

# THEO+Net™

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## *Installation and Reference*



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# Introduction

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Welcome to THEO+Net Version 4, an add-on Plus Pak for the THEOS 32 Version 4 operating system. With THEO+Net, you can connect multiple computers together and communicate easily and efficiently between them.

Some of the capabilities of THEO+Net include:

- ▶ Connect as a user to a THEOS-based system:
  - ▶ From another THEOS system using the [NetTerm Client](#).
  - ▶ From a Windows-based system using the [THEOS WorkStation Client](#).
  - ▶ From any computer using its Telnet client.
- ▶ Connect as a user to any system with a Telnet server using the THEOS [Telnet Client](#).
- ▶ Transfer files from or to the THEOS system:
  - ▶ To or from another THEOS system using the [NetTerm Client](#).
  - ▶ To or from a Windows-based system using the [THEOS Work-Station Client](#).
  - ▶ To or from any computer with a FTP server using the THEOS [FTP Client](#).
- ▶ Synchronize the date and time between two systems using the NET TIME client.

THEO+Net is also the foundation for other Plus Pak options, including:

- ▶ THEO+Mail, an e-mail client that can send and receive messages to or from remote users.
- ▶ THEO+Server, an HTML server and FTP server. Allows the THEOS system to be the file storage site for remote FTP clients and Web browsers.

## ■ **Hardware Requirements**

THEO+Net has the following minimum hardware requirements:

- ▶ 8 Mb RAM
- ▶ 10 Mb available disk space
- ▶ IEEE 802.3 Ethernet medium (cable)
- ▶ Ethernet Network Interface Card (NIC) or modem for PPP connection to another network
- ▶ Multiple computers and/or access to the Internet

The actual amount of RAM and disk space required depends upon the services started, number of sockets enabled, *etc.*

## ■ **Software Requirements**

THEO+Net requires THEOS 32 Version 4, patch level 40264 or above.

The [THEOS WorkStation Client](#) can be used on a Windows For Workgroups version 3.11, Windows 95 or Windows NT system with the appropriate network support configured.

## ■ **About This Manual**

This manual is designed to show you how to install, configure and use THEO+Net Version 4 on an existing THEOS 32 Version 4 system. It is divided into five parts:

► Part I “ [Networking Fundamentals](#)”

Gives a general overview of networking concepts, terminology and components with emphasis on those applying to THEO+Net.

► Part II “ [Installation and Setup](#)”

Step-by-step instructions for installing and configuring the software.

► Part III “ [Command Reference](#)”

All commands and setup programs are described in detail.

► Part IV “ [THEOS WorkStation Installation and Reference](#)”

Installation, configuration and usage description for the THEOS WorkStation product.

► Appendices

Support information, [Glossary of Terms](#), and an [Index](#).

## ■ Documentation Conventions

Throughout this manual, syntax is used that looks like:


```
NET
NET START server-name
NET function parameters
FTP filename (FILE options)
```

These symbols are used to show the correct syntax for typing the command.

**BOLD** Words and characters shown capitalized and in boldface must be entered exactly as shown.

*italics* Italicized words show parameters whose value is supplied by you.

FILELIST Underlined portions of a word indicate the minimum spelling allowed for abbreviations of the word.

 Specific keys on the keyboard are indicated by icons of the key. These standards are used in the formal definitions of the syntax of a command or feature and in the descriptive text of the feature. The descriptive text also uses the following typographic conventions to identify the various items described.

**File names** File names that appear in text are always shown in small caps. For instance, the SYSTEM.TEOS32.DEV NAMES file.

**Definitions** A significant word or term that is being defined in the text is shown in boldface italics. For instance: The ***command name*** is the name of the program that you want to execute.

**Literal text** Text appearing in an example, that is also referred to in the text description of the example, is shown with a different typeface. For instance: When a report is aborted, the spooler prints the message “\*\*\*\*\* A B O R T \*\*\*\*\*” and performs a form-feed.

# **Part I** ---

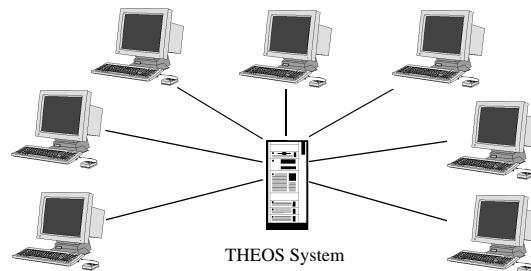
# **Networking Fundamentals**



# 1 Networks

---

Among its many other capabilities, the THEOS operating system is essentially a multiuser operating system. In the most basic meaning of the term *network*, a multiuser operating system is a network hub for terminals.



Over the years, the meaning of the term network has expanded and has taken on more specific meanings. With a multiuser operating system, the central computer acts as a *terminal server*. That is, a system providing services to terminals. (Multiuser operating systems provide much more than this basic service, but, for the purposes of this discussion of networks, that is its principal duty.) The current meaning of network refers to a network of computers.

THEOS provided this basic capability with THEO+Com™ and ScanTerm™. THEO+Com allows a user on a THEOS system to connect to and act as a terminal to another THEOS system or non-THEOS system. (In network terminology, THEO+Com is a client application that communicates with a remote Terminal Server.) THEO+Com provides basic file transfer capabilities between the THEOS system that it is running on and the remote system that it is connected to.

The ScanTerm product allows a DOS-based system to act as a terminal to the THEOS system. The THEOS system was still operating as a Terminal Server but with the added capability of file transfers to and from the non-THEOS system using ScanTerm.

Over the years, other operating environments began developing and using network operating systems, primarily to provide a shared database to multiple users. Because THEOS is a multiuser operating system, it has always provided a shared database to multiple users. However, these other environments extended the capabilities of their network operating systems to provide more than mere Terminal Server capabilities to their systems. Also,

with the proliferation of networks, standards were formed that allow networks using different network operating systems to communicate.

To extend its capabilities, the THEOS 32 Version 4 operating system now offers THEO+Net as an add-on Plus Pak. With THEO+Net installed, the THEOS operating system becomes a network operating system providing terminal server functionality that is now referred to as the Login Server. It also provides several client applications such as Telnet, FTP, SendMail, finger, and other network services.

Because THEO+Net is software for an intercomputer network, it cannot operate by itself. It needs hardware components and software on other computers to successfully operate as a network operating system. To avoid using proprietary hardware or special software on the other non-THEOS systems that might be on the network, THEO+Net is designed to use common, standardized hardware and software. The requirements of this hardware and software are: Ethernet mediums and interfaces or PPP interfaces and software supporting the TCP/IP network protocol suite.

## ■ Network Standards

A network, by its very nature, involves the communication between many different components, devices and software. There are many standards organizations whose responsibilities are to provide definitions for hardware and software so that two products adhering to these definitions can operate together. These definitions are referred to as ***standards***.

Locally, in the United States, the two principal standards organizations are the American National Standards Institute (ANSI) and the Institute of Electrical and Electronic Engineers (IEEE). Internationally, the principal organization is the International Standards Organization (ISO).

Although separate, these organizations all work together to develop and distribute standards. Once the IEEE develops and approves a standard, that standard is sent to ANSI for review. If ANSI approves the standard, it is then sent to the ISO. The ISO solicits comments from all member countries to ensure that the standard will work at the international level, resulting in an IEEE- or ANSI-developed standard becoming an ISO standard.

## ■ Ethernet

The Ethernet standard is a definition for network medium (cables) and the interface between that medium and the Network Interface Cards (NIC) on computers connected to the network. These are the physical portions of a network. Ethernet is the first widely accepted, nonproprietary, standardized



network. It was originally developed by the Xerox Corporation at its Palo Alto Research Center (Xerox PARC). The original standard promoted by Digital Equipment Corporation, Intel Corporation and Xerox (DIX) became the IEEE 802.3 standard and now includes coax, twisted pair, fiber optics and wireless connection methods. The current standard differs from the original, which still exists as Ethernet Version 2. Subsequent references to Ethernet in this manual refer to the IEEE 802.3 definition of Ethernet.

Ethernet uses a method of signaling called Carrier Sense Multiple Access with Collision-Detect (CSMA/CD). The signaling rate is 10 Mbps (ten million bits per second) or 100Mbps. Each NIC device listens to the network for transmissions from other devices. If a transmission is received that matches the device's address, it is processed in accordance with higher-level protocols. If not, the transmission is simply ignored. When a device wishes to transmit, it first "listens" for another existing transmission. If none is present, it transmits its message and then notes the voltage level on the line to see if another device transmitted at the same time (a "collision"). If a collision occurs, each device waits a short, random time period and retransmits, after checking for an existing transmission. Thus, many devices have access to the network (multiple access), they each listen before transmitting (carrier sense), and they retransmit if a collision occurs (collision detect).

Ethernet supports many types of mediums or cables. There is a relatively thick 50-ohm coax cable, normally colored yellow and referred to as "thick" Ethernet. There is also a smaller 50-ohm coax cable referred to as "thin" Ethernet. Also supported are shielded and unshielded twisted-pair cable (STP and UTP), fiber optic cable and wireless transmissions. The characteristics, advantages and disadvantages of one medium over another, and the usage of these various mediums are discussed in Chapter 2 "[Ethernet Mediums and Topologies](#)," starting on page 27.

The connection of the medium to the computer is provided by a Network Interface Card (NIC) that is inserted into an expansion slot within a computer. Modern NICs provide support and connections for Thicknet cable (DB-15), Thinnet cable (BNC) and twisted-pair cable (RJ-45). The NIC is responsible for encoding and decoding the signals transmitted on the Ethernet medium and ensuring that the signals are properly transmitted or received.

## ■ **PPP - Point to Point Protocol**

The Point-to-Point Protocol (PPP), is an alternate method of connecting a system to a network. Ethernet connects one computer to a network of computers. As its name suggests, PPP connects one computer to one other computer. Generally, a PPP connection is used to connect one computer to another computer that has its own local area network or, more likely, has a network connection to the global Internet. For instance, PPP can be used to connect your system to an Internet Service Provider (ISP) via a modem.

Like Ethernet, PPP provides a connection that allows various network protocols to be used to transmit data over the network. For instance, a PPP connection can be used on a TCP/IP network, as used by THEO+Net, or it can be used with NetBEUI, IPX, *etc.*

PPP is used to connect two computers using serial adapters, modems or other devices capable of transmitting 8-bit data. Frequently, PPP is used in conjunction with a Dial-Up Networking interface (DUN), which provides connections over a Public Switched Telephone Network (PSTN), such as your local telephone system. It is also used for connections over private, dedicated connections like a dedicated analog telephone line or a dedicated ISDN line.

Some of the key features of PPP features:

- ▶ Address notification allows a server to inform a dial-up client of its IP address for that link, but the mechanism is powerful enough for clients to request IP addresses and supports fallback configurations.
- ▶ Authentication is available as an option, either with the Password Authentication Protocol (PAP), or the Challenge Handshake Authentication Protocol (CHAP).

## ■ TCP/IP

While Ethernet is primarily a hardware protocol, TCP/IP is a collection or suite of software protocols. These protocols are used to control and manage the communication of information between two computers.

Most of the protocols included in the suite of protocols called TCP/IP are:

Protocol	Stands for	Function
ARP	Address Resolution Protocol	To match hardware network addresses to TCP/IP network addresses.
BGP	Border Gateway Protocol	To pass routing information across inter-networks. <sup>1</sup>
BOOTP	Boot Protocol	To boot and configure systems to the network remotely. <sup>1</sup>
DHCP	Dynamic Host Configuration Protocol	To boot and configure systems to the network remotely.
DNS	Domain Name System	To associate host and network names with host and network addresses.
EGP	Exterior Gateway Protocol	To pass routing information across inter-networks. <sup>1</sup>
FTP	File Transfer Protocol	To copy files between hosts.
HTTP	Hypertext Transfer Protocol	To publish and read hypertext documents across the World Wide Web.
ICMP	Internet Control Message Protocol	To carry internetwork routing control messages between networked systems.
IGMP	Internet Group Management Protocol	To manage transmission of data to selected groups of hosts. <sup>1</sup>
IP	Internet Protocol	To move network traffic across internetworks.
MIME	Multipurpose Internet Mail Extensions	To attach multiple data files of any sort (text, graphics, audio, <i>etc.</i> ) to electronic mail.

Table 1: TCP/IP Protocols

Protocol	Stands for	Function
NTP	Network Time Protocol	To keep system clocks synchronized across internetworks.
OSPF	Open Shortest Path First	To pass routing information across internetworks. <sup>1</sup>
POP3	Post Office Protocol	To transfer electronic mail between a mail server and a client.
RARP	Reverse Address Resolution Protocol	To match TCP/IP network addresses to hardware network addresses. <sup>1</sup>
RIP	Routing Information Protocol	To pass routing information between internetworked systems. <sup>1</sup>
SLIP	Serial Line Internet Protocol	For serial links between a host and an IP network. <sup>1</sup>
SMTP	Simple Mail Transfer Protocol	To transfer electronic mail between a client and a mail server.
SNMP	Simple Network Management Protocol	To provide basic network management functions of networked devices. <sup>1</sup>
TCP	Transmission Control Protocol	To connect applications on two internetworked hosts (connection-oriented, reliable <sup>2</sup> ).
Telnet	Telecommunications Network Protocol	To log onto remote hosts and run terminal sessions.
TFTP	Trivial File Transfer Protocol	A minimal implementation of a file transfer protocol. <sup>1</sup>
UDP	User Datagram Protocol	To connect applications on internetworked hosts (connectionless, unreliable).

Table 1: TCP/IP Protocols

1. This protocol is not supported by THEO+Net.
2. Reliable means that message delivery is confirmed by the recipient with a reply. Errors in delivery also cause replies.

Implementations of network software supporting TCP/IP do not necessarily support all of these protocols. Only the protocols for specific features are

implemented. For instance, if a system does not support e-mail, then MIME, POP and SMTP are not implemented.

Although slightly technical, to aid understanding of the Ethernet and TCP/IP standards and protocols, communications are normally presented in a layered table or diagram.

Layer Name	Layer Function
4 Application	User program. Responsible for the generation of and presentation of information either from or to the user. TCP/IP applications communicate in client/server pairs at this layer.
3 Transport	Manages the flow of data between two internetwork hosts. Two protocols supported: TCP for reliable data flow, and UDP that offers no reliability guarantees.
2 Network	Data moves between networks at this layer. The Internet Protocol (IP) operates at this layer to route packets across networks independent of the network medium.
1 Data Link	Data moves within the local network at this layer. Also known as the network interface layer.
0 Physical	The hardware components of the network and the interface between those components and the higher layers.

This layered definition not only specifies the various functions of network communications with TCP/IP, it also shows the sequence of operations. Network communication is a process of encapsulating information received from a higher layer and passing the encapsulated data onto a lower layer, or vice versa. For instance:

1. An application, such as Telnet, accepts information from the operator. It packages this information with a header describing where the information is coming from (your network id), and where it is going to (destination id). It then passes this “packet” of data to the transport layer.
2. The transport layer program examines, but does not modify, the information. Using information it has gathered from prior network communications, it adds headers to this packet to form a TCP segment and passes this new packet onto the next layer.
3. At the network layer, IP header information is added to the packet and passed on to the next layer.
4. The data link layer, headers and trailers are added to the packet to create an Ethernet frame, which is given to the next layer, the NIC.

### 5. The NIC transmits the frame onto the network.

The encapsulation is reversed on the receiving end, with each layer stripping off the header (and trailer, if appropriate) that was addressed to it. The packet is then passed up to the next layer until it arrives at the application layer. The application layer receives only the original data transmitted by the application on the other end of the communications link.

All nodes on a network receive packets addressed to all other nodes on the network. One of the responsibilities of most NICs is to ignore any packet that is not addressed to its own address.

For additional information and a tutorial on TCP/IP, visit the following Internet web page:

<http://ds1.internic.net/rfc/rfc1180.txt>

## ■ Identifying Hosts on a Network

One useful analogy when describing network operations is the telephone system, which is a special type of network. When you make a call to someone, a circuit is established between yourself and the person that you called. You are not concerned with the type of equipment they are using or the route that the phone company selected to connect you with them. You might be using a standard, rotary-dial phone and they might have a digital cellular phone; the phone company might have routed the call across the country and back again or it may have used one or more satellites. All of this doesn't matter as long as you dialed the telephone number correctly, with any necessary country code and area code.

### ■ IP Addresses

Instead of a telephone number, network connections are made with an IP address. TCP/IP uses a 32-bit numeric address to identify NICs on an Ethernet network. For convenience, this 32-bit value is normally specified as four, 8-bit values separated by periods or "dots." Thus, it is commonly referred to as a "dotted IP address."

This dotted IP address has the general form of:

A.B.C.D

where the A, B, C and D represent the four 8-bit values. Being 8-bit values, each of these components may be a value in the range 0–255. In the currently implemented addressing scheme<sup>1</sup>, there are five "classes" of IP addresses, each with a specific range of values. These are named Class A,

Class B, *etc.* Without going into the details, Class C addresses are normally used in the types of networks implemented with THEO+Net.

In a Class C network, the range of addresses permitted is:

192.0.0.0 through 223.255.255.255

### ■ Subnets and Subnet Masks

In order to improve routing and delivery efficiency, IP addresses are divided into subnets. A subnet is the portion of the IP address that is common to all of the nodes on a particular network. For instance, a network assigned the following addresses

```
192.168.25.1
192.168.25.2
192.168.25.3
...
192.168.25.253
192.168.25.254
```

would have a subnet of 192.168.25.0.

A subnet mask field is used to define the portion of the IP address that identifies the subnet for this network. Conventionally, the subnet mask defines either 8, 16 or 24 bits as the subnet identifier. For instance, the above subnet would have a subnet mask of 255.255.255.0, indicating that the first 24 bits of the address identify the subnet. THEO+Net can use this convention for defining subnets. With a subnet mask of this value, the subnet can have 254 nodes (the node values 0 and 255 have special significance and cannot be assigned to an actual node).

However, THEO+Net is not restricted to this convention. You may specify a subnet with a different number of bits. For instance, you could have a

1. The current addressing scheme provides for 4,294,967,296 addresses. However, because of the way they are assigned, a large portion of these addresses are never used and the actual number of unique addresses is much less. To address this limited addressing scheme, there are two proposals being evaluated presently. One changes the way that addresses are assigned so that more of the possible addresses will be used. This is named Classless Inter-Domain Routing (CIDR) or “supernetting.” Another method, named IP version 6 (IPv6), increases the number of possible addresses by increasing the length from 32 to 128 bits. This provides 340,282,366,920,900,000,000,000,000,000,000,000,000,000 addresses, which is approximately 340 billion billion billion billion host addresses! Both of these schemes will probably become standards soon, but they both provide for the continued use of the existing standard.

subnet mask of 255.255.255.192, indicating that the subnet is identified by the first 26 bits of the address. This subnet could have only 62 nodes. This can be useful in some situations.

For instance, when you are given a Class C address range from your Internet Service Provider (ISP), you will have a range of 254 node addresses that you could use on one subnet. If you needed three subnets for some reason, you could divide the Class C address into three ranges of addresses. The three subnets could use the subnet mask value of 255.255.255.192 with 62 nodes on each subnet.

Class C address from ISP:	209.95.32.0	–	209.95.32.255
1st subnet:	209.95.32.0	–	209.95.32.63
2nd subnet:	209.95.32.64	–	209.95.32.127
3rd subnet:	209.95.32.128	–	209.95.32.191

There is one subnet left over for future expansion.



## ■ TCP Simple Services

Most network operating systems supporting the TCP/IP protocol support a set of servers collectively referred to as TCP Simple Services. (THEOS and this manual use this term but other systems do not use a special name for these services.) These servers are combined into a single server and provide some simple capabilities such as:

- ▶ **CHARGEN** - Generates a continuous stream of characters. Used in diagnostic situations to test the communications from the server to a client.
- ▶ **DAYTIME** - Gets the current date and time from the server's system and sends that to the client.
- ▶ **DISCARD** - Opposite of the ECHO service: all characters received are discarded or ignored.
- ▶ **ECHO** - Echos all characters sent by a client back to the client. Used in diagnostic situations to test the communications between the server and the client.
- ▶ **FINGER** - Returns information about user accounts on the system.
- ▶ **NSLOOKUP** - Translate an IP address to its domain name.
- ▶ **QUOTE** - Randomly selects a famous quotation and sends the text to the client.
- ▶ **TIME** - This service has three modes of operation: Gets the current date and time from the server's system and sends it to the client; gets the current date and time from another TCP server system and sends it to the client; or, gets the current date and time from another TCP server system, sets the local TCP server system to that time and sends it to the client. This service is principally used to synchronize the time between two systems.

Not all of these services are provided by all network operating systems supporting TCP/IP. THEO+Net supports the following services:

- ▶ **CHARGEN**, accessed via the [Net Command](#).
- ▶ **DAYTIME**, accessed via the [Net Command](#).
- ▶ **ECHO**, accessed via the [Net Command](#).
- ▶ **FINGER**, accessed via the [Finger Client](#).
- ▶ **NSLOOKUP**, accessed via the [NsLookup Client](#).
- ▶ **QUOTE**, accessed via the [Quote Client](#).
- ▶ **TIME**, accessed via the [Net Command](#).

These services are started automatically when the Login Server is started if the “[Start TCP services](#)” is enabled (see “[Setup NET](#)” on page 187), or manually with the NET START TCP command.

## 2 Ethernet Mediums and Topologies

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This chapter and Chapter 3 “[Bridges, Routers and Gateways](#)” provide basic information about some of the hardware components of an Ethernet network. They are intended for novice users and installers of networks to provide a groundwork for later descriptions of THEO+Net installation, configuration and operation. Experienced network administrators may skip these chapters.

The term **network medium** refers to the type of conductor or cable used to connect the various nodes of a network. There are several types of network mediums that can be used in an Ethernet network. You should define the medium or cable used in a network long before you begin your cable design. The cable chosen often dictates the connectors, terminations, distances allowed, routing and LAN types supported in the network.

The **topology** of a network refers to the layout or configuration of the network medium and nodes.

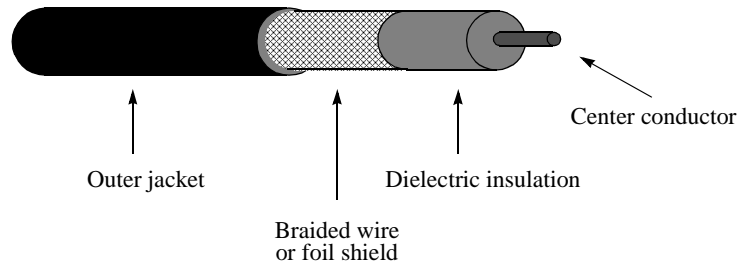
### ■ Ethernet Network Mediums

All LAN mediums can be divided into three basic types: coax, twisted-pair and fiber optic. These three types of mediums are defined in the IEEE 802.3 international standard.

#### ■ Coax Mediums

There are two types of coax mediums supported by Ethernet network standards: Thin Coax and Thick Coax. Coax offers the least expensive choice of medium, both in cost of materials and cost of installation. However, it is also the most restrictive in the distances allowed, the connectivity offered and the transmission speeds supported.

Coax cable gets its name from its construction. As illustrated in the following figure, coax consists of a center conductor and a coaxially-positioned outer shield conductor that are separated by an insulating plastic, called a dielectric. An outer jacket insulates the shield. The shield may be a foil-wrap or a wire braid. Some cables may use a double shield. The center conductor may be solid or stranded wire.

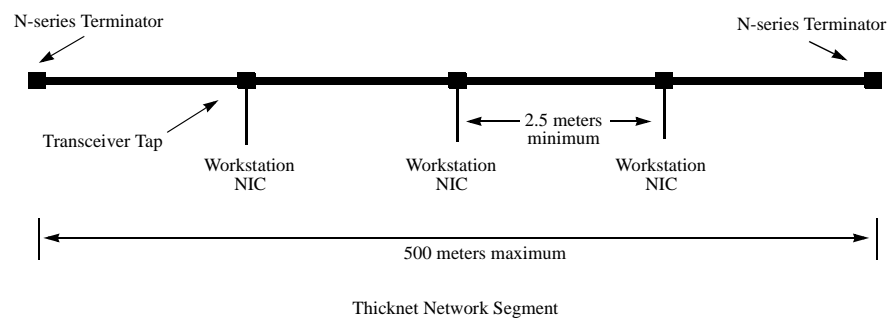


The specific composition or materials used for each of the components defines its electrical and signal-carrying characteristics. Cable suitable for an Ethernet medium must have 50-ohm impedance and conform to the IEEE 802.3 specification.

Wire sizes for coax cable are usually specified by an “RG” number or manufacturer’s part number. The RG numbering system is a standard coax cable rating system that identifies the physical size, characteristic impedance, power handling and other cable characteristics. Common Ethernet LAN coax cables are Ethernet 10Base2, Ethernet 10Base5, RG-8/U and RG-58A/U. The size of Ethernet 10Base5 and RG-8/U is about  $\frac{1}{2}$  inch, while Ethernet 10Base2 and RG-58A/U is about  $\frac{1}{4}$  inch. Thus, Ethernet 10Base2 is frequently referred to as **Thinnet** and Ethernet 10Base5 is **Thicknet**. Both Thinnet and Thicknet are used for small (2–10 nodes), short-distance LANs (one to two rooms) because of their low-cost and relative ease of installation.

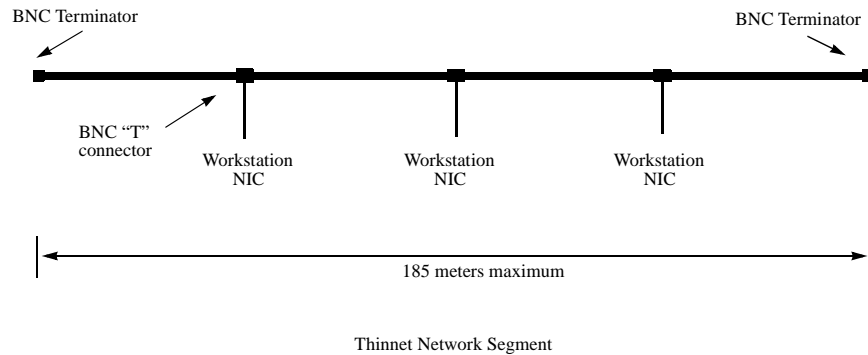
- **10Base5 Medium**

Thicknet, or **10Base5** cabling, is the original LAN cable. It supports a transmission speed of 10 Mbps with a maximum distance of 500 meters from end-to-end. Thicknet cables are generally run in the walls or above the ceiling tiles near workstations. A transceiver is required to tap into the cable for the run to the workstation. The transceiver, also known as a vampire-tap, mounts directly around the coax and makes a connection via a hole drilled through the outer jacket, shield and dielectric insulation.



### • 10Base2 Medium

Thinnet, or **10Base2** cable, is a newer Ethernet coax standard. Its smaller size allows greater flexibility and it does not use taps to connect the cable to a workstation. Instead, Thinnet is connected directly to the back of a workstation at its network interface card with a special “T” adapter. However, it has a maximum distance of 185 meters from end-to-end compared with the 500 meters allowed by Thicknet cabling.



As illustrated, coax mediums always use a bus topology.

Coax mediums should be grounded at one point, and one point only. This is generally done at one of the terminators.

### ■ Twisted-pair Mediums

Twisted-pair cable is the most common type of LAN cabling used today. It is versatile, easy to install, inexpensive and has good performance capabilities. Twisted-pair cable is available with or without shielding and comes in a variety of wire sizes, colors, twisting and sheathing materials.



Most LAN twisted-pair cable is four-pair cable (eight wire). Although many LAN topologies only use two of the pairs, some care should be given before using the other pairs for another LAN segment or for a telephone connection. Some of the 100 Mbps and higher LAN schemes may use all four pairs.

One of the main advantages of twisted-pair cabling is the ease with which nodes can be added or removed. Generally, a twisted-pair medium uses modular plugs and wall jacks, similar to a telephone outlet and cable. In fact, the modular connector most commonly used for a network is the RJ-45 connector, which is the same connector as used with many telephone systems. (Most home telephone systems use RJ-11 connectors, a two-pair plug and jack. This is not suitable for network connections.)

The RJ-45 connector is an eight-pin connector, with only four of the pins used for the network. However, do not use standard telephone cabling between the NIC and the wall jack because it uses different pin connections for the jacks and plugs.

Cables for LAN wiring may be made with either stranded or solid copper wire. Choose data-grade cable with approximately ten twists per foot. Solid wire is normally used for cable runs that are terminated in screw-down outlet jacks or punchdown blocks. Stranded wire is normally used for cable runs that are terminated with an insulation-piercing modular connector such as an RJ-45 plug. You should never use solid copper wire with modular-type connectors.

There are five categories of cabling specifications for twisted-pair cabling. Two of these five categories are specifically excluded from LAN usage because of their unreliability in network transmissions. Of the remaining three, two are dominant in most LAN installations. Category-3 can support network speeds up to 16 MHz. Category-5 supports 100 MHz networks as well as the lower speeds.

Categories are rated in terms of bandwidth, in MHz, rather than data rate, in Mbps, because data encoding techniques often camouflage actual cable signaling rates. The popular 10 Mbps networks require matching cable bandwidths of 10 MHz because of their signal structure, but 100 Mbps network techniques can range from 16 MHz (per pair) to 33 MHz because of encoding. Components, such as jacks, plugs and patch panels, are also rated by category of performance.

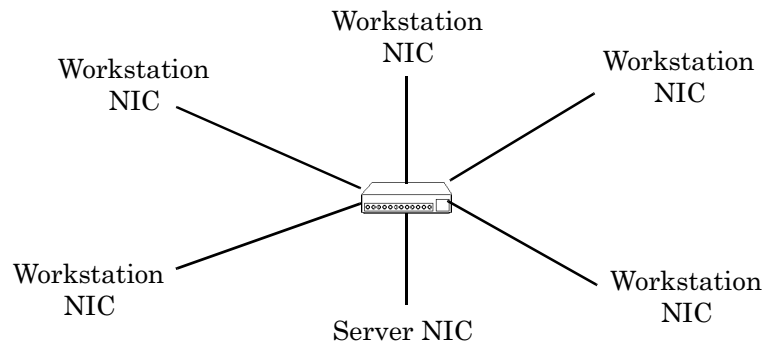
Standard eight-pin, RJ-45 style modular connectors are used for unshielded twisted-pair (UTP) cables. Two- or four-pair, 24 AWG, UTP Category-3 or Category-5 cable is used. For future expansion and upgrades, it is best to use four-pair Category-5 cabling even though the current network might only use two pairs at a 10Mbps transmission speed.

Although only two of the pairs are used in a standard Ethernet network, all eight wires are connected to the jack. Wiring connection is straight-through, which means simply that pin 1 at one end of a cable will corre-

spond to pin 1 at the other end of the cable. This is a departure from normal telephone cords, which reverse the connections from end-to-end.

Shielded twisted-pair (STP) cabling is similar to UTP with the addition of a metallic shield around the cable. The shield is either a foil-wrap or a braid. The advantages of STP are higher transmission rates and resistance to outside electrical interference. However, its disadvantages are higher cost for the materials and more difficult installation. Instead of using RJ-45 modular connectors, STP cabling requires Type-1 Media Interface Connectors. An STP medium should use Category-5 shielded, twisted-pair cable.

A twisted-pair network uses a star topology with a hub at its center.



### ■ Fiber Optic Mediums

Fiber optic cable may also be used in LAN wiring. Generally, it is used only for “backbone” wiring, such as between wiring closets or between buildings. It is not yet as common as twisted pair for horizontal wiring.

Fiber optic offers some unique advantages over metallic wiring, either coax or twisted-pair: It does not generate nor is it susceptible to electrical or magnetic interference. The nonconductive fiber eliminates grounding problems. Outdoor rated fiber optic cables are frequently completely non-metallic and are thus resistant to lightening strikes. There are disadvantages to fiber optic: It is more expensive to purchase, it requires more expensive connectors, it is more difficult to install because of the care that must be taken to avoid damage to the fiber and it is much more difficult to test when problems occur. Breaks in a fiber optic cable cannot be located with a simple continuity tester, but require special, expensive equipment and trained operators.

FDDI (Fiber Distributed Data Interface) is a fiber optic networking standard that operates at 100 Mbps. This standard is different from Ethernet

and not directly supported by THEO+Net, although you can connect an Ethernet network to a fiber optic network with a bridge or router device.

### ■ Summary

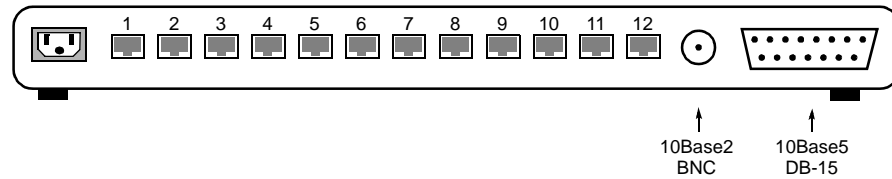
	10Base2	10Base5	10BaseT	100BaseT	10BaseFx
<b>Medium</b>	Thinnet Coax	Thick-net Coax	UTP	STP	FO
<b>Speed</b>	10 Mbps	10 Mbps	10 Mbps	100 Mbps	10 Mbps
<b>Maximum Distance (meters)</b>	185	500	200	200	2,000
<b>Distance from Bus or Hub to NIC (meters)</b>	50	50	100	100	2,000
<b>NIC Connector</b>	BNC	DB-15	RJ-45	RJ-45	
<b>Terminator</b>	BNC	N-series	N/A	N/A	
<b>Number of Stations per segment</b>	30	100	limited to number of ports on hub	limited to number of ports on hub	



## ■ 10BaseT Networks

### ■ Wiring Hub

The wiring hub in a 10BaseT network operates as both the center of the star topology and as a multiport repeater: It receives and regenerates signals received from any attached node.

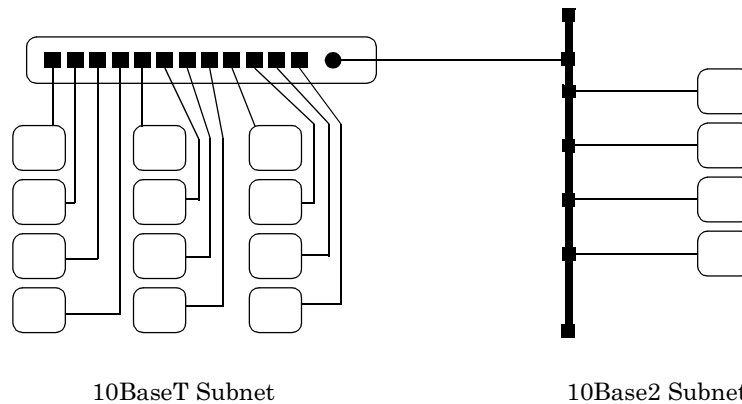


Typical 10BaseT Hub

All hubs that conform to IEEE 10BaseT specifications perform tasks in addition to regenerating and repeating signals. A 10BaseT hub tests each port connection, detects and handles excessive collisions, and ignores data that exceeds the maximum 802.3 frame size.

### ■ Expanding the Network

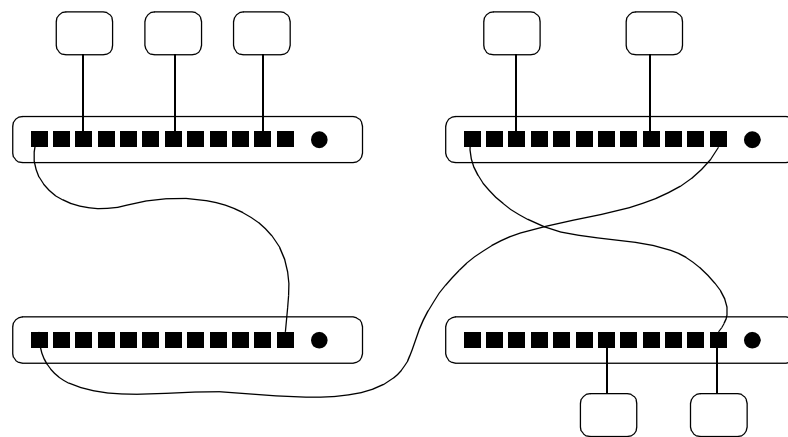
10BaseT hubs have a fixed number of jacks or ports. The specific number depends upon the manufacturer and model, but a typical hub will have 12 or 16 ports. In addition, a hub may provide two additional connectors for connecting this hub to either a 10Base2 or 10Base5 LAN, providing an easy method of expanding and connecting multiple LANs.



Generally, one of the RJ-45 ports may be labeled uplink/downlink for use in cascading this hub with another 10BaseT hub. Some hubs may allow any port to be used as a cascade connector.

When one hub is connected to another, a special crossover cable must be used. In this cable, the transmit and receive wire pairs have to be crossed over. That is, the receive pair at one end must be connected to the transmit pair at the other end of the cable, and vice versa. The only exception to using a crossover cable is when a hub has a special port containing the crossover function.

In the following figure, four 12-port 10BaseT hubs are cascaded or connected together. Although any one of these hubs can only support a maximum of 12 nodes, this four-hub network can support 32 nodes (only three hubs may have stations attached and four of the ports are used for inter-connecting the hubs).

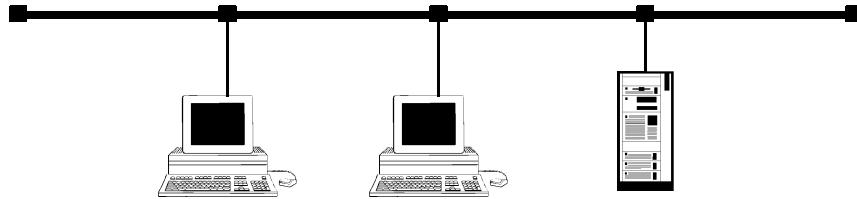


Four-hub, Cascaded 10BaseT Network

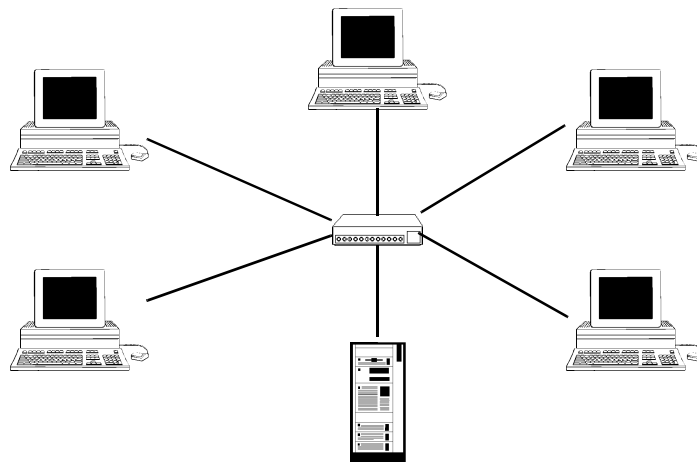
When expanding a network keep in mind the limitation of Ethernet networks. Informally, the limitation is referred to as the 5-4-3 rule: A network may have as many as five segments connected together with four repeaters as long as only three of the segments have stations connected to them. In the above diagram, no two stations are separated by more than two hubs. Hubs connected together in this manner are operating as repeaters.

## ■ Typical Topologies

LAN topology refers to how the wires are hooked up. There are two basic topologies supported with Ethernet networks: bus and star. The standard mediums of coax and twisted-pair use different topologies: Coax uses a bus topology; Twisted-pair uses a star topology. Each topology has its advantages and disadvantages.



Bus Topology



Star Topology

The topology that you choose will depend upon several factors:

- ▶ Cost of medium, connectors, *etc.* and installation costs.

A bus topology using a 10Base2 medium may be the lowest cost for materials and installation if there are only a few stations and a short distance between the farthest stations. For larger size networks, twisted-pair medium is often the same price or even less.

- ▶ Number of stations on a segment.

As shown in the summary, a bus topology using a 10Base2 medium allows 30 nodes in a network segment. A star topology network using 10BaseT medium is limited to the number of ports on the hub. Hubs generally have 8, 12, 16 or 32 ports. However, multiple hubs may be cascaded to make the number of stations allowed considerably higher.

- ▶ Distances between the two farthest stations.

The various mediums have restrictions on the maximum distance for the segment. For instance, 10Base2 requires that the two stations farthest from each other be within 185 meters (607 feet). This distance may be extended with repeaters or by bridging to alternate mediums such as fiber optic.

- ▶ Any existing network that you must connect with.

This is not a major consideration as there are bridges that can interconnect between differing network mediums and topologies. However, if you are merely adding a few stations to an existing network, of course it is best to use the same medium and topology as that existing network.

- ▶ Maintainability. A bus topology requires that the bus be “broken” in order to add a station. A star topology allows a station to be added by merely connecting it to an unused port on the hub.

Star topologies are also more reliable and fault-tolerant when compared to a bus. When there is a problem with the cable on a bus topology network, the network fails. On a star, a failed cable affects only the one station connected by it. Many hubs will automatically disconnect a port when the connection is failing. They may also have built-in diagnostics to help in troubleshooting problems with connections and cables.

► Future expansion requirements.

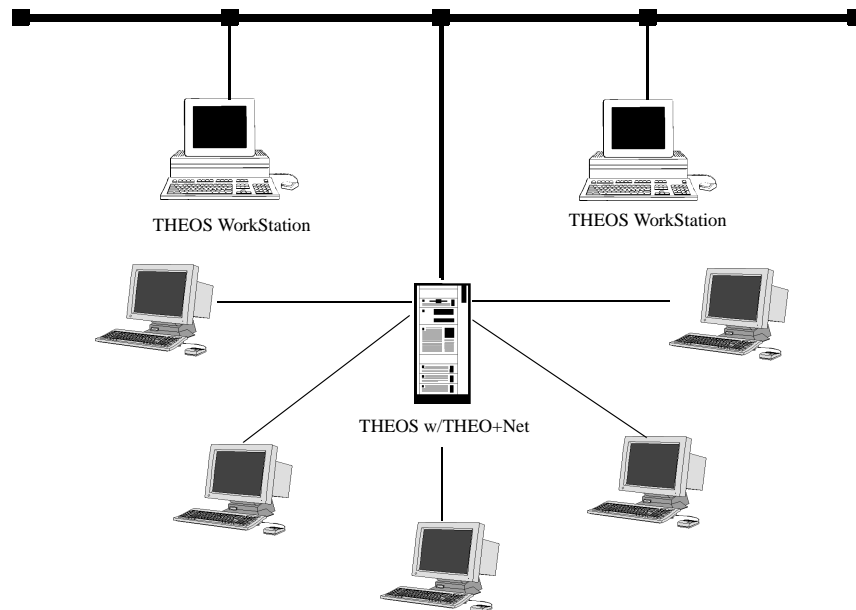
This is perhaps the most important consideration because the network topology and medium are generally installed in walls and ceilings and thus become part of a building. Computers, NICs, hubs, gateways, *etc.* can be and are upgraded easily. Changing the wiring in a wall is not as easy.

A bus topology using a 10Base2 medium is the oldest network architecture and enhancements to this medium are not likely. A star topology using hubs and Category-5 10BaseT medium is compatible with the existing standards and can support 100BaseT (Fast Ethernet) and probably future enhancements to the standard.

### ■ Small-size Office

In this text, a small office is a company using a single THEOS system acting as a multiuser hub. The system uses THEO+Net to provide Login Server capability for a few Windows-based workstations using [THEOS WorkStation Client](#). It is generally used in a single room or a few adjacent rooms.

Assuming that future expansion is not a consideration, or if considered, will require a physical move to new offices, the cheapest and easiest network installation is a bus topology using 10Base2 thinnet coax medium.



The coax cable may be placed in the walls and ceiling or merely run along the walls near the floor, depending upon safety considerations and any codes that may apply in your area.

The components necessary for this network are:

1. One NIC for each computer/workstation on the network.
2. One “T” connector for each computer/workstation on the network.
3. Two 50-ohm terminators for the bus.
4. Thinnet cable for each segment between the “T” connectors and for each segment between the “T” connector and the NIC.
5. If in-the-wall wiring is done, then one jack for each workstation/computer connection.

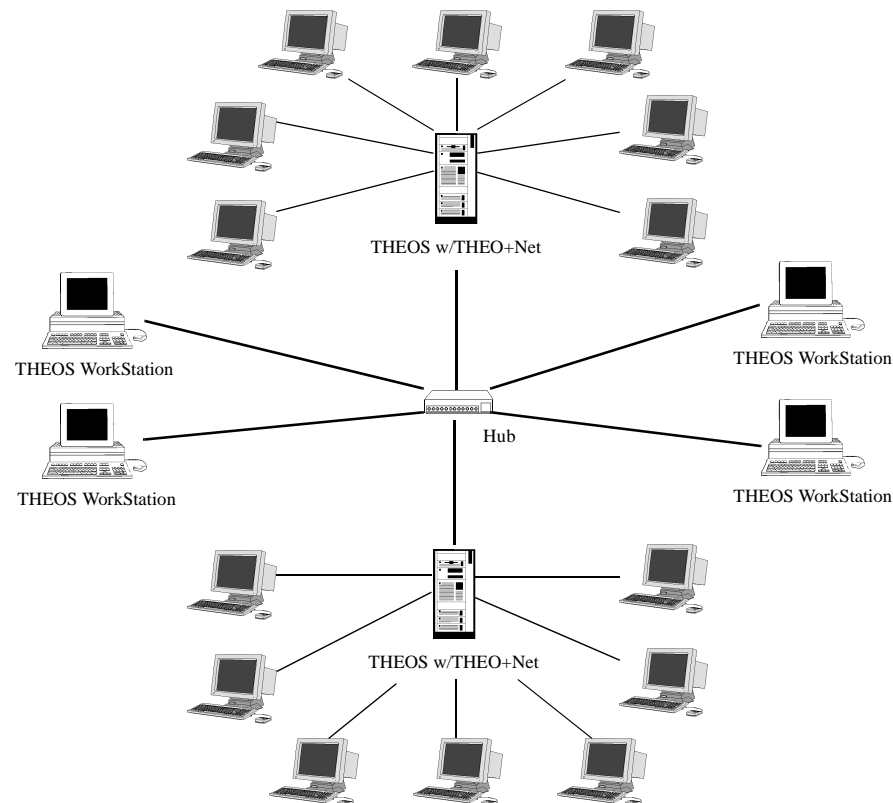
The positions of the THEO+Net system and the [THEOS WorkStation Client](#) systems on the network bus are irrelevant. Although logically the systems are quite different, on the network, all connections are equal.

