

KINETICS

FastPath™ 4

Administrator's Guide

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Contents

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About This Guide

| | |
|---|-----|
| Who should read this guide..... | P-2 |
| How to use this guide..... | P-2 |
| If you are new to FastPath gateways | P-2 |
| If you are experienced with FastPath gateways | P-3 |
| Terminology used in this guide | P-4 |
| Additional reading | P-5 |

1 Installation and Configuration:

An Overview

| | |
|---|------|
| Do you need to configure the FastPath?..... | 1-2 |
| A note on network configuration..... | 1-3 |
| Before you begin | 1-4 |
| Using the FastPath Manager | 1-6 |
| Opening a gateway | 1-7 |
| The main configuration dialog box..... | 1-8 |
| Reset and Pause | 1-8 |
| Entering configuration data | 1-9 |
| Using the K-STAR gateway program | 1-10 |
| Remote Boot | 1-10 |
| Downloading K-STAR | 1-11 |
| Sending the configuration data: Go | 1-11 |
| Diagnostics and Log windows | 1-12 |
| Saving your configuration data | 1-12 |
| Quitting the FastPath Manager | 1-12 |
| Finishing the installation | 1-13 |
| The Ethernet connection..... | 1-13 |
| Thick Ethernet..... | 1-13 |
| Thin Ethernet | 1-14 |
| Checking the configuration..... | 1-16 |
| Changing configuration data | 1-16 |

| | |
|---|------|
| 2 K-STAR AppleTalk Configuration: | |
| Phase 2, Transition Bridge, and Phase 1 | |
| AppleTalk configuration features..... | 2-2 |
| AppleTalk Phase 2 addressing..... | 2-3 |
| Network numbers | 2-3 |
| Node addresses | 2-3 |
| Zones | 2-4 |
| Required configuration data | 2-5 |
| An example Phase 2 internet..... | 2-6 |
| Explicit configuration: gateway 1..... | 2-8 |
| Seeding on the Ethernet interface: gateway 2 | 2-12 |
| Seeding on the LocalTalk interface: gateway 3 | 2-14 |
| Transition bridge addressing | 2-17 |
| Network numbers | 2-17 |
| Zones | 2-17 |
| Required configuration data | 2-18 |
| An example transition bridge internet | 2-19 |
| Explicit configuration: bridge 1 | 2-21 |
| Seeding on the Ethernet interface: bridge 2..... | 2-25 |
| Seeding on the LocalTalk interface: bridge 3..... | 2-27 |
| AppleTalk Phase 1 addressing..... | 2-32 |
| Required configuration data | 2-33 |
| An example Phase 1 internet..... | 2-34 |
| Explicit configuration: gateway 1..... | 2-36 |
| Seeding on the Ethernet interface: gateway 2 | 2-39 |
| Seeding on the LocalTalk interface: gateway 3 | 2-41 |
| AppleTalk management issues | 2-45 |
| Network ranges and zone lists | 2-45 |
| New zone names..... | 2-46 |
| AppleTalk encapsulated in UDP: IPTalk..... | 2-46 |
| AppleTalk zone security | 2-47 |
| Zones in the Chooser | 2-47 |
| How zone security works | 2-47 |
| AppleTalk Phase 1, Option 13: ON | 2-49 |
| AppleTalk Phase 2, Option 13: ON | 2-50 |
| AppleTalk Phase 1, Option 14: ON | 2-51 |
| AppleTalk Phase 2, Option 14: ON | 2-52 |
| AppleTalk Phase 1, Option 15: ON | 2-53 |
| AppleTalk Phase 2, Option 15: ON | 2-54 |

3 K-STAR IP Configuration

| | |
|---|------|
| If you are new to IP internets..... | 3-2 |
| IP addresses..... | 3-2 |
| IP subnets..... | 3-3 |
| IP broadcast addresses..... | 3-6 |
| Required K-STAR IP data | 3-7 |
| Configuring the gateway as an IP host | 3-7 |
| Client Macintosh IP addresses..... | 3-8 |
| Example K-STAR IP configurations..... | 3-9 |
| The default K-STAR IP configuration..... | 3-10 |
| Using a noncontiguous address range: | |
| “Split addressing” with Option 9..... | 3-14 |
| The gateway managing a separate IP network: | |
| “Split addressing” with Option 9..... | 3-20 |
| Distributing Macintosh clients: Option 7..... | 3-24 |
| An IPTalk configuration..... | 3-28 |
| If you are using atalkad | 3-33 |
| K-STAR IP management issues | 3-37 |
| Managing Macintosh clients | 3-37 |
| Dynamic IP addresses..... | 3-37 |
| Static IP addresses | 3-37 |
| Macintoshes on Ethernet..... | 3-38 |
| How dynamic addressing works | 3-38 |
| Split addressing management issues..... | 3-39 |
| Using the new UDP port numbers..... | 3-40 |

4 K-STAR DECnet Configuration

| | |
|-----------------------------------|-----|
| K-STAR DECnet addressing..... | 4-2 |
| Required configuration data | 4-2 |
| An example internet | 4-3 |
| Supplying the DECnet data | 4-4 |

5 Troubleshooting

| | |
|---|------|
| Calling for help | 5-2 |
| FastPath installation problems | 5-2 |
| FastPath configuration problems | 5-4 |
| Can't locate a gateway to open..... | 5-4 |
| Problems downloading or configuring | 5-7 |
| AppleTalk Phase 2..... | 5-8 |
| AppleTalk transition bridge..... | 5-9 |
| AppleTalk Phase 1 | 5-10 |
| K-STAR IP..... | 5-10 |
| DECnet..... | 5-11 |
| Network Connections | 5-12 |

A FastPath Operations

| | |
|---|------|
| The FastPath power-on sequence..... | A-2 |
| The download sequence..... | A-4 |
| Hardware self-testing | A-5 |
| AppleTalk autoconfiguration..... | A-7 |
| FastPath protocols and routing | A-9 |
| PROM-resident AppleTalk routing..... | A-9 |
| K-STAR AppleTalk Phase 2 routing issues | A-13 |
| K-STAR routing and encapsulation..... | A-13 |
| PROM-resident IP routing | A-17 |

B FastPath Manager Reference

| | |
|-------------------------------------|------|
| About the FastPath Manager | B-2 |
| Gateway selection window | B-3 |
| Diagnostics window..... | B-4 |
| Main configuration dialog box | B-6 |
| K-STAR IP dialog box | B-18 |
| K-STAR IP “More” dialog box..... | B-22 |
| DECnet dialog box | B-23 |
| Appletalk Phase 1 dialog box | B-24 |
| IP Subsectioning dialog box..... | B-25 |
| FastPath Manager menus..... | B-26 |
| The File menu | B-27 |
| The Gateways menu | B-28 |
| The Configuration menu..... | B-29 |
| The Windows menu..... | B-30 |

C FastPath Diagnostic Messages

| | |
|-----------------------------------|------|
| Conventions and organization..... | C-2 |
| Alphabetic listing..... | C-3 |
| Gateway startup..... | C-6 |
| PROM startup | C-6 |
| K-STAR startup | C-9 |
| Ethernet initialization..... | C-10 |
| AppleTalk | C-11 |
| Autoconfiguration | C-12 |
| Node-finding..... | C-13 |
| RTMP | C-16 |
| ZIP..... | C-19 |

| | |
|-------------------------------|------|
| IP..... | C-22 |
| Address resolution: ARP | C-22 |
| Atalkad | C-23 |
| DECnet | C-23 |
| IP Subsectioning..... | C-26 |

D Kinetics FastPath Management Information Base for SNMP

| | |
|---|-----|
| Related RFCs | D-2 |
| Managed objects | D-3 |
| Object type syntax | D-5 |
| Kinetics FastPath MIB definitions | D-7 |
| Objects..... | D-7 |
| Object Groups | D-7 |
| Format of Definitions..... | D-8 |
| Object Definitions | D-9 |

E PROM-Resident Configuration: AppleTalk Phase 1

| | |
|--|-----|
| PROM-resident AppleTalk Phase 1 | E-2 |
| Supplying configuration data | E-2 |
| Addressing rules | E-3 |
| Required configuration data..... | E-3 |
| PROM-resident Phase 1 configuration..... | E-4 |
| Using seed data | E-6 |

F Network Hardware Issues

| | |
|--------------------------------|-----|
| Network size restrictions..... | F-2 |
| Ethernet topology | F-4 |
| Combining networks | F-4 |
| Repeaters and connectors..... | F-5 |
| Adding a node to Ethernet..... | F-7 |

G Technical Specifications

| | |
|---|-----|
| Internal components..... | G-2 |
| Power and environmental requirements..... | G-3 |
| External components..... | G-4 |
| LocalTalk connector..... | G-4 |
| Ethernet connectors..... | G-5 |

Glossary

Index

Limited Warranty

List of Figures

| | |
|---|------|
| 1-1. Connecting to a Macintosh via LocalTalk..... | 1-4 |
| 1-2. The LEDs on the FastPath front panel..... | 1-5 |
| 1-3. Selecting thick Ethernet connection..... | 1-13 |
| 1-4. Connecting to thick Ethernet..... | 1-14 |
| 1-5. Selecting thin Ethernet connection..... | 1-14 |
| 1-6. Connecting to thin Ethernet..... | 1-15 |
| | |
| 2-1. Example AppleTalk Phase 2 internet..... | 2-6 |
| 2-2. AppleTalk Phase 2 Zones and Net Numbers..... | 2-7 |
| 2-3. Example Phase 1/Phase 2 internet..... | 2-19 |
| 2-4. Transition bridge configurations..... | 2-20 |
| 2-5. Example AppleTalk Phase 1 internet..... | 2-34 |
| 2-6. AppleTalk Phase 1 Zones and Net Numbers..... | 2-35 |
| 2-7. Phase 1 "Stay in Zone" security..... | 2-49 |
| 2-8. Phase 2 "Stay in Zone" security..... | 2-50 |
| 2-9. Phase 1 "LaserWriter" security..... | 2-51 |
| 2-10. Phase 2 "LaserWriter" security..... | 2-52 |
| 2-11. Phase 1 "Tilde" security..... | 2-53 |
| 2-12. Phase 2 "Tilde" security..... | 2-54 |
| | |
| 3-1. IP network numbers as assigned by NIC..... | 3-3 |
| 3-2. IP Subnetting: Class A..... | 3-4 |
| 3-3. IP Subnetting: Class B..... | 3-4 |
| 3-4. IP Subnetting: Class C..... | 3-5 |
| 3-5. IP broadcast address with no subnet..... | 3-6 |
| 3-6. IP broadcast address with subnetting..... | 3-6 |
| 3-7. K-STAR IP configuration..... | 3-7 |
| 3-8. A default K-STAR IP configuration..... | 3-11 |
| 3-9. Using a noncontiguous range of client addresses..... | 3-15 |
| 3-10. A separate IP network managed in the gateway..... | 3-20 |
| 3-11. Distributed Macintosh clients..... | 3-25 |
| 3-12. UDP encapsulation: IPTalk..... | 3-30 |
| 3-13. Using atalkad..... | 3-34 |

| | |
|---|------|
| 4-1. A DECnet network..... | 4-3 |
| 4-2. DECnet configuration data | 4-4 |
| 5-1. Hardware installation check..... | 5-3 |
| 5-2. Can't find and open the gateway..... | 5-5 |
| 5-3. Problems downloading or sending data..... | 5-7 |
| A-1. FastPath State Diagram | A-3 |
| A-2. The FastPath LEDs | A-6 |
| A-3. PROM-resident AppleTalk Phase 1 routing | A-10 |
| A-4. EtherTalk packets: AppleTalk on Ethernet | A-10 |
| A-5. K-STAR routing | A-14 |
| A-6. Examples of K-STAR encapsulation..... | A-15 |
| A-7. PROM-resident IP Routing..... | A-17 |
| D-1. Global object identifier tree..... | D-4 |
| E-1. A Phase 1 configuration..... | E-4 |
| E-2. Seeding on the Ethernet interface | E-6 |
| F-1. Grounded and terminated Ethernet cable..... | F-4 |
| F-2. Using a connector to combine Ethernet cables | F-5 |
| F-3. Using a repeater to combine Ethernet cables..... | F-6 |

List of Tables

| | |
|---|------|
| A-1. AppleTalk Protocols..... | A-11 |
| A-2. Internet Protocols | A-16 |
| C-1. Alphabetic Listing of Diagnostic Messages | C-3 |
| F-1. AppleTalk Network Size Restrictions | F-2 |
| F-2. Ethernet Network Size Restrictions | F-2 |
| F-3. Combined Ethernet Network Size Restrictions..... | F-3 |

Federal Communications Commission Warning

The EtherPort cards generate, use, and can radiate radio-frequency energy and, if not installed and used in accordance with the instruction guide, may cause interference to radio communications. The EtherPort cards have been tested and found to comply with the limits prescribed for a Class A computing device, pursuant to Subpart J of Part 15 of the Federal Communications Commission (FCC) Rules, which are designed to provide reasonable protection against such interference when operated in a commercial environment. Operation of this equipment in a residential area is likely to cause interference, in which case the user, at his own expense, will be required to take whatever measures may be required to correct the interference.

The FCC rules are designed to provide reasonable protection against such interference in a commercial installation. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause interference to radio or television reception, which can be determined by turning the equipment off and on, try to correct the interference by one or more of the following measures:

- Reorient the receiving antenna.
- Relocate the equipment with respect to the receiver.
- Move the equipment away from the receiver.
- Plug the equipment into a different outlet, so the equipment and the receiver are on different branch circuits.
- If necessary, consult your Kinetics dealer or an experienced radio-television technician for additional suggestions. You might find the following FCC booklet helpful:

How to Identify and Resolve Radio-TV Interference Problems, U.S. Government Printing Office, Washington, DC 20402, Stock No. 004-000-0034504.

About This Guide

THIS GUIDE CONTAINS INSTRUCTIONS FOR INSTALLING AND configuring the FastPath™ 4 gateway.

The FastPath hardware connects a LocalTalk® or compatible network to a thick or thin Ethernet or compatible network.

The FastPath gateway program is called K-STAR™ for “Kinetics-Style Addressing and Routing.” K-STAR contains software modules that implement AppleTalk Phase 1 and Phase 2 protocols, transition bridge software, TCP/IP protocols (including UDP, ICMP, and RIP), DECnet™, and SNMP. You provide configuration data to the gateway and download the K-STAR gateway program using the FastPath Manager™ Macintosh application.

The FastPath also contains a PROM-resident implementation of AppleTalk® Phase 1, which can be used for “install and go” autoconfiguration. The gateway’s PROM-resident implementation of IP is provided for backward compatibility only and is not described in this guide.

Who should read this guide

This guide is written for the network administrator who is responsible for setting up and maintaining the internet. The network administrator must be familiar with using the Macintosh and should have some technical knowledge of network addressing and operation.

In general, the network administrator is involved in planning and implementing the physical internet (for example, laying the network cables, adding and removing nodes on individual networks, placing gateways, bridges, and routers), as well as installing and configuring network software and services.

How to use this guide

This guide has sample configurations organized in chapters for the different protocols supported on the FastPath gateway, and comprehensive reference material presented in Appendixes. General network management issues relating to a particular protocol are presented at the back of each chapter, and there is a separate chapter on troubleshooting.

If you are new to FastPath gateways

1. Read Appendix A for background information on how the FastPath works. This Appendix describes the basic architecture and operations of the FastPath gateway and explains the configuration and protocol alternatives.
2. Read Chapter 1 to find out how to install the gateway and the recommended procedure for configuring it. You should read this Chapter step-by-step to get the complete sequence for installing and configuring the gateway. If you follow this procedure, you will not disrupt the rest of the network if you make a mistake.
3. Determine which protocols the gateway needs to route between its two interfaces. This depends on the network software running on devices on the two networks connected to the gateway. Note that when you use the K-STAR gateway program, the gateway can support several types of protocols with the appropriate configuration data for each.

4. Read the configuration chapter for each type of protocol the gateway will support. The sections entitled "Required Configuration Data" describe the addressing information you need to know before configuring the gateway with the appropriate data for your site.
 - Chapter 2 describes how to configure the gateway for AppleTalk Phase 2 routing, a combination of AppleTalk Phase 2 and Phase 1, or AppleTalk Phase 1 using the protocols contained in the K-STAR program.
 - Chapter 3 describes how to configure the gateway for TCP/IP/UDP routing using the Kinetics Internet Protocol (KIP)-derived protocols contained in K-STAR.
 - Chapter 4 describes how to configure the gateway for DECnet routing.
 - If the gateway needs to support only AppleTalk Phase 1 and you do not need to use the zone security features provided in K-STAR, you can use the PROM-resident AppleTalk protocols. See Appendix E.

See Appendix C for an explanation of the diagnostic messages you might see when the configuration is complete.

5. If you run into any trouble when installing the configured gateway on the internet, check the troubleshooting information in Chapter 5.

**If you are
experienced with
FastPath gateways**

1. Read Appendix A and Appendix B to see the new features and options in the gateway's routing capabilities and in the FastPath Manager configuration software.
2. Read "Changing Configuration Data" in Chapter 1 if you are using the new version of the FastPath Manager to open and modify existing configuration files.

3. Check the “Required Configuration Data” sections and the overviews preceding examples for the configuration types you require. Overviews of the configuration procedure are presented as bulleted lists in bold type in Chapters 2 through 4.
4. You will notice new diagnostic messages in the Diagnostics window of the FastPath Manager. These are documented in Appendix C.
5. If you are managing an internet that has already been configured using the gateway’s PROM-resident IP protocols, please refer to your existing documentation on “IP Subnetting” in previous versions of the FastPath documentation.



The gateway’s PROM-resident IP implementation was previously referred to as the “IP Subnetting” configuration type. In this version of the FastPath Manager, it is called “IP Subsectioning” to avoid confusion with standard IP subnetting. Note, however, that the PROM-resident code itself has not changed.

Gateways configured with PROM-resident IP Subsectioning can operate on internets that also support K-STAR IP gateways, and K-STAR IP is the recommended method of IP configuration. If you are using the PROM-resident IP protocols, please refer to your existing documentation.

6. If the internet supports SNMP and network management utilities, see Appendix D for the Kinetics FastPath Management Information Base (MIB).



In this release, it is recommended that you supply all configuration information *before* downloading K-STAR.

Terminology used in this guide

In this guide, the term **Ethernet** refers to both thick and thin Ethernet cable, as well as any IEEE 802.3 standard network. The term **LocalTalk** refers to any system of cables and connectors that supports AppleTalk protocols and runs at 230.4 kilobits per second; for example, LocalTalk or PhoneNET.

This guide refers to an **internet** as a collection of LocalTalk and Ethernet networks connected by gateways. The term **AppleTalk internet** means all devices on the internet that use AppleTalk protocols; the devices may be connected to LocalTalk cable or Ethernet. Similarly, the **IP internet** refers to all systems that use TCP/IP/UDP, regardless of their physical location. For example, a Macintosh running TCP/IP software may be physically connected to Ethernet or to a LocalTalk network with a gateway to Ethernet. In either case, it is part of the IP internet.

In this guide, the FastPath is typically referred to as a **gateway**. However, it can also be referred to as a **bridge** or **router**, depending on the context in which the FastPath is operating. A gateway routes information between two or more networks, which can use different types of cable and support different protocol software. Gateway functionality includes encapsulation between different protocols (see Appendix A for details). If the networks support the same protocols (for example, AppleTalk protocols only), a gateway can be called a "bridge." Bridge functionality simply routes the same type of protocols between two networks (for example, routing AppleTalk packets across Ethernet to another AppleTalk network). The FastPath is always acting as a router, in that it routes packets between two networks.

Additional reading

The following publications provide overviews of networking solutions and are useful as background material if your experience with networking is not extensive.

- *LocalTalk Cable System Owner's Guide*, supplied with LocalTalk connector kits from Apple Computer, is the place to start for information on installing LocalTalk networks.
- *Networks and Communications Buyer's Guide*, available from Digital Equipment Corporation. This guide provides information on installing cable and cable connections for DEC networks.

- Newton, Harry. *The Teleconnect Dictionary*. Chelsea, MI: Harry Newton and The Telecom Library Research Group, 1987, provides useful networking definitions.
- *Network Primer* (Kinetics), describes the language and components of Macintosh network operation. It discusses hardware, software, standards, and protocols.

The following publications provide information about hardware and software products available for Ethernet and LocalTalk networks.

- *Counterpart*, the Kinetics third-party vendor catalog, lists sources for equipment and software that can be used with Kinetics products.
- *Excelan Product Catalog*, Excelan, Inc., lists all current Excelan and Kinetics products.

The following publications provide detailed information about AppleTalk protocols, standards, and uses.

- *Inside AppleTalk*, Addison-Wesley Publishing Company, Inc. This book is now available in book stores, from Apple Computer, and from the publisher. This provides the complete AppleTalk network specification.
- *Inside Macintosh*, Addison-Wesley Publishing Company, Inc. All five volumes are available in book stores, from Apple Computer, and from the publisher. The AppleTalk Manager chapter provides detailed information about programming the Macintosh to work in AppleTalk networks. It also provides background information about the AppleTalk architecture.

The following publications contain detailed information about Ethernet network standards and uses:

- *The Ethernet: A Local Area Network: Data Link Layer and Physical Layer Specifications*. DEC, Intel, and Xerox Corporations, Version 2.0, November 1982.

- *Carrier Sense Multiple Access with Collision Detection (CSMA/CD) Access Method and Physical Layer Specifications* (ANSI/IEEE Standard 802.3-1985), (ISO/IDS 8802/3), IEEE 1984. Available from IEEE, 345 East 47th Street, New York, NY 10017. This provides the Ethernet standard.

The KIP documentation required for configuring the atalkatab database file is available from Stanford University. You can obtain it by using FTP with the login name "anonymous" on "sumex-aim.stanford.edu" in the <info-mac> directory, or by writing to Stanford University, Information Resources, Networking, Pine Hall, Stanford, CA 94305.

The next set of references are RFCs (Requests for Comment) that define standard network practices. These RFCs are available from the DDN Network Information Center (NIC), SRI International, 333 Ravenswood Avenue, Room EJ291, Menlo Park, CA 94025 for \$5.00 each (\$10.00 for RFCs longer than 100 pages). The NIC telephone number is (415) 859-3695. These RFCs are also available via e-mail or ftp if you have access to the DDN networks. The UNIX e-mail address is operators@sri-nic.arpa.

- Mogul, J., and J. Postel, *Internet Standard Subnetting Procedure*, RFC 950, August 1985. This RFC describes a method for implementing subnets and is the basis for the 4.3BSD subnetting scheme of the University of California at Berkeley.
- Reynolds, J., and J. Postel, *Internet Numbers*, RFC 997, March 1987. This RFC, or its successor, is the official status report on IP network numbers.
- Braden, R., and J. Postel, *Requirements for Internet Gateways*, RFC 1009, June 1987. This lengthy RFC defines the formal requirements for gateways used on IP networks.
- Rose, M., and McCloghrie, K., *Structure and Identification of Management Information for TCP/IP-based Internets*, RFC 1065, August 1988. This RFC provides the common definitions for the structure and identification of management information for TCP/IP-based internets.

- McCloghrie, K., and Rose, M., *Management Information Base for Network Management of TCP/IP-based Internets*, RFC 1066, August 1988. This RFC provides the initial version of the Management Information Base (MIB) for use with network management protocols in TCP/IP-based internets in the short-term.
- Case, J., Fedor, M., Schoffstall, M., and Davin, J., *A Simple Network Management Protocol*, RFC 1067, August 1988. This RFC defines a simple protocol by which management information for a network element may be inspected or altered by logically remote users.

Installation and Configuration: An Overview

THIS CHAPTER PROVIDES AN OVERVIEW OF HOW TO INSTALL AND configure the gateway. You should read this chapter step-by-step as a guide to FastPath installation and as an introduction to the recommended configuration procedure using the FastPath Manager program.

This chapter does not explain specific configuration data that will be needed for the gateway to route correctly at your site. See Chapters 2 through 4 for information on supplying the network addresses and other information that the gateway requires to route one type or several types of network traffic using the K-STAR gateway program.

See Appendix E for information on configuring the gateway's PROM-resident AppleTalk protocols.

For information on configuring the PROM-resident IP protocols, see your existing documentation: PROM-resident IP is provided for backward compatibility only and is not described in this guide. See Chapter 3, "K-STAR IP Configuration," for the recommended way to configure the gateway for IP routing.

Do you need to configure the FastPath?

NO if: The FastPath will function as an AppleTalk Phase 1 bridge, the network configuration is simple (for example, a single Ethernet backbone with bridges to LocalTalk networks), and you do not need to assign specific zone names or network numbers or implement AppleTalk zone security. In this case, you can use the gateway's PROM-resident AppleTalk Phase 1 protocols, and you do not need to supply any configuration data to the gateway. You can allow it to autoconfigure as follows:

- Unpack the gateway and place it in its permanent position between a LocalTalk network and Ethernet.
- Connect the gateway to LocalTalk (see "Before You Begin").
- Connect the gateway to Ethernet (see "The Ethernet Connection").
- Plug in the gateway and power it on (see "Before You Begin").

The gateway identifies itself to the AppleTalk Phase 1 network on LocalTalk and on Ethernet, acquires its own addresses, and begins operation. See Appendix E for more information.

YES if: The FastPath will handle any other type of protocols or configuration methods: AppleTalk Phase 2, transition bridge software (where the internet supports both AppleTalk Phase 1 and Phase 2), AppleTalk Phase 1 (if Phase 1 will be used together with any other type of configuration method, if you want to specify a particular zone name for one or both sides of the gateway, or if zone security is required), TCP/IP, IP/Talk (UDP encapsulation), DECnet, and/or SNMP with network management utilities, or if you are using the atalkatab file for centralized configuration. In all of these cases, you need to configure the gateway using the FastPath Manager software.

A note on network configuration

It is important to note that many protocol suites can co-exist on the same physical internetwork, and that a single gateway running the K-STAR gateway program can be configured to handle several different types of network traffic. When you configure the gateway, you are supplying it with addresses and other information it requires to route one type or several types of network traffic through its two hardware interfaces.

Configuration data determines the type(s) of network traffic that will be handled by a given gateway. In general, a gateway should be configured to handle routing for the network software running on devices on both sides of the gateway. For example, AppleTalk devices (such as Macintoshes, AppleShare servers, or LaserWriters) on one side of the gateway can communicate with similar devices on the other side of the gateway after you have configured the gateway (or have allowed it to autoconfigure) on the AppleTalk network.

If Macintoshes on the LocalTalk side of the gateway are running TCP/IP software, they can communicate with TCP/IP devices on Ethernet (and vice versa) only after you have configured the gateway on the IP network, and so on for all types of routing supported by the gateway. See Appendix A for a complete list of the protocols supported in the gateway.



It is very important that you check your data before you configure the gateway and bring it up on an internet. **Duplicate addresses (such as AppleTalk network numbers, IP addresses, or DECnet node numbers within an area) can cause confusion on the entire internet.** In larger organizations, where there is likely to be an internet administrator, be sure to obtain valid addresses from her.

Before you begin

It is recommended that you configure the gateway on a small, isolated network where you can test a configuration without disrupting service on either network. This is recommended, but not required.

To set up an isolated network with only two nodes, you can connect the gateway to a Macintosh using LocalTalk as follows:

- Push the network selection switch on the gateway back panel toward the AUI interface (thick Ethernet). When the switch is in this position, you can operate the gateway for testing without bothering about terminating the Ethernet side. You will see several "Ethernet Transmission Error" messages in the Diagnostics window when you test the configuration, but you can simply ignore these messages.
- Connect the gateway to a Macintosh via the LocalTalk interface (usually the printer port).

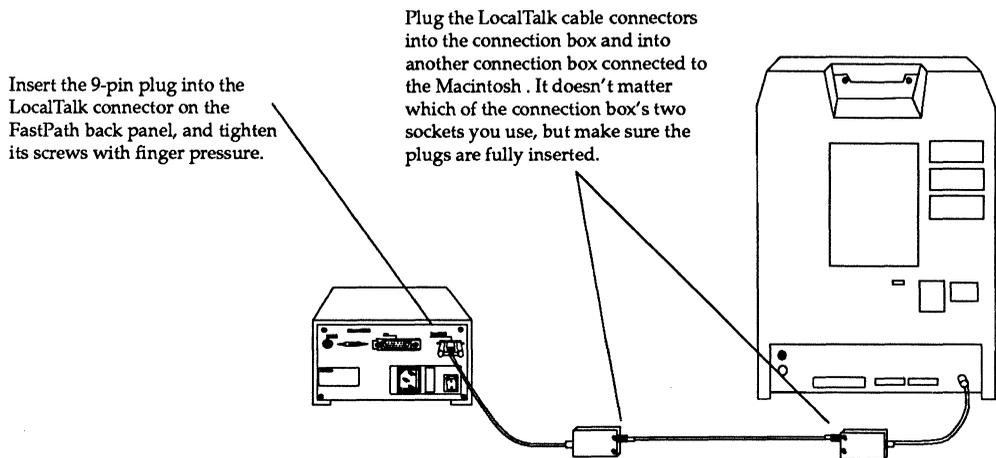


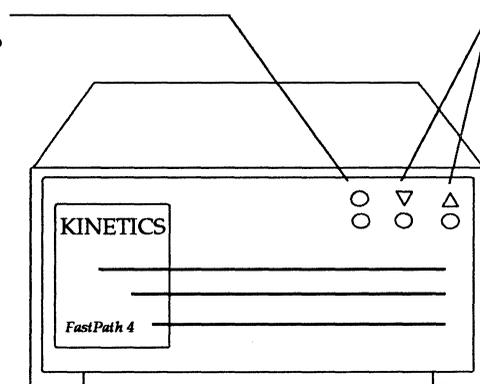
Figure 1-1. Connecting to a Macintosh via LocalTalk

If you are using LocalTalk cable, you should secure the cables with a cable tie to prevent the plugs from working loose and disrupting the network. If you are using another type of equivalent cable (for example, PhoneNET), make sure the terminating resistors are in place at both ends of the two-node network. See the vendor-supplied documentation for the cable you are using.

- Plug in the gateway. Check that the electrical outlet is grounded and that it is compatible with the voltage rating on the gateway back panel, then plug the female end of the power cord into the AC power socket on the gateway's back panel and the other end of the power cord into a grounded, three-prong electrical outlet.
- Power on the gateway by pressing the "1" on the ON/OFF switch located on the back panel.

The three LEDs on the gateway front panel light up briefly while the gateway tests its hardware components. See Appendix A for a full description of the hardware self-tests.

The LED below this symbol is the power light. It is normal for this to stay on continuously while the FastPath is in use.



The LEDs below these symbols are the network traffic lights. These light up during hardware self-testing, and then blink on and off according to network traffic.

Figure 1-2. The LEDs on the FastPath front panel

Using the FastPath Manager

The FastPath Manager is a Macintosh application that communicates with the gateway. It is the mechanism for downloading code (K-STAR or customized code developed at your site) and sending configuration information to the gateway.

The FastPath Manager is always launched on a Macintosh on the LocalTalk or Ethernet network connected to the gateway. When the Macintosh is connected to LocalTalk, the application continuously receives diagnostics from all FastPath gateways on the LocalTalk net and displays them in a Diagnostics window. When the Macintosh is connected to Ethernet, the Diagnostics window does not display messages from the gateways; however, you can still see these messages by clicking the Log... button in the FastPath Manager.

To use the FastPath Manager,

- Check that the Macintosh has AppleTalk enabled in the Chooser. (If AppleTalk is not enabled, the Macintosh can not see the gateway.)
- Double-click on the FastPath Manager icon to launch the application. You can launch it from the configuration diskette, or copy the FastPath Manager to the Macintosh hard disk and launch from there.

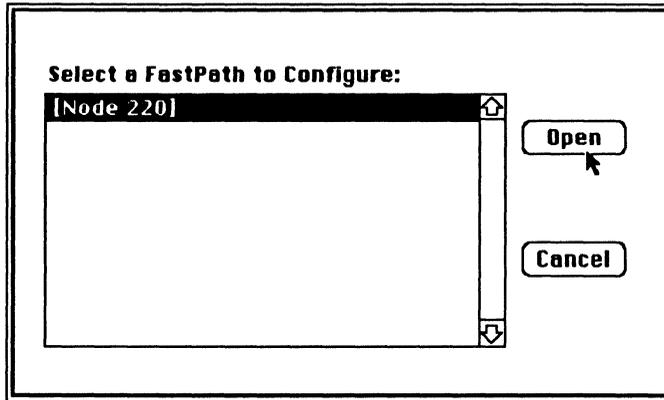


The rest of this section introduces the FastPath Manager and describes the recommended configuration procedure:

- Opening the gateway
- The main configuration dialog box
- Reset and Pause
- Entering configuration data
- Using the K-STAR gateway program
 - Remote Boot
 - Downloading K-STAR
- Sending the configuration data: Go
- Diagnostics and Log windows
- Saving your configuration data
- Quitting the FastPath Manager

Opening a gateway

When you launch the FastPath Manager, the first dialog box asks you to select a gateway to configure.



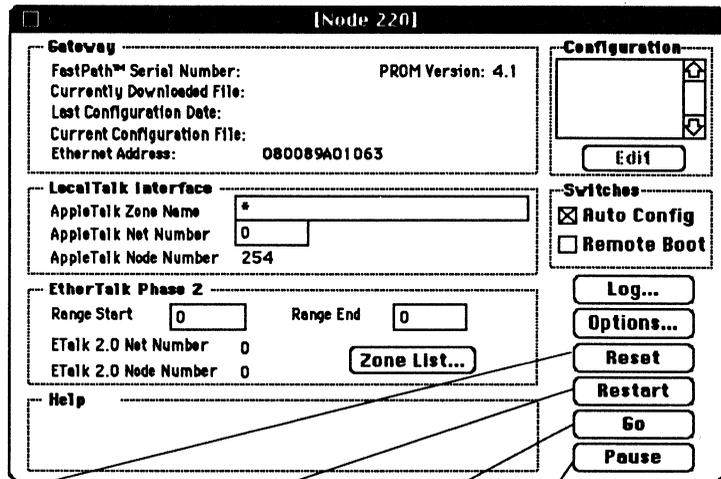
When you have connected the gateway to a single Macintosh on LocalTalk, you should see only one gateway listed in this window. If you do not see a gateway listed here, select the Find All... command from the Gateways menu. If the gateway still does not appear, see Chapter 5, "Troubleshooting."

In the initial configuration process, before you have assigned a name to the gateway, a default name appears in this list. On the LocalTalk interface, this is likely to be "[Node 220]" which is a temporary name built by the FastPath Manager based on the AppleTalk node ID of the LocalTalk interface. You can "open" the gateway by double-clicking on its name or by clicking once and selecting Open.

You can select Find All... from the Gateways menu to open a gateway at any time while the FastPath Manager is running.

The main configuration dialog box

When you open the gateway, the Diagnostics window comes up, immediately followed by the main configuration dialog box. The main configuration dialog box looks something like this:



When you click Reset, all gateway RAM is cleared. To prevent it from autoconfiguring, click Pause within 25 seconds of the initial Reset.

Restart is the equivalent of turning the gateway off and on again. See "Changing Configuration Data" at the end of this chapter for information on using Restart.

After you have entered configuration data and downloaded K-STAR, clicking Go sends the data to the gateway and tells it to start execution.

When you click Pause within 25 seconds after a Reset or Restart, the gateway is "paused" and will not attempt to begin operations.

Reset and Pause

Because the gateway can autoconfigure for AppleTalk routing, and because it remembers its configuration even after it has been turned off, you need to clear its RAM before you send it new configuration data:

- Click the Reset button before entering any configuration data. This clears the gateway's RAM and puts it in the reset state necessary for configuration. The gateway will wait for 25 seconds before attempting to autoconfigure.

When you reset the gateway, the main configuration dialog box disappears. Choose Find All... from the Gateways menu, then select the same gateway and open it again. When the main configuration dialog box comes up on your screen again,

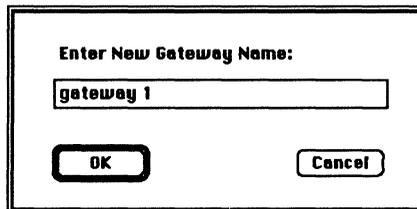
- Click the Pause button within 25 seconds of the initial Reset. This prevents the gateway from autoconfiguring before you supply the new configuration data.

Entering configuration data

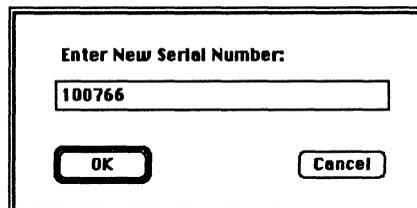
You can now take your time and enter the configuration data required for your site. See *Chapters 2 through 4* for details on supplying the K-STAR configuration data required for your network configuration, or *Appendix E* for PROM-resident configurations. Note that the configuration data you enter is not sent to the gateway until you click Go.

If you are configuring the gateway for the first time, it's a good idea to name it and enter its serial number in the FastPath Manager. The name you assign is used when the gateway responds to DECnet or SNMP NBP lookups. The serial number is not used by the gateway, but it makes network administration easier.

