



BRIDGE COMMUNICATIONS, INC.

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REFERENCES

The following publications describe the Bridge Communications product line:

- [1] Series/1 Planning and Installation Guide (Bridge Communications, Inc.)
- [2] Series/100 Planning and Installation Guide (Bridge Communications, Inc.)
- [3] NCS/150 Installation and Operations Guide (Bridge Communications, Inc.)
- [4] Network Management Guide (Bridge Communications, Inc.)
- [5] Connection Service User's Guide (Bridge Communications, Inc.)
- [6] Software Technical Reference Manual (Bridge Communications, Inc.)

The following publications describe the TCP/IP protocols:

- [7] TCP/IP Internet Protocol Transition Workbook (SRI International, 1982)
- [8] Ethernet Address Resolution Protocol, RFC-826 (SRI International, 1982)
- [9] Internet Protocol, RFC-791 (SRI International, 1982)
- [10] Internet Control Message Protocol, RFC-792 (SRI International, 1982)
- [11] User Datagram Protocol, RFC-768 (SRI International, 1982)
- [12] Transmission Control Protocol, RFC-793 (SRI International, 1982)
- [13] Telnet Protocol, RFC-764 (SRI International, 1982)
- [14] Name Server Protocol, IEN-116 (SRI International, 1982)
- [15] EtherLink Installation Guide, (3COM Corporation, 1985)

1.0 INTRODUCTION

This document provides information about TCPTerm, a high-performance Ethernet LAN interface between personal computers and other LAN resources such as mainframes, minicomputers, and workstations. TCPTerm uses protocols supported in TCP/IP network environments.

1.1 Features and Capabilities

TCPTerm consists of three services that operate under DOS 2.0 or higher and that make the personal computer a directly attached network host with terminal access, file transfer capabilities, and network management functions.

TCPTerm integrates the IBM Personal Computer* (or compatible) into a TCP/IP-based Ethernet LAN environment for the purposes of:

- Communicating with host computers as a remote VT100 terminal using the Telnet protocol
- Exchanging files with other computers via the FTP protocol
- Participating in Bridge's Network Management Service with network map, audit trail, and statistics facilities

TCPTerm features include:

- Installation on a floppy disk or on the hard disk in your personal computer
- Easy-to-use menu-oriented customization program
- Configuration of DMA channel and interrupt vector under program control
- Ethernet driver with three choices for address (hardware, internet derived, or user specified)
- Personal computer to host file transfer capabilities
- Compatibility with other Bridge TCP/IP-based products
- Access to TCP/IP name servers via the IEN116 protocol

* IBM is a registered trademark of International Business Machines Corporation.

1.2 Terminal Service

The Terminal Service (the Telnet program) is an emulator that allows you to use your personal computer as an intelligent terminal to connect to a host computer via Ethernet and emulate a VT100 terminal.

When you want to work interactively on a host computer, you can use the Telnet service to connect your personal computer (via an address or logical name) to the host. Telnet allows you to log on to the host and then use your personal computer as a display terminal. The Telnet service from your personal computer is especially useful when you need to do extensive computation on a host computer or make use of the host text editor or other interactive computer programs available on a host.

Telnet also allows you access to devices (such as modems) connected to ports on Bridge Communications Servers running TCP/IP.

For further information on the Terminal Service, see Section 3.0.

1.3 File Transfer Service

The File Transfer Service (the FTP program) allows you to connect (via address or logical name) to the host computer to send files directly from a personal computer to the host computer (or in the reverse direction).

File transfers can be performed at rates of 1200 to 6000 bytes (1-3 pages) per second, depending on the type of personal computer used (PC, PC/XT, or PC/AT). FTP allows you to transfer text files as well as binary files.

FTP can be used in a number of ways. Suppose you have created a file on your personal computer that you want to mail to a colleague. You can transfer the file to a host that supports electronic mail.

You can use FTP to incorporate the results of computation on a host into a document created on your personal computer. You can also use FTP to transfer the file to a host for processing.

Depending on the file protection scheme of the particular host, FTP allows you to review your colleagues' documents by transferring files from their directories to your personal computer and then returning the revised copies. You can also have someone review one of your documents in the same way.

For further information on the File Transfer Service, see Section 4.0.

