriver package for Kerberos and encryption support routines. KConfig, an application written by Rick Watson, is used to configure settings for Kdriver.

If you use a version of the Cornell Kerberos driver obtained from a source besides NCSA, encryption will not be supported, some settings changes made by KConfig won't be saved in the preferences file, and the ticket display may show garbage for the user realm.

Kdriver supports Kerberos V4. Kdriver requires that each Kerberos server host also be running a UDP daytime server.

NCSA Telnet supports the Telnet Authentication and Encryption options described in RFC1411/1416 and IETF drafts dated July 1991. Future versions may support the IETF draft **AUTH_ENCRYPT** option described in the draft dated April 1993.

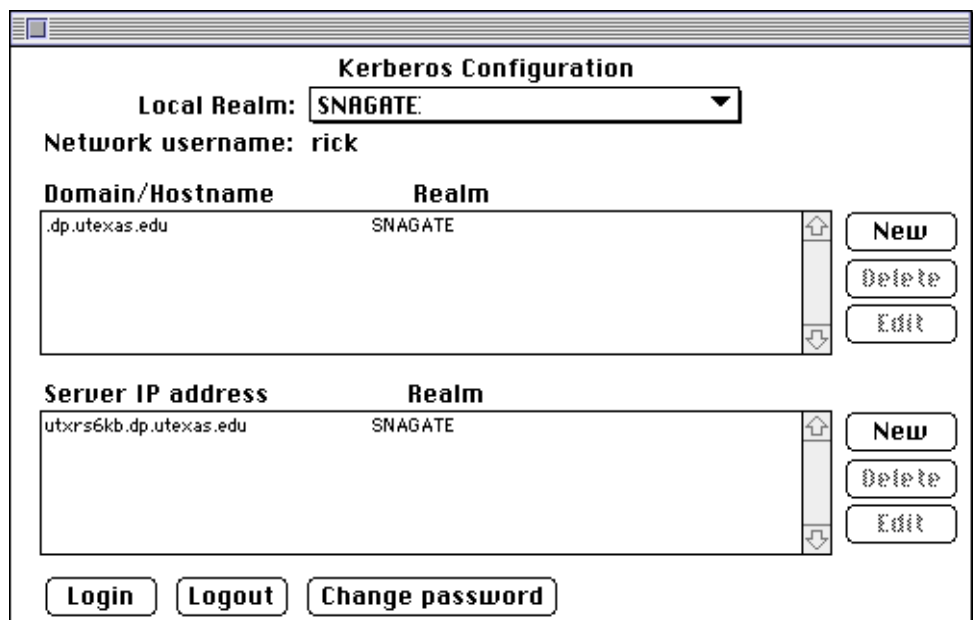
Installation

Kdriver must be installed in your System Folder to work. Drag the Kerberos Client extension to your closed System Folder. On System 7 machines, you will be asked to verify that the file will be placed into your Extensions folder.

Reboot your Macintosh and use KConfig to configure settings for your Kerberos environment.

Using KConfig

This section assumes you are familiar with Kerberos.



Domain/Hostname to Realm maps are useful if you are supporting more than one Kerberos realm. The map will attempt to match up a Kerberos realm with IP domain names.

Enter Kerberos server IP addresses or hostnames for each Kerberos realm that you are using. After you have entered your Kerberos servers, you can pick your local realm using the **Local Realm** popup menu at the top of the configuration dialog.

The **Login** button will allow you to authenticate to a Kerberos server and obtain an initial ticket granting ticket for other services. You don't have to login using KConfig, NCSA Telnet will prompt you when a password is needed.

The **Logout** button destroys all tickets.

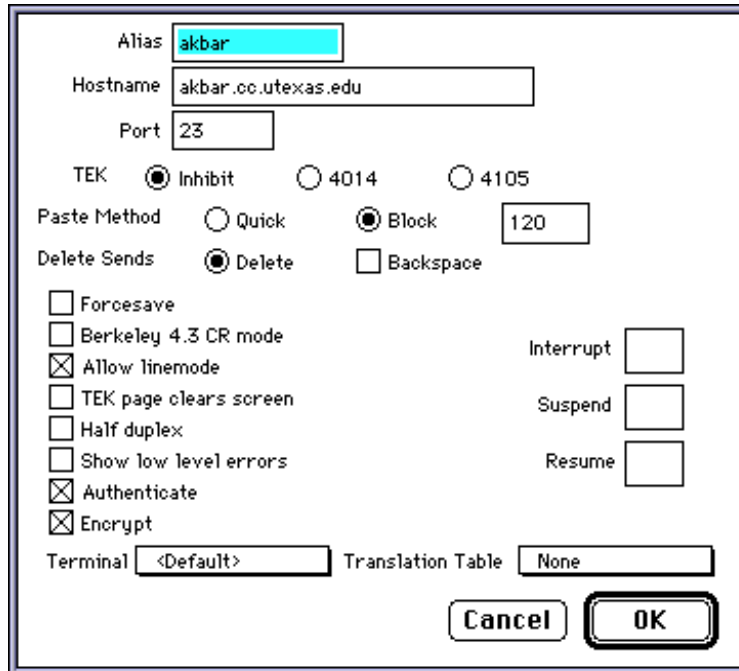
Use the **Show Credentials** menu item in the **File** menu to display all your Kerberos tickets.

The **Change Password** button allows you to change your Kerberos password.

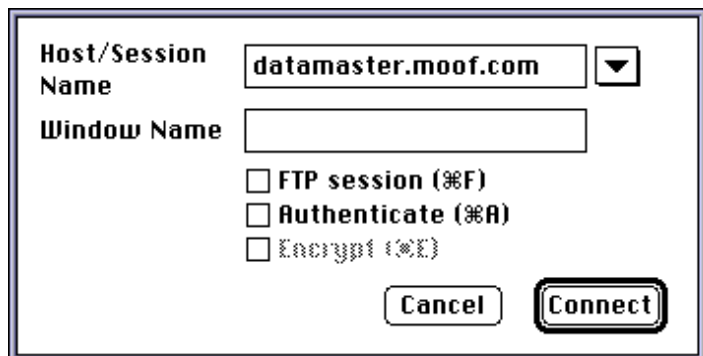
You may (or may not) have to reboot after making initial settings.

Activating Authentication and Encryption in NCSA Telnet

Options to Authenticate and/or Encrypt a session occur in two places in NCSA Telnet.



Select the appropriate options for each session that you configure, including the Default session. Options for the default session will be presented in the Open Connection dialog box.



You may select the **Authenticate** and **Encrypt** options when opening a session. The **Authenticate** option is required for Encryption. Ftp sessions cannot currently be authenticated or encrypted.

Encryption Active Indicators.

Padlock indicators serve as a visual indicator that a session is encrypted. For NCSA Telnet, this is displayed next to the zoom box in the window's titlebar.



If anything other than the padlock is displayed, the session is not two-way encrypted. An arrow indicates that the session is encrypted in one direction only. This is probably evidence of a bug in the NCSA Telnet code or your telnet server. The absence of any indicator means that no encryption is taking place.

Acknowledgments

A great deal of thanks goes to Rick Watson for his help in incorporating his code for authentication and encryption into NCSA Telnet and for his permission to use parts of his documentation for this manual.

File Transfer

This chapter discusses the various features NCSA Telnet for the Macintosh® provides for transferring Macintosh-specific and other files. It also describes the most common File Transfer Protocol (FTP) commands.

Terminology

The following terms are frequently used in this chapter's discussions concerning file transfer procedures.

ASCII File

An *ASCII*, or *text*, file is one that you can read. You can use it with standard editors on the Macintosh or host. When text files are transferred, they are translated to a format appropriate for the receiving machine.

Binary File

A *binary*, or *image*, file cannot be read by standard text editors. Unlike ASCII text files, binary files are not changed in any way when transferred.

Client/Server

The *client* is the computer system that requests services, and the *server* is the system that provides services. The client is not always your Macintosh, despite appearances. When you use NCSA Telnet for the Mac to connect to a host, your Macintosh is the telnet client. When you request a file transfer from your Macintosh, the transfer is actually initiated on the host, making the host the FTP client and your Macintosh the FTP server. So your Macintosh can be both a telnet client and an FTP server at the same time.

File Transfer

In a *file transfer*, the contents of a file are copied to a file on another computer.