When wiring the coax, remember that the cable is continuous from one end to the other, with a terminator at each end. “T” connectors are put into the line where workstations or computers connect. Although it is possible to connect or disconnect a computer from the network, do not add or remove “T” connectors while the network is in operation.

### ■ Medium-size Office

A medium-size office is an office with one, two or more THEOS systems acting as multiuser hubs and THEO+Net Login Servers, and with several Windows-based workstations using THEOS WorkStation. The distribution of the system is across several rooms in the building and may involve several dozen terminals and workstations.

Although not the cheapest, the best network topology for this size of company is a star topology using 10BaseT, Category-5 twisted-pair medium and components.



The Category-5 twisted-pair cable is generally placed in the walls and ceiling. When placed in the ceiling, many building codes require that you use plenum-grade cabling.



The components necessary for this network are:

1. One NIC for each computer/workstation on the network.
2. One or more hubs.
3. Optional punch-down block if hub installed in a “wiring closet.”
4. One jack for each workstation/computer connection.
5. Category-5, twisted-pair cable for each segment between the hub or punch-down block and each NIC.
6. Category-5, twisted-pair cable for connecting each workstation/computer to the wall jack.

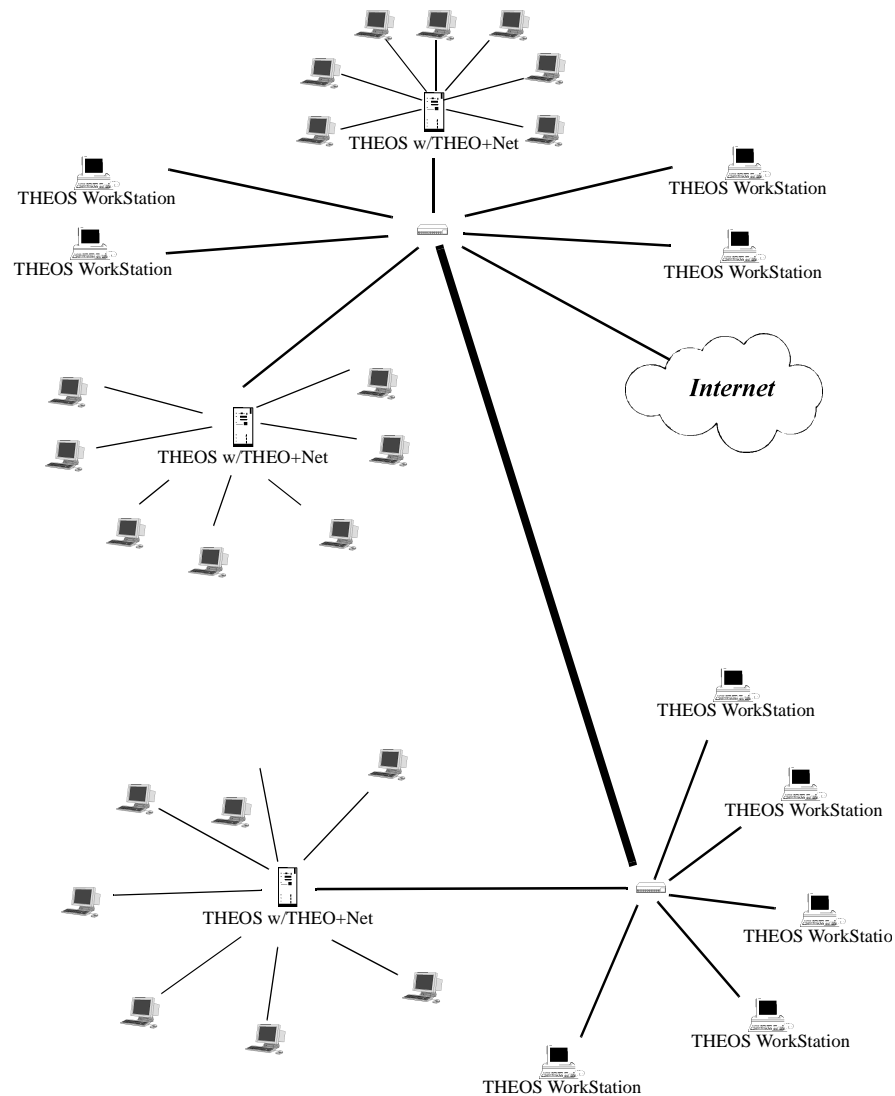
Although Category-3 grade cable and components could be used, by using Category-5 during the initial installation, the wiring will not have to be changed when the network is upgraded to Fast Ethernet in the future. The price difference between Category-3 and Category-5 cabling and components is much less than the price of reinstalling the wiring in the future.

If you are adding cabling to an existing Category-3 network, use Category-5 for the new wiring. Category-3 and Category-5 cabling can be mixed. In the future, when Fast Ethernet is needed, only the Category-3 portions of the network need be replaced.

### ■ Large-size Office

A large office network is similar to the medium-size office described above. The main difference is that the large office network is frequently distributed over several buildings or across large buildings requiring long cable runs between separate subnetworks. Also, a large office network will frequently have connections to a WAN such as the Internet.

The only network topology suitable for this size of company is a star topology using 10BaseT, Category-5 twisted-pair medium and components.



The components necessary for this network are:

1. One NIC for each computer/workstation on the network.
2. One or more hubs.
3. Optional punch-down blocks if hubs are installed in a “wiring closet.”
4. One jack for each workstation/computer connection.
5. Category-5, twisted-pair cable for each segment between the hub or punch-down block and each NIC.
6. Category-5, twisted-pair cable for connecting each workstation/computer to the wall jack.
7. Optional modem for dial-up Internet connections.
8. Optional ISDN interface for dedicated Internet connection.

If distance between hubs exceeds 100m (328ft), you may need to use a repeater or, alternately, use 10Base2 or 10Base5 coax medium between hubs. Another option if the distance is great is to use fiber optic cabling with the appropriate transceivers at each end.



# 3 Bridges, Routers and Gateways

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Before discussing bridges, routers and gateways more fully, you should understand why these devices and concepts might be needed and used.

## ■ Internetworks

An internetwork is two or more networks connected together to form one larger network. (Note the lowercase “i” on internetwork. By convention, the global Internet is referred to using an uppercase “I.”) Although there are several reasons why internetworks are used, the principal ones are:

- ▶ To reduce network traffic.
- ▶ To connect two or more dissimilar networks.
- ▶ For security.

## ■ Reducing Network Traffic

A company with dozens or even hundreds of workstations connected on a network may be sending several hundreds or several thousands of message “packets” on the network every minute. Although networks and computers connected to networks can handle this load, the effective throughput of a system is degraded because of the frequent message collisions on the medium.

To reduce this problem, networks with many nodes are frequently divided into two or more networks, either logically or physically. For instance, either by logical company divisions such as executive, sales, support, production, *etc.*, or by physical location such as first floor, second floor, north side, *etc.*

## ■ Connecting Two Dissimilar Networks

A network of computers may use many different protocols: NetBEUI, Novell, TCP/IP, *etc.* Some network operating systems, like THEO+Net, only use and recognize one protocol: TCP/IP. In order for a THEOS user to communicate with a user on a system using another protocol, that other system will have to have support for TCP/IP.

An alternate method of mixing systems with differing protocols is to use a protocol converter. In this situation, the systems are kept separate, on their

own networks. The protocol converter is then used to join the two networks. See “[Bridges](#)” on page 48, “[Routers](#)” on page 50 and “[Gateways](#)” on page 52 for information about these converters and translators.

A similar reason for multiple networks exists when a new network is added to a site that already has an existing network. Even when the existing network is the same type and protocol as the new network, it is frequently easier to add the new workstations and servers as a separate network and connect this new network to the existing network with a bridge, router or gateway, as appropriate.

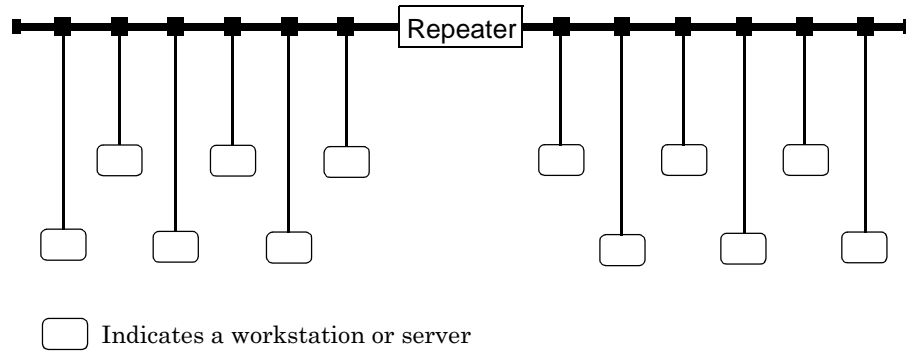
### ■ Security

The third common reason for using multiple networks connected together as an internet is for security reasons. Although THEO+Net can be configured to restrict access to or from specific nodes on a network with the [View/Maintain Allow List](#), [View/Maintain Deny List](#) setup, the remote access security provided with [Setup NETUSER](#) is more flexible because it allows users on other networks access only if they know a netuser account name and password.

When connecting two networks, the THEOS Login Server system should not be the system operating as the gateway. A Login Server will treat all nodes that it has direct access to as “local users.” If the Login Server system is the system with direct access to the multiple networks, then all of the nodes on those networks are local users and not remote users. As local users, they are not required to pass the network user security. Either use a separate device such as a router or bridge to connect the networks, or use one of the workstations as the gateway.

## ■ Repeater

A repeater is the simplest type of hardware component in a network. Normally, it is used to connect two segments of similar medium. It regenerates a signal received on one cable segment and then retransmits it to the other cable segment.



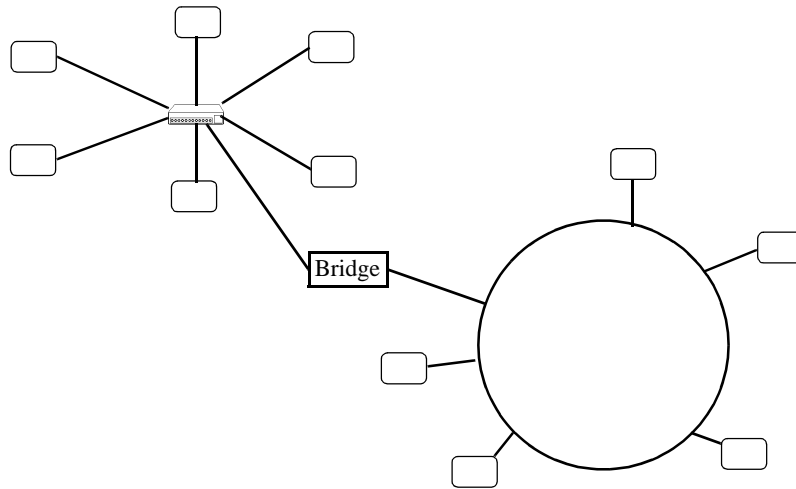
There are two types of repeaters: electrical and electrical-optical. An electrical repeater simply receives an electrical signal and regenerates it. During regeneration, a new signal is formed which matches the original characteristics of the received signal. By transmitting a new signal, the repeater removes any distortion present on the original signal, enabling an extension in the transmission distance. Although several segments can be connected with repeaters, and the overall length can be extended, there are limitations on the total, extended length. For instance, a Thicknet coaxial bus-topology network can only be extended to a maximum of 2.3 km.

A second type of repeater is an electrical-optical repeater. It is used to connect a copper medium to a fiber optic medium. It converts an electrical signal into an optical signal for transmission and performs a reverse function when receiving a light signal. Fiber optic mediums can be much longer than copper-based mediums. Thus, two electrical-optical repeaters with fiber optic cable between them can create a segment several miles in length. Also, an electrical-optical repeater is used to isolate portions of a network to eliminate or reduce surges and lightening damage.

A repeater is restricted to connections between two identical network segments. For instance, between two Ethernet segments or between two Token Ring network segments but not between an Ethernet and a Token Ring network. A repeater extends a network segment, it does not connect or “bridge” segments. The repeated segment is still a single network segment.

## ■ Bridges

A bridge is more intelligent than a repeater and is used to connect two or more, possibly dissimilar networks. For instance, a bridge can connect an Ethernet network to a Token-Ring network.



Although similar to a repeater in some ways, a bridge provides some key differences. Principally, bridges can connect two dissimilar networks and it performs filtering.

**Filtering and Forwarding.** When a bridge begins to operate, it examines each message packet transmitted on the connected networks. By reading the source address included in each message packet, the bridge maintains a table of local addresses for each network. That is, addresses for the nodes on that network.

It also reads the destination address in each message packet. If the destination address is not on that network, it merely ignores it. Only message packets addressed to nodes on the other network are actually forwarded across the bridge. Repeaters, on the other hand, always forward all message packets that are received.

There are two types of bridges: transparent and translating. Both types provide the filtering and forwarding capabilities just described. A transparent bridge is much like a repeater, although some transparent bridges do support the connection of differing mediums. For instance, a transparent bridge could connect a 10Base2 medium to a 10BaseT medium in an Ethernet network.



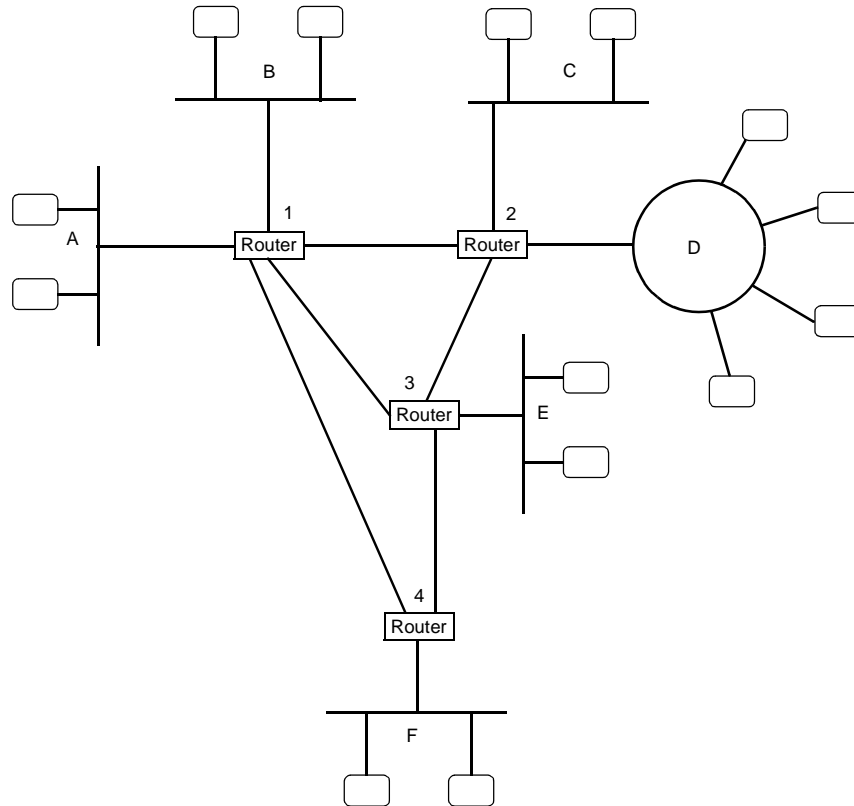
A translating bridge provides the capability to connect two different networks, for instance, an Ethernet network to a Token-Ring network. Since different networks generally use different mediums, translating bridges provide support for different physical connections.

Unlike a repeater and a transparent bridge, a translating bridge acts more like a gateway between the two networks. It functions as two nodes, one for each of the networks. For instance, it might be an Ethernet node on one side and a Token-Ring node on the other. When a message packet from one network has a destination for the other network, the bridge transforms the message packet (leaving the data intact) into the type of message packet needed on the other network. It then transmits that message packet on that network, using the appropriate transmission protocol for the network.

A problem associated with translating bridges is the different message packet lengths associated with different networks. For instance, Ethernet message packets can vary from 64 to 1,500 bytes; a Token-Ring message packet has a maximum size of 4,500 to 18,000 bytes, depending upon the transmission rate. Thus, when using a translating bridge, the workstations must be configured to transmit message packets with the size limited to the smaller size of the networks connected.

## ■ Routers

A router is like a bridge in many ways. It connects two or more networks, possibly dissimilar, and performs filtering and forwarding operations between those networks. A router has more intelligence than a bridge and operates at a higher level in the layered model for networks. The filtering and forwarding decisions made by a router enables it to transmit the message packets in a more orderly and efficient manner than allowed with simple bridges.



This means that a router can determine the best path through a series of data links from a source network to a destination network. It operates with a single protocol, such as IP, IPX, *etc.* (There are special routers called protocol-independent routers that can operate between networks of different protocols. However, these are the exception.)

For instance, in the above internetwork, when network A wants to send a message to network F, it can go through several different routes:  
 $A \rightarrow R1 \rightarrow R2 \rightarrow R3 \rightarrow R4 \rightarrow F$ ,  $A \rightarrow R1 \rightarrow R3 \rightarrow R4 \rightarrow F$  or  $A \rightarrow R1 \rightarrow R4 \rightarrow F$ . A router, con-

figured properly, will probably choose the last route: A→R1→R4→F because it is the shortest route. However, good routers will route a packet to its destination over the best available path at the time of the transmission. For instance, the shortest path might have experienced a lot of failures recently, or there is an excessive amount of traffic on one or more legs of the shortest route. This good router would choose a different route that is better at this particular time. The next packet between the two networks might choose a different path because the conditions have changed.

Another difference between bridges and routers is that routers support message packet fragmentation and reassembly. As mentioned in the discussion of bridges, one of its major limitations is that message packets must be packaged using the shortest length supported by the most limiting network. A router can fragment a long message packet and transmit it in multiple, shorter lengths. The receiving router then reassembles the multiple message packets, in the proper sequence, and transmits the message packet to the destination network with a message packet length supported by that network.

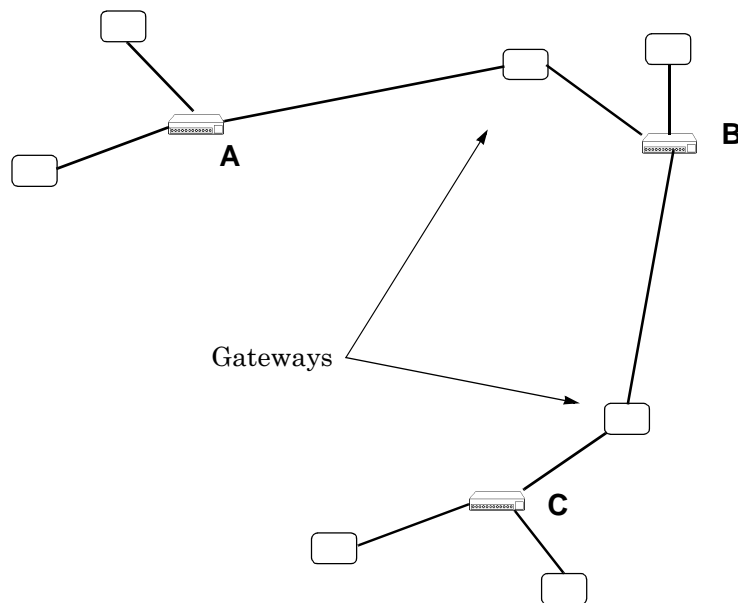
All of this intelligence and sophistication is not without a penalty. This penalty is packet processing time, software complexity and cost. Since routers provide more complex series of functions than bridges, their ability to process packets is typically one-half to two-thirds the processing speed of bridges. In addition, the time needed to program and setup a router adds to its cost.

## ■ Gateways

A gateway is not so much a device as it is a concept. Originally, the term gateway referred to a device providing a communications path between two networks. Thus, a bridge and a router are gateways. A gateway may also be a computer system that has access to two or more networks. For instance, a computer with two NICs or a NIC and a dial-up adapter.

In THEO+Net, and in this manual, the term gateway is used to refer to a computer or device on a network that has access to another network with a second NIC or dial-up adapter. Because this type of gateway uses network software to connect the two networks, it can have the intelligence to “route” traffic between the networks.

A network may have multiple gateways, if there is more than one computer on the network that has access to multiple networks.



In the above internetwork, network A and C have single gateways, and network B is connected to those two gateways.

Since THEO+Net supports Ethernet and PPP, it can only route between networks of those types. To connect to a different type of network, a translating bridge or router must be used. An example of this is an ISDN router that connects an ISDN Internet connection to your LAN.

## ■ Hubs

In Chapter 2 “[Ethernet Mediums and Topologies](#)” 10BaseT networks were described. This type of network uses twisted-pair medium and wiring concentrators, also called hubs. Hubs are typically located in telephone wiring closets, with stations and servers cabled to the hub in the form of a “star.” Hubs can be connected together to form a bus of hubs, for instance, one on each floor of an office complex.

Because workstations are connected to a single point, administration of a hub-based network is normally simple and economical. A central point allows network configuration and reconfiguration, monitoring and management.

### ■ Intelligent Hubs

An intelligent hub is a tremendous advance in functionality and capability over conventional hubs. The intelligent hub includes its own microprocessor and memory that can provide the ability to interconnect separate networks through integrated bridges and routers.

Most intelligent hubs include a multibus backplane, which enables bridges and routers to access and route data originating over multiple types of media. With an intelligent hub, an administrator can enable or disable network ports from a network management workstation, segment a network to balance traffic better and improve performance, and facilitate troubleshooting and maintenance operations.

### ■ Switching Hubs

Improvements in the design of intelligent hubs have led to the development of a new type of hub: the switching hub. This type of equipment examines the destination address of each message packet as a part of the decision criteria to invoke a switching operation.

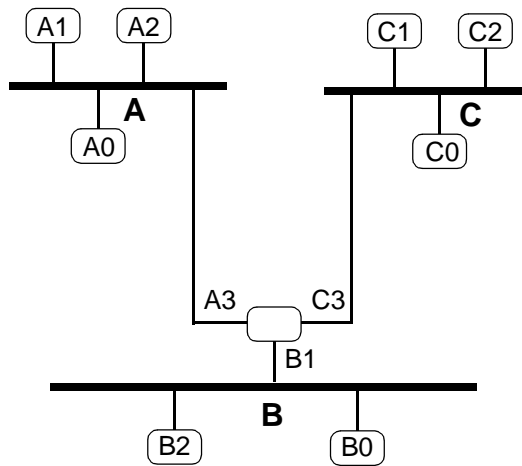
Some switching hubs are limited to working with individual workstations connected to each port, while other hubs can switch message packets from all workstations on a segment connected to the hub. These types of hubs are primarily used in multispeed networks. That is, networks that have some 10 Mbs workstations and some 100 Mbs Fast Ethernet workstations.

## ■ Network Operations with Gateways

In a TCP/IP network, such as used by THEO+Net, each system is configured so that the network software knows:

- ▶ Its own IP address (see “[IP Addresses](#)” on page 22)
- ▶ Its own subnet IP address (see “[Subnets and Subnet Masks](#)” on page 23)
- ▶ The local gateway’s IP address

Referring to the following network diagram, there are three networks, A, B and C. The network A has four nodes A0, A1, A2 and A3, network B has three nodes B0 through B2, and network C has four nodes: C0 through C3. These three networks are called subnets of this local internet.



One of the computers (A3/B1/C3) is connected to all three subnets using three NICs, one for each subnet. This system is the gateway between the subnets.

The configuration information used in SETUP NET for these 11 NICs and 9 systems might be:

	IP address	Subnet Mask	Subnet IP	Default Gateway
A0	192.168.10.1	255.255.255.0	192.168.10.0	192.168.10.4
A1	192.168.10.2	255.255.255.0	192.168.10.0	192.168.10.4
A2	192.168.10.3	255.255.255.0	192.168.10.0	192.168.10.4
A3	192.168.10.4	255.255.255.0	192.168.10.0	
B0	192.168.20.1	255.255.255.0	192.168.20.0	192.168.20.2
B1	192.168.20.2	255.255.255.0	192.168.20.0	
B2	192.168.20.3	255.255.255.0	192.168.20.0	192.168.20.2
C0	192.168.30.1	255.255.255.0	192.168.30.0	192.168.30.4
C1	192.168.30.2	255.255.255.0	192.168.30.0	192.168.30.4
C2	192.168.30.3	255.255.255.0	192.168.30.0	192.168.30.4
C3	192.168.30.4	255.255.255.0	192.168.30.0	

The above table is only an example of the addresses that might be assigned to the networks. What is important about this table is that it shows that the nodes for each subnet share a common subnet IP address. Subnet IP addresses for a NIC are defined by the IP address of the NIC and the subnet mask, which defines which bits of the IP address define the subnet IP address. This subnet IP address tells the network software which network(s) it is a part of.

In this internet, the nodes A0, A1 and A2 do not have direct access to the nodes on the B and C networks. They may, however, communicate with those nodes by sending the message to A3, asking it to forward or *route* the message to the other network. That is why those nodes have their “Default Gateway” set to the IP address of the gateway node. The default gateway for a node tells the network software where to forward messages that are not addressed to nodes on the local network(s).

A THEO+Net gateway performs forwarding but not filtering (filtering doesn’t apply to Ethernet networks).

For example, if node A1 wants to send a message to node C1:

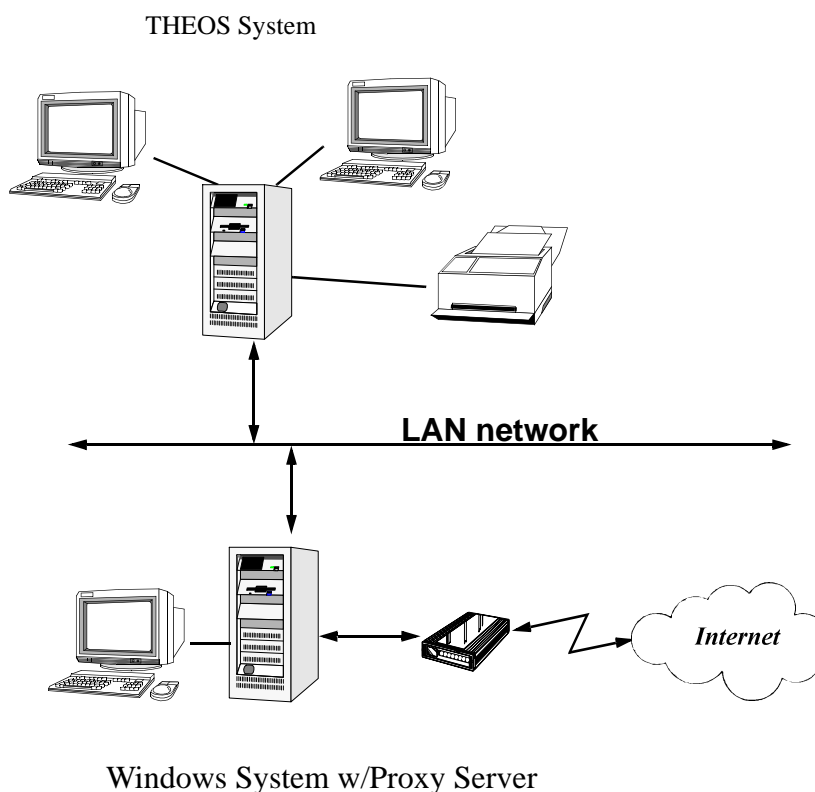
1. Node A1: Since the message is not destined for a node on the local subnet A, it sees that there is a default gateway on the subnet and transmits the message with an intermediate destination of A3.
2. Node A3: Receives the message and sees that it is actually addressed to C1, a node that is not on either of its local subnets (A and B). The configuration for this system says that there is no default gateway. It checks its routing tables and finds that the destination C1 can be reached by transmitting the message on its C network NIC.
3. Node C1: Receives the message.



## 4 Using a Proxy Server

A **proxy server** is software used on a networked computer with access to two or more networks, one being the Internet. A proxy server is somewhat like a special gateway with firewall capabilities. A **firewall** is software that allows users on one side of the firewall (LAN) to have controlled access to resources on the other side (Internet), but access from the outside (Internet) is not allowed to the inside (LAN).

With a proxy server, a LAN with one of its nodes having direct or dial-up access to the Internet, users on the other nodes of the LAN can easily access the Internet.



In the above illustration, the users on the THEOS system can access sites on the Internet because the Windows system is on the LAN and it has Internet access and a proxy server. The THEOS users can use [FTP Client](#), [Telnet Client](#)

and TCP/IP Services clients such as NET TIME to connect to sites on the Internet.

A proxy server is named proxy because it operates in place of the real site, in this case, the Internet. The proxy server operates on behalf of the client requesting a resource.

For instance, a THEOS user uses the [Telnet Client](#) to request a connection to a Telnet Server on the Internet. The Telnet Client connects to the proxy server and makes a request for a connection to the remote Telnet Server. The proxy server then creates a connection between itself and the remote Telnet Server on behalf of the Telnet Client. All data from the remote Telnet Server is received by the proxy server and forwarded to the Telnet Client and all data and requests from the Telnet Client are forwarded to the remote Telnet Server.

## ■ **Advantages of Proxy Servers**

There are many advantages to using proxy servers:

- ▶ Only one connection to the Internet is required to service all of the nodes on a local network.
- ▶ For dial-up connections to the Internet, some proxy servers can use multiple modems to increase the effective throughput for Internet connections.
- ▶ Proxy servers act as a natural firewall. The proxy server can be configured to restrict requests from your LAN to the Internet. Some proxies can also restrict access from the Internet to your LAN.
- ▶ Proxy servers eliminate the need for a hardware router and the complexities that go with installing and supporting a router. The need to register each of your users with Internet addresses is eliminated.
- ▶ On-demand connections. Many proxy servers can be configured to dial-up and connect to the Internet on demand and to terminate the connection after a specified period of time or inactivity.
- ▶ Many proxy servers provide caching capabilities. This means that, once one user has accessed a web page on the Internet, another user requesting that same page will use the cached copy from memory, which is much faster than downloading it again from the remote site.

## ■ **Disadvantages of Proxy Servers**

The principal disadvantage of a proxy server, compared to using a router with direct Internet connection, is the overhead involved. Using a proxy effectively adds another communications link between the requesting client and the remote server. The Internet already places many links between you and the destination and one more link does not improve the response time.

Another significant disadvantage doesn't really have anything to do with proxy servers. Frequently, a proxy server is used on a system with modem access to the Internet. Modems, even with the latest technology, have very low bandwidth (message carrying capability) compared to direct connections provided by ISDN and T1 lines.

## ■ **Acquiring Proxy Server Software**

There are many proxy servers available that can be installed on Windows 95 and Windows NT. Some are freeware, some shareware and others may cost many hundreds of dollars. Use your Windows system web browser to view the site:

`http://www.windows95.com/apps/servers-proxy.html`

Or use one of the search engines available on the Web and search for "proxy server."

Your web browser may have proxy server capabilities already built-in.

## ■ **Configuring THEO+Net to use a Proxy Server**

After you have acquired, installed and configured your proxy server on the Windows system, you need to tell THEO+Net how to access the proxy server. Each THEOS system on your network must be configured. Some proxies can generate a report telling you the pertinent information that you will need for configuring clients on the systems in your network. Be sure to use this report, if it is available.

## ■ FTP

When a proxy server is installed and running on a node of your network, you can use the [FTP Client](#) to access a remote FTP server in one of two ways:

1. Use the PROXY option of the [FTP Client](#) command. Specify the IP address of the node running the proxy server.

```
>ftp (proxy 192.168.25.32
```

2. Use [Setup FTP](#) and define the IP address of the node running the proxy server as the default proxy address for [FTP Client](#) access.

With the proxy server's node specified in the FTP configuration file, you must use the NOPROXY option if you want to connect to a site that is not routed through the default proxy.

3. When you have multiple proxy servers available to you, the default server can be specified in the FTP configuration file. To access the FTP servers via an alternate proxy server, use the PROXY option on the [FTP Client](#) command to specify the proxy to be used for that specific connection.

## ■ Telnet

When a proxy server is installed and running on a node of your network, you can use the [Telnet Client](#) to access remote Telnet servers by:

1. Use the PROXY option of the [Telnet Client](#) command. Specify the IP address of the node running the proxy server.

```
>telnet hq.com (proxy 192.168.25.32
```

2. Use [Setup TELNET](#) and define the IP address of the node running the proxy server as the default proxy address for [Telnet Client](#) access.

When the proxy server's node is specified in the Telnet configuration file, you must use the NOPROXY option if you want to connect to a site that is not routed through the default proxy.

3. When you have multiple proxy servers available to you, the default server can be specified in the Telnet configuration file. The alternate proxy servers are accessed with the PROXY option on the [Telnet Client](#) command.

## ■ TCP/IP Services

Most proxy servers do not provide built-in support for the [TCP Simple Services](#) such as DAYTIME, QUOTE and TIME. [TCP Simple Services](#) are described on page 25. However, these services can frequently be configured to proxy these requests in addition to the standard proxies that they provide.

The exact procedure will vary, depending upon the specific proxy server that you are using. In general, there will be some method of defining “mapped ports.” If this is available, define entries for:

Name	Proxy Port	Type	Destination	Destination Port
Daytime	13	TCP	your ISP	13
Finger	79	TCP	your ISP	79
Quote	17	TCP	your ISP	17
Time	37	TCP	your ISP	37



# 5 Network Security

---

Security for a THEOS multiuser system has always been a concern but not a major problem. Because THEOS is a multiuser system, the user connections are almost always to terminals that are local and normally in the same building as the main computer. Also, the user terminals are typically in a company's own building and, for the most part, the users were trusted employees. THEOS also provides security among multiple users by adding its own layers of protection, including user accounts, passwords and command privilege levels.

Of course, some systems allow dial-in connections. The standard user accounts and passwords have provided sufficient security for most users. For dial-in connections, there are dial-back modems available that offer more secure access to your system.

However, with THEO+Net, the user connections may be remote, either in different buildings from the main computer, or across the world with an Internet connection. Additional security is necessary to protect your valuable company information. In addition to the standard user accounts and passwords, THEO+Net provides two additional security features that control access to the THEO+Net Login Server.

- ▶ Allow/Deny IP address lists
- ▶ NetUser accounts and passwords

Additional security may be available with some router and gateway devices or proxy servers.

## ■ User Accounts

When THEO+Net is installed on a system, all user accounts should have passwords. This is particularly important for all of the system accounts. That is, all accounts with an account number of zero.

Refer to “[Selecting Passwords](#)” on page 67 for suggestions about user account passwords.

## ■ Allow/Deny IP Addresses

The allow and deny lists are lists of IP address specifications. These lists define which IP addresses are specifically allowed or denied access to this system's Login Server. These lists are maintained with the [Setup NET](#), [View/Maintain Allow List](#), [View/Maintain Deny List](#) screens described on page 194.

The allow list is a list of addresses, address ranges and address subnets that are specifically allowed to connect to the server. The deny list is a similar type of list of addresses that are specifically not allowed to connect to the server. These two lists are used in sequence. For instance, if a site matches one of the entries in the allow list and also matches one of the entries in the deny list, the client is not allowed to connect to this Login Server.

If your system has connections to insecure networks, such as the Internet, you should define IP addresses or subnet address that you want to have access to your Login Server.

These lists are only checked if there is at least one entry defined in the list. For instance, if there are no entries in the allow list but there is an entry in the deny list, then all sites are allowed to connect except those listed in the deny list. Conversely, if there are entries in the allow list but no entries in the deny list, then only the sites specified in the allow list are allowed to connect to your Login Server.

Generally, specific IP addresses for individual nodes or subnet addresses for groups of nodes that you want to have access to your system are defined in the allow list. When subnet addresses are defined in the allow list, specific IP addresses of nodes on those subnets that you do not want to have access to your system are listed in the deny list. For instance:

Allow List:

```
192.168.38.*
207.21.75.*
```

Deny List:

```
207.21.75.5
207.21.75.6
```

These specifications state that everyone on my local network (192.168.38.\*) is allowed to connect to the server. Also, everyone in the subnet 207.21.75.\* is allowed to connect except the two nodes



207.21.75.5 and 207.21.75.6, which are specifically denied access to the Login Server on this system.

If your system has access to the Internet, the allow and deny lists should be used because Internet access might allow anybody to connect to your Login Server. Refer to “[Internet Access](#)” on page 68 for additional information about security issues and the Internet.

## ■ **Remote User Security and Netuser Accounts**

A **remote user** is a user whose IP address is not part of the subnets that the Login Server has direct access to. (Subnets are described in Chapter 1 “[Networks](#)” in the section “[Subnets and Subnet Masks](#)” on page 23.) Because remote users are less likely to be in the same building as the main computer, and may not be a trusted employee, additional security is offered to protect your system from unauthorized access by these users.

If remote user security is enabled (see “[Enable Remote User Security](#)” on page 193), and a remote user passes the allow/deny list test and connection permissions list test, they must enter a valid network logon user account name and password. These account names and passwords are defined with the [Setup NETUSER](#) screen. Refer to “[Selecting Passwords](#)” on page 67 for suggestions about network user account passwords.

Network logon user accounts and passwords are separate from, and in addition to, the standard user accounts and passwords used in THEOS systems. When the Login Server recognizes that the client connection is a remote user, it displays a special window asking the remote user to login:

**NETWORK User Logon**

User Name: [                      ]

Password: [                      ]

Please enter your Network User name.

Network user names and passwords may be 16 characters in length and are case-sensitive. You must enter the name and the password exactly as defined in the [Setup NETUSER](#) screen. The remote user is allowed a total of six chances to correctly enter a valid network user name and password. After six attempts, the connection is terminated.

When a remote user successfully enters the network user name and password, the standard user account name and password associated with the network user name are used to automatically log onto a user account. If no standard user account name is associated with the network user name, the remote user is presented with the standard “Logon please” prompt. They must then enter the standard account name and password before they are logged onto the system. Thus, a remote user may have to enter two different accounts and passwords: One to access the Login Server, another to access the THEOS system.

Note: Once a user, remote or local, is logged into the system, they may use the LOGOFF or LOGON commands to log onto a different command. If this presents a security problem, be sure to assign a specific user account and password to the network user name definitions. Then, use logon EXECs and application programs to isolate the user from the CSI prompt. When a system allows network access it should password-protect all accounts.

## ■ **SendMail Security**

There have been notices and announcements on the Internet and in the public news media that some versions of the SendMail utility have security weaknesses that allow users to gain access to a system without proper authorization (that is, bypassing network accounting and logs). For many reasons, these problems do not apply to the THEO+Mail [SendMail Client](#). Principally:

- ▶ The problems were associated with the SendMail utility found on UNIX-based systems.
- ▶ The problems were associated with specific versions and implementations of the SendMail utility, not the basic design or protocol used by SendMail.

The THEO+Mail [SendMail Client](#) does not have these weaknesses and, because of its design and the design of the THEOS operating system, cannot have these weaknesses.

## ■ **Selecting Passwords**

Password-protected accounts and network user names only offer security when a “good” password is chosen. A sample set of guidelines for password selection is shown below.<sup>1</sup>

### Do not:

- ▶ Use your login name in any form (as-is, reversed, capitalized, doubled, *etc.*).
- ▶ Use your first, middle or last name in any form.
- ▶ Use your spouse’s or child’s name.
- ▶ Use other information easily obtained about you. This includes license plate numbers, telephone numbers, social security numbers, the make of your automobile, the name of the street you live on, *etc.*
- ▶ Use a password of all digits, or all the same letter.
- ▶ Use a word contained in English or foreign language dictionaries, spelling lists or other lists of words.
- ▶ Use a password shorter than six characters.

---

1. These are extracted from the InterNIC FYI RFC 1244.

Do:

- ▶ Use a password with mixed-case alphabetic characters.
- ▶ Use a password with nonalphabetic characters (digits or punctuation).
- ▶ Use a password that is easy to remember, so you don't have to write it down.
- ▶ Use a password that you can type quickly, without having to look at the keyboard.

Methods of selecting a password which adheres to these guidelines include:

- ▶ Choose a line or two from a song or poem, and use the first letter of each word.
- ▶ Alternate between one consonant and one or two vowels, up to seven or eight characters. This provides nonsense words which are usually pronounceable, and thus easily remembered.
- ▶ Choose two short words and concatenate them together with a punctuation character between them.

Users should also be asked to change their password periodically, possibly as often as every month. This makes sure that an intruder who has guessed a password will eventually lose access, as well as invalidating any list of passwords they may have obtained.

## ■ Internet Access

Remote users on the Internet may try to connect to your Login Server if they know your IP address on the Internet. If you have a permanent connection to the Internet, your IP address is constant. Remote users may be able to find your address if you have registered it with InterNIC or if you have published the address in a location where they can find it. For instance, your ISP may offer a directory of users or you may have a web page that lists your IP address for Telnet connections.

If your connection to the Internet uses dynamically assigned IP addresses, used by most dial-up connections, then your IP address may be different each time that your system connects to the Internet. If your Internet access is provided by a Windows 95 or Windows NT system, there are utilities available that can determine your current IP address and automatically publish that information in a static location, such as a web page.

Some are freeware and others shareware. Use your Windows system web browser to view and search the site:

<http://www.windows95.com/apps/netapps.html>

Or use one of the search engines available on the Web.

When trying to determine whether or not a remote Internet user will be allowed access to your system, you must consider whether or not they have a static IP address or if they will be using dynamically assigned IP addresses. If their address is static, merely add it to the allow list of IP addresses.

If their address is dynamically assigned, you will have to use a subnet specification for their normal ISP assignment. Have them contact their ISP to determine the range of possible addresses that may be assigned when they connect to the Internet. Using this information, define the IP address subnet(s) or subnet ranges that will include all of the possible addresses that they might be assigned.

Although you should always use network user names and passwords, when the remote user has dynamically assigned IP addresses, network user names and passwords are particularly important. You want to prevent other customers of that ISP from gaining access to your system.

## ■ Summary

The security features described in this chapter are used in combination. In order for a client connection to be established with your Login Server, all of the security features must allow the connection. These features are tested in the following sequence:

Security Feature	NetTerm	TWS	Telnet
Allow List, empty = allow all; nonempty = client must be listed	✓	✓	✓
Deny List, empty = deny none; nonempty = denied if IP listed	✓	✓	✓
NetUser Accounts	If remote	If remote	If remote
User Accounts	✓	✓	✓
Logoff disconnect	No	No	No

For instance, a connection from a client is attempted. If their IP address is listed in the allow list, not listed in the deny list, automatic permissions are disabled but the IP address is not listed in the connection permissions database, the connection is refused.

Note that [Telnet Client](#) connections operate a little differently than [NetTerm Client](#) or [THEOS WorkStation Client](#) connections.

## 6 PPP and Dial-Up Networking

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PPP and Dial-Up Networking (DUN) allows you to create a network connection between two computers using a modem and telephone connection.

A dial-up connection to another system uses the Point-to-Point Protocol (PPP), which is a standard definition of how two computers communicate over a serial connection. The Point-to-Point Protocol between the two systems is not a replacement for TCP/IP, but rather it is a replacement for the Ethernet standard used when two computers communicate over an Ethernet medium. In fact, your system may use Dial-Up Networking to communicate with one remote computer and its network while at the same time it uses Ethernet to communicate with the other computers on its LAN.

When DUN is used, the [TCP/IP Parameters](#), [Login Server](#), [Name Services](#), [View/Maintain Allow List](#), [View/Maintain Deny List](#) and [View/Maintain Host Names Database](#) must still be configured on your system. If the system is also part of a LAN using Network Interface Cards (NICs) and Ethernet, the [Interface Cards](#) must also be configured.

When [Dial-Up Networking](#) is configured, any of the users on the system can connect to a remote PPP server and use the connection to perform any network operation supported by the PPP server system and this THEOS system. When other systems on your LAN have designated your computer as a gateway and a DUN connection is opened on this system, those other sites on the LAN can use your computer's DUN connection to access the remote PPP server.

Because Dial-Up Networking connections are not fixed and you may connect to a different PPP server each time that you connect, you must specify which PPP server you want to connect to each time. To make this process easier, the [Dial-Up Networking](#) configuration uses profiles to describe the connection to the remote server. With a profile definition you define the serial port to use, the telephone number to dial, the serial connection speed and handshake, and your account name and password for that remote PPP server. Refer to page [198](#) for a description of profile definition configuration.

A PPP dial-up connection is created with the [DialNet Command](#) described on page [103](#). This command also lets you monitor the connection and it is used to terminate an open connection. Unlike Ethernet connections, which are potentially available at all times because of the cabling used for the connection, a DUN connection is only created or opened on demand.

When you want to use a dial-up connection with one of the client applications provided with THEO+Net, you must use the DialNet command to open the connection before you use the client to connect to a remote server. For instance,

```
>dialnet start myisp
Profile "MYISP" connected successfully,
  Host IP address: 206.163.58.53
  Remote IP address: 204.245.231.131.

>ftp ftp.theos-software.com
Connecting to ftp.theos-software.com (207.21.75.100)
...

>dialnet stop myisp
Profile "MYISP" is now disconnected.
```

Other client applications, such as the TheoMail command provided with the THEO+Mail Plus Pak, may allow you to specify the profile in the client's configuration so that you don't have to create the connection first with the DialNet command.

## ■ Dynamic IP Assignment

When Ethernet is used to connect your system to another computer, the two systems have fixed IP addresses and these IP addresses are rarely changed. However, because Dial-Up Networking normally connects you to an ISP, and most ISPs have multiple computers handling incoming connections, the IP address of the remote PPP server may be different each time that you connect. This does not cause any problems if you use domain names instead of dotted IP addresses to refer to the servers on the dial-up network.

If you have a dedicated connection to your ISP, they allocate a specific telephone number and modem for your exclusive use. Any connection to that modem has a previously defined, fixed IP address which was assigned when the you arranged for the dedicated connection account. This IP address will not change as long as you maintain that account with the ISP. With a dedicated connection, your IP address is constant and other people on the Internet can easily connect to your system with the TWS or NetTerm clients or a Telnet client. If you have other network servers installed on your system such as the FTP and HTTP servers provided with the THEO+Server Plus Pak, they can also access those servers with standard network FTP clients or web browsers.

However, if you don't have a dedicated connection to the ISP, each time that you connect, the ISP assigns an IP address for your computer from



the pool of available IP addresses that it has. This is called **dynamic IP assignment**.