1.4 Network Management Service

The Network Management Service includes network map, statistics, and audit trail facilities.

The network map is a list of the addresses of all Bridge servers on the network that run the TCP/IP protocols. The first address is always the local personal computer.

TCPTerm gathers statistics on system load and performance. These statistics can be displayed as network management reports:

- Statistics for the busiest samples of the day
- Statistics for the busiest minutes of the day
- Statistics for the specified hour
- Statistics for the previous day

When the audit trail facility is enabled with the customizing program, TCPTerm sends audit trail data to a specified NCS/150. The audit trail data includes information about session connection and disconnection, reasons for disconnections, and excessive errors. The NCS displays reports derived from audit trail data.

For further information on the Network Management Service, refer to Section 5.0.

1.5 Compatibility

The TCPTerm applications run with

- DOS 2.0 or higher
- A host computer connected to an Ethernet network running Transmission Control Protocol/Internet Protocol (TCP/IP)
- IBM PC, PC/XT, PC/AT, or compatible personal computers
- All Bridge servers that support the TCP/IP protocols: CS/1, CS/100, CS/1-SNA, GS/3, GS/6, and NCS/150

There may be a compatibility problem between TCPTerm and other I/O or network drivers installed in your personal computer (see Section 2.3.1 for further information).

2.0 INSTALLATION

This section describes the TCPterm hardware environment, how to install the software, and how to configure your system.

2.1 Hardware

This section describes the hardware environment.

2.1.1 Requirements

TCPterm operates on a standard IBM PC or PC/XT, PC/AT, or compatible. The requirements include the following:

- 256K bytes of memory
- One floppy disk drive
- 80-column display (monochrome or color)
- EtherLink interface (Bridge order code PC-ELINK) and an Ethernet transceiver and transceiver cable. The EtherLink interface is available from Bridge Communications, Inc. (See the EtherLink Installation Guide to install EtherLink in your personal computer.)

2.1.2 EtherLink Interface Configuration

Several jumper-selectable hardware options are available on the EtherLink interface. Make sure that the positions of jumpers jpl and jp2 (DMA channel select) and jumper jp3 (interrupt vector select) match the values that the TCPterm software uses (see Section 2.3).

The choice of DMA channel and interrupt vector depends on what other I/O equipment is installed in the personal computer. For example, on an IBM PC/XT the hard disk is configured to use interrupt vector 5, so the EtherLink interface must use interrupt vector 3. Similarly, the PC/XT uses DMA channel 3 for the hard disk, so the EtherLink must use DMA channel 1. Note that the EtherLink interface is shipped with interrupt vector 3 and DMA channel 1. The custom program can be used to configure the software to match the hardware configuration (see Section 2.3).

For more information about the EtherLink interface, see the EtherLink Installation Guide.

2.2 Software

This section describes how to install TCPterm. The distribution diskette is a read-only master copy that does not contain DOS and must be copied to a double-sided diskette that contains DOS or to a hard disk.

2.2.1 Installing on a Diskette

1. Place the DOS diskette in drive A: and a blank double-sided diskette in drive B:.

At the A:> prompt, format the blank working diskette with the following command:

```
format b:/s
```

2. Remove the DOS diskette from drive A: and replace it with the TCPterm diskette. Copy the distribution diskette to your newly formatted diskette with the following command:

```
copy *.* b:
```

3. Store the distribution diskette in a safe place.

2.2.2 Installing on a Hard Disk

1. Place the distribution diskette in drive A:.
2. If you have an A:> prompt on the screen, change to the hard disk prompt (C:>), make a new directory for TCPterm (called IP in the example), and change to the new directory with the following commands:

```
c:  
mkdir ip  
cd ip
```

3. Copy the distribution diskette to your hard disk with the following command at the C:> prompt:

```
copy a:*.* c:
```

4. Store the distribution diskette in a safe place.

2.3 System Customization

This section describes system customization. Before you run the customization program, there are three things you need to do:

1. Ensure that the files that initialize the TCPterm driver are in the appropriate directory.
2. Determine if any hardware configuration information needs to be changed.
3. Obtain internet addresses and names.