- Select Name... from the Gateways menu and type a name that is no longer than 20 characters; for example: gateway 1



- Select Serial Number... from the Gateway menu and type the box's serial number (from the label on the gateway's back panel); for example, 100766



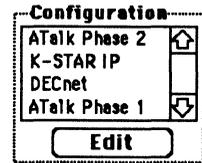
Using the K-STAR gateway program

K-STAR is the FastPath gateway program that contains the following configuration types:



The menu items that have been checked are all supported in K-STAR. These can be used in any combination together.

(Note that ATalk Phase 1 alone is also supported in PROM.)



When you select a configuration method, its name appears in the Configuration area of the main dialog box. Double-clicking on this listing opens the appropriate dialog box to supply configuration data.

When you configure any of the K-STAR modules (or any combination of them), you need to download the K-STAR program to the gateway.

When you download K-STAR, it is loaded into protected memory in the gateway. You should not have to download K-STAR again, even if there is a power failure, unless one of the following occurs:

- The gateway's memory becomes corrupted for some reason (see "Remote Boot").
- You click Reset in the FastPath Manager (see "Changing Configuration Data").
- You change the zones in an AppleTalk Phase 2 configuration (see "Changing Configuration Data").

Remote Boot

To protect against the unlikely event that the gateway's memory becomes corrupted, it is recommended that you turn on the Remote Boot software switch before downloading K-STAR. Turning on the Remote Boot switch prevents the gateway from executing the PROM-resident protocols, should K-STAR become corrupted. (See Appendix A for more information on how this mechanism works.)

- Before downloading K-STAR, select the Remote Boot switch in the Switches area of the main configuration dialog box. This is recommended in the K-STAR configuration examples in this guide.

Click in the selection box next to the Remote Boot switch. This prevents the gateway from operating without a valid gateway program if its memory becomes corrupted.

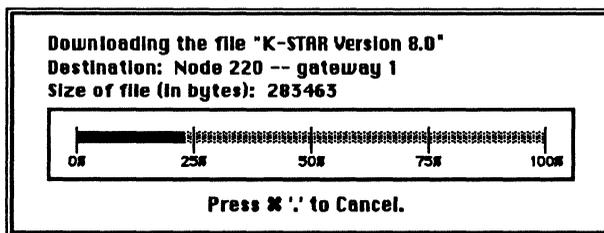


The gateway will autoconfigure if this switch is on and you have not configured any zone names or network numbers.

Downloading K-STAR

After selecting Reset and Pause (as described earlier), supplying your configuration data, and turning on Remote Boot, you download K-STAR to the gateway as follows:

- Select Download a File from the File menu, and open the K-STAR file. A window like this displays while K-STAR is downloading to the gateway:



Sending the configuration data: Go

After the K-STAR gateway program has been downloaded, you can send the configuration data to the gateway:

- Click the Go button.

This sends the configuration information that is currently in the FastPath manager and tells the gateway to start executing the K-STAR code that you downloaded (or to start executing the gateway code in PROM if there is no download code).

Diagnostics and Log windows

After you click Go, the Diagnostics window displays in the foreground. If you are on LocalTalk (as recommended), you will see messages describing the gateway's activity. If there is more than one gateway on the LocalTalk network, the messages you see will be from all gateways on LocalTalk. These messages are documented in Appendix C of this guide.

If you are running the FastPath Manager on a Macintosh connected to Ethernet, or if there is more than one gateway on the LocalTalk network, click the Log... button to see the diagnostic messages from the open gateway. The Log... button reads a buffer directly from the open gateway and displays the most recent gateway messages.

Saving your configuration data

After checking the messages in the Diagnostics window, it's a good idea to save your working configuration in a file. This is recommended, but not required.

- Save the configuration in a file (using the File menu) for future use.

Quitting the FastPath Manager

- You can now close the FastPath Manager by selecting Quit from the File menu.

Finishing the installation

When you have configured the gateway,

- Turn off the gateway and unplug it.
- Move the gateway to its permanent location and plug it in.
- Connect the gateway to LocalTalk and Ethernet.
- Power on the gateway.

The procedures for connecting the gateway to LocalTalk, and for powering on the gateway after it is fully installed, are described in “Before You Begin” in this chapter.

The Ethernet connection

Before connecting the gateway to the Ethernet, the network cables should be fully installed and terminated, and the appropriate connection devices should be in place. If you need to install connection devices on Ethernet, see Appendix F or contact the internet administrator.

Thick Ethernet

If you are connecting to a thick Ethernet cable or any type of network cable that uses the Medium Attachment Unit (AUI) interface, you need a transceiver and transceiver cable.

To connect the gateway to thick Ethernet,

- Make sure that the switch at the top of the gateway’s back panel is positioned toward the transceiver connector.

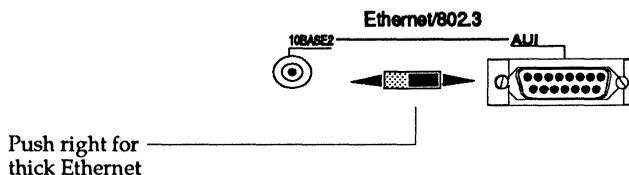


Figure 1-3. Selecting thick Ethernet connection

- Plug the transceiver into the AUI interface on the gateway back panel and slide the lock mechanism to the right to secure the connection.

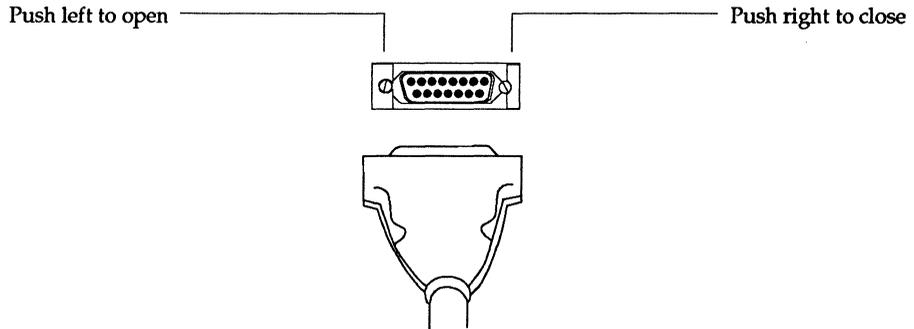


Figure 1-4. Connecting to thick Ethernet

Thin Ethernet

If you are connecting to thin Ethernet cable or equivalent coaxial cable, use a T-connector such as the one provided with the gateway. If the connector is not already installed on thin Ethernet, see Appendix F or contact the internet administrator.

- Push the switch at the top of the gateway's back panel toward the 10BASE2 BNC connector.

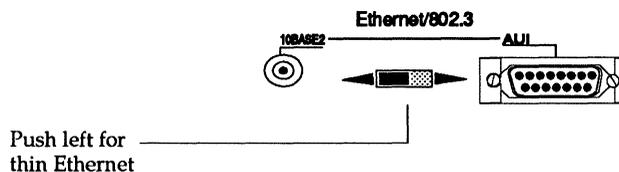


Figure 1-5. Selecting thin Ethernet connection

- Pick up the T-connector on your thin Ethernet cable and plug it into the BNC connector on the gateway back panel. When it is firmly plugged in to the gateway BNC connector, twist the sleeve on the T-connector clockwise to lock the connection in place.

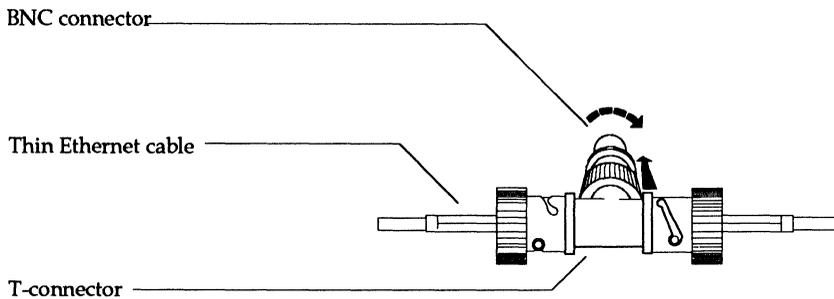


Figure 1-6. Connecting to thin Ethernet



Do not attach thin Ethernet cable directly to the gateway without using a T-connector. In a direct connection, the Ethernet cable cannot be terminated and the network will not function properly.

Make sure that both sides of the T-connector are connected to thin Ethernet cable, or, if the gateway is the last device on the thin Ethernet cable, that one side of the T-connector is connected to the cable and the other side is connected to a network terminator. It's important that neither side of the T-connector is left open. It is also important to protect the T-connector (using the protector provided with the gateway) from contacting other exposed metal, including parts of the FastPath. Otherwise, the connection may be affected by ground currents that upset network traffic.

- When you have finished connecting the gateway to LocalTalk and Ethernet (either standard or thin Ethernet), plug it in and power it on by pressing the "1" on the ON/OFF switch located on the back panel.

Checking the configuration

After installing the gateway on the working internet, launch the FastPath Manager on a Macintosh on either one of the networks. In the gateway selection window, you will see a list of all gateways on that network.

- Select and open the gateway you have just configured and installed.

When the main configuration dialog box comes up on your screen, it should contain the same configuration data you entered. This data is stored in the gateway, and is displayed on your screen when communication is established between the gateway and the FastPath Manager.

- Check the data on your screen against the data you entered. If all the data is present and correct, then the gateway is using the proper configuration data.
- Click the Log... button in the main configuration dialog box to see the startup and diagnostic messages produced by the gateway. These messages are documented in Appendix C of this guide.

Beyond this simple check, you can use the Macintosh Chooser to see that zones and their devices are accessible through the gateway, access an IP host on Ethernet from an IP host on LocalTalk, and so forth, to ensure that everything is working.

Changing configuration data

When you have configured the gateway, downloaded K-STAR, and clicked the Go button, the gateway begins executing code and will not accept any further data. To send new configuration data, even a minor change, you first need to return the gateway to its initial state where it is not executing code.

To avoid resetting the gateway, which clears the K-STAR program from its protected memory locations, you can use the Restart button as described here.



Note, however, that when you are changing zone names in an AppleTalk Phase 2 configuration (including Phase 2 in the transition bridge software), you must download K-STAR again after entering the new zone configuration data.

- Click the Restart button before entering any configuration data. This is the equivalent of turning the gateway off and on again. Unless you click Pause within 25 seconds, the gateway will begin executing K-STAR again with the current configuration data.

When you restart the gateway, the main configuration dialog box disappears. Choose Find All... from the Gateways menu, then select the same gateway and open it again. When the main configuration dialog box comes up on your screen again,

- Click the Pause button within 25 seconds of clicking Restart. This prevents the gateway from restarting itself before you supply the new configuration data.
- Enter the required configuration changes.
- If you changed the zone list for the EtherTalk Phase 2 interface, download K-STAR again before you click Go. Otherwise, simply click Go.



If you are changing a configuration file that was created using a previous release of the FastPath Manager and that contains data for any configuration type(s) which are not configured in the main dialog box, you must follow these steps; otherwise, the gateway will not recognize the data in the file.

- Open the existing configuration file.
- In the Configuration menu, select all configuration types that have associated data, even those that will not be affected by your changes.

- Enter your configuration changes, download the current version of K-STAR (if you have not done so already) and send the data to the gateway by clicking Go.
- Save the configuration file again.

If you are simply *using* an existing configuration file that was created with a previous release of the FastPath Manager (without changing any of the data) you must still follow these steps. Open the existing file, select all configuration types used in the file, send the data to the gateway, and save the configuration file again.

K-STAR AppleTalk Configuration: Phase 2, Transition Bridge, and Phase 1

THIS CHAPTER TELLS YOU HOW TO CONFIGURE GATEWAYS FOR AppleTalk Phase 2, transition bridge, and AppleTalk Phase 1 routing using the protocols contained in the K-STAR gateway program.

If you are updating an internet from AppleTalk Phase 1 to AppleTalk Phase 2, you need to install new AppleTalk software on individual Macintoshes and configure the gateway for Phase 2 routing. If there is a Phase 1 router on your local Ethernet, at least one of the Phase 2 routers on that Ethernet must be configured as a transition bridge. If there is a Phase 1 router on your local LocalTalk net, *all* of the Phase 2 routers on that LocalTalk net must be configured as a transition bridge. See the section on “Transition Bridge Addressing” later in this chapter.

Any of the AppleTalk configurations described in this chapter can be used together with the K-STAR IP or K-STAR DECnet configurations described in Chapters 3 and 4. For information on AppleTalk routing to an AppleTalk service on an IP host, see “IPTalk Configuration” in Chapter 3. For information on AppleTalk Phase 1 configuration without using K-STAR, see Appendix E.

AppleTalk configuration features

1. **Autoconfiguration.** You can allow the FastPath to automatically identify itself to its network interfaces and begin AppleTalk routing. By default, the gateway will acquire AppleTalk Phase 1 information and use the Phase 1 protocols that are built in to its PROM.
 - See Chapter 1 and Appendix E if you are only using AppleTalk Phase 1 protocols, and do not require any of the K-STAR security options or other K-STAR protocols. In this case, you do not need to configure the gateway.
 - You can allow the gateway to autoconfigure for AppleTalk Phase 2 protocols by installing the FastPath as described in Chapter 1, launching the FastPath Manager, then following these steps:
 1. click Reset, then open the gateway again
 2. turn on the Remote Boot switch
 3. download K-STAR
2. **Explicit configuration.** You can use the FastPath Manager to supply explicit configuration data that are meaningful for your site and network records. You can do this by opening a gateway and starting from scratch, or by opening an existing configuration file and modifying its data.
 - See the example “explicit” configurations in this chapter.
3. **Seeding a gateway.** If there is already a fully configured FastPath on one (or both) of the gateway’s networks, you can allow the new gateway to acquire its configuration data from the existing one. This is called “seeding,” and is useful for ensuring that all gateways connected to a given network agree about that network’s zone(s) and net number(s).
 - See the example “seeding” configurations in this chapter.

AppleTalk Phase 2 addressing

AppleTalk Phase 2 introduces the concept of extended networks and non-extended networks. LocalTalk is a non-extended network. Ethernet and Token Ring are examples of extended networks.

Network numbers

On non-extended networks (LocalTalk) a network number is a single decimal number between 1 and 65,279; for example, 30. The network number must be unique on the internet.

On extended networks (the Ethernet side of the FastPath), a *range* of network numbers (a “network range”) is a contiguous range of decimal numbers between 1 and 65,279; for example, 1-10. The network range must be unique in the internet: no two networks can use the same number, and no two network ranges can overlap or have any network numbers in common.

Each number in a network range can be associated with up to 253 nodes. The size of the network range determines the maximum number of AppleTalk devices on the physical network. For example, a network having the range 1-10 could contain up to 10×253 , or 2,530 nodes.



The gateway uses some memory to store each network number in a range, so it is advisable to use the smallest range required for your network.

Node addresses

On non-extended networks, an AppleTalk node automatically acquires its node number when it is turned on, and does not necessarily retain the same node number from one session to another. The node number cannot be assigned explicitly.

On extended networks, an AppleTalk node is identified by a node address that consists of a network number within that network’s range and a node number. The entire node address is acquired dynamically when the node boots up.

Zones

An AppleTalk zone is a logical grouping of devices that makes it easier for users to locate and access network services. On non-extended networks, a network can be associated with one zone name, and all of the nodes on that network belong to that zone. Zone names can be 1 to 32 characters, including embedded spaces. The FastPath considers a character in a zone name to be invalid if its ASCII value is less than hex 20 or equal to hex 7F.

On extended networks, a *list* of one or more zone names (a “zone list”) can be associated with the network. The zone list becomes available to nodes on that network through the Macintosh Control Panel. All gateways on the internet must agree about the zone name assigned to the LocalTalk side, and about the list of zone names assigned to the Ethernet side of each gateway.

If a node does not select a zone from this list, it is automatically assigned to the default zone. The default zone is the first name you enter in the zone list, or the name you select from the list as the default zone. **The same zone name must be the default zone on all gateways on that network.**

The zone name chosen by a node is the zone it belongs to and in which its services will be listed. A node can belong to only one zone. If a user on an EtherTalk Phase 2 network chooses a zone from the list displayed in the Macintosh Control Panel, that system’s services will appear in the chosen zone. This does not restrict the user’s ability to view and access network services in other AppleTalk zones using the Macintosh Chooser.



The gateway uses some memory to store each zone name in a list, so it is advisable to use the smallest list required for your network.

Required configuration data

To route AppleTalk Phase 2 packets to devices on both network interfaces, the FastPath requires the following data:

- One AppleTalk zone name for the gateway's LocalTalk interface.
- One AppleTalk network number for the gateway's LocalTalk interface.
- A list of AppleTalk zone names (one or more) for the gateway's EtherTalk Phase 2 interface.
- A range of AppleTalk network numbers (one or more) for the gateway's EtherTalk Phase 2 interface.



In this AppleTalk Phase 2 implementation, it is important that you enter all Phase 2 configuration information before you download K-STAR. This is the recommended procedure for all configurations, but it is currently *required* for AppleTalk Phase 2. It should also be noted that if you change the Phase 2 zone list, *you must download K-STAR again after completing the changes*. This is not required for any type of configuration other than AppleTalk Phase 2, and should be especially noted.

An example Phase 2 internet

Figure 2-1 shows an example internet configuration using only AppleTalk Phase 2 routing on two Ethernets and two LocalTalk networks.

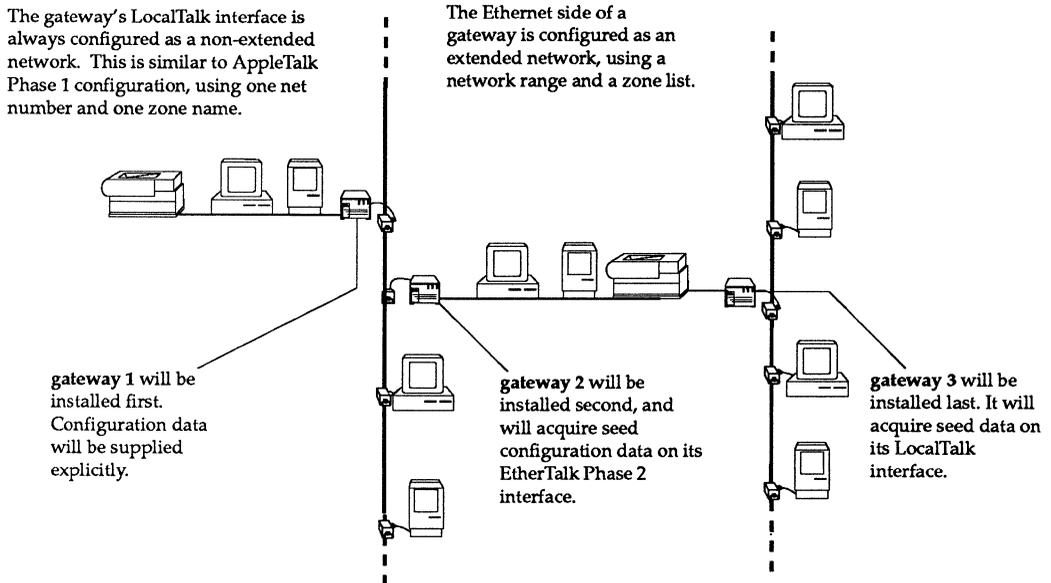


Figure 2-1. Example AppleTalk Phase 2 internet

The three gateways in this example will be configured for AppleTalk Phase 2 routing. The first gateway (gateway 1) will be explicitly configured with the proper network numbers and zones. Gateway 2 will acquire seed configuration data on its EtherTalk Phase 2 interface, and gateway 3 will acquire seed configuration data on its LocalTalk interface.

When the sample gateways are fully configured, they will have the configuration shown in Figure 2-2. Seeded data is shown in italic type.

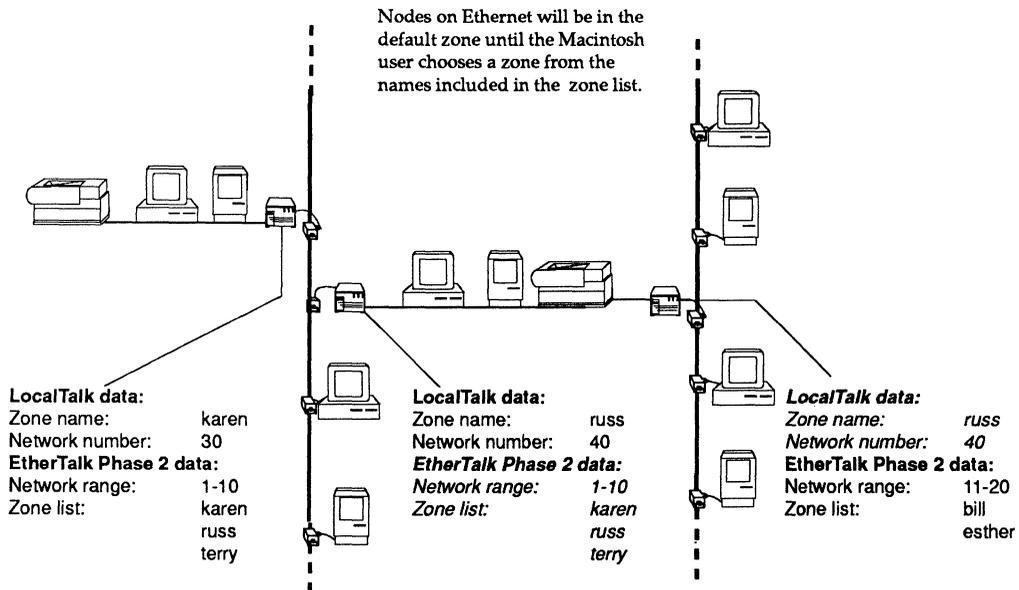


Figure 2-2. AppleTalk Phase 2 Zones and Net Numbers

For each of the three gateways to be configured, you should follow the general procedure described in Chapter 1; that is, connect one FastPath to one Macintosh via LocalTalk, configure it as described below, turn it off, unplug it, and move it to its permanent location.

Explicit configuration: gateway 1

After connecting the FastPath to a Macintosh via LocalTalk, launch the FastPath Manager, and select and open the gateway. In the main configuration dialog box,

- Click the **Reset** button, then open the gateway again.
- Click the **Pause** button.
- Enter the **AppleTalk** configuration data for the network on the gateway's LocalTalk interface.
- Enter the **EtherTalk Phase 2** configuration data.
- Turn on the **Remote Boot** switch (optional).
- **Download K-STAR.**
- Click the **Go** button.
- **Save the configuration data in a file** (optional).

This example uses the internet configuration shown in Figure 2-2. For your site, you should determine the proper network numbers and zone names for the gateway before you configure it.

```
LocalTalk Interface Zone Name:  karen
LocalTalk Interface Net Number: 30
EtherTalk Phase 2 Network Range: 1-10
EtherTalk Phase 2 Zone List:   karen
                               russ
                               terry
```

Note that zones are primarily intended for user convenience and for managing AppleTalk services (such as LaserWriters or AppleShare servers). You should choose zone names that will be meaningful to users to indicate where the services are located.

After selecting **Reset** and then **Pause**,

1. Click in the **AppleTalk Zone** name field for the LocalTalk side and type **karen**, then press *tab*.
2. Type the net number for the LocalTalk interface: **30**, then press *tab*.
3. Type the lower number of the EtherTalk Phase 2 network range in the **Range Start** field: **1**, then press *tab*.

4. Type the high end of the network range in the Range End field: 10, then press *tab*.

gateway 1

Gateway
FastPath™ Serial Number: 100766 PROM Version: 4.1
Currently Downloaded File: *None*
Last Configuration Date: Tue Aug 1, 1989 15:08:08
Current Configuration File: *None*
Ethernet Address: 080089A00018

LocalTalk Interface
AppleTalk Zone Name: karen
AppleTalk Net Number: 30
AppleTalk Node Number: 133

EtherTalk Phase 2
Range Start: 1 Range End: 10
ETalk 2.0 Net Number: 0
ETalk 2.0 Node Number: 0 **Zone List...**

Configuration
Edit

Switches
 Auto Config
 Remote Boot

Log...
Options...
Reset
Restart
Go
Pause

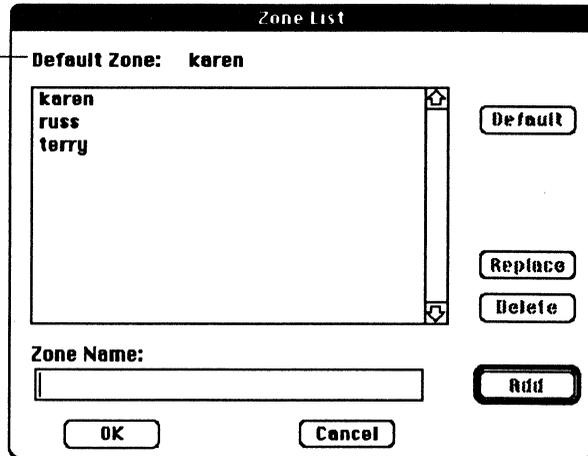
5. Click the Zone List... button to open the zone list dialog box.
6. Type the first zone name for this network in the Zone Name field at the bottom of this box: **karen** and click Add (or press *return*) to enter it in the zone list. Because it is the first zone name in the list, this will be the default zone for EtherTalk Phase 2 Macintoshes on this Ethernet until the Macintosh user explicitly chooses a different zone.

Note that a single asterisk is not allowed as a zone name in AppleTalk Phase 2.

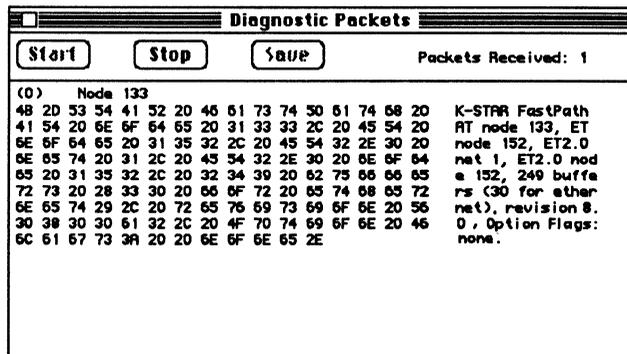
7. Type the additional zone names:

russ (click Add or press *return*)
terry (click Add or press *return*)

Unless you explicitly select another zone name and click the Default button, the first name you enter is the default zone. All gateways on this Ethernet must agree about the default zone.



8. Click OK to return to the main configuration dialog box.
9. Turn on the Remote Boot switch by clicking in the selection box.
10. Select Download a File... from the File menu and open K-STAR.
11. When K-STAR has been downloaded, click the Go button. In AppleTalk Phase 2, the gateway immediately begins Phase 2 node finding when you click Go. This can cause a delay of up to 5 seconds before the Diagnostics box appears.



The Diagnostics window is continually being updated with new messages from all gateways on the LocalTalk network (in this case, only one). See Appendix C for an explanation of the gateway startup message in the rightmost column.

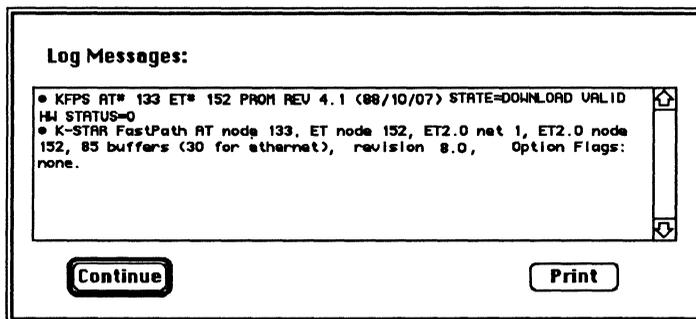
12. Select Save Configuration File... from the File menu and type a name for the configuration; for example,

GW1.ETALK2.config

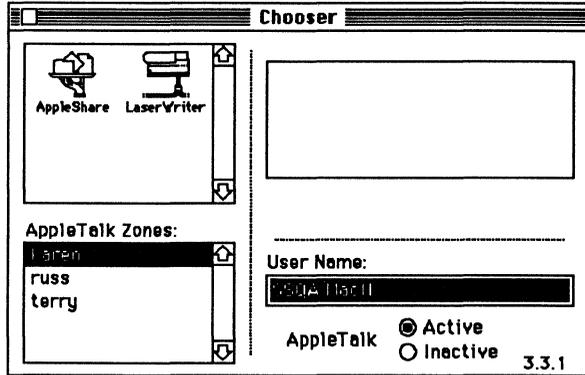
Click the Save button to save the configuration file to disk.

At this point, Quit the FastPath Manager (using the File menu), turn off the FastPath, unplug it, and move it to its permanent location on the internet. When you bring up the gateway on the internet, launch the FastPath Manager on a Macintosh on either side of the gateway, and select and open the gateway.

Click Log... to access the diagnostic messages from the gateway. The Log window contains a static version of the most recent messages from the gateway that is currently open.



You should also check that the zone names you have assigned appear in the Macintosh Chooser. Select the Chooser from the Apple (🍏) menu:



Seeding on the Ethernet interface: gateway 2

This example uses seeding to acquire data from the Ethernet interface of gateway 1. After connecting the FastPath to a Macintosh via LocalTalk, launch the FastPath Manager, and select and open the gateway. In the main configuration window,

- Click the Reset button, then open the gateway again.
- Click Pause.
- Enter the AppleTalk configuration data for the network on the gateway's LocalTalk interface.
- Turn on the Remote Boot switch (optional).
- Download K-STAR.
- Click the Go button.
- Save the configuration data in a file (optional).

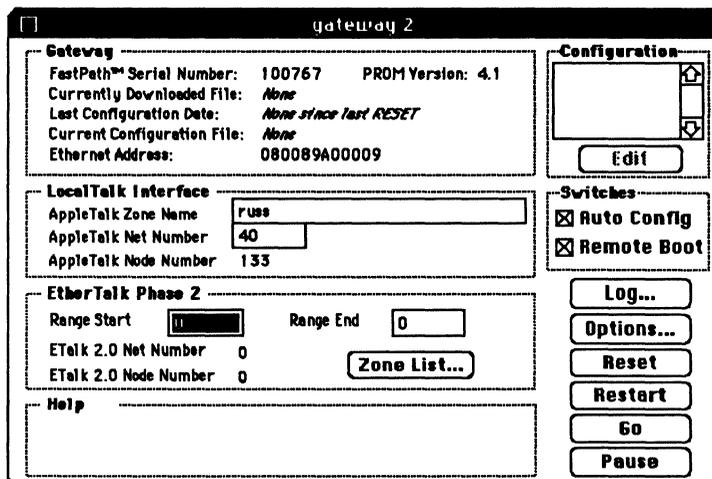
This example uses the internet configuration shown in Figure 2-2. For your site, you should determine the proper network numbers and zone names for the gateway before you configure it.

```
LocalTalk Interface Zone Name:   russ
LocalTalk Interface Net Number:  40
EtherTalk Phase 2 configuration: seeded from gateway 1
```

After selecting Reset and then Pause,

1. Click in the AppleTalk Zone name field for the LocalTalk interface and type *russ*, then press *tab*.

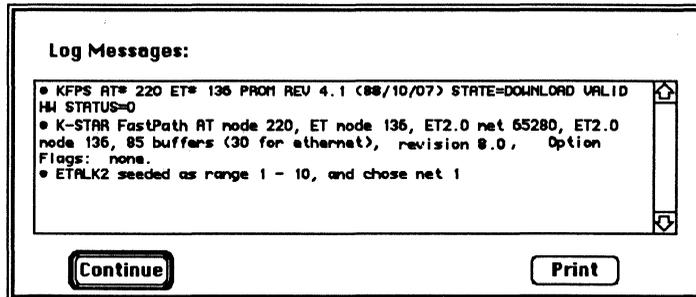
2. Type the net number for the LocalTalk side: 40, then press *tab*.
3. Turn on the Remote Boot switch.



4. Download K-STAR using the Download a File... command in the File menu.
5. When K-STAR has been downloaded, click the Go button. A few seconds after you select Go, the Diagnostics window displays in the foreground. You may see a message such as "WARNING: ETALK2 has not acquired a net number." Because you are configuring on an isolated network, no configuration data has been supplied to the EtherTalk Phase 2 interface. This message should no longer appear when the gateway is in its permanent location.
6. Save the configuration file to disk.

At this point, Quit the FastPath Manager (using the File menu), turn off the FastPath, unplug it, and move it to its permanent location on the internet. When you bring up the gateway on the internet, launch the FastPath Manager on a Macintosh on either side of the gateway, and select and open the gateway.

Click Log... to open the Log window:



These messages indicate that the gateway has acquired its EtherTalk Phase 2 data from gateway 1 on Ethernet, and has selected a net number for itself from the network range.

Seeding on the LocalTalk interface: gateway 3

This example uses seeding to acquire data from the other gateway on the LocalTalk interface of the FastPath. After connecting the FastPath to a Macintosh via LocalTalk, launch the FastPath Manager, and select and open the gateway.

- Click the Reset button, then open the gateway again.
- Click Pause.
- Enter the EtherTalk Phase 2 configuration data.
- Turn on the Remote Boot switch (optional).
- Download K-STAR.
- Click the Go button.
- Save the configuration data in a file (optional).

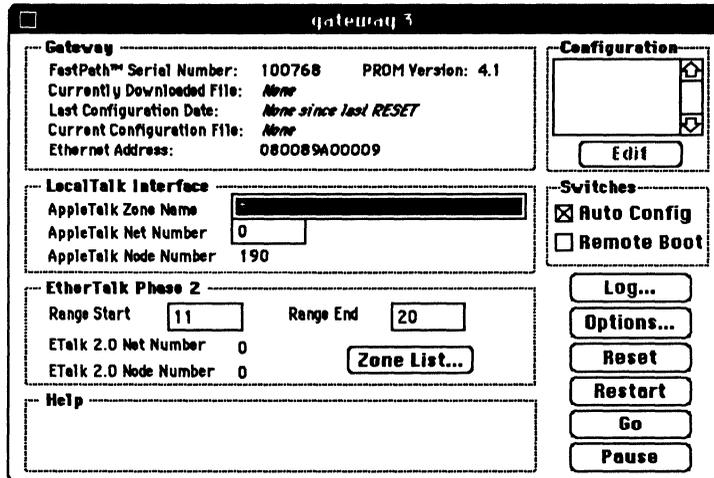
This example uses the internet configuration shown in Figure 2-2. For your site, you should determine the proper network numbers and zone names for the gateway before you configure it.

The configuration data for this box is

```
LocalTalk Interface configuration: seeded from gateway 2  
EtherTalk Phase 2 Network Number Range: 11-20  
EtherTalk Phase 2 Zone List: bill  
                           esther
```

After selecting Reset and then Pause,

1. Press *tab* twice to position the cursor in the Range Start field, type the lower number of the range: **11**, then press *tab*.
2. Type the high end of the network range in the Range End field: **20**, then press *tab*.



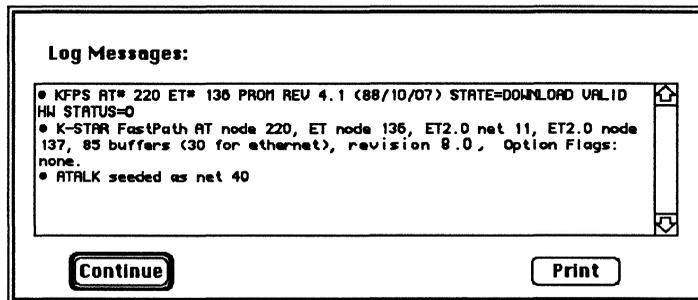
3. Click the Zone List... button to open the zone list dialog box.
4. Type the first zone name for this network: **bill**, and click Add (or press *return*). This will be the default zone name assigned to AppleTalk Phase 2 nodes on this Ethernet until the Macintosh user explicitly chooses a different zone.
5. Type the next zone name: **esther** and click Add (or press *return*), then click OK to return to the main configuration dialog box.
6. Turn on the Remote Boot switch, then download K-STAR using the Download a File... command in the File menu.
7. When K-STAR has been downloaded, click the Go button. In AppleTalk Phase 2, the gateway immediately begins

Phase 2 node finding when you click Go. This can cause a delay of up to 5 seconds before the Diagnostics box appears. Because you are configuring on an isolated network, you may see diagnostic messages warning that the LocalTalk interface has not acquired its seed data. These messages should no longer appear when the gateway is in its permanent location.

8. Save the configuration file to disk.

At this point, Quit the FastPath Manager (using the File menu), turn off the FastPath, unplug it, and move it to its permanent location on the internet. When you bring up the gateway on the internet, launch the FastPath Manager on a Macintosh on either side of the gateway, and select and open the gateway.

Click Log... to open the Log window:



These messages indicate that there are no Option flags on, and that the gateway has acquired its AppleTalk data from gateway 2 on its LocalTalk interface.

Transition bridge addressing

If there is a Phase 1 gateway or router on your local Ethernet, at least one of the Phase 2 gateways on that Ethernet must be configured as a transition bridge. If there is a Phase 1 router on your local LocalTalk net (even a LocalTalk-to-LocalTalk bridge), *all of the Phase 2 gateways on that LocalTalk net* must be configured as transition bridges.