With dynamic IP assignment, your IP address on the remote network will probably be different each time that you connect. Because it changes each time, other users will not be able to configure their clients to access your system when you are connected. However, they may still access your system if you tell them what the IP address is. When the [DialNet Command](#) connects to the PPP server it reports the IP addresses for both the remote site and for your connection to that site.

```
>dialnet start myisp
Profile "MYISP" connected successfully,
Host IP address: 206.163.58.53
Remote IP address: 204.245.231.131.
```

The “Host IP address” is the IP address for your computer; the “Remote IP address” is the IP address for the ISP’s computer that you have connected to. To let other users know your host IP address you can send them an e-mail message, transfer a web page or data file with the information using your FTP client, if that web page or file is transferred to a site that is accessible by your users. To assist you, the [DialNet](#) command writes the IP address assigned to your computer to the file `SYSTEM.THEOS32.DUN_IP:S`. This file can be used by an application to automate the notification to users of your current IP address.

The `SYSTEM.THEOS32.DUN_IP:S` file is replaced each time that a profile is connected and it is erased when a profile is disconnected. If you have multiple telephone lines and modems connected to your computer and you have more than one profile connected at a time, only the last profile connected is retained in the `SYSTEM.THEOS32.DUN_IP:S` file and this file is erased when any profile is disconnected.

Be aware that when you post your IP address to a site that others can see, your system might be accessed by any user. If this is a concern, implement all of the security features described in Chapter 5 “[Network Security](#),” starting on page [63](#).



# **Part II** ---

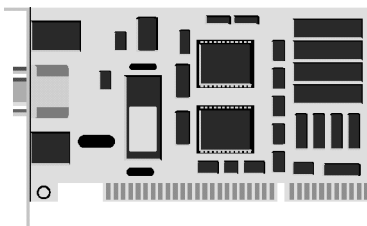
## **Installation and Setup**



# 7 NIC Installation

---

Each server and each workstation in a network of computers is connected via a Network Interface Card (NIC). A NIC is a circuit board or PCMCIA card that installs inside of the computer and provides a connector plug for connecting the card to the network medium.



THEO+Net can use any of the following cards:

- ▶ NE2000 Compatible
- ▶ SMC EtherCard PLUS Elite and Elite16
- ▶ 3COM PCI Fast EtherLink XL, model 3C905-TX and 3C905B-TX
- ▶ PCI cards using Realtek 8029 and 8139 chipsets
- ▶ LinkSys LNEPCI2

A list of specific adapter cards that have been tested can be found on the THEOS web site, at the following address:

<http://www.theos-software.com/support/hardware.asp>

Many modern NICs provide for three connectors, any one of which can be used. These connectors may be a BNC connector for connecting to a 10Base2 medium, a DB15 for connecting to a 10Base5 medium and a RJ45 for connecting to a 10BaseT medium. To connect to multiple networks, multiple NICs must be installed and configured.

The NIC must be installed prior to configuration and usage of THEO+Net. To install or replace a NIC, follow the directions supplied with the network card. Except for PCMCIA cards, installation of a NIC requires the opening of the computer case. Make sure that the computer is powered off and follow the instructions provided with the computer for safely opening and installing cards in the case.

Most NICs are configured with software, which is generally supplied as a DOS program. To use this software, you will need to boot the computer with DOS and then run this utility on all systems that will be used as THEOS servers and clients. You cannot use THEO+DOS to run the DOS configuration program—you must boot the system in DOS mode.

For Windows-based clients and servers, follow the instructions supplied with the card and use the networking software available for that operating environment.

During installation of the card, write down the network card configuration information because you will need it to configure the servers and clients. Specifically, you'll need to know:

- ▶ I/O address
- ▶ Memory address
- ▶ Interrupt (IRQ)

If some type of “connection test” utility is included with the network cards, use it to be sure that the cards are communicating properly. **DO NOT** continue with the installation procedure until you know that the network cards are communicating with each other.

## ■ PCI Bus, Plug and Play NICs

THEO+Net can use PCI “Plug and Play” (PnP) cards if they use the Realtek 8029 chipset. Other types of cards may be supported. Check the THEOS web site for the list of tested NICs.

For NICs that are “plug and play,” there isn't any DOS setup utility and, if supported by THEO+Net, you do not use DOS or Windows to initialize the card. The [Setup NET](#) command can determine the I/O address, memory address and IRQ setting for these cards.

## ■ Installing NIC on a Laptop Computer

Laptop computers connected to a docking station should use a standard ISA or PCI bus NIC. Follow the normal procedures described above if this is the case. Doing so will avoid the power-off reset situation that normally happens with a laptop using PC cards.

Laptop computers used without a docking station use PCMCIA cards (PC cards) for Network Interface Cards. The NIC PC card must be one of the cards supported by THEO+Net or be NE2000 compatible. Be sure that the card has a connector that is compatible with the rest of your network (RJ45 or BNC).

To use the PC card NIC with THEO+Net, you must load the software drivers supplied with the PC card and configure it under DOS. This can be either a stand-alone DOS version or DOS under Windows. The DOS drivers must initialize the card so that THEO+Net can recognize it.

The configuration of the card may need only be done once. Typically these cards default to using port address 300 and interrupt 10. Interrupt 10 generally avoids conflict with sound boards that might be built into the laptop.

Powering off the computer or pressing its “Reset” button will generally reset the devices in the computer. Therefore, once the card has been configured, **DO NOT POWER OFF** the laptop. You must either soft-reset (**Ctrl+Alt+Del**) or use a DOS reboot program that resets the computer without resetting devices. Otherwise, THEO+Net will not find the adapter.

On some laptops, **Ctrl+Alt+Del** will also reset the PCMCIA card. If this is the case, THEO+Net will not find it. In this situation, you can use the DOS DEBUG utility to “write” a program called REBOOT.COM, then reboot the laptop out of DOS by typing “REBOOT.”

At the DOS prompt type the following:

```
>DEBUG REBOOT.COM
A 100 
      INT 19 
      
R CX 
2 
w 
```

The above program may not work for all computers and NIC combinations.

### ■ Windows-Only Laptops

If there is no prior version of DOS installed (just the version that Windows installs), when you reboot the system, select “DOS” from Multiboot. When you see the message “Starting Windows...” press the **[F8]** key and select the “Command Mode Only.”

When you get to a prompt, load and setup the PC card drivers by executing the BAT file that loads them. Reboot the computer using the REBOOT.COM program that you created. Choose “THEOS” when the Multiboot selections are displayed.



# 8 THEO+Net Installation

---

This section assumes that you have a working computer system, with THEOS 32 Version 4 installed and configured, and with a Network Interface Card properly configured.

## ■ Your THEO+Net Package

The THEO+Net package consists of a set of floppy diskettes, and an *authorization code*.

The authorization code is supplied on paper. **This is the only copy that you will receive.** Please keep this document with your operating system diskettes and make several copies. Replacement authorization codes can be obtained from your THEOS reseller, but that takes time and there may be a charge.

## ■ Installation Procedures

To install THEO+Net Version 4, follow these steps:

1. Boot the system with THEOS 32 Version 4, preferably in “Maintenance Mode,” or at least make sure you are the only user logged onto the system. To boot the system in maintenance mode, press **[Esc]** when prompted during the boot process.

Maintenance mode is preferred because that is what you are doing: Maintaining the operating system by installing a major operating subsystem. It is important that other users are not active on the system. The installation process updates some system files that may be in use by other users if they were logged onto the system.

Maintenance mode might not be available on the system. If you are not asked when the system boots, you will have to change the system configuration to allow maintenance mode. Use the Sysgen command described in the *THEOS System Reference* manual.

If maintenance mode is not used, be sure that networking is not started. If it is started, you will have to disable it (use the Setup Net command) and reboot. Once networking is started the only way to stop it is to reboot the system.

2. Log onto the “system” account. Make sure you are at the CSI prompt.
3. Insert the first diskette of the set of disks provided with THEO+Net into your diskette drive.
4. Enter the command:

```
>install
```

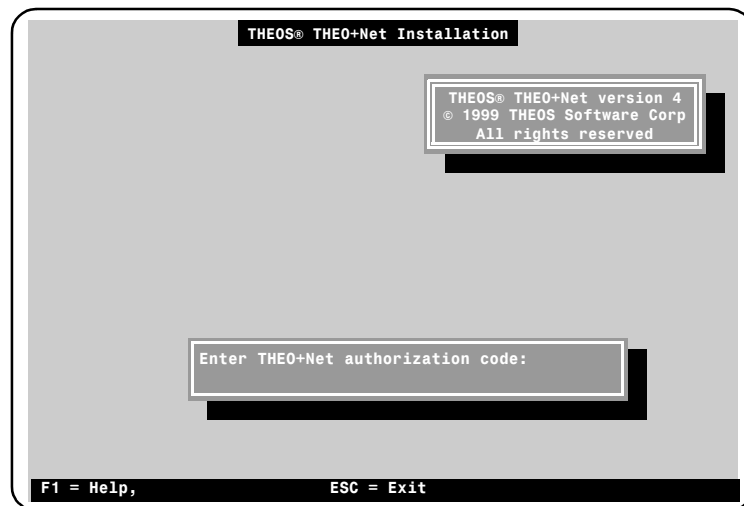
If the diskette drive you are using is not the normal, default “F” drive, specify the drive code letter after the “install” command name.

For instance, if you are using the “G” drive, enter the command:

```
>install g 
```

This program loads and executes the installation program for THEO+Net from the diskette.

5. The THEO+Net Version 4 installation screen displays and prompts you to enter the authorization code, which was supplied as a document with this product.



6. Enter the authorization code in the box and press . It can be entered with uppercase or lowercase letters.

If you enter an invalid authorization code, the message: “Incorrect access code!” is displayed. You are given three chances to enter a correct code. If a valid authorization code is not entered on the third attempt, the installation process exits.

7. After the code is accepted, installation begins. Progress information is displayed as the files are copied from the diskette onto your system. When prompted, insert the next diskette.

This completes the installation of THEO+Net Version 4.

## ■ **Upgrading THEO+Net PowerStep**

THEO+Net, like the operating system itself, has a PowerStep associated with it. The PowerStep for a THEOS product is a license controlling how many users may be started at any one time. The PowerStep for THEO+Net is subordinate to the PowerStep of the operating system. The PowerSteps available for THEO+Net are:

THEOS PowerStep	THEO+Net PowerStep
1	Not available
2	1
3	1 or 2
5	1, 2, 3 or 4
8 and above	Any value less than or equal to the THEOS PowerStep

For instance, a system with a PowerStep of 32 and a THEO+Net PowerStep of 12 may have 33 users connected and logged onto the system (32 plus the main console), any 12 of these may be network users.

To upgrade your THEO+Net PowerStep, perform a normal upgrade of THEO+Net first. After you have upgraded the software, restart the install process and then select the “Change PowerStep” item in the installation menu. You will be prompted to enter your new authorization code for your new PowerStep. The installation program changes your THEO+Net PowerStep to the number of users associated with the new authorization code.

## ■ Acquiring an Updated Copy of THEO+Net Version 4

A system with THEO+Net Version 4 already installed on it may be updated to a later version by obtaining the most current version from THEOS Software Corporation (resellers) or by downloading the current version from the THEOS Web site (resellers or end users). The THEOS Web site contains the latest version of most software provided by THEOS Software Corporation.

The latest version of the commercial release of THEO+Net can be found by going to the “Download” link in the home page:

<http://www.theos-software.com>

Be sure to view the “Installation instructions” link in the download directory entry for THEO+Net Version 4. A software portal and a matching authorization code are required to install THEO+Net onto a computer, even when the software is downloaded from the Web site.

The THEOS Web site may also allow you to download a “beta” version of THEO+Net. A **beta version** of software is a pre-release version and is not intended to be installed on a production system. A beta version may contain errors that could affect data integrity or operation of your system.

## ■ Using THEO+Net to Acquire Updated Copy

If you already have a version of THEO+Net on your system and it has Internet access, you may get the current version from the THEOS FTP site using the FTP client included with THEO+Net.

```
>ftp ftp.theos-software.com
possible proxy connection messages
-----
Welcome to THEOS Software Corporation FTP site.
Anonymous user logged in.
-----

FTP? bin
Using Binary mode to transfer files.

FTP? cd theos/theo+net
CWD command successful.

FTP? ls
_INDEX.TXT
THEONET.ZIP
TOOLKIT.ZIP
TWS136.ZIP

FTP? get theonet.zip
Receiving theonet.zip (1 of 1)
422,370 bytes received in 143.6 seconds (2.94 Kbytes/sec)

FTP? bye
Goodbye

>
```

The file downloaded will be the current version of the THEO+Net product.

The specific name of the compressed file that was actually downloaded must be used when uncompressing it.

```
>unzip theonet.zip
Archive: /TEMP/THEONET.ZIP:S
  inflating: THEONET1.IMG
  inflating: THEONET2.IMG
```

The UNZIP utility can be downloaded from the THEOS FTP site. It is located in the /theos/misc directory. If you don't have a copy on your system, download the UNZIP.CMP file, uncompress it with the EXPAND utility, and rename it into the SYSTEM.CMD32 library.

Copy each of the image files to floppy diskettes.

```
>backup f (buffer from theonet1.img
>backup f (buffer from theonet2.img
```

Use these diskettes to install the new version of THEO+Net.

# 9 THEO+Net Configuration

---

This section assumes that you have already installed, configured and tested the Network Interface Cards (NICs) on this system and that THEO+Net has been installed onto the system.

THEO+Net needs a lot of information before it can be used on a system. To define this information, you will need to use the **Setup** command. This command is fully described in Chapter 20 “[Setup Command](#),” starting on page 185. In this chapter, only the basic, minimal configuration is described. To configure THEO+Net for basic usage as a Login Server for local networked computers, [Setup NET](#) must be performed. To fully configure THEO+Net you must also use [Setup FTP](#), [Setup NETUSER](#) and [Setup TELNET](#).

In configuring THEO+Net, you must:

1. Tell THEO+Net how to communicate with the Network Interface Cards on this system.
2. Tell THEO+Net how TCP/IP is used on this system.
3. Tell THEO+Net how the Login Server is used on this system.

Other information may be necessary if you wish to use more than the basic Login Server function of THEO+Net.

## ■ Configuring THEO+Net

Before configuring THEO+Net, you will need to collect some information or decide upon some standards you will use in your network. First, get the information you wrote down when you installed the NIC. This information includes:

- ▶ I/O Address
- ▶ mapped memory address
- ▶ interrupt (IRQ)

If your system is connected to more than one network and you installed more than one NIC, you need the information for each of the cards that were installed.

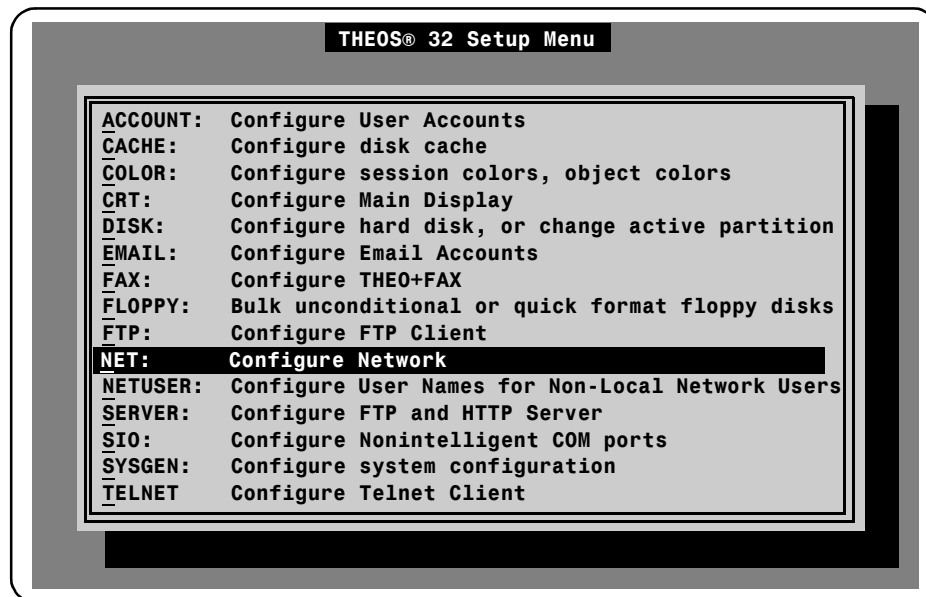
Also, you will need to choose:

- ▶ A name for your computer on the network
- ▶ The IP address for your computer

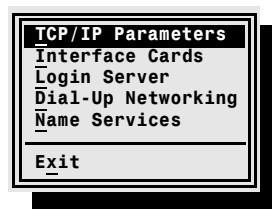
Note: You do not need to be in maintenance mode when configuring THEO+Net. You do, however, have to be logged onto the SYSTEM account.

Use the Setup command and select its NET function:

>setup



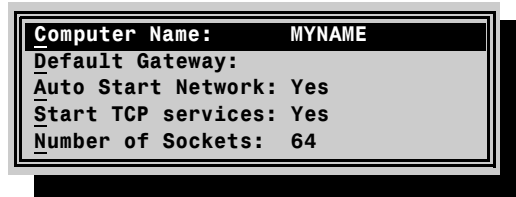
When selected, you are presented with a menu of items that you can configure for THEO+Net.





## ■ TCP/IP Configuration

First, choose the “[TCP/IP Parameters](#)” menu item. This displays the following screen:



Computer Name:	MYNAME
Default Gateway:	
Auto Start Network:	Yes
Start TCP services:	Yes
Number of Sockets:	64

Configuration

**Computer Name.** Enter the name you have chosen for this computer. If you are not sure what type of name to use, read the section “[Choosing a Computer Name](#)” on page 98.

**Default Gateway.** For most small networks that are self-contained, merely leave this field blank. One common situation that might require an entry in this field would be a local network that is composed of two or more networks with dedicated gateways or systems using multiple NICs. Another example would be a network with a Windows-based system using a proxy server to access the Internet over a dial-up adapter.

If this system is part of a network that has access to multiple networks, then specify the IP address of the node that is operating as a gateway to the other network(s). When there is a proxy server providing access to the Internet, specify the IP address of the system running the proxy server. If there are multiple gateways on the network, specify the IP address of the primary gateway.

When there is only one network that you have access to, leave this field blank, or if this system is the only gateway in the network, then leave this field blank. For more information about gateways, refer to Chapter 3 “[Bridges, Routers and Gateways](#),” starting on page 45.

**Auto Start Network.** A “Yes” entry specifies that the network is started and enabled when the computer is booted. A “No” entry causes the network to not start automatically on system boot.

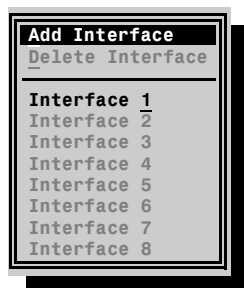
Enter a “Yes” for this field unless you want to “manually” start the network after bootup.

**Start TCP services.** For most systems, enter a “No” in this field. You would enter a “Yes” if you want to be able to use this system for the diagnostic services such as CHARGEN and ECHO or if you wanted to use the DAYTIME, QUOTE or TIME services. Refer to the Chapter 13 “[Net Command](#)” for a description of the “[Server-Functions](#).”

**Number of Sockets.** A pair of sockets is assigned and used for each user connected to the Login Server. The default value of 64 supports 20 to 30 user connections to the Login Server. If your network needs more user connections than this, enter a larger value.

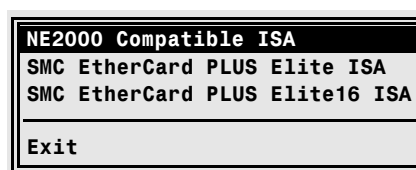
#### ■ NIC Configuration

Choose the “[Interface Cards](#)” menu item. This displays the following screen:



Since there are no NICs configured, all of the choices except “Add Interface” and “Exit” are grayed, indicating that they cannot be selected. Press  while the “Add Interface” item is highlighted.

When adding a new interface card you must first specify the type of card. You must have the card physically installed in the computer so that the setup process can offer the appropriate selection of card types available. For instance, the following menu displays when there is an ISA network card installed in the system.



Select the appropriate card type from the list offered. If your card type is not offered the card is either not supported or you have not installed it cor-

rectly. After a card is selected the following screen displays (it may be slightly different depending upon the card type selected).

<b>Name:</b>	<b>NE2000 Compatible</b>
<b>IRQ:</b>	<b>3</b>
<b>Port:</b>	<b>320</b>
<b>Memory:</b>	<b>N/A</b>
<b>Use DHCP:</b>	<b>No</b>
<b>IP1 :</b>	
<b>SubNet1 :</b>	

**Configuration**

Use the information that you wrote down during the card installation for the fields “IRQ,” “Port” and “Mem.” Leave the field “Use DHCP” set to “No” unless you know that your system uses a Dynamic Host Configuration Protocol server. Most systems will not have this type of server on their network.

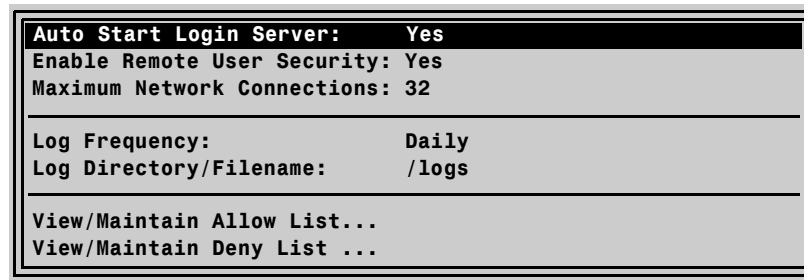
The fields “IP 1” and “Subnet Mask 1” define your system’s network address. Read the section [“Selecting Your IP Address and Subnet Mask”](#) on page 96, if you are at all unsure about the values to enter here. Once these fields have been defined, press **F10** to save and exit this screen. The other fields for “IP 2” *etc.*, are not needed except in very special circumstances.

When you are finished, your “Interface 1” definition should look something like:

<b>Name:</b>	<b>NE2000 Compatible</b>
<b>IRQ:</b>	<b>3</b>
<b>Port:</b>	<b>320</b>
<b>Memory:</b>	<b>N/A</b>
<b>Use DHCP:</b>	<b>No</b>
<b>IP1 :</b>	<b>192.168.1.1</b>
<b>SubNet1 :</b>	<b>255.255.255.0</b>

## ■ Login Server Configuration

Next, choose the “[Login Server](#)” menu item. This displays the following screen:



<b>Auto Start Login Server:</b>	<b>Yes</b>
<b>Enable Remote User Security:</b>	<b>Yes</b>
<b>Maximum Network Connections:</b>	<b>32</b>
<hr/>	
<b>Log Frequency:</b>	<b>Daily</b>
<b>Log Directory/Filename:</b>	<b>/logs</b>
<hr/>	
<b>View/Maintain Allow List...</b>	
<b>View/Maintain Deny List ...</b>	

**Auto Start Login Server.** If you want this system to provide login services to other users on the network, and if you want this Login Server to be started automatically each time that the network is started, enter a “Yes” in this field. If either of these conditions is not true, enter a “No.”

You can always start and stop the Login Server manually with the NET START and NET STOP commands.

**Enable Remote User Security.** Remote user security refers to access permissions for network users who are not part of the local network. In general, this field should be left with a “Yes” entry. See “[Setup NETUSER](#)” on page 203 for a description of the maintenance of the remote user security database.

**Maximum Network Connections.** The default value for this field is 32. It refers to the maximum number of login user sessions that are allowed on this system. You may enter a value between 8 and 128 if you want to allow fewer or more network connections to this system.

**Log Frequency.** In general, this field is left with a “No Log File” entry unless there are problems with network connections and you need to see the transaction log for this system. If you want logging enabled, select one of the rotating frequencies of “Daily,” “Weekly” or “Monthly.” This will keep each log file smaller and will allow you to find the log entries for a particular network session much easier than the “One Log File” selection.

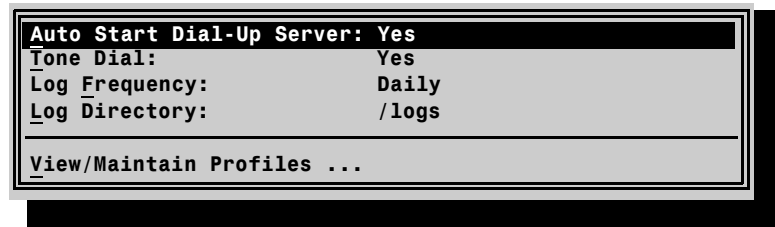
**Log Directory/Filename.** This field is disabled if the previous field was set to “No Log File.” If a “One Log File” frequency was selected you must enter the path and file name that you want used for your network log. When one

of the rotating log frequencies is selected, enter only the path for the log file. The log file name is determined by the frequency selected.

The “View/Maintain Allow List” and the “View/Maintain Deny List” items do not have to be configured at this time. If you wish to do so, refer to the description in the Setup command for these items, which are described on page 196.

## ■ Dial-Up Networking Configuration

If you have an Internet Service Provider and you will be using a modem to connect to that ISP, you must configure the PPP server and define a profile that describes the connection to the ISP. Choose the “Dial-Up Networking” menu item.



<b>Auto Start Dial-Up Server: Yes</b>	
<b>Tone Dial:</b>	Yes
<b>Log Frequency:</b>	Daily
<b>Log Directory:</b>	/logs
<b>View/Maintain Profiles ...</b>	

**Auto Start Dial-Up Server.** Use a value of “Yes” in this field and the PPP Server is started when the network is started. When this field is “No,” the PPP Server is only started and stopped with the Net START PPP and Net STOP PPP commands.

**Tone Dial.** Specify “Yes” if you want all of the profiles to connect using tone dialing. A “No” in this field defaults to pulse dialing.

**Log Frequency.** This field specifies whether or not PPP connections are logged and how frequently the file is “rotated.” When this field is set to “None” no PPP logging is maintained.

With this field set to “Single,” “Daily,” “Weekly” or “Monthly” records are written to the PPP log file every time that a major event occurs with the PPP client. For more information about these files, refer to “Network Log File” on page 246.

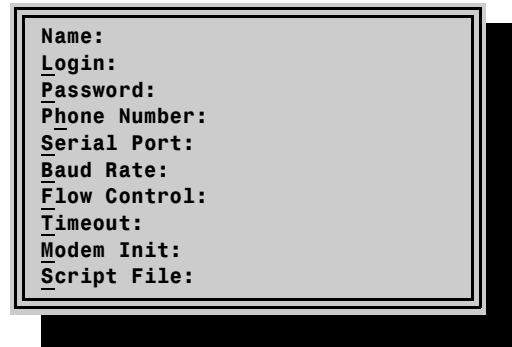
**Log Directory.** This field is used only when the previous field is not set to “None.” It specifies the path and possibly the name of the PPP log file. When the Log Frequency field is “Single” both the path and file name of the log file is specified here. When the Log Frequency field is “Daily,” “Weekly” or “Monthly” only the path to the log file is specified. The specific log file

name will be determined by the log file name rules described in “[Network Log File](#)” on page 246.

**View/Maintain Profiles.** Use this item to create a profile for connecting to your ISP.

Since there are no profiles defined yet, selecting this menu item displays a message “\*\*\* Empty List \*\*\*.” Create a new profile definition by pressing the **Ins** key.

When you create a new profile or modify an existing one, the following window displays:



```

Name:
Login:
Password:
Phone Number:
Serial Port:
Baud Rate:
Flow Control:
Timeout:
Modem Init:
Script File:
  
```

For the “Profile Name” field, you can use your ISP’s name if you want. For the “Login Name” and “Password” fields you must enter the account name and password that your ISP assigned to you. Because the “Login Name” and “Password” fields are case-sensitive, you must enter them **exactly** as specified by your ISP. After entry, the password is encrypted and displayed as asterisks. You will not be able to see this value again.

Specify the phone number used for dial-up access to your ISP. The “Serial Port” must be the name of the port that the modem is connected to. The serial port must be specified with the physical name of the port, not the logical name that it might be attached as. For instance, use MULTI12 instead of COM5.

The “Baud Rate” is the transmission speed between your computer and the modem, not the connection speed which is determined by negotiations between the two modems. Use a speed that is sufficiently high to allow the modem to communicate at its most efficient speed. For instance, if your modem is a 28.8K or 33.6K modem, specify a baud rate of 38,400.

Specify a “Time-out” value that is appropriate for your expected usage. This value determines how long the modem connection is maintained

when there is no activity. If you want the connection to remain open indefinitely (and your ISP allows this), specify a time-out value of zero.

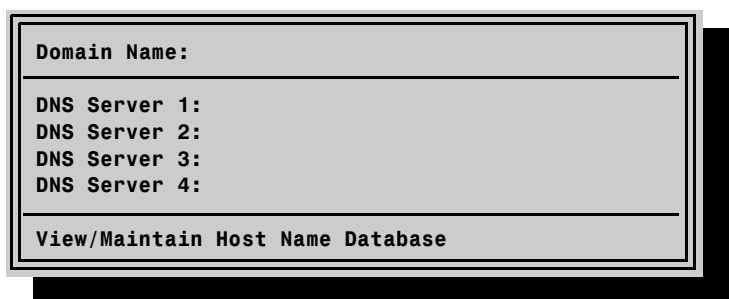
Save the profile definition by pressing the **F10** key.

## ■ Domain Name System Server Configuration

Although you don't have to have a Domain Name System (DNS) server configured with THEO+Net, if you have access to the Internet defining the DNS server makes it much easier to use the system when a DNS server is available. The DNS server is responsible for translating a domain name to its dotted IP address. Without a DNS server available, you must specify all network references using the dotted IP address. This can be very awkward, at best.

If your system only has access to the LAN, no DNS server is required. Instead, the [View/Maintain Host Names Database](#) may be used to translate names to the IP address of the local system.

When the network has access to the Internet, your ISP will provide the IP addresses for the DNS server that it has available for your usage. Choose the "[Name Services](#)," menu item. This displays the following screen:



Domain Name:

---

DNS Server 1:

DNS Server 2:

DNS Server 3:

DNS Server 4:

---

View/Maintain Host Name Database

If your system has a domain name registered with InterNic, enter that name in the "Domain Name" field. If your network is not registered then leave this field blank.

Enter the DNS server IP address provided by your ISP in the IP 1 field. Some ISPs may provide multiple IP addresses for DNS servers. If yours did, then enter them in the same sequence that your ISP provided them.

When using a proxy server to access your ISP, it may require that it be specified as your DNS server. Refer to the instructions for the proxy server.

The “View/Maintain Host Name Database” item does not have to be configured at this time. If you wish to do so, refer to the description in the Setup command for this item, which is described on page 201.

### ■ Finishing the THEO+Net Configuration

The remaining menu items in the [Setup NET](#) command may not have to be used at this time. With the configuration done so far, this system is ready for usage as a Login Server for access by other network users with their [NetTerm Client](#), [Telnet Client](#) or [THEOS WorkStation Client](#) applications. And you may use this system’s [NetTerm Client](#) to access other THEOS Login Servers on the network.

If you are ready to use networking, exit the setup menus by pressing the **[F10]** key until you are at the CSI prompt again. Make sure that all users are logged off and then reboot your system using the Reboot command.

The Setup command also allows you to configure your [FTP Client](#) and [Telnet Client](#). These client applications are used to access servers on other systems on your network or on remote networks that you have access to.

If you think you need to configure these parameters at this time, refer to Chapter 20 “[Setup Command](#),” starting on page 185, for a complete description of all of these configuration screens.

### ■ Selecting Your IP Address and Subnet Mask

Read the section “[Identifying Hosts on a Network](#)” on page 22 for a description of IP addresses and subnet masks.

There are two different situations affecting how you select your IP address: Either you have a network with direct, dedicated Internet access or you do not.

#### ■ Dedicated Internet Access

If you are using a dedicated connection to the Internet through an ISP, they will assign you an IP address or an IP address subnet. In this situation, all of the computers on the network that have this dedicated Internet access must use the addresses assigned by the ISP and the subnet mask associated with that address or addresses.

#### ■ No Internet Access or Nondedicated Internet Access

For computers that do not have Internet access or are part of a subnet that does not have dedicated Internet access, you should choose one of the



address subnets unused by Internet systems even if your system has no access to the Internet. Although your network does not have the access at this time, it might in the future. When that future arrives, you will have to re-address all of your computers unless you select non-conflicting addresses from the start.

The address ranges that will never be assigned to nodes on the Internet are:

Class A: 10.0.0.0	–	10.255.255.255	= 16,777,214 nodes
Class B: 172.16.0.0	–	172.31.255.255	= 1,048,574 nodes
Class C: 192.168.0.0	–	192.168.255.255	= 65,534 nodes

The set of addresses you choose depends upon the number of nodes that you have or expect to have on your network. Generally, the last set will provide sufficient addresses for your needs.

Pick a subnet address in the 192.168 range of addresses. For instance, 192.168.20. Write down the subnet mask for this address. In this case, the subnet mask will probably be the standard Class C subnet mask of 255.255.255.0.

Now, all of the addresses for the computers on this local network must start with 192.168.20. The last portion of the dotted IP address uniquely identifies the computer on this local network. It is not necessary to assign the addresses sequentially. They may be assigned in any order that you like.

A network with one server and one client might assign the addresses 192.168.20.1 and 192.168.20.2 respectively. If you are setting up a 10-node network (one server and nine clients, five servers and five clients, *etc.*), you might assign addresses beginning with 192.168.20.1 for the first server and ending with 192.168.20.10 for the last client, or 192.168.20.1 through 192.168.20.5 for the servers and 192.168.20.101 through 192.168.20.105 for the clients.

If there are multiple, local networks connected with routers and gateways, each of the networks must use subnet addresses that are different from the subnet addresses in use by the other networks. For instance, if one network uses 192.168.20.0 for its subnet address, the other networks must use a different value, such as 192.168.21.0 and 192.168.22.0, *etc.*

## ■ Choosing a Computer Name

In order to easily distinguish between multiple computers on a network, we give them names. With THEO+Net, computer names may be 15 characters in length, may contain the dash character ( - ) and any alphanumeric character (including the international, accented characters). They must start with an alphabetic character.

The name that you assign your computer may be used by many other clients and servers on the network. Even if your network is small now, maybe with only three computers connected to it, it may not be that way always. To avoid problems either now, or in the future, a good name for the computer should be chosen.

The following are some do's and don'ts you should consider when choosing a name for a computer.

Do not:

- ▶ Overload other terms already in common use.
- ▶ Choose a name after a project unique to that machine. For instance, "Documentation," "Engineering," "Sales," *etc.*
- ▶ Use your own name. Even if the computer is on your desk, it may be moved in the future and then it wouldn't be yours anymore. Who wants to use a computer with someone else's name assigned to it?
- ▶ Use long names. Long names are hard to remember and even harder to type.
- ▶ Use alternate spellings or words. For instance, the name "Rigle" instead of "Rigel" (it's the name of a star).
- ▶ Use domain names. This is not really a problem with THEO+Net systems because domain names require a period in the name and periods are not allowed in a THEO+Net computer name.
- ▶ Use domain-like names.
- ▶ Use antagonistic or otherwise embarrassing names.
- ▶ Expect case to be preserved. Not all computers distinguish between two names that are the same except for the case mode used.

Do:

- ▶ Use words/names that are rarely used.
- ▶ Use theme names such as colors, feminine names, *etc.*
- ▶ Use real words. Random strings are inappropriate for the same reason that they are so useful for passwords: They are hard to remember.
- ▶ If multiple companies may have computers on the network, use company names or initials as part of the name. For instance, “ABC\_Rover.” When this portable computer is connected with another company’s network, it still uniquely identifies this computer as being owned by the ABC company, and not any laptop that is owned by the other company.
- ▶ Don’t worry about reusing someone else’s host name. Extremely well-known host names such as “sri-nic” and “uunet” should be avoided since they are understood in conversation as absolute addresses even without a domain. In all other cases, the local domain is assumed to qualify single-part host names. This is similar to the way phone numbers are qualified by an area code when dialed from another area.

Most people don’t have the opportunity to name more than one or two computers, while site administrators name large numbers of them. By choosing a name wisely, both user and administrator will have an easier time of remembering, discussing and typing the names of their computers.



# **Part III** ---

## **Command Reference**



# 10 DialNet Command

The DialNet command is used to control and monitor Dial-Up Networking connections (DUN).

1 DIALNET *function profile*

2 DIALNET

---

*function*           »   START  
                      STOP  
                      STATUS

*profile*            »   name of profile defined in SETUP NET

DIALNET

The DialNet command can operate with a command-line interface or as a windowed interface. This is reflected in the two modes of operation. Both modes can perform the same operations, but the information shown and how it is displayed differs between the two.

## Operation

**Mode 1**—This is the command-line interface to DialNet and is suitable for usage by EXECs and application programs. To use this mode when there are multiple profiles defined, you must know the name of the profile definition that you want to use. If there is only one profile defined, that profile is used automatically and you do not have to specify the profile name.

DialNet can perform three functions:

To connect to a remote PPP server, use the command:

```
>dialnet start profile-name
```

To display the status of a current connection to a PPP server, use the command:

```
>dialnet status profile-name
```

To disconnect from a remote PPP server, use the command:

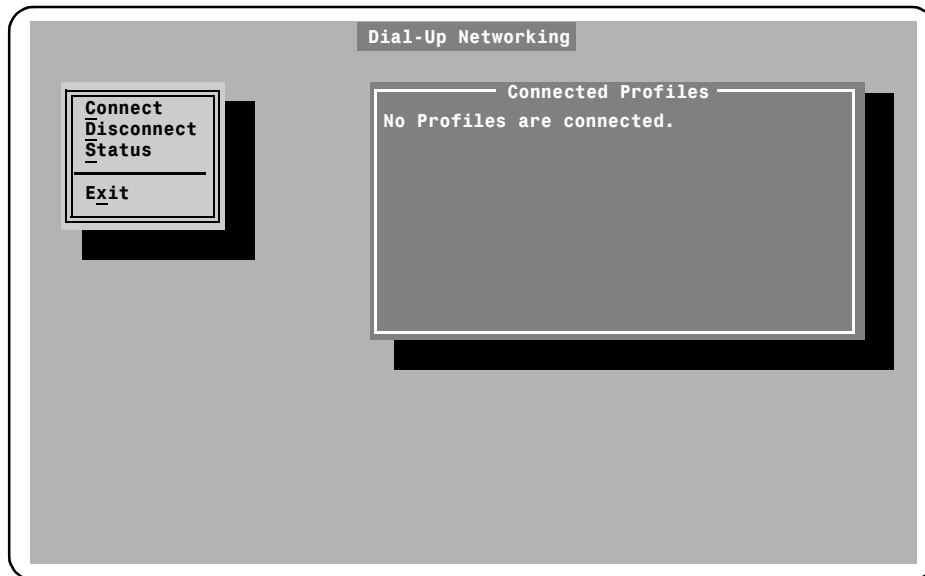
```
>dialnet stop profile-name
```

Refer to the [Command-Line Interface](#) section later in this chapter for a description of the information displayed by these functions.

**Mode 2**—This is the windowed interface to the DialNet command.

### Windowed Interface

When [Mode 2](#) is used, it displays the following screen and menu:



Use the normal menu selection keys to select the desired item.

The window on the right displays a brief summary about each profile that is currently connected.

When Connect, Disconnect or Status is selected, and you have multiple profiles defined, you are offered a list of the profiles available for that function. Profiles are defined with the [Setup NET](#) command, “[Dial-Up Networking](#)” menu. When only one profile is defined, the operation is performed automatically on that single profile.

You may exit this menu by selecting the Exit item, by pressing **[Esc]** or by pressing **[F9]**.

**Connect.** Selecting this item connects to the single profile defined in your configuration or, if there are multiple profiles defined it displays a list of those profiles that are not currently connected. Select the profile that you want connected. An attempt is made to dial and connect to the PPP server specified in the profile definition. Press **[Esc]** if you do not want to connect to any of those profiles at this time.



When successfully connected, the “Connected Profiles” window on the right is updated with the new connection summary information. Note that the “Connect Time” information display is only updated every ten seconds.

For possible problems that might be encountered during the connection attempt, refer to the [DialNet Start](#) description on page 107.

**Disconnect.** When only one profile is connected, this function disconnects that profile. When multiple profiles are connected a list of those connected profiles is displayed and you can select the one that you want disconnected. Press **[Esc]** if you do not want to disconnect any of those profiles at this time. If there are no profiles connected, an error message displays.

DUN connections are available to all users on your system, so be sure that the connection is not being used at this time. It is possible that another session on this terminal or another user on the system is using the connection.

**Status.** When only one profile is connected the status of that connection is displayed. When multiple profiles are connected a list of those connected profiles displays and you can select the one that you want the status displayed. Press **[Esc]** if you do not want to see the status of any of those profiles at this time. If there are no profiles connected, an error message displays.

The status display for a connected profile appears as:

```

Connection Status
Profile:          PACIFIER
Host IP:          206.163.58.6
Remote IP:        204.245.231.131
Connected on:     03/12/1999 08:02:45   for: 00:06:12
Bytes sent:       1,591 received:       2,611
Packets sent:     34 received:          27
Packets rejected: 2
Largest packet sent: 133 received:      576
Handshake:        CTS/RTS   Baud rate: 38,400
Inactivity time-out: 00:10:00   remaining: 00:07:39
Modem phone speed: 28,800

```

Most of the meanings of the fields in this display are apparent. To clarify those that might not be apparent:

- Host IP** The IP address for your computer. This was assigned by the remote PPP server and may be different each time that you connect. (Dynamic IP address assignment.)
- Remote IP** The IP address of the remote PPP server. This may be different each time that you connect if the remote site has multiple PPP servers.
- Packets rejected** The number of packets sent to or received from the PPP server that were rejected for one reason or another. Each time that a packet is rejected, a log entry is added to the DUN log file defined in Setup NET, Dial-Up Networking, General, [Log Directory](#) field.
- Baud rate** The transmission speed between your computer and the modem. This is specified in the profile definition.
- remaining** This is the amount of time remaining until the connection is automatically terminated. This time is reset to the “Inactivity Time-out” value every time that a packet is sent or received over the connection.
- Note: This field and the “Inactivity Time-out” field are only displayed if there is a timeout value specified for the profile.
- Modem phone speed** This is the transmission speed between the two modems: your modem and the remote modem. This speed may be lower than the [Baud rate](#) speed because it is the result of negotiations between the two modems and is the best speed that they support with the current telephone connection.

**Command-Line Interface**

The DialNet command-line interface provides all of the capabilities of the menued interface and can be used from an EXEC or application program. Unlike the menued interface, which displays a list of profile names that you can choose from, the command-line interface requires that you know the name of the profile definition that you want to use.

When DialNet is used from an application, remember that i/o redirection can be used to redirect the output of DialNet to a disk file. For instance:

```
>dialnet start myisp > connect.message
```

This disk file can then be read and used by the application program.

**DialNet Start**

The DialNet Start function connects this system to the remote PPP server defined in the profile definition. For instance:

```
>dialnet start myisp
Profile "MYISP" connected successfully,
Host IP address: 206.163.58.53
Remote IP address: 204.245.231.131.
```

If the profile is already connected, the same messages are displayed.

There are several situations that may prevent a successful connection.

- ▶ The PPP server is not started. (See the Net Start PPP command.)
- ▶ The profile name specified is not defined.
- ▶ The profile is already in use by another user.
- ▶ The serial port referenced in the profile definition is in use by another task.
- ▶ The telephone number is invalid or cannot be reached at this time (busy or your phone line is already in use).
- ▶ The “Login Name” and/or “Password” specified in the profile definition is invalid. Remember that some PPP servers use case-sensitive account names and almost all use case-sensitive passwords.

## DialNet Stop

The DialNet Stop function disconnects this system from a currently connected remote PPP server. For instance:

```
>dialnet stop myisp
Profile "MYISP" is now disconnected.
```

There are several situations that may prevent a successful disconnection.

- ▶ The PPP server is not started.
- ▶ The profile name specified is not defined.
- ▶ The profile is not currently connected.

## DialNet Status

The DialNet Status function displays the status of a profile.

```
>dialnet status myisp2
Dial-Up Network Profile "MYISP2" is not started.

>dialnet status myisp
Dial-Up Network Profile "MYISP" is connected.
Connection task: 13
Host IP address: 206.163.58.17
Remote IP address: 204.245.231.131
Bytes sent: 0
Bytes received: 0
Packets sent: 0
Packets received: 0
Packets rejected: 2
Largest packet sent: 0 bytes.
Largest packet received: 0 bytes.
Inactivity time-out value: 600 seconds.
Time remaining in inactivity timer: 67 seconds.
Registered users for this profile: 1
Connect time: 00:08:53
Serial port speed: 19200 bps
This connection is the default gateway.
```

The fields displayed in this status report have the following meanings:

- Connection task** The user partition number assigned for this connection.
- Host IP address** The dotted IP address assigned by the remote PPP server for your system on its network.
- Remote IP address** The dotted IP address of the remote PPP server.
- Bytes sent** The number of bytes transmitted over this connection.
- Bytes received** The number of bytes received over this connection.
- Packets sent** The number of TCP/IP packets transmitted over this connection.
- Packets received** The number of TCP/IP packets received over this connection.
- Packets rejected** The number of TCP/IP packets rejected. A log entry is added to your Dial-Up Networking log file, if one was defined in the Setup NET command, Dial-Up Networking, [Log Frequency](#) field.
- Largest packet sent** Size of largest packet sent to PPP server.
- Largest packet received** Size of largest packet received from PPP server.
- Inactivity time-out value** This value is defined in the profile definition.
- Time remaining in inactivity timer** The amount of time remaining until an automatic disconnect occurs. This timer is reset every time that a packet is sent or received over this connection.
- Registered users for this profile** Indicates the number of users that are actively using this connected profile at this time.
- Connect time** The length of time that this profile has been connected.
- Serial port speed** The transmission speed between your computer and the modem. This value is specified in the profile definition.
- This connection is the default gateway.** Indicates that, while this profile is connected, it is the default gateway. When the profile is disconnected, the default gateway reverts to the gateway specified in the [Setup NET](#) command, “[TCP/IP Parameters](#)” menu.

### Dynamic IP Addresses

Because dial-up connections to ISPs cause your IP address to be dynamically assigned, each time that you connect you may have a different IP address assigned to your computer on their network. Besides displaying the IP address assigned to you, DialNet also writes the information to a disk file.

Each time that you successfully connect to a profile, DialNet writes the “Host IP address” to the file SYSTEM.THEOS32.DUN\_IP:S. When you disconnect from a profile, that file is erased, indicating that the IP address is no longer valid. This file is a stream file that can be used by application programs. If other, remote users need to access your computer via this dial-up connection, you must let them know the IP address currently assigned to your computer.

### Restrictions

To successfully use the DialNet command, several conditions must be met:

- ▶ The PPP server must be started.
- ▶ One or more profiles must be defined in the [Setup NET](#), “Dial-Up Networking” menu.
- ▶ The specific *profile* requested must be defined.
- ▶ The serial port specified in the *profile* definition must be attached as a public device or not attached by any user.
- ▶ If the serial port is a public device, it must be unused at the present time by any other process.