2.3.1 Location of Files

Use the following guidelines for file location:

1. Locate the system disk that you used when you powered on or rebooted the personal computer.
2. Check the directory of this disk for the CONFIG.SYS and NETDEV.SYS files with the following command:

```
dir
```

3. Display the CONFIG.SYS file with the following command:

```
type config.sys
```

4. The CONFIG.SYS file must contain a line which names the file that contains the TCPterm device driver.
 - a. If you already have a CONFIG.SYS in your root directory, add the following line using a text editor:

```
device = netdev.sys
```

- b. If you do not have a CONFIG.SYS file, create one that contains this single line.

If TCPterm is on your hard disk, copy the NETDEV.SYS file to the root directory.

If TCPterm is on a floppy diskette, ensure that there is a CONFIG.SYS file on your floppy diskette, and that this line is present.

The TCPterm driver and other drivers for the EtherLink interface cannot coexist. The CONFIG.SYS file cannot contain "DEVICE = ..." lines for incompatible drivers. Create a separate copy of CONFIG.SYS for TCPterm. When you want to run TCPterm, boot your personal computer with the CONFIG.SYS that has a "device =" line for NETDEV.SYS; when you want to use the other driver, boot your

personal computer with the CONFIG.SYS that initializes that driver.

2.3.2 Hardware Configuration

The custom program is used to configure the software to match the hardware configuration. The choice of DMA channel and interrupt vector depends on what other I/O equipment is installed in the personal computer.

Carefully review the manuals of the I/O interfaces used in your personal computer to determine the DMA channel and the interrupt vector the EtherLink interface and TCPTerm software should use.

The EtherLink interface is shipped with the following settings:

DMA Channel 1

Interrupt Level 3

I/O Base Address 300 hexadecimal
(uses addresses 300-30F hexadecimal)

If you reconfigure the EtherLink interface, you will have to reconfigure the software during the customization process. For more information about the EtherLink interface, see the 3COM EtherLink Installation Guide.

2.3.3 Internet Names and Addresses

See your network manager for the following information:

1. An internet address assigned to your computer.
2. The IP addresses of the name servers, if you plan to use one or more name servers.
3. The internet address of a gateway to the other network if you plan to communicate with hosts not directly attached to the same network.
4. The internet address of the audit server, if a Network Control Server is present in the network.
5. A list of Internet-to-Ethernet address translations for the other hosts on your Ethernet. This is required only if the hosts in the network do not support the ARP protocol.
6. The IP internet names or addresses of the hosts to which you plan to connect.

2.3.4 Running the Custom Program

For simplicity and uniformity, one device driver contains the customization parameters for all network levels and all commands. The menu-driven custom program is used to set parameters that describe the network environment and preferred option settings.

**** Note ****

Very little customization is required. In most cases, only the internet, name server, audit server, and the default gateway addresses are specified. The other parameters are seldom changed from their defaults.

There are several customization parameters that are applicable to all or several different TCPterm commands. Customization parameters that apply to just one command are described in the description of that command. The custom program is easy to use and does not require unused parameters to be specified.

The command "custom netdev" begins customization of the device driver named "netdev.sys." When all options are selected (from menus or submenus), the custom program writes the new parameters into the NETDEV.SYS file.

The customization of NETDEV.SYS does not take effect until you initialize it as a DOS device driver. The initialization is automatic when DOS is bootloaded with a CONFIG.SYS file that contains the line DEVICE = NETDEV.SYS.

PC Network Customizer Menu (Main menu)

Using the information gathered from the previous subsections, customize the file named NETDEV.SYS on the working diskette or hard disk. Make sure you are in the root directory, and enter the following command at the prompt:

```
custom netdev
```

The system displays the main menu with options and submenus. To make a selection (on any menu), type the character that appears at the beginning of the line. Figure 2-1 shows the main menu.

If you make a menu selection with an uppercase character, or if your <CAPS LOCK> is on, the system repaints the screen but does not display an error message. Reenter your selection with a lowercase character.

Errors in typing names or addresses can be corrected by using the backspace key to discard the last character typed, or by using <CTRL U> to discard the entire line.

The following parameters (m, o, p, t, and u) are optional:

■ Set terminal options (m)

Toggles modes for lines too long to fit on screen. Discard mode places all excess characters in column 80. Wraparound mode places excess characters on next line.

Toggles interpretation of backspace key. Possible values are backspace and delete (Control Backspace). (See Section 3.2 to set the selection permanently.)