Option 17 must be enabled to activate the transition bridge software.

The transition bridge software requires a full LocalTalk configuration, as well as full EtherTalk Phase 1 and EtherTalk Phase 2 configurations.

The EtherTalk Phase 2 interface observes the AppleTalk Phase 2 addressing rules with the following exceptions:

Network numbers

On the EtherTalk Phase 2 interface of the FastPath, the transition bridge uses a network range with only one element; for example, 10-10. The range start and the range end must be equal, and must be unique in the internet. This allows the transition bridge software to maintain routing information that is comprehended by Phase 1 nodes. Because the size of the network range determines the maximum number of AppleTalk devices on the physical network, a network running the transition bridge software can support no more than 253 EtherTalk Phase 2 nodes. However, because the transition bridge is also configured for an EtherTalk Phase 1 interface, the network can also support up to 254 EtherTalk Phase 1 nodes, with a total limit of AppleTalk nodes on Ethernet equal to 507.

Zones

On extended networks (the EtherTalk Phase 2 interface of the FastPath), the transition bridge uses a zone list with only one element. This allows the transition bridge software to maintain routing information that is comprehended by Phase 1 nodes.

Required configuration data

To operate as a transition bridge, the FastPath requires the following data:

- One AppleTalk zone name for the gateway's LocalTalk interface.
- One AppleTalk network number for the gateway's LocalTalk interface.
- One AppleTalk zone name for the gateway's EtherTalk Phase 1 interface.
- One AppleTalk network number for the gateway's EtherTalk Phase 1 interface.
- A "list" of one AppleTalk zone name for the gateway's EtherTalk Phase 2 interface.
- A "range" of one AppleTalk network number for the gateway's EtherTalk Phase 2 interface.



Option 17 must be enabled.

An example transition bridge internet

Figure 2-3 shows an example internet configuration that supports both Phase 1 and Phase 2 nodes on Ethernet.

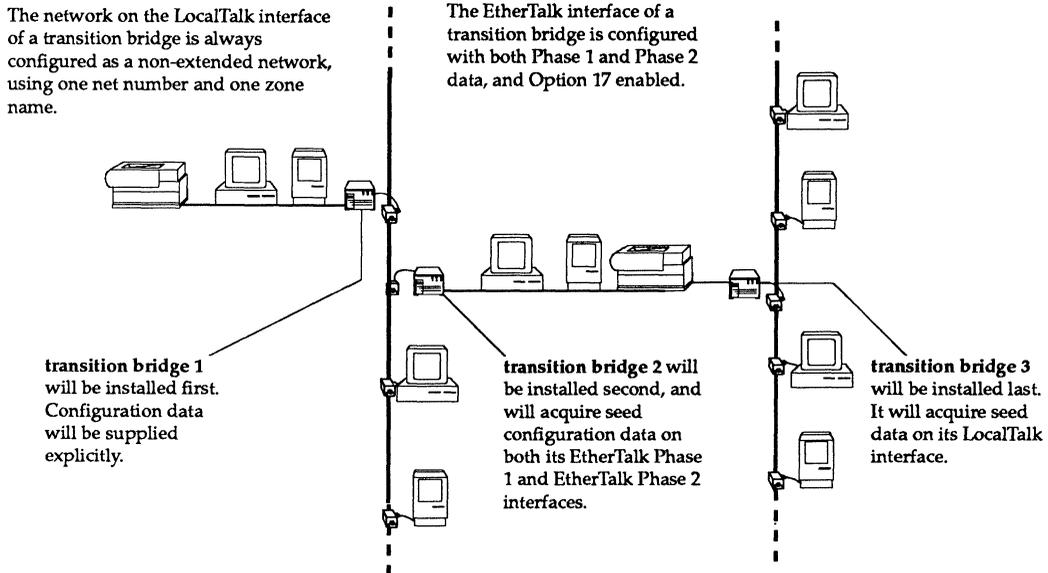


Figure 2-3. Example Phase 1/Phase 2 internet

The three gateways in this example will be configured as transition bridges. The first transition bridge (**bridge 1**) will be explicitly configured with the proper network numbers and zones. **Bridge 2** will acquire seed configuration data on its EtherTalk Phase 1 and EtherTalk Phase 2 interfaces, and **bridge 3** will acquire seed configuration data on its LocalTalk interface.

When the sample transition bridges are fully configured, they will have the configuration shown in Figure 2-4. Seeded data is shown in italic type.

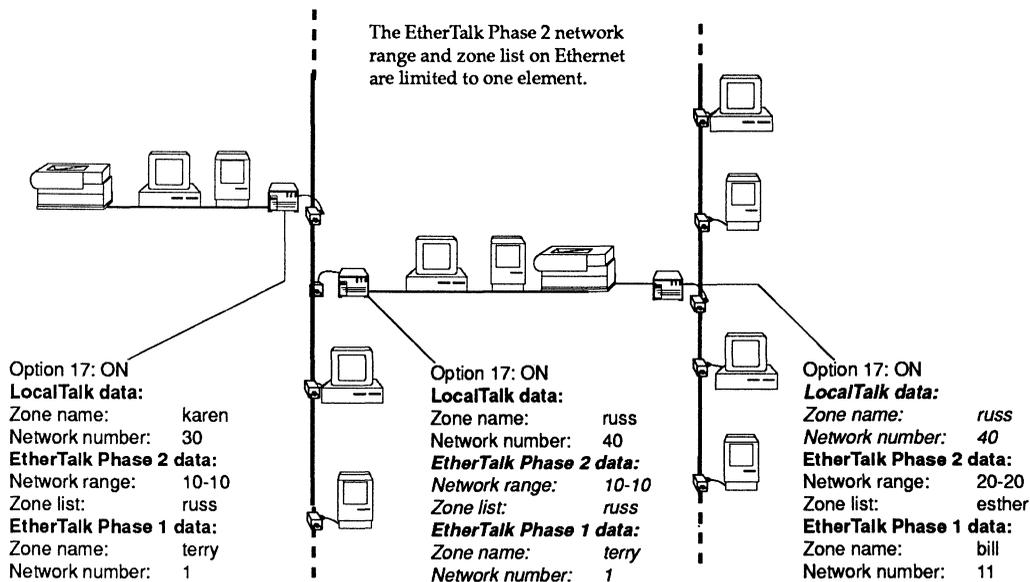


Figure 2-4. Transition bridge configurations

For each of the three gateways to be configured, you should follow the general procedure described in Chapter 1.

Explicit configuration: bridge 1

After connecting the FastPath to a Macintosh via LocalTalk, launch the FastPath Manager, and select and open the gateway.

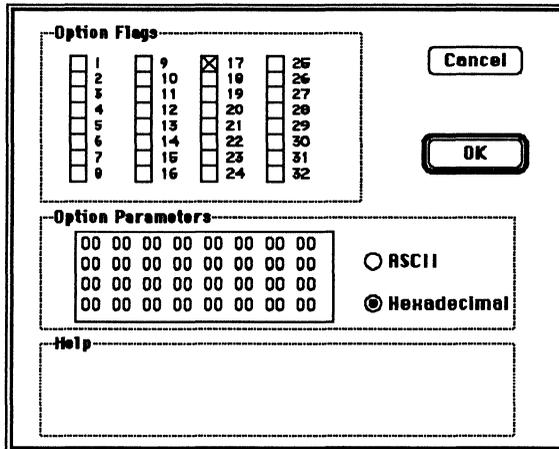
- Click the Reset button, then open the gateway again.
- Click the Pause button.
- Turn on Option 17.
- Enter the AppleTalk configuration data for the network on the gateway's LocalTalk interface.
- Enter the EtherTalk Phase 2 configuration data.
- Select ATalk Phase 1 from the Configuration menu and double-click on the ATalk Phase 1 listing in the Configuration area.
- Enter the EtherTalk Phase 1 configuration data .
- Turn on the Remote Boot switch (optional).
- Download K-STAR.
- Click the Go button.
- Save the configuration data in a file (optional).

This example uses the internet configuration shown in Figure 2-4. For your site, you should determine the proper network numbers and zone names for the gateway before you configure it.

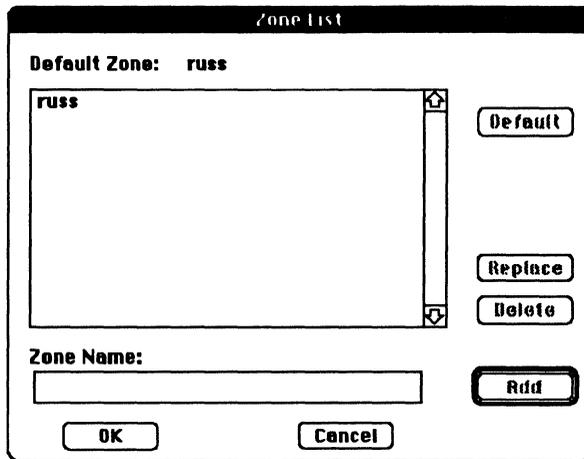
| | |
|----------------------------------|-------|
| Option 17: | ON |
| LocalTalk Interface Zone Name: | karen |
| LocalTalk Interface Net Number: | 30 |
| EtherTalk Phase 2 Network Range: | 10-10 |
| EtherTalk Phase 2 Zone List: | russ |
| EtherTalk Phase 1 Zone Name: | terry |
| EtherTalk Phase 1 Net Number: | 1 |

After selecting Reset and then Pause,

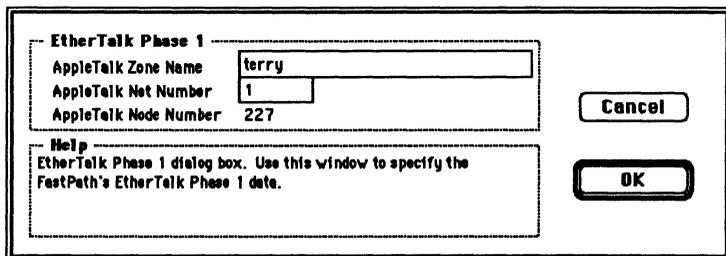
1. Click the Options... button in the main configuration dialog box. This brings up the Options window.
2. Turn on Option flag 17 by clicking in the selection box next to the number 17 (an X appears in the selection box when the option flag has been turned on), then click OK to close the Options window.



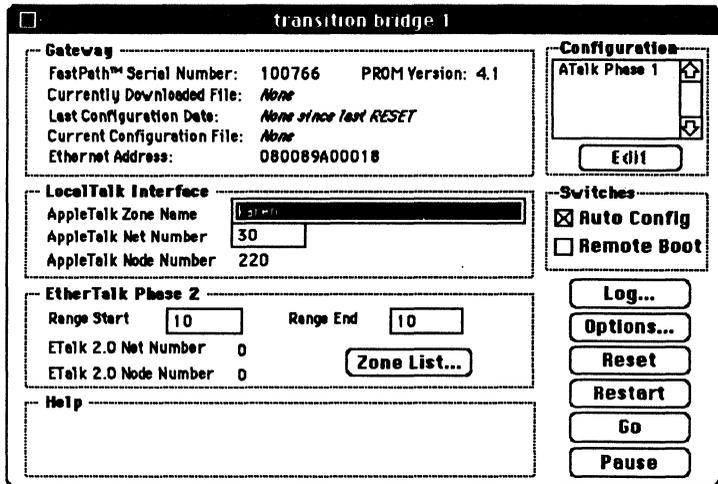
3. Click in the AppleTalk Zone name field for the LocalTalk interface and type *karen*, then press *tab*.
4. Type the net number for the LocalTalk interface: *30*, then press *tab*.
5. Type the lower number of the EtherTalk Phase 2 network range in the Range Start field: *10*, then press *tab*.
6. Type the high end of the network range in the Range End field: *10*, then press *tab*. *Note that the Range Start and Range End must be equal on a transition bridge.*
7. Click the Zone List... button to open the zone list dialog box.
8. Type the zone name for this network in the Zone Name field at the bottom of this box: *russ* and click Add (or press *return*) to enter it in the zone list. *Note that there must be only one EtherTalk Phase 2 zone name on a transition bridge, and a single asterisk is not allowed as a zone name.*



9. Click OK to return to the main configuration dialog box.
10. Select ATalk Phase 1 from the Configuration menu, and double-click on AppleTalk Phase 1 in the Configuration listing to bring up the EtherTalk Phase 1 dialog box.
11. Type the EtherTalk Phase 1 zone name: **terry**, then press *tab*.
12. Type the EtherTalk Phase 1 net number: **1**, then press *tab*.



13. Click OK to return to the main configuration dialog box.



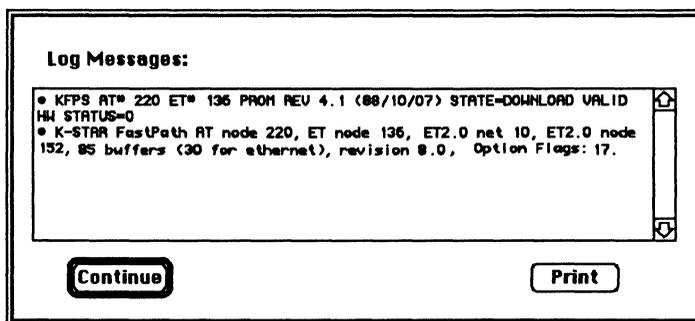
14. Turn on the Remote Boot switch by clicking in the selection box.
15. Download K-STAR using the Download a File... command in the File menu.
16. When K-STAR has been downloaded, click the Go button. In AppleTalk Phase 2, the gateway immediately begins Phase 2 node finding when you click Go. This can cause a delay of up to 5 seconds before the Diagnostics box appears.
17. Select Save Configuration File... from the File menu and type a name for the configuration; for example,

BRIDGE1.config

Click the Save button to save the configuration file to disk.

At this point, Quit the FastPath Manager (using the File menu), turn off the FastPath, unplug it, and move it to its permanent location on the internet. When you bring up the gateway on the internet, launch the FastPath Manager on a Macintosh on either side of the gateway, and select and open the gateway.

Click Log... to open the Log window:



This message shows that Option 17 is turned on (the gateway is running the transition bridge software).

Seeding on the Ethernet interface: bridge 2

This example uses seeding to acquire data from the Ethernet interface of the gateway configured as **bridge 1**. After connecting the FastPath to a Macintosh via LocalTalk, launch the FastPath Manager, and select and open the gateway. In the main configuration window,

- Click the Reset button, then open the gateway again.
- Click Pause.
- Turn on Option 17.
- Enter the AppleTalk configuration data for the network on the gateway's LocalTalk interface.
- Turn on the Remote Boot switch (optional).
- Download K-STAR.
- Click the Go button.
- Save the configuration data in a file (optional).

This example uses the internet configuration shown in Figure 2-4. For your site, you should determine the proper network numbers and zone names for the gateway before you configure it.

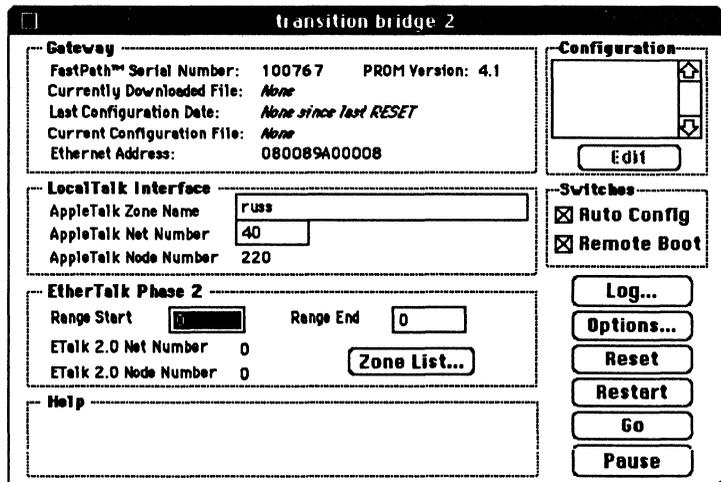
```

Option 17:                ON
LocalTalk Interface Zone Name:  russ
LocalTalk Interface Net Number:  40
EtherTalk Phase 1 and Phase 2 configuration: seeded from
transition bridge 1

```

After selecting Reset and then Pause,

1. Click the Options... button in the main configuration dialog box. This brings up the Options window.
2. Turn on Option flag 17 by clicking in the selection box next to the number 17 (an X appears in the selection box when the option flag has been turned on), then click OK to close the Options window.
3. Type russ in the AppleTalk Zone name field for the LocalTalk interface, then press *tab*.
4. Type the net number for the LocalTalk interface: 40, then press *tab*.
5. Turn on the Remote Boot switch.



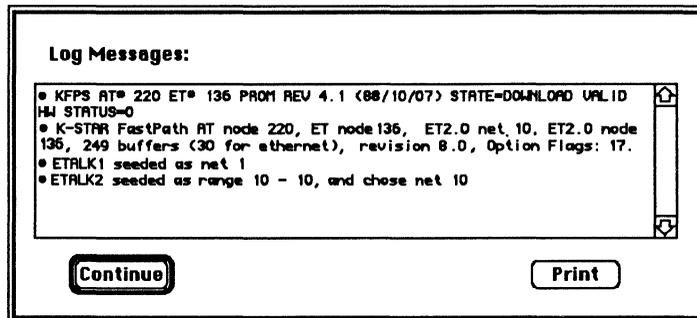
6. Download K-STAR using the Download a File... command in the File menu.
7. When K-STAR has been downloaded, click the Go button. Because you are configuring on an isolated network, you may see diagnostic messages warning that the EtherTalk interfaces have not acquired their seed data. These

messages should no longer appear when the gateway is in its permanent location.

8. Save the configuration file to disk.

At this point, Quit the FastPath Manager (using the File menu), turn off the FastPath, unplug it, and move it to its permanent location on the internet. When you bring up the gateway on the internet, launch the FastPath Manager on a Macintosh on either side of the gateway, and select and open the gateway.

Click Log... to open the Log window:



These messages indicate that Option 17 is turned on (the gateway is running the transition bridge software), and that both the EtherTalk Phase 1 and EtherTalk Phase 2 net numbers have been acquired from bridge 1 on Ethernet.

Seeding on the LocalTalk interface: bridge 3

This example uses seeding to acquire data from the other gateway on the LocalTalk interface of the FastPath. After connecting the FastPath to a Macintosh via LocalTalk, launch the FastPath Manager, and select and open the gateway.

- Click the Reset button, then open the gateway again.
- Click Pause.
- Turn on Option 17.
- Enter the EtherTalk Phase 2 configuration data.

- **Select ATalk Phase 1 from the Configuration menu and double-click on the ATalk Phase 1 listing in the Configuration area.**
- **Enter the EtherTalk Phase 1 configuration data .**
- **Turn on the Remote Boot switch (optional).**
- **Download K-STAR.**
- **Click the Go button.**
- **Save the configuration data in a file (optional).**

This example uses the internet configuration shown in Figure 2-4. For your site, you should determine the proper network numbers and zone names for the gateway before you configure it. The configuration data for this box is:

```

Option 17:                                ON
LocalTalk interface configuration: seeded from gateway 2

EtherTalk Phase 2 Network Range: 20-20
EtherTalk Phase 2 Zone List::      esther

EtherTalk Phase 1 Zone Name:       bill
EtherTalk Phase 1 Network Number:  11

```

After selecting Reset and then Pause,

1. Click the Options... button in the main configuration dialog box to bring up the Options window.
2. Turn on Option flag 17 by clicking in the selection box next to the number 17 (an X appears in the selection box when the option flag has been turned on), then click OK to close the Options window.
3. Tab twice to position the cursor in the Range Start field, type the lower number of the EtherTalk Phase 2 network range: *20*, then press *tab*.
4. Type the high end of the network range in the Range End field: *20*, then press *tab*. *Note that the Range Start and Range End must be equal on a transition bridge.*

5. Click the Zone List... button to open the zone list dialog box.
6. Type the zone name for this network in the Zone Name field at the bottom of this box: **esther** and click Add (or press *return*) to enter it in the zone list. *Note that there must be only one EtherTalk Phase 2 zone name on a transition bridge, and that a single asterisk is not allowed as a zone name in AppleTalk Phase 2.*
7. Click OK to return to the main configuration dialog box.
8. Select ATalk Phase 1 from the Configuration menu and double-click on its listing in the Configuration area to bring up the EtherTalk Phase 1 dialog box.
9. Type the EtherTalk Phase 1 zone name: **bill**, then press *tab*.
10. Type the EtherTalk Phase 1 net number: **11**, then press *tab*.

EtherTalk Phase 1

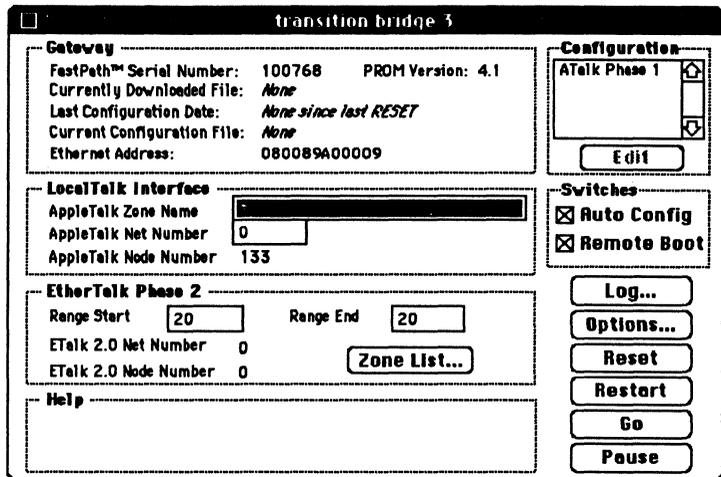
| | |
|-----------------------|------|
| AppleTalk Zone Name | bill |
| AppleTalk Net Number | 11 |
| AppleTalk Node Number | 227 |

Cancel

OK

Help

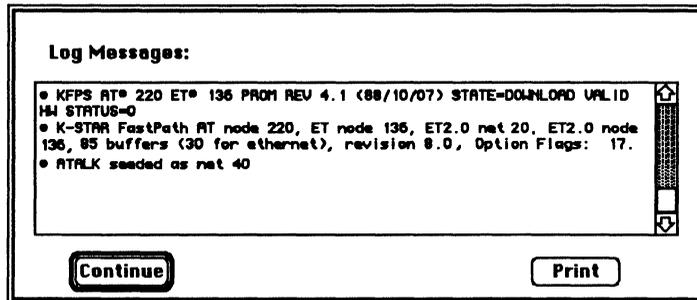
11. Click OK to return to the main configuration dialog box.
12. Turn on the Remote Boot switch by clicking in the selection box.



13. Download K-STAR using the Download a File... command in the File menu.
14. When K-STAR has been downloaded, click the Go button. In AppleTalk Phase 2, the gateway immediately begins Phase 2 node finding when you click Go. This can cause a delay of up to 5 seconds before the Diagnostics box appears. Because you are configuring on an isolated network, you may see diagnostic messages warning that the LocalTalk interface has not acquired its seed data. These messages should no longer appear when the gateway is in its permanent location.
15. Save the configuration file to disk.

At this point, Quit the FastPath Manager (using the File menu), turn off the FastPath, unplug it, and move it to its permanent location on the internet. When you bring up the gateway on the internet, launch the FastPath Manager on a Macintosh on either side of the gateway, and select and open the gateway.

Click Log... to open the Log window:



These messages indicate that Option 17 is turned on (the gateway is running the transition bridge software), and the LocalTalk net number has been acquired from bridge 2 on the gateway's LocalTalk interface.

AppleTalk Phase 1 addressing

When you are explicitly supplying AppleTalk Phase 1 network numbers and zone names, the basic rules to remember are:

- AppleTalk zone names can be 1 to 32 characters, including embedded spaces. The characters must be legal printing characters (that is, greater than hex 20 and not equal to hex 7F). In AppleTalk Phase 1, zones are a superset of networks: a zone can include multiple networks, but a network cannot have multiple zones. All gateways on the internet must agree about the zone name assigned to a particular network.
- AppleTalk network numbers can be any decimal number between 1 and 65,279. An AppleTalk network number must be unique to a cable (you can not repeat the number on more than one network), and all gateways must agree about what number is assigned to a particular cable. The maximum number of AppleTalk devices on a Phase 1 network is 254.
- AppleTalk automatically assigns a node number when a device boots up. AppleTalk node numbers cannot be assigned explicitly.

Required configuration data

To route AppleTalk Phase 1 packets to devices on both network interfaces using K-STAR, the gateway requires the following data:

- One AppleTalk zone name for the gateway's LocalTalk interface.
- One AppleTalk network number for the gateway's LocalTalk interface.
- One AppleTalk zone name for the gateway's EtherTalk Phase 1 interface.
- One AppleTalk network number for the gateway's EtherTalk Phase 1 interface.



Options 17 and 18 must be enabled when you are using the AppleTalk Phase 1 software in K-STAR.

An example Phase 1 internet

Figure 2-5 shows an example internet configuration using only AppleTalk Phase 1 routing on two Ethernets and two LocalTalk networks.

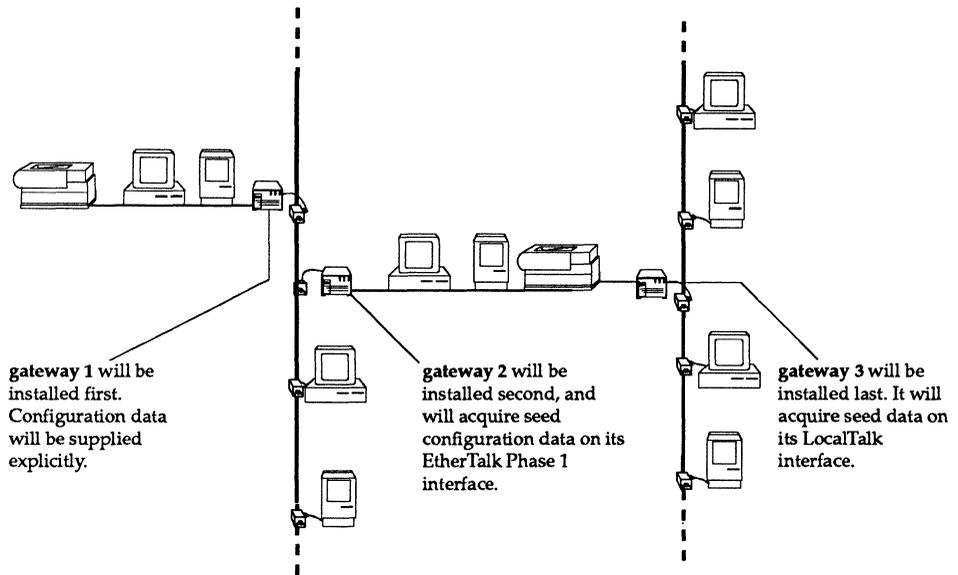


Figure 2-5. Example AppleTalk Phase 1 internet

The three gateways in this example will be configured for AppleTalk Phase 1 routing. The first gateway (**gateway 1**) will be explicitly configured with the proper network numbers and zones. **Gateway 2** will acquire seed configuration data on its EtherTalk Phase 1 interface, and **gateway 3** will acquire seed configuration data on its LocalTalk interface.

When the sample gateways are fully configured, they will have the configuration shown in Figure 2-6. Seeded data is shown in *italic type*.

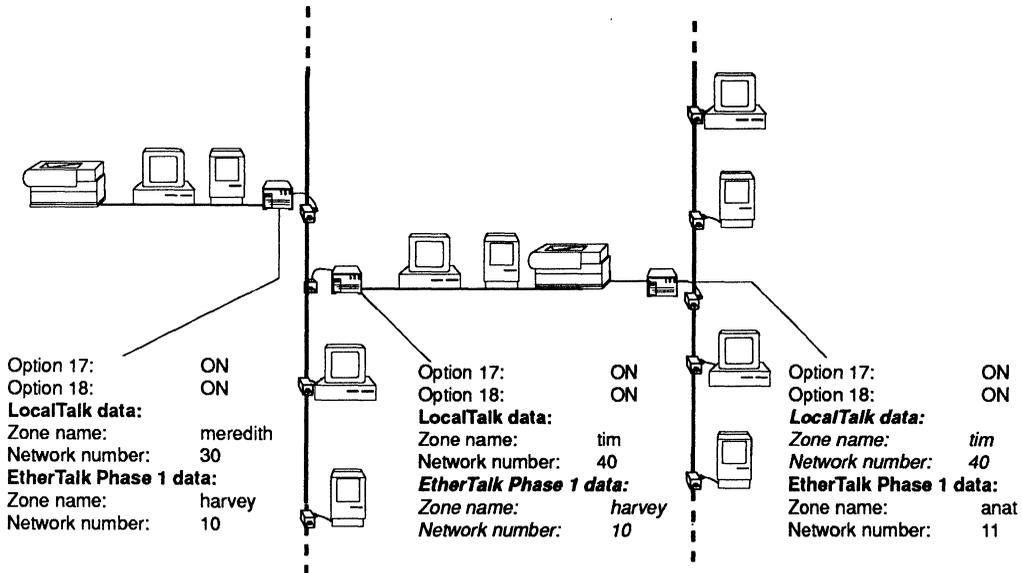


Figure 2-6. AppleTalk Phase 1 Zones and Net Numbers

For each of the three gateways to be configured, you should follow the general procedure described in Chapter 1; that is, connect one FastPath to one Macintosh via LocalTalk, configure it as described below, turn it off, unplug it, and move it to its permanent location.

Explicit configuration: gateway 1

After connecting the FastPath to a Macintosh via LocalTalk, launch the FastPath Manager, and select and open the gateway. In the main configuration dialog box,

- Click the Reset button, then open the gateway again.
- Click the Pause button.
- Turn on Options 17 and 18.
- Enter the AppleTalk configuration data for the network on the gateway's LocalTalk interface.
- Select ATalk Phase 1 from the Configuration menu and double-click on the ATalk Phase 1 listing in the Configuration area.
- Enter the EtherTalk Phase 1 configuration data.
- Turn on the Remote Boot switch (optional).
- Download K-STAR.
- Click the Go button.
- Save the configuration data in a file (optional).

This example uses the internet configuration shown in Figure 2-6. For your site, you should determine the proper network numbers and zone names for the gateway before you configure it.

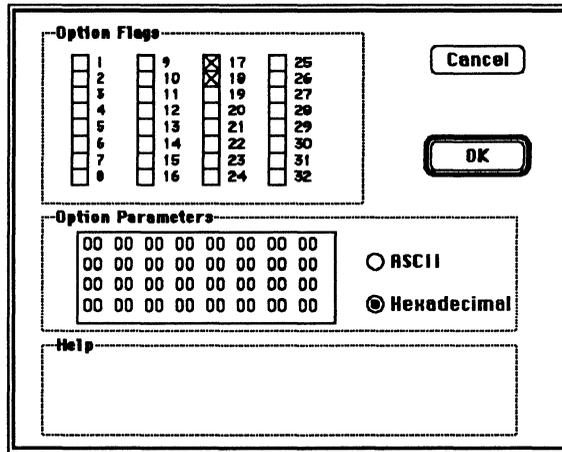
| | |
|---------------------------------|----------|
| Option 17: | ON |
| Option 18: | ON |
| LocalTalk Interface Zone Name: | meredith |
| LocalTalk Interface Net Number: | 30 |
| EtherTalk Phase 1 Zone Name: | harvey |
| EtherTalk Phase 1 Net Number: | 10 |

Note that zones are primarily intended for user convenience and for managing AppleTalk services (such as LaserWriters or AppleShare servers). You should choose zone names that will be meaningful to users to indicate where the services are located.

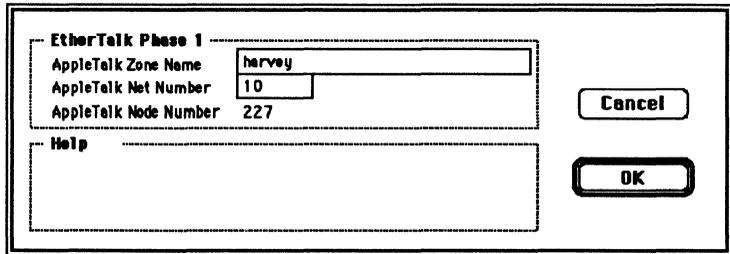
After selecting Reset and then Pause,

1. Click the Options... button in the main configuration dialog box. This brings up the Options window.

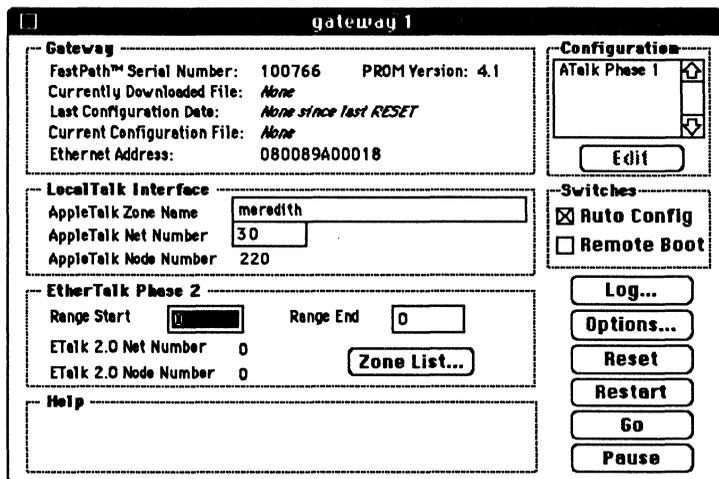
- Turn on Option flag 17 and Option flag 18 by clicking in the selection box next to the numbers 17 and 18 (an X appears in the selection box when the option flag has been turned on), then click OK to close the Options window.



- Click in the AppleTalk Zone name field for the LocalTalk interface and type **meredith**, then press *tab*.
- Type the net number for the LocalTalk interface: **30**, then press *tab*.
- Select ATalk Phase 1 from the Configuration menu, and double-click on the ATalk Phase 1 listing in the Configuration area of the screen. This brings up the EtherTalk Phase 1 dialog box.
- Click in the AppleTalk Zone Name field in the EtherTalk Phase 1 dialog box, type **harvey**, then press *tab*.
- Type the net number for the EtherTalk Phase 1 interface: **10**, then press *tab*.



8. Click OK to return to the main configuration dialog box.



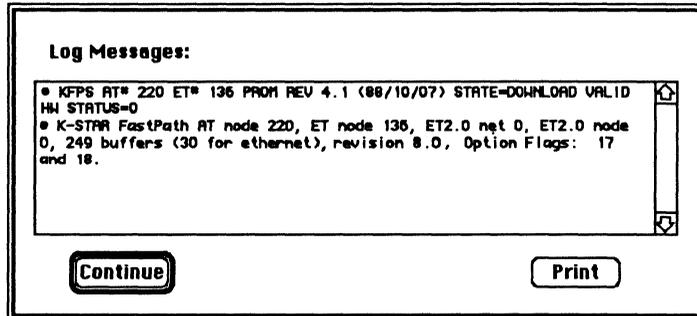
9. Turn on the Remote Boot switch by clicking in the selection box.
10. Download K-STAR using the Download a File... command in the File menu.
11. When K-STAR has been downloaded, click the Go button.
12. Select Save Configuration File... from the File menu and type a name for the configuration; for example,

GW1.ETALK1.config

Click the Save button to save the configuration file to disk.

At this point, Quit the FastPath Manager (using the File menu), turn off the FastPath, unplug it, and move it to its permanent location on the internet. When you bring up the gateway on the internet, launch the FastPath Manager on a Macintosh on either side of the gateway, and select and open the gateway.

Click Log... to open the Log window:



These messages indicate that both Option 17 and Option 18 are enabled. This means that the gateway is routing AppleTalk Phase 1 packets (no AppleTalk Phase 2 packets will be processed.)

Seeding on the Ethernet interface: gateway 2

This example uses seeding to acquire data from the Ethernet interface of gateway 1. After connecting the FastPath to a Macintosh via LocalTalk, launch the FastPath Manager, and select and open the gateway. In the main configuration window,

- Click the Reset button, then open the gateway again.
- Click Pause.
- Turn on Options 17 and 18.
- Enter the AppleTalk configuration data for the network on the gateway's LocalTalk interface.
- Turn on the Remote Boot switch (optional).
- Download K-STAR.
- Click the Go button.
- Save the configuration data in a file (optional).

This example uses the internet configuration shown in Figure 2-6. For your site, you should determine the proper network numbers and zone names for the gateway before you configure it.