MacBinary File

A *MacBinary file* is a file that has been encoded in the MacBinary file format. This means that the file contains all of the information contained in a normal Macintosh file and therefore can be used for transferring applications and other Macintosh-specific files. MacBinary files are virtually useless on any other machine, but are in a format that allows them to be stored for downloading later to a Macintosh.

About File Transfer Protocol (FTP)

NCSA Telnet for the Mac has an internal FTP server that permits reliable file transfers between a Macintosh and any FTP host on the network. File transfers are initiated from the FTP host. With the NCSA Telnet implementation of FTP, you can:

- Stream transferring files in either text (ASCII) or binary (image) format.

- Change the directory.

- Show the name of the current directory.

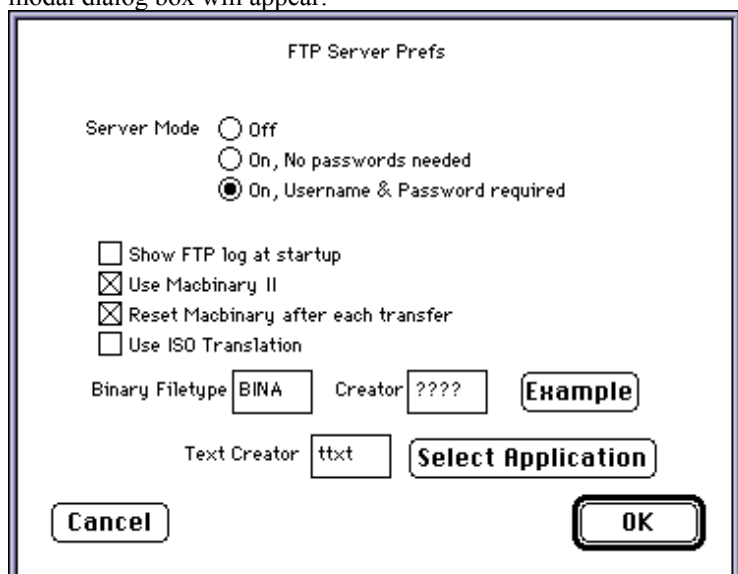
- List files in the current directory (with wildcard specifications).

- Send and receive multiple files with one command (using wildcards).

NOTE: File transfers are processed in the background. Therefore, while a file transfer is in progress you can perform other NCSA Telnet activities such as switching sessions, adding new sessions, or changing parameters. While one FTP connection is active, requests for another are ignored.

Configuring the FTP Server

To configure the FTP server, select **FTP Server** from the **Preferences** submenu of the **Edit** menu. A modal dialog box will appear:



Each of these options are described in the following sections.

Server Mode

NCSA Telnet's FTP server can operate in three modes. When **Off** is selected, NCSA Telnet will refuse all FTP connections to your Macintosh. When **On, No passwords needed** is selected, NCSA Telnet will allow anyone to connect to your Macintosh through FTP. When **On, Username & Password required** is selected, NCSA Telnet requires connecting users to supply a valid username and password before gaining access to your Macintosh through FTP. (For information regarding the configuration of usernames and passwords for FTP, see the section "Controlling Access" in this chapter.)

WARNING: NCSA recommends that you do **NOT** leave the FTP server in the **On, No passwords needed** mode. This mode allows ANYONE access to your entire filesystem. This mode is included in NCSA Telnet for quick and simple file transfers. It is not included to be used as a part of a permanent configuration setup.

Show FTP log at start-up

When this option is checked, NCSA Telnet will display the FTP log when NCSA Telnet is launched.

Use Macbinary II

When this option is selected, NCSA Telnet will use Macbinary transfer mode when in binary mode. This can be turned off or on from this dialog, or by sending quote macb enable or quote macb disable to the FTP server.

Reset Macbinary after each transfer

NCSA Telnet can save you the trouble of tracking whether Macbinary transfer mode is enabled each time you want to transfer files. When **Reset Macbinary for each transfer** is enabled, the status of MacBinary transfer mode returns to the default of your preference, enabled or disabled, whenever you begin a new FTP session. This ensures that MacBinary mode is set to your preferred default each time you open a new FTP session, regardless of how you set the mode in a previous FTP session.

NOTE: Each FTP corresponds not to the individual file transfer but to the opening of each FTP command connection.

33 > NCSA Telnet for the Macintosh®

Binary Filetype and Creator

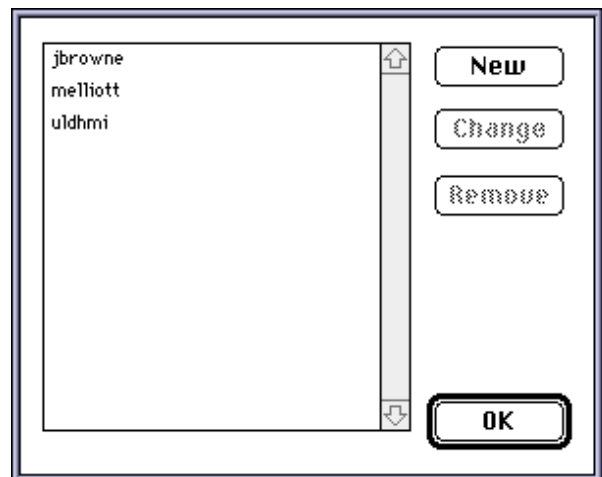
Using the **Binary Filetype** and **Creator** fields, you can specify the filetype and file creator type for files transferred in binary mode when Macbinary transfer mode is disabled. Selecting the **Example** button allows you to select a file using the standard file dialog box and determine the filetype and file creator type for that file. For more information regarding filetypes and file creator types, refer to the subsection "Creator File Type" in the section "Global Preferences" in Chapter 2, "Configuration."

Text Creator

Using the **Text Creator** field and **Select Application** button you can select the four letter file creator type given to files transferred to your Macintosh using the ASCII transfer mode. For more information regarding filetypes and file creator types, refer to the subsection "Creator File Type" in the section "Global Preferences" in Chapter 2, "Configuration."

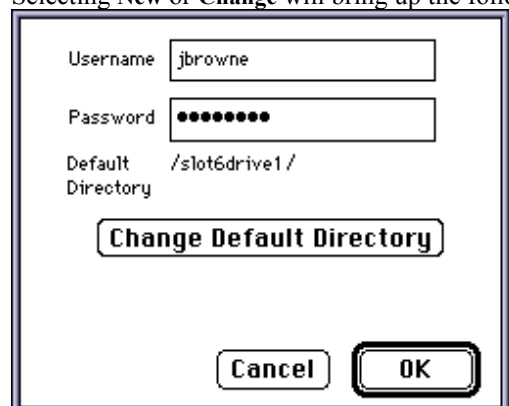
Controlling Access

To configure who has access to your Macintosh via FTP, select **FTP Users** from the **Preferences** submenu of the **Edit** menu. A modal dialog box similar to the following will appear:



Using this dialog box, you may add new users, change an existing user's information, or remove a user's access privileges. In this case, there are three users: jbrown, mellio, and uldhmi.

Selecting **New** or **Change** will bring up the following modal dialog box:



The **Username** field specifies the name that will be recognized by NCSA Telnet's FTP server at the username prompt.

You may type in the user's password in the **Password** field. When entering new passwords, they are displayed in normal text. When changing records, the password field always displays eight bullets (•) regardless of the length of the actual password. Passwords are kept in the preferences file in an encrypted format. **NOTE:** The encryption method used on the passwords is quite simple. It will prevent the casual user from discovering your passwords, but you should never give anyone a copy of your preferences file.

NCSA Telnet's FTP server places each user in a default directory when that user logs in using the correct username and password. The **Default Directory** field displays the default directory for this user. The **Change Default Directory** button allows you to change the default directory for the user.

In this case, the user is "jbrowne". His password is not displayed, and his current directory after logging in via FTP will be "/slot6drive1/."

Transferring Files

Before you attempt to transfer files using FTP, make sure the following conditions are met:

Your host system supports FTP file transfer. If you do not know whether it does, see your system administrator.

You have not disabled the file transfer capability of NCSA Telnet for the Mac. Two conditions inform you that the FTP capability is disabled: (1) the **Server Mode** is set to Off in the FTP Server Preferences modal dialog box and (2) your machine does not respond to the FTP command when you attempt to start up FTP. See the section "Configuring the FTP Server" in this chapter for more information.