■ Set the office number (o)

The office number could be the address or building number.

■ Set the phone number (p)

■ Telnet specific customization (t)

Toggles between (shown on screen) "Transmit on each character" and "Transmit on newline" using the "n" option.

■ Set user's name (u)

PC Network Customizer - Ver 2.0

Last Customized at <time> on <day-month-year>
User's name is
User's office is
User's phone number is
Debug options are all off
This machine has 1 net interfaces

-d Set debug options
-e Exit and save
-h Do hardware customizations
-m Set terminal options
-o Set the office number
-p Set the phone number
-q Quit without saving
-s Do Site Customization
-t Telnet specific customization
-u Set user's name

Enter Command _

Figure 2-1 PC Network Customizer Menu

Hardware Customization Menu (h)

If the defaults for the DMA channel, the interrupt vector, and the I/O base address are accepted, you can omit the hardware customization menu. If not, select the "Do hardware customizations" option on the main menu by typing:

h

The Hardware Customization screen is illustrated in Figure 2-2.

Enter the information for the following options, if applicable:

- The I/O base address (b) ranges between 300 and 30F hexadecimal.
- Up to five initial values for Internet-to-Ethernet address cache (c). The translation cache settings are only useful if the environment does not support the ARP protocol.

IP addresses are entered in octal or decimal form. Ethernet addresses are entered as 6 octal byte values (each between 0 and 377) separated by commas. The internet addresses appear on the screen in decimal form, and Ethernet addresses appear in octal form.

- The DMA channel for network interface (d) should be set to correspond to the DMA channel that the EtherLink interface uses. The default is channel 1.
- The interrupt vector (v) should be set to correspond to the interrupt vector number that the EtherLink interface uses. If not set, the TCPterm Ethernet driver uses interrupt vector 3 as a default.
- Press ESC to return to the PC Network Customizer menu.

Hardware Customization

Uses hardware Ethernet address. CSR base I/O address in hex 0300

Interrupt vector 3

DMA channel 1

This machine has 1 net interfaces

- b Set net interface CSR base I/O address
- c Set Internet to Ethernet Translation Cache
- d Set net interface DMA channel
- e Set Ethernet address
- n Set number of net interfaces on this machine
- v Set net interface interrupt vector
- ESC return

Enter Command _

Figure 2-2 Hardware Customization Menu

Site Customization Menu (s)

Select the "Do Site Customization" option by typing:

s

The Site Customization screen is illustrated in Figure 2-3.

Enter the address information for the personal computer, name servers, and if applicable, the default gateway and audit server. The other options can be omitted.

- The internet address of this computer (a).
- The internet address of the default IP gateway, if applicable (g).
- The internet address of an IP audit server (l). If this address is set to 0,0,0,0, the audit trail feature is disabled. To enable the feature, specify the address of an NCS/150-TCP in the network.
- The internet addresses of up to five name servers (n).
- The local standard time offset in minutes before UT (Universal Time or Greenwich Mean Time) (z). West of UT the value is positive, east of UT is negative. For EST, the value is +300, and for SET (Standard European Time), the value is -60.
- Press ESC to return to the PC Network Customizer menu.

Site Customization

My Internet Address	Audit Server	Default Gateway
000,00,000,000	0,0,0,0	000,00,000,000

Print Server: 0,0,0,0

There are no time servers and 0 name servers.

There are 0 bits of subnet; the subnet mask is 000,000,000,0

The time zone is EDT. It is 240 minutes from UT.

- a Set my internet address
- g Set default gateway's address
- l Set audit server's address
- n Set name servers
- p Set the print server's address
- s Set number of subnet bits
- t Set time server's address
- z Set time zone
- ESC return

Enter Command _

Figure 2-3 Site Customization Menu

Exit and save (e)

Before attempting to use TCPTerm applications, you must save the parameters and initialize your system. From the main menu, select the "Exit and save" option (e) and reboot at the DOS prompt.

e
Ctrl-Alt-Del

2.4 Temporary Customization

To temporarily customize the driver (named NETCUST), use the following command:

```
custom netcust
```

which will recustomize the currently active device driver. The options are identical with those in "custom netdev".

Customization of NETCUST takes effect immediately and is lost when the next bootload takes place. Note that for temporary customization to work, there must be an active device driver previously loaded by DOS.