To connect two profiles, the definitions for the profiles must use different serial ports and each must have its own telephone line.

# 11 Finger Client

The Finger client queries a server for the status of a specific account or for other information about accounts on a server.

- 1 FINGER *local-user-name*
- 2 FINGER *user-name@server*
- 3 FINGER *@server*

---

<i>local-user-name</i>	»	user account name on local server
<i>server</i>	»	server name or IP address
<i>user-name</i>	»	user account name

FINGER

The Finger client is mainly used to determine if an account name is valid. Depending upon the Finger server at the site, it may also be used to determine if a particular account has picked up their mail recently.

## Operation

**Mode 1**—Requests information about *local-user-name* from your mail server. The mail server is specified in the SendMail configuration file (SYSTEM.THEOS32.EMAILCFG) which is part of the THEO+Mail package and maintained with the Setup EMAIL command.

```
>finger sales
Querying user "sales" at host "mail.theos-software.com".

User ID: sales                      Name: sales
New mail has arrived.
```

This example shows the display from a user at THEOS Software, a site that has a permanent connection to the Internet with their own mail server.

```
>finger myname
Querying user "myname" at host "128.100.24.3".

Login: myname                      Name: My Name
Directory: /home/m/myname          Shell: /bin/tsh
Last login Wed Dec 3 11:02 (PST) on tty7 from ip83.pdx2.myisp.com
New mail received Wed Dec 3 11:16 1997 (PST)
      Unread since Wed Dec 3 11:08 1997 (PST)
No Plan.
```

This second example is the display from a system that uses a proxy server to forward the finger request from nodes on the local network to the service provider on the Internet. For information about using proxy servers, refer to Chapter 4 “[Using a Proxy Server](#),” starting on page 57.

**Mode 2**—Requests information about *user-name* on *server*. The specific information returned is determined by the finger server.

```
>finger support@pacifier.com
Querying user "support" at host "pacifier.com".

Login: support                Name: Pacifier Technical Support
Directory: /admin/support      Shell: /bin/bash
Last login Tue Nov 18 18:22 (PST) on ttyq8 from tech1.pacifier.com
New mail received Wed Nov 19 08:44 1997 (PST)
      Unread since Tue Nov 18 18:27 1997 (PST)
No Plan.
```

**Mode 3**—Requests information about all users logged onto *server*. Many finger servers do not support this request.

```
>finger @theos-software.com
Querying user "" at host "theos-software.com".
```

```
Finger online user list request denied.
```

```
>finger @ccnet.com
Querying user "" at host "ccnet.com".
```

Login	Name	TTY	Idle	When	Where
root	Operator	co	10	Tue 09:54	
texas	Verio Customer Care	p0		Tue 16:01	oz.onramp.net
...					

```
>finger @netcom.com
Querying user "" at host "netcom.com".
```

User	Real Name	Idle	TTY	Host	Console Location
abenamer	Allan Benamer	1:43	r9	netcom	(unknown-8-127.ju)
acapela	Michael H. Collier		p6	netcom21	(uswgco2.uswest.c)
aci		0:59	pe	netcom	(aci.vip.best.com)
...					

715 active login sessions.

## Notes

Specifying a name before the “@” of the server name specifies a particular user on the server. This name is almost always the same as the person's e-mail address. However, for the Finger client to work, the site “fingered” must be running a finger server that accepts the command and responds with the relevant information. Having an e-mail address does not guarantee that Finger will produce any results.



The information displayed by this Finger Client is dependent upon, and provided by, the Finger Server specified. For instance, one Finger server might respond with a simple notification that the user has new mail. Another server might respond with lots of information, some of it might actually be useful. As an example, compare the following Finger displays:

```
>finger president@whitehouse.gov
```

```
Querying user "president" at host "whitehouse.gov".
```

```

    Finger service for arbitrary addresses on whitehouse.gov is not
    supported. If you wish to send electronic mail, valid addresses are
    "PRESIDENT@WHITEHOUSE.GOV", and "VICE-PRESIDENT@WHITEHOUSE.GOV".

```

```
>finger me@myisp.com
```

```
Querying user "me" at host "myisp.com".
```

```

Login: me                               Name: My Name
Directory: /home/c/me                   Shell: /bin/tcsh
Mail forwarded to: Someone Else <them@somesite.com>
New Mail received Wed Nov 26 10:15 1997 (PST)
    Unread since Wed Nov 26 10:00 1997 (PST)
No Plan
You have new mail.

```

```
>finger support@theos-software.com
```

```
Querying user "support" at host "theos-software.com".
```

```
User Id: support
```

```
Name: THEOS Support
```

The first response from the server at `whitehouse.gov` doesn't provide any information about the specific account. Instead, it responds with a text message. The second response from `myisp.com` provides almost complete information while the last response from `theos-software.com` provides minimal information sufficient to confirm that the account name exists and includes a more descriptive name for the user at that account.

## ■ Server Specification

Specification of the *server* for [Mode 2](#) or [Mode 3](#) may be accomplished by specifying:

- ▶ The dotted IP address for the server.  

```
>finger @207.21.75.100
```
- ▶ The host name as defined in the file [SYSTEM.TEOS32.HOSTS](#). This file is maintained by the [Setup NET](#), [View/Maintain Host Names Database](#).  

```
>finger @my-company
```
- ▶ Or the domain name as defined by the Domain Name Service specified in [Setup NET](#), [Name Services](#), [DNS Servers](#).  

```
>finger @theos-software.com
```

For instance, your company might be registered with Internic (<http://rs.internic.net>) with a domain name of `my-company.com`, with an IP address of `172.20.2.1`. If you have specified a host name of “HEADQUARTERS” in the host names database with that IP address, you can specify your company’s site as:

- ▶ `172.20.2.1`
- ▶ `headquarters`
- ▶ `my-company.com`

Domain names and host names are case-insensitive.

# FLIP

## Operation

- |                         |   |   |
|-------------------------|---|---|
| <i>filename</i>         | » | name of file on local client system containing FTP script                         |
| <i>host</i>             | » | <i>server</i><br><i>server:port</i>   |
| <i>localhost</i>        | » | LOCALHOST   |
| <i>options</i>          | » | ASCII               NOPROXY       VERBOSE<br>BINARY             PROXY <i>host</i> |
| <i>port</i>             | » | port number on server for FTP communication (default is 25)                       |
| <i>send-rec-options</i> | » | RECEIVE <i>remote-name</i><br>SEND <i>local-name</i>                              |
| <i>server</i>           | » | network server name or id (may also be <i>localhost</i> )                         |
| <i>site</i>             | » | site definition name from FTP configuration file                                  |
| <i>user-password</i>    | » | user name and optional password for user  |

**Mode 2**—Similar to **Mode 1** except that a connection to *host* is attempted before entering interactive mode. Refer to “**Server Specification**” on page 118 for a description of server specifications.

Because a user name is not specified, “anonymous” is used for the user name. Refer to “[User Account Specification](#)” on page 119 for a description of anonymous user accounts.

**Mode 3**—Similar to [Mode 2](#) except that, after a connection to *host* is established, you are logged onto *user* account with *password*. See “[User Account Specification](#)” for information about user accounts on the FTP server.

Note: The password does not have to be specified on the command line. When it is not specified, you will be prompted to enter it “silently.”

**Mode 4**—This mode uses a site definition to define the host and other connection parameters. Site definitions are created with the [Setup FTP](#) command, described on page 207. All site definition names are simple names without dots or other punctuation characters.

When a simple name is used, as in this mode of the command, the FTP program first checks to see if it matches one of the site definitions. If it does, it uses that site definition to make a connection to the remote server. [Mode 2](#) of the command is assumed when it doesn’t match a site definition.

**Mode 5**—In this mode, the contents of *filename* are used as a script of commands to the FTP client. This script should contain several of the [FTP Commands](#) described on page 122. See “[FTP Script File](#)” on page 138.

## Options

- ASCII** This is a default option that specifies that files are transferred as ASCII files. Compare with the [BINARY](#) option.
- BINARY** Specifies that files are transferred as binary files. In binary mode, no interpretation or conversion is performed on the contents of files transferred.
- NOPROXY** If the FTP configuration file ([SYSTEM.TEOS32.FTPCFG](#)) specifies a default proxy server, this option ignores that specification and connects to the requested server address directly.
- PROXY** *proxy-server* Whether or not a proxy server is specified in the FTP configuration file, *proxy-server* is used as the proxy server for this FTP session. A default proxy server can be specified in the FTP configuration file ([SYSTEM.TEOS32.FTPCFG](#)) that is maintained by the [Setup FTP](#), [Proxy](#) screen.
- VERBOSE** Enables verbose mode. With verbose mode on, commands sent to and responses received from the remote FTP server are displayed. With verbose mode off, these commands are not displayed.

**Send-Receive Options**

These two options may only be used when the FTP server name or site name is specified on the command line ([Mode 2](#), [Mode 3](#) or [Mode 4](#)). The *user-password* may also be specified on the command line.

**RECEIVE** *remote-name* Transfer the file *remote-name* from the FTP server to the local computer using the current transfer mode ([ASCII](#) or [BINARY](#)).

If *remote-name* contains a path specification, a CD command is issued to change to that directory. *remote-name* may contain wild-card specifications for the file description. All files received from the remote server are received into the current working directory of the local system.

**SEND** *local-name* Transfer the file *local-name* from the local computer to the FTP server using the current transfer mode ([ASCII](#) or [BINARY](#)).

If *local-name* contains a path specification, a CD command is issued to the FTP server system to change to that directory. All files sent are located in the current working directory of the local computer. *local-name* may contain wild-card specifications for the file description.

Note: FTP servers normally change the file date on received files to their own local date and time, or possibly to UTC time.

**Notes**

This FTP client conforms to the standards proposed in RFC-959. That document can be found on the Internet at the following sites:

`ftp://ds1.internic.net/rfc/rfc959.txt`

`http://www.w3.org/Protocols/rfc959`

This program accepts all user input from stdin and displays all output on stdout. These can be redirected to disk files or other devices, if desired. Additionally, if invoked by an EXEC program, commands may be entered with the `&stack` or `&begstack` commands.

As mentioned in the section “[Options](#)” on page 116, the remote FTP server may be connected via a proxy server on another system that you can access. For general information about using proxy servers, refer to Chapter 4 “[Using a Proxy Server](#),” starting on page 57.

## ■ Server Specification

Specification of the *host*, for [Mode 2](#) or [Mode 3](#) or with the [OPEN](#) commands, may be accomplished by specifying:

- ▶ The dotted IP address for the server.

```
FTP? open 207.21.75.100
```

- ▶ The host name as defined in the file [SYSTEM.THEOS32.HOSTS](#). This file is maintained by the [Setup NET](#), [View/Maintain Host Names Database](#).

```
FTP? open my-company
```

- ▶ Or the domain name as defined by the Domain Name Service specified in [Setup NET](#), [Name Services](#), [DNS Servers](#).

```
FTP? open ftp.theos-software.com
```

For instance, your company might be registered with Internic (<http://rs.internic.net>) with a domain name of `my-company.com`, with an IP address of `172.20.2.1`. If you have specified a host name of “HEADQUARTERS” in the host names database with that IP address, you can specify your company’s FTP site as

- ▶ `172.20.2.1`
- ▶ `headquarters`
- ▶ `my-company.com`

Domain names and host names are case-insensitive.

The host specification may include a port number. When not specified, the default port number of 25 is used for FTP transfers and communication. In some situations, you may need to specify a port other than 25 to access the server.

For instance, a host machine may have two FTP servers. In this situation, one of the servers will use port number 25 and the other server will use a different port number. To access this other server you will have to specify the port number used by that server. A similar situation exists when a host machine has an FTP server and a proxy server.

To specify a port number other than 25, use a server name or IP address followed by a colon and the port number for that server.

## ■ FTP Server Response Messages

In the examples used in this chapter, the response text shown for various commands is not necessarily what is displayed for a specific connection to a remote FTP server. The server is responsible for the specific text displayed by the FTP client.

For instance, one server might display:

```
FTP? cd temp
CWD command successful

FTP? remove test.file
DELE command successful
```

While another server might display:

```
FTP? cd temp
Directory changed to "/temp"

FTP? remove test.file
File "test.file" has been deleted.
```

Additionally, the command names are shown in lowercase. Command names may be entered in uppercase, lowercase or in mixed case.

## ■ User Account Specification

Most FTP servers require that client connections are made only when a valid user account is specified and the password for that account is entered successfully. When connecting to a remote FTP server, the user account determines your home directory, which files you “own,” and what directories you can view, upload and download from.

```
>ftp my-company.com "my-name" "my-private-password"
Connecting to my-company.com (172.20.2.1)
-----
Welcome to My Company FTP site.
MY-NAME logged in.
-----
FTP?
```

Note that, in the above example, the user name and password were specified with enclosing quotes. This was done because some servers use case-sensitive name and password verification. Without the enclosing quotes, the Command String Interpreter (CSI) folds all tokens to uppercase before passing the argument to the program. This might cause the user name or password to be invalid.

```
>ftp
FTP? open headquarters
Connecting to my-company.com (172.20.2.1)
-----
User-name: my-name
Password: (enter my-private-password )
Welcome to My Company FTP site.
MY-NAME user logged in.
-----
FTP?
```

As indicated, when the password is requested in interactive mode, it is not displayed on your screen.

Most FTP servers allow *anonymous connections*. An anonymous connection is made by either not specifying a user name, or by specifying the special user name of “anonymous.” When you specify a user name of “anonymous,” you will still be asked for a password. The recommended password for anonymous connections is your e-mail address. For instance, “me@my-company.com.” In fact, some servers may require this style of password.

```
>ftp headquarters ; connect as anonymous user
Connecting to my-company.com (172.20.2.1)
-----
Welcome to My Company FTP site.
Anonymous user logged in.
-----
FTP?
```

or

```
>ftp
FTP? open headquarters
Connecting to my-company.com (172.20.2.1)
-----
User-name: anonymous
Password: me@my-company.com
Welcome to My Company FTP site.
Anonymous user logged in.
-----
FTP?
```

When connecting as an anonymous user, the password entered is displayed as you type it. When no password is specified by you, the default anonymous password is used. This default password is defined in the FTP configuration file ([SYSTEM.TEOS32.FTPCFG](#)) that is maintained by the [Setup FTP, Password](#) screen. If the configuration file does not specify the password for anonymous connections, a password of “local-name@your-domain” or, if your system is not part of a domain, then “account-name@local-name” is used for the password.



Note: Most FTP sites do not allow full access to anonymous users. For instance, they will frequently not allow you to upload files. They may also restrict the directories that you may view or download files from.

### ■ Directory and File Name Specification

Many FTP servers are implemented on systems which use case-sensitive user names, passwords, directory names and file names. Other FTP servers are implemented on systems that may or may not use case-sensitive names. It is always best to specify user names and passwords in the same case as they were given to you and to specify directory names and file names in the same case as displayed by the directory listing on the server.

The file name specifications for files on the server must be specified in the syntax used by the server's operating system. For instance, you may use the directory-name shortcuts of `./` and `../` only if the server's operating system supports it. In most cases, this syntax will be identical to the syntax used by the THEOS operating system.

### ■ Transfers of Non-Stream Files

The FTP standard transfers stream files. However, this FTP Client can be used to send a non-stream file, such as a compiled command, indexed, keyed or relative data file, etc. It does this by repackaging the file using the `FileType` protocol before sending it to the remote server. When the destination is a THEOS-based FTP server, the received stream data is converted back to its original format by the THEOS FTP server. A THEOS FTP server is included in the THEOS+Server Plus Pak.

If the destination is not a THEOS-based FTP server, it is saved on the server as a stream file in the `FileType` format. This file cannot be easily used by systems other than THEOS system, but it can be stored for subsequent retrieval by a THEOS FTP client. When receiving a file from that non-THEOS FTP server, the THEOS FTP client recognizes that the file is a THEOS file in `FileType` format and converts the file back to its original format before saving it on the local system.

Although non-stream files transferred by this client are not usable by any system other than a THEOS-based system, non-THEOS FTP sites can be used for intermediate storage. For instance, a data file could be uploaded to a generic Internet Service Provider (ISP) FTP server and then subsequently downloaded to another THEOS system.

When a non-stream file is uploaded with this FTP client, subsequently downloaded by a non-THEOS FTP client and then transferred to a THEOS system (for instance, with the [THEOS WorkStation Client](#)), the resulting file will have to be converted with the `FileType` command before it can be used by THEOS applications.

## FTP Commands

The following commands may be used in the interactive mode of the FTP command or they may be added to a text file and then invoked with [Mode 5](#) of the FTP command. When the FTP command is in its interactive mode, it uses a prompt text of FTP?. For instance:

```
>ftp

FTP? verbose
Verbose mode ON

FTP?
```

A valid connection with a remote server must be made before most of the commands may be used. The only commands that do not require a connection to a remote FTP server are: [BYE](#), [CLOSE](#), [EXIT](#), [HELP](#), [LCD](#), [LMD](#), [LPWD](#), [MODE](#), [OPEN](#), [OS](#), [QUIT](#), [SHELL](#), [TYPE](#) and [VERBOSE](#).

Note: Many of the commands described here look like THEOS commands, DOS commands or UNIX commands, but they are not. These are FTP commands and only have the syntax and options as described in the following pages.

### ■ FTP Command Line Editing

You may make a mistake or want to change some parameter of the command line as you type it. It is not necessary to cancel the entire command and start over. Use the following FTP editing keys to make changes to the command before pressing [Enter ↵](#).

Edit Key	Control Key	Function
<a href="#">Home</a>	<a href="#">Ctrl</a> + <a href="#">G</a>	Move to the beginning of the command line.
<a href="#">End</a>	<a href="#">Ctrl</a> + <a href="#">E</a>	Move to the end of the command line.
<a href="#">Backspace</a>		Delete the character to the left of the cursor.
<a href="#">Del</a>	<a href="#">Ctrl</a> + <a href="#">Z</a>	Delete the character under the cursor.
<a href="#">F5</a>	<a href="#">Ctrl</a> + <a href="#">N</a>	Delete all characters to end-of-line.
<a href="#">←</a>	<a href="#">Ctrl</a> + <a href="#">H</a>	Move the cursor left one character position.
<a href="#">→</a>	<a href="#">Ctrl</a> + <a href="#">L</a>	Move the cursor right one character position.
<a href="#">Insert</a>	<a href="#">Ctrl</a> + <a href="#">R</a>	Toggle between character insert and replace mode. *
<a href="#">Esc</a>	<a href="#">Ctrl</a> + <a href="#">I</a>	Erase the entire command line.
<a href="#">Enter ↵</a>	<a href="#">Ctrl</a> + <a href="#">M</a>	Terminate editing and execute the command.

Table 2: FTP Command-Line Edit Keys

**APPEND** Transfer a file from the local computer to the remote FTP server, using the current transfer mode ([ASCII](#) or [BINARY](#)). If the file already exists on the remote server, this file is appended to the end of that existing file.

There are two forms of the command:

```
APPEND local-name
APPEND local-name remote-name
```

*local-name* may contain path specifications, which refer to the location of the file on the local client system. When *remote-name* is not specified, the file is received onto the remote server system into the current working directory (see [CHDIR](#) command to change the current working directory on the server system) and has the same file name as *local-name*.

When *remote-name* is specified, it refers to the destination location and name on the server system. *remote-name* may contain path specifications, but not wild cards.

**ASCII** Sets the current file transfer mode to ASCII. This mode should be used for text files only. Any characters that look like line-ending characters might be translated into the local system's line-ending character.

**BINARY** Sets the current file transfer mode to binary. All character codes are transferred without translation or interpretation.

**BYE** Terminate the current FTP session and exit the FTP client. This command is synonymous with the [EXIT](#) and [QUIT](#) commands. Use the [CLOSE](#) command if you want to terminate the session with the FTP site but remain in the FTP client program.

**CD** Synonym to the [CHDIR](#) command.

**CHDIR** Change the current working directory on the remote FTP server system.

```
FTP? pwd
"/" is current directory.

FTP? chdir one/two
Directory changed to "/one/two"

FTP? cd ..
Directory changed to "/one"
```

**CLOSE** Terminate the current FTP session without exiting from the FTP client. Some servers may display an informational message when you terminate the session.

```
FTP? close
Goodbye.
```

```
FTP?
```

**DELETE** Erases a file from the remote FTP server. The file name for the file is specified with the command:

```
DELETE filename
```

*filename* may contain path and wild-card specifications.

```
FTP? delete myfile.command
DELE command successful.
```

```
FTP? remove myfile.help
DELE command successful.
```

```
FTP? delete temp/myfile.txt
DELE command successful.
```

**DIR** Display a directory listing for files and directories on the remote server system. The appearance of the listing depends upon the current setting of the [VERBOSE](#) mode.

When VERBOSE mode is OFF, and the directory information sent by the remote FTP server is in the standard, UNIX format, the information is reformatted before displaying it. Specifically, directory names are either underlined or colored, the file name is moved to the beginning of the line, access permission codes are removed, and the date and time are changed to “dd mon year,” followed by the time in 12-hour form with an “a” or “p” indicator.

With VERBOSE mode ON, the directory information is displayed exactly as received from the remote server.

This command has three different forms:

```
DIR
DIR filename
DIR dirname
```

The first form (DIR) displays the directory listing of the current working directory on the remote FTP server.

```

FTP? dir
accounts          16 May 1997  5:58p
files             11 Aug 1997  7:29p
programs          29 Jul 1997 11:37a

```

```

FTP? v
Verbose mode ON

```

```

FTP? dir
d----- 1 owner  group  0 May 16 15:58 accounts
d----- 1 owner  group  0 Aug 11 19:29 files
d----- 1 owner  group  0 Jul 29 11:37 programs

```

The second form (DIR *filename*) displays the directory entry for *filename* on the remote FTP server. *filename* may contain path and wild-card specifications. Only files matching the *filename* specification are included.

```

FTP? dir files/Config.cmp
Config.cmp                      336 26 Feb 1997 6:21p

```

The third form (DIR *dirname*) displays the directory entry of the *dirname* directory on the remote FTP server. *dirname* may contain a path specification. Only the specified *dirname* is displayed, not the current working directory.

```

FTP? dir programs
program1.command      89,020 12 Oct 1997 1:15p
program2.command     113,920 12 Oct 1997 1:20p
program3.command      77,160  2 Nov 1997 8:12a

```

See also: [LS](#), [SAVEDIR](#) and [SAVELS](#) commands.

**EXIT** Terminate the current FTP session and exit the FTP environment. This command is synonymous with the [BYE](#) and [QUIT](#) commands.

**GET** Synonym to the [RECV](#) command.

**HELP** Display help information about the FTP commands available.

There are two forms of this command:

```

HELP
HELP cmd-name

```

The first form displays all command names and abbreviations available in the FTP client environment.

**FTP? help**

Following is a complete list of commands. The command name may be abbreviated. To display help for a specific command, use the syntax: `HELP cmd`.

<u>A</u> PPEND	<u>C</u> LOSE	<u>L</u> CD	<u>M</u> ODE	<u>R</u> D	<u>S</u> END
<u>A</u> SCII	<u>D</u> ELETE	<u>L</u> MD	<u>O</u> PEN	<u>R</u> ECV	<u>S</u> HELL
...					

The second form displays the specific help text for *cmd-name*.

**FTP? h lcd**

Syntax: `LCD <directory>` (change local directory)

**LCD**

Change the current working directory on the local client system and display the new current working directory. The command name must be followed by the path to the new directory.

**FTP? lpwd**

Local directory: (null)

**FTP? lcd fax**

Local directory: /FAX:S

Note: When the FTP client exits, your current working directory is restored to the directory in use at the time that FTP was invoked.

**LDIR**

Similar to the [DIR](#) command, this command displays a directory listing for files and directories, but on the local system. The appearance of the listing does not depend upon the setting of the [VERBOSE](#) mode.

This command has two different forms:

```
LDIR
LDIR filename
```

The first form (DLIR) displays the directory listing of the current working directory on the local system.

**FTP? lcd tips**

Local directory: /TIPS:S

**FTP? ldir**

aol.tip	1,454	2 Sep 1998	12:06p
config.tip	2,950	12 Nov 1998	2:04p
ftp.tip	557	2 Sep 1998	11:54a
...			

The second form (`LDIR filename`) displays the directory entry for *filename* on the local system. *filename* may contain path and wild-card specifications. Only files matching the *filename* specification are included.

```
FTP? ldir /data/*.  
misc
```

15 Sep 1998 1:29p

See also: [LLS](#) command.

## **LLS**

Display the directory listing from the local system for the current working directory, a specific file or group of files. This is similar to the [LDIR](#) command but only the file names or directory names are displayed, without any detail about the files or directories.

Like the [LDIR](#) command, there are two forms of this command:

```
LLS  
LLS filename
```

The first form displays the files and directories in the current working directory of the local system.

```
FTP? ll  
aol.tip  
config.tip  
ftp.tip  
...
```

The second form (`LLS filename`) displays a list of files matching *filename*, which may contain path specifications or wild cards.

See also: [LDIR](#) command.

## **LMD**

Creates a new directory on the local client system. The new directory name is specified with the command:

```
LMD dirname
```

Unless a path is specified with *dirname*, the new directory is created in the current working directory of the local system (see [LPWD](#)).

```
FTP? lmd example
```

```
FTP? lcd example  
Local directory: /FAX/EXAMPLE:S
```

**LPWD**

Display the current working directory of the local client system.

```
FTP? lpwd
Local directory: /FAX:S
```

**LS**

Display the directory listing from the remote server for the current working directory, a specific file or group of files, or directory other than the current working directory. Unlike the [DIR](#) command, the setting of the [VERBOSE](#) mode does not affect the information displayed, except for the normal inclusion of reply codes and intermediate messages. Also, only the file names or directory names are displayed, without any detail about the files or directories.

Similar to the [DIR](#) command, there are three forms of this command:

```
LS
LS filename
LS dirname
```

The first form displays the files and directories in the current working directory of the remote server.

```
FTP? ls
.login
public_html
.history
mail
.pinerc
```

The second form (LS *filename*) displays a list of files matching *filename*, which may contain path specifications or wild cards.

The third form (LS *dirname*) displays the files in the specified *dirname*.

See also: [DIR](#), [SAVEDIR](#) and [SAVELS](#) commands.

**MD**

Synonym to the [MKDIR](#) command.



**MKDIR**

Creates a new directory on the remote FTP server. The new directory name is specified with the command:

```
MKDIR dirname
```

Unless a path is specified with *dirname*, the new directory will be created in the current working directory (see [CHDIR](#)).

```
FTP? ls  
myip.htm
```

```
FTP? mkdir example
```

```
FTP? ls  
myip.htm  
example
```

**MODE**

Display the current file transfer mode ([ASCII](#) or [BINARY](#)). This command is synonymous with the [TYPE](#) command.

```
>ftp (binary
```

```
FTP? mode  
Using Binary mode to transfer files.
```

**OPEN**

Establish a new FTP session. Any current FTP session is closed. There are five forms of the command:

```
OPEN  
OPEN host  
OPEN host user  
OPEN host user password  
OPEN site
```

Basically, these are all the same command. You are prompted for any information omitted from the command or the *site* definition. For a description of the *host* parameter, refer to “[Server Specification](#)” on page 118. For a description of user and password, refer to “[User Account Specification](#)” on page 119. Sites are defined in [Setup FTP, Site Maintenance](#) described on page 208.

The *user* and *password* cannot be enclosed within quotation marks. Case mode is retained as entered and quotation marks are passed to the server as part of the user name or password.

With the first form of the command, you are prompted to enter the server name, user name and password.

```

FTP? open
Host-name: ftp.theos-software.com
Connecting to ftp.theos-software.com (207.21.75.100)
-----
User-name: anonymous
Password: me@my-company.com
Welcome to THEOS Software Corporation FTP site.
Anonymous user logged in.

```

The second form connects to *host* and then asks you for the user name and password. The third form connects to *host* and logs on as *user*; you are prompted for the password. The fourth form supplies all of the information.

Note that, with the fourth form, the password is supplied with the command and is visible. The other forms prompt you for the password, which is entered “silently.”

```

FTP? open ftp.somesite.com
Connecting to ftp.somesite.com (128.100.1.2)
-----
User-name: me
Password:
information messages from ftp server
User me logged in.

```

As described in “[User Account Specification](#)”, anonymous connections are made by specifying a user name of “anonymous.”

Some servers allow you to use a dash at the start of the password to suppress any information messages. This may not work for all servers.

To terminate the connection, use the [QUIT](#) or [CLOSE](#) command.

**OS** This command is synonymous with the [SHELL](#) command.

**PWD** Display the current working directory of the remote FTP server. Refer to the [CHDIR](#) command for example usage.

**PUT** Synonym to the [SEND](#) command.

**QUIT**

Terminate the current FTP session and exit the FTP environment. This command is synonymous with the **BYE** and **EXIT** commands.

```
FTP? quit
Thanks for visiting our site.
You were online for 0 minutes.

>
```

The actual text displayed after the **QUIT** command is dependent upon the FTP server. Generally, the message is just “Goodbye.”

**RD**

Synonym to the **RMDIR** command.

**RECV**

Transfers one or more files from the remote FTP server to the local system using the current transfer mode (**ASCII** or **BINARY**).

There are two forms of the command:

```
RECV remote-name
RECV remote-name local-name
```

*remote-name* may contain a path specification or wild cards. When no path specification is included, only the current working directory on the FTP server is searched for matching files. Because most FTP servers use case-sensitive directory and file names, the *remote-name* should be specified with the same case mode as used on the server system.

The first form of the command (**RECV remote-name**) saves the file on the local system in the current working directory. Any existing file on the local computer with the same name as *remote-name* is replaced with the received file. If the file-name or file-type of *remote-name* is longer than eight characters, it is truncated to the first eight characters of the name or type.

```
FTP? recv *.htm
Receiving firstfile.htm (1 of 2)
5,536 bytes received in 2.2 seconds (2.48 Kbytes/sec)
Receiving secondfile.htm (2 of 2)
4,536 bytes received in 2.3 seconds (1.98 Kbytes/sec)
```

The above two files are received as **FIRSTFIL.HTM** and **SECONDFI.HTM**, respectively.

```
FTP? cd ..
Directory change to "/"

FTP? recv WebPages/firstfile.htm
5,536 bytes received in 2.3 seconds (2.37 Kbytes/sec)
```

When the second form of the command is used (**RECV** *remote-name local-name*), only one file is transferred. Wild cards are not allowed in either file specification. The file is received onto the local system using the location and name specified with *local-name*. If *local-name* does not specify a path, the current working directory on the local system is used. Any existing file on the local computer with the same name as *local-name* is replaced with the received file.

```
FTP? recv firstfile.htm webpage.html
5,536 bytes received in 5.0 seconds (1,117.48 bytes/sec)

FTP? recv ../WebPages/firstfile.htm webpage1.html
5,536 bytes received in 2.3 seconds (2.37 Kbytes/sec)
```

Refer to the notes on “[Transfers of Non-Stream Files](#)” on page [121](#) to information about receiving compiled programs and indexed, keyed or relative data files from a THEOS FTP server.

**REMOTE** Executes a command on the remote FTP server. The command is specified with this REMOTE command:

REMOTE *command*

For a list of commands available on the server, use the REMOTE HELP command. These remote commands are just that, commands available on the remote system. They are not part of this FTP client’s command set.

```
FTP? remote help
214-The following commands are recognized
(* => unimplemented)
  ABOR  DELE  NLST  QUIT  RNT0  STOU
  ACCT* HELP  NOOP  REIN  SITE* STRU
  ALLO  LIST  PASS  REST* SIZE  SYST
  APPE  MDTM  PASV  RETR  SMNT* TYPE
  CDUP  MKD   PORT  RDM   STAT  USER
  CWD   MODE  PWD   RNFR  STOR  XCUP
                          XCWD

214 Direct comments to FTP@THEOS-SOFTWARE.COM.

FTP? remote help stat
214 Syntax: STAT [<directory>] (status)

FTP? remote stat
211-THEOS FTP Server status:
    Version 1.0
```

```

Connected to 209.95.32.4
Logged in as PRIVATE
TYPE: ASCII, FORM: Nonprint; STRUcture: File;
      transfer MODE: Stream
No data connection
211 End of status.

```

Responses from the **REMOTE** command are always displayed with response codes included, independent of the current setting of the **VERBOSE** mode.

The remote **SITE** command may have additional, site-specific commands available.

**REMOVE**     Synonym to the **DELETE** command.

**RENAME**     Renames a file on the remote FTP server. There are three forms of this command:

```

RENAME
RENAME old-filename
RENAME old-filename new-filename

```

These three forms all operate the same. You are prompted for the old and new file names if they are not specified with the command. Path specifications are allowed but wild cards are not.

The *old-filename* specification must be for a file that does exist and the *new-filename* specification must be for a file that does not exist.

```

FTP? rename
Old-filename: example.fil
File exists, ready for destination name
New-filename: example.txt
File "example.fil" renamed to "example.txt".

```

**RMDIR**     Removes or erases a directory on the remote FTP server. The directory name is specified with the command:

```
RMDIR dirname
```

Only directories may be erased with this command. To erase a file, use the **DELETE** command.

The *dirname* directory must be empty.

```

FTP? rmdir temp
temp: File exists.

FTP? cd temp
Directory change to "/temp"

FTP? delete myfile.command
DELE command successful.

FTP? cd ..
Directory change to "/"

FTP? rd temp
Directory "temp" removed.

```

**SAVEDIR** Similar to the [DIR](#) command except that the output is saved in a file. The format of the command is:

```

SAVEDIR filename
SAVEDIR filespec filename
SAVEDIR dirname filename

```

The *filespec* and *dirname* have the same meanings as the [DIR](#) command. They specify which files on the remote system are included in the directory listing. When *filespec* is omitted, all files in the current working directory are included. *filename* specifies the name of the file on your system that is used to save this directory listing.

This command is principally used when FTP is invoked from an [FTP Script File](#) with an application program.

**SAVELS** Similar to the [SAVEDIR](#) command except that the directory listing format used the [LS](#) command format. The format of the command is:

```

SAVELS filename
SAVELS filespec filename
SAVELS dirname filename

```

**SEND** Transfers one or more files from the local system to the remote FTP server using the current transfer mode ([ASCII](#) or [BINARY](#)). If a file already exists on the remote server system with the same destination name, it is replaced by this transferred file. Use the [APPEND](#) command to send a file and append it to an existing file on the remote server.

There are two forms of the command:

```

SEND local-name
SEND local-name remote-name

```

In the first form (`SEND local-name`), the *local-name* may contain path specifications or wild cards, but not both. When *local-name* does not include any path specification, the files are located on the local client system in its local current working directory ([LPWD](#)). When *local-name* does include a path specification, the files are located on the local client system using that path specification.

The file or files are sent to the remote server and saved in its current working directory ([PWD](#)).

```
FTP? send path/file.name
```

is equivalent to:

```
FTP? send path/file.name file.name
```

If *local-name* includes wild-card specifications, all files matching the specifications in the local current working directory are sent to the remote server system and saved in its current working directory.

In the second form of the command (`SEND local-name remote-name`), both names may include path specifications. However, wild cards are not allowed. The *remote-name* specifies the specific location and name used to save the file on the remote system.

```
FTP? send *.htm
Sending "fileone.htm"
4,536 bytes sent in 0.8 seconds (5.39 Kbytes/sec)
Sending "filetwo.htm"
5,536 bytes sent in 0.8 seconds (6.71 Kbytes/sec)

FTP? send private/first.file temp/file.one
139 bytes send in 0.6 seconds (227.12 Bytes/sec)
```

Note: FTP servers normally change the file date on received files to their own local date and time, or possibly to UTC time.

Refer to the notes on “[Transfers of Non-Stream Files](#)” on page [121](#) for information about sending compiled programs and indexed, keyed or relative data files.

**SHELL** Use the local system's CSI SHELL to execute commands on the local system. This command is synonymous with the **OS** command.

There are two forms of the command:

```
SHELL
SHELL command
```

In the first form, the CSI SHELL is entered. You can then enter any command, or series of commands, that you want executed on the local system. When you are finished and want to return to the FTP environment, use the special EXIT command.

```
FTP? shell

THEOS 32 Command SHELL
Type "EXIT" to terminate.

>logon data

>exit

FTP?
```

When the second form of the command is used, a full-screen window is opened on your display and the requested command is executed. When the command is finished, the window is closed and control returns to the FTP client.

```
FTP? shell logon data
the data account becomes the current account

FTP?
```

**TYPE** Display the current file transfer mode (**ASCII** or **BINARY**). This command is synonymous with the **MODE** command.

**USER** Changes the user account that you are logged into on the remote server. There are three forms of the command:

```
USER
USER name
USER name password
```

All three forms perform the same operation. With the first form of the command, you are prompted for the new user name and password. With the second form, the user name is supplied and you are prompted for the password. With the third form,



you supply the user name and the password. Note that first two forms allow you to enter the password “silently.”

To connect as an anonymous user, specify a user name of “anonymous.” For more information about user accounts, refer to “[User Account Specification](#)” on page 119.

```
FTP? user
User-name: myname
Password:
User MYNAME logged in.
```

**VERBOSE** Toggles the verbose mode and displays the new, current mode.

With VERBOSE mode OFF, response codes received from the server and intermediate messages are suppressed. With VERBOSE mode ON, these codes and intermediate messages are displayed.

```
FTP? verbose
Verbose mode ON

FTP? pwd
257 "/e/download/os/" is current directory.

FTP? recv ftp.cmp
200 PORT command successful.
150 Opening BINARY mode data connection forftp.cmp(63632 bytes).
226 Transfer complete.
63,632 bytes received in 0.31 seconds (207.27 Kbytes/sec)

FTP? v
Verbose mode OFF

FTP? recv ftp.cmp
63,632 bytes received in 0.31 seconds (207.27 Kbytes/sec)
```

In addition, the verbose mode affects the display of the [DIR](#) command. When VERBOSE mode is OFF, and the directory information sent by the remote FTP server is in the standard, UNIX format, the information is reformatted before displaying it. Specifically, the file name is moved to the beginning of the line, access permission codes are removed, and the date and time are changed to “dd mon year,” followed by the time in 12-hour form with an “a” or “p” indicator.

With VERBOSE mode ON, the directory information is displayed exactly as received from the remote server. For example:

```

FTP? v
Verbose mode OFF

FTP? dir
Config.cmp          336 26 Feb 1997 6:21p
FAX.C               13,080 30 Jan 1997 5:05p
FTP.CMP             63,632 16 Jul 1997 12:08p

FTP? v
Verbose mode ON

FTP? dir
200 PORT command successful.
150 Opening ASCII mode data connection for /bin/ls.
-rwxrwxrwx  1 owner    group  336 Feb 26 18:21 Config.cmp
-rwxrwxrwx  1 owner    group 13080 Jan 30 17:05 FAX.C
-rwxrwxrwx  1 owner    group 63632 Jul 16 12:08 FTP.CMP
226 Transfer complete.

```

**VIEW**

Transfer an ASCII text file from the FTP server computer and displays the transferred file with WindoWriter. The file name to transfer is specified with the command:

`VIEW filename`

WindoWriter is used because of its full-screen display and scrolling capabilities. With WindoWriter, you can print the file, make changes, cut and paste to another file, *etc.*

Although *filename* is transferred to the local machine, it is not saved. WindoWriter opens the temporary copy of *filename* in read-only mode. You may use WindoWriter's "Save As" command to save the file for subsequent use on the local machine.

**FTP Script File** [Mode 5](#) of the FTP Client command allows you to specify an FTP script file. This script file is used to set up for an FTP session or to perform a complete, unattended file transfer. An FTP script file contains a list of [FTP Commands](#) to be executed. For instance:

```

open ftp.theos-software.com anonymous me@my-company.com
binary
lcd /downloads
cd theos/theos32
recv sp*.zip
quit

```

The above FTP script file would connect to the THEOS Software FTP site and download the latest service pack for the operating system. It is received into the local "downloads" directory. After the file is received, the connection is terminated and the FTP Client is exited.

```

>ftp example.ftp (file
open ftp.theos-software.com anonymous me@my-company.com
Connecting to ftp.theos-software.com (207.21.75.100)
-----
Welcome to THEOS Software Corporation FTP site.
Anonymous user logged in.
-----

binary
Using Binary mode to transfer files.

lcd /downloads
Local directory: /DOWNLOADS:S

cd theos/theos32
CWD command successful.

recv sp*.zip
Receiving SP40210.ZIP (1 of 1)
477,742 bytes received in 161.8 seconds (2.95 Kbytes/sec)

quit
Goodbye

```

Of course, the above simple example could be handled easier with a [Mode 3](#) command:

```

>cd /downloads

>ftp ftp.theos-software.com anonymous me@my-company.com (receive
theos/theos32/sp*zip

```

However, the FTP script file capability does not have to be a single file transfer. For instance, an FTP script that connects to your company's main office and downloads the current databases could be written as:

```

open headquarters me my-password
binary
lcd /database
cd /master.files/database
get *.*
cd /private.files/database
get *.*
cd /
lcd /
view notices.txt

```

This script downloads all of the files from two different directories. It resets both the local system and the remote system back to the root directory and then retrieves and displays the contents of the NOTICES.TXT file.

Notice that there is no QUIT command at the end. When a script is not terminated with a [QUIT](#) or a [CLOSE](#) command (or their synonyms), the FTP Client is not exited. Instead, after the last command in the script is executed, interactive mode is entered. At this point you can perform other operations and exit when you desire.



# 13 Net Command

The Net command controls THEO+Net and provides a common interface for many of the functions and simple clients available with THEO+Net.

- 1 NET
- 2 NET    **START**    *server-name*  
          **STOP**     *server-name*
- 3 NET    *function* *parameters*
- 4 NET    *tcp-server-function* *host* *parameters*
- 5 NET    **RECEIVE** *file* *destination-file* ( *send-rec-options*  
          **SEND**   *file* *destination-file* ( *send-rec-options*
- 6 NET    EXEC   *program* ( *program-options* *exec-options*

<i>destination-file</i>	»	name to assign to file on receiving system, with optional path			
<i>exec-options</i>	»	MAXIMIZE MINIMIZE	NORMAL NOWAIT	WAIT	
<i>file</i>	»	file name to send to or receive from THEOS server, with optional path; may contain wild cards			
<i>function</i>	»	DISCONNECT	PING	PINGALL	WHO
<i>host</i>	»	TCP/IP address or name from the host names database. LOCALHOST may be used to access this system.			
<i>program</i>	»	program to execute on client, with parameters			
<i>send-rec-options</i>	»	ABORT FILES	NEWFILE NOTYPE	OLDER REPLACE	SKIP TRANSLATE
<i>server-name</i>	»	DIALNET DIALUP FTP FTPSERVE FTPSEVER	HTTP LOGIN NETLOGIN NETWORK PPP	PPPSERVE PPPSERVER TCP TCPSEVER TCPSEVER	WEB WEBSEVER WEBSEVER WWW
<i>tcp-server-function</i>	»	CHARGEN	ECHO	TIME	DAYTIME

**Operation**

**Mode 1**—Invokes Net command in its menu mode. See “[Net Menu](#)” on page [147](#).

**Mode 2**—Starts the network or starts or stops the Login Server, the FTP Server, TCP Simple Services, the Mail Server, the PPP server or the Web Server.

```
>net start network
```

The network can be automatically started at system bootup if the configuration requests it. If it is not started at bootup it can be started manually with the above command. When the network is started, either automatically or manually, other network servers are also started if they have been enabled to start automatically.

The network must be started before any of the following servers. If you attempt to start a server without first starting the network the message “Network not operational” is displayed and the return code is set to one.

```
>net start login
```

```
>net stop login
```

Both the NETLOGIN and LOGIN names may be used to refer to the Login Server. Also, when no *server-name* is specified, the NETLOGIN server is implied and used as the default.

The Login Server may be started automatically when THEO+Net is started. Refer to the [Setup NET](#) command, “[Login Server](#)” on page [193](#). This server must be started on this system to allow other clients on the network to use this system as a host when connecting as a user with the [THEOS WorkStation Client](#) (Windows-based clients), the [NetTerm Client](#) (THEOS-based clients) or a [Telnet Client](#).

```
>net start tcp
```

```
>net stop tcp
```

The TCPSEVER, TCPSEVER and TCP names may be used to refer to the TCP Simple Services Server. A brief description of [TCP Simple Services](#) can be found on page [25](#).

The TCP Simple Services may be started automatically when THEO+Net is started. Refer to the [Setup NET](#) command, “[TCP/IP Parameters](#)” on page [188](#). These services must be started on this system to allow other clients on the network to use this system as the host for the TCP simple services described on page [149](#).

```
>net start ftp
```

```
>net stop ftp
```

The THEOS FTP Server is an optional product available with the THEO+Server Plus Pak. The FTPSERVE, FTPSERVER and FTP names may be used to refer to the FTP Server.

The FTP Server must be started on this system to allow other clients on the network to use this system as the host for FTP clients, which are described in Chapter 12 “[FTP Client](#),” starting on page [115](#).

```
>net start web
```

```
>net stop web
```

The THEOS WebServer is an optional product available with the THEO+Server Plus Pak. Any of the names HTTP, WEB, WEBSERVE, WEB-SERVER and WWW may be used to refer to the Web Server.

The Web Server must be started on this system to allow other clients on the network to use this system as the host for HTTP clients.

```
>net start dialup
```

```
>net stop dialup
```

The DIALUP service is used by the PPP client [DialNet Command](#) and is necessary if you use a dial-up or modem to connect to another network such as the Internet. The PPP, PPPSERVE, PPPSERVER, DIALNET and DIALUP names may be used to refer to this service.

**Mode 3**—Bypassing the Net menu, invokes *function*. Refer to “[Functions](#)” on page [148](#).

```
>net ping
```

Network Broadcast Ping

Name	Address
Win_DocSystem	192.168.0.101
TheosServer	192.168.0.100

2 network nodes responded.

**Mode 4**—Invokes the TCP/IP Simple Services *server-function*. Refer to “[Server-Functions](#)” on page [149](#).

**Mode 5**—Transfers *file* from this client to the THEOS server (RECEIVE) or transfers *file* from the THEOS server to this client (SEND). You must already be connected as a client to a THEOS server and you must be logged onto an account to use this mode. Client connections are made with the [NetTerm Client](#) or the [THEOS WorkStation Client](#) programs. (Because the Telnet protocol does not support file transfers, connections made with a Telnet client cannot use the file transfer capabilities of the Net command.)

```
>net send c:\windows\readme.txt
```

```
>net receive data.file /private/data.fil:a
```

The send or receive direction is relative to the client system. Therefore, Net Receive receives a file from the host on the client; Net Send sends a file from the client to the host.