Invoking FTP on the Host Computer

Since FTP is initiated by the remote host, the FTP commands vary depending on the host system. For full documentation of FTP and commands within FTP, refer to the manuals for the host computer. On UNIX systems you can read online documentation by entering:

```
% man ftp
```

Issuing the FTP Command

On most systems, at the prompt you enter the FTP command and the IP name or IP address of the target machine. You can enter the FTP command in one of three ways. For example, if your Macintosh is named *mymachine* and your IP address is 192.17.20.22, any of the following procedures invokes FTP.

Enter either the machine name or IP address and then press RETURN:

```
% ftp mymachine    or    % ftp 192.17.20.22
```

Select **Send FTP Command** from the **Network** menu or press **⌘-F**. Either one causes NCSA Telnet to enter the FTP command and issue a RETURN.

Enter **ftp-SPACEBAR**, select **Send IP Number** from the **Network** menu, and press RETURN. The **Send IP Number** command enters your IP address for you.


Use whichever method you are comfortable with to invoke FTP. Your host computer may not accept FTP commands as described here, so you may have to try some variations to find the easiest method for your site.

Regardless of how you invoke FTP, most FTP clients generate a response like this:

```
Connected to 192.17.20.22.
220 Macintosh Resident FTP server, ready
Name (192.17.20.22:uldhmi):
```

Most FTP clients prompt for your username and password. If NCSA Telnet for the Mac is configured for passwords (see "Configuring the FTP Server" in this chapter), then you must enter a password. Otherwise, just press RETURN to bypass the prompts. If you are

not prompted for a username and password, assume that you are logged on and enter your FTP commands at the FTP prompt.

NOTE: When an FTP connection is active, the cursor changes to a small file icon: 

When the FTP connection terminates, the small file icon changes back to the standard I-beam cursor.

FTP Commands

After FTP is invoked and passwords are checked, most FTP clients prompt you for individual FTP commands. These commands are documented in the manuals for the host computer. Most FTP implementations have similar commands because they are modeled after the Berkeley UNIX version of FTP.

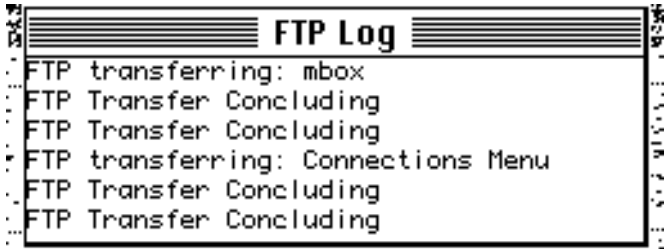
Once you are in FTP, you can access online help for a list of available commands. FTP commands that are common to most implementations are listed below (boldface type indicates user entries and italics type indicates variables) and are described in the following subsections:

Command	Action
ascii	Sets mode to ASCII transfer mode (default)
binary	Sets mode to binary (image or I) transfer mode
cd	Changes the directory on your Macintosh
dir	Shows filenames in the Macintosh's default directory
get <i>filename</i>	Gets specified file from the Macintosh and sends it to the host
help	Shows an online list of FTP commands
put <i>filename</i>	Sends specified file from the host to the Macintosh
pwd	Shows the name of the current Macintosh directory

FTP Log

To help you keep track of file transactions, NCSA Telnet shows current and past transactions in the

FTP log, like the sample below:



```

FTP Log
: FTP transferring: mbox
: FTP Transfer Concluding
: FTP Transfer Concluding
: FTP transferring: Connections Menu
: FTP Transfer Concluding
: FTP Transfer Concluding

```

To view the log, select **Show FTP Log** from the **File** menu.

Setting the Transfer Mode

The default mode for FTP transfers is ASCII format. To transfer graphic or binary data files, you must change the transfer mode to binary format before using the put or get commands. To set the transfer mode to binary, enter either binary or bin.

If you intend to use the file you are transferring with a Macintosh-specific application, you may also need to set MacBinary transfer mode. For more information, see the "Transferring MacBinary Files" subsection later in this section.

To set or reset the transfer mode to ASCII format, enter ascii.

Examples in the "Transferring Files to the Macintosh" section later in this chapter demonstrate FTP transactions with an ASCII file and with a binary file.

Changing the Current Directory

FTP transfers files to the default directory on your local disk. To change the directory, enter `cd` at the FTP prompt (`ftp>`).

The `cd` command from FTP (shown in the list of common FTP commands) requires you to specify a directory by manually entering a path instead of using a dialog box. To specify a directory using the `cd` command, use the colon (`:`) or slash (`/`) to separate folder names (as the Macintosh requires).

For example, to change the default directory to a directory named *myfolder* on your local Macintosh disk named *hd20*, enter one of the following at the FTP prompt:

```
ftp> cd ".hd20:myfolder"    or    ftp> cd "/hd20/myfolder"
```

To find out which directory is set as your default transfer directory, enter `pwd` at the FTP prompt. For example, entering the `pwd` command after the sample `cd` command above results in the following:

```
ftp> pwd
"/hd20/myfolder" is the current directory
```

Transferring Files to the Macintosh

Even though you seem to be initiating the transfer from the Macintosh, the transaction actually operates from the host's side. The practical effect of this arrangement makes the commands seem backwards. For example, to transfer a file from the host to your Macintosh, do not use a `get` command as you might expect, but a `put` command in the form:

```
put filename.ext
```

The following example demonstrates how to use the `put` command to transfer the ASCII file `temp2` from a host to a local Macintosh. Boldface type represents user entries:

```
% ftp -n 192.17.20.124
Connected to 192.17.20.124.
220 Macintosh Resident FTP server, ready
ftp> put temp2
200 This space intentionally left blank < >
150 Opening connection
226 Transfer complete
262145 bytes sent in 32.61 seconds (7.8 Kbytes/s)
ftp> quit
221 Goodbye
%
```

NOTE: Do not exit the program while a file transfer is in progress or the file transfer will fail.

Transferring Files to the Host

To request that a file be sent from the Macintosh to the host, use a `get` command in the form:

```
get filename.ext
```

The following example demonstrates how to use the `get` command to transfer the binary file `bridge.pic` from a local Macintosh to a remote host. Note that the file is in the directory `/HD20/pictures`, and the `cd` command is used to locate that directory. Again, boldface type represents user entries:

```
% ftp -n 192.17.20.124
Connected to 192.17.20.124.
220 Macintosh Resident FTP server, ready
ftp> bin
200 Type set to I, binary transfer mode
```

37 > NCSA Telnet for the Macintosh®

```
ftp> cd "/hd20/pictures"  
250 Ckdir okay  
ftp> get bridge.pic  
200 This space intentionally left blank <>  
150 Opening connection  
226 Transfer complete  
262144 bytes received in 9.22 seconds (28 Kbytes/s)  
ftp> quit  
221 Goodbye  
%
```

To send a text file after this transfer is complete, you must first enter `ascii` to reset the transfer mode to ASCII.

Transferring Multiple Files

Some versions of FTP let you transfer multiple files sequentially with one command, either `mput` or `mget`, and wildcard characters.

WARNING: If you transfer multiple binary files using a UNIX host, note that there is a bug in the `mget` command as implemented on some systems (especially 4.2 BSD UNIX systems). When used in binary mode, `mget` adds a carriage return to the filenames as they are transferred. The files themselves are not affected. Use a UNIX utility to remove the carriage return from the filename. When used in ASCII mode, the `mget` command causes no problems.

The trick to using wildcards in FTP `get` commands is to enclose the filename in quotation marks. For example, enter `get "*.image"`. Do not use quotation marks with `put` commands.

Transferring MacBinary Files

Sometimes you may need to upload Macintosh-only files to non-Macintosh hosts, then download them later without losing any Macintosh-specific data such as icons and creation date.

To transfer Macintosh-only files (such as applications and most data files) to an intermediate host while retaining all Macintosh-specific information in those files:

Enable the **MacBinary Enabled** item on the **File** menu. A checkmark appears next to the command when it is enabled. You can alternately enable and disable MacBinary by selecting this option. (The MacBinary transfer protocol is available only when FTP is in binary mode.) When MacBinary is enabled, all `get` and `put` commands transfer Macintosh files in MacBinary format.

Set the file transfer mode to binary by entering either `binary` or `bin` at the FTP prompt.

NOTE: If you are writing host-based scripts to download from or upload to a Macintosh in MacBinary mode, enter quote `MACB ENABLE` and quote `MACB DISABLE` from the host's FTP client to enable and disable MacBinary mode, respectively.

FTP Client

NCSA Telnet can connect directly to the FTP port of a host machine, allowing you to transfer a file directly between the remote host and Macintosh. To transfer a file from a remote machine to a Macintosh, you normally need to:

Log on to any UNIX account.