3.0 Telnet Terminal Service

This section describes how to connect to a remote host from the IBM personal computer using the TCP/IP protocol, how to use Telnet functions, and how to close the connection.

3.1 Connecting with Telnet

The command to connect to the host from the personal computer takes the following form:

```
telnet <hostname>
```

or

```
telnet <hostaddress>
```

For example:

```
telnet host1
```

or

```
telnet 192.9.255.071
```

Figure 3-1 illustrates the Telnet connection screen display.

```
IBM PC User Telnet  Version <number>
To host <host> via <Ethernet>.  Time is <time> on <date>

Last customized at <time> on <date>
Telnet escape character is F10
Trying...Open

<login message from host>
```

Figure 3-1 Telnet Connection Screen Display

Log in to the host as you normally would.

From the point of view of the target host, Telnet emulates a standard "network virtual terminal." From the point of view of the keyboard user, Telnet emulates a DEC VT100* terminal.

Typing the Telnet command with the name or address of a target host causes Telnet to try to establish a connection. When that connection is successful, the target host displays its login message.

Typing the Telnet command without the name or address of the target host causes Telnet to display an error message:

```
telnet: improper arguments.  
usage: telnet [-d file -p port] host
```

If you try to make a connection, and the host does not respond, the Telnet command tries eight times, displays an error message, and exits. This message means either that the target host is not communicating on the network, or that a network or gateway in the communication path to that host has failed.

To exit a connection attempt, use the following command:

```
F10 c
```

* DEC and VT100 are trademarks of Digital Equipment Corporation.

3.2 Terminal Emulation

The following conventions apply to the translation between your personal computer and the network virtual terminal emulation:

- The function key F10 is an escape used to invoke Telnet functions. To invoke Telnet functions, press the F10 key and type one of the characters listed in the Telnet help screen shown in Figure 3-2. To display the help list on your screen, press F10 and then type a question mark.
- Note: The backspace key can be permanently set with a toggle in the "Set Terminal Options" menu (m option on main menu).
- To print the screen on a locally attached printer, type the following command at the command line:

 SHIFT PrtSc
- Up arrow, down arrow, right arrow, and left arrow on the keypad of the personal computer operate as cursor directional keys.

```
?      Print this list
a      Send are you there
b      Send telnet interrupt process in urgent mode
c      Close connection and exit Telnet
d      Discard characters at end of the line
e/E    Send on every character/end-of-line
i/I    Send/show my internet address
l      Local echo
n      Refuse a file transfer request
q      exit telnet immediately. [Dangerous]
r      Remote echo
s      Give connection status
u/U    Turn status line off/on
w      Wrap around characters at end of line
x      Expedite outstanding data
y      Accept a file transfer request
B/D    Have <-- key be backspace/delete
N      Display network statistics
+      Print out tasking statistics
!      Enter inferior command interpreter
```

Figure 3-2 Telnet Help Screen

3.3 Closing the Connection

When you log out at the end of a login session, some hosts close the connection and Telnet exits and returns to DOS. Other hosts issue an invitation to log in again. In the case of the latter, the command

F10 c

closes the connection and exits Telnet.

Other methods of exiting, such as F10 q or powering off the personal computer, leave a dangling Telnet connection so that a later attempt to log onto the host from the same personal computer may fail because of the unclosed connection.

If you close a connection without logging out, most hosts handle it the same way as a telephone line hangup. If you exit Telnet without logging out or closing the connection, the host may not know you have terminated the connection, and there is no way to pick up the dangling connection again. If there is a lack of activity for a period of time, the host may log you out and close the connection.

If you experience difficulty disconnecting your personal computer from the host using the host's logout command or using F10 c, press

F10 q

There might be some delay before you can connect to the same host again.

4.0 File Transfer Service

This section describes how to use the File Transfer Service (the FTP program) to transfer files to and from a remote network host.

4.1 Starting FTP

The command to execute FTP takes the following form:

```
ftp <hostname>
```

or

```
ftp <hostaddress>
```

If you make a mistake while typing, the following error messages and an FTP prompt appear:

```
Host <host> unknown.  
Open to remote host <host> failed.
```

You can then use the command

```
open <host>
```

to try again.