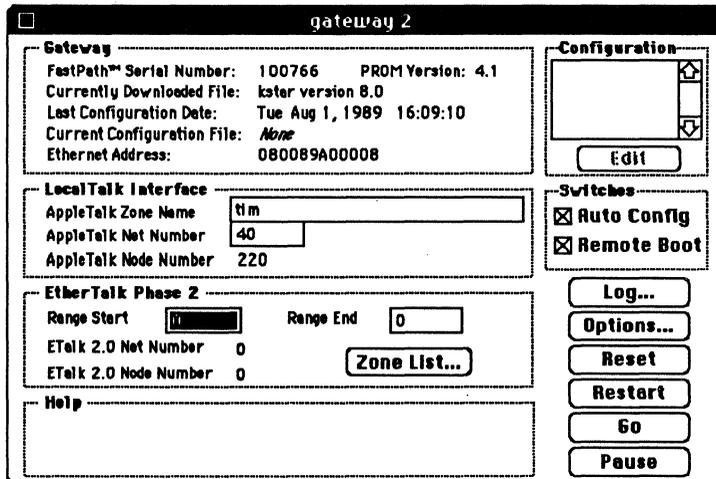
Option 17: ON
 Option 18: ON

LocalTalk Interface Zone Name: tim
 LocalTalk Interface Net Number: 40

EtherTalk Phase 1 configuration: seeded from gateway 1

After selecting Reset and then Pause,

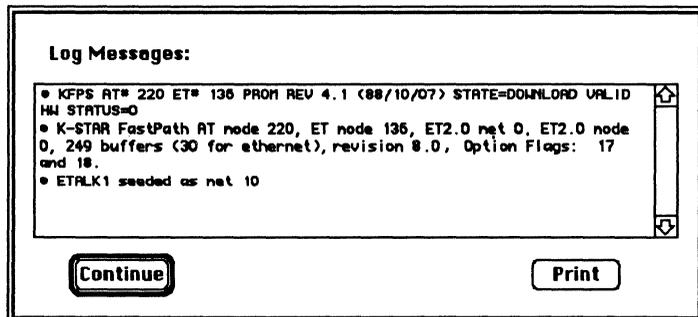
1. Click the Options... button in the main configuration dialog box. This brings up the Options window.
2. Turn on Option flag 17 and Option flag 18, then click OK to close the Options window.
3. Type **tim** in the AppleTalk Zone Name field for the LocalTalk interface, then press *tab*.
4. Type the net number for the LocalTalk interface: **40**, then press *tab*.
5. Turn on the Remote Boot switch.



6. Download K-STAR using the Download a File... command in the File menu.
7. When K-STAR has been downloaded, click the Go button. Because you are configuring on an isolated network, you may see diagnostic messages warning that the EtherTalk Phase 1 interface has not acquired its seed data. These messages should no longer appear when the gateway is in its permanent location.
8. Save the configuration file to disk.

At this point, Quit the FastPath Manager (using the File menu), turn off the FastPath, unplug it, and move it to its permanent location on the internet. When you bring up the gateway on the internet, launch the FastPath Manager on a Macintosh on either side of the gateway, and select and open the gateway.

Click Log... to open the Log window:



These messages indicate that Options 17 and 18 are turned on (the gateway is routing AppleTalk Phase 1 packets), and the EtherTalk interface has acquired the Phase 1 net number 10.

Seeding on the LocalTalk interface: gateway 3

This example uses seeding to acquire data from the other gateway on the LocalTalk interface of the FastPath. After connecting the FastPath to a Macintosh via LocalTalk, launch the FastPath Manager, and select and open the gateway.

- Click the Reset button, then open the gateway again.
- Click Pause.
- Turn on Options 17 and 18.
- Select ATalk Phase 1 from the Configuration menu and double-click on the ATalk Phase 1 listing in the Configuration area.
- Enter the EtherTalk Phase 1 configuration data.
- Turn on the Remote Boot switch (optional).
- Download K-STAR.
- Click the Go button.
- Save the configuration data in a file (optional).

This example uses the internet configuration shown in Figure 2-6. For your site, you should determine the proper network numbers and zone names for the gateway before you configure it.

The configuration data for this box is:

| | |
|------------|----|
| Option 17: | ON |
| Option 18: | ON |

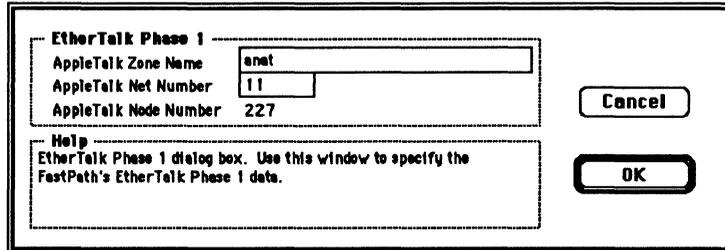
LocalTalk Interface configuration: seeded from gateway 2

| | |
|-----------------------------------|------|
| EtherTalk Phase 1 Zone Name: | anat |
| EtherTalk Phase 1 Network Number: | 11 |

After selecting Reset and then Pause,

1. Click the Options... button in the main configuration dialog box. This brings up the Options window.
2. Turn on Option flag 17 and Option flag 18, then click OK to close the Options window.
3. Select ATalk Phase 1 from the Configuration menu and double-click on its listing in the Configuration area to bring up the EtherTalk Phase 1 dialog box.
4. Type the zone name in the AppleTalk Zone Name field in this dialog box, *anat*, then press *tab*.

5. Type the net number for the EtherTalk Phase 1 interface: **11**, then press *tab*.



EtherTalk Phase 1

AppleTalk Zone Name anat

AppleTalk Net Number 11

AppleTalk Node Number 227

Cancel

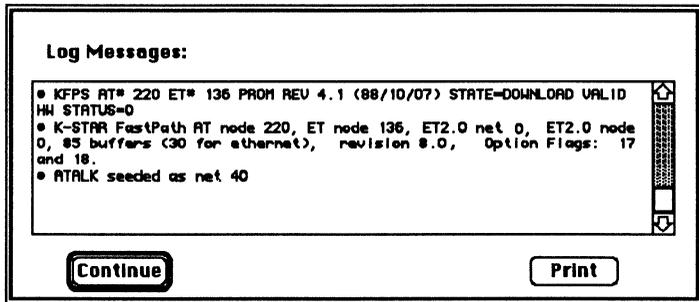
OK

Help
EtherTalk Phase 1 dialog box. Use this window to specify the FastPath's EtherTalk Phase 1 data.

6. Click OK to return to the main configuration dialog box.
7. Turn on the Remote Boot switch, then download K-STAR using the Download a File... command in the File menu.
9. When K-STAR has been downloaded, click the Go button. Because you are configuring on an isolated network, you may see diagnostic messages warning that the LocalTalk interface has not acquired its seed data. These messages should no longer appear when the gateway is in its permanent location.
10. Save the configuration file to disk.

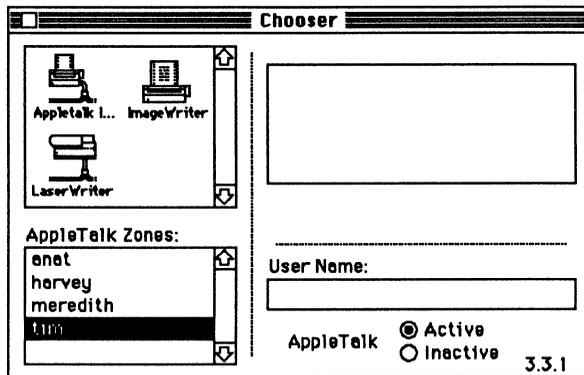
At this point, Quit the FastPath Manager (using the File menu), turn off the FastPath, unplug it, and move it to its permanent location on the internet. When you bring up the gateway on the internet, launch the FastPath Manager on a Macintosh on either side of the gateway, and select and open the gateway.

Click Log... to open the Log window:



These messages indicate that Options 17 and 18 are turned on (the gateway is routing AppleTalk Phase 1 packets), and the LocalTalk interface has acquired the Phase 1 net number 40.

You can also check that all of the zones you have entered are visible on the internet by opening the Macintosh Chooser:



K-STAR AppleTalk management issues

A gateway should be configured for AppleTalk Phase 2 routing to support communication between EtherTalk Phase 2 devices and AppleTalk devices on LocalTalk. To update Macintoshes on Ethernet, install the EtherTalk Phase 2 software, select the EtherTalk icon with double arrows (the double arrows signify Phase 2) in the Macintosh Control Panel, and reboot the Macintosh.

If there is a Phase 1 gateway or router on your local Ethernet, at least one of the Phase 2 gateways on that Ethernet must be configured as a transition bridge. If there is a Phase 1 router on your local LocalTalk net (even a LocalTalk-to-LocalTalk bridge), all of the Phase 2 gateways on that LocalTalk net must be configured as a transition bridge.

If none of the AppleTalk devices on Ethernet have been upgraded to AppleTalk Phase 2 protocol software, you can configure the gateway for AppleTalk Phase 1. If you wish to use the zone security options, or to add any K-STAR IP or DECnet configuration data, you must use the K-STAR implementation of AppleTalk Phase 1 (as documented in this chapter) rather than the PROM-resident protocols (as described in Appendix E).

Network ranges and zone lists

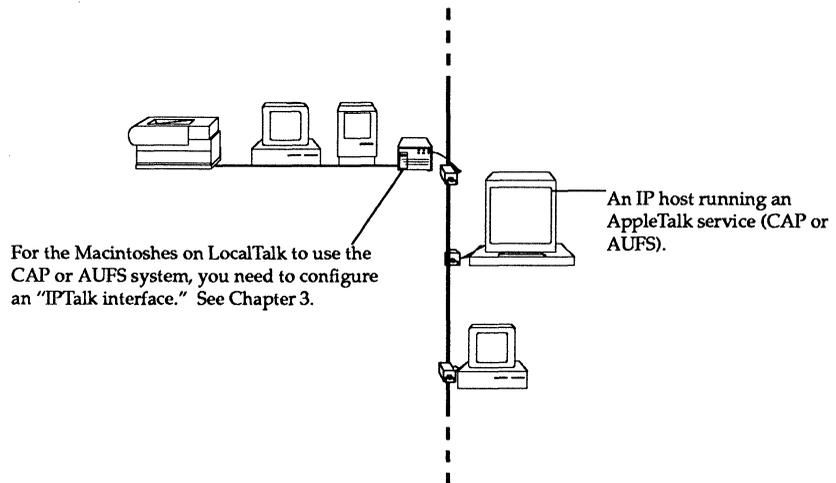
When you are configuring a network range or a zone list on the gateway's EtherTalk Phase 2 interface, it is advisable to use the smallest range and smallest number of zone names required for your network. The gateway uses some memory to store each network number and zone name, so if the network range or zone list is very large, a lot of the gateway's RAM will be used for storage, rather than being used to help route packets.

New zone names

When you are reconfiguring gateways with new zone names, the gateway must be off the internet for a full 10 minutes before you reboot it with a new zone name. This is required because it takes a full 10 minutes (and possibly more, if the internet is very large) for the other bridges and gateways on the internet to time out the old zone name or names for that network.

AppleTalk encapsulated in UDP: IPTalk

When a Macintosh uses an AppleTalk service that exists on an IP host, the gateway encapsulates the AppleTalk packet in IP and forwards it to the IP host. The IP host must know how to which strips off the IP header and reads the AppleTalk packet; for example, it must be running Columbia AppleTalk Protocol (CAP) or Apple UNIX File System (AUFS). See "IPTalk Configuration" in Chapter 3 for more information.



K-STAR AppleTalk zone security

The FastPath running K-STAR supports zone security for AppleTalk Phase 1 and Phase 2 internets. To understand how K-STAR zone security works, you need to know how users access AppleTalk services in other zones.

Zones in the Chooser

When a Macintosh user selects a zone and an AppleTalk service in the Macintosh Chooser, the following events occur:

- The Macintosh sends a Broadcast Request, which is received by the gateway. If there is more than one gateway on the local network, the request packet is sent to the gateway from which the most recent RTMP packet was received.
- The gateway sends out an NBP lookup to all devices in the selected zone. If the zone is on a remote network, it directs the broadcast to the relevant networks.
- AppleTalk services in the selected zone send NBP reply packets back to the Macintosh that originated the request, which displays the services' names in the Chooser. If the services are on a remote network, the replies are routed through one or more gateways to reach the requesting Macintosh.

How zone security works

K-STAR zone security options operate in two ways.

1. **Option 13** is used to hide network services in other zones from users on the LocalTalk side of the gateway. This is called "Stay in Zone" security.

When you select Option 13, the gateway drops NBP *request* packets from Macintoshes if the destination zone name (the zone name in which the user wishes to see an AppleTalk service) and the source zone name (the LocalTalk zone name) are different.



In this case, the LocalTalk zone name of the Macintosh user is the *source* zone (the source of the request packets). The gateway connecting that LocalTalk network to the internet needs to have Option 13 set.

2. **Options 14 and 15** are used to protect network services on the LocalTalk side of the gateway from other network users. Option 14 hides LaserWriters (“LaserWriter security”) and Option 15 hides any service whose name ends in a tilde (“Tilde security”).

When you select Option 14 or 15, the gateway processes all NBP *reply* packets; if the LocalTalk zone name of the gateway is one of the zones for the source network, and if the LocalTalk zone of the gateway is not one of the zones for the destination network, it removes the appropriate entries: devices of type “LaserWriter” if Option 14 is set, or entries whose names end in a tilde (~) if Option 15 is set. If there are no entries left after processing, the gateway drops the packet.

Note that Options 14 and 15 are recommended only for gateways with low network traffic, because it causes significant processing overhead.



In these cases, the LocalTalk zone in which the services reside is the *source* zone name (the source of the reply packets). The gateway connecting that LocalTalk network to the internet needs to have Option 14 set (“LaserWriter” security) and/or Option 15 set (“Tilde” security).

AppleTalk Phase 1, Option 13: ON

In this Phase 1 internet, all gateways have Option 13 turned on. Macintosh users on LocalTalk nets will be restricted to services in their own zone: if that zone name includes another network, they will see all services on that network.

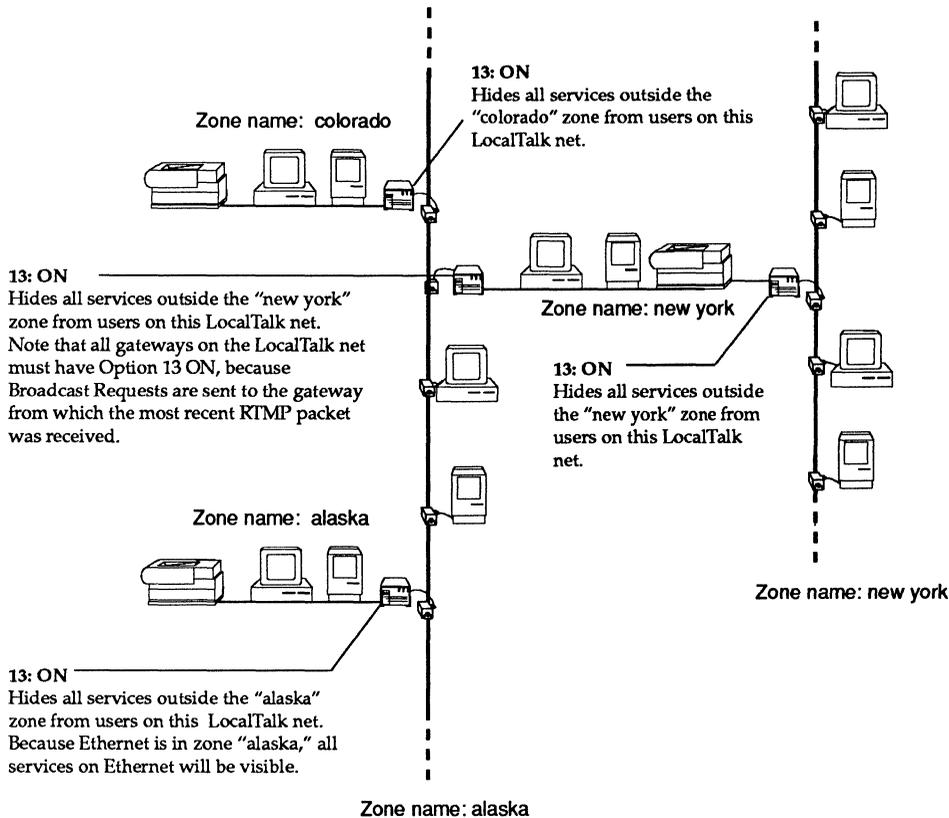


Figure 2-7. Phase 1 "Stay in Zone" security

AppleTalk Phase 2, Option 13: ON

In this Phase 2 internet, all gateways have Option 13 turned on. Macintosh users on LocalTalk nets will be restricted to services in their own zone: if that zone name is included in the EtherTalk Phase 2 zone list on another network, they will see only the services registered in their zone.

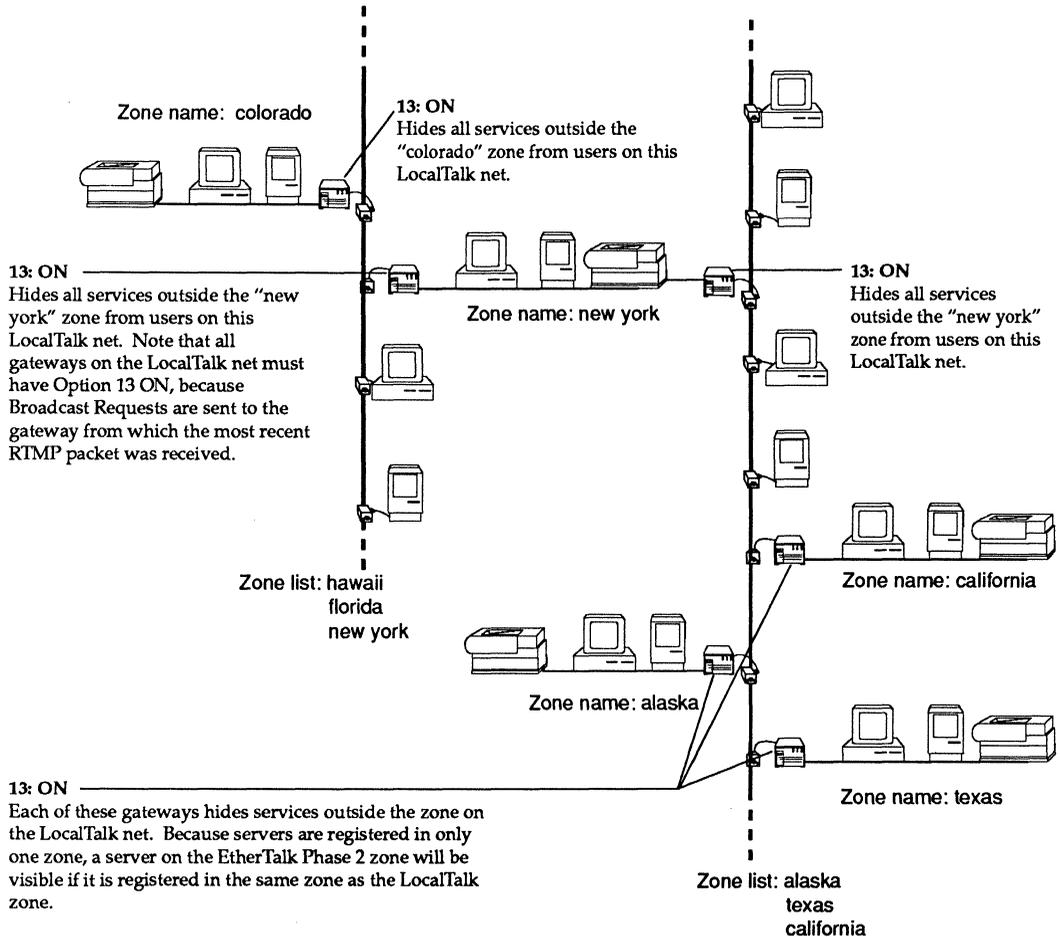


Figure 2-8. Phase 2 "Stay in Zone" security

AppleTalk Phase 1, Option 14: ON

In this Phase 1 internet, all gateways have Option 14 turned on. LaserWriters on LocalTalk nets will be hidden from users in other zones; if the zone name includes another network, all users on that network will be able to access those LaserWriters.

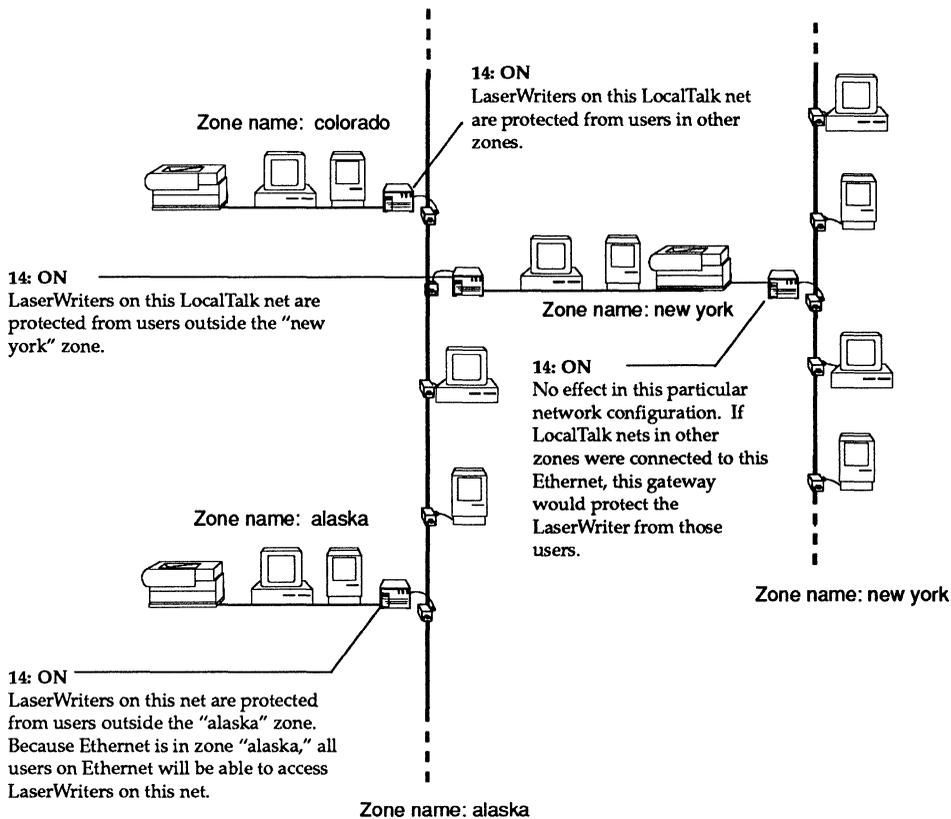


Figure 2-9. Phase 1 "LaserWriter" security

AppleTalk Phase 2, Option 14: ON

In this Phase 2 internet, all gateways have Option 14 turned on. LaserWriters on LocalTalk nets will be hidden from users in other zones; if that zone name is included in the EtherTalk Phase 2 zone list on another network, users on that Ethernet will be able to access those LaserWriters.

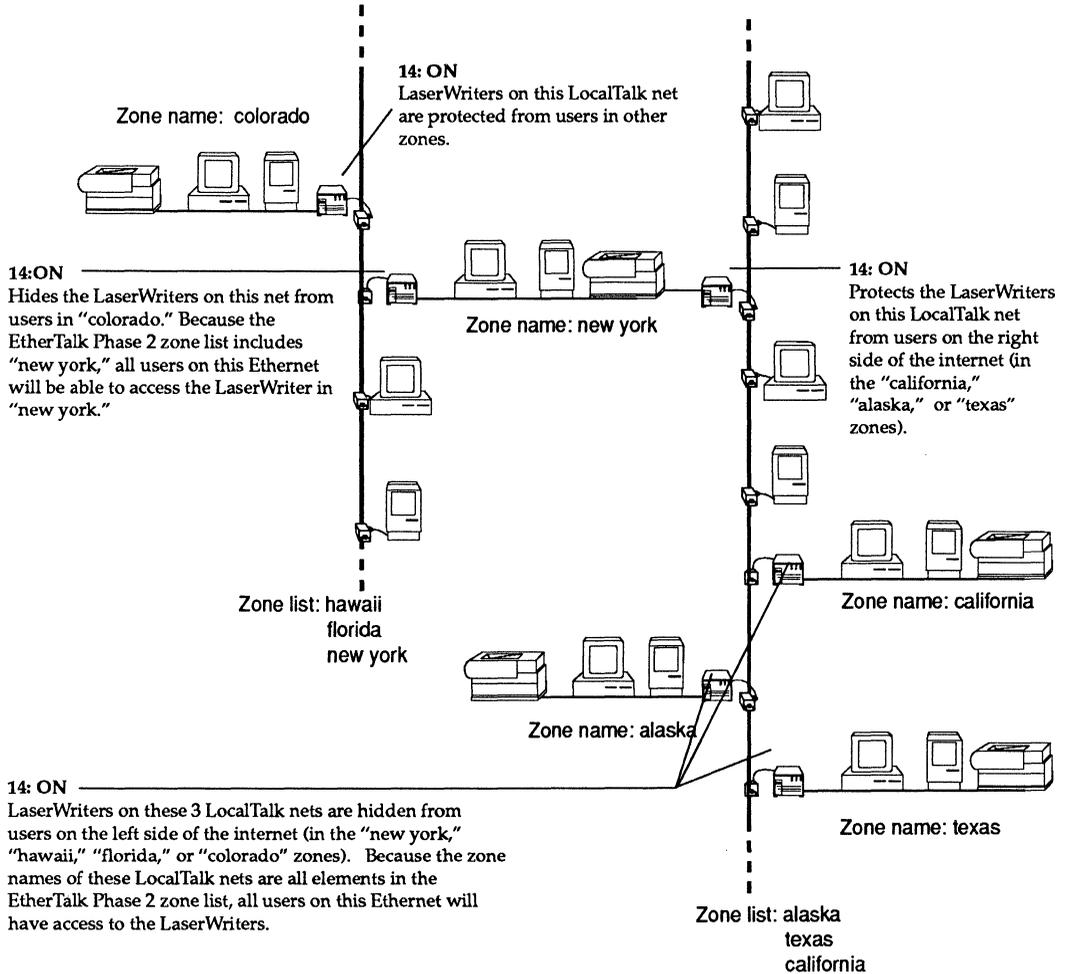


Figure 2-10. Phase 2 "LaserWriter" security

AppleTalk Phase 1, Option 15: ON

In this Phase 1 internet, all gateways have Option 15 turned on. AppleTalk services whose names end in tilde (~) on LocalTalk nets will be hidden from users in other zones; if the zone name includes another network, all users on that network will be able to access those services.

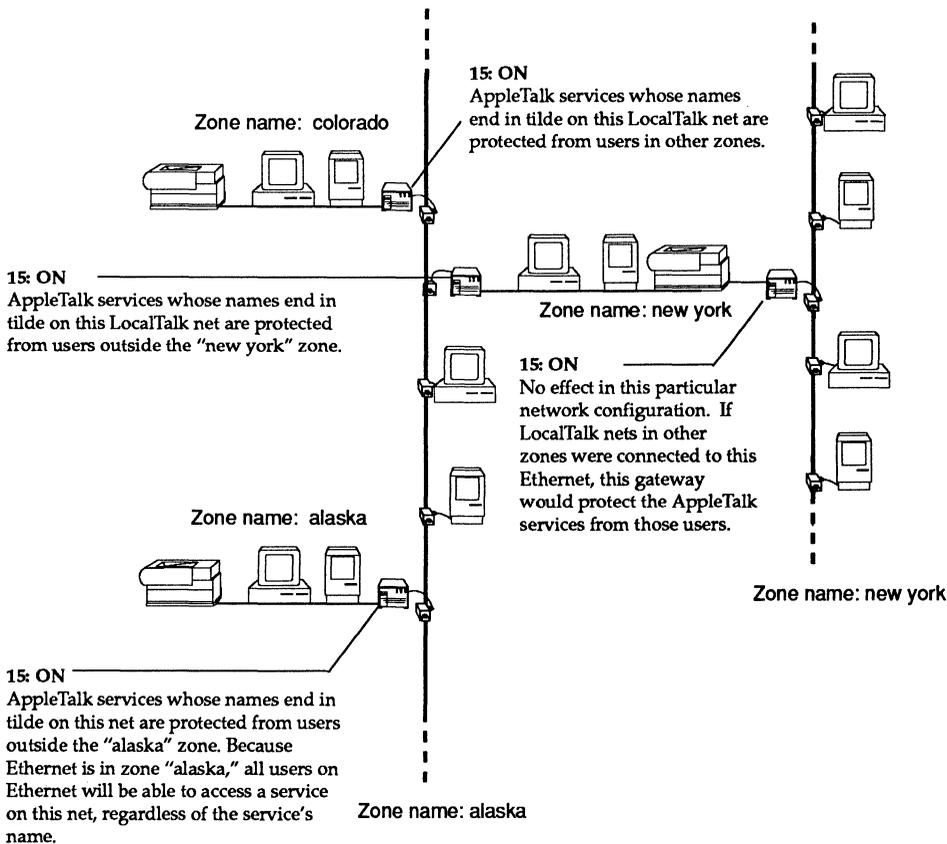


Figure 2-11. Phase 1 "Tilde" security

AppleTalk Phase 2, Option 15: ON

In this Phase 2 internet, all gateways have Option 15 turned on. AppleTalk services whose names end in tilde (~) on LocalTalk nets will be hidden from users in other zones; if that zone name is included in the EtherTalk Phase 2 zone list on another network, users on that Ethernet will be able to access those services.

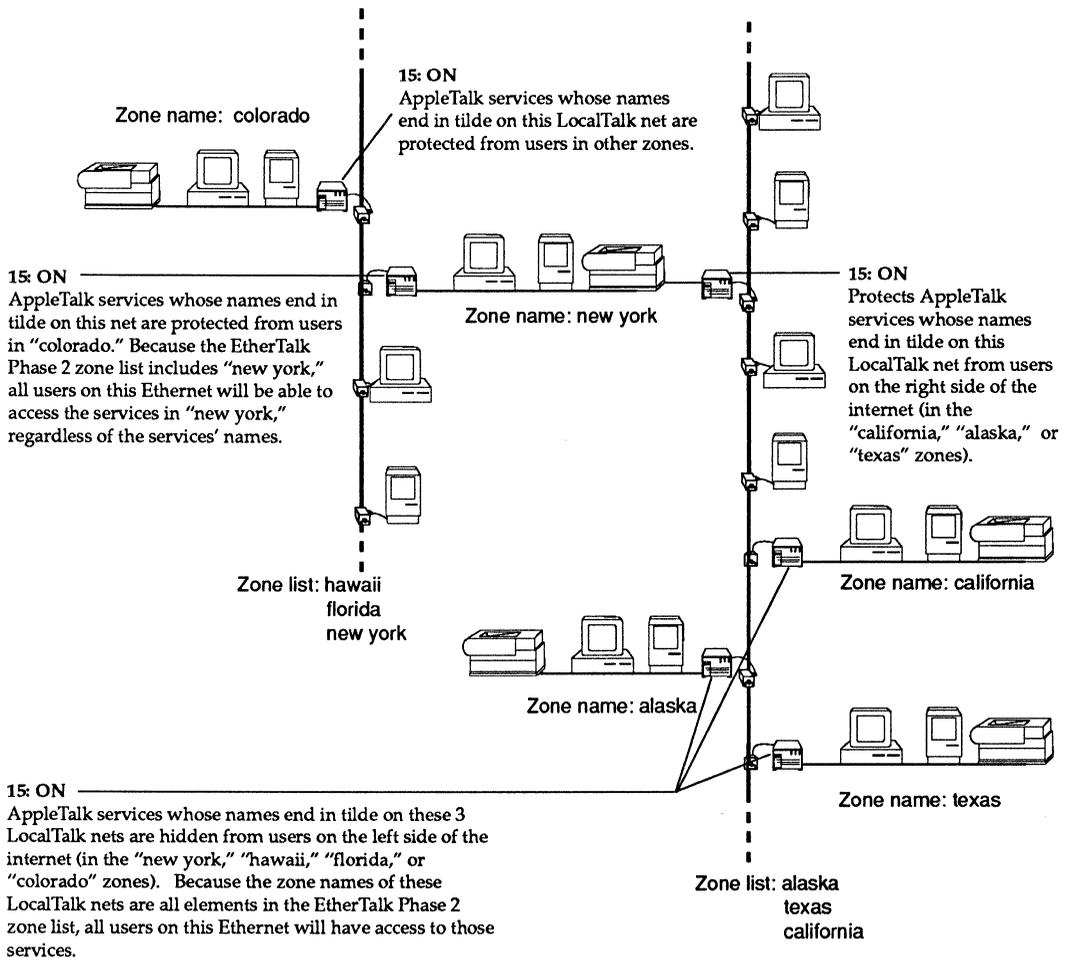


Figure 2-12. Phase 2 "Tilde" security

K-STAR IP Configuration

THIS CHAPTER EXPLAINS HOW TO CONFIGURE THE FASTPATH ON IP networks or subnets using the IP protocols contained in the K-STAR gateway program. K-STAR IP is derived from the Kinetics Internet Protocol (KIP) implementation developed at Stanford University, which provides a number of convenient IP addressing and routing features for the FastPath gateway.

- Automatically calculates the appropriate IP subnet mask and broadcast address
- Uses RIP packets and ICMP redirects in routing
- Manages a range of IP addresses for Macintoshes
- Supports IP-Talk (UDP encapsulation of AppleTalk packets, as used by Columbia AppleTalk Protocols (CAP) and Apple UNIX File System (AUFS) systems)
- Can acquire configuration data from the UNIX atalkd daemon.

If you are new to IP internets

This section reviews basic IP addressing conventions for the network administrator who has not used IP addressing before. K-STAR automatically determines the correct IP subnet mask (if one is in use on Ethernet) and the correct IP broadcast address.

IP addresses

An IP address is a 4-byte number that uniquely identifies a host on the IP network. It is composed of a network number (which is always the same for every host on a network) and a host number (which must be unique for each host on a network). IP addresses are assigned to each computer by appending a unique host number to the network number.

IP network numbers are managed and assigned by the DDN Network Information Center (NIC), SRI International, 333 Ravenswood Avenue, Menlo Park, CA 94025. *If the IP internet at your site needs to communicate with any other IP network that is not directly under your administration, you must acquire an official IP network number from the above address.*

The 4-byte IP address can be written in “decimal dot” or hexadecimal notation, depending on which you are more comfortable with. The following is an IP address expressed in both notations:

| Decimal dot notation | Hexadecimal notation |
|----------------------|----------------------|
| 130.57.64.1 | 8239401 |

IP network numbers are divided into class A, class B, and class C numbers as shown in Figure 3-1. The network class determines how many bytes of the address represents the network number, and what the value of the first byte will be.

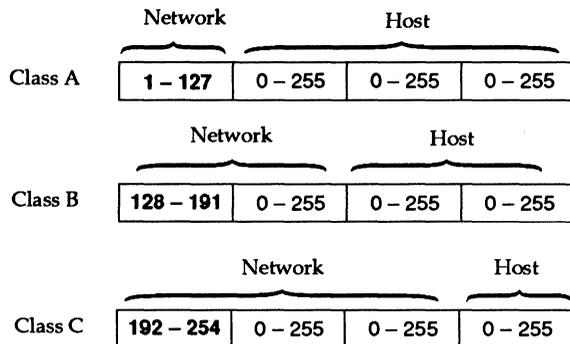


Figure 3-1. IP network numbers as assigned by NIC

For example, "130.57" is a class B Internet number, because the network number is 2 bytes with the value of the first byte between 128 and 191.

When you assign an IP address to a device, you can append any host number that is not already used by another device. *The host number part of the IP address must be unique on the IP network.* At most sites, IP addresses are maintained and assigned by one network administrator, and they must be acquired from her.

IP subnets

An IP subnet is a logical sub-section of an IP network. Subnets are only seen internally at a site; external IP networks see the IP network as one entity. A subnet has the same IP network number as the rest of the network, but applies a "subnet mask" that defines a fixed-length portion of the host portion of the address as a "subnet number." The "default subnet mask" defines the actual network portion of the address (as shown in Figure 3-1) as the network number; that is, it does not add any bits.

An IP subnet mask is a 4-byte number that contains only 1-bits and 0-bits: the 1-bits always represent the network portion of the address and 0-bits represent the host portion of the address. Net masks can also be specified in hexadecimal or decimal dot notation.

For example, for the class A IP address 18.192.127.51 with a subnet mask of FFFF0000 (255.255.0.0 in decimal), the second

IP broadcast addresses

The Internet broadcast address is an address understood by all hosts on a local network as a special address for broadcast packets (i.e., packets that should be received and processed by all IP hosts on the local network.) By default, the gateway uses the industry standard broadcast address with all 1 bits in the host number.

| | | | | |
|----------------------|-----|----|-----|-----|
| Class B net number | 137 | 57 | 64 | 163 |
| IP broadcast address | 137 | 57 | 255 | 255 |

Figure 3-5. IP broadcast address with no subnet

If you have partitioned the network into subnets, the broadcast address uses the subnet mask to limit broadcasts to the local subnet. It is not possible to extend broadcasts to another network.

| | | | | |
|----------------------|-----|-----|-----|-----|
| Class B net number | 137 | 57 | 64 | 163 |
| subnet mask | 255 | 255 | 255 | 0 |
| IP broadcast address | 137 | 57 | 64 | 255 |

Figure 3-6. IP broadcast address with subnetting



K-STAR automatically assigns the correct IP broadcast address based on the IP address of the gateway, the subnet mask it has acquired, and the state of **Option 4**. If the gateway is connected to a subnet that supports 4.2BSD-compatible devices, you need to turn on **Option 4**. This tells K-STAR to use a broadcast address with all 0s in the host portion of the address.