Transfer the file from the remote host to your UNIX account via FTP.

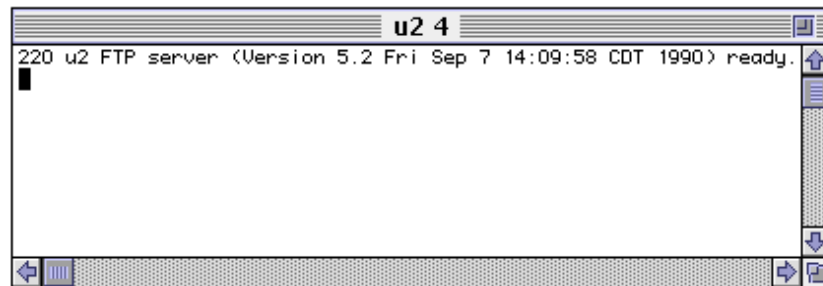
Transfer the file from your UNIX account to the Macintosh via FTP.

This procedure transfers files directly between a UNIX host and your Macintosh and removes the need to log on to a secondary UNIX account for FTP to use as a temporary go-between.

38 > NCSA Telnet for the Macintosh®

Logging on to the FTP Client

To start an FTP client session, click on the **FTP Session** button in the Open Connection dialog box. This opens a window displaying an FTP client connection message that is similar to the one below:



NOTE: Clicking on the **FTP Session** button is exactly the same as opening a connection to a UNIX machine on port 21, which is the FTP port. Therefore, if you set up an alias to a machine with port 21, all sessions opened to that alias are FTP clients. For more information about aliases and session configuration records, see "Session Configuration Records" in Chapter 2, "Configuration."

To use the FTP client:

You must first log on to the server.

Enter user followed by your login name and press RETURN. Example:

```
user loginname RETURN
```

The host sends a message prompting you to enter your password.

Enter your password and press RETURN.

If you are logged in, the host sends back a message saying that you are connected properly.

Once logged on, you can use the FTP client just as you would normally use an FTP session.

Tektronix 4014 and 4105 Emulation

This chapter describes the scope of NCSA Telnet for the Macintosh's® Tektronix 4014 and 4105 emulation capabilities and explains how to conduct Tektronix graphics emulation sessions and operations in graphics windows.

Tektronix Graphics Emulation

NCSA Telnet for the Macintosh can emulate Tektronix 4014 and 4105 terminals. Emulated capabilities include text modes, Tektronix 4014 or 4105 text sizing, zoom, and pan. The use of Tektronix graphics with NCSA Telnet depends on host programs that can produce graphic images. When the host programs run and produce Tektronix 4014 or 4105 graphics commands, NCSA Telnet automatically switches into graphics mode, opens a graphics window, and does the drawing.

Getting Started

The type of Tektronix emulation, if any, done for a given session is determined by the TEK field in the session configuration record. See the section "Session Configuration Records" in Chapter 2, "Configuration" for more information.

A host program generates the Tektronix clear screen character sequence (ESC,-FF) over a currently open connection. When NCSA Telnet receives this command, a graphics window opens. All graphics output from the session is redirected into this graphics window until you either close the window or send the TEK end command.

Tektronix related options in the Session menu

TEK Page

The **TEK Page** command in the **Session** menu provides a quick way to create a Tektronix emulation window without intervention from host software. Normally the emulation window appears automatically as soon as NCSA Telnet receives the clear screen command sequence from the host. You can, however, create the window immediately by selecting **TEK Page** from the **Session** menu.

Just as you would use the Page key on an actual Tektronix terminal to clear the window for the current session, you can select **TEK Page** to clear a graphics window.

TEK form feed clears screen

When this option is on, NCSA Telnet's Tektronix emulation will clear the current Tektronix window when a Tektronix clear screen command is received. If this option is off, NCSA Telnet will create a new window for the new Tektronix image. Each new screen created in this way has as its name the session name and time.

Graphics Window Operations

NCSA Telnet lets you detach, delete, zoom, copy, resize, and print graphics windows, as described in the following sections.

Detaching a Graphics Window

To detach a graphics window, click on the text window for that graphic's connection. Pressing the **OPTION** key while you click on a window lets you click without detaching the corresponding graphics window. When a window is detached, its title no longer contains the bullet character (•) that identifies it as the active output window.

40 > NCSA Telnet for the Macintosh®

The window can also be detached under the control of host software. When the CAN character (dec 24) is received, the terminal is reset to VT screen emulation.

Deleting a Graphics Window

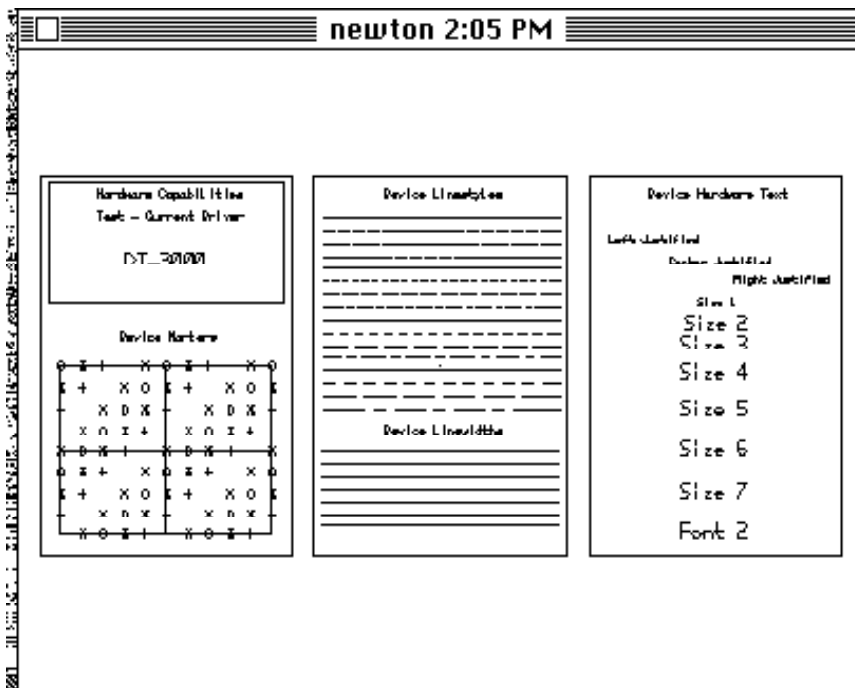
To delete a graphics window, click on its close box.

Zooming/Unzooming a Graphics Window

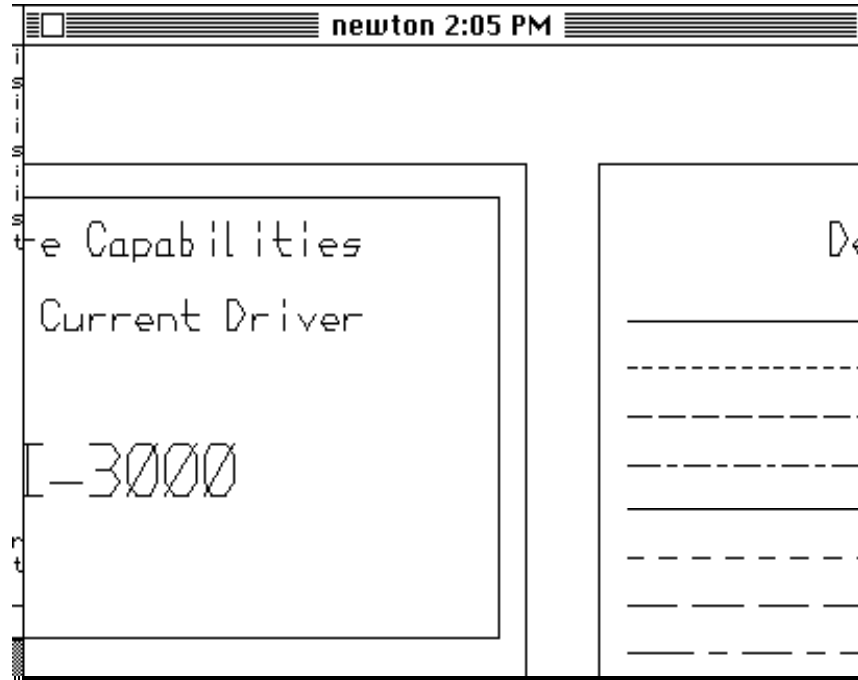
To magnify (zoom in on) a portion of a drawing in a graphics window, drag a selection rectangle around the area you want to view more closely. When you release the mouse button, the selected section of the drawing expands to fill the entire window. To prevent distortion or stretching of the TEK image, the magnified selection always maintains the same aspect ratio as the TEK window.