If the host does not respond, the following messages and an FTP prompt appear:

```
Connection to host <host>.....failed.  
Open to remote host <host> failed.
```

If your attempt to connect to the host succeeds, FTP prompts you for a login sequence, and prints a message indicating that you are successfully logged in and waits for the next command.

4.2 File Transfer from Host

To transfer a file from the host to the personal computer, use the Get command at the FTP prompt:

```
get <sourcefile> <destinationfile>
```

For example:

```
get ip.test test1.txt
```

To make sure that you do not delete one of your personal computer files by transferring a host file with the same name, check the local directory first or transfer the file with a new name. Refer to Section 4.4 for a complete list of FTP commands.

Unless you specify the full pathname of the destination file, the file is placed in your current directory.

Figure 4-1 illustrates the screen display for a successful transfer.

To work on the transferred file, terminate the connection with the following command at the FTP prompt:

```
quit
```

```
200 PORT command okay
150 Opening data connection for <sourcefile> <destinationfile>
<network number> <number of bytes>.
#
226 Transfer complete.
Received (<bytes>) in <nn> seconds at <nn> bytes/sec.
```

Figure 4-1 Successful Get Display

4.3 File Transfer to the Host

To transfer a file from the personal computer local directory to the host, use the PUT command at the FTP prompt:

```
put <sourcefile> <destinationfile>
```

For example:

```
put test1.txt ip.test2
```

To make sure that you do not delete one of your host files by transferring a personal computer file with the same name, check your host directory first or send the file with a new name.

4.4 FTP Command Options

Many FTP command options do not require a connection to be made with a specified host. When the FTP command is issued without an argument, FTP waits for your instructions. If you type a command option that requires a connection to a host, FTP displays the error message "Not connected."

The following commands are recognized by FTP. All of the commands are listed with the minimum number of required keystrokes in uppercase characters.

Append <localfile> <remotefile>

Append a local file to a file on the remote host. If the remotefile name is left unspecified, the local file name is used for the remote file. File Transfer uses ASCII or binary type, whichever is currently specified.

AScii

Set the file transfer type to ASCII. The default is ASCII.

BEll

Toggle bell on or off after each file transfer command is completed.

BIrary

Set the file transfer type for a binary image transfer. If you use the binary mode to transfer an ASCII file to a DEC 20 host, your text will not be readable. Just specify ASCII mode and send the file again.

BYe

Terminate the FTP session with the remote host and exit FTP. Synonym for QUIT.

CD <remotedirectory>

Change the working directory on the remote host to <remote-directory>.

CLose

Terminate the FTP session with the remote host and return to the command interpreter.

DELeTe <remote-file>

Delete the file <remotefile> on the remote host.

DEBUg [debug-value]

Toggle debugging mode on or off. If you specify an optional debug-value (debug off, for example), it is used to set the debugging level. When debugging is on, FTP displays each

command sent to the remote host, preceded by the string "-->".

DIR [<remotedirectory>] [<localfile>]

Displays a listing of the directory contents of the directory <remotedirectory>. If no directory is specified, the current working directory on the remote host is used. If no local file is specified, output is sent to the screen.

Get <remotefile> [<localfile>]

Retrieve <remotefile> and store it on the local host. If the local file name is not specified, the file is given the same name it has on the remote host. The current type setting is used while transferring the file.

HAsh

Toggle hash sign (#) display for each data block transferred. The size of a data block is 1024 bytes.

HElp [<command>]

Display an informative message about the meaning of the specified command. If no argument is given, FTP displays a list of the commands.

LCD [<directory>]

Change the working directory on the local host to the one specified. If no directory is specified, your home directory is used.

LPWD

Display the working directory on the local host.

LS [<remotedirectory>]

Display an abbreviated listing of the contents of a directory on the remote host. If <remotedirectory> is not specified, the current working directory is used. The wildcard (*) is permitted.

MGet <remotefiles>

Similar to the Get command. When more than one file is specified, each file is written to a separate file. The wildcard (*) is permitted.

MKdir <directory name>

Make a directory on the remote host.

MPut <local files> Similar to the PUt command. If more than one file is specified, each file is written to a separate file. The wildcard (*) is permitted.

Open <hostname> Establish a connection to the specified host.

PRompt Toggle interactive prompting. Interactive prompting occurs during multiple file transfers to allow you to selectively retrieve or store files. If prompting is turned off (the default), any MGet or MPut will transfer all files.