Required K-STAR IP data

When you are supplying IP addresses using K-STAR, there are two goals:

1. Configuring the gateway so it can communicate with other entities on the IP network on Ethernet.
2. Assigning an IP address range that the gateway will administer for client Macintoshes.

The client Macintoshes running TCP/IP software can be on a connected LocalTalk network, or can be distributed across LocalTalk and Ethernet.

The gateway is a host on the existing Ethernet/IP network, and administers IP addresses for all client Macintoshes.

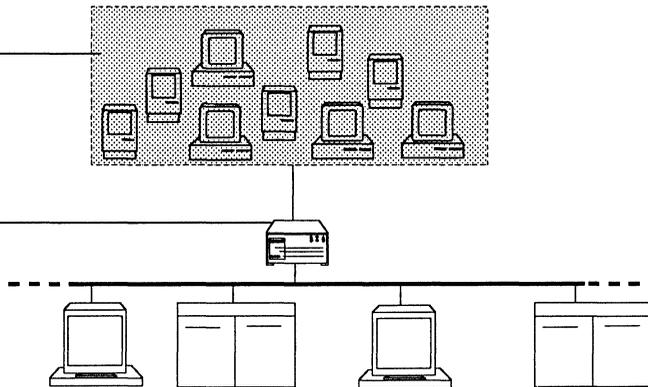


Figure 3-7. K-STAR IP configuration

Configuring the gateway as an IP host

To communicate with other entities on the Ethernet/IP network, the gateway needs the following data:

- A unique IP address on the existing IP network. You supply this address in the K-STAR IP dialog box using the FastPath Manager.
- An IP network number. The gateway derives this from the IP address you supply and the subnet mask.
- An IP subnet mask. The gateway acquires the correct subnet mask as follows:

Using the ICMP protocol, it acquires the subnet mask in use on the Ethernet/IP network.

If ICMP does not provide a subnet mask, it checks for a configured subnet mask (that is, one that you entered).

If the gateway still does not find a subnet mask, it calculates a default subnet mask. The default subnet mask does not define any subnet portion; it masks out the actual network portion of the IP address based on the class of the IP network number (the value of the first byte). For example, if the IP network number is class B, the default subnet mask is FFFF0000 (255.255.0.0).

- An IP broadcast address. By default, the gateway derives the broadcast address from the IP address you supply and the subnet mask, and uses the standard broadcasting method (all 1s in the host number). If you need to use 4.2 BSD-compatible IP broadcasting (all 0s in the host number), turn on Option 4 in the FastPath Manager.

Client Macintosh IP addresses

To administer a range of IP addresses for client Macintoshes, the gateway needs the following data:

- A decimal number indicating the number of client Macintoshes that will be statically assigned an IP address. You supply this data in the K-STAR IP dialog box using the FastPath Manager.
- A decimal number indicating the number of client Macintoshes that will dynamically acquire an IP address as they boot up on the IP network. You supply this data in the K-STAR IP dialog box using the FastPath Manager.
- An IP address indicating where the range of client IP addresses should start. By default, the gateway uses its own address +1. If Option 9 is set, you can supply this address in the K-STAR IP "More" dialog box.

In all cases, the Macintosh IP addresses are a contiguous range starting at a specified address. The number of addresses in the range must be less than or equal to 60, which is the number of clients you specify as "static addresses" plus the number you

specify as “dynamic addresses,” with the low end of the range used as static IP addresses.

The client Macintosh IP addresses can be configured as follows:

1. The client IP addresses can be on the existing Ethernet/IP net. The range of Macintosh IP addresses then starts at the gateway address +1. (This is the default IP configuration method.)
2. The client IP addresses can be on the existing Ethernet/IP net, but the starting point is an IP address that you supply separately from the gateway IP address. Option 9 must be ON.
3. The client IP addresses can be on a *different* IP network from the existing Ethernet/IP net. In this case, you supply a second IP address for the gateway as a host on the new IP network. The range of Macintosh IP addresses starts at the second gateway address +1. The gateway then sends out RIP packets to inform other routers about the existence of the new network. Option 9 must be ON.



The K-STAR IP software supports up to 60 IP addresses in the range managed by the gateway for client Macintoshes. Provided that you have an unused block of addresses, you can assign a greater number of IP addresses than you need in the “Number of Clients” area. This will allow you to add client Macintoshes without reconfiguring the gateway at a future date.

Example K-STAR IP configurations

The example K-STAR IP configurations in the sections that follow all use variations on the same data. The gateway is configured as a host on an Ethernet/IP net 130.57.64.0, which is subnetted with the netmask 255.255.255.0 (FFFFFF00) so the third byte of the address is the subnet number. In this case, the subnet mask in use on the Ethernet interface will automatically be applied; there is no need to supply it in the K-STAR IP configuration.

The example configurations show four different ways to manage client IP addresses:

1. As a range of IP addresses contiguous with the gateway's IP address on the existing IP net 130.57.64.0 (the "default configuration").
2. As a range of IP addresses that are noncontiguous with the gateway's IP address (a "noncontiguous address range").
3. As a separate IP network, with the gateway configured as a host on that network, as well as on the existing IP net ("the gateway managing a separate network").
4. As a range of IP addresses contiguous with the gateway's IP address on the existing IP net 130.57.64.0, but where the Macintosh clients are distributed on the gateway's LocalTalk interface, Ethernet interface, and on a separate LocalTalk network connected to the gateway across Ethernet ("distributing Macintosh clients").

See "Changing Configuration Data" in Chapter 1 if you are modifying an existing K-STAR IP configuration.

See "K-STAR IP Management Issues" at the end of this chapter for information on assigning these IP addresses to Macintoshes.

The default K-STAR IP configuration

Figure 3-8 shows an example IP internet configuration using K-STAR IP. The gateway is configured as a host on the Ethernet/IP subnet 130.57.64.0. The client Macintoshes are seen as IP hosts on the existing network, and a block of free addresses on that net must be allocated for them. The range of nine Macintosh IP addresses will start at the gateway address +1. (This is the default IP configuration method.)

LocalTalk network supporting 9 Macintoshes running TCP/IP software.

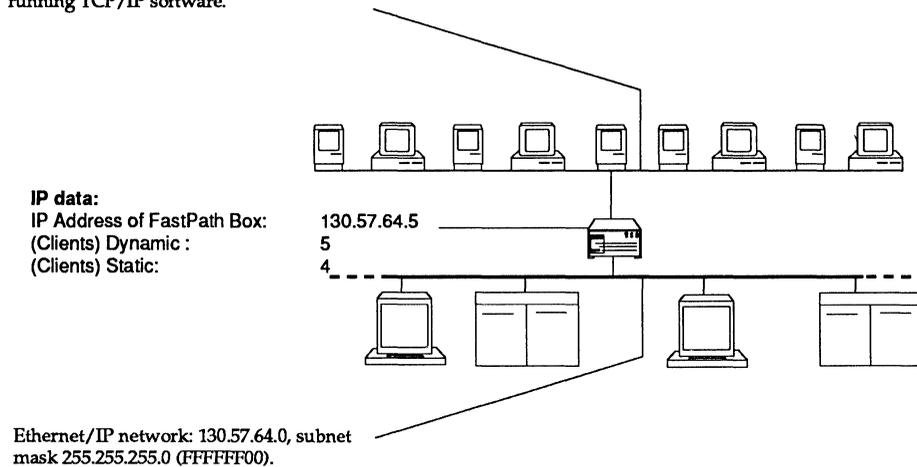


Figure 3-8. A default K-STAR IP configuration

The following IP addresses will be available for static assignment to client Macintoshes:

130.57.64.6
130.57.64.7
130.57.64.8
130.57.64.9

Note that the static addresses begin at the gateway address +1. The following IP addresses will be available for client Macintoshes to acquire dynamically as they boot up on the IP network:

130.57.64.10
130.57.64.11
130.57.64.12
130.57.64.13
130.57.64.14



The entire range of client IP addresses cannot be duplicated anywhere on the IP internet.

In configuring the gateway, you should follow the general procedure described in Chapter 1. After connecting the gateway to a Macintosh via LocalTalk, launch the FastPath Manager, and select and open the gateway. In the main configuration dialog box,

- Click the **Reset** button, then open the gateway again.
- Click the **Pause** button.
- Enter the **AppleTalk** configuration data; see Chapter 2.
- Select **K-STAR IP** from the **Configuration** menu and double-click on the **K-STAR IP** listing in the **Configuration** area.
- Enter the **IP address** of the **FastPath Box**.
- Enter the **number of client Macintoshes** controlled by the gateway.
- Turn on the **Remote Boot** switch (optional).
- **Download K-STAR**.
- Click the **Go** button.
- **Save the configuration data in a file** (optional).

This example uses the internet configuration shown in Figure 3-8. For your site, you should determine the proper IP address and number of Macintosh clients before you configure the gateway.

| | |
|-----------------------------|-------------|
| IP Address of FastPath Box: | 130.57.64.5 |
| (Clients) Dynamic: | 5 |
| (Clients) Static: | 4 |

After selecting **Reset** and then **Pause**, enter the **AppleTalk** configuration you require, as described in Chapter 2. Then proceed with the **IP** configuration:

1. Select **K-STAR IP** from the **Configuration** menu and double-click on **K-STAR IP** in the **Configuration** area to open the **IP** dialog box.
2. Type the gateway's **IP address** in the **IP Address of the FastPath Box** field: **130.57.64.5**, then press **tab**.

| | | | |
|----------------------------------|-------------|-----------------------------|--------------------------|
| IP Information | | Number of IP Clients | |
| IP Address of FastPath Box | 130.57.64.5 | Dynamic | <input type="checkbox"/> |
| IP Subnetwork Mask | 0.0.0.0 | Static | <input type="checkbox"/> |
| IP Broadcast Address | 0.0.0.0 | | |
| IP Address of Default Router | 0.0.0.0 | | |
| Administrator | | More... | |
| IP Address of Administrator Host | 0.0.0.0 | | |
| IPTalk Interface | | Cancel | |
| AppleTalk Zone Name | * | | |
| AppleTalk Network Number | 0 | | |
| AppleTalk Node Number | 0 | | |
| Help | | OK | |

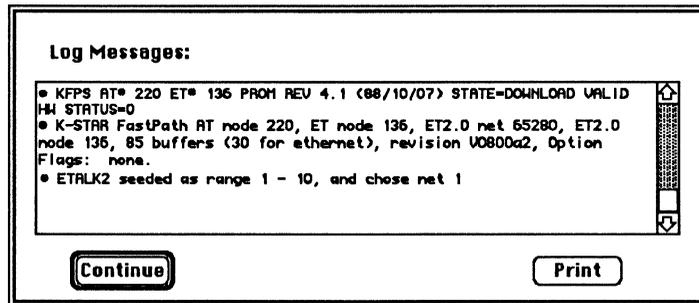
3. Double-click in the Dynamic field in the "Number of IP Clients" area, and type the number of client Macintoshes that will dynamically acquire IP addresses from the gateway: 5, then press *tab*.
4. Type the number of client Macintoshes that will be assigned static IP addresses administered by the gateway: 4, then press *tab*. The total number of clients supported by a gateway must be less than or equal to 60.
5. Click OK to return to the main dialog box.
6. Turn on the Remote Boot switch by clicking in the selection box.
7. Select Download a File... from the File menu and open K-STAR.
8. Click Go to send the configuration data to the gateway.
9. Select Save Configuration File... from the File menu and type a name for the configuration; for example,

KSTAR-IP.config

Click the Save button to save the configuration file to disk.

At this point, Quit the FastPath Manager (using the File menu), turn off the FastPath, unplug it, and move it to its permanent location on the internet. When you bring up the gateway on the internet, launch the FastPath Manager on a Macintosh on either side of the gateway, and select and open the gateway.

Click Log... to access the diagnostic messages from the gateway. The Log window contains a static version of the most recent messages from the gateway that is currently open.



This message indicates that the gateway has come up on the internet with no option flags set. The "ETALK2" message is described in Chapter 2 (and Appendix C). No IP error messages are showing in this window, so you can check the configuration as described in Chapter 1. See Appendix C for a description of IP error messages that could appear here.

Using a noncontiguous IP address range: "split addressing" with Option 9

In the example configuration shown in Figure 3-9, the gateway is configured on the Ethernet/IP subnet 130.57.64. The client Macintosh IP addresses will be allocated as a range that is noncontiguous with the gateway's IP address. Option 9 must be ON.

LocalTalk network supporting 9 Macintoshes running TCP/IP software. The IP addresses for these Macs will begin at a separate (noncontiguous) address on the same IP network.

IP data:

Option 9:

IP Address of FastPath Box:

Local Parameter #1:

(Clients) Dynamic:

(Clients) Static:

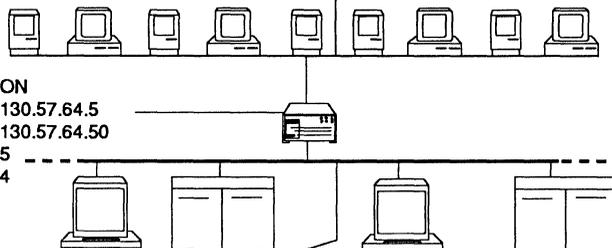
ON

130.57.64.5

130.57.64.50

5

4



Ethernet/IP network: 130.57.64.0, subnet mask 255.255.255.0 (FFFFFF00).

Figure 3-9. Using a noncontiguous range of client addresses

Note that the client addresses begin with the Local Parameter #1 address, *not* the Local Parameter address +1. The following IP addresses will be available for static assignment to client Macintoshes:

130.57.64.50
130.57.64.51
130.57.64.52
130.57.64.53

The following IP addresses will be available for client Macintoshes to acquire dynamically as they boot up on the IP network:

130.57.64.54
130.57.64.55
130.57.64.56
130.57.64.57
130.57.64.58



This entire range of addresses cannot be duplicated anywhere on the IP internet.

In configuring the gateway, you should follow the general procedure described in Chapter 1. After connecting the gateway to a Macintosh via LocalTalk, launch the FastPath Manager, and select and open the gateway. In the main configuration dialog box,

- Click the Reset button, then open the gateway again.
- Click the Pause button.
- Enter the AppleTalk configuration data; see Chapter 2.
- Turn on Option 9 in the Options window.
- Select K-STAR IP from the Configuration menu and double-click on the K-STAR IP listing in the Configuration area.
- Enter the IP address of the FastPath Box.
- Click More.
- In the Local Parameters field #1, type the IP address that will be the starting point of the client IP address range.
- Enter the number of client Macintoshes controlled by the gateway.
- Turn on the Remote Boot switch (optional).
- Download K-STAR.
- Click the Go button.
- Save the configuration data in a file (optional).

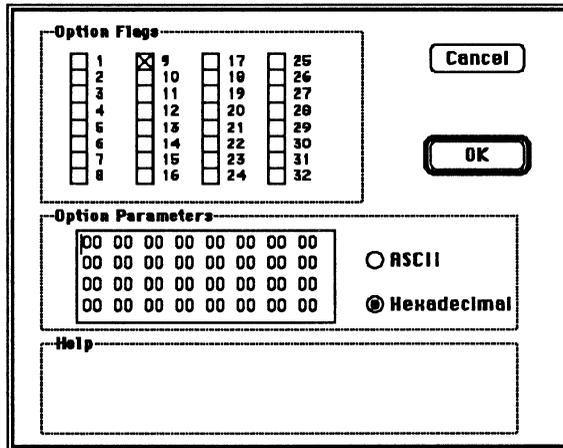
This example uses the internet configuration shown in Figure 3-9. For your site, you should determine the proper IP addresses for the gateway before you configure it.

| | |
|-----------------------------|--------------|
| Option 9: | ON |
| IP Address of FastPath Box: | 130.57.64.5 |
| Local Parameter #1: | 130.57.64.50 |
| (Clients) Dynamic: | 5 |
| (Clients) Static: | 4 |

After selecting Reset and then Pause, enter the AppleTalk configuration you require, as described in Chapter 2. Then proceed with the IP configuration:

1. Click the Options... button in the main configuration dialog box. This brings up the Options window.

- Turn on Option flag 9 by clicking in the selection box next to the number 9 (an X appears in the selection box when the option flag has been turned on), then click OK to close the Options window.



- Select K-STAR IP from the Configuration menu and double-click on K-STAR IP in the Configuration area to open the IP dialog box.
- Type 130.57.64.5 in the IP Address of the FastPath Box field, then press *tab*. This will be the gateway's IP address on the existing Ethernet/IP network.
- Click More to open up another dialog box.
- Tab twice to position the cursor in the Parameter #1 field and type the IP address that will be the starting point for the client IP addresses: 130.57.64.50, then press *tab*.

| | | |
|---------------------------|--------------|---------------------------------------|
| Servers | | <input type="button" value="Cancel"/> |
| IP Address of Name Server | 0.0.0.0 | |
| IP Address of File Server | 0.0.0.0 | <input type="button" value="OK"/> |
| Local Parameters | | |
| Parameter #1 | 130.57.64.50 | |
| Parameter #2 | 0.0.0.0 | |
| Parameter #3 | 0.0.0.0 | |
| Parameter #4 | 0.0.0.0 | |
| Help | | |

7. Click OK to return to the previous dialog box.
8. Double-click in the Dynamic field in the “Number of IP Clients” area, and type the number of client Macintoshes that will dynamically acquire IP addresses from the gateway: 5, then press *tab*.
9. Type the number of client Macintoshes that will be assigned static IP addresses administered by the gateway: 4, then press *tab*.

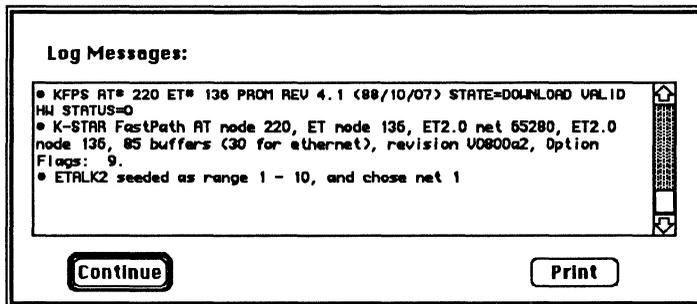
| | | | | |
|----------------------------------|-------------|-----------------------------|---|--|
| IP Information | | Number of IP Clients | | <input type="button" value="More..."/> |
| IP Address of FastPath Box | 130.57.64.5 | Dynamic | 5 | |
| IP Subnetwork Mask | 0.0.0.0 | Static | 4 | |
| IP Broadcast Address | 0.0.0.0 | | | |
| IP Address of Default Router | 0.0.0.0 | | | <input type="button" value="Cancel"/> |
| Administrator | | | | |
| IP Address of Administrator Host | 0.0.0.0 | | | |
| IPTalk Interface | | | | |
| AppleTalk Zone Name | * | | | |
| AppleTalk Network Number | 0 | | | <input type="button" value="OK"/> |
| AppleTalk Node Number | 0 | | | |
| Help | | | | |

10. Click OK to return to the main dialog box.

11. Turn on the Remote Boot switch by clicking in the selection box.
12. Select Download a File... from the File menu and open K-STAR.
13. Click the Go button.
14. Save the configuration file to disk.

At this point, Quit the FastPath Manager (using the File menu), turn off the FastPath, unplug it, and move it to its permanent location on the internet. When you bring up the gateway on the internet, launch the FastPath Manager on a Macintosh on either side of the gateway, and select and open the gateway.

Click Log... to access the diagnostic messages from the gateway.



This message indicates that the gateway has come up on the internet with Option 9 set, so the split addressing feature is in effect. No IP error messages are showing in this window, so you can check the configuration as described in Chapter 1. See Appendix C for a description of IP error messages that could appear here.

The gateway managing a separate IP network: “Split addressing” with Option 9

In the example configuration shown in Figure 3-10, the gateway is configured as a host on the Ethernet/IP subnet 130.57.64.0, and as a host on a separate class C IP network 192.85.6.0. The client Macintoshes are seen as IP hosts on the separate IP network.

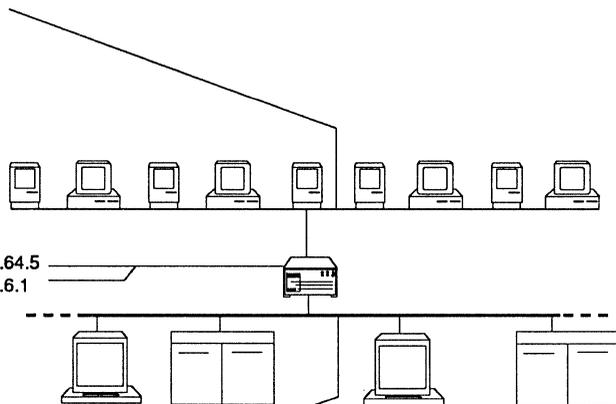
As a side effect of this configuration method, other IP routers need to be informed about the existence of the new network. If routers on the internet support the Routing Information Protocol (RIP), they will automatically be informed by the RIP packets sent out by the gateway. **If RIP is not supported on the internet, you need to update the routing tables on other hosts.**

The client Macintosh IP addresses are contiguous with the gateway’s IP address on the new IP network; the block of free addresses begins at the IP address specified in the Local Parameter #1 field + 1. Option 9 must be ON.

LocalTalk network supporting 9 Macintoshes running TCP/IP software. These Macintoshes will be hosts on a class C IP network 192.85.6.0, which is entirely administered within the gateway.

IP data:
Option 9: ON
IP Address of FastPath Box: 130.57.64.5
Local Parameter #1: 192.85.6.1
(Clients) Dynamic: 5
(Clients) Static: 4

ON
130.57.64.5
192.85.6.1
5
4



Ethernet/IP network: 130.57.64.0, subnet mask 255.255.255.0 (FFFFFF00).

Figure 3-10. A separate IP network managed in the gateway

The following IP addresses will be available for static assignment to client Macintoshes:

192.85.6.2
192.85.6.3
192.85.6.4
192.85.6.5

Note that these begin at the *Local Parameter #1 address +1*. Because you are using a separate IP network number, the address specified in the Local Parameter #1 field is used as the gateway's address on the new network.

The following IP addresses will be available for client Macintoshes to acquire dynamically as they boot up on the IP network:

192.85.6.6
192.85.6.7
192.85.6.8
192.85.6.9
192.85.6.10



This entire range of addresses cannot be duplicated anywhere on the IP internet. In addition, there can be no IP hosts on this IP network other than the gateway and its clients.

In configuring the gateway, you should follow the general procedure described in Chapter 1. After connecting the gateway to a Macintosh via LocalTalk, launch the FastPath Manager, and select and open the gateway. In the main configuration dialog box,

- Click the Reset button, then open the gateway again.
- Click the Pause button.
- Enter the AppleTalk configuration data; see Chapter 2.
- Turn on Option 9 in the Options window.
- Select K-STAR IP from the Configuration menu and double-click on the K-STAR IP listing in the Configuration area.
- Enter the IP address of the FastPath Box.
- Click More.

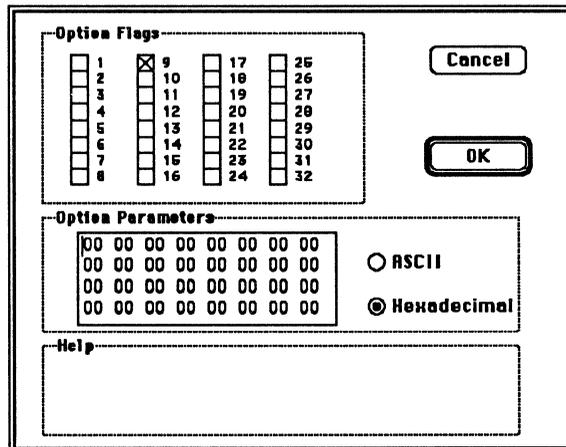
- In the Local Parameters #1 field, type the IP address that will be the gateway's address on the new IP network.
- Enter the number of client Macintoshes controlled by the gateway.
- Turn on the Remote Boot switch (optional).
- Download K-STAR.
- Click the Go button.
- Save the configuration data in a file (optional).

This example uses the internet configuration shown in Figure 3-10. For your site, you should determine the proper addresses for the gateway before you configure it.

| | |
|-----------------------------|-------------|
| Option 9: | ON |
| IP Address of FastPath Box: | 130.57.64.5 |
| Local Parameter #1: | 192.85.6.1 |
| (Clients) Dynamic: | 5 |
| (Clients) Static: | 4 |

After selecting Reset and then Pause, enter the AppleTalk configuration you require, as described in Chapter 2. Then proceed with the IP configuration:

1. Click the Options... button in the main configuration dialog box. This brings up the Options window.
2. Turn on Option flag 9 by clicking in the selection box next to the number 9 (an X appears in the selection box when the option flag has been turned on), then click OK to close the Options window.



3. Select K-STAR IP from the Configuration menu and double-click on K-STAR IP in the Configuration area to open the IP dialog box.
4. Type **130.57.64.5** in the IP Address of the FastPath Box field, then press *tab*. This will be the gateway's IP address on the existing Ethernet/IP network.
5. Click More to open another dialog box.
6. Tab twice to position the cursor in the Parameter #1 field, and enter an IP address using a separate IP network number: **192.85.6.1**, then press *tab*.

| Servers | |
|---------------------------|---------|
| IP Address of Name Server | 0.0.0.0 |
| IP Address of File Server | 0.0.0.0 |

| Local Parameters | |
|------------------|------------|
| Parameter #1 | 192.85.6.1 |
| Parameter #2 | 0.0.0.0 |
| Parameter #3 | 0.0.0.0 |
| Parameter #4 | 0.0.0.0 |

Buttons: Cancel, OK

Help: _____

7. Click OK to return to the previous dialog box.
8. Double-click in the Dynamic field in the "Number of IP Clients" area, and type the number of client Macintoshes that will dynamically acquire IP addresses from the gateway: **5**, then press *tab*.
9. Type the number of client Macintoshes that will be assigned static IP addresses administered by the gateway: **4**, then press *tab*. The total number of clients supported by a gateway must be less than or equal to 60.

10. Click OK to return to the main dialog box.
11. Turn on the Remote Boot switch by clicking in the selection box.
12. Select Download a File... from the File menu and open K-STAR.
13. Click the Go button.
14. Save the configuration file to disk.

At this point, Quit the FastPath Manager (using the File menu), turn off the FastPath, unplug it, and move it to its permanent location on the internet. When you bring up the gateway on the internet, launch the FastPath Manager on a Macintosh on either side of the gateway, select and open the gateway, and check the log messages.

Distributing Macintosh clients: Option 7

In the example configuration shown in Figure 3-11, the gateway at the top of the Figure will administer IP addresses for Macintoshes on both LocalTalk networks and for the Macintosh on Ethernet. Turning on Option 7 in the FastPath Manager allows the gateway to administer IP addresses for Macintoshes connected directly to Ethernet or to a different LocalTalk network connected to the gateway over Ethernet, provided all the Macintoshes are in the same AppleTalk zone.



All of the Macintoshes administered by one gateway *must be in the same AppleTalk zone*, which must be the zone name configured on that gateway's LocalTalk interface. If a Macintosh is on the gateway's EtherTalk Phase 2 interface, the LocalTalk zone must be included in the EtherTalk Phase 2 zone list and must be selected in the Macintosh Control Panel. **This method of managing client addresses cannot be used if there is more than one gateway configured for K-STAR IP in the same AppleTalk zone.**



When you use the gateway to administer IP addresses for Macintoshes on Ethernet, the Macintosh's performance on the network will be reduced, since all traffic from that Macintosh must go through the FastPath. If the internet supports a BOOTP or RARP server, you should use that to acquire the Macintosh IP address instead. See "Macintoshes on Ethernet" at the end of this chapter for more information. Any of the three addressing methods shown in the previous examples in this chapter (see Figures 3-8, 3-9, and 3-10) can be used in conjunction with Option 7 to allow the gateway to administer addresses for clients on more than one physical network. In this example, we use the default K-STAR IP addressing method shown in Figure 3-8.



Option 7 cannot be used together with Option 8.

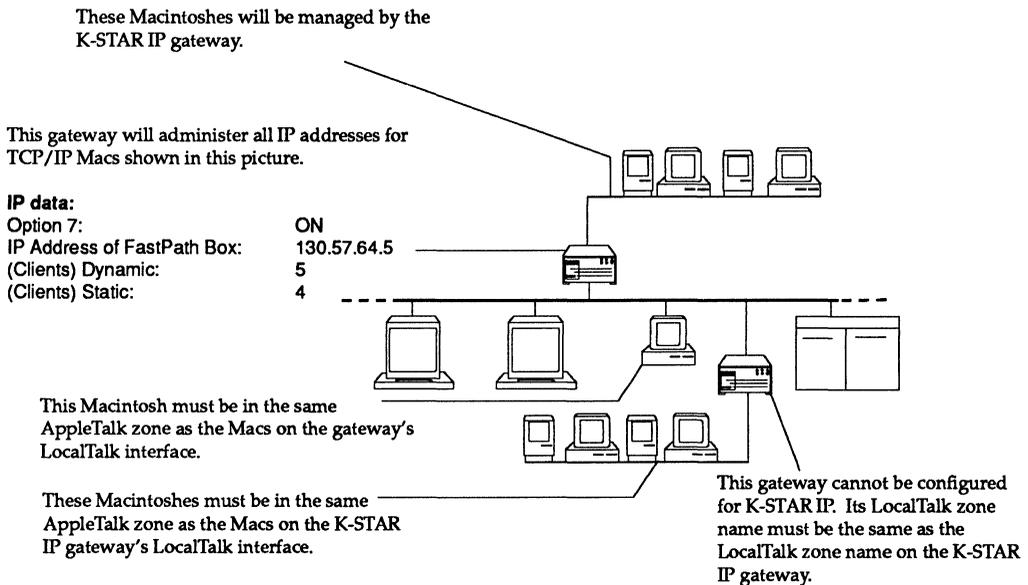


Figure 3-11. Distributed Macintosh clients

Note that in this example, the client addresses begin with the gateway address +1. The following IP addresses will be available for static assignment to client Macintoshes:

130.57.64.6
130.57.64.7
130.57.64.8
130.57.64.9

The following IP addresses will be available for client Macintoshes to acquire dynamically as they boot up on the IP network:

130.57.64.10
130.57.64.11
130.57.64.12
130.57.64.13
130.57.64.14

In configuring the gateway, you should follow the general procedure described in Chapter 1. After connecting the gateway to a Macintosh via LocalTalk, launch the FastPath Manager, and select and open the gateway. In the main configuration dialog box,

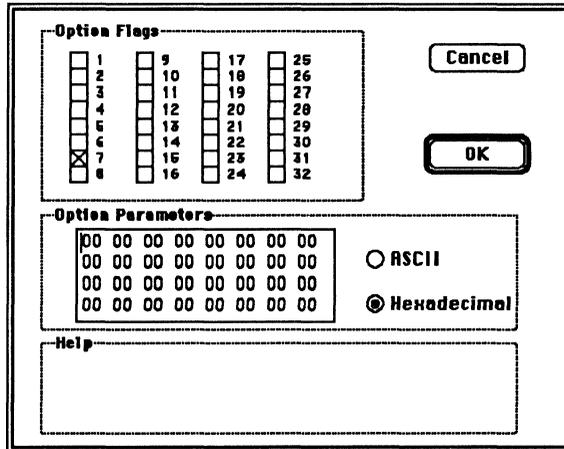
- **Click the Reset button, then open the gateway again.**
- **Click the Pause button.**
- **Enter the AppleTalk configuration data; see Chapter 2.** Note that the LocalTalk zone name must be included in the EtherTalk Phase 2 zone list if client Macintoshes will be supported in Ethernet.
- **Turn on Option 7.**
- **Select K-STAR IP from the Configuration menu and double-click on the K-STAR IP listing in the Configuration area.**
- **Enter the IP address of the FastPath Box.**
- **Enter the number of client Macintoshes controlled by the gateway.**
- **Click OK.**
- **Turn on the Remote Boot switch (optional).**
- **Download K-STAR.**
- **Click the Go button.**
- **Save the configuration data in a file (optional).**

This example uses the internet configuration shown in Figure 3-8. For your site, you should determine the proper addresses for the gateway before you configure it.

| | |
|-----------------------------|-------------|
| Option 7: | ON |
| IP Address of FastPath Box: | 130.57.64.5 |
| (Clients) Dynamic: | 5 |
| (Clients) Static: | 4 |

After selecting Reset and then Pause, enter the AppleTalk configuration you require, as described in Chapter 2. Then proceed with the IP configuration:

1. Click the Options... button in the main configuration dialog box. This brings up the Options window.
2. Turn on Option flag 7, then click OK to return to the main dialog box.



3. Select K-STAR IP from the Configuration menu and double-click on K-STAR IP in the Configuration area to open the IP dialog box.
4. Type the gateway's address in the IP Address of the FastPath Box field: 130.57.64.5, then press *tab*.

5. Double-click in the Dynamic field in the “Number of IP Clients” area, and type the number of client Macintoshes that will dynamically acquire IP addresses from the gateway: 5, then press *tab*.
6. Type the number of client Macintoshes that will be assigned static IP addresses administered by the gateway: 4, then press *tab*. The total number of clients supported by a gateway must be less than or equal to 60.
7. Click OK to return to the main dialog box.
8. Turn on the Remote Boot switch by clicking in the selection box.
9. Select Download a File... from the File menu and open K-STAR.
10. Click Go to send the configuration data to the gateway.
11. Save the configuration file to disk.

At this point, Quit the FastPath Manager (using the File menu), turn off the FastPath, unplug it, and move it to its permanent location on the internet. When you bring up the gateway on the internet, launch the FastPath Manager on a Macintosh on either side of the gateway, and check the diagnostic messages in the Log window.

An IP*T*alk configuration

The IP*T*alk software in K-STAR encapsulates outgoing AppleTalk packets in UDP for transmission to CAP or AUFS hosts. When it receives encapsulated packets back from these hosts, it strips off the UDP transmission data and sends it to AppleTalk nodes on its LocalTalk or EtherTalk interface.

Configuring an IPTalk interface for the gateway using the FastPath Manager allows nodes on the IPTalk network that is *directly connected to the K-STAR gateway* to communicate with nodes on the AppleTalk internet. When you configure for IPTalk in this way, nodes on remote IPTalk networks (IPTalk networks that are not directly connected to the AppleTalk internet) will not be able to communicate with the AppleTalk internet.



All nodes on one IPTalk network must be connected to the same Ethernet cable. In addition, because the IPTalk software uses the lower-order byte of the host's IP address as a virtual AppleTalk node address, the IP addresses of hosts on this IPTalk network must all have the same high-order 3 bytes. This is true regardless of the class of the IP network number. Note that this precludes using class C subnets as IPTalk networks.



Note that using the atalkatab configuration file to configure IPTalk networks removes this restriction, and allows IPTalk traffic to be routed through IP routers to remote IPTalk networks. Configuring an IPTalk interface in K-STAR using the FastPath Manager is recommended only when no administrator host is present; that is, when the atalkatab file and atalkad daemon are not available on the internet.

To use the IPTalk software in K-STAR, you define an IPTalk interface by supplying an AppleTalk zone name and net number for the (logical) IPTalk network. When a Macintosh user selects the IPTalk network (via a zone name in the Chooser), all outgoing AppleTalk traffic destined for that network will be encapsulated in UDP. The hosts on the IPTalk network must understand this packet structure and be able to strip off the UDP transmission data to read the AppleTalk packet within; that is, they must be running CAP or AUFS (or compatible) software. When the CAP or AUFS system returns AppleTalk data encapsulated in UDP, the gateway strips off the UDP transmission data and routes it to the AppleTalk node(s) that originated the request.

Figure 3-12 shows an example internet configuration where some hosts on an IP network are running CAP or AUFS, but there is no administrator host (running atalkkad) available on the internet. The CAP and AUFS systems accept AppleTalk packets encapsulated in UDP transmission data, and form a logical IPTalk network with other AppleTalk and EtherTalk hosts.

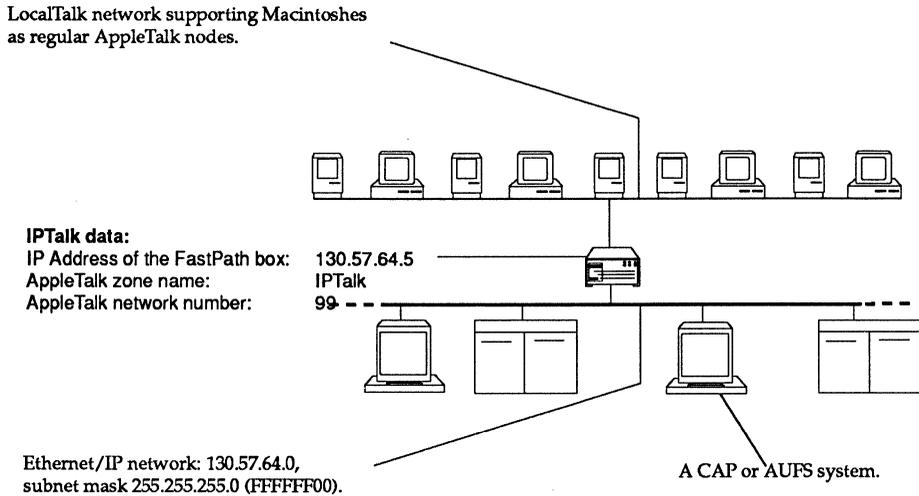


Figure 3-12. UDP encapsulation: IPTalk

This release of K-STAR uses the range of “well-known” ports (beginning at 200 rather than 768) that NIC assigned for use by the Kinetics Internet Protocol (KIP) as of April, 1988. This is compatible with the latest versions of CAP (CAP 5.0 or later) See the section on “Using the new UDP port numbers” in this chapter for more information.