Both SEND and RECEIVE allow the *file* and *destination-file* to be specified with wild cards. The syntax and operation of the wild cards is similar to the syntax and operation of wild cards used with the CopyFile command.

```
>net send *.data:s
```

The above command sends all files with a file-type of DATA on the s drive. The files are received with the file names unchanged.

```
>net send *.data:s =.=
```

This command performs the same function as the first command: All files with a file-type of DATA on the s drive are sent and received with the same file names.

```
>net send *.data:s =.newdata
```

In the above command, all files with a file-type of DATA on the s drive are sent to the host system. They are received on the host system with the same file-name but the file-type is changed to NEWDATA for each file.

```
>net send my.library.* your.library.=
```

In this command, each of the member files of MY.LIBRARY are sent to the host system and received into the host system's library YOUR.LIBRARY. The member-names are not changed.

```
>net send file*.data abc=x.files
```

The above command sends all files with a file-type of data and with a file-name that starts with file. The files are received on the host system with



the file-name changed to ABC=X where the equal sign is replaced with the portion represented by the \* in the source file name. For instance, FILEONE.DATA is received as ABCONEX.DATA, FILE486.DATA is received as ABC486X.DATA, *etc.*

```
>net send *.data* =.new=
```

In this example, all files with a file-type of data are sent to the host system. The host system receives these files with the same file-name but the file-type is changed to NEW= where the equal sign is replaced with the source file's file-type wild card component. For instance, FILE1.DATA111 is received as FILE1.NEW111, FILE486.DATA1998 is received as FILE486.NEW1998.

The specification of *file* and *destination-file* must use the file naming conventions of its operating system. If the source is a THEOS system then use THEOS naming conventions; if the source is a Windows system then use Windows naming conventions.

When the *destination-file* is specified with a drive code the file is received with a file name equal to the source file name but on the designated drive. When *destination-file* is omitted, the file is received with the source file name on its default drive.

For a description of the options available with this mode, refer to “[Send & Receive Options](#)” on page 152.

**Mode 6**—Forces the client system to execute *program*. You must already be connected as a client to a THEOS server to use this mode. [NetTerm Client](#), Telnet and [THEOS WorkStation Client](#) connections can use this mode.

The *exec-options* can be specified to control the display of the command on your remote system. Refer to “[EXEC Options](#)” on page 153 for a description of these options.

When specifying *program*, be sure to specify the command in the format required by the client's operating system. For instance, assuming that the client connection is from TWS:

```
>net exec "edit c:\autoexec.bat"
```

```
>net exec "edit /autoexec.bat:c"
```

Only the first command is proper because that is the format used for specifying directory paths and drive codes on Windows and DOS systems. The second command will not edit the desired file.

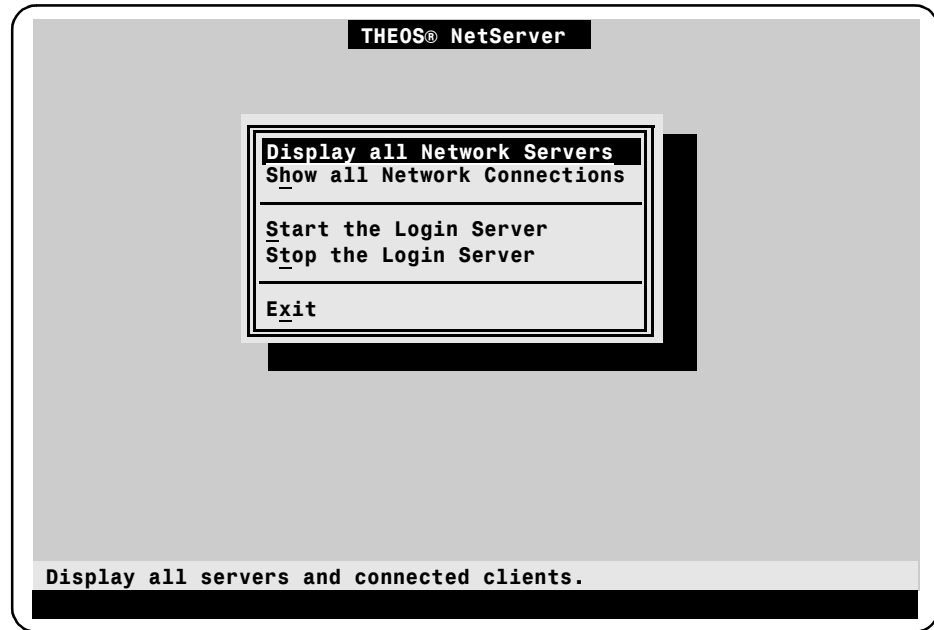
Also note that the options for the Net EXEC command are specified at the end of the command line. To avoid confusion it is best to enclose the program specification in quotation marks:

```
>net exec "list some.file (printer" (nowait
```

The above command executes the command line `list some.file (printer` on the client system as a background task. The Net command returns control to you as soon as the task is started.

## Net Menu

When Net is invoked with [Mode 1](#), the following menu displays.



NET

Use the normal menu selection keys to select the desired function.

**Display all Network Servers.** Displays all of the servers connected to the network and all clients currently connected on the network. This display is the same as the Net [WHO](#) display described on page [148](#).

**Show all Network Connections.** Displays all servers connected to the network and all clients whether currently connected or not. This display is the same as the Net [PING](#) display described on page [148](#).

**Start the Login Server.** Starts the Network Login Server that connects this system to the network as a THEOS Login Server. The network must be configured to perform this operation (refer to “[Setup NET](#)” on page [187](#)). This is the same as a Net START LOGIN command described on page [142](#).

**Stop the Login Server.** Stops the Network Login Server. This system is taken off of the network as a THEOS Login Server. This is the same as a Net STOP LOGIN command described on page [142](#).

**Exit.** Exits the Net command. You can also exit by pressing **[Esc]** any time that the menu is displayed.

**Functions**

**DISCONNECT** This function can only be used while you are connected to the Login Server via a [NetTerm Client](#) or a [THEOS WorkStation Client](#).

This function disconnects you from the host Login Server. Although this is equivalent to the EXIT command, the disconnect function cannot be used on a Telnet connect while the EXIT command can be used with all connections.

**PING** Broadcasts a “ping” on the network requesting that all nodes respond. The responding nodes are displayed. This display is identical to the PING \* command.

```
>net ping
```

Network Broadcast Ping

Name	Address
Accounting	192.168.87.12
Executive	192.168.87.15
Administration	192.168.87.63

3 Network nodes responded.

**PINGALL** Similar to the PING function, a “ping” is broadcast to all nodes requesting that they respond. However, it does this every few seconds until the program is exited with **[Esc]** or **[F9]**. This is identical to the PING \* \* command.

**WHO** All THEOS login servers that this system can access are displayed along with the client nodes that are actively connected to those servers.

```
>net who
```

Server/Client	Connect Date&Time	Pid	Account
Administration			
Executive	1 Sep 1996 8:15am	6	Brad
Accounting	1 Sep 1996 7:48am	7	Payroll
Plant	1 Sep 1996 5:00am	8	Products
Development			
Documentation	1 Sep 1996 10:15am	9	Develop

**Server-  
Functions**

The server-functions refer to the TCP Simple Services that are available with THEO+Net. These services are standard services available from most TCP/IP servers.

TCP Simple Services are not necessarily enabled at all times. They may be enabled automatically if “[Start TCP services](#)” is set to “Yes” in the [Setup NET](#), “[TCP/IP Parameters](#)” menu. They may also be started manually with the Net START TCPSERVE function described on page [142](#).

The general syntax for requesting these services is:

```
>net service-name
```

or

```
>net service-name host
```

For instance:

```
>net daytime
```

A host name may be specified following the service name. When this is done, the specified host is used for the TCP Simple Service instead of your system’s TCP server. This capability is particularly useful for the [TIME](#) service. By specifying a host whose time is known to be accurate, you can find out and optionally set your system to the current time.

**CHARGEN** Generates a continuous sequence of characters until terminated by entry of [\[Esc\]](#). Although trivial, this service is valuable when testing and debugging network applications that use data from a server.

The text string generated by the THEOS CHARGEN service is a 72-character line of ASCII characters in normal collating sequence. Each successive line increments the starting character by one.

```
>net chargen
! "$%&'()*+,-./0123456789:;<=>?@ABCDEFGHIJKLMNO...
! "$%&'()*+,-./0123456789:;<=>?@ABCDEFGHIJKLMNO...
! "$%&'()*+,-./0123456789:;<=>?@ABCDEFGHIJKLMNO...
...
```

**DAYTIME** Displays the current date and time from the server. Although there is no specific standard for the format of the string returned, the THEOS DAYTIME service returns it formatted as *day-name, month-name day-number, year time UTC-offset*.

```
>net daytime
Tuesday, November 26, 1999 12:08:15 -0800
```

Note: The *UTC-offset* is only displayed if the system has been configured for time zones and the *UTC* offset has been defined. Use the **SYSGEN** command to set these attributes.

Like the other TCP services, this service can get the information from another server by specifying a server.

```
>net daytime time.nist.gov
Tue Aug 26 13:08:22 1999
```

**ECHO** All data sent to the server is echoed back to the client.

```
>net echo
>This is a test of the TCP/IP echo command.
<This is a test of the TCP/IP echo command.
>
```

**TIME** Displays the time on a network server or gets that time and sets the time on your system. There are three forms of this function.

#### NET TIME

Invoking the **TIME** function with no arguments displays the current system time on your system. This is equivalent to the **SHOW TIME** command.

```
>net time
Tue, Nov 25, 15:22:20 1999
```

#### NET TIME *server*

When a server address or name is specified with the **TIME** function, the current time from that server is retrieved and displayed.

```
>net time time.nist.gov
Tue, Nov 25, 15:24:45 1999
```

Note: The above IP address is for the National Institute of Standards and Technology (NIST), located in Boulder, Colo-

rado. It should report a time that is accurate to the nearest second, depending upon the time lag of the Internet. There are other time servers maintained by NIST including `time-a.timefreq.bldrdoc.gov` and `time-nw.nist.gov`.

It does not matter where the server is physically located because the time information provided by any time server will include its UTC offset. If your system is configured properly for UTC offset the time is easily adjusted by the NET command.

#### NET TIME *server* (SET

With this last form, the remote server is contacted and that system's current time is retrieved. That time is used to set the system time of the local THEOS system.

```
>show time
15:11:32 Tuesday, November 25, 1999.
```

```
>net time time-nw.nist.gov (set
Tue, Nov 25, 15:26:20 1999
```

```
>show time
15:26:23 Tuesday, November 25, 1999.
```

NET

**Send &  
Receive  
Options**

The following options may be used for **Mode 5**. With the exception of **FILES** and **TRANSLATE**, they control the actions to be taken when the receiving system already has a file with the same file name.

**ABORT** Specifies that, if the receiving system has an existing file with the same name as *file*, the transfer is to terminate without replacing this file or attempting to transfer any other files.

**FILES** The files listed in *file* are sent to or received from the server. *file* must be an ASCII stream file containing one or two file descriptions per line. The **SELECTED.FILES** and **SELECTED.EXEC** files created by the **FILELIST** command and the **FOUND.EXEC** created by the **LOOK** command can be used for this specification file. You may also create the specification file with an editor or application program.

For instance, the **FILELIST** command is used to create a list of files to be compressed:

```
>filelist a (10/1/96 10/8/96 exec
```

A file now exists that lists all of the files on the A disk that have been changed between 10/01/1996 and 10/08/1996. The following command will transfer these files from the server to the client system:

```
>net receive selected.exec (files
```

When a record in *file* contains two file descriptions, the first file name specifies the file to transfer and the second file name specifies the name that it will be saved as on the receiving system.

**NEWFILE** Specifies that, if the receiving system has an existing file with the same name as *file*, you are to be asked if it should be replaced with the new file. The method of asking and the options available at that time are dependent upon the receiving system.

**NOTYPE** Suppresses the display of the transfer progress window.

**OLDER** This option specifies that the file is only transferred if the file does not exist on the destination or if the time-stamp of the file on the destination system is older than the time-stamp of the file on the source system.



**REPLACE** This is the default option specifying that, if the receiving system has an existing file with the same name as *file*, that file is replaced with the file from the sending system.

**SKIP** Specifies that, if the receiving system has an existing file with the same name as *file*, the transfer is to skip this file and continue with the next file in the list.

**TRANSLATE** When the file being transferred is an ASCII stream file, the record terminators are to be translated to the receiving system's syntax (CR for THEOS, CRLF for DOS/Windows).

**EXEC Options** The following options may be used for [Mode 6](#). The [MAXIMUM](#), [MINIMUM](#) and [NORMAL](#) options are effective only when the client is a [THEOS Work-Station Client](#).

**MAXIMUM** Indicates that the program is executed in its maximized mode. When neither this option nor the [MINIMUM](#) option is used, the program is executed with its default size of window.

**MINIMUM** Indicates that the program is executed as a minimized icon.

**NORMAL** The program is executed in its default or normal-sized window.

**NOWAIT** Tells the THEOS Server to not wait for completion of the program. When executed from the command line, control returns to the CSI and you may enter another THEOS command. When executed from an application program or an EXEC, control returns to the calling program.

Note: When the client system is a THEOS system, the *program* is executed as a background task. This means that it does not have a console keyboard available to it. If the *program* needs a keyboard it will exit.

**WAIT** A default option that tells the THEOS Server to wait for completion of the program before returning control to you or the calling program.

**Restrictions** The Net command requires a privilege level of one.

A privilege level of five is required to use the [WHO](#) function and its complement, the “[Display all Network Servers](#)” menu item.

To use the START or STOP functions, you must be logged onto the SYSTEM account (id = zero) and have a privilege level of five.

**See also** [DialNet Command](#), [FTP Client](#), [NetTerm Client](#), [Ping Client](#), [Quote Client](#), [Setup Command](#), [Telnet Client](#), [THEOS WorkStation Client](#)

For an overview of networking functions and operation, see “[Networking Fundamentals](#)” on page 13.

# 14 NetAlive Client

The NetAlive client periodically tests whether a connection can be made to a specific machine. Multiple connections can be tested with different time periods for each.

- 1 NETALIVE (*option*)
- 2 NETALIVE *control-file* (*option*)
- 3 NETALIVE STATUS
- 4 NETALIVE STATUS *host*
- 5 NETALIVE START *control-file*
- 6 NETALIVE STOP

---

<i>control-file</i>	»	file name of NetAlive control file
<i>host</i>	»	TCP/IP address or name from the host names database
<i>option</i>	»	NOTYPE TYPE

NETALIVE

## Operation

**Mode 1**—Using the default control file (SYSTEM.TEOS32.NETALIVE:S) the NetAlive client is started. Each of the host machines defined in the control file is contacted to see if a connection can be made.

When the connection test to a particular host is successful no special action is taken unless there was a failure on a previous connection test of the host. If the flag was set due to a prior connection failure, the flag is cleared and the *success-command* specified in the control file is invoked.

If the connection for a particular test cannot be made the *failure-command* specified in the control file is invoked and the test is rescheduled. A flag is set so that when the connection is retested, if it succeeds the *success-command* specified in the control file will be invoked.

In all cases, after a test is made for a particular host the test is rescheduled for the time period specified for the host in the control file.

Note: The NetAlive client is normally used as a background task and may be started and stopped with [Mode 5](#) and [Mode 6](#) of this command.

**Mode 2**—The operation is identical to the [Mode 1](#) operation except that the default control file is not used. Instead, *control-file* is used.

**Mode 3**—Display the status of a NetAlive client running on another session/user or background task ([Mode 5](#)). A status line is displayed for each host that that NetAlive client is testing. See “[NetAlive Status](#)” on page [160](#) for a description of this display.

**Mode 4**—Display the status of a NetAlive client running on another computer system. *host* is the IP address of that other computer’s NetAlive client.

```
>netalive status othersys.com
localhost/HTTP          OK
localhost/FTP           OK

>netalive status www.theos-software.com
Connecting to 207.21.75.2 port 4395
connect() Connection was refused
```

The second example above show the display when the remote host is not running a NetAlive client.

**Mode 5**—Starts the NetAlive client as a background task. If *control-file* is not specified, the default control file is used (SYSTEM.THEOS32.NETALIVE:S).

```
>netalive start
Task started as process #31.
```

**Mode 6**—Stops a previously started NetAlive client.

## Options

**NOTYPE** This is the default mode of operation. Nothing is displayed by the NetAlive client unless directed to do so by one of the *failure-* or *success-commands*.

**TYPE** Tells NetAlive to display messages on *stderr* describing each test as it is performed. The message includes the date and time of the test, host and port names and host and port numbers.

If the test fails an additional line is displayed giving the failure code. These codes are listed in Appendix C: “[Network Error Codes](#),” starting on page [253](#).

For instance, if the control file contains the line:

```
localhost, netlogin, 60, msg * “Login server down”
```

and your netlogin server is not started on this system, NetAlive displays:

```
>netalive (type
1999/01/13 10:41:46 localhost/netlogin (192.168.100.1/3257)
1999/01/13 10:41:46 failure 1061 on localhost/netlogin
1999/01/13 10:42:46 localhost/netlogin (192.168.100.1/3257)
1999/01/13 10:42:46 failure 1061 on localhost/netlogin
```

## Notes

Although not its primary purpose, this client may be used to keep an Internet connection alive if one or more of the hosts specified in the control file is remote and accessed via a Dialup Network connection. For instance, if your ISP disconnects you after 20 minutes of idle time, a NetAlive test repeated every 10 minutes will keep you connected to your ISP. This may be good or bad, depending upon your ISP service rates.

When the path to a host is via a DUN (DialUp Networking) connection and that connection does not exist, NetAlive will not establish the connection...it will merely report a failure. NetAlive only uses existing network connections. Use [DialNet Command](#) (described on page 103) to establish the connection if necessary.

After a connection test is performed for a host, the next test is scheduled using the current system time plus the time period specified for the test. If the system clock is changed by another task after this scheduling, the test may be performed either much later or earlier than you specified.

## Start at Boot

To cause the NetAlive command to be started when your system is booted you must edit the file SYSTEM.TEOS32.STARTCFG:S. For instance:

```
[Start]
NETALIVE=/SYSTEM.CMD32.NETALIVE:S
```

If the file already exists and there is a [Start] section defined, merely add the line to that section:

```
[Start]
TCPSERVE=/SYSTEM.TEOS32.TCPSERVE:S
HTTP=/SYSTEM.TEOS32.WEBSERVE:S
FTP=/SYSTEM.TEOS32.FTPSERVE:S
PPPSERVE=/SYSTEM.TEOS32.PPPSERVE:S
NETALIVE=/SYSTEM.CMD32.NETALIVE:S
```

**NetAlive  
Control-file**

The file `SYSTEM.TEOS32.NETALIVE:S` is the default control file used by the NetAlive client.

This control file is an ASCII, editable file and should be created using Win-  
doWriter or some other text file editor. The file consists of one or more lines  
of text with each line specifying the connection test to be performed.

### ■ Control-file Lines

The general format for each line in a NetAlive control file is:

*host, port-number, period, failure-command, success-command*

Each of the fields is separated from the other fields by a comma and  
optional white space (one or more space or tab characters).

**Host** This is the host name or IP address of a network server  
machine. When a name is used it must be defined in your host  
names database or it must be resolved by the DNS server  
defined in your network configuration.

**Port name/number** The common services name or number. Any of the  
names defined in the file `SYSTEM.TEOS32.SERVICES:S` may be  
used. If you know the service number, you may specify that  
number.

**Period** Test frequency, specified in seconds.

**Failure-command** Command line to execute when the connection test fails.  
This command is only executed when the connection test fails  
the first time or when the test fails after a previous successful  
test. Multiple, consecutive failures will only cause this com-  
mand to be executed one time.

**Success-command** Command line to execute when the connection test  
succeeds. This command is only executed when the connection  
test succeeds and the previous test of this connection failed.

This success-command is optional. When not specified no  
action is taken when a connection becomes available after a  
failure.

## ■ Success and Failure Command Lines

Multiple commands may be specified by joining the command lines with an ampersand character ( & ). The command line may not contain commas or embedded ampersand characters. Create and use an EXEC program if this syntax is necessary.

The command(s) used should execute quickly as it is executed by NetAlive in its own time-slice. Subsequent connection tests are not scheduled until this command completes and returns control to NetAlive.

### Macros in Command Lines

There are two macro names that may be used in the success and failure command lines.

<b>%time</b>	Replaced with the time that the connection test was performed. The time is in 24-hour format hh:mm:ss.
<b>%err</b>	Replaced with the connection test error code. Typically, this code is 1061, meaning that the connection was refused for some reason.

NETALIVE

### Example Control-File Lines

The following control-file line specifies that the local server (the machine that NetAlive is executing on) is to be tested for a network login connection every 60 seconds. If the test fails a message is sent to all users on the SYSTEM account notifying them of this failure.

```
localhost, netlogin, 60, msg system "Login server down at %time."
```

This second example tests a connection to a web site and, if it is not available it broadcasts a message to all logged on users. When the site becomes available it broadcasts another message to all users informing them that it is now available. It also adds a line to the WEBACCES.LOG:S file with the time that the server was available.

(Note: Although this line is shown with three lines of text, it must be contained in one long line in the control file.)

```
www.private.com, http, 600, msg * "Private Web access down at %time.",  
    msg * "Private Web access up at %time." & echo %time "Private Web  
up!" >> /webaccs.log:s
```

This next control-file line tests the HTTP connection to a server named "myserver" every 10 minutes. If it is not available it executes the command

X10. Presumably, this is a program or an EXEC that will turn the power off to the server machine and then turn it back on, allowing the server to be reset.

Continued testing by NetAlive is suspended until this X10 command finishes and returns control to NetAlive.

The next time that this connection is tested (10 minutes after it was reset), if the connection is available a message is sent to the user on the SYSTEM account informing them that it is now available.

```
myserver, http, 600, x10 server reset, msg system "Server on-line at
%time."
```

## NetAlive Status

When the NetAlive STATUS ([Mode 3](#) or [Mode 4](#)) is used, NetAlive displays one line of status information for each of the host machines defined in the control file. This status information is simple: the host name and port name followed by:

**OK** The connection has been available since NetAlive first started testing.

**Single date/time** The connection is not currently available. The date and time specify the time that NetAlive first detected the failure.

**Two date/times** The connection is currently available but has been down in the past. The first date/time indicates the last time that NetAlive first detected it was down. The second date/time specifies the time when NetAlive detected that the connection was available again. In the following example, the localhost/FTP connection is available but it was down for two hours and ten minutes on January 8.

An example display from a NetAlive status request:

```
>NetAlive status
myserver/HTTP          OK
mail.pacifier.com/POP3  OK
localhost/FTP          Jan08 14:48:56 Jan10 16:58:27
localhost/HTTP         OK
yourserver/FTP         Jan08 16:22:45
```

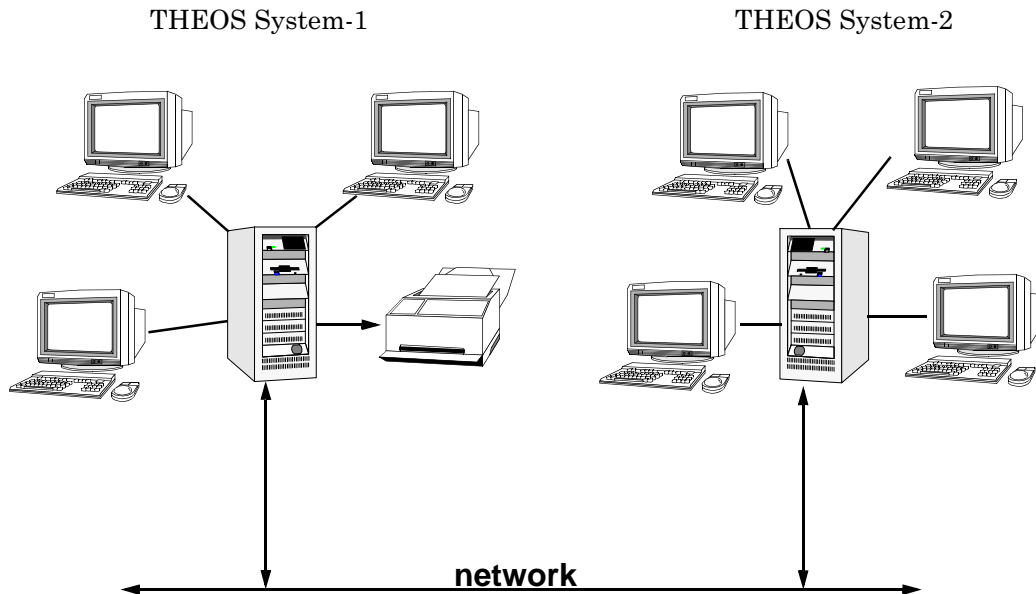
**Restrictions** The privilege level of the NetAlive command is five.

**See also** [Net Command](#)



# 15 NetTerm Client

The NetTerm command establishes a client/server connection between the THEOS system that you are currently using to another THEOS system that is a server on your network.



In the above figure, the two THEOS-based computers have THEO+Net installed. System-2 is set up as a Login Server to this local area network. With NetTerm, any of the terminals connected to System-1 can become a user of System-2. Programs used while connected with NetTerm on this second system have all of the same resources (disks, printers, communications, *etc.*) available as the other terminals directly connected to that system. In addition, the printer connected to System-1 is also available as a slave printer.

- 1 **NETTERM** (*options*)
- 2 **NETTERM** *server* (*options*)
- 3 **NETTERM** *server account* (*options*)

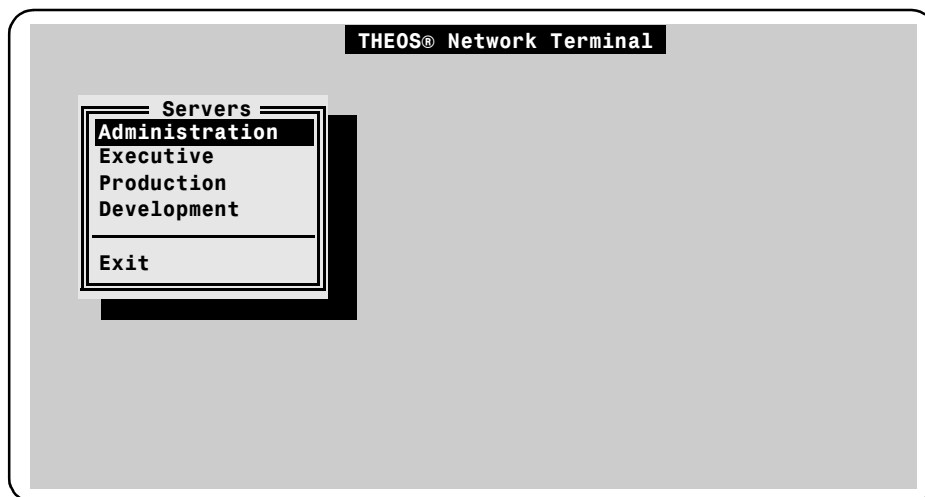
---

<i>account</i>	»	account name to log to after connection
<i>localhost</i>	»	LOCALHOST
<i>server</i>	»	network server name, IP name or IP address (may also be <i>localhost</i> )
<i>options</i>	»	ACCOUNT <i>account</i> CTL NOPRT PRT <i>nn</i>

The standard synonym for the NetTerm command is NT.

**Operation**      **Mode 1**—Invokes the NetTerm command without connecting to any server. NetTerm queries the network to find all of the THEOS servers that are connected to the network.

When no other THEOS servers are present on the network, an error message displays and the program exits. When there is one or more THEOS servers connected to the network (other than the THEOS system that NetTerm is running on), the names of these available servers are displayed in a menu. For instance.



The list of servers is updated approximately once per second to reflect servers that are joining or leaving the network and servers whose permission list is changed.

Choose one of the servers offered and a client connection is established with that server. If no default connection is defined (see “Default Connections” on page 164) and the ACCOUNT option is not used, you are started at that server’s logon prompt.

**Mode 2**—Invokes NetTerm and connects to *server*. If *server* is not a THEOS Network Login Server, or if that THEOS server does not give you permission to connect to it, an error message displays. If no default connection is defined (see “Default Connections”) and the ACCOUNT option is not used (**Mode 3**), you are started at that server’s logon prompt.

**Mode 3**—Same as **Mode 2** except that you are automatically logged onto *account*. If that account has a password, you must enter the password when the connection is established.

Options

- ACCOUNT** *account* After a connection is established, log onto *account* on the *server* system. If *account* has a password, you are prompted to enter the password before you are allowed to log onto the account.
- CTL** Set control mode for this console on the *server*. Control mode causes all control characters received to be displayed visually. For instance, receipt of a CR is displayed as ^M.
- NOPRT** Do not connect any of your printers as a slave printer to the server.
- PRTnn** Your printer number **PRTnn** becomes a slave printer for your session on the remote *server*. When this option is not used (and the **NOPRT** option is not specified), your lowest numbered, attached printer becomes the slave printer.



**Default  
Connections**

When an account name is not defined on the command line ([Mode 1](#) or [Mode 2](#)), the account name specified in your system's NetTerm configuration file is used. If no NetTerm configuration file is found, a normal user start is performed on the server and you are prompted to "Logon please."

NetTerm searches your system for the NetTerm configuration file using the following file specifications:

```
environ/account.NTCFG
environ/SYSTEM.NTCFG
account.NTCFG
SYSTEM.NTCFG
```

where *environ* is the current value of the environment variable NetTerm and *account* is the name of the account that you are using on your system when you invoked NetTerm.

**NetTerm  
Configuration  
File**

NetTerm configuration files are ASCII text files containing the following information:

```
[name1 Server]
Account=account
```

```
[name2 Server]
Account=account
```

*etc.*

*name1*, *name2* are the names of remote servers that you connect to. *account* is the name of the account that you want to automatically log onto when you connect with that server. For instance:

```
[Administration Server]
Account=Reports
```

```
[Executive Server]
Account=Remote
```

```
[Production Server]
Account=Guest
```

```
[Development Server]
Account=Programs
```

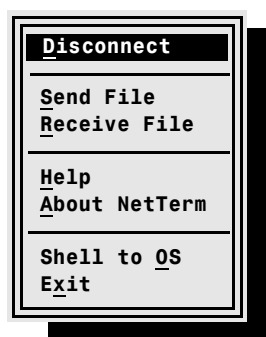
When this file is used to connect to the "Development" server, you are automatically logged onto the account "Programs."

**NetTerm Menu** Once you are connected to the server, your system is a client to the remote server. This means that any keys pressed are transmitted to the server as if you had a terminal directly connected to that system. Text received from the server is displayed on your console.

Exceptions to this transmission to the remote server are **Break** key sequences. Only **Break**,**C** and **Break**,**Q** are passed directly to the remote server. All other **Break** key sequences are acted upon by this NetTerm command.

To transmit a **Break** key sequence other than **Break**,**C** and **Break**,**Q**, you must press **Break**,**B** followed by the key you want transmitted. For instance, to transmit a **Break**,**X** to the server, you must press **Break**,**B**,**X**.

Pressing **Break**,**M** displays the NetTerm menu:



**Disconnect.** Selecting this item performs a disconnect from this server. If you are in the middle of executing a program, a **Break**,**Q** is transmitted. You are logged off the server, if necessary.

When the disconnect is finished, you are presented with the menu of available servers that was described on page [162](#).

This disconnect and reconnect can be performed directly, without using the menu, by pressing **Break**,**R**.

**Send File.** Sends a file from this client to the server system. You are prompted for the file name you want transferred. You may specify any file on your system that you have access to. Specify the complete path, if necessary. The file is received on the server system into the current account, current working directory. An information window and status bar displays during the transfer:

```

File name.....MY.FILE
File size.....34,024
Date stamp.....12 Jul 1997 02:46pm
Bytes sent.....25,600
Transfer time..0:00
Progress.....

```

You may also send files to the server by executing the NET SEND command on the server system. This ability is particularly useful for transferring files under program control.

**Receive File.** Similar to the “Send File” function described above except that it transfers a file from the server to this client system.

You may also receive files from the server by executing the NET RECEIVE command on the server system.

**Help.** Displays help information about NetTerm. Note that you may press **[F1]** with any of the menu items selected to receive addition information about that specific menu item.

**About NetTerm.** Displays copyright and version information about the NetTerm command and displays information about your current connection on the network:

```

About NetTerm
THEOS® NetTerm -- Network Terminal Emulator
Version: 4.0 (050CT97)

Copyright © 1997 THEOS Software Corporation

Client Name: Chris
IP Address: 192.168.200.2

Server Name: Development
IP Address: 192.168.200.50
OS Name: THEOS 32 Version 4.0
OS Serial: 200.12345
Connect at: 28 Oct 1997 11:15am

```

**Shell to OS.** Invokes the CSI shell without exiting the NetTerm command. This is the only way to maintain the connection with the server while executing another command on your system from this terminal and session.

To return to the NetTerm command environment, execute the command name EXIT.

**Exit.** Disconnects from the server and exits NetTerm. This action can also be performed without the menu by pressing **Break**, **X**.

#### Notes

When connected to a remote THEOS server, you may execute any programs on that server that you have access to. While connected, the programs that you execute have the full resources of the server available to them. Additionally, they may have access to one of the printers on your client system if a printer was attached when you established the connection and you did not use the NOPRT option.

#### Cautions

You may execute the NetTerm command on the server. This will attempt to establish a link to another THEOS server. When this is done you will be communicating to the second server via the first server.

Although this is allowed and is useful at times, it can be quite confusing. To transmit a **Break**, **C** to the second server, you must use the **Break**, **B**, **C** keys to tell the first server to transmit a **Break**, **C** to the second system. Similarly, to terminate the connection with the second server, you must use the **Break**, **B**, **B**, **X** keys to tell the first server to transmit a **Break**, **X** to the second system.

If you use the NetTerm command on the second system to connect to a third THEOS server, it is even more confusing.

#### Restrictions

You may only connect to a THEOS server that gives your system permission to connect to it. Refer to Chapter 5 “[Network Security](#),” starting on page [63](#) for additional information about access permissions and security issues.

#### See also

[Net Command](#), [Setup Command](#), [Telnet Client](#), [THEOS WorkStation Client](#)

NETTERM



# 16 Nslookup Client

---

The Nslookup client looks up domain names and returns their associated IP address, or looks up an IP address and returns its domain name.

1 NSLOOKUP *domain*

2 NSLOOKUP

---

*domain*                    »    domain name or IP address or host name

## Operation

**Mode 1**—Looks up and reports on *domain*. The information displayed is Server name, alias (if any), and the dotted IP addresses associated with *domain*.

```
>nslookup teleport.com
Server:      teleport.com
Address:     192.108.254.10
            192.108.254.12

>nslookup www.microsoft.com
Server:      www.microsoft.com
Address:     207.68.137.62
            207.68.156.53
            207.68.156.54
            207.68.156.61
            207.68.156.16
            207.68.156.58
...

```

Multiple addresses listed for a domain indicate that all of those addresses are associated with the domain. They refer to different machines at that site's location. One may be for their FTP server, another for incoming mail, *etc.* Their exact function cannot be determined by this display.

**Mode 2**—Enters an interactive mode where you can specify more than one domain before exiting.

**>nslookup**

```
Enter name to lookup: ftp.theos-software.com
Server:  ftp.theos-software.com
Address: 207.21.75.100
```

```
Enter name to lookup: ibm.com
"ibm.com" not found.
```

```
Enter name to lookup: www.ibm.com
Server:  www.ibm.com
Address: 204.146.17.33
```

```
Enter name to lookup: laptop
Server:  Laptop
Alias:   Laptop.Documentation-system
Address: 192.48.200.3
```

```
Enter name to lookup:
```

Pressing **[Enter ↵]** only, terminates the NsLookup command.

### Domain Specification

When *domain* is entered, the name resolver searches the following locations until a match is found or until all locations have been searched without success:

1. Cached names and IP addresses.
2. Host names database. This is maintained by the [Setup NET, View/Maintain Host Names Database](#) screen, described on page 201.
3. The DNS servers, as specified in the THEO+Net Configuration file. The DNS server locations are maintained by the [Setup NET, Name Services, DNS Servers](#) screen, described on page 201.

*domain* may be specified in several ways.

- As a dotted IP address. When an IP address is specified, a “reverse lookup” is performed. That is, the domain name associated with the IP address is determined and displayed.

```
>nslookup 207.21.75.100
Server:  theos-software.com
Address: 207.21.75.100
```

- As a host name as defined in the file [SYSTEM.TEOS32.HOSTS](#).

```
>nslookup my-company
Server:      my-company
Alias:       my-company.theos-system
Address:     192.12826.30
```

When domain is found in the host names database, the alias entry is displayed with the host name, dot, your-computer-name. Your-computer-name is defined in the [Setup NET, TCP/IP Parameters](#) screen that is described on page [188](#).

- Or the domain name as defined by the Domain Name Service specified in [Setup NET, Name Services, DNS Servers](#).

```
>nslookup www.theos-software.com
Server:      www.theos-software.com
Address:     207.21.75.100
```

NSLOOKUP

# 17 Ping Client

The Ping client allows you to broadcast a “Are you there?” or a “Who’s there?” query to a specific node or to all nodes on the local intranet.

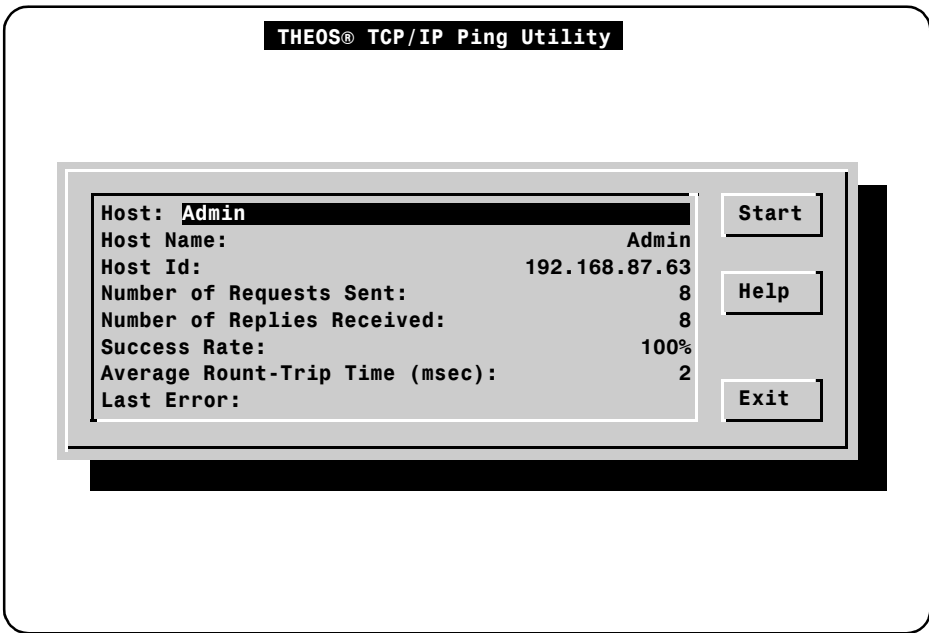
- 1 PING
- 2 PING *address...* ( *options*
- 3 PING \*
- 4 PING \* \*

---

<i>address</i>	»	node IP address or name (may also be <i>localhost</i> )
<i>localhost</i>	»	LOCALHOST
<i>options</i>	»	<u>NOTYPE</u>

PING

**Operation**      **Mode 1**—Invokes the interactive or windowed display mode of this command. This provides the most information about the queried node.



Entry is allowed for the “Host” field only. Enter the dotted IP address for a node or its name as defined in the host names database. Host names are defined with the [Setup NET](#), [View/Maintain Host Names Database](#) screen. The “Host Name” and “Host Id” fields display the name and matching IP address for the specified host.

In this mode, queries are repeatedly sent to the specified node until the operator terminates the operation with entry of any key, by using the mouse and selecting the “Stop” button, or when the node fails to respond. (The “Start” button changes to “Stop” after a host is specified.)

As each query is sent, the information on the screen is updated to reflect the success rate and the response time for the node.

**Mode 2**—With this form, Ping queries the network one time for a response from the specified *host*. The *host* is a dotted IP address or its name as defined in the host names database.

```
>ping accounting
```

```
Host:   Accounting,  address: 192.168.87.12
        round-trip time = 2 milliseconds.
```

```
>ping 192.168.87.15
```

```
Host:   Executive,  address: 192.168.87.15
        round-trip time = 1 milliseconds.
```

If the NOTYPE option is used, the display is suppressed. However, the return code is set to a success/fail code of zero or one.

**Mode 3**—The network is queried for responses from all nodes connected to the local intranet. This is the same operation performed by the Net [PING](#) command.

```
>ping *
```

```
Network Broadcast Ping
```

<u>Name</u>	<u>Address</u>
Accounting	192.168.87.12
Executive	192.168.87.15
Admin	192.168.87.63

```
3 Network nodes responded.
```

Some network operating systems, such as Windows 95, will not respond to this type of broadcast ping.

**Mode 4**—Similar to [Mode 3](#), the network is queried for responses from all nodes connected to the local intranet. This mode differs in that the network is continuously queried until the operator terminates the program by pressing **[Esc]** or **[F9]**. This is the same operation performed by the Net [PINGALL](#) command.

**Return Code**

A return code (RC) of zero indicates a successful ping response. An RC of 1 indicates no ping response. An RC of 2 indicates that the *address* could not be resolved.

PING



# 18 Quote Client

The Quote client queries a quote server for the next random quotation.

1	<u>QUOTE</u>	
2	<u>QUOTE</u>	<i>server</i>
<hr/>		
<i>localhost</i>	»	LOCALHOST
<i>server</i>	»	network server name or id (may also be <i>localhost</i> )

## Operation

**Mode 1**—Displays a random quotation from the [SYSTEM.TEOS32.NET-QUOTE](#) database.

```
>quote
The difference between the right word and the almost
right word is the difference between lightning and
a lightning bug.
--Mark Twain
```

The quote server on this system must be started. The quote server is part of the TCP Simple Services.

**Mode 2**—Accesses *server* and uses its quote server to display a random quotation from *server*'s database. *server* may be specified with:

- ▶ The dotted IP address for the TCP server.  

```
>quote 207.21.75.100
```
- ▶ The host name as defined in the file [SYSTEM.TEOS32.HOSTS](#). This file is maintained by the [Setup NET](#), [View/Maintain Host Names Database](#).  

```
>quote my-company
```
- ▶ By the special name LOCALHOST, meaning that this machine's server is queried. This is the equivalent of a [Mode 1](#) command.
- ▶ Or the domain name as defined by the Domain Name Service specified in [Setup NET](#), [Name Services](#), [DNS Servers](#).  

```
>quote theos-software.com
```

**Examples**

**>quote**

Life is so unlike theory.

--Anthony Trollope

**>quote**

Time is that quality of nature which keeps events  
from happening all at once. Lately it doesn't seem to  
be working.

--Anonymous

QUOTE

# 19 Route Command

The Route command displays and maintains the routing tables used to establish network paths to various IP addresses.

- 1

ROUTE
- 2

ROUTE (PRTnn
- 3

ROUTE (ADD net-addr net-mask gateway-addr host-addr
- 4

ROUTE (DELETE net-addr net-mask

gateway-addr	»	dotted IP address of gateway machine
host-addr	»	dotted IP address of NIC in local machine used to access gateway-addr
net-addr	»	dotted IP address of destination network
net-mask	»	dotted subnet mask for the destination network

The routing table maintained by this command is the internal, memory-resident table. This table is created dynamically each time that the network is started. It is a combination of default entries, entries provided by a gateway (if any) and by dynamic network processes such as DialUp Networking. It is augmented by the routes defined with this command and by routes defined in the `SYSTEM.TEOS32.NETROUTE` file.

**Please note: For most networks, it is not necessary to modify this table.**

**Operation**      **Mode 1**—Displays the current internal routing table on *stdout*.

>route

Net Address	Subnet Mask	Gateway Address	Host Address
127.0.0.1	255.255.255.255	127.0.0.1	127.0.0.1
127.255.255.255	255.255.255.255	127.0.0.1	127.0.0.1
127.0.0.0	255.0.0.0	127.0.0.1	127.0.0.1
192.168.100.1	255.255.255.255	127.0.0.1	127.0.0.1
192.168.100.255	255.255.255.255	192.168.100.1	192.168.100.1
192.168.100.0	255.255.255.0	192.168.100.1	192.168.100.1

**Mode 2**—Displays the current internal routing table on the designated printer.

**Mode 3**—Adds another route definition to the internal routing table.

```
>route (add 192.168.0.0 255.255.255.0 192.168.100.2 192.168.100.1
```

The above command adds another entry to the routing table.

**Mode 4**—Deletes a route definition from the internal routing table.

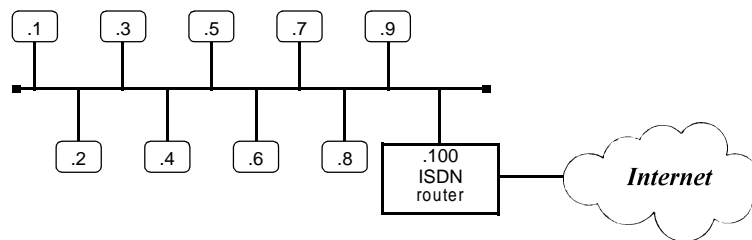
```
>route (delete 192.168.0.0 255.255.255.0
```

## Notes

All IP addresses starting with 127 are “loopback addresses.” By convention, only the 127.0.0.1 address is used. Network packets addressed to this address are not sent to the network hardware. Instead, they are captured by the network software and handled internally on this machine.

When the network on this machine wants to send a network packet to another node on the network the internal routing table is used to determine and control what path is used to find that machine.

For instance, the following diagram shows a typical, small LAN with access to the Internet through an ISDN router. The ISDN router could be replaced with a DSL modem or a network modem-sharing device. It could even be a computer with a proxy server and modem connection to an ISP.



The .1, .2 *etc.* references are to the last portion of the IP address of the node.

Each of the THEOS-machine nodes on the LAN can use the default routing tables generated when the network software is started. These default routes are identical with the exception that each machine’s routing table points to its own NIC address.