To unzoom (and see the entire drawing once again), doubleclick anywhere in the window.

The screen image below shows a Tektronix emulation window at normal size (i.e., at zero magnification):



The following screen image shows a portion of the same drawing in zoomed magnification:



You can copy and print the contents of both zoomed or unzoomed windows. When you copy or print a zoomed window, only the visible portion of the window is copied or printed.

Copying a Graphics Window

To copy the contents of a graphics window onto the Macintosh Clipboard, activate the window by clicking on it, then choose **Copy** from the **Edit** menu. Now you can paste the graphic into another Macintosh application.

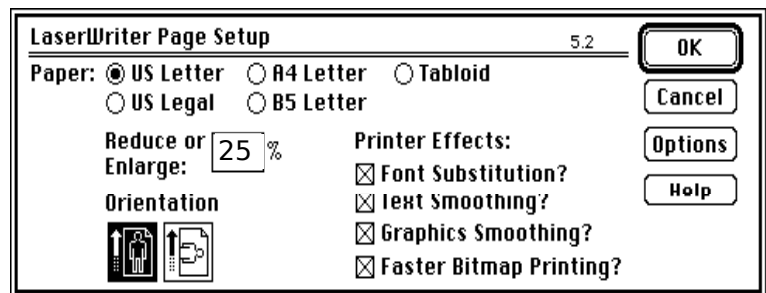
Resizing a Graphics Window

Although no grow icon is drawn in the Tektronix emulation window, clicking and dragging the lower right corner of the window will resize it as if it did have a grow icon.

Printing a Graphics Window

To print the contents of a graphics window on a local printer or a printer on the AppleTalk network, activate the window by clicking on it and choose **Print Selection** from the **File** menu.

NCSA Telnet centers and scales all graphics to fit the page. To achieve the best possible resolution on a LaserWriter, enter 25 percent as the **Reduce or Enlarge** option in the Page Setup dialog box, as shown in the sample below.



The 25 percent setting does not change the size of the image but makes the lines thinner.

42 > *NCSA Telnet for the Macintosh®*

For more information about the Page Setup dialog box, refer to your Macintosh user's guide.

Interactive Color Raster Graphics

This chapter introduces the Interactive Color Raster protocol and describes how to use this protocol in your programs to display color graphics with NCSA Telnet for the Macintosh®, how to control raster graphics windows, and how to display and manipulate color images. The chapter concludes with a sample program you can use as a template for designing programs that use the ICR protocol.

Interactive Color Raster Graphics

Interactive Color Raster (ICR) is a protocol for displaying raster graphics on your workstation screen. The ICR protocol controls its own windows through NCSA Telnet for the Mac and shares characteristics of the Tektronix graphics terminal emulation protocol. For example, escape sequences control the display.

You can use ICR to write mainframe programs that display color images in their own windows on your Macintosh screen, and you can apply the full range of 256 colors out of a palette of 16 million colors to your graphics displays. The ICR protocol is intended for use on a 256-color Macintosh.

Starting and Quitting ICR Graphics Emulation

To use ICR, you need a program that runs on the remote host computer. This program must give all appropriate commands to conduct ICR graphics emulation. To create an ICR program, work from the protocol description contained later in this chapter in the "Using the ICR Protocol" section and from the example in the "Sample Program for ICR in C" section.

When the protocol command for creating a window arrives from the host, NCSA Telnet creates a Macintosh window for it. All human-readable text continues to go to the session window, while graphics commands are sent to the proper graphics window.

To quit ICR emulation, the ICR program on the remote computer can remove the window. If it does not, you can delete a graphics window by clicking in the close box in the upper left corner of the window's title bar. If you exit NCSA Telnet while some windows remain open, the windows close automatically.

Using the ICR Protocol

You must write a program that issues graphics commands to NCSA Telnet. NCSA Telnet follows your programs' directions to receive graphics commands, interpret them, create or destroy windows, set the color environment, or display raster graphics.

Begin all ICR graphics sequence commands with the escape sequence ESC^ (escape, caret) to insure that NCSA Telnet can determine the difference between regular text and ICR graphics.

Description of the Protocol

Each ICR command appears in the following form:

ESC^*X*; *parameters* ^ *data*

where:

X is one of the command characters (W, D, M, R, P, or I) described in the table below.

^ is the caret character (ASCII 94).

Parameters is one or more of the parameters of *X* described in the table below. Parameters are always printable ASCII characters and are delimited by commas (.). If your program omits parameters, NCSA Telnet supplies default values.

44 > NCSA Telnet for the Macintosh®

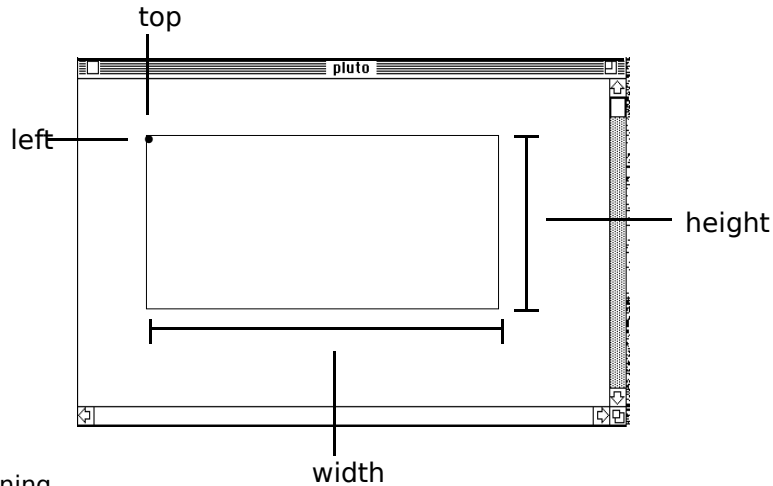
The command is terminated with a caret (^).

Each command can be followed by a data stream (*data*). If a command requires a data stream, the stream follows the command.

Command characters and their parameters are described in the table below:

Command	Parameters	Description
W	left; top; width; height; display; windowname	Creates a window at the specified location on the screen, where 0, 0 is the upperleft corner of the screen.

- The *left*, *top*, *width*, and *height* integers specify location and size on the screen:



Integer	Meaning
left	the pixel value of the horizontal, or x, location of the upper-left corner of the graphics window
top	the pixel value of the vertical, or y, location of the upper-left corner of the graphics window
height	the number of pixels that comprise the vertical height of the graphics window
width	the number of pixels that comprise the horizontal width of the graphics window

- The *display* integer identifies the hardware screen number (for machines with multiple screens). This parameter is not applicable to Macintosh systems.
- Windowname* is a string that distinguishes multiple windows. The windowname assigned to a window is used by all other commands to specify that window.

D	windowname	Destroys a window by physically removing it from the screen and memory.
---	------------	---

- Windowname* is the unique name assigned to a window when it is created by the W command.

M	start; length; count; windowname	Loads into the graphics window a color map palette (of up to 256 colors) or portion of one. NCSA Telnet assumes that palette entries are 8-bit R, G, and B, 3 bytes per entry, in that order. The default palette is a straight gray-scale ramp, where 0=black and 255=white. (See "Color Maps" section later in this chapter.)
---	----------------------------------	---

- The *start* integer identifies the first entry to change.
- The *length* integer indicates the number of entries to change.
- The *count* integer indicates the total number of bytes in the data portion. The count parameter should be followed with the command's data stream.
- Windowname* is the unique name assigned to a

45 > NCSA Telnet for the Macintosh®

window when it is created by the W command.

R *x*; *y*; *expand* Indicates that the data to follow are run-length
length; encoded. (See the "Run-Length Encoding Format"
windowname section later in this chapter.)

- The *x* and *y* integers identify the point where the raster line starts and the data follow for length bytes of encoded data.
- The *expand* integer indicates the number of times each dimension is to be expanded on your local screen. For example, an *expand* value of 2 makes the picture 4 times larger.
- The *length* integer indicates the encoded length (in bytes) of the data.
- *Windowname* is the unique name assigned to a window when it is created by the W command.

P *x*; *y*; *expand*; Indicates that the data to follow are pixel data.
length; • The *x* and *y* integers identify the point where
windowname the raster line starts and the data follow for
length bytes of pixel data.