PUt <localfile> [<remote-file>]
Send a local file to the remote host. If <remotefile> is not specified, the local file name is used for the remote file.

PWd Display the name of the current working directory on the remote host.

QUIt Terminate the FTP session; synonym for BYe.

QUOte arguments... The arguments specified are sent verbatim to the remote FTP server. A single FTP reply code is expected in return.

RECV <remotefile> [<local file>]
Synonym for Get.

REname [<oldname>] [<newname>]
Rename the file <oldname> to <newname> on the remote host.

RMdir <directory name> Delete the directory on the remote host.

REMOTEHelp Request help from the remote FTP server. If a command name is specified, it is supplied to the server as well. Display a list of debugging commands.

SEnd <localfile> [<remotefile>]

Synonym for PUT.

STatus

Show current status of FTP.

TEnex

Set the file transfer type needed to talk to hosts running the TOPS-20* operating system.

TYpe [<typename>]

Set the file transfer type to <typename>. If no type is specified, the current type is displayed. The default is ASCII.

USER <user-name> [<password>] [<account>]

Identify yourself to the remote host. When you have made a connection, but have made a typing error in your user name or password, this command allows you to log in again without closing the connection.

Verbose

Toggle verbose mode. In verbose mode, all responses from the FTP server are displayed on the screen. In addition, if verbose is on, when file transfer completes, statistics regarding the efficiency of the transfer are reported. By default, verbose is on.

Wildcard

Toggle to enable and disable the use of a wildcard in file names.

? [<command>]

Synonym for HELP. Command arguments with embedded spaces can be quoted with quotation marks ("").

* TOPS-20 is a trademark of Digital Equipment Corporation.

4.5 Closing the Connection

To close a FTP connection, use the following command at the prompt:

QUIT

When you issue a QUIT command, FTP responds with the following messages:

220 Goodbye.
Connection to <host> closed.

5.0 NETWORK MANAGEMENT SERVICE

This section describes the Network Management Service: network map, network statistics, and audit trail.

5.1 Network Map

The network map is a list of the addresses of all Bridge servers on the network that run the TCP/IP protocols. The first address is always the local personal computer.

Any server that has been down for five minutes or longer is indicated in the list as inactive; after a server has been inactive for 72 hours, it is dropped from the network map list. Inactive and dropped servers are reported in the audit trail (see Section 5.3).

The SHOW command can be used to display network maps and statistics. The SHOW ? command displays a list of the valid SHOW keywords, indicating command format:

```
SHOW STats | NETmap.
```

The uppercase characters denote the minimum required characters.

The SHOW NETmap command can be entered in its short or long form. The syntax for the short form is

```
SHOW NETmap
```

and the syntax for the long form is

```
SHOW NETmap Long
```

SHOW NETmap, in its short form, displays a list of all Bridge servers running the TCP/IP protocols on the network and their addresses (see Figure 5-1).

In its long form, the display also includes associated software release numbers (see Figure 5-2).

Network Map

0-	192.9.255.104	1-	192.9.255.180
2-	192.9.255.184	3-	192.9.255.185
4-	192.9.255.186	5-	192.9.255.195
6-	192.9.255.182	7-	192.9.255.183
***-	192.9.255.113	9-	192.9.255.193
10-	192.9.255.102	11-	192.9.255.181
12-	192.9.255.71	13-	192.9.255.192
14-	192.9.255.197	15-	192.9.255.196
16-	192.9.255.112	*** 1 Inactive nodes ***	

Figure 5-1 Short Network Map Display

Network Map

0-	192.9.255.104	PC/xx1-TCP-0000X
1-	192.9.255.180	SW/100-TCP-12013
2-	192.9.255.184	SW/100-TCP-12013
3-	192.9.255.185	SW/100-TCP-12013
4-	192.9.255.186	SW/100-TCP-12013
5-	192.9.255.195	SW/100-TCP-12013
6-	192.9.255.182	SW/100-TCP-12013
7-	192.9.255.183	SW/100-TCP-12013
***-	192.9.255.113	PC/xx1-TCP-0000X
9-	192.9.255.193	SW/3-IP-10019
10-	192.9.255.102	PC/xx1-TCP-12013
11-	192.9.255.181	SW/100-TCP-12013
12-	192.9.255.71	SW/150-NCS-TCP 11002
13-	192.9.255.192	SW/100-TCP-12013
14-	192.9.255.197	SW/100-TCP-12013
15-	192.9.255.196	SW/100-TCP-12013
16-	192.9.255.112	PC/xx1-TCP-0000X
*** 1 Inactive nodes ***		

Figure 5-2 Long Network Map Display

5.2 Statistics

The statistics on system load and performance are gathered by TCP/IP and available on the personal computer.