Assuming that the LAN is a Class C network addressed with 192.168.100.\*, the routing table for the .1 node is:

Net Address	Subnet Mask	Gateway Address	Host Address
0.0.0.0	0.0.0.0	192.168.100.100	192.168.100.1
127.0.0.1	255.255.255.255	127.0.0.1	127.0.0.1
127.255.255.255	255.255.255.255	127.0.0.1	127.0.0.1
127.0.0.0	255.0.0.0	127.0.0.1	127.0.0.1
192.168.100.1	255.255.255.255	127.0.0.1	127.0.0.1
192.168.100.255	255.255.255.255	192.168.100.1	192.168.100.1
192.168.100.0	255.255.255.0	192.168.100.1	192.168.100.1

This table specifies:

Line 1: All packets not routed by the other entries are sent to the ISDN router at 192.168.100.100 via the NIC addressed at 192.168.100.1.

Line 2: All packets addressed to localhost are sent to the loopback address.

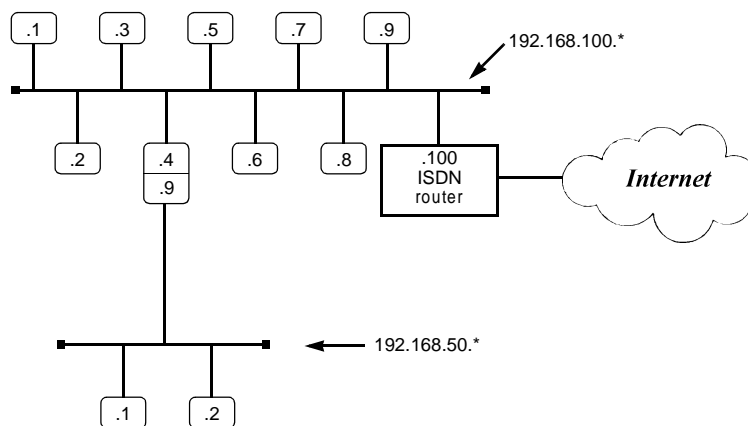
Line 3 and 4: All packets broadcast to the localhost are sent to the loopback address.

Line 5: All packets addressed to this machine (from this machine) are sent to the loopback address.

Line 6: All packets broadcast to the local network are sent to this network via the NIC addressed at 192.168.100.1.

Line 7: All packets broadcast to other machines on the subnet are sent to this network via the NIC addressed at 192.168.100.1.

A more complex network might be:



This network is comprised of three networks: the 192.168.100.\* LAN, the 192.168.50.\* LAN and the Internet. One of machines has two NICs installed in it and acts as a “bridge” between the two LANs.

Each of the machines on the 192.168.100.\* LAN must be configured to route packets addressed to the other LAN through the .4 node. You could do this by using the Route command to add an additional route definition.

On the .1 machine you would:

```
>route (add 192.168.50.0 255.255.255.0 192.168.100.4 192.168.100.1
```

On the .2 machine you would:

```
>route (add 192.168.50.0 255.255.255.0 192.168.100.4 192.168.100.2
```

Similar commands are done for each of the other machines except the .4 machine itself. On that machine the default routing is already different because the two NICs were configured in [Setup NET](#).

## ROUTE

Net Address	Subnet Mask	Gateway Address	Host Address
0.0.0.0	0.0.0.0	192.168.100.100	192.168.100.4
127.0.0.1	255.255.255.255	127.0.0.1	127.0.0.1
127.255.255.255	255.255.255.255	127.0.0.1	127.0.0.1
127.0.0.0	255.0.0.0	127.0.0.1	127.0.0.1
<b>192.168.50.9</b>	<b>255.255.255.255</b>	<b>127.0.0.1</b>	<b>127.0.0.1</b>
<b>192.168.50.255</b>	<b>255.255.255.255</b>	<b>192.168.50.9</b>	<b>192.168.50.9</b>
<b>192.168.50.0</b>	<b>255.255.255.0</b>	<b>192.168.50.9</b>	<b>192.168.50.9</b>
192.168.100.4	255.255.255.255	127.0.0.1	127.0.0.1
192.168.100.255	255.255.255.255	192.168.100.4	192.168.100.4
192.168.100.0	255.255.255.0	192.168.100.4	192.168.100.4

These additional entries tell the network software to “forward” all packets received for the 192.168.50.\* network to that network by transmitting them via the NIC at 192.168.50.9. No additional routing entries need to be added on this machine.

Similar routing entries must be added to the machines on the 192.168.50.\* LAN.

**Initial  
Routing  
Table**

When the network is first started at boot time or with the NET START NETWORK command, the internal routing tables are initialized to include:

- ▶ A path to the default gateway, if defined
- ▶ Three entries for loopback addresses
- ▶ Three entries for each NIC IP address defined
- ▶ Entries copied from the [SYSTEM.TEOS32.NETROUTE](#) file, if any

During the course of operation, additional entries are added and deleted from the routing table due to transient PPP connections.

**Restrictions**

Routes added or deleted by this command are only defined until the network is restarted by a system reboot.

If you want the changes made with this command to be used the next time that your network is restarted, you must add them to the [SYSTEM.TEOS32.NETROUTE](#) file (see page 245).

**ROUTE**



# 20 Setup Command

The Setup command provides a single command to configure and initialize the major components of THEOS, various types of devices and optional components such as THEO+Net.

1	<u>SETUP</u>				
2	<u>SETUP</u>	<i>function</i>			
<hr/>					
<i>function</i>	»	ACCOUNT	DISK	FLOPPY	SIO
		COLOR	DOS	FTP	SYSGEN
		CRT	EMAIL	NET	TELNET
		DIGIXE	FAX	NETUSER	

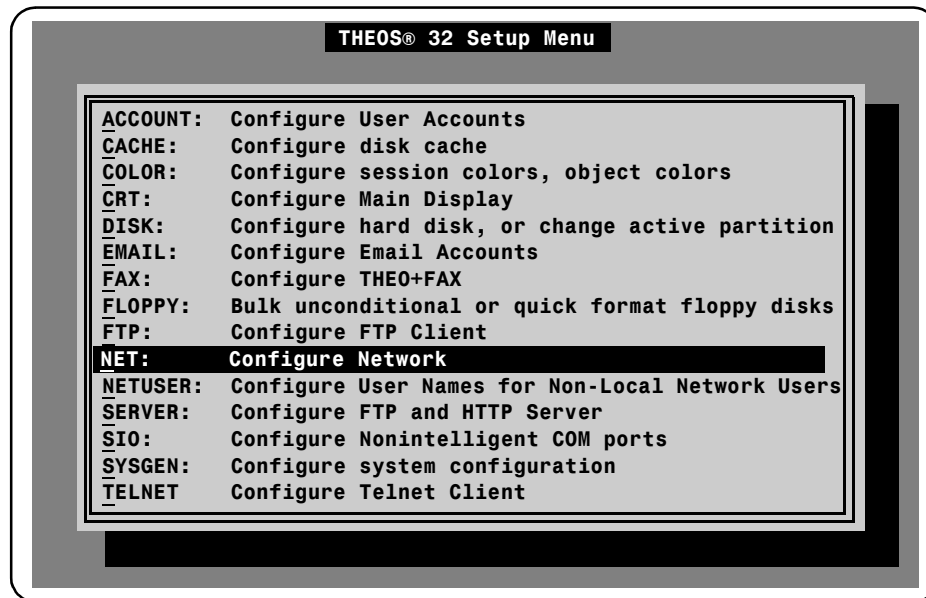
- Operation**

**Mode 1**—Invokes Setup in its menu mode. See “[Setup Menu](#)” below.

**Mode 2**—Bypassing the Setup menu, the *function* screen is displayed. Refer to “[Functions](#)” on page [186](#).
- Setup Menu**

When Setup is invoked with [Mode 1](#), the Setup Menu is displayed. This menu is dynamic because only those components installed on your system are presented in the menu. For instance, if you do not have the THEO+Fax software installed on the system, the FAX menu item is not offered.

There may be additional items displayed on the menu, depending upon any add-on products that you may have installed on your system.



## Functions

The following functions are available only when THEO+Net is installed on the system.

**FTP** Invokes the THEOS FTP Client Configuration screen described on page 206. It configures the FTP client and defines and maintains FTP site definitions.

**NET** Invokes the network configuration screen described on page 187. This is the primary configuration program for THEO+Net.

**NETUSER** Invokes the NETWORK Logon User Maintenance screen described on page 203. This screen defines and maintains user accounts for remote access to this system.

**TELNET** Invokes the THEOS Telnet Client Configuration screen described on page 210.

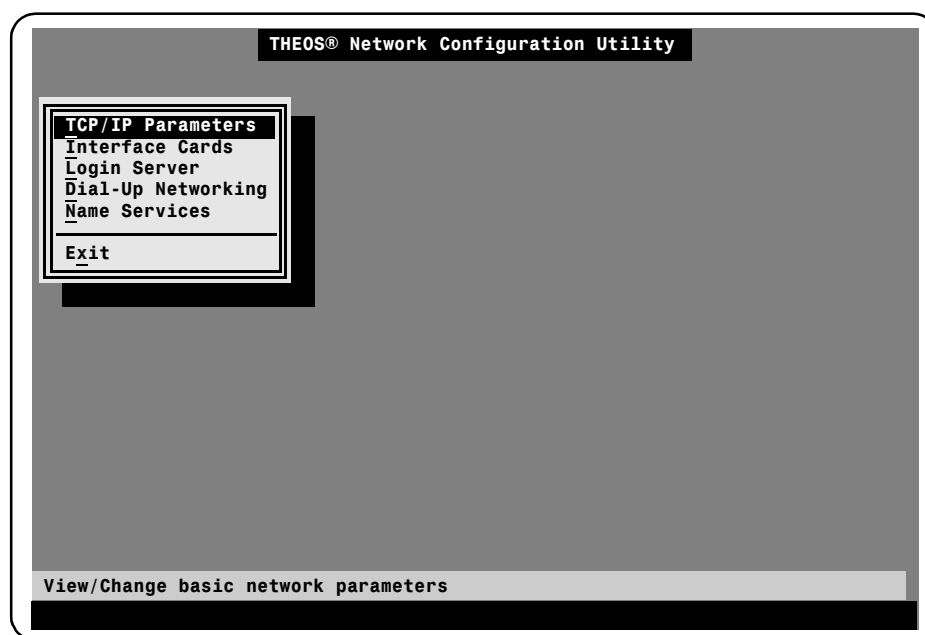
For other menu items in this command, refer to the Setup command description in the *THEOS System Reference* manual or to the appropriate THEOS Plus Pak manual.

**Setup NET**

The “Network Configuration” menu configures the THEO+Net software to use the network adapter card(s) in your system and supplies the information necessary for this server and clients to use the network. This function is available only when THEO+Net has been installed on the system.

This menu allows you to define the physical components of the network ([Interface Cards](#)), the identity of your computer on the network ([TCP/IP Parameters](#)), the THEOS Network Login Server attributes ([Login Server](#)), the location of the Domain Name Servers ([Name Services](#)) and any PPP dial-up networking profiles ([Dial-Up Networking](#)).

The host names screen ([View/Maintain Host Names Database](#)) defines names and their associated IP address. These names can be used by the various client programs and network utility programs when specifying other nodes on the local intranet or the Internet.



SETUP

Use the normal menu selection keys to select the desired item.

Be sure to get advice and permission from your network administrator before making changes to the network configuration.

## ■ TCP/IP Parameters

**TCP/IP** refers to the Transmission Control Protocol/Internet Protocol used by the network. This item defines the identification of your computer on the network. It maintains the section “[Login Server]” in the file `sys-TEM.TEOS32.NETCFG`.

```

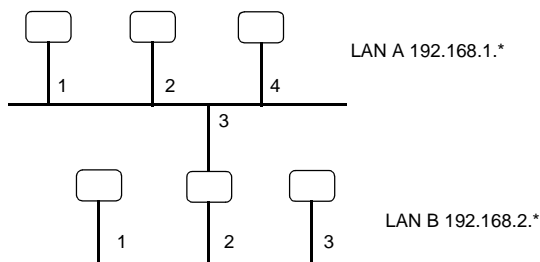
Computer Name:      MYNAME
Default Gateway:
Auto Start Network: Yes
Start TCP services: Yes
Number of Sockets: 64
  
```

**Computer Name.** The computer name is an alternate and descriptive method of identifying a node of the network. The name specified here is the description used when displaying your network connections.

Specify a name for your computer on the network. The name should be unique on the network and may be as long as 15 characters. It can contain alphanumeric characters and the dash character ( - ).

**Default Gateway.** This field specifies the machine used to forward network traffic off of the local network (LAN). When an address is specified here, and a connection is requested or a message is to be sent to an address that is not on the local network, this request or message is sent to the gateway system for forwarding to the proper system.

1. If this system is part of a network that is connected to another network, specify the name or IP address of the node that is operating as a gateway to the other network(s). For instance, in the following network the machine connected to both LAN A and LAN B is operating as a gateway. It has two NICs in it, one for each LAN. The nodes 1, 2 and 4 of LAN A would specify node 3 as their gateway; the nodes 1 and 3 of LAN B would specify node 2 as their gateway.



2. Leave this field blank if you only have access to the LAN that this system is on.
3. Also, if this system is operating as the gateway used by other nodes of the network (this machine has two or more NICs or one NIC and a dial-up connection), and there is no other gateway on the network, leave this field blank. In the above diagram, node 3 of LAN A and node 2 of LAN B would not have a gateway defined because they are the gateway.

For additional information about gateways, refer to Chapter 3 “[Bridges, Routers and Gateways](#),” starting on page 45.

**Auto Start Network.** A “Yes” entry specifies that the network is started and enabled when the computer is booted. A “No” entry causes the network to not start automatically on system boot.

When the network is started, either automatically on boot or manually with the **Net Start Network** command, all other network servers specified as automatic start are also started. When the network is not started no other network servers or network services are started and they cannot be used until the network is started.

**Start TCP services.** A “Yes” entry specifies that the [TCP Simple Services](#) are started and enabled when THEO+Net is started. A “No” entry means that the TCP Simple Services are not started automatically when the network is started. TCP Simple Services are described on page 25. TCP Simple Services can be started manually with the **Net Start TCP** command.

TCP Simple Services require a significant amount of memory to operate. If you do not use these services, you should disable them.

**Number of Sockets.** A socket is the basic communications device used by the TCP/IP protocols. A pair of sockets is assigned and used for each user connected to the Login Server. Additional sockets are used for other purposes. Enter the number of sockets that you want maintained by the protocol manager. The default value of 64 will support 20 to 30 user connections to the Login Server. The maximum value of 255 will support approximately 120 network users.

## ■ Interface Cards

This menu item invokes a submenu that allows you to define the Network Interface adapter Cards (NIC) used in your system and the parameters necessary to access them. THEO+Net allows each THEOS system on the network to have as many as eight NICs, each with its own IP address or addresses. A NIC is the physical link between your computer and a network segment.

Every system on the network must have at least one NIC or PPP interface and this interface setup must be done for each THEOS computer system on the network. This setup screen maintains the section “[Interface *n*]” in the file SYSTEM.THEOS32.NETCFG.

## SETUP



Be particularly careful when defining and maintaining the parameters for your network cards. The most common cause of network failure is incorrect configuration of the interface cards.

You may add and maintain as many as eight NICs. To add a new card to the system use the [Add Interface](#) menu item; to view or modify an existing definition, merely position to the desired interface number and press [Enter ↵](#). Use the [Delete Interface](#) menu item to remove a definition.

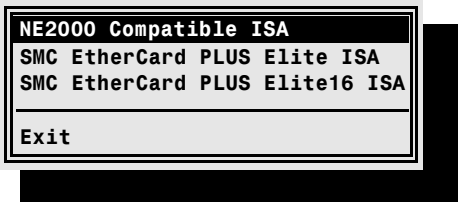
The numbers used for the interface definitions are assigned by the Setup NET program and are always consecutive. This means that, if interfaces 1

and 2 are defined and you add another interface, it will be numbered 3. Also, with interfaces 1, 2 and 3 defined, when interface 2 is deleted, the remaining interfaces are numbered 1 and 2.

A grayed interface item indicates that it is undefined and cannot be selected.

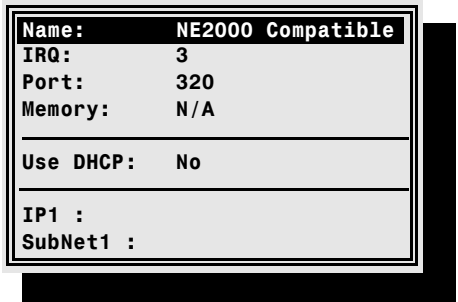
When adding, viewing or modifying an adapter definition, you can press **F10** to save any changes that you have made or you may press **Esc** to discard your addition or change.

**Add Interface.** When adding a new interface card you must first specify the type of card. You must have the card physically installed in the computer so that the setup process can offer the appropriate selection of card types available. For instance, the following menu displays when there is an ISA network card installed in the system.



SETUP

Select the appropriate card type from the list offered. If your card type is not offered the card is either not supported or you have not installed it correctly. After a card is selected the following screen displays (it may be slightly different depending upon the card type selected).



- IRQ:** Set this field to the interrupt request value used by the interface adapter.
- Port:** Set this field to the I/O port number used by the interface adapter.

**Mem:** If applicable to the adapter, specify the starting address of the dual-ported memory used by the network card. When not applicable, this field cannot be selected.

**Use DHCP:** This Yes/No field specifies whether the IP address for this interface is static and defined in this setup (“No” value) or is defined by a Dynamic Host Configuration Protocol (DHCP) server (“Yes” value).

Do not set this field to “Yes” unless you have a DHCP server on your network and you want the IP address of this interface assigned by that server.

A short discussion of DHCP is provided in Appendix D: “[DHCP](#),” starting on page [255](#).

**IP 1:** The TCP/IP address is a unique identification for each network adapter on the network. This address has four components separated by periods or “dots.” Specify the dotted, IP address for this interface adapter.

**Subnet Mask 1:** The subnet mask field helps the network software be more efficient when connected to large networks. For Class C networks the recommended mask is 255.255.255.0.

As many as 32 TCP/IP addresses and subnet masks may be defined for each interface board. However, the TCP/IP addresses assigned to all interfaces defined for this system cannot exceed 32. Although the reasons for providing multiple IP addresses for a board are complex, when defined, the interface card can accept messages to any of the addresses equally.

Note: Setup NET does not permit the definition of an IRQ, I/O port or memory address which has already been assigned to another adapter.

**Delete Interface.** When selected, a list box appears showing all eight interface adapter numbers. All undefined adapters are grayed and cannot be selected. Select the adapter number that you want to delete and its definition is completely removed from the network configuration. Press **[Esc]** to return to the main menu without deleting any adapters.

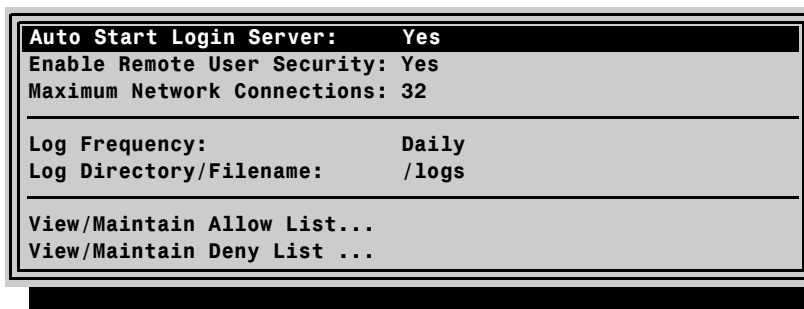
**View or Modify Interface.** There is no specific menu item for viewing and modifying existing interface definitions. Merely position to the interface number and press **[Enter ↵]**. The existing definition for the adapter is displayed and you can position to each field and change it if you desire.



Some network interface cards use a DOS configuration utility to define and change their setup parameters. To run this utility you will have to boot the system with a DOS system diskette or a DOS partition on your hard drive. Note the parameters provided by that utility and use them when setting up the THEO+Net software.

## ■ Login Server

The Network Login Server is that portion of THEO+Net responsible for allowing other computers to connect to this system as a user. When enabled, the Login Server allows other THEOS systems on the network to connect to this server system with the [NetTerm Client](#) software or the [Telnet Client](#). Other Windows-based systems on the network can connect to this server with [THEOS WorkStation Client](#) software or with Telnet client software.



<b>Auto Start Login Server:</b>	<b>Yes</b>
<b>Enable Remote User Security:</b>	<b>Yes</b>
<b>Maximum Network Connections:</b>	<b>32</b>
<hr/>	
<b>Log Frequency:</b>	<b>Daily</b>
<b>Log Directory/Filename:</b>	<b>/logs</b>
<hr/>	
<b>View/Maintain Allow List...</b>	
<b>View/Maintain Deny List ...</b>	

SETUP

**Auto Start Login Server.** A value of “Yes” in this field causes the “network Login Server” to be started when the network is started. When this field is “No,” the Login Server is not started when the network is started. The Login Server may be started and stopped manually after the network is started by using the Net START or Net STOP commands.

**Enable Remote User Security.** A “No” entry disables remote user protection. The default for this field is “Yes,” meaning that remote user security is normally enabled.

Remote user security applies to network clients ([NetTerm Client](#), [Telnet Client](#), [THEOS WorkStation Client](#)) that are on a network other than the local network used by this Login Server. That is, their IP address is not in the same subnet as the IP address for the Login Server. When remote user security is enabled, the network user names and passwords defined by the [Setup NETUSER](#) program are used to control access to this server. Clients on the same subnet as this server will not be asked for a network account name and password, even when remote user security is enabled.

Setting this field to “No” means that any NetTerm, Telnet or TWS client can logon to this server if they have network access to the machine. No special user name or password will be requested of them. This may be very dangerous, depending upon how easy your network is to access by outside users.

**Maximum Network Connections.** Specify the maximum number of network sessions that may be connected at one time to this Login Server. This value must be in the range of 8–128. The reason for restricting the number of network sessions is that a network connection requires more resources by the operating system than a non-network connection, both in memory requirements and in computer time needed to service the connection.

Although each network user is counted as one of the users for your Power Step, a network user may have several session connections to the server. After the initial connection, additional sessions by the same network user do not count against the Power Step. However, each network session connection counts against the value specified in this field.

**Log Frequency.** This field specifies whether or not network history information is saved and how frequently the file is “rotated.” When this field is set to “N” no network history is maintained.

With this field set to “One,” “Daily,” “Weekly” or “Monthly” records are written to the network log file every time that a major event occurs with the network. For more information about these files, refer to “[Network Log File](#)” on page 246.

**Log Directory/Filename.** This field is used only when the previous field is not set to “N.” It specifies the path and possibly the name of the network log file. When the [Log Frequency](#) field is “Single” both the path and file name of the log file is specified here. When the [Log Frequency](#) field is “Daily,” “Weekly” or “Monthly” only the path to the log file is specified. The specific log file name will be determined by the log file name rules described in “[Network Log File](#)” on page 246.

Note: When the logging is enabled, THEO+Net appends log entries to the file every time there is connection or disconnection activity. Over time, this file can become quite large. Either clear the file periodically, or disable this feature when logging is not needed for diagnostic purposes.

#### ■ View/Maintain Allow List, View/Maintain Deny List

The Allow and Deny lists are lists of IP addresses that the Logon Server on this system uses to determine whether or not a remote site is allowed to connect to the server. The allow list is a list of addresses, address ranges

and address subnets that are specifically allowed to connect to the server. The deny list is a similar type of list of addresses that are specifically not allowed to connect to the server.

Both lists of IP addresses are used in sequence. For instance, if a site matches one of the entries in the allow list and also matches one of the entries in the deny list, the site is not allowed to connect.

A list is only checked if there is at least one entry defined in the list. For instance, if there are no entries in the allow list but there is an entry in the deny list, then all sites are allowed to connect except those listed in the deny list.

For further information about the usage of allow and deny lists, refer to Chapter 5 “[Network Security](#),” starting on page [63](#).

An entry in the allow or deny list may be specified in one of several forms:

- ▶ The host name as defined in the file [SYSTEM.THEOS32.HOSTS](#). This file is maintained by the [View/Maintain Host Names Database](#) screen in this Setup command.

**my-company**

- ▶ Or the domain name as registered with the Domain Name Service specified in [Name Services](#) screen in this Setup command.

**myisp.com**

- ▶ The dotted IP address for a site.

**207.21.75.100**

- ▶ The dotted subnet IP address for a group of sites.

**192.168.\*.\***

With this syntax, all sites whose IP address matches the wild-card specification are treated as a match for the list.

- ▶ A range of IP addresses or subnet IP address.

**192.168.50.0 - 192.168.50.48**

This syntax specifies that all sites will match if their IP address is greater than or equal to the first IP specified and less than or equal to the second IP specified.

Note: Host and domain names may be specified in this range syntax form. These names always resolve to specific IP addresses, so their numeric value can be compared.

ftp.mycompany.com - mail.mycompany.com

Of course, the host name must be defined in the host names database or the domain name must be registered with the DNS server in order for it to have a value. Although the name will resolve to a specific IP address, it might not resolve to the same address each time. Some domain names are registered with multiple IP addresses.

**View/Maintain Allow List.** Allows you to view, add or delete entries in the allow list. When selected, a window displays the existing entries in the allow list.

SETUP



INS=New Entry DEL=Delete ENTER=Modify F1=Help F9=Exit F10=Save & Exit

As the instructions at the bottom of the screen indicate, use the **[Ins]** key to add a new entry, the **[Del]** key to delete a selected entry, the **[F10]** key to save the changes and exit to the main menu, and the **[Esc]** key to exit to the main menu without saving any changes.

**View/Maintain Deny List.** Identical to the “View/Maintain Allow List” described above, except that the list is the deny list.

## ■ Dial-Up Networking

This menu item should be used only when this computer system connects to a PPP server such as an Internet Service Provider (ISP). Dial-up networking uses Point-to-Point Protocol (PPP) over a serial data cable instead of Ethernet over coaxial or twisted-pair cable. Dial-up networking can be used in addition to Ethernet networking.

```
Auto Start Dial-Up Server: No
Tone Dial:                      Yes
Log Frequency:                  Daily
Log Directory:                  /logs

View/Maintain Profiles ...
```

**Auto Start Dial-Up Server.** A value of “Yes” in this field causes the PPP Server to be started when the network is started. When this field is “No,” the PPP Server is only started and stopped with the Net START PPP and Net STOP PPP commands.

**Tone Dial.** Specify “Yes” if you want all of the profiles to connect using tone dialing. A “No” in this field defaults to pulse dialing.

If a profile requires a different dialing method, you can override the setting here by using the “T” or “P” characters in the telephone number.

**Log Frequency.** This field specifies whether or not PPP connections are logged and how frequently the file is “rotated.” When this field is set to “None” no PPP logging is maintained.

With this field set to “Single,” “Daily,” “Weekly” or “Monthly” records are written to the PPP log file every time that a major event occurs with the PPP client. For more information about these files, refer to “[DialUp Networking Log File](#)” on page 248.

**Log Directory.** This field is used only when the previous field is not set to “N.” It specifies the path and possibly the name of the PPP log file. When the **Log Frequency** field is “Single” both the path and file name of the log file is specified here. When the **Log Frequency** field is “Daily,” “Weekly” or “Monthly” only the path to the log file is specified. The specific log file name will be determined by the log file name rules described in “**DialUp Networking Log File**” on page 248.

Note: When the logging is enabled, DUN appends log entries to the file every time there is connection or disconnection activity. Over time, this file

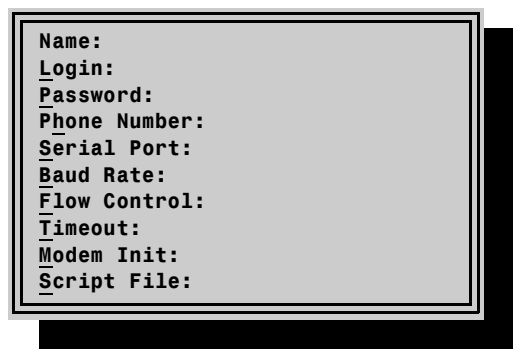
can become quite large. Either clear the file periodically, or disable this feature when logging is not needed for diagnostic purposes.

**View/Maintain Profiles.** This item allows you to create new profiles, change or delete existing profiles. A profile definition describes how to connect to a remote PPP server and identifies your account on that server.

Selecting this menu item presents you with a list of the profile names already defined. You can create a new profile definition by pressing the **Ins** key, delete an existing profile by selecting it and pressing the **Del** key, or modify a profile by selecting it and pressing **Enter ↵**.

When you create a new profile or modify an existing one, the following window displays:

SETUP



```

Name:
Login:
Password:
Phone Number:
Serial Port:
Baud Rate:
Flow Control:
Timeout:
Modem Init:
Script File:
  
```

**Name** This field is the “key” to this profile definition. The name entered here is the name that is used by all other programs when they need to find the profile definition that they will use.

The profile name is a case-insensitive, alphanumeric field and can be 1–31 characters in length. Space characters are allowed in this name.

**Login** Enter your login name for your account with this provider. Typically, this will be your e-mail user name, but not necessarily. Your provider will provide you with this information.

The login name is a case-sensitive field and must be specified exactly as your provider specifies. Setup allows you to specify login names up to 255 characters in length.

**Password** Enter the password for your account with this provider. The password field allows you to enter mixed-case passwords con-

taining alphanumerics, spaces and punctuation characters and may be 255 characters in length.

While entering the password, you can see the characters that you are typing. However, after you position to another field or save this profile definition, the characters are replaced with asterisks and you will never be able to see the password value in plain text again. Before moving to the next field be sure that you have entered the password correctly.

**Phone Number** Enter the telephone number for the Internet Service Provider. This number field is 255 characters long and may contain any of the characters that are valid for an ATD modem command. Refer to Appendix B: “[Modem Dialing Codes](#)” on page 251 for a list of these codes.

**Serial Port** Enter the name of the physical serial port. This is a name such as SIO1, SIO2, MULTI3, *etc.*, not COM1, COM2, *etc.* This is the port that the modem is physically connected to.

**Baud Rate** When you position to this field, a list-box displays the valid baud rates that you may use. The baud rate specified here is the transmission speed between the serial port and the modem, not the speed between your modem and the remote PPP server’s modem.

For instance, if you have a 33.6Kb modem, select a baud rate of 38,400 or better. The baud rate specified here is the maximum speed that may be used for the connection between the two modems.

If your serial port is not an intelligent, buffered serial port, you should probably use a baud rate of 19,200 or less.

**Flow Control** When you position to this field, a list-box displays the available flow controls that you may use. Flow control is used to prevent data loss between the computer and the modem. Most modems support and use CTS flow control.

**Time-out** Enter the number of minutes that the connection may remain idle (no packets sent or received) before it is automatically disconnected. A time out value of zero indicates that the connection is not automatically terminated when idle.

**Modem Init String** If the modem used by this profile requires an initialization string, specify it here. Refer to the modem’s documenta-

tion for information about initialization requirements. If you have connection problems, your ISP may be able to provide some assistance with this topic. The input length for this field is 255 characters.

**Script File** If your ISP requires special commands or text strings to log in, create a Modem Script Language (MSL) file that performs these special operations and specify the file name here.

The Modem Script Language is described in the *THEO+Com Installation and User's Guide*.

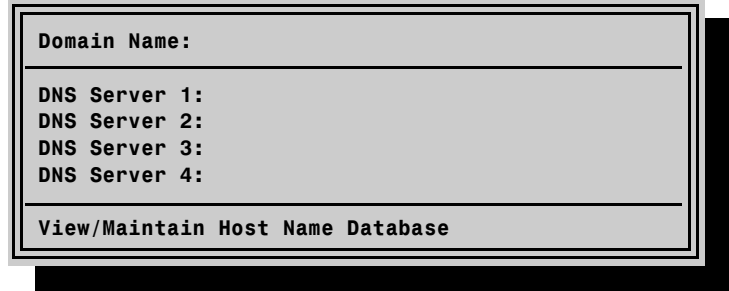
All of the fields except **Modem Init String** and **Script File** are required fields and must be specified.

To save a profile definition, use the **[F10]** key. You may exit this screen without saving your changes or additions by pressing the **[Esc]** key.

### ■ Name Services

A Domain Name Service (DNS) server is a server that is responsible for looking up and translating domain names into TCP/IP addresses. Normally, the Internet Service Provider (ISP) provides these servers. For instance, a request for “theos-software.com” is translated by a DNS server into “207.21.75.100.”

If you do not have access to the Internet from this system, do not enter any DNS server addresses and do not specify a domain name.



**Domain Name.** If you have acquired a domain name from a domain name registration service enter the name assigned to you by that service. The name used here must be recognized by other network's DNS servers.

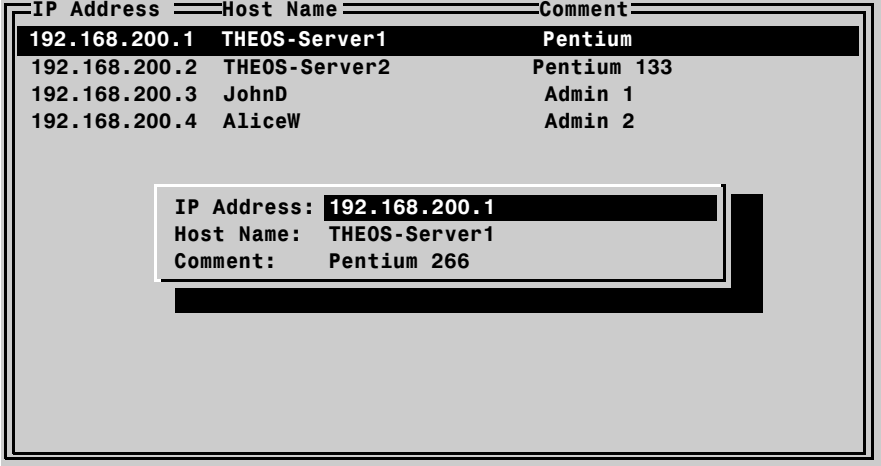


**DNS Servers.** This selection allows you to enter the TCP/IP addresses of up to four DNS servers. These addresses are provided by your Internet Service Provider (ISP).

Note: Some proxy servers do not proxy DNS requests but operate as a DNS server themselves (by using the true DNS servers defined in the proxy's own configuration). For these types of proxies, specify one DNS server and use the proxy server's IP address.

Also, if you have enabled Use DHCP (see page 192) for one or more of the NICs you should not specify any DNS servers in this screen. The DHCP server will provide the appropriate DNS server IP addresses.

**View/Maintain Host Names Database.** This item maintains the SYS-TEM.THEOS32.HOST file and allows you to define names for the other machines on the network. Although this database is not necessary for successful operation of the network, the information in it makes the identification of network nodes much more convenient.



IP Address	Host Name	Comment
192.168.200.1	THEOS-Server1	Pentium
192.168.200.2	THEOS-Server2	Pentium 133
192.168.200.3	JohnD	Admin 1
192.168.200.4	AliceW	Admin 2

IP Address:	192.168.200.1
Host Name:	THEOS-Server1
Comment:	Pentium 266

SETUP

Instructions at the bottom of the screen tell you how to add new entries, delete or change existing ones, and how to save your changes and additions.

Host names may be up to 15 characters in length, may contain letters, digits and the dash character but they must start with a letter. Both upper and lowercase letters may be used.

The information in this database is used by the Net **PING** and Net **PINGALL** commands for displaying the names of the systems that are connected to

the network. It is also used by other clients to allow you to connect to machines with these names instead of the cryptic IP addresses. For instance, with the above host name definitions you can NetTerm "John D" instead of NetTerm 192.168.200.3.

#### ■ Exit

Exits Setup. Any changes made during this session have already been saved. Most changes are saved within submenus, so there is no “exit without saving” option for this main menu.

The only changes that are effective without restarting the network are: [Enable Remote User Security](#), [View/Maintain Allow List](#), [View/Maintain Deny List](#), and changes to [View/Maintain Profiles](#). All other changes are saved but not effective until the server is restarted. If the network is already started, the changes are not effective until the system is rebooted.

**Setup  
NETUSER**

The “Logon User Maintenance” menu maintains and displays the data in the SYSTEM.TEOS32.\_NET\_USR file. This information is used to control access to this THEOS server from remote network connections. A remote network connection is a network node that is not on the local network, as defined by the [Setup NET](#), [Interface Cards](#) configuration.

Note: Remote user access control is enabled by default. However, it can be disabled by setting [Enable Remote User Security](#) to “No” in the [Login Server](#) configuration, described on page [193](#).



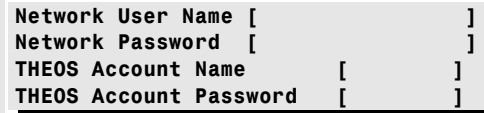
Use the normal menu selection keys to select the desired item.

To add a new user to the system use the [Add User](#) menu item; to modify an existing definition, use the [Change User](#) menu item. Use the [Delete User](#) menu item to remove a definition.

When adding, viewing or modifying a user definition, you can press **[F10]** to save any changes you have made or you may press **[Esc]** to discard your addition or change.

## ■ Add User

When adding, viewing or modifying a user definition, you are presented with a user maintenance window.



```

Network User Name [
Network Password [
THEOS Account Name [
THEOS Account Password [
  
```

**Network User Name** Enter the name to be used by a remote user when connecting to this server. Network user names may contain up to 16 characters of uppercase or lowercase letters, digits, spaces and other punctuation characters. Leading and trailing spaces are removed and multiple, embedded spaces are reduced to single spaces.

**Network Password** Enter the password for the user name. Network passwords may also be 16 characters long and may contain the same type of characters as network user names.

Each network user name must have a password with at least three characters.

**THEOS Account Name** This is an optional field. When specified, and when a user connects using the network user name and password, they will be automatically logged into the account name specified here.

If desired, enter the account name for an account that currently exists on this THEOS network server.

**THEOS Account Password** When a THEOS account name is specified in the previous field, you may also provide the password for that account here. When a password is entered here, it must be the password already defined for the account name.

When an account name is specified that has a password, but no password is provided in this field, a remote user connecting to this THEOS server with this network account name will be asked for the password for the THEOS account each time that the user attempts to connect.

### ■ Change User

When selected, the user maintenance window is displayed with the same four fields as described above. When the network user name is entered, it must be for a name already defined. The associated information is then displayed in the three remaining fields and you can change any of the information except the network user name. The network password information is always displayed as 16 asterisk characters.

### ■ Delete User

When selected, the user maintenance window is displayed with the same four fields as described above. When the network user name is entered, it must be for a name already defined. The associated information is then displayed in the three remaining fields and you are asked to confirm the deletion of the entry.

### ■ List Users

When selected, a list-box window displays the network user names and any associated THEOS account names. If the account name has a password defined in the database, an asterisk is displayed. The network password information is not displayed.

### ■ Exit

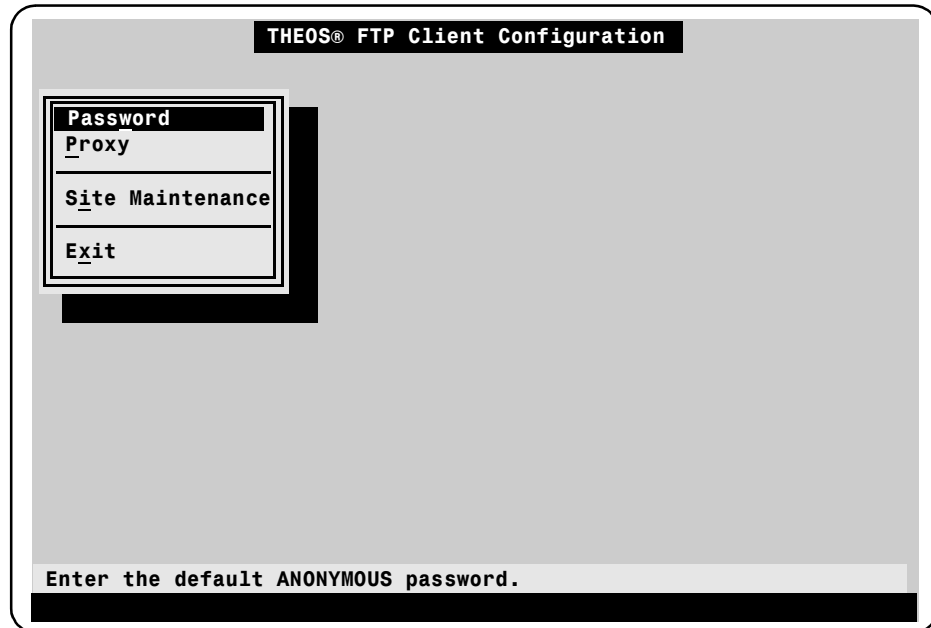
This menu item saves any changes made and exits Setup.

You can exit without saving your changes by pressing **[Esc]**.

Changes made to user definitions become effective immediately, without restarting the network.

## Setup FTP

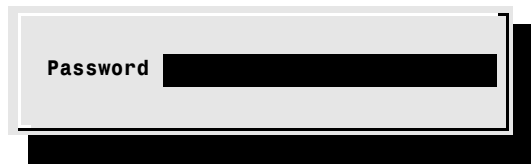
The “FTP Client Configuration” menu maintains and displays the data in the SYSTEM.TEOS32.FTPCFG file. This information is used for the default configuration when the [FTP Client](#) is invoked.



Use the normal menu selection keys to select the desired item.

### ■ Password


Use this selection to define or change the password used when an anonymous FTP connection is made.



The password defined here is used when an anonymous logon is performed without specifying a password at logon time. The anonymous logon password is typically your Internet e-mail address, although it may be anything you want that is also acceptable to the remote FTP server.

## ■ Proxy

Use this selection to define or change the default proxy server address.



Enter the dotted IP address or the domain name for your default FTP proxy server.

Specifying a proxy name or IP address here tells the [FTP Client](#) that FTP sites are accessed via a proxy server by default. If a proxy server is not used to access FTP sites, or is used infrequently, leave this field blank.

The proxy server may also be specified with the PROXY command-line option when the [FTP Client](#) is invoked. If a proxy server name is specified here in setup, and you do not want to use a proxy server for a specific connection, the NOPROXY command-line option may be used. See also “[Using a Proxy Server](#)” on page 57.

SETUP

## ■ FTP Sites

The FTP site definitions maintained or displayed with these screens are used by the [FTP Client](#) program as shortcuts to commonly visited sites. By using a site definition, you can predefine a simple name that specifies the FTP server address or name, your user name and password for that site, the initial directories to be used for both the remote site and the local system, and the transfer mode for files transmitted.

For instance, a common connection to the THEOS download site:

```
>ftp ftp.theos-software.com
User-name: anonymous
Password: me@myisp.com
Welcome to THEOS Software Corporation FTP site.
Anonymous user logged in.
-----
FTP? binary
Using Binary mode to transfer files.

FTP? cd theos
CWD command successful.

FTP? lcd download
Local directory: /DOWNLOAD:S

FTP?
```

The same connection could be done using a site definition with the single command:

```
>ftp theos
Welcome to THEOS Software Corporation FTP site.
Anonymous user logged in.
-----
Using Binary mode to transfer files.
CWD command successful.

FTP?
```

**Site Maintenance.** Displays a list of the existing definitions for your sites. With this selection, you can also see the complete definition for a site entry.

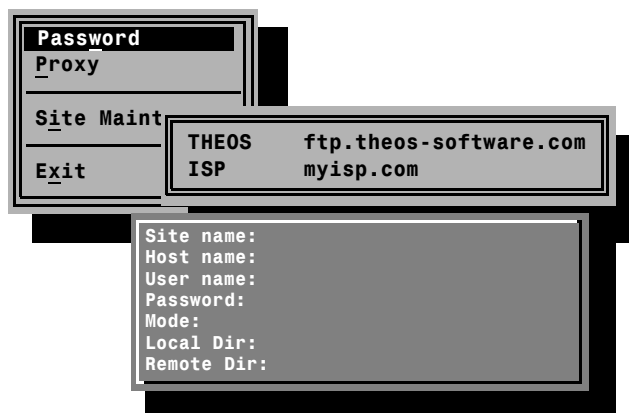


Use the arrow keys to position within the list of defined sites and press **Enter** to display the site definition for the selected site. That screen allows you to view or change the definition.

The **Esc** key exits the view list and returns to the main menu.

Press **Del** to delete an existing site definition.

Press **Ins** and a screen displays allowing you to define a new site definition.





**Site name:** Enter a simple name using alphanumeric characters only. Site names are case-insensitive and may be one to eight characters in length. If the name is already the name of a defined site, an error message appears and you must enter a different name.

**Host name:** Enter the FTP server name or address. This may be specified as a host name, domain name or a dotted IP address.

**User name:** Enter your user account name for the FTP site. You may also enter “anonymous” to connect as an anonymous user.

**Password:** Enter the password associated with the account name.

If the account name is “anonymous,” enter your e-mail address. When no password is entered for anonymous accounts, the default FTP **Password** will be used.

**Mode:** Enter an “A” for **ASCII** transfer mode or a “B” for **BINARY** transfer mode. Entering any other character is interpreted as ASCII.

**Local Dir:** Enter the path name of the initial current working directory on your local system. This directory does not have to exist at this time, although it should exist at the time this site definition is used for a connection. The name specified here is used for an initial **LCD** command when the connection is made with this site definition.

**Remote Dir:** Enter the path name of the initial current working directory on the remote FTP site. This name is used for an initial **CD** command when the connection is made with this site definition.

The site name and host name must be specified. If these two fields are not defined when this screen is exited, the definition is not saved. The other fields are optional. You can cancel the creation of a new site by entering **[Esc]**, which returns to the menu without saving the new definition. Pressing **[F10]** saves the definition and returns to the menu, even if some of the fields are undefined (except site and host name fields).

**Setup TELNET** The “Telnet Client Configuration” menu maintains and displays the data in the SYSTEM.TEOS32.TELNETCF file. This information is used for the default configuration when the [Telnet Client](#) is invoked.

THEOS® Telnet Client Configuration

Telnet Proxy

Exit

Enter the Telnet Client Proxy name.

Use the normal menu selection keys to select the desired item.

#### ■ Telnet Proxy Name

Use this selection to define or change the default proxy server address used by the [Telnet Client](#).

Proxy name

Proxy name:

Enter the dotted IP address or the domain name for your default Telnet proxy server.

Specifying a proxy name or IP address here tells the [Telnet Client](#) that Telnet sites are accessed via a proxy server by default. If no proxy server is ever used to access Telnet sites, leave this field blank.