- The *expand* integer indicates the number of times each dimension is to be expanded on your local screen. For example, an *expand* value of 2 makes the picture 4 times larger.
- The *length* integer indicates the length (in bytes) of the data. Length should be the same as the number of pixels to be displayed.
- *Windowname* is the unique name assigned to a window when it is created by the W command.

I *x*; *y*; *expand*; Indicates that the data to follow are encoded with
length; the IMCOMP compression scheme (4:1 compression).
windowname You *must* use the M command before the picture
displayed with the I command appears correctly.

- The *length* integer indicates the number of pixels per line. One I call represents 4 lines of data. Since IMCOMP is a 4 x 4 square compression scheme, each line of data appears as 4 lines of pixels on the screen.
- The *y* integer is required to increment by fours: 0, 4, 8, 12, 16, etc.
- The *length* integer indicates the length (in bytes) of the data. Length should be the same as the number of pixels to be displayed.
- *Windowname* is the unique name assigned to a window when it is created by the W command.

ASCII Encoding

NCSA Telnet assumes that all parameter values (except ESC) are printable ASCII. This means that the parameters require no special encoding, but data values need help. ESC is an allowable exception on most login data streams.

Your ICR program must encode 8-bit data values into printable ASCII for transmission. When possible, the values that fall in the printable ASCII range are passed untouched and all values outside that range are encoded as two bytes.

Use the following encoding for all characters 0–255:

Input:	realchar
Transmission:	specialchar followed by transchar

46 > NCSA Telnet for the Macintosh®

Encoding: $\text{specialchar} = \text{realchar} \div 64 + 123$

$\text{transchar} = \text{realchar} \bmod 64 + 32$

Decoding: $\text{realchar} = (\text{specialchar} - 123) * 64 + (\text{transchar} - 32)$

The codes above work to encode data values in printable ASCII character for all characters 0–255, as shown below:

Special	Range
123	0–63
124	64–127
125	128–191
126	192–255

Because all encoded characters are preceded by a character in the 123–126 range, you can send all regular characters that are 32–122 (inclusive) without encoding.

Warning: On CTSS, trailing spaces are trimmed, so you should avoid the values 0, 32, 128, and 192 because they code to special space.

NOTE: In the specifications, all data lengths and counts refer to the protocol data, not to the ASCII-encoded data. The length fields for the R, P, and M commands all reflect the data's length on the originating machine before encoding.

Run-Length Encoding Format

Data for the run-length encoded line are first run-length compressed and then ASCII encoded. Therefore the deciphering process first decodes ASCII to binary and then decodes the run-length binary data.

Using all 8 bits of the byte stream representing the pixels in a given RLE line, start with the control character. (*n*) represents the lower seven bits of the byte. The high bit represents whether the following (*n*) characters are reproduced exactly (high bit = 0) or whether the following single character is reproduced (*n*) times (high bit = 1).

Input: 1 1 1 1 23 23 23 234 112 33 44 55 42 42 42 42
Tokenized: (128+4) 1 (128+3) 23 (5) 234 112 33 44 55 (128+4) 42
Alternate count, data, count,data

After coding into this tokenized form, you know the data length for the R command. (The length is 12 in the example above). Even though ASCII encoding occurs after this step, use the length value from this step.

ASCII result: 125 36 123 33 125 35 123 55 123 37
126 74 112 33 44 55 125 36 42

Color Maps

You can use the M command to manipulate the color table for your local display. The format for color map data is a series of color map entries. Each color map entry is three bytes, one R (red), one G (green), and one B (blue). For example, to set entries 3 through 7 of the color table, you could use the following M command might be use:

```
ESC^M;3;4;12;wind^RGBRBRGRBRGB
```

where the RGBRBRGRBRGB data are the list of byte values for the new entries in RGB order. The actual data transmitted over the line must still be ASCII encoded, but the data start out in this form. Note that the count field (12 in this example) is always 3 times the length value (4 in this example).

ICR Graphics Windows

Raster graphics windows require a lot of memory—one byte for each pixel in each graphics window on the screen. If insufficient memory remains to open a new window, NCSA Telnet displays an alert dialog box and does not create the window.

Allocating Memory

If you are using MultiFinder, you can prevent running out of memory by setting NCSA Telnet's allocated memory size to a larger value. For example, if you need space for two 256 x 256 image windows, increase the memory for NCSA Telnet by 128K (256 bytes x 256 bytes, or 64K, for each window).

Copying a Graphics Window

You can copy the contents of an ICR window to the Macintosh Clipboard, Then paste it into a program capable of pasting color images.

To copy the contents of a graphics window:

Click in the graphics window to bring it to the front.

Choose **Copy** from the **Edit** menu. Now you can paste the graphic into another Macintosh application.

System Color Problems

Image windows use the colors available for display on your Macintosh screen. When you close graphics windows, the system does not always restore the color environment to its original state, which causes incorrect colors in other windows. We are working to minimize the effects of NCSA Telnet and ICR graphics on your system's color table.

NOTE: Pressing CONTROL-C or using other methods to interrupt ICR commands, can make NCSA Telnet appear to lock up. (See also "Telnet Options" in Chapter 3, "Advanced Features.") When this occurs, either press RETURN several times or enter commands until the session window resumes activity. It may help to remember that when you issue a drawing command NCSA Telnet expects an influx of a certain number (often hundreds) of bytes of image data to finish drawing the current line.

Sample Program for ICR in C

The sample C program shown below is included on the distribution disk. It produces a test pattern on your screen if you are running an active ICR-equipped NCSA Telnet. If you do not have ICR, this program produces thousands of encoded characters on your display.

```

/* icrtest
 *
 * Produces a test pattern on an ICR compatible display. Demonstrates and provides * example code for writing ICR programs.
 *
 * National Center for Supercomputing Applications
 * University of Illinois, Urbana-Champaign
 *
 * by Tim Krauskopf
 * This program is in the public domain.
 */
#include <stdio.h>

int
    xdim=0,ydim=0;          /* size of image on disk */

char
    *malloc(),
    *testimage,
    rgb[768];              /* storage for a palette */

```

```

main(argc,argv)
    int argc;
    char *argv[];
    {
        register int i,j;
        register char *p;

        puts("Creating test pattern");

        xdim = 150;
        ydim = 100;

        if (NULL == (testimage = malloc(xdim*ydim)))
            exit(1);

/*
* Make the test image in a strange pattern.
*/
    p = testimage;

    for (i=0; i<ydim; i++)
        for (j=0; j<xdim; j++) {
            *p++ = 50 + (((i & 0xfffff8) * (j & 7))>>2);
        }

    puts("Displaying test pattern with the Interactive Color Raster protocol");

    rimage(0);          /* display remote image with [palette] */
}

/*****

/* rimage
* Remote display of the image using the ICR.
* Just print the codes to stdout using the protocol.
*/

rimage(usepal)
    int usepal;
    {
        int i,j,newxsize;
        char *space,*thisline,*thischar;
        register unsigned char c;

/*
* Open the window with the W command.
*/

(void)printf("\033^W;%d;%d;%d;%d;0;test window^",0,0,xdim,ydim);

/*
* If a palette should be used, send it with the M command.
*/
    if (usepal) {

```


49 > NCSA Telnet for the Macintosh®

```

(void)printf("\033^M;0;256;768;test window^");    /* start map */

thischar = rgb;
for (j=0; j<768; j++) {
    c = *thischar++;
    if (c > 31 && c < 123) {
        putchar(c);
    }
    else {
        putchar((c>>6)+123);
        putchar((c & 0x3f) + 32);
    }
}
}

/*

* Send the data for the image with RLE encoding for efficiency.
* Encode each line and send it.
*/
space = malloc(ydim+100);
thisline = testimage;

for (i = 0; i < ydim; i++) {
    newxsize = rleit(thisline,space,xdim);
    thisline += xdim;    /* increment to next line */

    (void)printf("\033^R;0;%d;%d;%d;test window^",i,1,newxsize);

    thischar = space;
    for (j = 0; j < newxsize; j++) {

/*****

/* Encoding of bytes:
*
* 123 precedes #'s 0-63
* 124 precedes #'s 64-127
* 125 precedes #'s 128-191
* 126 precedes #'s 192-255
* overall: realchar = (specialchar - 123)*64 + (char-32)
*    specialchar = r div 64 + 123
*    char = r mod 64 + 32
*/

/*****

c = *thischar++;    /* get byte to send */

if (c > 31 && c < 123) {
    putchar(c);
}
else {
    putchar((c>>6)+123);
    putchar((c & 0x3f) + 32);
}
}
}