These statistics can be displayed as network management reports using the SHOW Statistics command. Depending on the key word used in the SHOW Statistics command, the reports contain an accumulation of system statistics for the busiest sample of the day, the busiest minutes of the day, the averages for a specified hour, and the averages for the past 24 hours.

The SHOW Statistics command can take two forms. If it is used without a final argument, SHOW Statistics displays a summary of the statistics for the personal computer. If it is used with an argument (Sample, Min, <hour>, Day), the command displays the corresponding network management statistics report. For example, the command

SHOW Statistics

displays the statistics report shown in Figure 5-3.

PORT #3 STATISTICS REPORT: -----

DAILY AVERAGE:	CALL/D	PKT/S	BYTE/S	ERROR/D
	10	10	120	0
BUSIEST MINUTE:	CALL/M	PKT/S	BYTE/S	ERROR/M
	3	70	2000	0
BUSIEST SAMPLE:	MAX#SN	PKT/S	BYTE/S	ERROR
	2	80	2400	0

HOUR	CALL/H	PKT/S	BYTE/S	ERR/H	HOUR	CALL/H	PKT/S	BYTE/S	ERR/H
0	0	0	0	0	1	0	0	0	0
2	0	0	0	0	3	0	0	0	0
4	0	0	0	0	5	0	0	0	0
6	0	0	0	0	7	0	0	0	0
8	3	10	800	0	9	1	30	700	0
10	0	20	100	0	11	0	20	108	0
12	1	10	200	0	13	2	30	120	0
14	1	30	500	0	15	1	2	100	0
16	0	2	70	0	17	1	2	80	0
18	0	0	0	0	19	0	0	0	0
20	0	0	0	0	21	0	0	0	0
22	0	0	0	0	23	0	0	0	0

Figure 5-3 Statistics Report

The first area of the report lists the daily average, busiest minutes, and busiest samples statistics. The second area of the report lists the hour average statistics for every hour of the current day. Because of the limitation imposed by screen size, errors are summarized rather than itemized. Other SHOW Statistics commands are as follows:

SHOW Statistics ?	displays a list of keywords, indicating command format.
SHOW Statistics Sample	displays the busiest samples of the day.
SHOW Statistics Minutes	displays statistics for the busiest minutes of the 24-hour period starting at midnight or when the last command was given.
SHOW Statistics <hour>	displays statistics for the most recent hour.
SHOW Statistics Day	displays statistics for the most recent day.

5.3 Audit Trail

Audit trail data includes information about session connection and disconnection, reasons for disconnections, and excessive errors.

The records are sent to the NCS/150 specified in the custom program. You can view the audit trail with the proper command at the NCS/150. If excessive errors are reported, the network manager should try to determine the cause by using the SHOW STatistics command to display NCS network performance statistics.

Table 5-1 lists the audit trail record types generated by TCPTerm and briefly describes each type.

 Table 5-1 Record Type Codes

<u>Code</u>	<u>Meaning</u>	<u>Description</u>
CD	Connected	A connection was established between the specified devices.
DC	Disconnected	The initiating device disconnected from the destination device. This record type is followed by one of the explanatory codes AD, NR, OK, and UE, and the fields shown below separated by spaces: <ul style="list-style-type: none"> ■ Duration of connection (secs) ■ Number of bytes received ■ Number of packets received ■ Number of bytes transmitted ■ Number of packets transmitted
EE	Ethernet error	The specified server reported 100 or more Ethernet errors within the hour. Ethernet errors include Cyclic Redundancy Check (CRC), alignment, packet-too-short, and packet collision errors. The record is followed by the number of Ethernet errors.
PO	Passive open	The host has opened a passive connection (similar to CD).

For further information, refer to the NCS/150 Installation and Operations Guide, reference [3].