The proxy server may also be specified with the PROXY command-line option when the [Telnet Client](#) is invoked. If a proxy server name is specified here, and you do not want to use a proxy server for a specific connection, the NOPROXY command-line option may be used.

**Setup  
Command  
Restrictions**

The Setup command can only be used when you are logged onto the SYSTEM account (account id zero). And, although the Setup command requires only a privilege level of one, all of the network setup functions require a privilege level of five.

SETUP

# 21 Telnet Client

The Telnet command establishes a client/server connection between this THEOS system and a remote Telnet server system. The remote system need not be THEOS-based.

1   TELNET   *server* ( *options*

2   TELNET   *server port* ( *options*

---

*localhost*

»

LOCALHOST

*server*

»

network server name or id (may also be *localhost*)

*port*

»

numeric port number to use for this session

*options*

»

ANSI

ECHO

NOPROXY

TRACE

CTL

FLOW

PROXY

VT100

VT220

**Operation**      **Mode 1**—Invokes the Telnet client and connects to *server* using its standard Telnet port number (23). Refer to “[Server Specification](#)” on page 217 for information about the *server* parameter specification.

**Mode 2**—Invokes the Telnet client and connects to *server* using its port number *port*. Do not use this mode unless you know that the remote server uses a nonstandard port for Telnet access.

The port value may be specified with a numeric, such as 23, or a name. The name must be the name of a well-known service, such as FTP, HTTP, *etc.* Service names are defined in the file SYSTEM.TEOS32.SERVICES.

- Options**

**ANSI**

Requests ANSI terminal emulation by the Telnet server.

**CTL**

Sets control mode for display of control characters received from the server. Control mode causes all control characters received to be displayed visually. For instance, receipt of a CR is displayed as ^M.

**ECHO**

Displays characters typed on your keyboard. This is the default when [Mode 2](#) is used with a *port* value other than 23.
- This option tells the Telnet client to echo all outbound characters. This character-echo might be in addition to the remote

server or the application running on the server. If characters are displayed twice, then terminate this session and reconnect without the ECHO option.

**FLOW** Displays the commands interchanged between this Telnet client and the Telnet server. When used in conjunction with the [TRACE](#) option, the command interchange is also written to the TELNET.TRACE file.

The flow-control commands may be useful for diagnostic purposes when there is some type of problem negotiating a proper connection with the remote server. These flow-control commands will generally only occur during the start-up phase of the connection:

```
>telnet some.host (flow
Connecting to 192.168.100.4 port 23
..recv: DO TermType
send: WILL TermType
recv: SB TermType SEND
send: SB TermType IS VT220
recv: SB TermType SEND
send: SB TermType IS VT220
recv: WILL Echo
send: DO Echo
recv: DO Window-Size
send: WILL Window-Size
send: SB NAWS 80 24
session text begins here...
```

For a description of the meanings of any flow-control commands displayed, refer to [RFC 854](#).

**NOPROXY** If the Telnet configuration file ([SYSTEM.TEOS32.TELNETCF](#)) specifies a default proxy server, this option ignores that specification and connects to the requested Telnet server address directly.

**PROXY** Indicates that, whether or not a proxy server is specified in the Telnet configuration file, the proxy server specified here is used as the proxy server for this Telnet session. The requested proxy server name or IP address is specified immediately following the PROXY option keyword:

```
>telnet myip.com (proxy 128.24.100.0
```

A default proxy server can be specified in the Telnet configuration file ([SYSTEM.TEOS32.TELNETCF](#)) which is maintained by the [Setup TELNET](#), [Telnet Proxy Name](#) screen. When speci-

fied there you do not need to use this PROXY option...the proxy is always used unless the **NOPROXY** option is specified.

**TRACE** All characters displayed by the Telnet client are also copied to the file TELNET.TRACE. If **FLOW** is also specified, those characters are also copied to this file.

The TELNET.TRACE file is written to the system disk, root directory, of the current account. This file will replace any file with the same name.

All characters copied to the trace file are copied in CTL mode, even when the display uses interpreted control codes.

**VT100** Requests VT-100 terminal emulation by the remote server. (Class code 100 on THEOS Telnet Server.)

**VT220** Requests VT-220 terminal emulation by the remote server. (Class code 220 on THEOS Telnet Server.)

## Notes

Telnet is one of three clients used to connect as a user to another computer system on the network.

- ▶ **THEOS WorkStation Client** - Used from a Windows system to establish a user terminal session on a THEOS Login Server system.
- ▶ **NetTerm Client** - Used from one THEOS system to establish a user terminal session on another THEOS system's Login Server.
- ▶ **Telnet Client** - Used from a THEOS system to establish a user terminal session on another system's Telnet Server. The other system may be a THEOS system (a Telnet Server is included as part of the Login Server) or any other system with a Telnet server, such as provided by most Internet Service Providers (ISP). The other system may be on the local intranet or on the Internet.

**RFC 854.** This Telnet client conforms to the standards proposed in RFC 854. That document can be found at many sites on the Internet, including:

`ftp://ds1.internic.net/rfc/rfc854.txt`

`http://www.cres.it/rfc/rfc854.txt`

When connected to the remote server, you may execute any programs on that server that you have access to.

The THEOS Telnet server supports additional terminal emulations not used by this Telnet client. When connecting to a THEOS server from

another operating system's Telnet client, you may be able to use: ANSIC, ANSICOLOR, SCOANSI, SCO-ANSI, VT320, DEC-VT220, VT220AM, DEC-VT100, WYSE-50, WYSE50, WYSE-60, WYSE60, PCTERM, PCTERM-US, PCTERM-UK and PCTERM-SP. Whether or not any of these are actually used will depend upon the Telnet client.

### ■ Connecting to a THEOS Telnet Server

Telnet can connect to a THEOS Login Server if the THEOS system has its Login Server started (see “[Start the Login Server](#)” on page 147). When connected to a THEOS Telnet Server, you are emulating a “dumb terminal” connected to the THEOS system. You will not be able to use your local printer as a slave printer and you cannot transfer files back and forth with the [Net Command](#).

**Localhost:** For testing purposes, you can connect to your own system's Telnet server by using the *server* name of localhost. This is a reserved host name that always refers to the client system.

**Console Attachment:** When you first connect to the THEOS Telnet Server your console attachment will have a line and page size that is equal to your local system's line and page size. After you logon you may change the console attachment to another size supported by your local system. If you change your console screen size during the Telnet session, when you terminate the session your console will be reset to its original width and depth.

**Break Signal:** To transmit a break signal to the THEOS Telnet Server, use the `^Q` key (single back quote). For instance, to tell the THEOS Telnet Server to abort the program that it is running, press `^Q,^Q`. To type a back quote that is not interpreted as a break signal, press `^Q,^Q`.

**Terminating Session:** Executing the LOGOFF command on the THEOS Telnet Server will log off of the account but it will not terminate the Telnet session. Use the EXIT command to logoff and disconnect from the server.

### ■ Terminating Telnet Sessions

A Telnet session is terminated and the Telnet program is exited when you either fail to make a connection to the Telnet Server or, after making the connection, you use the server's “log off” command. The name of this command is dependent upon the server but will generally be LOGOUT, BYE, QUIT or something similar. Of course, when the server is a THEOS Telnet Server, use the EXIT command.

You may enter `^Break,^Q` to terminate the session, but this is not generally advised. Entry of `^Break,^Q` terminates execution of your Telnet client,



which terminates the connection to the server. It is better to log off the server.

During the Telnet session, characters are not transmitted immediately. This is done to reduce the traffic between the two systems, which is especially important when the two systems are connected via the Internet. Instead, characters typed by you are sent when either of two conditions occur:

- ▶ End-of-line is entered (carriage return), or
- ▶ One or more characters entered followed by a pause of more than one second.

### ■ Server Specification

The specification of the *server*, for [Mode 1](#) or [Mode 2](#), may be accomplished by specifying:

- ▶ The dotted IP address for the server.  

```
>telnet 207.21.75.100
```
- ▶ The host name as defined in the file [SYSTEM.THEOS32.HOSTS](#). This file is maintained by the [Setup NET](#), [View/Maintain Host Names Database](#).  

```
>telnet my-company
```
- ▶ Or the domain name as defined by the Domain Name Service specified in [Setup NET](#), [Name Services](#), [DNS Servers](#).  

```
>telnet myisp.com
```

For instance, your company might be registered with Internic (<http://rs.internic.net/>) with a domain name of `my-company.com`, with an IP address of `128.100.2.1`. If you have specified a host name of “HEAD-QUARTERS” in the host names database with that IP address, you can specify your company’s Telnet site with any of the following *server* specifications:

- ▶ `128.100.2.1`
- ▶ `headquarters`
- ▶ `my-company.com`

Domain names and host names are case-insensitive.

**Restrictions** When the remote server is THEOS-based, and the “Allow/Deny” capability is enabled, your IP address must pass those tests. Other servers may have similar access restrictions implemented.

Also, when the remote server is a THEOS Login Server, it may have enabled its “Remote User Security,” in which case you will be required to enter your network user name and password as defined in the server’s [Setup NETUSER](#) database.

**See also** [Net Command](#), [NetTerm Client](#), [Setup Command](#), [THEOS WorkStation Client](#)

**Example** This first example shows a successful connection to an ISP.

```
>telnet ispname.com
```

```
Telnet Open >ISPNAME.COM  
Connecting...
```

*Possible introductory information messages from the remote Telnet server*

```
login: cpw  
Password:
```

*Other information messages from the remote Telnet server, such as:*

```
For a menu driven interface type menu from the prompt  
TERM was vt100  
Setting default terminal size to 80x24.  
pacifier:~% dir -l  
total 4  
drwx----- 2 cpw user 512 Aug 13 12:11 mail  
drwxr-xr-x 2 cpw user 512 Aug 22 08:07 public_htm  
pacifier:~%exit  
logout
```

In this second example, an attempt is made to connect to the THEOS Internet site. The server name “theos” is defined in the local host-names database so the server name is translated to the IP address defined there. However, this site does not support Telnet connections and the connection request is refused.

```
>telnet theos
```

```
Telnet Open >207.21.75.100  
Connecting...  
425 Unable to connect with remote host
```

In this final example, a connection is made to the home office system over the Internet. The name is defined in your host names database. This system is THEOS-based and has remote security enabled. (The screen is cleared before the Network login window is displayed and after you have successfully entered your user name and password.)

```
>telnet home-office
```

```
Telnet Open >128.100.2.0  
Connecting...
```



```
HOMEOFFICE>show who  
ACCOUNT  = REMOTE  
USERNUM  = 25  
PORT     = 36  
PRIVLEV  = 3  
LOGON    = 11:10:20 11/14/97
```

```
HOMEOFFICE>
```

TELNET

TELNET

# 22 TraceRT Client

The Tracert client reports the path and the time taken for a message to be sent to and received from a remote host. “TRACERT” stands for “TRACE ROUTE.”

1    TRACERT    *server*

2    TRACERT    *server*    ( *options*

---

*localhost*

»    LOCALHOST

*server*

»    network server name or id (may also be *localhost*)

*options*

»    HOPS                    NORESOLVE    RESOLVE

**Operation**      **Mode 1**—Traces the route between you and *server*, using default options of RESOLVE, and HOPS 30.

```
>tracert www.theos-software.com
Tracing route to theos-software.com [207.21.75.100]
over a maximum of 30 hops.

  1  98 ms  ciso.teleport.com [192.108.254.1]
  2   6 ms  s4-6-b0.pdx.rain.net [199.2.96.161]
  3   7 ms  f0.pdx0.verio.net [199.2.96.34]
  4  18 ms  pdx0.mae-west.verio.net [205.238.56.33]
  5  34 ms  mae-west.mae-west1.verio.net [205.238.56.82]
  6  26 ms  mae-west12.paix1.verio.net [205.238.56.94]
  7  45 ms  paix1.paix.verionet [205.238.56.89]
  8  27 ms  f1.paix.wna.net [207.21.100.5]
  9  60 ms  paix1.wc.ccnet.com [207.21.100.10]
 10  25 ms  h108-4-51.ccnet.com [199.108.4.51]
 11 136 ms  theos-21-75-1.ccnet.com [207.21.75.1]
 12  61 ms  theos-21-75-100.ccnet.com [207.21.75.100]

Trace complete.
```

**Mode 2**—Traces the route between you and *server*, using the specified options.

```
>tracert 199.2.117.161 (noresolve hops 10
Tracing route to 199.2.117.161
over a maximum of 10 hops.

  1   3 ms  192.108.254.1
  2  18 ms  199.2.96.161
  3 146 ms  206.163.42.98
  4 130 ms  199.2.117.161
```

Trace complete.

**Options**      **HOPS** *count*   Specifies the maximum number of segments or hops to report. If server is not reached within this number of hops, the trace is abandoned. The default number of HOPS is 30.

**NORESOLVE**   Suppress the translation of IP addresses to domain names.

**RESOLVE**   Translate each IP address to its domain name. This is a default option.

**Notes**      TraceRT is used to determine how many routers are involved in a particular connection to a remote site. Often this will explain why access to some sites appears slow while others are quick to respond. Each router in the path requires additional time to transmit each packet of data. This is particularly noticeable when viewing web pages. Many HTML pages require hundreds of packets of data to be communicated back and forth before the page is completely displayed on the screen.

TraceRT attempts to trace the route that an IP packet travels between you and *server*. It does this by sending a short packet to an unused port on *server*. The message is sent as many times as specified with the HOPS option, or a default value of 30. A field in the header of the packet is used to cause the packet to fail at each of the routers in the path of the message.

The time displayed by TraceRT for each of the hosts is the round trip time that it took for the message to get to that router and return to you.

The times reported by TraceRT will be different, almost every time that it is run. The amount of traffic on the Internet is constantly changing, from millisecond to millisecond. Heavy traffic causes slow delivery because of message collisions and retransmissions over each of the various mediums between you and the destination.

**See also**      [Ping Client](#)

# 23 TWS Command

The TWS command allows users of the [THEOS WorkStation Client](#) on a Microsoft Windows system to control the behavior of the client session window.

<u>TWS</u> <i>function</i>			
<i>function</i>	»	CHANGE DISCONNECT FOCUS MAXIMIZE	MINIMIZE ONTOP RESTORE TITLE

**Operation**      Performs *function* on the [THEOS WorkStation Client](#) session window.

```
>tws disconnect off
>tws change off
>tws ontop on
```

The above commands prevent the operator from disconnecting from the THEOS Login Server and from changing the focus or size of the window used by the [THEOS WorkStation Client](#). Additionally, the window will remain displayed on top of all other windows, even if the [Net Command](#) is used to execute another program ([Mode 6](#)).

- Functions**
- CHANGE OFF    Disables the ability of the [THEOS WorkStation Client](#) user to select another window, either manually with the mouse or keyboard or with the EXEC mode of the [Net Command](#). This function also disables the ability to minimize and maximize the client session window.
  - CHANGE ON    Enables the ability to select another window on the client and to minimize and maximize the [THEOS WorkStation Client](#) window.
  - DISCONNECT    Disconnects this workstation session.
  - DISCONNECT OFF    Prevents the user from disconnecting this [THEOS WorkStation Client](#) session.

**DISCONNECT ON** Enables the disconnect feature of the [THEOS WorkStation Client](#), for this session only.

**FOCUS** Causes the [THEOS WorkStation Client](#) program to become the active window on the client system. If the window was minimized, the window is restored to its prior size as it is activated.

**MAXIMIZE** The window used by the [THEOS WorkStation Client](#) session is set to its largest size.

**MINIMIZE** The window used by the [THEOS WorkStation Client](#) session is minimized to an icon and the prior window is selected as the focus.

**ONTOP OFF** Disables the “on-top” feature for the [THEOS WorkStation Client](#) session window. That is, when the window is not the active window, other windows may overlay it.

**ONTOP ON** Enables the “on-top” feature for the [THEOS WorkStation Client](#) session window. That is, when the client session window is not the active window, it still is the topmost window displayed on the screen and might overlay the window that has the focus.

If the client session window is currently minimized, the on-top feature is not evident until the window is restored. That is, the minimized icon is not displayed on top of other windows.

**RESTORE** The [THEOS WorkStation Client](#) session window is restored to its size before being maximized or minimized.

**TITLE** “*title*” Change the title used in the [THEOS WorkStation Client](#) session window.

## Notes

Although this program can be executed from the command line, it is normally used in an EXEC language program or by an application program. The operator of the [THEOS WorkStation Client](#) has on-screen controls that can control most of these functions and operations.

The CHANGE, DISCONNECT and ONTOP functions of the [THEOS WorkStation Client](#) session can only be enabled/disabled with this program. There are no comparable screen-buttons or menu items that the operator can use to access these functions.

## Restrictions

This program is only effective when it is executed in a partition that has a [THEOS WorkStation Client](#) for a console.

## See Also

[Net Command](#), [THEOS WorkStation Client](#)



# **Part IV** \_\_\_\_\_

## **THEOS WorkStation**

### **Installation and Reference**



# 24 THEOS WorkStation

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THEOS WorkStation is designed to provide easy connectivity between Microsoft Windows For Workgroups 3.11, Windows 95/98, or Windows NT systems and a THEO+Net Login Server. The Login Server is the portion of THEO+Net that allows users to log onto the THEOS system from a network client system. Before the introduction of THEOS WorkStation, connecting to a THEOS system from a Windows-based PC required an RS-232 serial port and cable for each user. Each user would then run a DOS-based terminal emulator program, such as ScanTerm, to access the server.

THEOS WorkStation simplifies connectivity. It replaces any serial connections between the THEOS system and the Windows clients with a single Ethernet cable that can support up to 128 clients simultaneously. All that is required is one Ethernet card for the THEOS server, one Ethernet card for each client, and appropriate network cabling and hardware to connect the clients to the server.

## ■ What You Can Do With THEOS WorkStation

- ▶ Connect a THEOS application server to a Windows-based desktop.
- ▶ Increase security and simplify tape backup procedures by storing imported files on the server and transferring them back to the client when needed using the built-in file transfer feature. Mission-critical files can be stored on the server and routinely backed up by system manager.
- ▶ Use printers on the Windows clients as local THEOS printers.
- ▶ Windows-compliant features such as Copy/Paste and font selection options are also available. On-screen THEOS application server data can be pasted directly into a Windows application.
- ▶ Integrate your THEOS application directly into the Windows desktop by creating an icon for it. The login process can be fully automated and users can be placed directly into any THEOS application simply by double-clicking the mouse on the THEOS WorkStation icon.

## ■ **Software and Hardware Requirements**

The THEOS WorkStation client for Windows and Windows NT is supplied on a single diskette and is installed after the Windows software is already installed and running.

If you are installing the THEOS WorkStation software under Windows For Workgroups 3.11, you will also need to obtain the Windows TCP/IP 32-bit drivers and install and configure them. You can obtain a self-extracting zipped file containing these drivers from America On Line (AOL), the Microsoft Download Service: (206) 936-6735, CompuServe, the Internet at Microsoft FTP (microsoft.com), its World Wide Web site (<http://www.microsoft.com>) or at the THEOS Internet web site: <http://www.theos-software.com>.

### ■ **Supported Network Cards**

Any Ethernet card supported by Windows can be used on the client. However, using a network with 100BaseT network cards requires that the entire network use 100BaseT network hardware. This includes the network where the THEO+Net Login Server resides.

### ■ **Client Hardware Requirements**

The requirements that follow are the minimums required to achieve good performance:

- ▶ MS Windows clients require Windows for Workgroups 3.11, Windows 95/98 or Windows NT.
- ▶ Pentium-class or faster CPUs.
- ▶ 16MB of memory.
- ▶ Video cards that support 800x600 mode with large fonts.

### ■ **Client/Server Cabling Requirements**

A variety of standard Ethernet cable is supported such as twisted pair and RG-58 coaxial cable. If the office is not already wired with Ethernet cable, we recommend 10BaseT wiring and hubs. We also suggest that you diagram the locations of each client and the server so that you can formulate the best wiring plan. For more information on cabling requirements, please check the documentation supplied with your Ethernet card, Microsoft Windows documentation, or a commercially published book on the subject of network cabling.

# 25 TWS Installation and Configuration

---

These installation instructions assume that Windows For Workgroups 3.11, Windows 95/98 or Windows NT is already installed on the client systems. It is helpful to have some experience with installing and configuring PC network hardware and TCP/IP software. However, the Windows for Workgroups and other Windows version operating system manuals have step-by-step instructions for installing and configuring network hardware and various network software drivers. Additionally, it is assumed that THEOS WorkStation users are familiar with standard Windows operational concepts and terminology.

## ■ Network Card Installation

If you are setting up a new client/server environment, please follow the directions supplied with your network cards and the Windows documentation to configure them. Configuration of ISA cards requires setting the base I/O address, interrupt, and/or memory address for each card. Many network cards include a software setup utility to configure and test them. PCI network cards running under Windows 95/98 do not require any special setup, just the drivers included with the card.

After physically installing the cards, connect the cards using the desired cabling. If you are using a hub, be sure it is powered on. After the clients are connected to each other, run the connection test utility (typically under DOS) to be sure that the cards are communicating properly. One PC will act as the “initiator” while the other will act as the “responder.” DO NOT continue with this installation procedure until you know that the network cards are communicating with each other.

## ■ THEOS WorkStation Client Installation/Configuration

If you have multiple Windows clients, the THEOS WorkStation software is installed on each one.

### ■ **Windows 3.11 and Windows 95/98 Software Installation**

1. Place the THEOS WorkStation diskette in the floppy drive and select “Run” from the “File” menu. On Windows 95/98 select “Run” from the “Start” menu. Type “a:setup” as the command line and click on “Ok.”

2. Next you are prompted for the default language. English is the default so click on “Continue.”
3. The installation procedure advises you that the TCP/IP protocol must be installed and configured before THEOS WorkStation can be used. Click “Continue” to proceed.
4. Next, you are prompted for a subdirectory location. The default is “C:\THEOSWS.” You can either click the “Set Location” button and type a new directory name, or accept the default subdirectory and click the “Install” button to continue.
5. The software is copied into the appropriate subdirectory, either the default or the one that you specified.
6. If the software has been successfully copied, you will see the “successfully installed” message. Click “OK” to return to Windows. The THEOS WorkStation group is added to your Windows desktop.

### ■ TCP/IP Installation/Configuration

Installation and configuration of the TCP/IP networking protocols differ between the two versions of the Windows operating system.

### ■ Windows For Workgroups 3.11

Before you can connect to THEO+Net with the THEOS WorkStation client, you must install the 32-bit TCP/IP drivers for Windows 3.11. These drivers are not included with Windows 3.11, but they are available at the THEOS web site: <http://www.theos-software.com>. Once you have the drivers, list the contents of the README.TXT file and follow the instructions for installing the software.

After the TCP/IP software is installed, you must configure it on each client. Go to “Network Setup” and click on “Drivers.” Click on the TCP/IP driver that you just installed and then click on “Setup.” The name of the network host adapter that you installed should display. You must now specify an IP address and subnet mask for the client. For example your IP address might be 192.168.0.2 and subnet mask might be 255.255.255.0. When finished, click “OK”. To get the new settings to take effect, you must reboot the Windows client.

Remember that each Windows client must have a unique IP address.

### ■ Windows 95/98

Windows 95/98 has built-in TCP/IP support. To install it, go to Control Panel and click on “Network.” Click “Add,” highlight/click “Protocol,” high-

light/click “Microsoft,” then highlight/click “TCP/IP.” To configure TCP/IP, highlight it as the protocol and then click the “Properties” button. Just as in Windows 3.11, you must now specify an IP address and subnet mask. For example, your IP address might be 192.168.0.2 and subnet mask might be 255.255.255.0. When you are finished, click the “OK” button to save the settings. To invoke the new settings, you must reboot the Windows client.

Remember that each Windows client must have a unique IP address.



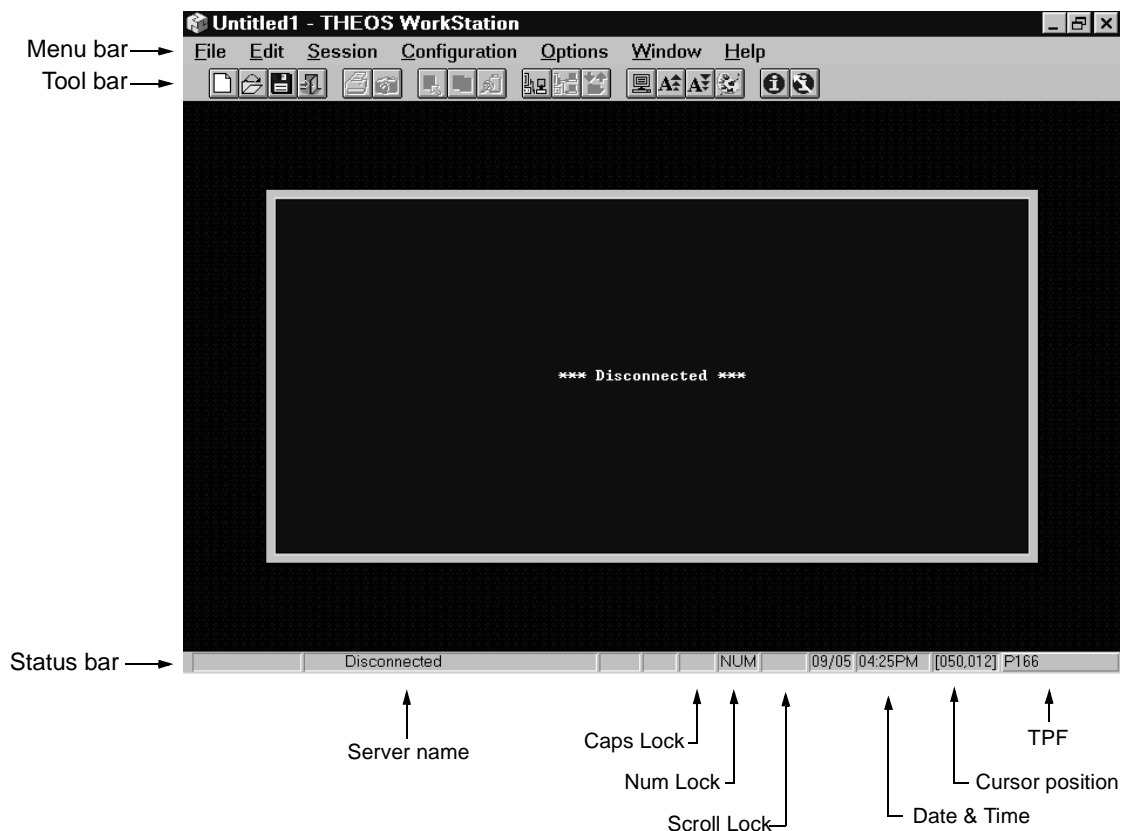


# 26 THEOS WorkStation Client

## ■ Logging on to THEO+Net

Assuming that the network cards and TCP/IP protocol have been installed, configured correctly, and that the THEOS WorkStation software has been installed and configured correctly, you are now ready to access a THEO+Net system. To log onto a THEOS Login Server, simply click on the THEOS WorkStation icon. This opens a new window with a tool bar across the top of the screen.

The following screen displays:




















The display consists of standard Windows features including a pull-down menu bar at the top of the screen, a tool bar underneath it, a large display

area and a status bar at the bottom of the screen. The menu can be used with either a mouse or hot-keys and can access all of the TWS functions.

### ■ Tool Bar Icons

The tool bar requires use of a mouse. The tool bar consists of a series of buttons that access the more frequently used features. Slide the mouse cursor slowly along the tool bar and a brief description of each button will display next to the button and on the status bar.

	New Session		Connect a New Session
	Open a Profile		Transfer Files
	Save Profile		Increase Font Size
	Exit this Session		Decrease Font Size
	Print User Profile		Colors
	Capture Screen to Clipboard		Help
	Select Text		Context-sensitive Help
	Copy Text to Clipboard		
	Paste Text from Clipboard		
	Connect/Disconnect		

Some menu options or tool bar buttons may display as “grayed-out.” This simply means that those functions are not currently available. For example, if you have not yet connected to a server, the print button displays in this manner. Also the status of some buttons may change. For example after you have connected to a server the “Connect” button changes its status to a “Disconnect” button.

The status bar displays informative messages such as connection status, time, date, computer name, status keys, *etc.*

The following sections are designed to show you how to further use THEOS WorkStation rather than present a menu and tool bar item-by-item tutorial. You can get detailed help for the menu options from the Help index or from the context-sensitive help available in many of the dialog boxes.

## ■ **Connecting To a Server**

To connect to a server click on the connect button. This will open a dialog box asking you to pick a server to connect to. Find the desired server name and click on it. This should establish an immediate connection to that server and display the Logon please: prompt. At this point, you can log onto and operate THEOS just as you would from any THEOS console.

You can also manually enter an IP address and connect to a THEO+Net Login Server over the Internet if the THEO+Net host has a full-time, 24-hour-a-day Internet connection and a static IP address. Check with your THEOS reseller for more information. If the login server does not have a fixed IP address you can still connect to them but you will have to contact them by other means to determine their current IP address at the time that you want to establish the connection.

When connecting to a server not on the local network, you must connect by specifying the IP address and not the name.

The access and deny lists used by the THEO+Net Login Server must allow and not deny access from your machine.

## ■ **Disconnecting From a Server**

Before you disconnect from the THEOS Login Server, we suggest that you log off of your THEOS WorkStation session. Logging off ensures that all files are closed and that there are no “open” network connections. When you have logged off, simply click on the disconnect button.

## ■ Customizing TWS

Once you have successfully connected and logged onto THEOS, it might be helpful to automate these steps so that the next time you log on, you can automatically connect to the desired server with the functionality that you want. The following sections describe some of the parameters that can easily be configured and saved in a configuration file called a “terminal profile file” or “tpf.”

### ■ Fonts and Screen Size

TWS screen fonts can be changed via the “Configuration, Display” menu selection. A variety of fonts are displayed in the dialog box. Only fonts identified as monospace font are displayed. If you enable the “SemiGR Mapping” feature, you can use any font in the dialog box. Semi GR Mapping provides line-graphic character support for those fonts that do not have it. Without this option enabled, fonts other than the “Terminal” font will not display line-graphic characters. Since line-graphic characters are routinely used in THEOS applications, you will want to enable this option.

If you are running Windows using the standard VGA resolution of 640x480, your TWS screen may not display as large as you might like. To get the best resolution we recommend reconfiguring your video mode to 800x600 mode with large fonts. Although today’s video cards typically support 800x600 mode, not all support large fonts. Without large font support, the TWS software and the characters in 800x600 mode will display smaller than 640x480 mode.

Once the TWS window is open, you can then use your mouse to drag the window to the desired location on your Windows desktop.

### ■ Full-Screen Mode

You can have your TWS session fill your screen by clicking your mouse on the “Options” menu and then click on “Full Screen.” Full-screen mode defaults to “clean screen” mode. This means that no tool bar or menu bar is displayed. Once you are in full-screen mode, you can re-display a configuration menu by pressing <Alt> spacebar or clicking the right mouse button. If you want to return the window to a smaller size with the menus and tool bar displayed, select “Restore.”

### ■ Mouse and Hot Keys

The mouse and certain “Accelerator” or “function keys,” such as **F1**, have special meaning to both Windows and THEOS. To enable the mouse under THEOS from a TWS client, go to the “Configuration,” “Miscellaneous”


menu and click on “Remote Mouse.” This allows you to use a mouse in THEOS programs. To change the hot-key values, go the “Configuration,” “Special Keys” menu. For example, if you put a check mark next to F1, that will enable the help function for THEOS and disable the Windows help function for THEOS WorkStation help under Windows.

## ■ **Connections and Slave Printers**

Use the “Connections,” “Preferences” menu option to configure a default server name to connect to, the account you wish to log onto with optional password, and slave printer parameters. You can also specify if you want to automatically disconnect upon exiting TWS.


## ■ **Sessions**

Depending upon the THEO+Net configuration, it might be possible for you to open multiple sessions and connect to the same server multiple times. If multiple sessions are supported on your system, simply click on the “New

Session in Same Server” icon  or choose “New Session” from the Session menu. A maximum of eight logins per user to a single server are supported. When multiple sessions are open, you can easily switch directly from session-to-session by pressing **[Alt]+n** where *n* is a digit between one and eight.

## ■ **File Transfer**

Files can be easily transferred between the Windows client and the THEOS server, provided that you are logged onto a THEOS account using THEOS WorkStation. If you are not logged onto an account, the file transfer function is unavailable. For TWS, either click on the File Transfer tool



bar button  or select “File Transfer” from the menu. When the file transfer dialog box is selected, a set of Windows and THEOS dialog boxes displays. You can easily move files between the Windows client and the THEOS server using the “drag & drop” feature of Windows.

If you transfer files that already exist, TWS will warn you before the files are transferred.

The only files that TWS is capable of transferring are those files owned by the currently logged account.

## ■ **Copy/Paste**

On-screen data from a THEOS application can be copied into any Windows application using the Copy/Paste feature. To copy data into the Windows

Clipboard, either click on the Select tool bar icon  or select “Edit,” then “Select” from the menu. Then, while holding down the left mouse button, move the mouse pointer to the THEOS screen area where the copy is to begin and then drag the mouse over the data that you wish to copy and release the mouse button. Now that the text is highlighted and selected, click on the Copy tool bar icon  or select the “Edit,” “Copy” menu item.

To paste the data into your Windows application, make that application the active Window and then execute the Paste function from within that application. If data is “lost” when pasting between a THEOS and Windows application, go to the “Configuration,” “Miscellaneous” menu option and increase the “Paste Pacing” value by increments of 5 and retry the operation. Once you find the optimum setting, it can be saved as part of your default terminal profile file.

## ■ **THEOS WorkStation Slave Printers**

THEOS WorkStation allows you to access any THEOS printer that your local Windows client has access to. It can be a locally connected printer or a shared Windows network printer. To make the Windows printer work correctly with THEOS, it must be configured using a printer emulation that THEOS supports. If the printer is a dot matrix printer, then it should be configured under Windows as an IBM Proprinter. Under THEOS, you would attach this printer using class code 145, which is the IBM Proprinter class code.



However, THEOS WorkStation can be configured so that the slave printer is attached automatically whenever you log on. To do this, there are two TWS areas that you need to configure. First, select the “Configure,” then the “Preferences” menu options. Specify the slave printer number. This is the THEOS printer number that will display in the THEOS list of attachments. Next, specify the THEOS class code number. This is a number such as 145 (IBM Proprinter) or 135 (HP LaserJet), *etc.* Click on “OK” to save your changes.

Next, select the “Configure,” then “Miscellaneous” menu options. Click the left mouse button to put a check mark next to “TWS Prt Driver,” then click on “OK” to save your changes.


If you don't configure the slave printer emulation to match the THEOS settings, the printer will not print ASCII data. Some Windows-only printers may not print properly even when configured this way. Windows-only printers are printers that require Windows to print. They won't work with DOS, THEOS or any other non-Windows operating systems. For this reason, Windows-to-THEOS slave printers should be printers that work independently of Windows.

### ■ Automatic THEOS WorkStation Login

Once you have logged on to THEO+Net manually, future logins can be simplified by selecting the "Preferences" option from the "Configuration" menu. The "Preferences" dialog box allows you to specify the server to log onto, the account name, password, and whether or not you want the "Auto-disconnect" enabled.

If you want to log onto a different server or to an Internet IP address, use the "File," "New" menu item or click on the New Session tool bar icon . Then use the "Session," "New Session" menu item or click on the "Connect" button  to display the "Connect" dialog box. You can then select a different server or type a specific IP address.

### ■ Terminal Profile Files

All of the previously discussed parameters can be saved for future login sessions using the "File" menu "Save" or "Save As" options or by clicking on the "Save Profile" tool bar button . You are prompted to enter a name for your terminal profile. You can use any name up to eight characters long. The extension always defaults to "tpf" so it does not need to be specified. In the next section, we'll show you how to create an icon for this file and associate it with your tpf file. Once this is done you can automatically log onto the server the next time by simply clicking on it with your mouse with your previously configured settings.

You can, of course, configure multiple terminal profile files by changing your THEOS WorkStation settings then clicking on the "File," "Save As" menu option and specifying a new tpf file name. You can then create multiple tpf icon shortcuts with the appropriate label for you to access quickly by clicking on them.

### ■ Creating a Terminal Profile Icon

Creating a terminal profile icon in Windows 3.11 is accomplished by following these steps:

1. Be sure that the TWS group is the active group by clicking your mouse on its menu heading.
2. Move the mouse pointer to the Program Manager menu and click on the “file” menu option. Then select “New” from the “File” menu.
3. Click on “OK” to create a new program item. This will display the “Program Item Properties” dialog box.
4. Specify the name for the icon in the “Description” field. This is the text that displays below the icon. To make your icon work, you will need to specify the “Command Line” to execute. For example the command line: `c:\theosws\theosws.exe admin.tpf` will execute the TWS software and uses “admin” as the terminal profile file.
5. Click on “OK” to create the icon. The new icon will display the TWS group. To display help, click on the “Help” button.

Creating a terminal profile icon in Windows 95/98 is accomplished by following these steps:

1. Click on the program name: THEOSWS.EXE.
2. On the Windows “File” menu click “Create shortcut.”
3. Drag the shortcut icon onto the desktop.

Once the icon is on the desktop, you can right-click the mouse on the icon and change its “Properties” or “Rename” it at any time.

### ■ Associating a Terminal Profile Icon with a TPF File

In Windows 3.11 this is accomplished by left-clicking the mouse on the new icon, then clicking on the “File” menu option “Properties.” In the command line field, type a space followed by the full tpf name. For example the target: `THEOSWS.EXE P200.TPF` would invoke one instance of TWS using the parameters in P200.TPF. You can automatically invoke multiple sessions, using the same profile by typing the tpf file name multiple times. If you wanted four sessions, you would specify P200.TPF four times, each delimited by a space.

In Windows 95/98 this is accomplished by right-clicking the mouse button on the terminal profile icon you previously created and clicking on “Properties.” Next, right-click the “Shortcut” tab. In the “Target” field, type a



space followed by the full tpf name. For example, the target: THEOSWS.EXE P200.TPF would invoke one instance of TWS using the parameters in P200.TPF. You can automatically invoke multiple sessions, using the same profile, by typing the tpf file name multiple times. If you wanted four sessions, you would specify P200.TPF four times, each delimited by a space.

TWS

TWS

# A: Configuration and Support Files

---

The following configuration files are all ASCII, editable files using, for the most part, plain English words for the parameter names and values. Although these files may be viewed and edited with a standard text editor such as WindoWriter, it is strongly recommended that they only be changed with the appropriate **SETUP** command.

The general content of these files is:

```
[Header1]
Parameter1=value1
Parameter2=value2
...

[Header2]
Parameter1=value1
...

etc.
```

For instance, the contents of the [SYSTEM.TEOS32.NETCFG](#) file might be:

```
[Access]
Allow1=207.21.75.*
Allow2=192.168.100.*

[PPP Server]
ToneDial=Yes
AutoStart=Yes
Profile1=PACIFIER
...
```

Other files may have more sections with more entries in each section, but, except as noted, they are all in the same general format.

## ■ **Configuration Files**

### ■ **SYSTEM.TEOS32.FTPCFG**

This file is maintained by [Setup FTP](#) and contains the configuration for the [FTP Client](#). Included in this file is the site definitions for FTP connections.

### ■ **SYSTEM.TEOS32.HOSTS**

This file contains the list of host names and matching IP addresses, as defined with the [Setup NET: View/Maintain Host Names Database](#) maintenance program. Because the entries in this file are cached, changes to this file are not effective until THEO+Net is restarted.

This file does not have sections, only a list of IP addresses and host names. When maintained with the **SETUP** command, the entries are sorted in computer name sequence. This file is hidden and will not appear on directory listings unless specifically requested.

### ■ **SYSTEM.TEOS32.NETCFG**

This file is the primary configuration file for THEO+Net. It is maintained by [Setup NET: Interface Cards](#), [TCP/IP Parameters](#), [Login Server](#), [Name Services](#) and the [View/Maintain Allow List](#), [View/Maintain Deny List](#) screens. The file has section headers for each of the sections maintained by these different screens. The headers are:

[Interfacen]	<a href="#">Interface Cards</a>
[TCP/IP_Driver]	<a href="#">TCP/IP Parameters</a>
[Login Server]	<a href="#">Login Server</a>
[DNS]	<a href="#">Name Services</a>
[Access]	<a href="#">View/Maintain Allow List</a> , <a href="#">View/Maintain Deny List</a>

## ■ SYSTEM.THEOS32.NETQUOTE

This file is used by the [Quote Client](#) and contains the text for the quotations displayed by that command. Additional quotations may be added, or existing quotations deleted or changed with a text editor. Each quotation is a series of one or more non-blank lines of text followed by a blank line.

For instance:

```
Our wretched species is so made that those who walk on the
well-trodden path always throw stones at those who are showing
a new road.
--Voltaire
```

```
Every man has three characters--that which he exhibits, that
which he has, and that which he thinks he has.
--Alphonse Karr
```

```
There is no failure except in no longer trying. There is no
defeat except from within, no really insurmountable barrier
save our own inherent weakness of purpose.
--Kin Hubbard
```

## ■ SYSTEM.THEOS32.NETROUTE

This is an optional file and is only used if your network requires customized routing tables. Most systems and networks will not require this file. Refer to the Chapter 19 “[Route Command](#),” starting on page 179 for a description of routing tables and usage of this file.

This file is an editable stream file containing zero or more lines. Each line should have the following contents:

```
net-addr net-mask gateway-addr NIC-addr metric
```

For instance:

```
207.21.76.0 255.255.255.0 207.21.75.42 207.21.75.30 1
```

This example says that, to send a packet to 207.21.76.0 it must be routed through the local machine's NIC at 207.21.75.30 and forwarded to 207.21.75.42. The metric of one indicates that there is only one intermediate node between this system and the target.

The syntax of entries in this file is identical to the `Route` command, Add option capability except that the *metric* is also specified in this file. See “[Route Command](#)” on page 179 for a description of these parameters.

The *metric* value is the number of machines or nodes that must be traversed to reach the target network.

The file can have up to 50 entries, each entry must be on a single line terminated by a CR.

#### ■ **SYSTEM.TEOS32.TELNETCF**

This file is maintained by [Setup TELNET](#) and contains the configuration for the [Telnet Client](#).

#### ■ **SYSTEM.TEOS32.\_NET\_USR**

This file is maintained by [Setup NETUSER](#) and contains the user names and passwords required of remote login users if [Enable Remote User Security](#) (see page 193) is not disabled. Note: This file is not an editable text file. Even when accessed by a custom program, the password information is not readable because it is encrypted.

### ■ **Support Files**

#### ■ **Network Log File**

This file is created only if specifically requested in the [Setup NET](#), [Login Server](#) screen, in the field “[Log Frequency](#).” When enabled, this file is a stream or sequential text file that may be viewed or printed with various system utilities. They may also be analyzed by application programs. The file contains a log entry line every time that a major event occurs for the network. These major events include starting the network and connections made with remote NetTerm, TWS or Telnet clients, and the termination of those connections.

Each log entry includes the date and time that the event occurred, the IP address of the remote computer and its computer name, if known, and a general description of the event.

This file grows in size as long as the “[Log Frequency](#)” entry is enabled. It should be enabled only for diagnostic purposes because it may become very large.

#### • **Log File Location**

By default, history logs are maintained in files written to the root directory of the system disk. However, you may specify a different location for the system log files by specifying a path in the “[Log Directory/File name](#)” field of

the system configuration file (see [Setup NET](#), [Login Server](#) screen on page 193).

- **Log File Names**

The name of a log file is determined by the “[Log Frequency](#)” and “[Log Directory/Filename](#)” fields of the network configuration. When this field is set to “None” no log files are created. When the “[Log Frequency](#)” field is set to “Single” the name of file is determined by the specification in the “[Log Directory/Filename](#)” field. A setting of “Daily,” “Weekly” or “Monthly” causes the name of the log file to change as it is rotated by day, week or month.

The names used for the network log files are:

Code	Rotated	Network Log File Name
Single	No	As specified in <a href="#">Log Directory/File-name</a> field
Daily	Daily	/logs/NLyymmdd.LOG
Weekly	Weekly	/logs/NLyymmdd.LOG
Monthly	Monthly	/logs/NLyymm01.LOG
<p>/logs/ is defined by the “<a href="#">Log Directory/Filename</a>” field in the configuration menu.</p> <p>yy is the year number.</p> <p>mm is the month number.</p> <p>dd is the day number. For code Weekly, the day number is always the day number of the Monday of the week that the log file was started.</p>		

The format for each record in the network log files is:

YYYY/MM/DD HH:MM:SS Message text

└──────────┴──────────┘

                    Date and time of event

### ■ DialUp Networking Log File

This file is created only if specifically requested in the [Setup NET, Dial-Up Networking](#) screen, in the field “[Log Frequency](#).” The creation and file names used for this log are identical to the network log file described above except that the fields that control the file are the “[Log Frequency](#)” and “[Log Directory](#)” fields in the [Setup NET, Dial-Up Networking](#) screen. Also, when a rotating log is requested, the prefix for the log file name is “DU” instead of “NT.”

### ■ Other Support Files

Library	Member	Description
SYSTEM.HELP32	*	Contains the help text for the various commands included with THEO+Net.
SYSTEM.MENU32	*	Contains the menu, literal and context-sensitive help text used by the commands included with THEO+Net.
	NETLOGON	Contains the literal text and prompts used for remote user logins.
	SETFTP	The menu, literal and help text for <a href="#">Setup FTP</a> .
	SETNET	The menu, literal and help text for <a href="#">Setup NET</a> .
	SETUSER	The menu, literal and help text for <a href="#">Setup NETUSER</a> .
	SETTEL	The menu, literal and help text for <a href="#">Setup TELNET</a> .
SYSTEM.NETCMD	*	Contains the TCP/IP services commands <a href="#">CHARGEN</a> , <a href="#">DAYTIME</a> , <a href="#">ECHO</a> and <a href="#">TIME</a> .
SYSTEM.TEOS32	DEV104	Device driver used for remote logins by a <a href="#">NetTerm Client</a> or a <a href="#">THEOS WorkStation Client</a> .
	DEV105	Device driver used for remote logins by a <a href="#">Telnet Client</a> .