```

50 > NCSA Telnet for the Macintosh®

```

    }
}

free(space);
}

/*****

/* rleit
 *
 * Compress the data to go out with a simple run-length encoded scheme.
 *
 */

rleit(buf,bufto,len)
    int len;
    char *buf,*bufto;
    {
    register char *p,*q,*cfoll,*clead;
    char *begp;
    int i;

    p = buf;
    cfoll = bufto;          /* place to copy to */
    clead = cfoll + 1;

    begp = p;
    while (len > 0) {      /* encode stuff until gone */

        q = p + 1;
        i = len-1;
        while (*p == *q && i+120 > len && i) {
            q++;
            i--;
        }

        if (q > p + 2) {    /* three in a row */
            if (p > begp) {
                *cfoll = p - begp;
                cfoll = clead;
            }
            *cfoll++ = 128 | (q-p); /* len of seq */
            *cfoll++ = *p;         /* char of seq */
            len -= q-p;           /* subtract len of seq */
            p = q;
            clead = cfoll+1;
            begp = p;
        }
        else {
            *clead++ = *p++;      /* copy one char */
            len--;
            if (p > begp + 120) {
                *cfoll = p - begp;
                cfoll = clead++;
                begp = p;
            }
        }
    }
}

```

51 > NCSA Telnet for the Macintosh®

```
    }
/*
* fill in last bytecount
*/
    if (p > begp)
        *cfol = 128 | (p - begp);
    else
        clead--;          /* don't need count position */

    return((int)(clead - bufto));    /* how many stored as encoded */
}
```

Troubleshooting

This appendix lists some common error messages reported by NCSA Telnet for the Macintosh® and their causes.

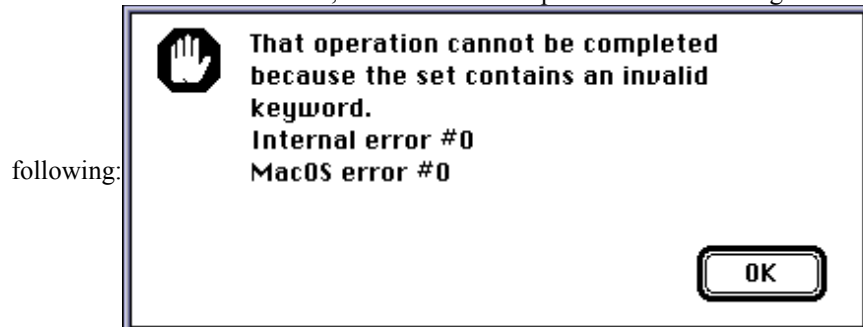
New Error Messages

With NCSA Telnet 2.6, a new error message system has been implemented. The majority of the error conditions NCSA Telnet can encounter are now presented to the user via more verbose modal dialog boxes. A few error conditions may still be presented via the former error message system, which is detailed in the section "Old Style Error Messages" in the chapter.

Each of the new style error modal dialog boxes includes the fields "Internal error #" and "MacOS error #." When reporting a problem or possible bug to NCSA, please include these numbers in your communication, if possible. These numbers are presented to help us help you track down the cause of the problem you are experiencing. If these numbers are zero, NCSA Telnet was unable to provide more detailed information than the message given.

Non-Fatal Errors

When a non-fatal error occurs, NCSA Telnet will present a modal dialog box similar to the

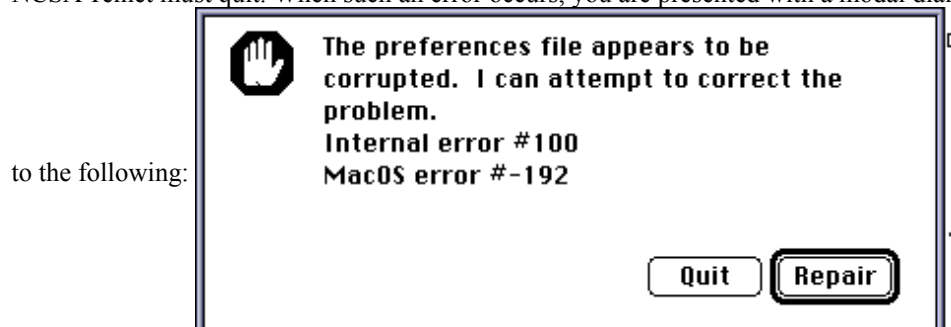


Non-fatal errors occur most often when an action you requested has failed due to insufficient memory, a corrupted file, or some other reason. In this case, the user tried to load a set file that is corrupted.

The following problems can currently cause non-fatal errors: out of memory, corrupted set files, unable to open or create a capture file.

Semi-Fatal Errors

Semi-fatal errors are errors which NCSA Telnet can attempt to remedy, but if the remedy fails NCSA Telnet must quit. When such an error occurs, you are presented with a modal dialog similar



This dialog allows the user to abort any recovery process NCSA Telnet may attempt before it is attempted. Selecting **Quit** will cause NCSA Telnet to quit immediately.

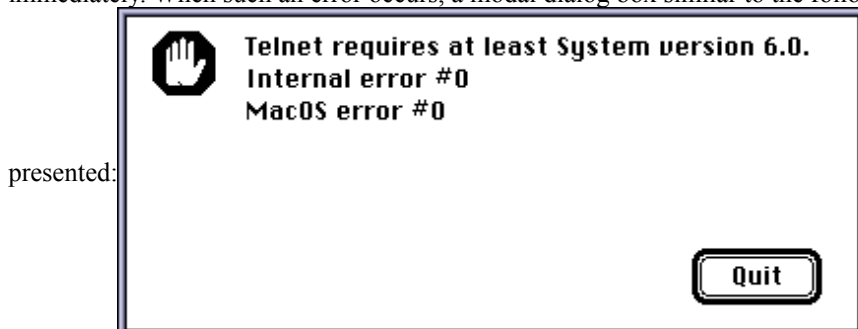
53 > NCSA Telnet for the Macintosh®

Selecting **Repair** instructs NCSA Telnet to attempt to repair the damage. However, selecting **Repair** will not always work, and may just lead to a fatal error condition.

The following condition can currently cause semi-fatal errors: corrupted preferences file.

Fatal Errors

Fatal errors are errors from which NCSA Telnet cannot recover from and thus must quit immediately. When such an error occurs, a modal dialog box similar to the following will be



In the case of a fatal error, the only option available is **Quit**.

The following conditions can currently cause fatal errors: no HFS filesystem, system version is not at least 6.0, lack of 128K ROMs, cannot open MacTCP, cannot create preferences file, corrupted NCSA Telnet application file (resources missing), or unable to repair a corrupted preferences file.

Old Style Error Messages

Not all of the error messages in NCSA Telnet 2.6 have been converted to the new error reporting system. The following is a list of some old style error messages you may see and a description of what they mean:

Couldn't get translation resource for national character set

A resource is missing from the NCSA Telnet application. Replace your copy of NCSA Telnet from a backup or download a new copy.

Translation resource is corrupted

A resource is missing from the NCSA Telnet application. Replace your copy of NCSA Telnet from a backup or download a new copy.

Error deleting old file

An error occurred when the FTP server attempted to overwrite a file on the local disk during a file transfer.

Error in Sfwrite

An error occurred when the FTP server attempted to write to the local disk during a file transfer.

Disk Full Error

The FTP server ran out of disk space when trying to transfer a file to the local disk.

Host or gateway not responding

This error used to be a catch-all for nearly any error related to connecting to a host. This error will now only be produced if the host you are trying to contact does not respond, or if a host you were connected to stops responding. Some possible causes of this problem include: accidentally unplugging your machine from the network, the remote host lost power or its network connection, or your local gateway or internet connection has gone down.

VT Compatibility and Escape Codes

This appendix lists the features and modes of the VT standard that are not supported by NCSA Telnet for the Macintosh®. This appendix also lists the escape codes sent by NCSA Telnet for certain codes in the various emulation modes. This appendix is intended as a reference of NCSA Telnet's implementation of VT emulation, and is not intended to be the definitive source for information regarding the VT series of terminals.

VT Compatibility

NCSA Telnet does not support double height or double width characters. NCSA Telnet also does not support the VT52 mode.