In configuring the gateway, you should follow the general procedure described in Chapter 1. After connecting the gateway to a Macintosh via LocalTalk, launch the FastPath Manager, and select and open the gateway. In the main configuration dialog box,

- Click the Reset button, then open the gateway again.
- Click the Pause button.
- Enter the AppleTalk configuration data; see Chapter 2.
- Select K-STAR IP from the Configuration menu and double-click on the K-STAR IP listing in the Configuration area.
- Enter the IP address of the FastPath Box.
- Enter the AppleTalk configuration data for the IPTalk interface.
- Click OK.
- Turn on the Remote Boot switch (optional).
- Download K-STAR.
- Click the Go button.
- Save the configuration data in a file (optional).

This example uses the internet configuration shown in Figure 3-12. For your site, you should determine the proper network numbers and zone names for the gateway before you configure it.

| | |
|---------------------------------|-------------|
| IP Address of the FastPath box: | 130.57.64.5 |
| AppleTalk zone name: | IPTalk |
| AppleTalk network number: | 99 |

After selecting Reset and then Pause, enter the AppleTalk configuration you require, as described in Chapter 2. Then proceed with the IP configuration:

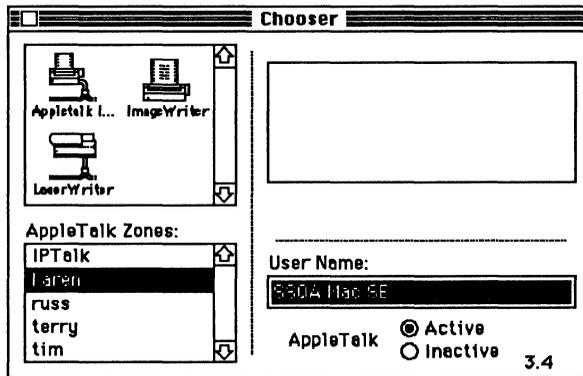
1. Select K-STAR IP from the Configuration menu and double-click on K-STAR IP in the Configuration area to open the IP dialog box.
2. Enter an unused IP address on the existing IP network in the IP Address for the FastPath Box field: 130.57.64.5, then press *tab*.
3. Click in the AppleTalk Zone Name field and type the zone name: IPTalk, then press *tab*.
4. Type the AppleTalk network number: 99, then press *tab*. Note that this AppleTalk network number must be unique; no two networks can use the same number.

| | | | |
|--|-------------|-----------------------------|---|
| IP Information | | Number of IP Clients | |
| IP Address of FastPath Box | 130.57.64.5 | Dynamic | 5 |
| IP Subnetwork Mask | 0.0.0.0 | Static | 4 |
| IP Broadcast Address | 0.0.0.0 | | |
| IP Address of Default Router | 0.0.0.0 | | |
| Administrator | | | |
| IP Address of Administrator Host | 0.0.0.0 | More... | |
| IPTalk Interface | | | |
| AppleTalk Zone Name | IPTalk | Cancel | |
| AppleTalk Network Number | 99 | | |
| AppleTalk Node Number | 5 | | |
| Help | | | |
| Main K-STAR dialog box. Use this window to configure your FastPath for KIP-style TCP/IP (Transmission Control Protocol/Internet Protocol) routing. | | OK | |

5. Click OK to return to the main dialog box.
6. Turn on the Remote Boot switch by clicking in the selection box.
7. Select Download a File... from the File menu and open K-STAR.
8. Click Go to send the configuration data to the gateway.
9. Save the configuration file to disk.

At this point, Quit the FastPath Manager (using the File menu), turn off the FastPath, unplug it, and move it to its permanent location on the internet. When you bring up the gateway on the internet, launch the FastPath Manager on a Macintosh on either side of the gateway, and check the diagnostic messages in the Log window.

When you bring up the gateway on the internet, open the Chooser on a Macintosh on either side of the gateway. The IPTalk zone should appear:



If you are using atalkad

If there is a UNIX host on the internet that is running the atalkad daemon, you can use the information maintained in the atalkatab file to configure the gateway. Basically, the information for all configurations is maintained in one database file (the atalkatab file, currently supported on UNIX IP hosts only). The atalkatab file must be up-to-date and the UNIX host must be able to communicate with the IP address you assign to the gateway. See the KIP documentation from Stanford University for details on configuring the atalkatab file.



If the internet supports more than one administrator host, it is important that all administrator hosts support the same atalkatab file.

For IP communication with the host running atalkad (the "administrator host"), the gateway needs only 2 addresses. No other IP data should be supplied.

IP data:

IP Address of FastPath Box: 130.57.64.5

IP Address of Administrator Host: 130.57.64.10

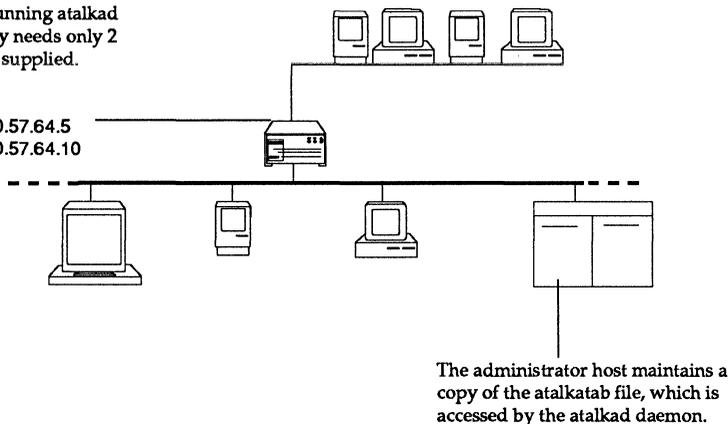


Figure 3-13. Using atalkad



If you are configuring the gateway to access atalkad, you should not supply any IP configuration data other than the two IP addresses shown in Figure 3-13: the IP address for the gateway and the IP address for the administrator host. Nor should you supply AppleTalk configuration data for the LocalTalk interface or the EtherTalk Phase 1 interface. However, since AppleTalk Phase 2 is not yet supported in the atalkatab file, you should supply the full EtherTalk Phase 2 configuration in the FastPath Manager. In addition, if you are supplying secondary addresses for the gateway (as described in Figures 3-9 and 3-10, you need to turn on Option 9 in the FastPath Manager. **All the other configuration information should be in the atalkatab file.**

To configure the gateway to query atalkad for its configuration information, after launching the FastPath Manager application and opening the gateway,

- Click the Reset button, then open the gateway again.
- Click Pause .
- *If you are using AppleTalk Phase 2, enter the Phase 2 configuration data, as described in Chapter 2.*
- Select K-STAR IP from the Configuration menu and

double-click the K-STAR IP listing in the Configuration area.

- Enter the IP address of the FastPath Box.
- Enter the IP address for the IP host running the atalkad daemon in the IP Address of Administrator Host field.
- Turn on the Remote Boot switch (optional).
- Download K-STAR.
- Click the Go button.
- Save the configuration data in a file (optional).

This example uses the internet configuration shown in Figure 3-13. For your site, you should determine the proper IP addresses for the gateway before you configure it.

IP Address of FastPath Box: 130.57.64.5
IP Address of Administrator Host: 130.57.64.10

After selecting Reset and then Pause, enter the EtherTalk Phase 2 configuration you require (if any), as described in Chapter 2. Then proceed with the IP configuration:

1. Select K-STAR IP from the Configuration menu and double-click K-STAR IP in the Configuration area to open the IP dialog box.
2. Enter the gateway's IP address in the IP Address for the FastPath Box field: **130.57.64.5**, then press *tab*.
3. Type the IP address of the host running atalkad in the IP Address of Administrator Host field: **130.57.64.10**, then press *tab*.
4. Click OK to return to the main dialog box.

| | | | |
|--|---|--|--------------------------------|
| IP Information | | Number of IP Clients | |
| IP Address of FastPath Box | <input type="text" value="130.57.64.5"/> | Dynamic | <input type="text" value="0"/> |
| IP Subnetwork Mask | <input type="text" value="0.0.0.0"/> | Static | <input type="text" value="0"/> |
| IP Broadcast Address | <input type="text" value="0.0.0.0"/> | | |
| IP Address of Default Router | <input type="text" value="0.0.0.0"/> | | |
| Administrator | | | |
| IP Address of Administrator Host | <input type="text" value="130.57.64.10"/> | <input type="button" value="More..."/> | |
| IPTalk Interface | | | |
| AppleTalk Zone Name | <input type="text" value="*"/> | <input type="button" value="Cancel"/> | |
| AppleTalk Network Number | <input type="text" value="0"/> | | |
| AppleTalk Node Number | <input type="text" value="0"/> | | |
| Help | | <input type="button" value="OK"/> | |
| Main K-STAR dialog box. Use this window to configure your FastPath for KIP-style TCP/IP (Transmission Control Protocol/Internet Protocol) routing. | | | |

5. Turn on the Remote Boot switch by clicking in the selection box.
6. Select Download a File... from the File menu and open K-STAR.
7. Click Go to send the configuration data to the gateway.
8. Save the configuration file to disk.

At this point, Quit the FastPath Manager (using the File menu), turn off the FastPath, unplug it, and move it to its permanent location on the internet. When you bring up the gateway on the internet, launch the FastPath Manager on a Macintosh on either side of the gateway, and check the diagnostic messages in the Log window.

K-STAR IP management issues

It is important to note that assigning duplicate IP addresses can cause confusion on the entire internet. An internet administrator must assign a number for the gateway and a consecutive range of unused numbers for use by its Macintosh "clients."

Managing Macintosh clients

When you configure K-STAR with a range of Dynamic Addresses and Static Addresses, the gateway can dynamically assign the number of IP addresses specified in the "dynamic address" field to Macintoshes as they boot up on the network. To the rest of the internet, these addresses look like addresses on the Ethernet. The IP addresses contained in the "static address" sub-range must be explicitly assigned to Macintoshes.



The K-STAR IP software supports up to 60 IP addresses in the range managed by the gateway for client Macintoshes. Provided that you have an unused block of addresses, you can assign a greater number of IP addresses than you need in the "Number of Clients" area. This will allow you to add client Macintoshes without reconfiguring the gateway at a future date.

Dynamic IP addresses

When you install TCP/IP software on a Macintosh (for example, Kinetics TCPort™ HostAccess, MacTCP™, or NCSA Telnet), you need to supply an IP address as part of the initial configuration. To allow the Macintosh to dynamically acquire its IP address from the gateway, select Dynamic instead of assigning an explicit IP address. (This is done slightly differently in Mac TCP and NCSA Telnet, but the functionality is still the same.)

Static IP addresses

Similarly, you can assign an explicit IP address to a Macintosh when you are initially configuring TCP/IP software on the Mac. This must be an unused IP address in the static range specified in the gateway configuration. Unless you are using the split-addressing feature as it is described in the section "The Gateway

Managing a Separate Network: 'Split Addressing' with Option 9" in this chapter, the IP address you assign to the Macintosh is in a range beginning at the gateway IP address + 1.



The static IP addresses assigned to Macintoshes are managed by hand; that is, there is no gateway function to determine which nodes have been assigned an IP address and which of the static addresses are still free. It is recommended that you keep track of these addresses in your network records.

Macintoshes on Ethernet

If the gateway is administering an IP address for a Macintosh that is directly connected to Ethernet, the Macintosh must have EtherTalk selected (via the Network icon in the Macintosh Control Panel). If you are using TCPort, set the TCPort interface to AppleTalk in the Control Panel. **When the TCPort interface is set to Ethernet, the TCPort dynamic address assignment must be done through a BOOTP (Boot Protocol) or RARP (Reverse ARP) server.**



When you use the gateway to administer IP addresses for Macintoshes on Ethernet, the Macintosh's performance on the network will be reduced, since all traffic must go through the FastPath. You can avoid this performance hit if there is a BOOTP (Boot Protocol) or RARP (Reverse ARP) server on the net. In this case, the interface in TCPort must be set to "Ethernet" using the TCPort entry in the Macintosh Control Panel.

How dynamic addressing works

When a Macintosh on LocalTalk that has been configured for dynamic addressing boots up on the network, it broadcasts NBP packets with a request for the type "IPGATEWAY." When the gateway receives the NBP packet, it sends back its own IP address in ASCII. When the client receives this response, it knows where the gateway is, and sends a request (an ATP packet) to acquire an IP address. When the gateway sends back an ATP packet containing an IP address within the dynamic range specified in K-STAR, the client uses NBP to register itself as that "IPADDRESS." Doing this verifies that no other node in its zone has the same IP address. If this process succeeds, the client starts using the IP address. Once the gateway has assigned an IP address, it periodically sends NBP packets to confirm that the address is still in use.

The range of dynamic addresses extends from the last address of the static range +1 to the last address of the static range + the dynamic range. The dynamic addresses are assigned to Macintoshes beginning with the highest available address. For example, if the gateway IP address is 130.57.64.15, the Static field is 10, and the Dynamic field is 45, the first Macintosh to acquire its IP address dynamically would get the address 130.57.64.70, the second would get the address 130.57.64.69, and so forth. If an IP address within this range becomes available again (that is, if the Macintosh using the address is powered down or otherwise not accessible at its original AppleTalk address for at least 5 minutes), the IP address is freed for future re-assignment.

Split addressing management issues

The split-addressing feature of K-STAR IP configuration is particularly useful when the number of nodes on an IP network or subnet is approaching the maximum limit, and you do not have a block of free addresses to assign to client Macintoshes. In this case, you should assign a separate IP network number, as described in "The Gateway Managing a Separate Network." If the client Macintosh network will communicate with any IP hosts who in turn communicate with systems that are not administered at your site, you need to obtain an official IP network number from SRI, as described in "If You are New to IP Internets." Otherwise, you can make up a dummy IP network number for the client Macintosh network.

If you have a block of free addresses on the existing IP network, but your addressing scheme puts the gateway at an IP address that is not immediately contiguous to that block of free addresses, you can use split addressing to specify a separate start address for the client Macintoshes on the same IP net. In this case, because the gateway already has its address on this network, the static range of IP addresses begins at the actual address entered in the Local Parameters #1 field, rather than this address +1.

When the IP network numbers on the Ethernet interface and the LocalTalk interface are different, K-STAR begins sending RIP packets out on the Ethernet side to inform other routers about

the new network. (Note that the RIP module in this implementation only broadcasts information about the networks it knows about, it does not respond to RIP requests or issue updates.) If the internet does not support RIP, you need to statically configure the routing tables with the path to the new network.

If the Ethernet/IP network is subnetted, and you supply a second address for the gateway using a separate network number, the subnet mask in use on Ethernet is automatically applied. If the Ethernet/IP network is not subnetted, you have the option to supply a subnet mask in the Parameters #2 field, below the second address.

Using the new UDP port numbers

When DDP packets are encapsulated in UDP, the DDP socket numbers in the address are translated to UDP port numbers that can be understood by IP hosts. Prior to April 1988, there was no official range of UDP port numbers for use by KIP, so KIP (and previous versions of K-STAR) used a range of unreserved UDP port numbers ranging from 768 to 896 and from 16384 to 16512.

This release of K-STAR uses the range of "well-known" ports (beginning at 200 rather than 768) that NIC assigned for use by the Kinetics Internet Protocol (KIP) as of April, 1988. This is compatible with the latest versions of CAP (CAP 5.0 or later) and KIP (KIP 0688 or later). To start using these UDP port numbers, turn on Option 11 in the Options window. To turn on Option 11, click the Options... button in the main configuration dialog box, and click in the selection box next to number 11.

Alternatively, if you are using atalkad on your internet, you can set the new UDP port number range in the FastPath by modifying the atalkatab file. See the KIP documentation for information on modifying atalkatab.

K-STAR DECnet Configuration

THIS CHAPTER TELLS YOU HOW TO CONFIGURE THE GATEWAY FOR DECnet Level-1 routing between LocalTalk and Ethernet. After you have configured the gateway as a DECnet router, Macintoshes that are configured as DECnet nodes on LocalTalk or Ethernet can communicate through the gateway with other DECnet nodes. The Macintoshes must be running DECnet software that implements DECnet encapsulated in AppleTalk packets.

The Macintoshes on the gateway's LocalTalk interface must be statically configured with DECnet addresses, just as if they were DECnet nodes on the Ethernet. The DECnet network sees these Macintoshes as nodes in the DECnet area on Ethernet.

K-STAR DECnet addressing

When you configure the gateway for DECnet routing, the gateway acts as a level-1 DECnet router. This means that the gateway routes only within its own area, it does not "know about" other DECnet areas in the internet (although it will know about a Level-2 router, if one is present).

When you are supplying DECnet addresses using K-STAR, the basic rules to remember are:

- The gateway and all Macintosh end-nodes are in the same area as the DECnet area on Ethernet. The Ethernet DECnet nodes see the LocalTalk nodes as if they were on Ethernet.
- The gateway and all Macintosh end-nodes need unique DECnet node numbers.
- All end-nodes on Ethernet and LocalTalk need to be explicitly updated to know about the additional DECnet nodes.

Required configuration data

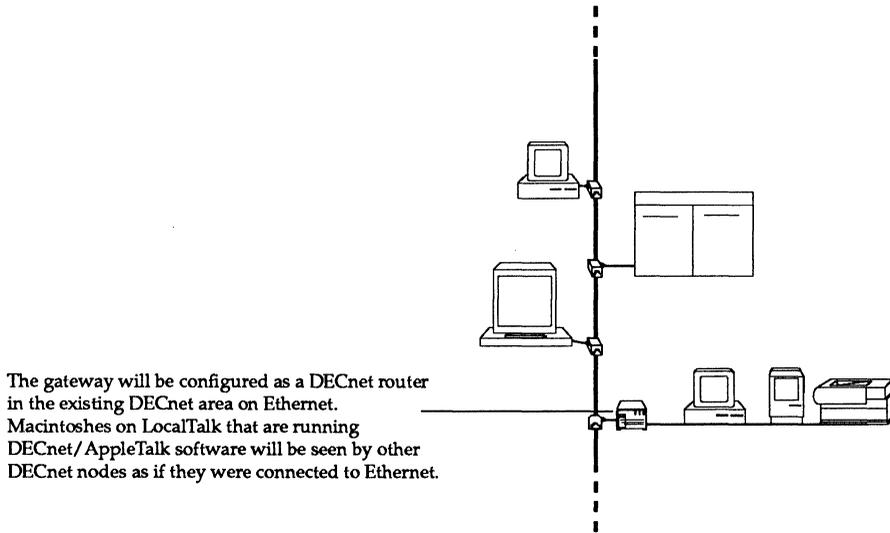
To perform DECnet Level-1 routing, the gateway requires the following data:

- A DECnet area number. This should be the DECnet area number that is in use on Ethernet.
- A DECnet node number. The DECnet node number can be any decimal number between 1 and 1,023, and must be unique for each node in the area.

It is also recommended that you supply a name for the gateway and enter its serial number to make future administration easier.

An example internet

Figure 4-1 shows an example internet configuration using DECnet routing on one Ethernet and one LocalTalk network.



The gateway will be configured as a DECnet router in the existing DECnet area on Ethernet. Macintoshes on LocalTalk that are running DECnet/AppleTalk software will be seen by other DECnet nodes as if they were connected to Ethernet.

Figure 4-1. A DECnet network

The gateway in this example will be configured for DECnet Level-1 routing. If the gateway receives a DECnet packet destined for another area, it will forward the packet to a Level-2 router if one is present on the internet. When the sample gateway is fully configured, it will have the configuration shown in Figure 4-2.

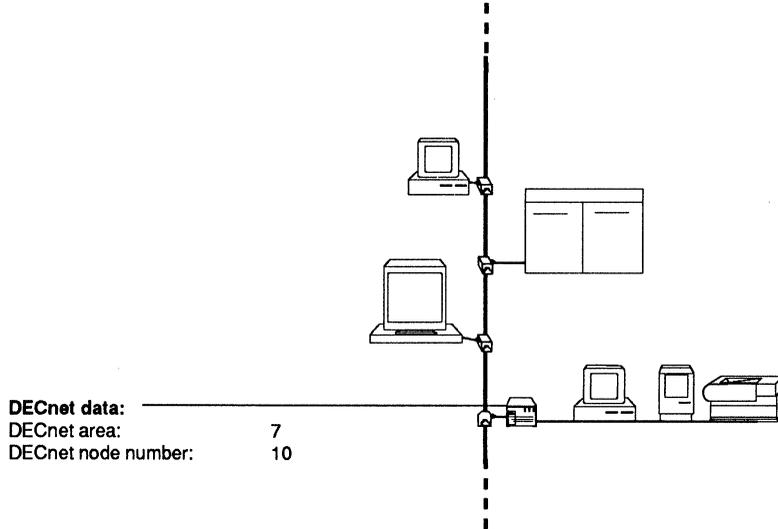


Figure 4-2. DECnet configuration data

In configuring the gateway for DECnet routing, you should follow the general procedure described in Chapter 1; that is, connect one gateway to one Macintosh via LocalTalk, configure it as described below, turn it off, unplug it, and move it to its permanent location.

Supplying the DECnet data

After connecting the gateway to a Macintosh via LocalTalk, launch the FastPath Manager, and select and open the gateway. In the main configuration dialog box,

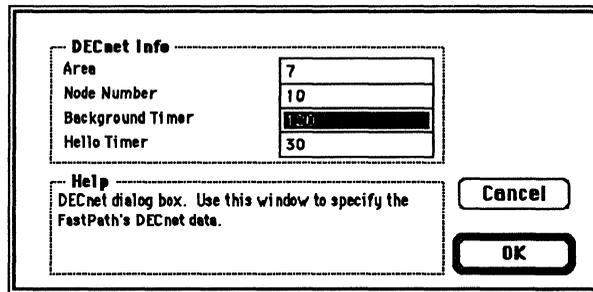
- Click the Reset button, then open the gateway again.
- Click the Pause button.
- Supply the AppleTalk data, as described in Chapter 2.
- Select DECnet from the Configuration menu and double-click on the DECnet listing in the Configuration area.
- Enter the DECnet area and node number for the gateway.
- Turn on the Remote Boot switch (optional).
- Download K-STAR.
- Click the Go button.
- Save the configuration data in a file (optional).

This example uses the internet configuration shown in Figure 4-2. For your site, you should determine the proper area and node number for the gateway before you configure it.

DECnet area: 7
DECnet node number: 10

After selecting Reset and Pause, supply the AppleTalk data you require, as described in Chapter 2. If you are configuring the gateway for IP, you can also supply that data, then proceed with the DECnet configuration:

1. Select DECnet from the Configuration menu, then double-click on the DECnet listing in the Configuration area to open the DECnet dialog box.
2. In the DECnet Area field, type 7, then press *tab*.
3. Type the DECnet node number: 10, then press *tab*.



The image shows a dialog box titled "DECnet Info". It contains four input fields: "Area" with the value 7, "Node Number" with the value 10, "Background Timer" with the value 120, and "Hello Timer" with the value 30. Below the input fields is a "Help" section with the text: "DECnet dialog box. Use this window to specify the FastPath's DECnet data." To the right of the dialog box are two buttons: "Cancel" and "OK".

4. If you wish, you can modify the default value of 120 in the Background Timer field. This value determines how frequently (in seconds) routing packets are sent out; the default value should be reasonable for most sites.
5. If you wish, you can modify the default value of 30 in the Hello Timer field. This value determines how frequently (in seconds) "hello" packets are sent to end nodes on the network, and the default value should be reasonable for most sites.

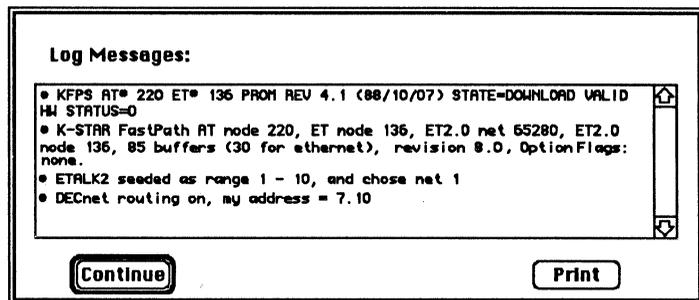
6. Click the OK button to return to the main dialog box.
7. Select the Remote Boot switch in the Switch Area by clicking in the selection box .
8. Select Download a File... from the File menu and download the K-STAR gateway program.
9. When K-STAR has been downloaded, click the Go button.
10. Select Save Configuration File... from the File menu and type a name for the configuration; for example,

GW1.DECnet.config

Click the Save button to save the configuration file to disk.

At this point, Quit the FastPath Manager (using the File menu), turn off the FastPath, unplug it, and move it to its permanent location on the internet. When you bring up the gateway on the internet, launch the FastPath Manager on a Macintosh on either side of the gateway, and select and open the gateway.

Click Log... to access the diagnostic messages from the gateway. The Log window contains a static version of the most recent messages from the gateway that is currently open.



The messages in this window indicate that there are no error conditions found in the DECnet configuration. See Appendix C for an explanation of the gateway's DECnet diagnostics.

Troubleshooting

THIS CHAPTER DESCRIBES SOME COMMON PROBLEMS AND SOLUTIONS in gateway installation and configuration.

In general, it is recommended that you follow the installation and configuration instructions described in Chapter 1; that is, that you bring the gateway up on an isolated LocalTalk network connected to a single Macintosh. Some of the solutions in this chapter assume that you are on an isolated network, and others deal with conditions that would not be visible until you bring the gateway up on a full internet.

At the end of this chapter, there is a brief overview of troubleshooting the gateway on a working internet by checking network equipment and connections.



If you are operating in an AppleTalk Phase 1 environment, you can use the LAN Ranger to view the internet topology and test the gateway and other network elements.

Calling for help

If your attempt to resolve the problem fails, and you purchased the gateway from an authorized Kinetics dealer, call your dealer for assistance. When you call a Kinetics dealer, be prepared to give a complete description of the problem, including what happens, when it happens, and what you've done to diagnose the problem. You should also have information about your network equipment on hand.

If you did not purchase the gateway from a dealer, call the Kinetics Technical Support Department at (415) 975-4547, or send an AppleLink message to AppleLink D0121. If you have access to the ARPAnet, you can send e-mail to support@kinetics.com.

Do not return the gateway to Kinetics without first calling Kinetics, discussing the problem, and obtaining a Return Materials Authorization (RMA) number.

FastPath installation problems

If the gateway does not appear to be working right when you power it on, follow the diagram in Figure 5-1 to verify its condition. See "Hardware Self-Tests" in Appendix A for a description of the power-on hardware checks and how the LEDs on the FastPath front panel should look.

The left-most LED is the power light. On an isolated LocalTalk net, this should be the only LED ON after self-testing. See Appendix A for a full description of the gateway's hardware self-tests.

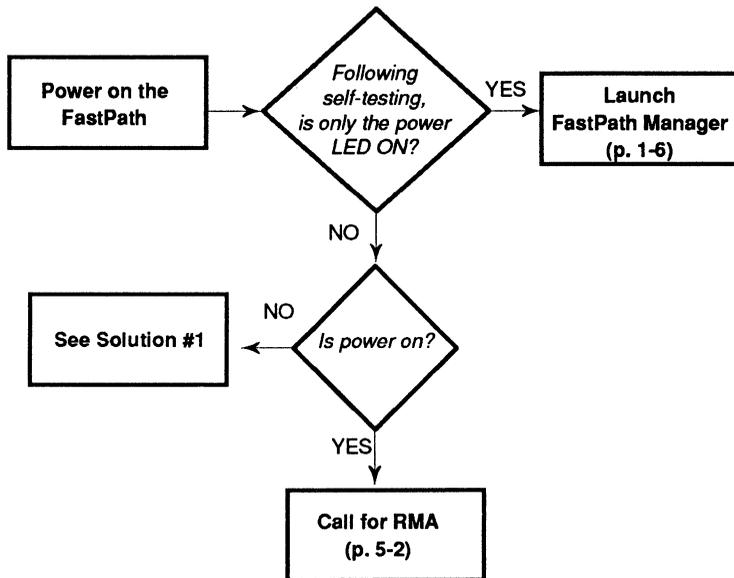
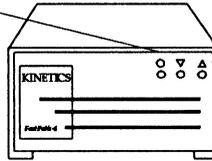


Figure 5-1. Hardware installation check

Solution #1:

Check that the power cord is plugged in properly to the gateway and to the grounded, three-prong outlet, and that the gateway is switched on.

FastPath configuration problems

This section describes problems you might see when using the FastPath Manager to configure the gateway. It assumes that you have followed the instructions in Chapter 1, and have read the appropriate configuration directions in Chapters 2 through 5.

Can't locate a gateway to open

If you launch the FastPath Manager on a Macintosh and the gateway does not appear in the gateway selection window, follow the diagram in Figure 5-2 and the solutions below to try to locate the gateway to open.

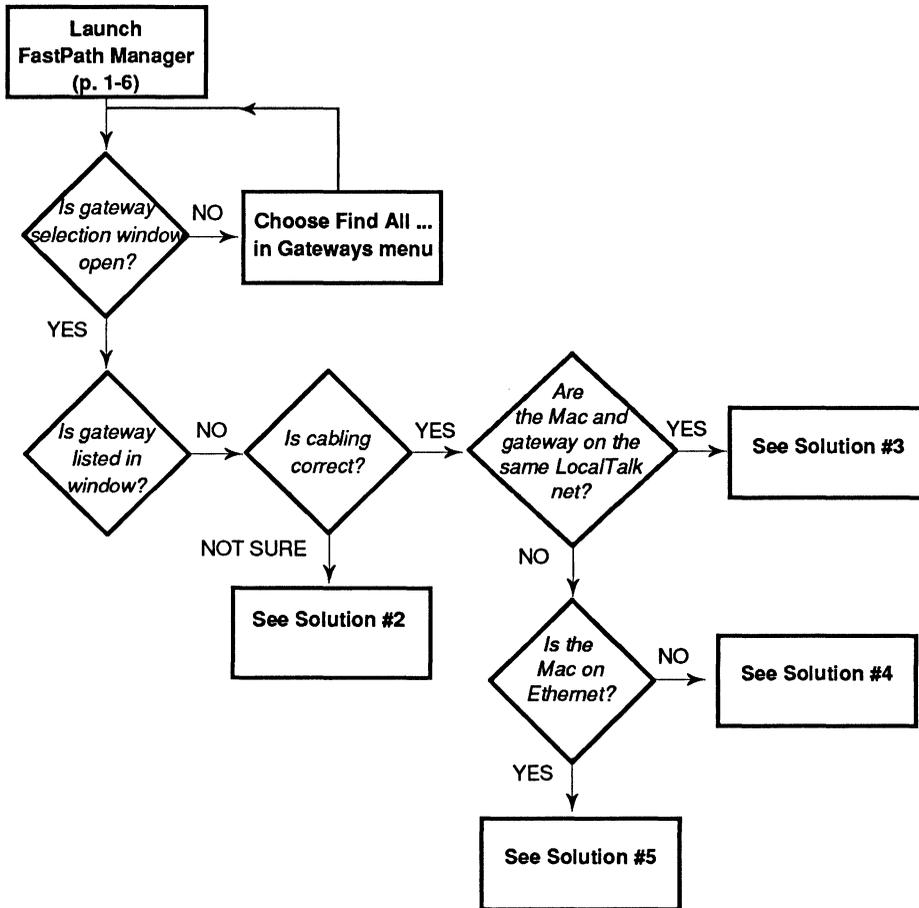


Figure 5-2. Can't find and open the gateway

Solution #2:

Check that the LocalTalk connection is secure, and make sure it is connected to the Macintosh printer port, not the modem port. If the connection appears to be correct, check that the LocalTalk DB9 connector is working correctly. You can check whether the LocalTalk cable or connector is defective by installing a different set of LocalTalk connectors. Swap with another device, if necessary, to find out whether this is the actual cause of the problem, then replace the faulty items.

- Solution #3:** Check that there are no protocol-dependent bridges between the Macintosh running the FastPath Manager and the gateway. If there are no bridges on the LocalTalk network,
- Turn the gateway off and then on again. If this doesn't correct the problem,
 - Quit the FastPath Manager and reboot the Macintosh, then relaunch the FastPath Manager.

Solution #4: If the Macintosh is on LocalTalk, make sure that AppleTalk is enabled in the Macintosh Chooser. If the Macintosh is on LocalTalk but it has an Ethernet card installed, check that the Built-in icon is selected in the Macintosh Control Panel.

To check that AppleTalk is enabled,

- Open the Chooser and select the Active button next to AppleTalk. If you can't enable AppleTalk, contact your Macintosh dealer for more information.

To check that Built-in is selected,

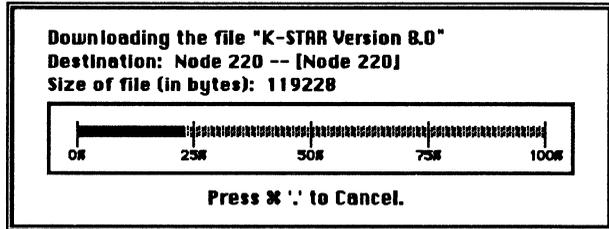
- Open the Control Panel and select the Network icon in the scrollable area on the left side of the window. The Control Panel displays at least two icons when an Ethernet card is installed, Built-in and EtherTalk, and possibly three icons (there may be two EtherTalk icons, one with double arrows). If the Macintosh is connected to a LocalTalk or equivalent network, click on the Built-in icon.

Solution #5: If the Macintosh running the FastPath Manager is on Ethernet, make sure that AppleTalk is enabled in the Macintosh Chooser, and the EtherTalk icon is selected in the Control Panel (either the icon with single arrows for EtherTalk Phase 1, or the double-arrow icon for EtherTalk Phase 2). Solution #4 describes how to check these conditions. If the Macintosh is running EtherTalk Phase 2, note that the FastPath Manager will automatically use AppleTalk Phase 1 internally to find the gateway.

If everything is in order in the Chooser and the Control Panel, relaunch the FastPath Manager on a Macintosh on the gateway's LocalTalk interface and check that neither Option 5 nor Option 18 are turned on in the gateway's configuration. If Option 5 (for EtherTalk Phase 1) or Option 18 (for EtherTalk Phase 2) is turned on, a Macintosh on Ethernet may not be able to see the gateway.

Problems downloading or configuring

When you select Download a File... from the File menu and open the K-STAR module, K-STAR should begin downloading to the gateway. A screen like this should appear:



If this download screen does not appear, follow the diagram in Figure 5-3, and see "The Download Sequence" in Appendix A for a full explanation of how the gateway accepts download code. Some solutions for common problems are presented below Figure 5-3.

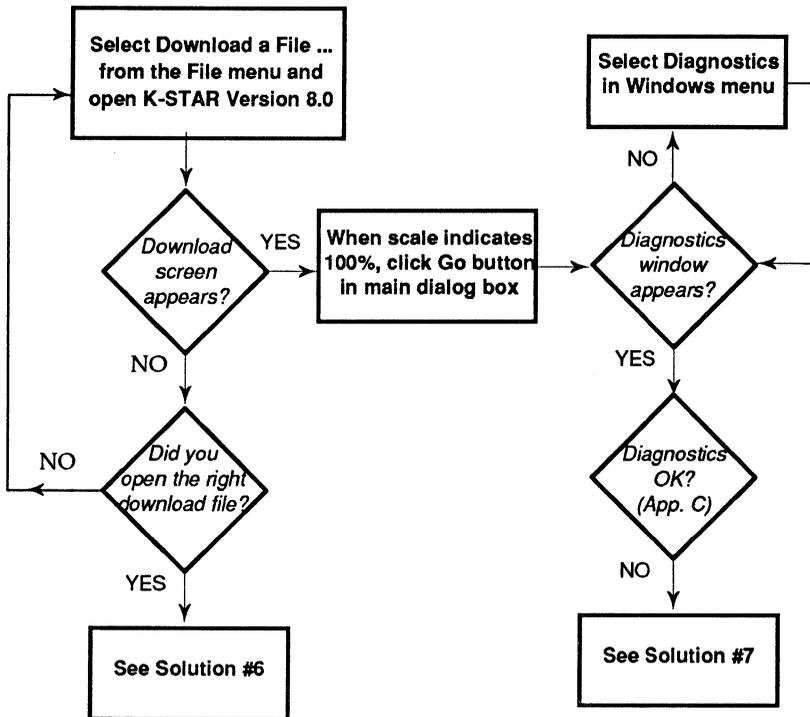


Figure 5-3. Problems downloading or sending data

Solution #6:

The most common difficulty in downloading K-STAR is that the gateway was not “paused” and more than 25 seconds elapsed following a Reset or initial power-on. In this situation, the gateway begins executing its PROM-resident routing code, and it cannot accept K-STAR code in that state.