Library	Member	Description
	DUN_IP	File created each time a dial-up connection is made. It contains the current IP address assigned to your computer by the remote PPP server. Erased each time that a profile is disconnected.
	ETHERNET	Device driver for the NIC adapter(s).
	NETALIVE	Optional file supplied by you. Controls what servers are tested for accessibility. Used by the <a href="#">NetAlive Client</a> . Refer to that command description on page 158 for a description of the format of this file.
	NETLOGIN	Login Server for remote connection by a <a href="#">NetTerm Client</a> , <a href="#">Telnet Client</a> or a <a href="#">THEOS WorkStation Client</a> .
	NETLOGON	Remote user security (account and password).
	SERVICES	This file contains the list of port numbers used for the “well-known” services defined by RFC 1060. The names in this list may be used by the <a href="#">Telnet Client</a> when specifying the <i>port</i> name. In general, do not modify this file.
	SET*	The programs used for <a href="#">Setup FTP</a> , <a href="#">Setup NET</a> , <a href="#">Setup NETUSER</a> and <a href="#">Setup TELNET</a> .
	TCP/IP	Program for TCP/IP protocol support.
	TCPSERVE	Server for TCP services such as <a href="#">CHAR-GEN</a> , <a href="#">DAYTIME</a> , <a href="#">ECHO</a> , <a href="#">QUOTE</a> , <i>etc.</i>



# B: Modem Dialing Codes

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The telephone number specified for Dial-Up Networking contain the normal digits representing the desired telephone number. It may also contain other special codes that instruct the modem to perform various actions while or after it dials the number.

Specifically, the following characters are allowed as part of a telephone number entry.

Character	Effect
( ) – <space>	Ignored. Used for readability purposes only.
digits 0–9	Generate the tones or pulses for the digit.
* # A B C D	Generates the corresponding DTMF tones if tone dialing mode is enabled.
,	Wait for two seconds. For additional periods of delay, multiple commas may be used.
/	Wait for 125 milliseconds. (Not all modems support this code.)
!	Go on-hook for ½ second then return off-hook. Also called flash hook.
W	Wait for a secondary dial tone.
@	Wait for five seconds of silence.
P	Switch to PULSE dialing mode.
T	Switch to TONE dialing mode.



# C: Network Error Codes

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Code	Meaning
1001	Network down.
1014	Fault.
1022	Invalid.
1024	MFILE
1026	NFILE
1035	Would Block.
1036	In Progress.
1037	I already.
1038	Not socket.
1039	Destination address required.
1040	Message size.
1042	No protocol option.
1043	Protocol not supported.
1044	Socket not supported.
1045	Operation not supported.
1046	PF not supported.
1047	AF not supported.
1048	Address in use.
1049	Address not available.
1053	Connection aborted.
1053	Connection reset.
1055	No buffers.
1056	Is connected.
1057	Not connected.
1058	Shut down.
1060	Timed out.
1061	Connection refused. Generally it means that the host was found but the service requested is not available at this time.

Code	Meaning
1093	Not initialized.
1201	No memory.

# D: DHCP

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DHCP stands for “Dynamic Host Configuration Protocol” and is a means for networked computers to get their TCP/IP networking settings from a central server. DHCP servers assign IP addresses and other TCP/IP configuration parameters automatically.

DHCP is implemented as a client/server application. THEO+Net contains within it a DHCP client. The DHCP server must be supplied by external equipment or software on another machine.

## ■ Advantages Of DHCP

DHCP eases the TCP/IP and NIC configuration. Without DHCP, all the machines on a network have to have unique static IP addresses assigned to them. Many options on the TCP/IP setup can be problematic, and one wrong setting can prevent a client from getting the desired access.

If you have a DHCP server on your network and you want the easiest network setup, enable DHCP for each NIC installed in your network (see “[Interface Cards](#)” on page 190). DHCP is recommend as insurance against IP conflict errors.

When THEO+Net starts on a machine and if one or more of the NICs are configured to use DHCP, a broadcast packet is transmitted on the network requesting an IP address (discover message). Any DHCP server that hears this request sends a response, offering an IP address (offer message). This IP address is chosen from a range of acceptable IP addresses configured in the DHCP server. Each range of IP addresses is referred to as a scope. A network may have a mixture of machines that use DHCP to assign IP addresses to their NICs and machines that use static IP addresses. A DHCP server checks to see if it can ping an IP address before it will allocate it. If it can ping an address, it knows the address is in use and it will not allocate it to any other machine. Most DHCP servers allow you to list the IP address scope that is to be used for assigning addresses to requests.

The client can then accept the IP address and tells the DHCP server (request message). The server acknowledges the request (ack message). Any further configuration information is also forwarded to the client at that stage, including DNS server details.

Currently, only the IP address assignment and the DNS server information provided by a DHCP server is used by THEO+Net. Other option information sent by the DHCP server is discarded. Future versions may use other information provided by the DHCP server, making network configuration even easier and more error resistant.

## ■ **Disadvantages of DHCP**

If a network has both fixed IP address machines and DHCP-assigned IP addresses, a conflict may occur if the fixed IP machine is not present on the network (not powered on or its network is not started) when another machine requests an IP address from the DHCP server. This can occur because the DHCP server picks an address, broadcasts a ping to see if any machine is already using that address. Since the machine is not present on the network at this time it does not respond and the server assigns the address to another machine. Later, when the fixed IP machine's network is started it cannot operate because of the IP address conflict that is present on the network. (The dynamically assigned machine will also start failing at this time.)

This problem can be eliminated if the DHCP server is configured so that its scope of addresses that it uses do not include any of the fixed IP addresses assigned to machines.

Another potential disadvantage is that a machine's IP address cannot be used in the allow/deny lists to control which users have access or are denied access to a particular server. Since the IP address is assigned dynamically each time the network is started you cannot know what IP will be assigned to a particular machine. It might still be possible to use IP address ranges in the allow/deny list.

## ■ **Recommendations**

Most simple networks, particularly small networks, will not have a DHCP server available to them and subsequently cannot use DHCP for IP address assignment.

Small networks (2-10 machines) that do have a DHCP server should probably not use DHCP because the simplicity of the network cannot take advantage of the DHCP server. However, if desired it does no harm and will make it easier when machines are moved from one location to another, *etc.*

Larger networks, particularly those that have machines that "come and go" frequently, should use a DHCP server if available. "Come and go"



refers to portable or guest machines that are connected to the network for short periods of time (an hour, a day, *etc.*) and then disconnected. This situation is just what DHCP is designed for. In this situation, the configuration of the machine is done by the network and the DHCP server. No changes have to be made if the NIC was originally configured to use DHCP services.



# E: Tips and Troubleshooting

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## ■ How Do I Prevent Tws Messages From Displaying?

THEOS WorkStation will display various informative messages such as “Printing...” or “Retrieving...” To disable these messages modify the default setting in the TWS configuration to disable Messages. This configuration item is in the Configuration, Miscellaneous dialog box.

## ■ Why Doesn't Ping Find Addresses Other Than Theos Servers?

This may be caused by one of two reasons: The other machine's NIC may not be configured correctly or you are trying a broadcast ping to a Windows system.

Use the DOS software utility included with your network card. Invoke the test utility and be sure the connected NIC is capable of BOTH initiating and responding. If they do not communicate, either they haven't been configured correctly or there is a cabling or connectino problem.

If you are using the broadcast ping (PING \* or NET PING commands) be aware that Windows 95/98 systems do not respond to this type of ping command. They should respond to a specific ping command such as Ping 192.168.10.2.

## ■ Problems with Dial-Up Networking and US Robotics or 3COM modem

US Robotics was purchased by 3COM. Their modems can change the attached baud so that it matches the transmission baud. Most of their modems default to this form of operation and it causes a failure to communicate with THEO+Net (and other communications programs in THEOS).

You can disable this feature by defining a [Modem Init String](#) in [Setup NET](#), [Dial-Up Networking](#), [View/Maintain Profiles](#). Use the following string:

```
AT&f1&B1
```

This forces the modem to use a fixed baud between the modem and your computer.

## ■ How can I transfer Windows 95 files with long file names?

The long file names used by Windows 95/98 are synonyms to the standard 8.3 file name used internally. To transfer one of these files you must either rename it to an 8.3 name or find the “real” file saved with the 8.3 file name. One method of doing this is to use the DOS prompt and the DOS dir command.

For instance, using the Start menu, select the MS-DOS Prompt item in the Programs menu:

```
C:\Windows>d

D:\THEO_DOC\THEO+Net>dir net*.*

Volume in drive D is WORK
Volume Serial Number is 11FF-224E
Directory of D:\THEO_DOC\THEO+Net

NETTERM  FM           205,824   02-25-99   2:28p  netterm.fm
NET       FM           95,232   02-25-99   5:52p  net.fm
NETALI~1 FM           63,488   02-22-99  10:54a  NetAlive.backup.fm
NETWORKS FM          136,192   02-27-99   8:36a  Networks.fm
NETALIVE FM           63,488   02-25-99   2:22p  NetAlive.fm
NETBAC~1 FM           95,232   02-25-99   5:28p  net.backup.fm
NETWOR~1 FM          135,168   02-25-99   1:10p  Networks.backup.fm
NETTER~1 FM          206,848   02-22-99  11:16a  netterm.backup.fm
NETWOR~2 FM          132,096   02-14-99   3:48p  Networks.spanish.fm
NETWOR~3 FM          132,096   02-14-99   3:44p  Networks.span-
ish.backup.fm
          10 file(s)          1,265,664 bytes
          0 dir(s)    1,294,467,072 bytes free
```

The file names on the left are the DOS 8.3 file names for the long file names shown on the right. Use the 8.3 names when you want to send the file to the THEOS server. The long file name can be used with the 32-bit version of TWS but it might be received on the THEOS system with a truncated and therefore non-unique form of the file name.

## ■ Why Don't Any Of The Theo+net Products Work With America Online?

Basically for the same reason that other standard products in other operating environments cannot access your AOL account.

America OnLine is a content provider, not an Internet Service Provider (ISP). It does not use the standard PPP interface for logging into their network. To access AOL you must use special DUN software which is not available for the THEOS operating system.

To use THEO+Net over the Internet, you must have an account with a standard ISP. If you already have an AOL account you may keep it in addition to a standard ISP account.

### ■ **Blink or underline attribute doesn't display in TWS session**

Certain screen attributes such as blink and underline are not supported by Microsoft Windows. For example, if you execute the THEOS CRT test from your TWS session, you will see that the TWS client will automatically "map" these attributes to a unique color so that the functionality of the attributes will be maintained. For instance, the blink attribute might be mapped to light blue.

### ■ **THEOS WorkStation can't find any servers to connect**

Check the network cable connection. Be sure that the cable is plugged into the network card and that there are no breaks in the cable. Be sure that the ends of the Ethernet cable are terminated. If there is a hub, be sure that it is powered on.

On the THEO+Net system, log onto the SYSTEM account and execute a SHOW USERS command to verify that the network Login Server is started. If the network is started, TCP/IP will display in the "Username" column, NETLOGIN will display in the "Prognome" column, and an R will display in the "Status" column.

You may need to return to DOS and use the testing utility supplied with your Ethernet host adapter. Follow the directions supplied with the test utility to verify that the host adapters are communicating.

Another reason why you might not be able to find a server and connect to it is the allow and deny lists defined for the server. The server might be restricting access from your machine and, in that case, you will not be able to connect to it. Contact the network administrator for that server and ask to be added to their allow list or removed from their deny list.

### ■ **Displaying the Host ID**

THEOS developers and other users who frequently work at the CSI might want to use the ACCOUNT utility to add the "\i" to each user account's prompt string so that the network host ID is displayed. This makes it easier to keep track of which system you are logged onto.

### ■ **Can't execute THEOS WorkStation from Windows**

If the Windows client is unable to execute, it is possible that Windows has been invoked with the /n option or it is running Windows in “safe” or diagnostic mode which disables the Windows network feature. Restart Windows without the /n switch or “normal” rather than safe mode.

### ■ **THEOS WorkStation appears to be locked**

Try disconnecting from and then reconnecting to the desired server. If this does not resolve the problem, contact your THEO+Net system manager. Either the THEO+Net system or the Windows client might need to be rebooted.

### ■ **THEOS WorkStation window is too small**

Verify that your Windows PC video card and monitor supports 800x600 mode and large fonts. If so, reconfigure Windows for this mode of operation. Once this has been accomplished, invoke TWS and move the window to a convenient location on your desktop. Go to the “Configuration,” “Display” menu or click on the “Display” button and try selecting a different font. Enable SemiGR Mapping to be sure that line-graphic characters display correctly.

### ■ **TWS Screen won't display THEOS line-graphic characters**

Be sure that TWS is configured to use a monospace font that inherently supports line-graphics such as the “Terminal” font or the shareware VTS font.

Although the majority of the monospace Windows True Type fonts do not support text mode line-graphic characters, you can use any of them provided you enable SemiGr Mapping (in the “Configuration,” “Display” screen. The “Courier New” True Type font might be a good choice.

### ■ **Windows printer won't slave print to THEOS**

Try reconfiguring the printer driver using the emulation that matches the THEOS class code the printer is emulating. Be sure that the printer is attached under THEOS using the class code that matches the Windows driver emulation. Some Windows-only printers may not work.

## ■ **Why can't THEO+Net "see" or find my PCI network card?**

This is most likely caused by an IRQ conflict on the system.

Use the SHOW PCI and SHOW IRQ commands to see if there are any potential IRQ conflicts. Some video cards use a system interrupt (commonly IRQ 11) even though THEOS doesn't use an interrupt for video display.

You can physically rearrange PCI cards in their slots to change interrupts. However, placing a SCSI card in the first slot and a video card after that may prevent any video from being displayed. If you are using a SCSI host adapter, put the video card in the first slot. You can rearrange other cards in the PCI slots as best suit your needs.

Some system BIOSs will display a PCI usage table prior to booting. Look here for conflicts too.

Some Pentium and Pentium II BIOSs have a Plug 'n Play O/S feature. This should be disabled. Leaving this feature enabled will prevent most PCI network cards from being "found" by SHOW PCI or the THEO+Net NIC setup.

## ■ **What network cards are supported?**

THEO+Net supports 16-bit ISA cards such as NE2000 compatible cards and NE2000 compatible PCI cards such as those using the Realtek 8029 chipset. For 100Mbit performance, the 3COM 3C905 NIC is supported.

Refer to the THEOS web site for a current list of supported NICs:

<http://www.theos-software.com/support/hardware.asp>

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264 *What network cards are supported?*



# F: Contacting THEOS

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Support for THEO+Net and other THEOS products is provided to authorized dealers and resellers of THEOS products. End users should contact their THEOS dealer regarding questions or problems relating to installation or operation of the THEOS operating system and other THEOS products.

THEOS Support Services for Resellers and Distributors are designed to provide the type of assistance best suited to your needs. Support options range from no-cost / low-cost information services on the WWW to THEOS on-site training classes, fee-based direct support or an annual support contract. Depending upon your needs and budget, you may choose any one of these options or combine several into a custom program suitable to your requirements.

When contacting Technical Support, include or be prepared to provide the following information:

- ▶ Product name and version number
- ▶ Product patch level (use **Show Version** command).
- ▶ Operating system serial number (displayed on bootup or use **Show Serial** command).
- ▶ Operating system version number (displayed on bootup or use **Show Version** command).
- ▶ Type of hardware being used.
- ▶ What happened and what you were doing when the problem occurred.
- ▶ The exact wording of any messages that appeared on the screen(s).
- ▶ How you tried to solve the problem.

Dealers and THEOS resellers may contact THEOS Technical Support by mail, fax, telephone or the Internet.

**Mail:** THEOS Technical Support  
THEOS Software Corporation  
1801 Oakland Boulevard, Suite 315  
Walnut Creek, CA 94596-7000

**Fax:** 925-935-1177

**Telephone:** 925-935-1118 ext 211  
Hours: Monday-Friday,  
8:30am - 4:30pm, Pacific Time

**Internet Email:** [support@theos-software.com](mailto:support@theos-software.com)

**Internet WWW:** <http://www.theos-software.com>

# Glossary of Terms

<b>10Base2</b>	A form of <a href="#">Ethernet</a> and <a href="#">IEEE 802.3</a> network cabling using thin <a href="#">coaxial-cable</a> . It refers to 10Mbps speed Baseband transmission over 185 meters maximum length. Commonly known as <a href="#">Thinnet</a> .	<b>24 x 7</b>	Refers to a 24 hour-per-day, 7 day-a-week connection. In other words, a full-time, continuous connection.
<b>10Base5</b>	A form of <a href="#">Ethernet</a> and <a href="#">IEEE 802.3</a> network cabling using thick <a href="#">coaxial-cable</a> . It refers to 10Mbps speed Baseband transmission over 500 meters maximum length. Commonly known as <a href="#">Thicknet</a> .	<b>API</b>	<a href="#">Application Program Interface</a> . A set of standards and associated software routines that carry out specific functions common to applications, such as handling the exchange of data between an application and a communication protocol.
<b>10BaseT</b>	A form of <a href="#">Ethernet</a> and <a href="#">IEEE 802.3</a> network cabling using twisted pair cabling. It refers to 10Mbps speed Baseband transmission twisted pair cable with a maximum segment length of 100m.	<b>ASCII</b>	Acronym for <a href="#">American Standard Code for Information Interchange</a> . An <a href="#">ANSI</a> standard for the common character set used in most modern computers.
<b>100BaseT</b>	IEEE standard from proposals by the <a href="#">Fast Ethernet</a> Alliance (including 3Com and SynOptics). It will support <a href="#">Category 3</a> , 4 & 5 <a href="#">UTP</a> cabling.	<b>ANSI</b>	<a href="#">American National Standards Institute</a> . The organization in the United States responsible for, among other things, the standards used in the computer industry.
<b>100BaseF</b>	A form of <a href="#">Ethernet</a> and <a href="#">IEEE 802.3</a> network cabling using fiber optic cabling. It refers to 100Mbps speed transmission with a maximum segment length of 2,000m.	<b>bps</b>	<a href="#">bits per second</a> . The speed at which data is transmitted.
		<b>BNC connector</b>	A cylindrical push-and-twist connector for connecting thin <a href="#">coaxial-cable</a> , such as <a href="#">10Base2 Ethernet</a> , to network interface cards, transceivers and other network elements. Said to be short for Bayonet Neill-Concelman after the developers of the connector. Also referred to as a Barrel Nut Connector because of its appearance.

<b>Bridge</b>	Device connecting two separate networks at the OSI Data Link Layer (Level Two Media Access Control Layer). Once bridging is accomplished, the bridge makes interconnected LANs look like a single LAN, passing data between the networks and filtering local traffic.	<b>Category 5</b>	Standard specified by EIA/TIA 568 for use at speeds up to 100Mbps including FDDI (TP PMD), 100BaseT and 100BaseVG-AnyLan, and potentially ATM at 155Mbps. This quality of cable is frequently used for 10BaseT networks because it allows for future upgrades without recabling.
<b>Broadcast ping</b>	A general request for acknowledgment sent on the network. Essentially, all nodes receiving the request are to acknowledge that receipt. Also used to determine the round-trip transmission time between the requesting node and the responding node. Not all NOS respond to a broadcast ping. <i>See also</i> “ping.”	<b>CHAP</b>	<u>C</u> hallenge <u>H</u> andshake <u>A</u> uthentication <u>P</u> rotocol. Defined in RFC 1994, this protocol is used when establishing a PPP connection between two computers. It allows the “connected-to” computer to verify that the user is authorized to connect to it.
<b>Cache</b>	A quick-access, memory storage of data recently retrieved from slower-access storage. THEO+Net caches all host names and IP addresses and domain names recently accessed.	<b>CIDR</b>	<u>C</u> lassless <u>I</u> nter- <u>D</u> omain <u>R</u> outing. CIDR is an effective method to stem the increase of IP address allocation as well as routing table overflow. Basically, CIDR eliminates the concept of class A, B, and C networks and replaces this with a generalized “IP prefix” notation of IP-address/ <i>nn</i> where <i>nn</i> indicates the number of high-order bits of the IP address to use for the subnet identification.
<b>Category 3</b>	Standard for UTP voice-grade cabling specified by the EIA/TIA 568 standard for use at speeds up to 10Mbps including 10BaseT Ethernet.	<b>Class code</b>	A program and translation table used by THEOS operating systems for supporting diverse terminal types and capabilities. The class code is responsible for translating the THEOS
<b>Category 4</b>	Standard specified by EIA/TIA 568 for use at speeds up to 20Mbps including 16Mbps Token Ring.		

	internal code for a feature into the terminal-specific code for the feature.	<b>Concentra- tor</b>	In a network, a device that connects to a group of nodes, providing a single shared connection to the network through a repeater. Sometimes used interchangeably with <a href="#">Hub</a> .
	Class codes also translate keyboard input into the THEOS internal standard for keyboard codes.		
<b>Client</b>	The front-end part of a client/server application that requests services across a network from a server, or back-end. It typically provides an interactive interface to the user.	<b>Converter</b>	A repeater that also converts from one media type to another, such as from <a href="#">10Base2</a> to <a href="#">10BaseT</a> . Often called a media adapter.
<b>Client/ Server Architec- ture</b>	Network design in which the processing tasks are distributed between user workstations (clients), who initiate an operation by a request, and a centralized processing station (server), that services the request.	<b>CSMA/CD</b>	<u>C</u> arrier <u>S</u> ense <u>M</u> ultiple <u>A</u> ccess with <u>C</u> ollision <u>D</u> etection. A method allowing multiple devices access to the LAN medium (cable) by listening and waiting for an idle condition before attempting to transmit. If a collision is detected, all affected devices wait differing amounts of time before initiating another attempt to transmit.
<b>Client/ Server Application</b>	A program divided into a client portion and a server portion that interact to perform an application.	<b>Default</b>	The action or option that is taken when you do not tell the program to do something specific. With THEOS commands, default options are used for the normal usage of the command. For instance, the FILELIST command has a default option of TYPE because the output is normally displayed on the screen.
<b>coaxial- cable</b>	A cable comprising a central wire surrounded by a second tubular screening of fine wire. Associated with IBM for linking terminals and other devices needing high-speed links, coax is used in <a href="#">Ethernet</a> . It is difficult to add or remove devices from a coaxial LAN as the cable is unwieldy and thick. It is being superseded by <a href="#">UTP</a> .	<b>Device driver</b>	A subprogram that performs the required translation of CPU instructions into the proper form to con-

	trol an I/O device such as a printer, display, network adapter, <i>etc.</i>		
<b>DHCP</b>	<u>D</u> ynamic <u>H</u> ost <u>C</u> onfiguration <u>P</u> rotocol. This protocol, defined in <a href="#">RFC 1541</a> , provides a method for assigning IP addresses when a network is started, rather than requiring it to be assigned when the network is configured.	<b>Domain</b>	A group of nodes on a network that form an administrative entity. It could also be a number of servers grouped together and named to simplify network administration and security. Every computer on the <a href="#">LAN</a> belongs to at least one domain. Being logged in on one domain, however, does not limit resources in other domains to which the user has access permissions.
<b>Dial-Up Networking</b>	A network connection using a telephone and a <a href="#">modem</a> to connect to a <a href="#">PPP</a> server.	<b>E1</b>	The European standard for high-speed data transmission at 2.048Mbps: 32 64Kbps channels are provided. Compare with <a href="#">T1</a> .
<b>DUN</b>	<u>D</u> ial- <u>U</u> p <u>N</u> etworking.		
<b>DNS</b>	<u>D</u> omain <u>N</u> ame <u>S</u> ystem. This is a general purpose distributed, replicated, data query service. The principal use is the lookup of host IP addresses based on host names. The style of host names now used in the Internet is called “domain name,” because they are the style of names used to look up anything in the DNS.  Some important domains are: .COM (commercial), .EDU (educational), .NET (network operations), .GOV (U.S. government), and .MIL (U.S. military). Most countries also have a domain. For example, .US (United States), .CA (Canada), .UK (United Kingdom), .AU (Australia). It is defined in <a href="#">RFCs</a> 1034 and 1035.	<b>E-mail</b>	<u>E</u> lectronic- <u>m</u> ail. The electronic transmission and reception of messages and text-based information.
		<b>Ethernet</b>	The most widely <a href="#">LAN</a> transmission network. Based on a bus network topology, it runs at a maximum 10Mbps and adopts <a href="#">CSMA/CD</a> techniques operating over conventional <a href="#">coaxial-cable</a> , thin wire coaxial-cable and unshielded twisted pair ( <a href="#">UTP</a> ) cabling. A fiber-optic implementation has also been defined. Originally developed by Xerox, Intel and Dec, Ethernet has moved through V1 and V2 proprietary definitions, and has now been standardized with the <a href="#">IEEE 802.3</a> standard.

<b>Fast Ethernet</b>	Proposed 100Mbps technology for workstation LANs from the Fast Ethernet Alliance, which includes 3Com and SynOptics. It has been adopted by the IEEE as the basis for the 100BaseT Ethernet standard.	<b>FTP</b>	<u>F</u> ile <u>T</u> ransfer <u>P</u> rotocol. The <u>T</u> CP/ <u>I</u> P standard, high-level protocol for transferring files from one machine to another. Usually implemented as applications-level programs, FTP uses the <u>T</u> elnet and TCP protocols.
<b>File server</b>	<p>A computer on a network that provides files to clients when requested. It also receives files from clients and stores them on its storage medium.</p> <p>A file server may be dedicated: the computer is used only as a file server; or non-dedicated: the computer is also used for other tasks such as HTTP server, FTP server, <i>etc.</i> or even as a general-purpose operating system.</p>	<b>FTP Client</b>	A client application that uses the Internet standard protocol for transferring files.
		<b>FTP Server</b>	Software that delivers files to an <u>F</u> TP <u>C</u> lient over a network connection. Files are transmitted using FTP defined in <u>R</u> FC <u>959</u> .
		<b>Gateway</b>	A protocol-conversion device used to interconnect networks or devices which operate with different communications protocols. Gateways typically include a full protocol suite for both of the networks connected.
<b>Finger Client</b>	A simple client application using the Finger protocol to retrieve information from a remote user information program. Typically, the information returned by this remote program is the “real name” of the account queried and its mail status. Additional information may also be returned.	<b>Hub</b>	The center of a star topology network or cabling system. A multi-node network topology that has a central multiplexer with many nodes feeding into and through the multiplexer or hub. The other nodes do not usually directly interconnect.
<b>Firewall</b>	A firewall is a system that controls access between two networks. Some firewalls place restrictions on what is permitted to pass between networks, others limit what is not permitted to pass between them.	<b>IEEE</b>	<u>I</u> nstitute for <u>E</u> lectrical and <u>E</u> lectronics <u>E</u> ngineers.
		<b>IEEE 802.3</b>	The IEEE standard for <u>E</u> thernet networks. A Physical Layer definition that

includes specification for physical cabling plus the method of transmitting data and controlling access to the cable. It uses the [CSMA/CD](#) access method on a bus topology [LAN](#).

## IMAP4

Internet Message Access Protocol, Version 4. This protocol allows a client to access and manipulate electronic mail messages on a server. IMAP4 permits manipulation of remote message folders, called “mailboxes,” in a way that is functionally equivalent to local mailboxes. IMAP4 also provides the capability for an offline client to resynchronize with the server. Defined by [RFC 2060](#).

## Interface

The device or place where two, possibly different, signals meet. For instance, a serial interface is the device or connector where serial bits are converted to bytes and vice versa.

## internet, intranet

(Lowercase “i.”) A group of networks that are interconnected so that they appear to be one continuous network.

Typical internets are built using [Routers](#), either to form a backbone network comprised of routers, or to link together [LANs](#) at the Network Layer.

## Internet

(Uppercase “I.”) A collection of thousands of networks and gateways, including the Milnet and NSFNET, all using the [TCP/IP](#) protocol suite. It functions as a single, cooperative virtual network.

The Internet provides universal connectivity and three levels of network services: connectionless packet delivery; full duplex stream delivery and application level services. Among the common services provided are: World-Wide Web (WWW), file transfer ([FTP](#)), terminal-emulation access ([Telnet](#)) and [E-mail](#) services.

## InterNIC

The InterNIC is a five year project partially supported by the National Science Foundation. It provides network information services to the networking community. The InterNIC began operations in April of 1993 and is a collaborative project of three organizations: General Atomics, AT&T and Network Solutions, Inc.

Among other responsibilities, InterNIC provides Internet registration services including IP address allocation, domain registration, and Autonomous System Number assignment.



<b>IP</b>	The <a href="#">TCP/IP</a> standard protocol that defines the IP datagram as the unit of information passed across an internet and provides the basis for connectionless packet delivery service.		ence Model - a framework for standards allowing the open exchange of information among terminals, computers, networks, and applications.
<b>IP address</b>	The 32-bit address assigned to hosts that want to participate in a <a href="#">TCP/IP</a> Internet. Usually expressed as four numbers separated by periods: 101.102.103.104. Each of the numbers may have a range of values between 0 and 255. Thus, the possible number of IP addresses is 4,294,967,296. The actual number of addresses that can be used is much less, because of the current address-assignment procedures. <i>See:</i> <a href="#">CIDR</a> .	<b>ISP</b>	<a href="#">Internet Service Provider</a> . A company providing access to the Internet, usually by dial-up modem. ISPs may also provide ISDN and dedicated, 24-hour per day direct access.
		<b>K</b>	Kilobyte. Approximately one thousand bytes (1,024).
		<b>LAN</b>	<a href="#">Local Area Network</a> . A communications system that links computers into a network, usually via a wiring-based cabling scheme. LANs connect PCs, workstations and servers together to allow users to communicate and share resources like hard disk storage and printers. Devices linked by a LAN may be on the same floor or within a building or campus. It is user-owned and does not run over leased lines, though a LAN may have gateways to the <a href="#">PSTN</a> or other, private networks.
<b>ISDN</b>	<a href="#">Integrated Services Digital Network</a> . An approach to switched digital networking that can handle a range of digital voice, data and image transmission. It is intended to provide end-to-end, simultaneous handling of digitized voice and data traffic on the same digital links via integrated switches.		
<b>ISO</b>	<a href="#">International Standards Organization</a> . An organization, located in Geneva, Switzerland, responsible for collecting and distributing national standards and establishing international standards. It is devoted to developing the OSI Refer-	<b>Line signal standards</b>	In the US: <a href="#">T1</a> carries data at 1.544Mbps and has 24 voice circuits; <a href="#">T2</a> is 6.312Mbps with 96 voice circuits, and <a href="#">T3</a> , 44.736Mbps.

	In Europe, the standards are of the form <i>En</i> . <a href="#">E1</a> line speed is 2.048Mbps with three voice circuits; <a href="#">E2</a> is 8.448Mit/s with 120 voice channels. <a href="#">E3</a> is 34.368Mbps with 480 voice circuits. In the UK, <a href="#">E1</a> is often referred to as MegaStream, a BT label for its 2Mbps leased circuits.			data from a computer's serial port and an analog telephone voice line.
		<b>NBS</b>		<a href="#">National Bureau of Standards</a> . Now called <a href="#">NIST</a> .
		<b>NetTerm Client</b>		A terminal-emulator client application program that allows a user on one THEOS-based system to connect to and become a user on another THEOS-based system on the network. The remote system must have the THEOS <a href="#">Login Server</a> started.
<b>Localhost</b>	A predefined or reserved server name that always refers to the local system's server. This special server name can be used with most network clients such as <a href="#">FTP Client</a> , <a href="#">NetTerm Client</a> , <a href="#">Telnet Client</a> , <i>etc.</i>	<b>Network administrator</b>		The person responsible for maintaining a computer network. They are responsible for assigning <a href="#">IP addresses</a> , names and other parameters for each node of the network. They are also responsible for cabling and hardware configuration and network software configuration.
<b>Login Server</b>	A network server that allows client system to connect as a user. <i>See:</i> <a href="#">NetTerm Client</a> , <a href="#">Telnet Client</a> and <a href="#">TWS Client</a> .			
<b>MB</b>	Megabyte. Approximately one million bytes (1,048,576).			
<b>MHz</b>	Megahertz. One million cycles per second.	<b>Network topology</b>		The different configurations that can be adopted in building networks. Common topologies include: <a href="#">Ring topology</a> , bus and <a href="#">Star Topology</a> .
<b>MIME</b>	<a href="#">M</a> ultipurpose <a href="#">I</a> nternet <a href="#">M</a> ail <a href="#">E</a> xtensions. An extension to Internet e-mail which provides the ability to transfer non-textual data, such as data files.	<b>NFS</b>		<a href="#">N</a> etwork <a href="#">F</a> ile <a href="#">S</a> ystem. A protocol developed by Sun Microsystems, and defined in <a href="#">RFC</a> 1094, which allows a computer system to access files over a network as if they were on its local disks. This protocol has been incorporated in products by
<b>modem</b>	<a href="#">M</a> odulator/ <a href="#">d</a> emodulator. A device that interfaces between a digital signal and an analog signal. Specifically, between the digital			

	more than two hundred companies, and is now a de-facto Internet standard.	<b>PABX (PBX)</b>	A <u>P</u> ri <u>v</u> ate <u>A</u> utomatic <u>B</u> ranch <u>eX</u> change/telephone exchange linked to the <u>P</u> STN. It handles calls automatically i.e., unattended. Normally a user-owned exchange.
<b>NIC</b>	<u>N</u> etwork <u>I</u> nterface <u>C</u> ard. Circuitry connecting a node to a network, usually in the form of a card in a PC expansion slot. In conjunction with the <u>N</u> OS and PC operating system, it helps transmit and receive message frames on the network.	<b>Password</b>	A special word or series of characters assigned to a user that allows access only to authorized systems, resources, files or programs. A user's password is usually known only to the user and the system manager or network administrator.
<b>NIST</b>	<u>N</u> ational <u>I</u> nstitute of <u>S</u> tandards and <u>T</u> echnology. United States governmental body that provides assistance in developing standards. Formerly the National Bureau of Standards ( <u>NBS</u> ).	<b>Patch level</b>	A sequentially-assigned number used to identify each revision of the software. A patch level of zero indicates that the software is an unmodified release of the product.
<b>NOS</b>	<u>N</u> etwork <u>O</u> perating <u>S</u> ystem. The software that connects all the devices on a network so that resources can be shared efficiently and files can be transferred. It handles administration of all network functions, Network operating systems are usually in two parts; server and client.	<b>Peer-to-Peer</b>	A <u>L</u> AN in which users can communicate directly with each other or system resources without involving a separate stand-alone server. Windows 95 supports Peer-to-Peer networking.
<b>OSI</b>	<u>O</u> pen <u>S</u> ystems <u>I</u> nterconnection Model. A seven-layer data communication reference model developed by the International Standards Organization (ISO) to enable software and equipment from different manufacturers to communicate in a network.	<b>ping</b>	A request for acknowledgment sent on the network. Essentially, a request for a reply that states the addressed node is present on the network. Also used to determine the round-trip transmission time between the requesting node and the addressed node. <i>See also</i> "Broadcast ping."

<b>POP</b>	<u>P</u> oint of <u>P</u> resence. May also refer to a Post Office Protocol.		wall. A proxy is a special server that typically runs on a firewall machine. The proxy waits for a request from inside the firewall, forwards the request to the remote server outside the firewall, reads the response and then sends it back to the client.
<b>POP3</b>	<u>P</u> ost <u>O</u> ffice <u>P</u> rotocol, Version 3. The protocol used by a mail server for delivering mail addressed to your e-mail account. See also: <a href="#">SMTP</a> .		
<b>POTS</b>	<u>P</u> lain <u>O</u> ld <u>T</u> elephone <u>S</u> ervice. Term refers to the existing, copper-wire telephone network. Although it might be possible to transmit at higher rates, POTS technology is limited to 33.6 Kbps transmissions.	<b>PSTN</b>	<u>P</u> ublic <u>S</u> witched <u>T</u> elephone <u>N</u> etwork. The normal voice-grade telephone system. Also called <a href="#">POTS</a> .
		<b>PTO</b>	<u>P</u> riate <u>T</u> elephone <u>O</u> ffice.
<b>PPP</b>	<u>P</u> oint to <u>P</u> oint <u>P</u> rotocol. This protocol, defined in <a href="#">RFC 1661</a> , provides a method for transmitting packets over serial point-to-point links, such as with telephone modem connections.	<b>Repeater</b>	A device that extends the maximum length of cable that can be used in a single network. A repeater will typically pass any software protocol without interpretation or modification.
<b>Protocol</b>	A set of rules governing the information flow within a communications infrastructure, often known as “data link control.” Protocols control format, timing, error correction and running order. They are essential for a device to be able to interpret incoming information. Suites of protocols are often used in networks, with each protocol responsible for one part of a communications function.	<b>RFC</b>	<u>R</u> equ <sup>est</sup> <u>f</u> or <u>C</u> omment. A document generally defining a <a href="#">Protocol</a> that is made available to the parties interested in the standard. After a period of time, the comments submitted are incorporated into the standard and it is published with an IEEE, ISO, ANSI or other governing-body number.  RFCs for most of the networking protocols are administered by the Network Working Group of <a href="#">InterNIC</a> . They use RFCs as the standard itself.
<b>Proxy Server</b>	The primary use of proxies is to allow access to the Internet from within a fire-		

<b>RFC 821</b>	The definition of the standard used for mail clients and servers. Specifically, it defines the communications protocol for <a href="#">SMTP</a> .
<b>RFC 854</b>	The definition of the standard used for <a href="#">Telnet Clients</a> and servers.
<b>RFC 959</b>	The definition of the standard used for <a href="#">FTP Clients</a> and servers.
<b>RFC 1034</b>	The definition of the Domain Name System ( <a href="#">DNS</a> ) used by the <a href="#">Internet</a> .
<b>RFC 1082</b>	The definition of the standard used for POP3, used by mail servers and clients.
<b>RFC 1288</b>	The definition of the protocol used by a <a href="#">Finger Client</a> .
<b>RFC 1541</b>	The definition of <a href="#">DHCP</a> .
<b>RFC 1661</b>	The definition of <a href="#">PPP</a> .
<b>RFC 1945</b>	The definition of the HTTP protocol version 1.0. <i>See also:</i> <a href="#">RFC 2068</a> .
<b>RFC 1994</b>	The definition of the <a href="#">CHAP</a> protocol. This protocol is used with PPP connections for authentication.
<b>RFC 2060</b>	The definition of the standard protocol for <a href="#">IMAP4</a> revision 1.
<b>RFC 2068</b>	The definition of the HTTP protocol version 1.1. This protocol is used by web browsers.

## Ring topology

A layout scheme in which the network takes the form of a closed loop with the devices attached into the ring. Every workstation is linked to two others, one on each side. All data is passed from node to node in one direction only, with each PC acting as a repeater for the next one in the loop.

Response time is determined by the number of stations on the ring - the more there are, the slower it works. If one PC fails, the loop is broken, though most rings have self-healing capacity to reconfigure and continue operation.

## RJ11

Popular name for the standard four-wire modular connector for telephone connections.

## RJ45

Popular name for the eight-pin modular connector in the [10BaseT](#) standard for UTP connections to workstations or smart wiring [Hubs](#). The actual connector is described in ISO standard 8877.

## Router

Network interconnector device operating at OSI Network Layer (Level Three) that supports a particular Network Layer protocol and related stack, such as [TCP/IP](#), DecNet, XNS, SNA, OSI IP, IPX.

	A router can be used to link <a href="#">LANs</a> together locally or remotely as part of a <a href="#">WAN</a> . A network built using routers is often termed an inter-network.	<b>SNMP</b>	<a href="#">Simple Network Management Protocol</a> . A standard application protocol that's part of the <a href="#">TCP/IP</a> suite. It allows network management systems to retrieve management information from the nodes on the network.
<b>Routing</b>	Process of delivering a message frame across one or more networks via the best path. The best path is determined using many different criteria such as time, cost, <i>etc.</i>	<b>SMTP</b>	<a href="#">Simple Mail Transfer Protocol</a> . The <a href="#">TCP/IP</a> standard protocol for transferring electronic mail messages from your mail client to the mail server. SMTP specifies how two mail systems interact and the format of control messages they exchange to transfer mail.
<b>Routing table</b>	Information stored within a router that contains network path and status information. It is used to select the most appropriate route to forward information along.	<b>Spooler</b>	The process of accepting one or more printing requests from users, storing the data temporarily in memory or on a disk, and sending the data to the printer at a rate it can handle. Meanwhile, the user is free to perform other tasks.
<b>SendMail Client</b>	A simple e-mail client application that sends mail to the user addresses on the Internet using <a href="#">SMTP</a> .	<b>Star Topology</b>	A network layout or design in which each node is connected to a central <a href="#">Hub</a> . The hub establishes, maintains and terminates all connections between the nodes. In a LAN, the hub is likely to be a workstation, whereas in larger multi-point networks the hub is more likely to be a multiplexer.
<b>Serial number</b>	The operating system and major THEOS products and applications are coded with a serial number. A program's serial number must match the operating system's and the <a href="#">THEOS Software Portal</a> 's serial number.	<b>STP</b>	<a href="#">Shielded Twisted-Pair</a> cable. A twisted pair of cables surrounded by a wire gauze shield, commonly
<b>Server</b>	A node that permits other nodes on the LAN to access its resources. The server may be dedicated, in which case this is its sole function, or non-dedicated, where the node can be used in other ways, such as a workstation.		

	used by IBM. STP is used for higher speed communication and longer cable lengths than UTP since it has better EMI/RFI isolation.	<b>T3</b>	A US standard for high-speed data transmission at 44.736Mbps, providing the equivalent bandwidth of 28 <a href="#">T1</a> circuits. Also called a DS3.
<b>Subnet</b>	A portion of a network, which may be a physically independent network, which shares a network address with other portions of the network and is distinguished by a subnet number. A subnet is to a network what a network is to an internet.	<b>TCP/IP</b>	<a href="#">T</a> ransmission <a href="#">C</a> ontrol <a href="#">P</a> rotocol/ <a href="#">I</a> nternet <a href="#">P</a> rotocol. A suite or collection of protocols including TCP and IP. It is a set of software and hardware standards for network clients and servers that enables them to connect to other computers on a group of interconnected TCP/IP networks.
<b>Subnet mask</b>	A 32-bit value consisting of a series of “1” bits followed by “0” bits used to define the range of IP addresses that share a network segment.	<b>TCP Simple Services</b>	A set of standard services provided with most TCP/IP network operating systems. Includes such services as chargen, daytime, quote, time, <i>etc.</i>
<b>Subnet number</b>	A part of the IP address which designates a subnet. That is, the portion of the address that is common to all of the nodes on the subnet.	<b>Telco</b>	Common abbreviation for the local telephone company.
<b>System account</b>	A term used to indicate the public account on a THEOS-based system. Normally named “SYSTEM,” it may have any name. However, the system account is always account number zero.	<b>Telnet</b>	A standard application protocol that is part of the <a href="#">TCP/IP</a> suite. Telnet allows users to log onto a remote host computer over a network and operate as if they were a local terminal.
<b>T1</b>	A US and Japanese standard for high-speed data transmission at 1.544Mbps: 24 64Kbps channels plus 8Kbps’ control information are provided. Also called a DS1. <i>See also</i> “E1.”	<b>Telnet Client</b>	Telnet is the Internet standard protocol for remote terminal connection service. It provides terminal emulation and connection to a remote <a href="#">Login Server</a> .

<b>Terminal Emulation</b>	A program which allows a computer to emulate a terminal on another system. Telnet is a form of terminal emulation and so is <a href="#">Net-Term Client</a> and THEOS ScanTerm.	<b>THEOS Software Portal</b>	A hardware device required for proper installation and operation of the THEOS operating system and major THEOS applications.
<b>Terminator</b>	A device that terminates a signal cable. Principally used in bus topology network. In a <a href="#">10Base2</a> bus, a 50-ohm terminator is required at each end of the <a href="#">coaxial-cable</a> bus.	<b>Thicknet</b>	See " <a href="#">10Base2</a> " on page <a href="#">267</a> .
<b>TheoMail Client</b>	The THEOS Internet Mail Client program. Included with the <a href="#">THEO+Mail</a> Plus Pak.	<b>Thinnet</b>	See " <a href="#">10Base2</a> " on page <a href="#">267</a> .
<b>THEO+Mail</b>	Product name for the THEOS Internet Mail Client Plus Pak. Includes the <a href="#">TheoMail Client</a> and the <a href="#">SendMail Client</a> , along with utility programs used to access mail messages from application programs.	<b>TP</b>	<i>See:</i> <a href="#">Twisted Pair</a> .
<b>THEO+Net</b>	Product name for the THEOS network operating system ( <a href="#">NOS</a> ) Plus Pak. Includes many sub-products such as a <a href="#">Login Server</a> , <a href="#">TCP Simple Services</a> , <a href="#">Telnet Client</a> , <a href="#">FTP Client</a> , <a href="#">Net-Term Client</a> , <a href="#">TWS Client</a> , <i>etc.</i>	<b>Tree topology</b>	A graphic description of a network topology where there is only one route between any two nodes.
<b>THEO+Server</b>	Product name for the THEOS FTP and Web Server Plus Pak. Includes the THEOS <a href="#">FTP Server</a> and the THEOS <a href="#">Web Server</a> .	<b>Twisted Pair</b>	Two insulated copper wires twisted together with the twists varied in length to reduce potential signal interference between the pairs. Where cables comprise more than 25 pairs, they are usually bundled and wrapped in a cable sheath.  Twisted pair is the most common medium for connecting phones, computers and terminals to PABXs. With the <a href="#">IEEE</a> ratification of <a href="#">10BaseT</a> for networking 10Mbps <a href="#">Ethernet</a> over UTP telephony wiring, twisted pair has become ubiquitous. As well as performance at Ethernet rates, it offers cost benefits to the end user through flexibility and ease of relocation. New data-grade and even voice-grade UTP methods support 100Mbps transmission.



<b>TWS Client</b>	A terminal-emulator client application program that allows a user on one Windows-based system to connect to and become a user on a THEOS-based system on the network. The remote system must have the THEOS <a href="#">Login Server</a> started.
<b>UTP</b>	<u>Un</u> shielded <u>Tw</u> isted- <u>Pa</u> ir cable. The standard cabling used for telephone lines. The standard <a href="#">IEEE 802.3, 10BaseT</a> , defines use of <a href="#">Ethernet</a> over UTP for rates up to 10Mbps.
<b>Web Server</b>	Software that delivers documents to a web browser over a network connection. Documents are transmitted using HTTP defined in <a href="#">RFC 2068</a> .
<b>WAN</b>	<u>W</u> ide <u>A</u> rea <u>N</u> etwork. A network which covers a larger geographical area than a LAN and where telecommunications links are implemented, normally leased from the appropriate PTO(s).
<b>Workstation</b>	Term used freely to mean a PC, terminal or high-end desktop processor - in short, a device that has data input and output and is operated by a user. In a network, a workstation is a terminal or a computer operating with terminal emulation software connected to a server.



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