Key Mapping

NCSA Telnet does not emulate the following VT-200 keys: F1, F2, F3, F4, and F5.

NCSA Telnet maps F6 through F20 on the VT-200 keyboard to F1 through F15 on the Apple Extended Keyboard.

NCSA Telnet maps PF1 through PF4 on the VT-200 keyboard to the top row of keys on the numeric keypad (CLEAR, =, /, *).

Key Codes sent by NCSA Telnet

NCSA Telnet always sends the CSI and SS3 control characters using their 7-bit extensions. Therefore, substitute ESC [(1B 5B) for CSI and ESC O (1B 4F) for SS3 in the following tables.

This section divides the keycode tables by the divisions used in the VT 200 manual.

Editing Keys

Key (VT Key Name)	VT200 mode	VT100 mode
HELP (find)	9B 31 7E	
	CSI 1 ~	
HOME (Insert Here)	9B 32 7E	Telnet will send the VT220
	CSI 2 ~	codes for these keys while in
PAGEUP (Remove)	9B 33 7E	VT100 mode, even though these
	CSI 3 ~	keys did not exist on the VT100.
DEL (Select)	9B 34 7E	
	CSI 4 ~	
END (Prev Screen)	9B 35 7E	
	CSI 5 ~	
PAGEDOWN (Next Screen)	9B 36 7E	
	CSI 6 ~	

Cursor Control Keys

Cursor Control Keys (Same for VT200/100)			
	Reset	Set	<- Cursor Key Mode
Key	Normal mode		Application mode
UpArrow	9B 41	8F 41	
	CSI A	SS3 A	
DownArrow	9B 42	8F 42	
	CSI B	SS3 B	
RightArrow	9B 43	8F 43	

55 > NCSA Telnet for the Macintosh®

CSI C SS3 C
 LeftArrow 9B 44 8F 44
 CSI D SS3 D

Auxiliary Keypad Codes

Auxiliary Keypad Codes (Same for VT200/100)

Key	Keypad Numeric mode	Keypad Application mode
0	30	8F 70
	0	SS3 p
1	31	8F 71
	1	SS3 q
2	32	8F 72
	2	SS3 r
3	33	8F 73
	3	SS3 s
4	34	8F 74
	4	SS3 t
5	35	8F 75
	5	SS3 u
6	36	8F 76
	6	SS3 v
7	37	8F 77
	7	SS3 w
8	38	8F 78
	8	SS3 x
9	39	8F 79
	9	SS3 y
-	2D	8F 6D
	-	SS3 m
+ (,)	2C	8F 6C
	,	SS3 l
.	2E	8F 6E
	.	SS3 n
Enter	**	8F 4D
	**	SS3 M
Clear (PF1)	8F 50	8F 50
	SS3 P	SS3 P
= (PF2)	8F 51	8F 51
	SS3 Q	SS3 Q
/ (PF3)	8F 52	8F 52
	SS3 R	SS3 R
* (PF4)	8F 53	8F 53
	SS3 Q	SS3 Q

Top-Row Function Keys

Key	(VT Key Name)	VT200 Mode Code	VT100 Mode Code
F1 (F6)		9B 31 37 7E	
		CSI 1 7 ~	
F2 (F7)		9B 31 38 7E	
		CSI 1 8 ~	Telnet will send the VT220
F3 (F8)		9B 31 39 7E	codes for these keys while in
		CSI 1 9 ~	VT100 mode, even though these
F4 (F9)		9B 32 30 7E	keys did not exist on the VT100.
		CSI 2 0 ~	
F5 (F10)		9B 32 31 7E	
		CSI 2 1 ~	
F6 (F11)		9B 32 33 7E	
		CSI 2 3 ~	

56 > *NCSA Telnet for the Macintosh®*

F7 (F12) 9B 32 34 7E
 CSI 2 4 ~
F8 (F13) 9B 32 35 7E
 CSI 2 5 ~
F9 (F14) 9B 32 36 7E
 CSI 2 6 ~
F10 (F15/Help) 9B 32 38 7E
 CSI 2 8 ~
F11 (F16/Do) 9B 32 39 7E
 CSI 2 9 ~
F12 (F17) 9B 33 31 7E
 CSI 3 1 ~
F13 (F18) 9B 33 32 7E
 CSI 3 2 ~
F14 (F19) 9B 33 33 7E
 CSI 3 3 ~
F15 (F20) 9B 33 34 7E
 CSI 3 4 ~

Obtaining NCSA Software

This appendix outlines the procedures for obtaining NCSA Telnet for the Macintosh® via anonymous FTP, an archive server, or U.S. mail.

Anonymous FTP

If you are connected to the Internet (NSFNET, ARPANET, MILNET, etc.) you can download NCSA Telnet for the Macintosh software and documentation at no charge from an anonymous File Transfer Protocol (FTP) server at NCSA. Follow the steps enumerated below. If you have any questions regarding the connection or procedure, consult your local system administrator or network expert.

Log on to a host at your site that is connected to the Internet and is running software supporting the FTP command.

Invoke FTP (on most systems) by entering the Internet address of the server:

```
% ftp ftp.ncsa.uiuc.edu or % ftp 141.142.20.50
```

Log on by entering anonymous for the name.

Enter your local login name and address (e.g., uldhmi@ncsa.uiuc.edu) for the password.

Enter get README.FIRST to transfer the instructions file (in ASCII) to your local host.

Enter quit to exit FTP and return to your local host.

Review the README.FIRST file for complete instructions concerning the organization of the FTP directories and the procedures you should follow to download the README files specific to the application you want.

Your logon session should resemble the following sample, where the remote user's name is uldhmi@ncsa.uiuc.edu and user entries are indicated in boldface type.

```
% ftp ftp.ncsa.uiuc.edu
Connected to zaphod.
220 zaphod FTP server (Version 6.23 Thu Apr 8 06:37:40 CDT 1993) ready.
Name (ftp.ncsa.uiuc.edu: uldhmi): anonymous
331 Guest login ok, send ident as password.
Password: uldhmi@ncsa.uiuc.edu
230 Guest login ok, access restrictions apply.
ftp> get README.FIRST
200 PORT command successful.
150 Opening ASCII mode data connection for README.FIRST (10283 bytes).
226 Transfer complete.
local: README.FIRST remote: README.FIRST
11066 bytes received in .34 seconds (32 Kbytes/s)
ftp> quit
221 Goodbye.
%
```

The README.FIRST file instructs you to copy the NCSA Telnet Mac README file to your directory and to read it before proceeding. Your FTP session should resemble the one listed below:

```
ftp> cd Mac/Telnet
250 CWD command successful.
ftp> get README
200 PORT command successful.
150 Opening ASCII mode data connection for README (10283 bytes)
226 Transfer complete.
local: README remote: README
```

58 > NCSA Telnet for the Macintosh®

2080 bytes received in .14 seconds (15 Kbytes/s)

ftp> quit

221 Goodbye.

%

The README file explains how to copy the contents of the NCSA Telnet Macintosh directory to your home directory via remote log on or anonymous FTP. The precise file transfer procedure varies according to the type of operating system (UNICOS or other OS) under which you use NCSA Telnet for the Macintosh®.

Archive Server

To obtain NCSA software via an archive server:

Email a request to archive-server@ncsa.uiuc.edu.

Include the word *help* in the subject or message line.

Press RETURN.

Send another email request to archive-server@ncsa.uiuc.edu.

Include the word *index* in the subject or message line.

Press RETURN.

For example, if you use the UNIX mailing system, your log on session should resemble the following sample, where user entries are indicated in boldface type.

```
% mail archive-server@ncsa.uiuc.edu
```

```
Subject: help
```

```
.
```

```
EOT
```

```
Null message body; hope that's ok
```

```
% mail archive-server@ncsa.uiuc.edu
```

```
Subject: index
```

```
.
```

```
EOT
```

```
Null message body; hope that's ok
```

The information you receive from the help and index commands gives you further instructions on obtaining NCSA software. This controlled-access server emails the distribution to you one segment at a time.

Mail

NCSA Telnet for the Macintosh® software and manuals are available for purchase, either individually or as part of anonymous FTP reel or cartridge tapes, through the NCSA *Technical Resources Catalog*. All orders prepaid. To obtain a copy of the catalog, contact NCSA Orders by electronic mail at orders@ncsa.uiuc.edu, by phone at (217) 244-4130, or by U.S. mail at:

NCSA Orders

152 Computing Applications Building

605 East Springfield Avenue

Champaign, IL 61820-5518