To clear the gateway,

1. Save your configuration data in a file if you have entered any AppleTalk Phase 2 zone data.
2. Click Restart.
3. Select Find All... in the Gateways menu and open the gateway again.
4. If necessary, click Pause and open the configuration file you created in step 1. If you do not need to open a file and you can start downloading K-STAR within 25 seconds of clicking Restart, you do not need to click Pause.
5. Select Download a File... in the File menu and open K-STAR again.
6. When the download has completed, click Go.

The FastPath power-on and download sequence is explained in detail in Appendix A. Note that, to use all of the features described in this guide, you must use K-STAR Version 8.0 or later.

Solution #7:

If the Diagnostic messages indicate that the configuration is wrong, the gateway will be unable to route packets successfully. Check the configuration data you have supplied to it. This is an extremely important step in any configuration, and it varies according to the configuration method(s) you are using. A checklist is shown below for each type of configuration.

AppleTalk Phase 2

- ✓ Check that K-STAR has been downloaded. The messages in the Log or Diagnostics window should include a startup message that begins with “KSTAR FastPath.” See Appendix C for a full description of this message.
- ✓ If the gateway is acquiring seed data on one of its interfaces, check that it succeeded in doing so. The messages in the Log or Diagnostics window should include a message

indicating that one or more interfaces have acquired data. See Appendix C for more information.

- ✓ Check that the network numbers you have assigned are unique on the internet.
- ✓ Check that the correct zone names are being used (see the Macintosh Chooser).
- ✓ Check that all gateways on the network agree about which name in the zone list is the default zone name.
- ✓ If you are reconfiguring zone names on a Phase 2 gateway, make sure you bring the gateway down and leave it off the internet for at least a full ten minutes to allow other gateways to time out the old zone information. **Also, make sure you have downloaded K-STAR again after entering the configuration change.**

AppleTalk transition bridge

- ✓ Check that K-STAR has been downloaded and that Option 17 is enabled. The messages in the Log or Diagnostics window should include a startup message that begins with "KSTAR FastPath" and concludes with "Option Flags: 17." (Other options may also be enabled.) See Appendix C for a full description of this message.
- ✓ Check that the EtherTalk Phase 2 interface has a network range with only one element (that is, the range start and range end are equal).
- ✓ Check that the network numbers you have assigned are unique on the internet.
- ✓ Check that the EtherTalk Phase 2 interface is configured with a zone list with only one name in it.
- ✓ If you are reconfiguring the zone name on a transition bridge, make sure you bring the gateway down and leave it off the internet for at least a full ten minutes to allow other gateways to time out the old zone information. **Also, make sure you have downloaded K-STAR again after entering the configuration change.**

AppleTalk Phase 1

- ✓ Unless you are using the PROM-resident Phase 1 protocols, Check that K-STAR has been downloaded and that Options 17 and 18 are enabled. The messages in the Log or Diagnostics window should include a startup message that begins with "KSTAR FastPath" and concludes with "Option Flags: 17 and 18." (Other options may also be enabled.) See Appendix C for a full description of this message.
- ✓ Check that the network numbers you have assigned are unique on the internet.
- ✓ If the gateway is acquiring seed data on one of its interfaces, check that it succeeded in doing so. The messages in the Log or Diagnostics window should include a message indicating that one or more interfaces have acquired data. See Appendix C for more information.
- ✓ If you are reconfiguring the zone name on a Phase 1 gateway, make sure you bring the gateway down and leave it off the internet for at least a full ten minutes to allow other gateways to time out the old zone information.

K-STAR IP

- ✓ Check that K-STAR has been downloaded. The messages in the Log or Diagnostics window should include a startup message that begins with "KSTAR FastPath. " See Appendix C for a full description of this message. If the message "IP Routing: ON" appears as part of the FastPath startup message, K-STAR has not been downloaded and you are using the PROM-resident protocols. (In this case, we recommend that you reconfigure the gateway using K-STAR IP.)
- ✓ Check that you have supplied the proper IP address (at least one) for the gateway. The gateway must be configured as a host on the Ethernet/IP network; that is, the IP address you supply must be unused by any other host on that network, and must have the correct IP network number.

- ✓ If you have supplied a second IP address (using the split-addressing feature) check the following:
 1. That Option 9 is enabled.
 2. That the second IP address is unique (if it is on the Ethernet/IP network) and followed by the proper number of unused IP addresses for Macintosh clients.
 3. That the entire range of IP addresses specified for client Macintoshes is available. Check that none of these addresses are assigned to other hosts or configured as part of a range on another gateway.
 4. If the second address is not on the Ethernet/IP network, make sure that other IP hosts support RIP; otherwise you need to statically configure their routing tables with information about the new IP network supported in the gateway.
- ✓ Check that all hosts on the existing IP net agree about the subnet mask in use. If there appears to be confusion among existing hosts on the network, you can explicitly supply the correct subnet mask in the proper field in the K-STAR IP dialog box.
- ✓ If you are using IPTalk, check that the AppleTalk network number specified for the IPTalk interface is unique on the AppleTalk internet.
- ✓ If you are using atalkad, check that the atalkatab file is correctly configured. See the KIP documentation for details on this database file.

DECnet

- ✓ Check that you have supplied the proper area number (this should be the same area number in use on Ethernet).
- ✓ Check that the node number you have supplied is unique within the gateway's area.

Network connections

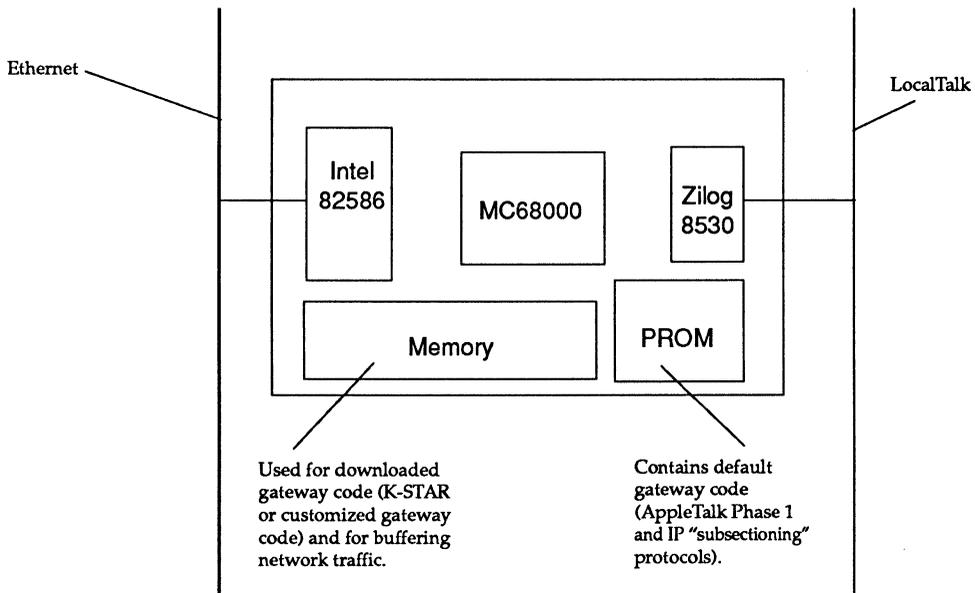
Some problems in network operation are easy to find and fix. The problem might be as simple as a gateway accidentally switched off, or a cable connection worked loose. If there is a problem with network operation, first try to isolate the area in which the problem occurs. Then check the equipment and connections in a particular area or on the whole network.

- Make sure the FastPath gateway is plugged in and switched on.
- On each Macintosh computer in the network, make sure the LocalTalk connector is plugged into the printer port, not the modem port.
- Make sure no cable connections are loose or unplugged. LocalTalk cable connections can work loose if not secured with cable ties.
- Refer to the documentation for the network medium you are using and make sure that the cables are installed correctly.
- Swap equipment to check for defective devices, cable, connections, and power sources.

FastPath Operations

THIS APPENDIX PROVIDES A REFERENCE TO GATEWAY OPERATIONS, including the power-on and download sequences, hardware self-testing, the autoconfiguration algorithm, and FastPath routing and encapsulation operations.

The FastPath gateway executes **gateway code**, which implements the protocols needed for encapsulation and routing. This code may be built-in to gateway PROM or downloaded from the FastPath Manager or a compatible mechanism.



- The FastPath PROM contains AppleTalk Phase 1 protocols and an implementation of IP routing that is backward compatible with FastPath 1s, 2s, and 3s.
- The downloadable K-STAR gateway code contains KIP-style TCP/IP/UDP, ICMP, RIP, AppleTalk Phase 1 and AppleTalk Phase 2, transition bridge software, NBP filters (for zone security), SNMP and DECnet protocols.

The FastPath Manager is a Macintosh application that communicates with the gateway. It is launched on a Macintosh on one of the networks connected to the gateway (LocalTalk or Ethernet). The FastPath Manager is the mechanism for downloading code (K-STAR or customized code developed at your site) and configuration information to the gateway. It also continuously receives diagnostics from the FastPath and displays them in a Diagnostics window, and uses a Log... button to retrieve a short "snapshot" log of FastPath events, which it displays in a Log window.

The FastPath accepts information from the FastPath Manager in the form of KLAP packets (Kinetics Link Access Protocol), which include commands and/or data for the gateway.

The FastPath power-on sequence

The FastPath has battery backed-up RAM, which allows it to automatically restart after a power failure. As shown in Figure A-1, a power-on, restart (either an automatic restart after a power failure or an intentional one by clicking on the Restart button in the FastPath Manager), or a reset (selecting the Reset button in the FastPath Manager) all result in an "initial state" where the FastPath is waiting to receive a command.

When it receives the GO command, the gateway bypasses its 25-second timer and begins validating and then executing its routing code.

When the gateway receives a PAUSE command, it "pauses" until it receives a GO or RESTART command. If it does not receive a PAUSE command, the gateway waits 25 seconds and then begins validating and executing routing code.

If the Remote Boot switch is turned on, and the download module is corrupted, the gateway chooses to broadcast a BOOTME packet rather than executing the default PROM code.

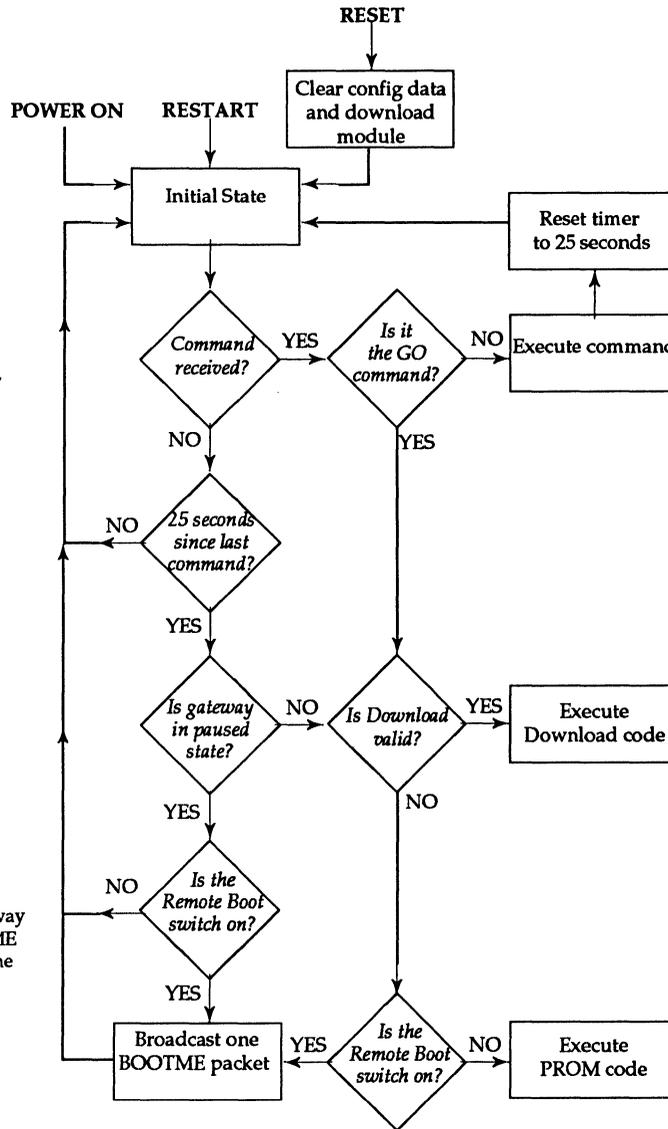


Figure A-1. FastPath State Diagram

A gateway is in its initial state following a RESTART command, a RESET command (which also clears configuration data and downloaded routing code), or a power on. From its initial state, it waits for 25 seconds to receive a command from the FastPath Manager. *The FastPath will only accept S-records during the initial 25 seconds before it begins executing gateway routing code.*

If the gateway does not receive any communication from the FastPath Manager within the 25-second waiting period and it is not “paused,” the gateway checks its memory for a valid download module and if it finds one, begins executing it; otherwise it executes the PROM-resident gateway code.

- If the gateway receives a GO command during the initial 25 seconds, it immediately verifies whether the download module is valid. If the download module is valid, it starts executing it. If the download module is invalid and the Remote Boot switch is not turned on (the default), the gateway starts executing PROM-resident code. Otherwise, the gateway performs a RESTART and is returned to the initial state.
- If the gateway receives a PAUSE command during the initial 25 seconds, it goes into a “paused” state where it continuously checks for commands and does not time out after 25 seconds. Selecting Go or Reset takes the gateway out of a paused state. Clicking Restart or power-cycling the box does not take the gateway out of a paused state; when it comes back up it will be in a paused state. (Note that it is an error to save configuration data in a file while the gateway is in a paused state. The paused state is saved with other configuration data, which can confuse the FastPath when the configuration file is used.)

The download sequence

Unless it has been paused, the FastPath will only accept S-records during the 25 seconds immediately following a RESET, RESTART, or power on. When the 25 seconds have passed, it

begins executing gateway routing code, and it will not accept S-records while it is executing code. When the gateway receives a single S-record, it resets its 25-second timer, so the download sequence must *begin* (but it does not necessarily need to complete) within the initial 25 seconds.

The recommended procedure for downloading K-STAR to the FastPath is as follows:

- Put the FastPath in “initial state” by clicking the Reset or Restart button in the FastPath Manager. Reset clears all memory locations, while Restart leaves the K-STAR download module and configuration information intact. Either way, the gateway is in initial state and begins the sequence shown in Figure A-1.
- If you need more than 25 seconds (for example, if you are entering configuration data), select Pause.
- Download K-STAR by using Download a File... from the File menu. If you have paused the gateway and entered configuration data, click the Go button. This sends the configuration data and the GO command to the FastPath, which tells it to immediately verify that the download module is valid and then start executing it.

Hardware self-testing

When you turn on the power to the FastPath, it conducts several brief tests to ensure that its CPU, LEDs, memory and specialized circuits are in good working order. During these tests, the three LEDs on the FastPath front panel light up.

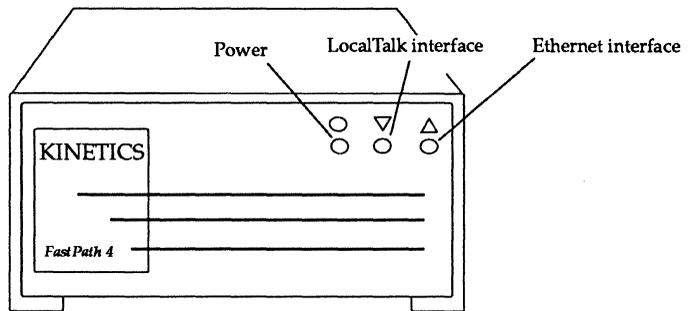


Figure A-2. The FastPath LEDs

The leftmost LED is the power light, indicating that the gateway is receiving power. The other two LEDs are the network traffic lights for the LocalTalk and Ethernet connections; in normal operation, these two LEDs light to indicate packets going through their respective connections.

When both of the network traffic lights have been turned off again, the self-testing is complete and successful. If both network traffic lights remain on, the tests have revealed a “fatal” error; that is, the gateway cannot be used until the problem is corrected. If one traffic light remains on, the corresponding network interface is inoperable. In either case, if the error condition persists you should contact your dealer or Kinetics. See “Calling for Help” in the chapter on “Troubleshooting.”

The gateway hardware self-tests are as follows:

1. Attempt to light the network traffic lights. In normal operation, the network traffic lights indicate incoming network traffic on the LocalTalk and Ethernet connections. The first test turns on all of these lights, thus indicating that the CPU, the LED control port, and the LEDs themselves are all functional. If this test fails, the lights do not come on. This is a “fatal” error; that is, the gateway cannot operate until this has been resolved.
2. Turn off power LED. This LED remains off until the self-tests have completed, unless there is a fatal error.

3. Test CPU stack memory. This test writes to and reads from a small area of RAM that will be used for further testing. If this test fails, the remaining tests are not executed (because they would be meaningless).
4. Test unprotected memory. The areas of RAM that store configuration data and downloaded gateway programs are protected from being overwritten by test data. The remaining RAM, which is used for packet buffers and other temporary storage, is unprotected. The third test writes to and reads from this unprotected RAM to check its integrity.
5. The fourth test writes and reads test data on the AppleTalk control chip to determine if that chip and its supporting circuitry are functional. If the gateway passes this test, it turns off the middle LED.
6. The last test partially initializes the Ethernet control chip and writes test data to it, to determine if that chip and its supporting circuitry are functional. If the gateway passes this test, it turns off the rightmost LED.
7. If there was not a fatal error, turn the power LED back on, indicating the end of the self-test sequence.

If either of the network traffic lights remain on, the corresponding network interface is inoperable. If both of the network interfaces are inoperable, both lights remain on as they would for a fatal error.

AppleTalk autoconfiguration

AppleTalk protocols always provide for dynamic access of minimal configuration information, and the gateway takes advantage of this feature when it autoconfigures. This is true for both AppleTalk Phase 1 and AppleTalk Phase 2.

Because the Phase 1 protocols are resident in the FastPath PROM, the FastPath can configure itself for AppleTalk Phase 1 routing from its initial "reset" state, with no interaction from the FastPath Manager at all. When you power on the FastPath unit, it follows the state diagram shown in Figure A-1. Because the gateway is not in a paused state and there is no valid download

module, the gateway begins executing PROM-resident AppleTalk Phase 1 code. This is the default action for the gateway. If the FastPath is returned to a reset state (by clicking Reset in the FastPath Manager), it will always attempt to configure itself for AppleTalk Phase 1 routing.

Because the AppleTalk Phase 2 protocols are implemented in K-STAR and must be downloaded once to the gateway, Phase 2 autoconfiguration requires some minimal interaction with the FastPath Manager before the gateway can automatically acquire its configuration data. Specifically, you must return the gateway to a reset state (click Reset), and download K-STAR. When the gateway finds a valid download module, it begins executing that code, and will autoconfigure for AppleTalk Phase 2 routing.

The FastPath acquires the required configuration data as follows:

- The gateway acquires its own Ethernet address (a unique, 6-byte hexadecimal number) from PROM. The Ethernet address is also printed on a label attached to the bottom of the gateway chassis.)
- The gateway listens for RTMP packets on both interfaces. If it finds an existing AppleTalk network number on either network, it uses that number. Otherwise it proceeds as follows:

If the LocalTalk network does not have an AppleTalk network number, the gateway assumes one, derived from the last two bytes of the Ethernet address. If that number is in use by another network, the gateway increments the number until it finds an apparently unused network number.

If the Ethernet does not have an AppleTalk network number, the gateway assumes a network number of 1 (a range of 1-1 on AppleTalk Phase 2). If that is in use by another network, the gateway tries 2 (or the range of 2-2), and continues incrementing until it finds an apparently unused network number.

- The gateway sends out enquiries on both network interfaces for an AppleTalk zone name. If only one of the two networks has a zone name, the gateway assigns the same name to the other network. If neither network has a zone name, the gateway assigns the name Default Zone to both.

The AppleTalk node numbers for both network interfaces are automatically assigned by AppleTalk. In the current AppleTalk protocol implementation, each FastPath acquires an 8-bit node number for itself as follows:

- On LocalTalk, each gateway sends out 640 enquiries for an AppleTalk node number. If it receives no acknowledgement from any other node, it assigns itself the node number. If it does receive an acknowledgement, it increments the number and tries again.
- On Ethernet, each AppleTalk Phase 1 gateway sends out 20 AARP probe packets; each AppleTalk Phase 2 gateway sends out 10 AARP probe packets. Just as on LocalTalk, it acquires the first unused (unacknowledged) number.

If the newly installed gateway receives RTMP data that conflict with its own automatic configuration data, the gateway uses the RTMP data.

FastPath protocols and routing

Gateway code (in PROM or K-STAR) provides routing and encapsulation as described in this section.

PROM-resident AppleTalk routing

Figure A-3 shows how the PROM-resident gateway code routes AppleTalk Phase 1 packets between LocalTalk and Ethernet.

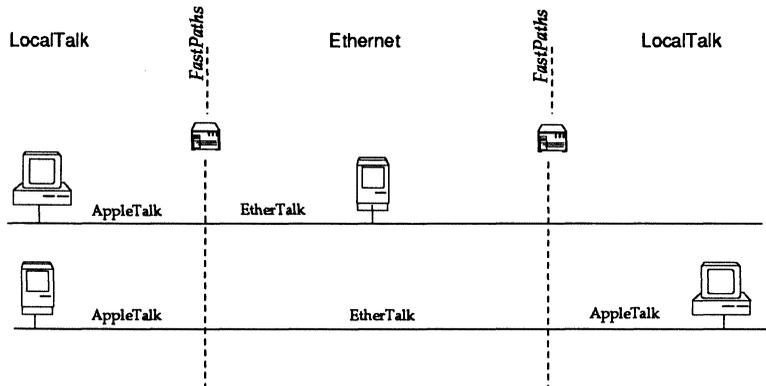


Figure A-3. PROM-resident AppleTalk Phase 1 routing

EtherTalk is an extension to the AppleTalk protocol suite that encapsulates an AppleTalk packet in an Ethernet frame. EtherTalk applies to both Phase 1 (in PROM or K-STAR) and Phase 2 (in K-STAR). Figure A-4 shows an Ethernet frame with EtherTalk Link Access Protocol.

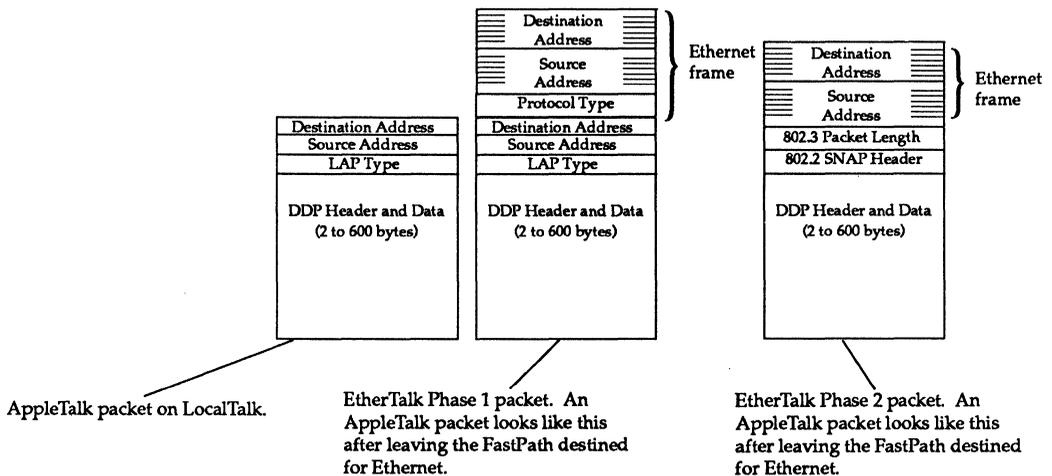


Figure A-4. EtherTalk packets: AppleTalk on Ethernet

The AppleTalk protocols supported by the gateway are described in Table A-1.

Table A-1. AppleTalk Protocols

| Protocol | Function |
|-----------------|---|
| ALAP | (AppleTalk Link Access Protocol). Encapsulates data into frames and permits nodes to access transmission lines for sending and receiving frames. |
| AARP | (AppleTalk Address Resolution Protocol). Maps 8-bit EtherTalk addresses to Ethernet hardware addresses. In AppleTalk Phase 2, AARP handles 24-bit addresses. |
| DDP | (Datagram Delivery Protocol). Extends the ALAP function of frame delivery across AppleTalk networks and permits addressing of individual sockets on nodes. On extended networks, DDP provides for zone multicasting (used mostly by NBP) and network-specific broadcasts. |
| RTMP | (Routing Table Maintenance Protocol). Establishes and maintains routing tables. RTMP routing tables allow bridges and gateways to connect networks into an internet and route packets from one cable to another. |

In AppleTalk Phase 1, AppleTalk bridges and gateways on the network continuously send RTMP packets every ten seconds to a broadcast Ethernet address. The packets contain that gateway's ID, network number, a list of the networks the gateway knows about, and the distance of those networks from the gateway (their "hopcount"). In AppleTalk Phase 2, the gateway continuously sends RTMP packets every ten seconds to a multicast broadcast Ethernet address. The RTMP packets contain all of the information contained in Phase 1 packets, and also handle network ranges. The gateway must maintain a routing table on a range-by-range basis for extended networks, with each range associated with a list of zone names.

| Protocol | Function |
|-----------------|--|
| NBP | (Name Binding Protocol). Maps names (user-designated character strings) into appropriate addresses on the internet. NBP also maps names to services. In AppleTalk Phase 1, when users request AppleTalk services (such as a printer), the request is sent to the gateway in the form of an NBP lookup. The gateway looks in the NBP packet to find which zone the request is for. It then sends a directed broadcast to all networks in that zone. In AppleTalk Phase 2, NBP lookups outside the local net are changed to a new packet type called an NBP forward request. These are forwarded to other gateways that are directly connected to a cable associated with a zone name, and the lookup request is multicast to all nodes in that zone. If the lookup is directed to zone "*", the gateway changes * to the source node's zone before forwarding the lookup request. |
| ZIP | (Zone Information Protocol). In AppleTalk Phase 1, maps networks to zone names on the internet, and acquires zone information from routers and propagates it around the internet. When a router gets an RTMP message indicating the presence in the internet of a new network, the router sends a "ZIP Request" packet to the bridge that sent the RTMP packet. This bridge sends back a ZIP Reply packet, which contains the zone name for the network. In AppleTalk Phase 2, ZIP has been modified to obtain zone multicast addresses and to verify valid zone names for a given node. |
| ATP | (AppleTalk Transaction Protocol). A basic transport protocol that detects errors and timeouts, providing loss-free transaction services. The ATP module supports only that minimal functionality required to support the ZIP protocol. |
| Echo | A support protocol that provides a way for a node to "bounce" a packet off another node. |

K-STAR AppleTalk Phase 2 routing issues

The FastPath maintains internal tables of zone names and associated network numbers. If it receives a packet destined for an extended network, it looks up the network number in its internal tables and routes the packet to the proper cable. If the packet is destined for node 0, it is routed only to gateways.

When a node boots up on the network, the gateway provides it several pieces of information, including the gateway's address, the network range, the zone list, and the zone multicast address for that node's zone. The node AARPs for a valid network number and an unused node number. AppleTalk Phase 2 reserves the node numbers \$00, \$FE, and \$FF, thereby limiting the total number of nodes associated with a single network number to 253. (If the gateway is not available, the node uses a network number from a default "startup range" of 65,280—65,534.)

The zone multicast address is used to prevent NBP broadcasts from interrupting all AppleTalk nodes on the cable. When a router receives an NBP FwdReq (forward request) for a particular zone, it directs the packet to the zone multicast address and it is received by all nodes in that zone. The FastPath processes NBP packets both at the source end and destination end in AppleTalk Phase 2. If it receives a BrRq with the zone name of "*", it changes * to the source node's zone name and changes the packet type from BrRq to FwdReq. It then checks its internal routing tables and forwards the packet to all networks in that zone. When the packet is received by another gateway that is directly connected to one of the destination networks, that gateway changes the NBP packet type to LkUp and sends it as a zone-specific multicast on that cable.

K-STAR routing and encapsulation

Figure A-5 shows the routing and encapsulation methods supported in the K-STAR download code.

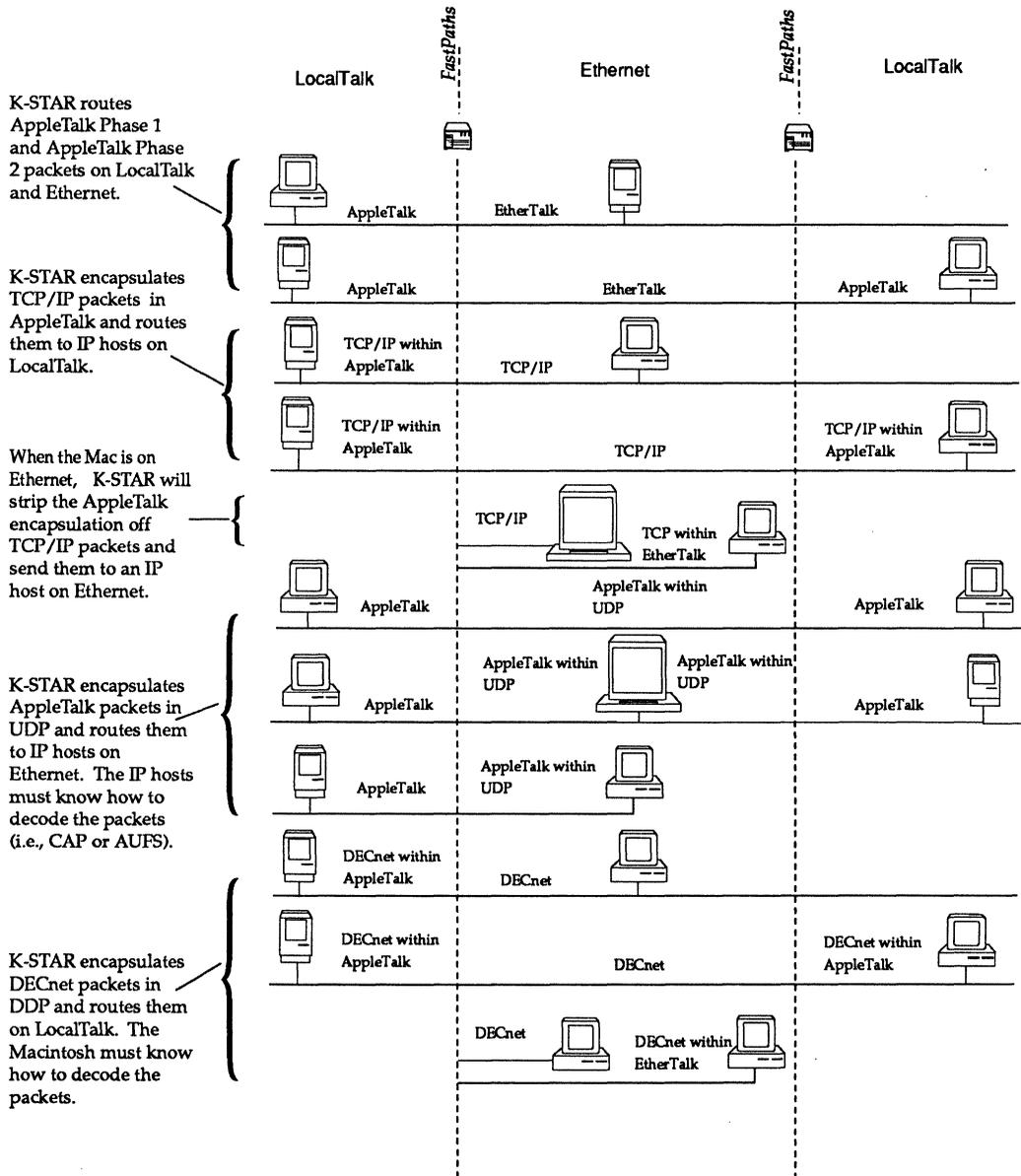
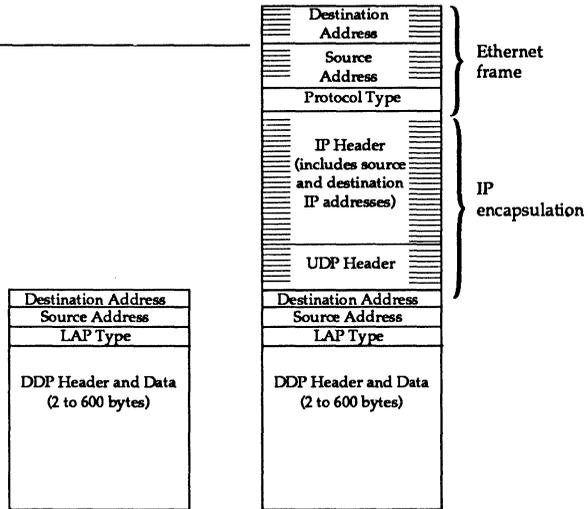


Figure A-5. K-STAR routing

Note that all these configuration methods can co-exist on a gateway when K-STAR has been downloaded.

Figure A-6 shows two examples of K-STAR encapsulation operations: a DDP packet encapsulated in UDP, and an IP packet encapsulated in DDP and an Ethernet frame. These are representative of gateway encapsulation operations.

When the gateway receives an AppleTalk packet destined for an IP host (a CAP or AUFS system), it encapsulates the packet in UDP and routes it to the host. The packet looks like this when it leaves the gateway destined for Ethernet.



When the gateway receives an IP packet destined for LocalTalk, it strips off the Ethernet frame, encapsulates the packet in DDP, and routes it to the AppleTalk node (which also speaks TCP/IP). The packet looks like this when it leaves the gateway destined for LocalTalk.

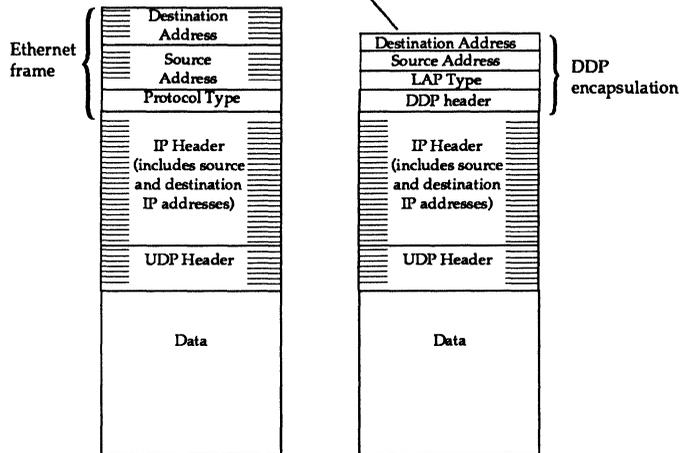


Figure A-6. Examples of K-STAR encapsulation

If a DDP datagram originates within the AppleTalk internet and is destined for a host within the IP internet, it is first encapsulated in a UDP datagram. The destination process must perform decapsulation.

Similarly, if IP packets (TCP/IP or UDP/IP) arrive at the gateway from the AppleTalk internet encapsulated in DDP/LAP packets, they are decapsulated and routed to the IP internet over the Ethernet. If the IP packets arrive on the Ethernet interface destined for an Internet address that is a node within the AppleTalk internet, they are encapsulated into DDP/LAP and routed to that destination.

The Internet Protocols supported in K-STAR IP are shown in Table A-2.

Table A-2. Internet Protocols

| Protocol | Function |
|-----------------|---|
| IP | (Internet Protocol). Provides datagram service between hosts and handles packet routing, fragmentation and reassembly. |
| ICMP | (Internet Control Message Protocol). Allows gateways and hosts to send error or control messages to other gateways or hosts. The gateway can determine the best route to a destination host using ICMP redirects. |
| ARP | (Address Resolution Protocol). Maps an IP address to the Ethernet address for that host. |
| TCP | (Transmission Control Protocol). Provides reliable data exchange between processes on different hosts. |
| UDP | (User Datagram Protocol). Provides unreliable connectionless datagram delivery service. Allows applications to send datagrams with a minimal protocol mechanism. |

Protocol Function

RIP (Routing Information Protocol). The RIP module in this implementation only broadcasts information at the required frequency; it does not respond to RIP requests nor does it issue updates. Turning on Option 10 will prevent the gateway from broadcasting RIP packets.

PROM-resident IP routing

Figure A-7 shows the protocols used to route IP packets in an IP configuration using the "IP SUBNET" code resident in the gateway's PROM.

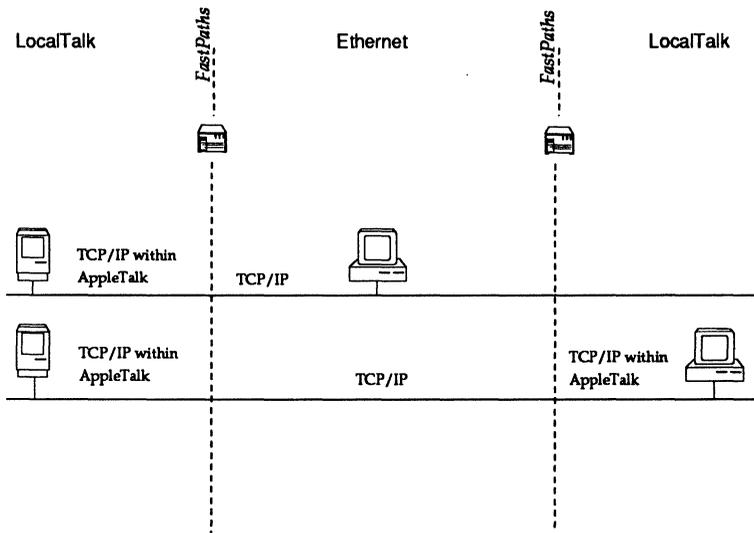


Figure A-7. PROM-resident IP Routing

In this situation, the Macintosh encapsulates IP packets that originate on the LocalTalk side in DDP, and sends them to the gateway. The gateway then strips off the AppleTalk data and sends the packet across Ethernet.

If the destination node is on another LocalTalk network across an Ethernet backbone, the gateway on the destination LocalTalk network encapsulates the IP packet in DDP again for transmission to the IP node on LocalTalk.

Note that the PROM-resident IP is supported only for backward compatibility in the FastPath 4. K-STAR IP is the recommended IP routing method. The PROM-resident IP configuration method has been renamed to "IP Subsectioning" (previously called "IP Subnetting") to avoid confusion with standard IP subnets.

FastPath Manager Reference

THIS APPENDIX PROVIDES A REFERENCE FOR THE FASTPATH MANAGER software. It is organized by the program's screens and dialog boxes as follows:

- Gateway selection window
- Diagnostics window
- Main configuration dialog box
 - Log Messages window (click the Log... button)
 - Options dialog box (click the Options... button)
- K-STAR IP dialog box (Configuration menu and area)
 - More dialog box (click the More button)
- DECnet dialog box (Configuration menu and area)
- AppleTalk Phase 1 dialog box (Configuration menu and area)
- IP Subsectioning dialog box (Configuration menu and area)

The FastPath Manager menus are described at the end of this Appendix.

About the FastPath Manager

The FastPath Manager is a Macintosh application that communicates with the gateway. It is the mechanism for downloading code (K-STAR or customized code developed at your site) and sending configuration information to the gateway.

The FastPath Manager is always launched on a Macintosh on a LocalTalk or Ethernet network connected to the gateway.

- When the Macintosh is connected to LocalTalk, the application continuously receives diagnostics from the gateway(s) on that interface and displays the messages in a Diagnostics window.
- When the Macintosh is connected to Ethernet, the Diagnostics window does not display messages from the gateway; however, you can still see diagnostics by clicking the Log... button in the FastPath Manager.

To launch the FastPath Manager application, double-click on its icon. The gateway selection window appears (see the section on "Gateway Selection Window").

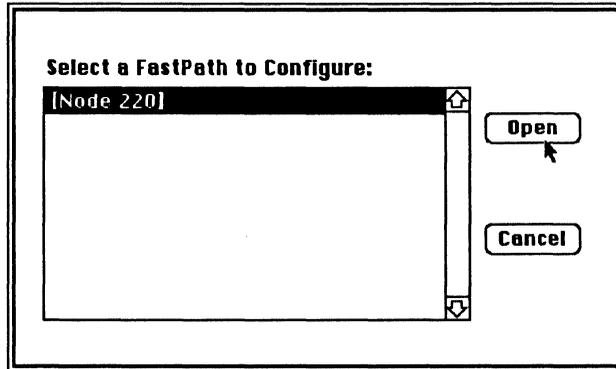
To download code to the gateway, select Download a File ... from the File menu and open K-STAR (Version 8.0 or higher). If you are downloading customized code developed at your site, open that file.

To send configuration information to the gateway, click the Go button. This sends the configuration information that is currently in the FastPath Manager windows and tells the gateway to start executing the download module (or the PROM-resident code, if no download module is present).

To close the FastPath Manager, select Quit from the File menu.

Gateway selection window

When you first launch the FastPath Manager, a brief copyright notice displays, followed by the gateway selection window:



You can display the gateway selection window by selecting Find All... from the Gateways menu at any time.

The data field in this window displays a list of all the gateways on the local network (the network the Macintosh is connected to). The gateways are listed by the name you have assigned to the gateway (using the Name command in the Gateways menu), or by a default name. Before you have assigned a name to the FastPath, a default name appears; on the LocalTalk interface, this is likely to be "[Node 220]," which is a temporary name built by the FastPath Manager based on the AppleTalk node ID of the LocalTalk interface. On the Ethernet interface, the temporary name is built using the AppleTalk node ID of the EtherTalk Phase 1 interface.

You can open one gateway from this list by selecting the name and clicking Open, or by double-clicking on the name. If you want to open more than one gateway, select Find All... from the Gateways menu and repeat the process. A configuration dialog

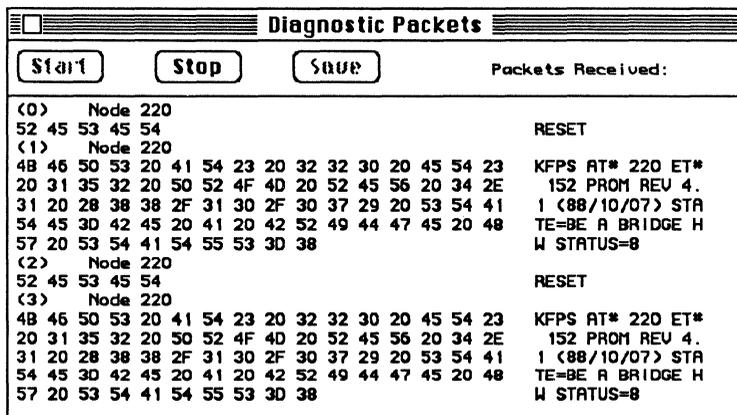
box will be open for each of the open gateways, and will be listed by the gateway's name under the Windows menu. You can configure a specific gateway by pulling down the menu and selecting the desired gateway name.

Diagnostics window

The Diagnostics window displays briefly before the main dialog box comes up, and is open in the background while you are using the FastPath Manager.

On LocalTalk, these messages are continually updated; click Stop to keep a message on the screen.

If you close this window by clicking in the "close box," it will *not* automatically reappear the next time you click Go. Instead of explicitly closing this window, you should click in the configuration dialog box to bring it to the foreground.



Hexadecimal representation

English representation; see Appendix C for an explanation of these messages.

If the FastPath Manager is running on a Macintosh on LocalTalk, the Diagnostics window dynamically displays up to 32 K-bytes of data as it receives the data from the gateway. If there is more than one working gateway on the LocalTalk net, it receives messages from all gateways. The messages start displaying in this window when the FastPath Manager receives a message from a gateway and the window is dynamically updated as new messages are received.

See the section on the Log window for an alternative way to view messages, including those that were generated before you launched the FastPath Manager.

The Diagnostics window automatically comes to the foreground upon receipt of the first diagnostic message after you click Go in the FastPath Manager. You can bring the Diagnostics window to the foreground at any time by selecting Diagnostics from the Windows menu.



If you close this window by clicking in the “close” box in the upper left corner of the main configuration dialog box, it will not automatically appear in the foreground after you click Go. In this case, you need to open the window using the Windows menu.

See Appendix C for documentation on the FastPath diagnostic messages.

Main configuration dialog box

The main configuration dialog box displays data on the gateway and accepts AppleTalk Phase 2 configuration data:

gateway 1

Gateway

FestPath™ Serial Number: 1D0766 PROM Version: 4.1
Currently Downloaded File: *None*
Last Configuration Date: *None since last RESET*
Current Configuration File: *None*
Ethernet Address: 080089A00018

LocalTalk Interface

AppleTalk Zone Name []
AppleTalk Net Number 0
AppleTalk Node Number 220

EtherTalk Phase 2

Range Start 0 Range End 0
ETalk 2.0 Net Number 0
ETalk 2.0 Node Number 0 **Zone List...**

Configuration

ATalk Phase 2 []
K-STAR IP []
DECnet []
ATalk Phase 1 []
Edit

Switches

Auto Config
 Remote Boot

Log...
Options...
Reset
Restart
Go
Pause

Help

The gateway's name is displayed in the bar at the top of the window. The Help area at the bottom of the window displays information about the button or area of the window you are currently using.

The other areas of this window are described in the sections below.

The Gateway area of the main dialog box contains display fields related to the gateway itself and its configuration:

| Gateway | | |
|-----------------------------|------------------------------|-------------------|
| FastPath™ Serial Number: | 100766 | PROM Version: 4.1 |
| Currently Downloaded File: | <i>None</i> | |
| Last Configuration Date: | <i>None since last RESET</i> | |
| Current Configuration File: | <i>None</i> | |
| Ethernet Address: | 080089A00018 | |

FastPath™ Serial Number: If you enter the gateway's serial number using the Gateway menu, it is displayed in this field. The gateway does not use this information; it is for administrative use only.

PROM Version: This field displays the version number of the gateway's PROM, which it obtains from the gateway. This version number is important when you use different versions of K-STAR or of the FastPath Manager; these programs must be compatible with the gateway PROM. You can check the version number of the FastPath Manager using the Get Info command on the application file from the Macintosh Desktop, or use "About FastPath Manager" under the Apple (🍏) menu if the FastPath Manager is running. FastPath Manager Version 5.1 or higher and K-STAR Version 8.0 or higher require PROM version 4.1 or higher.

Currently Downloaded File: When you download K-STAR (or site-specific gateway code), the name of the download file is displayed here. Clicking Reset clears this field.

Last Configuration Date: When you configure (or reconfigure) the gateway, this field is updated with the current date and time. Clicking Reset clears this field.

Current Configuration File: This field shows the filename of the configuration file currently being used by the gateway. Clicking Reset clears this field.

Ethernet Address: This field displays the Ethernet address that the gateway acquires from PROM. This field is not modifiable.

The **LocalTalk Interface** area of the main dialog box accepts AppleTalk Phase 2 configuration data for the network connected to the gateway's LocalTalk interface:

| LocalTalk Interface | |
|----------------------------|--------------------------------|
| AppleTalk Zone Name | <input type="text"/> |
| AppleTalk Net Number | <input type="text" value="0"/> |
| AppleTalk Node Number | 220 |

- AppleTalk Zone Name** This field must contain either the default asterisk (*) or a zone name, which is a character string between 1 and 32 characters which may include embedded spaces. The gateway considers a character to be invalid in a zone name if its ASCII value is less than hex 20 or equal to hex 7F. This field cannot be blank; if you blank it out the defaults will be assumed. The asterisk causes the gateway to acquire a zone name from another gateway or (if the gateway is set up to autoconfigure) to use the name "Default Zone." Note that all gateways on the internet must agree about a particular network's zone name.
- AppleTalk Net Number** This field must contain the default zero (0) or a decimal number within the range of 1—65,279. This field cannot be blank; if you blank it out the defaults will be assumed. The default 0 causes the gateway to use information it acquires from another gateway (seeding), or, if the gateway is set up to autoconfigure, to find an unused AppleTalk net number and assign it to the LocalTalk network. A decimal number entered in this field becomes the net number for the network connected to the gateway's LocalTalk interface. The AppleTalk network number must be unique for every network on the internet.
- AppleTalk Node Number** This field displays a number that is assigned automatically by AppleTalk when the gateway is started on the network. It cannot be changed manually.

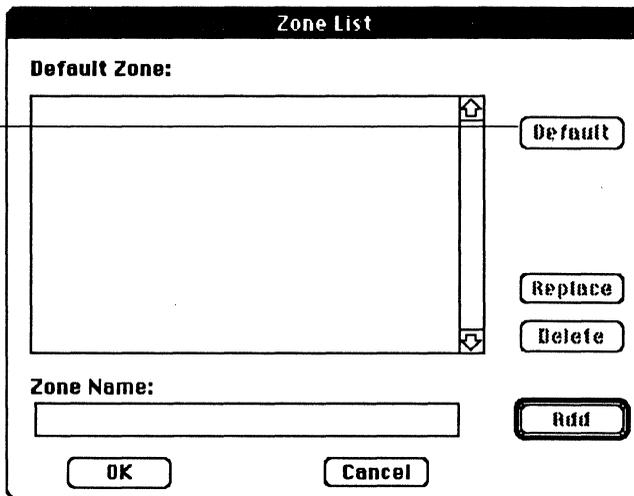
The **EtherTalk Phase 2** area of the main dialog box accepts AppleTalk Phase 2 configuration data for the network connected to the gateway's Ethernet interface:

The screenshot shows a dialog box titled "EtherTalk Phase 2". It contains the following elements:

- Range Start:
- Range End:
- ETalk 2.0 Net Number:
- ETalk 2.0 Node Number:
- A button labeled "Zone List..." is positioned to the right of the ETalk 2.0 Node Number field.

- Range Start** This field must contain either the default 0 or a decimal number between 1 and 65,279. The default 0 here and in the Range End field causes the gateway to acquire the network range from another gateway on the Ethernet interface, or, if the gateway is set up to autoconfigure, to find an unused AppleTalk net number and assign it to the EtherTalk Phase 2 network.
- Range End** This field must contain either the default 0 or a decimal number between 1 and 65,279, which must be greater than or equal to the number in the Range Start field. The default 0 here and in the Range Start field causes the gateway to acquire the network range from another gateway on the Ethernet interface, or, if the gateway is set up to autoconfigure, to find an unused AppleTalk net number and assign it to the EtherTalk Phase 2 network. The network range must be unique in the internet: no two networks can use the same number, and no two network ranges can overlap or have any network numbers in common. All gateways on a network must agree on the range for the network.
- ETalk 2.0 Net Number** This field displays the network number chosen by the gateway as a node on EtherTalk Phase 2. It cannot be changed manually.
- ETalk 2.0 Node Number** This field displays a number that is assigned automatically by AppleTalk when the gateway is started on the network. It cannot be changed manually.
- Zone List...** Click this button to open the Zone List dialog box shown on the next page.

Unless you explicitly select another zone name and click the Default button, the first name you enter in the Zone Name field will be the default zone. The default zone name appears next to the "Default Zone:" field at the top of the screen. All gateways on an Ethernet must agree about the default zone.

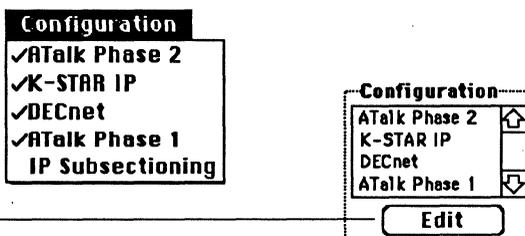


Enter a zone name in the "Zone Name" entry field, and click Add to add it to the EtherTalk Phase 2 Zone list. The zone list should contain one or more zone names (a character string between 1 and 32 characters which may include embedded spaces). The asterisk is not allowed as a zone name in Phase 2. The gateway considers a character to be invalid in a zone name if its ASCII value is less than hex 20 or equal to hex 7F. If you do not enter one or more zone names for EtherTalk Phase 2, the gateway acquires its zone names from another gateway on EtherTalk Phase 2, or, if it is set up to autoconfigure, uses the name "Default Zone."

The Configuration area of the main configuration dialog box displays a list of configuration types that reflects the configurations selected in the Configuration menu.

Select a configuration method from the menu to change the listing in the Configuration area.

Double-click on the entry or select it and click the Edit button to open a dialog box for the selected configuration type.



The first four configuration types in the Configuration menu are implemented in the K-STAR code, and can be used together on the same gateway. The IP Subsectioning configuration uses PROM-resident code, and is provided for backward compatibility only.

To add a configuration type to the Configuration area, select it in the Configuration menu.

To supply configuration data, select a configuration type in the Configuration area and click Edit, or double-click on the listing for that configuration type.

The Switches area contains two software switches:



Auto Config

The Auto Config switch is on by default. It is automatically turned off when you send the gateway configuration data that includes a non-zero net number, zone name, or when Option 17 is enabled, and close the configuration window. (That is, the gateway will only autoconfigure if the net numbers and zone names on all interfaces are not configured and (for K-STAR) if Option 17 is not enabled.) When you reset the gateway, this switch is on again until you send configuration data again. When you deselect this switch and send that information to the gateway, it explicitly puts the gateway into "seed" mode.

Remote Boot

The Remote Boot switch is off by default. If it is turned on and the gateway does not find a valid download module, the gateway sends out a "BOOTME" packet (one every 25 seconds) and waits for further instruction, rather than autoconfiguring with the default AppleTalk Phase 1 routing. This is intended for use with a remote boot server, but it is recommended when using the K-STAR download module. Even if the internet does not support a remote boot server, it is generally easier to detect an error condition if the gateway suspends operation rather than autoconfiguring.

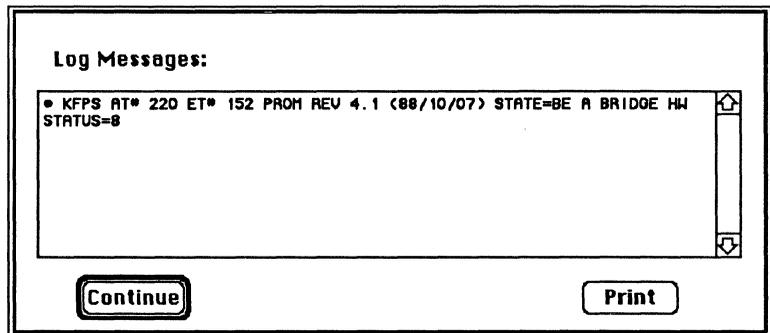


The six buttons in the lower right corner of the main configuration dialog boxes are as follows:

The **Log...** button reads a buffer in the gateway's memory, opens the Log Messages window and displays the buffer contents there. The messages are limited to 586 or fewer characters, which are stored in the gateway's buffer until they are displayed or overwritten by new messages. You can thus see the most recent messages that were generated when the FastPath Manager was not running.

To see additional messages (if any), use the scroll bars at the right of the window.

To return to the main dialog box, click Continue.



See Appendix C for documentation on the FastPath diagnostics.

The **Options...** button causes the Options dialog box to appear. This dialog box lets you set option flags that provide additional functionality to control aspects of gateway routing. All options are turned off by default. To turn an option on, click in the box next to the option flag number. An X appears in the selection box when the option is ON. To turn it off again, click again on the selection box. If the option is not defined, selecting it will have no effect on the gateway.

Option Flags

| | | | | | | | |
|--------------------------|---|--------------------------|----|--------------------------|----|--------------------------|----|
| <input type="checkbox"/> | 1 | <input type="checkbox"/> | 9 | <input type="checkbox"/> | 17 | <input type="checkbox"/> | 25 |
| <input type="checkbox"/> | 2 | <input type="checkbox"/> | 10 | <input type="checkbox"/> | 18 | <input type="checkbox"/> | 26 |
| <input type="checkbox"/> | 3 | <input type="checkbox"/> | 11 | <input type="checkbox"/> | 19 | <input type="checkbox"/> | 27 |
| <input type="checkbox"/> | 4 | <input type="checkbox"/> | 12 | <input type="checkbox"/> | 20 | <input type="checkbox"/> | 28 |
| <input type="checkbox"/> | 5 | <input type="checkbox"/> | 13 | <input type="checkbox"/> | 21 | <input type="checkbox"/> | 29 |
| <input type="checkbox"/> | 6 | <input type="checkbox"/> | 14 | <input type="checkbox"/> | 22 | <input type="checkbox"/> | 30 |
| <input type="checkbox"/> | 7 | <input type="checkbox"/> | 15 | <input type="checkbox"/> | 23 | <input type="checkbox"/> | 31 |
| <input type="checkbox"/> | 8 | <input type="checkbox"/> | 16 | <input type="checkbox"/> | 24 | <input type="checkbox"/> | 32 |

Option Parameters

| | | | | | | | |
|----|----|----|----|----|----|----|----|
| 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 |
| 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 |
| 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 |
| 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 |

ASCII
 Hexadecimal

Help

Option Flags

The following definitions apply to Option flags in this window.

- 1 Not defined.
- 2 (Can be used with all configuration types, including PROM-resident.) Tells the Ethernet controller to stop looking for a carrier sense (CRS) signal. This is primarily for use on broadband networks if Ethernet transmission errors are consistently seen. If the Ethernet transmission error is caused by a different condition, setting this option will not cause the message to stop appearing.
- 3 (Seldom used; this option can only be used with the PROM-resident IP Subsectioning configuration type.) By default, the gateway forwards packets to an IP router when the packet is not destined for the Ethernet/IP network. If the Ethernet/IP network is subnetted, use this option to supply the Ethernet side's subnet mask as the first 4 bytes in the Option Parameters field.
- 4 (K-STAR must be downloaded.) By default, the gateway uses standard IP broadcasting with all ones in the host portion of the IP address. This option tells K-STAR to calculate a 4.2 BSD-compatible IP broadcast address with all zeroes in the host portion.

- 5 (K-STAR must be downloaded.) Encapsulate all EtherTalk Phase 1 gateway traffic in UDP/IP and do not send RTMP packets on Ethernet. This option works only on EtherTalk Phase 1; see Option 18 for automatic EtherTalk Phase 2 encapsulation. When this option is set, you must launch the FastPath Manager on a Macintosh on the LocalTalk interface of the gateway. If the Macintosh is on Ethernet, it will not be able to find the gateway.
- 6 (Seldom used. This option can be used with all configuration types, including PROM-resident. It is used primarily for compatibility with early versions of K-Talk on UNIX hosts.) By default, the gateway uses AARP (AppleTalk Address Resolution Protocol) packets for AppleTalk address resolution. If this option is set, it continues to use AARP but also uses a variant of IP-style ARP packets.
- 7 (K-STAR must be downloaded.) Tell the gateway to administer IP addresses for Macintoshes that are physically connected to the gateway's LocalTalk or Ethernet interface, and/or to a LocalTalk network accessible to the gateway across Ethernet. See "Distributing Macintosh Clients" in Chapter 3. **All of the Macintoshes must be in the zone configured on the gateway's LocalTalk interface . Do not use this option if you have more than one gateway configured for K-STAR IP in this zone. Note also that Option 7 does not work if Option 8 is set.**
- 8 (K-STAR must be downloaded.) By default, the gateway responds to NBP proxy ARP requests for IP addresses that it knows about but that are not its clients. (Because of the way it assigns IP addresses dynamically, the gateway never responds to NBP proxy ARP requests for its client IP addresses.) If this option is set, the gateway responds to NBP ARP requests only for its own IP address. **Do not use this option if you have more than one gateway configured for K-STAR IP in the AppleTalk zone that is configured on the gateway's LocalTalk interface.**

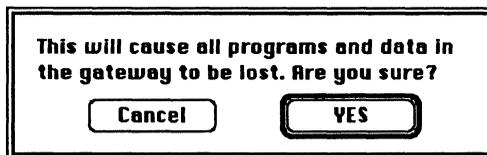
- 9 (K-STAR must be downloaded.) IP split addressing. This option tells the gateway to use a separate IP address as the starting point for Macintosh client addresses. The address is supplied in the K-STAR IP "More" screen in Parameter #1 field, and may be on the Ethernet/IP network or on a different IP network. In the latter case, K-STAR broadcasts RIP packets on Ethernet with information about the new network. Note that the RIP module in this release can only broadcast information. See the "Option 9" examples in Chapter 3.
- 10 (K-STAR must be downloaded.) Prevents the gateway from broadcasting RIP packets under any circumstances. If Option 10 and Option 9 are both set, you must statically configure the route to the new IP network on other IP hosts.
- 11 (K-STAR must be downloaded.) This option tells K-STAR to use the new NIC range of well-known DDP ports, beginning at 200 (instead of the previous KIP range beginning at 768). See "Using the New UDP Port Numbers" in Chapter 3.
- 12 Not defined.
- 13 (K-STAR must be downloaded.) Prevent users on the LocalTalk side of the gateway from seeing AppleTalk services outside their zone. When this option is set, the FastPath checks the destination zone name in NBP broadcast request packets (the zone selected in the Chooser, in which services may be registered). If it is the same zone as the source network, the packet is processed normally; otherwise, it is dropped. See "AppleTalk Zone Security" in Chapter 2.
- 14 (K-STAR must be downloaded.) Hide LaserWriters on the LocalTalk side of the gateway from users in other zones. When this option is set, the gateway examines NBP reply packets. If the LocalTalk zone name of the gateway is one of the zones for the source net, and if the LocalTalk zone of the gateway is not one of the zones for the destination net, the gateway filters the NBP packet for a tuple with the type LaserWriter; if it finds one, that tuple is removed from the packet. If the packet has any valid tuples after this processing, it is forwarded, otherwise it is dropped. This option is recommended only for gateways with low network traffic because it is expensive in processor resources. See "AppleTalk Zone Security" in Chapter 2.

- 15 (K-STAR must be downloaded.) Hide AppleTalk services whose names end in a tilde (~) on the LocalTalk side of the gateway from users in other zones. You need to add a tilde at the end of the name of AppleTalk services you wish to protect in this way. When this option is selected, the gateway examines NBP reply packets. If the LocalTalk zone name of the gateway is one of the zones for the source net, and if the LocalTalk zone of the gateway is not one of the zones for the destination net, the gateway filters the NBP packet for a tuple with an object name that ends with a tilde (~); if it finds one, that tuple is removed from the packet. If the packet has any valid tuples after this processing, it is forwarded, otherwise it is dropped. This option is recommended only for gateways with low network traffic because it is expensive in processor resources. See "AppleTalk Zone Security" in Chapter 2.
- 16 Not defined.
- 17 (K-STAR must be downloaded.) Enable AppleTalk Phase 1 protocols in K-STAR. If Option 17 is set and Option 18 is not set, the gateway is a transition bridge. If Option 17 and 18 are both set, K-STAR routes only AppleTalk Phase 1 packets. See Chapter 2 for more information.
- 18 (K-STAR must be downloaded.) Turn off EtherTalk Phase 2 protocols in K-STAR. If Option 17 and 18 are both set, K-STAR routes only AppleTalk Phase 1 packets. If Option 18 is set and Option 17 is not set, the gateway encapsulates all AppleTalk traffic in UDP/IP.
- 19-32 Not defined.

Option Parameters This area provides 32 bytes of parameter space. This is raw data space that can be divided up as required by any program that reads it; it is intended to provide space for parameters that may be required by network applications that access the gateway. You can supply ASCII or hexadecimal data by selecting one of the buttons at the right of this area (ASCII to enter ASCII characters or Hexadecimal for hex numbers) and then enter the appropriate data. Use the mouse to move the cursor to the specific character where you want to start typing. When you type, you overwrite the existing characters (initially all zeroes); you do not insert new characters between them. Pressing the Backspace or Delete key moves the cursor backward but does not alter any characters.

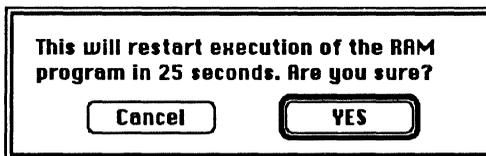


The **Reset** button clears all of the gateway's memory locations, leaving the gateway in the initial state. After resetting, the gateway waits for 25 seconds before it autoconfigures using PROM-resident AppleTalk Phase 1 protocols. When you click **Reset**, the following screen appears:



Click **Yes** to reset the gateway, or **Cancel** if you change your mind. When you click **Yes**, the gateway sends a **RESET** message. You need to select and open the gateway again following a **Reset**. If you need more than 25 seconds between the time you click **Reset** and the time you click **Go** in the **FastPath Manager**, click **Pause** to prevent the gateway from executing gateway code. See Figure A-1 in Appendix A for more information on the **Reset** sequence.

The **Restart** button sends the gateway all configuration data from the current session and tells it to start executing the download code (or the PROM-resident code, if no download module is found) after 25 seconds. The following window appears:



Click **Yes** to restart the gateway, or **Cancel** if you change your mind. When you click **Yes**, the gateway sends a **REBOOT** message. Twenty-five seconds later, the gateway program is restarted or the **PROM** code is started, if a valid gateway program is not found. This is the equivalent of power-cycling the gateway.

To get around the 25-second delay following a **Restart**, you can select and open the gateway again and click **Go**. See Figure A-1 in Appendix A for more information.

The **Go** button sends the gateway all configuration data from the current session and tells it to start executing the download code (or the PROM-resident code, if no download module is found). Use this button after you have completed configuring the gateway. See Figure A-1 in Appendix A for more information.

The **Pause** button has no effect when the gateway is executing routing code. It only functions during the 25-second interval after a Restart or Reset. If you click Pause within 25 seconds following a Reset or Restart command, the gateway will not execute gateway code until you click Go. If you click Pause after the 25-second interval, an error message is displayed.

K-STAR IP dialog box

Selecting K-STAR IP from the Configuration menu places a K-STAR IP listing in the Configuration area of the main dialog box. Double-click on this listing, or select it and click Edit, to access the K-STAR IP dialog box:

| | | | |
|----------------------------------|---------|-----------------------------|---|
| IP Information | | Number of IP Clients | |
| IP Address of FastPath Box | 0.0.0.0 | Dynamic | 0 |
| IP Subnetwork Mask | 0.0.0.0 | Static | 0 |
| IP Broadcast Address | 0.0.0.0 | | |
| IP Address of Default Router | 0.0.0.0 | | |
| Administrator | | | |
| IP Address of Administrator Host | 0.0.0.0 | | |
| IPTalk Interface | | | |
| AppleTalk Zone Name | * | | |
| AppleTalk Network Number | 0 | | |
| AppleTalk Node Number | 0 | | |
| Help | | | |

More... Cancel OK

The **IP Information** area accepts IP information for the gateway:

| IP Information | |
|------------------------------|---------|
| IP Address of FastPath Box | 0.0.0.0 |
| IP Subnetwork Mask | 0.0.0.0 |
| IP Broadcast Address | 0.0.0.0 |
| IP Address of Default Router | 0.0.0.0 |

IP Address of
FastPath Box

If you are configuring the gateway for K-STAR IP, this field must contain the IP address for the gateway as a host on the existing Ethernet/IP network. If Option 9 is selected, this address applies to the gateway's Ethernet interface. This number must be unique on the IP internet. Check existing host tables to make sure the address you enter here is not a duplicate address.

IP Subnetwork Mask

This field should contain the default zeroes (0.0.0.0) or the IP subnet mask in use on the Ethernet/IP network. The default zeroes cause K-STAR to calculate the appropriate subnet mask by sending ICMP packets on the network. If the gateway receives no response to the ICMP packets, it uses a default mask based on the class of the Internet network number (class A, B, or C) with no subnetting. If you enter a mask in this field, it must be the same subnet mask in use on the Ethernet interface or it is ignored. You can enter the mask in decimal-dot or hexadecimal notation.

IP Broadcast Address

This field should contain the default zeroes (0.0.0.0) or the IP broadcast address that is in use on the Ethernet/IP network. The default zeroes cause K-STAR to calculate the appropriate broadcast address based on the IP subnet mask and the state of option 4. If option 4 is ON, the host portion of the broadcast address will contain all zeroes; if it is not selected (default) the host portion of the broadcast address will contain all ones. If you enter a value in this field, option 4 is ignored. Note that the FastPath Manager does not check the validity of the value you enter.

IP Address of
Default Router

If there is a default IP router system on the internet (for example, a UNIX system that specifies efficient routes to other networks and subnets), this field should contain its IP address. This will cause packets to automatically be sent to that host. The default zeroes cause K-STAR to use RIP packets and ICMP redirects to determine the best way to route IP packets to remote networks.

The **Administrator** area is *only* for use where the atalkad daemon is supported on the internet and the atalkatab file is complete and up to date.

| Administrator | |
|----------------------------------|--------------------------------------|
| IP Address of Administrator Host | <input type="text" value="0.0.0.0"/> |

IP Address of Administrator Host

If the internet supports a host computer that is running the atalkad daemon, and you want K-STAR to query that daemon for this configuration data, enter the IP address of that host here. If you are configuring the gateway to access atalkad, you should not supply any IP configuration data other than the IP address for the gateway and the IP address for the administrator host. Nor should you supply AppleTalk configuration data for the LocalTalk interface or the EtherTalk Phase 1 interface. However, since AppleTalk Phase 2 is not yet supported in the atalkatab file, you should supply the full EtherTalk Phase 2 configuration in the FastPath Manager. In addition, if you are supplying secondary addresses for the gateway (as described in Figures 3-9 and 3-10), you need to turn on Option 9 in the FastPath Manager. **All the other configuration information should be in the atalkatab file.**

The **IPTalk Interface** area accepts IPTalk information. The IPTalk software in K-STAR encapsulates outgoing AppleTalk packets in UDP for transmission to CAP or AUFS hosts. When it receives encapsulated packets back from these hosts, it strips off the UDP transmission data and sends it to AppleTalk nodes on its LocalTalk or EtherTalk interface.

| IPTalk Interface | |
|--------------------------|--------------------------------|
| AppleTalk Zone Name | <input type="text" value="*"/> |
| AppleTalk Network Number | <input type="text" value="0"/> |
| AppleTalk Node Number | <input type="text" value="0"/> |

AppleTalk Zone Name

If you are configuring an IPTalk interface, this field should contain a valid AppleTalk zone name. When a Macintosh user selects the zone name you enter here, all AppleTalk traffic destined for that zone will be encapsulated in UDP.

AppleTalk Net Number If you are configuring an IPTalk interface, this field should contain a decimal number within the range of 1—65,279. This number is not associated with a cable, as in the AppleTalk configurations, but it still **must be unique on the AppleTalk internet**. This number will be used in the destination address for CAP or AUFS hosts on Ethernet.

AppleTalk Node Number This field displays a number that is calculated from the lowest byte of the gateway's IP address. It cannot be changed manually.

||||➔ All nodes on one IPTalk network must be connected to the same Ethernet cable. In addition, because the IPTalk software uses the lower-order byte of the host's IP address as a virtual AppleTalk node address, the IP addresses of hosts on this IPTalk network must all have the same high-order 3 bytes. This is true regardless of the class of the IP network number; note that this precludes using class C subnets as IPTalk networks.

||||➔ Note that using the atalkatab configuration file to configure IPTalk networks removes this restriction, and allows IPTalk traffic to be routed through IP routers to remote IPTalk networks. Configuring an IPTalk interface in K-STAR using the FastPath Manager is recommended only when no administrator host is present; that is, when the atalkatab file and atalkad daemon are not available on the internet.

In the **Number of IP Clients** area, you specify the number of client Macintoshes for which K-STAR will administer IP addresses. The total number of clients must be less than or equal to 60.

| Number of IP Clients | |
|----------------------|--------------------------------|
| Dynamic | <input type="text" value="0"/> |
| Static | <input type="text" value="0"/> |

Dynamic This field should contain the number of client Macintoshes that will dynamically acquire their IP addresses from the gateway when they boot up on the IP network. (For example, if you enter the number 10, up to 10 Macintoshes can acquire an IP address dynamically when they boot up.) If this field contains the default zero, no IP addresses will be assigned dynamically.

Static

This field should contain the number of client Macintoshes that will be statically assigned an IP address. This number added to the number in the Dynamic field must be less than or equal to 60. If you exceed this limit, FastPath Manager displays an error message in the Help area.

If both the Dynamic and Static fields contain the default zeroes, the gateway will not route IP packets to any Macintoshes.

Note that the entire range of static and dynamic addresses must not duplicate other IP addresses on the Ethernet. See Chapter 3 for information on using the split addressing feature (Option 9) to change the starting point for the range of IP addresses administered for Macintoshes.

K-STAR IP “More” dialog box

Click More in the K-STAR IP dialog box to open the K-STAR IP “More” dialog box, which lets you specify additional IP information:

The screenshot shows a dialog box with a double border. It is divided into three main sections: 'Servers', 'Local Parameters', and 'Help'.
- The 'Servers' section contains two rows: 'IP Address of Name Server' with a text field containing '0.0.0.0', and 'IP Address of File Server' with a text field containing '0.0.0.0'.
- The 'Local Parameters' section contains four rows: 'Parameter #1', 'Parameter #2', 'Parameter #3', and 'Parameter #4', each with a text field containing '0.0.0.0'.
- On the right side, there are two buttons: 'Cancel' (top) and 'OK' (bottom, with a shadow effect).
- At the bottom, there is a 'Help' label followed by a large empty rectangular area.

IP Address of
Name Server

This field should contain the IP address of a name server; that is, a computer on the IP network running an IP program that translates host names into addresses.

IP Address of File Server This field should contain the IP address of a file server; that is, a computer on the IP network on running a program that makes local files (or devices) available to other computers on the internet.

Parameter #1 - #4 These fields are used by the gateway in conjunction with option flags. Option 9 uses Local Parameter #1 for the split addressing IP address and (optionally) Local Parameter #2 field for the split addressing subnet mask.

DECnet dialog box

Selecting DECnet from the Configuration menu places a DECnet listing in the Configuration area of the main dialog box. Double-click on this listing, or select it and click Edit, to access the DECnet dialog box:

| DECnet Info | |
|------------------|-----|
| Area | 0 |
| Node Number | 0 |
| Background Timer | 120 |
| Hello Timer | 30 |

Help
DECnet dialog box. Use this window to specify the FastPath's DECnet data.

Cancel

OK

Area If you are configuring the gateway for DECnet routing, this field should contain the DECnet area number for the gateway. This must be the area number in use on Ethernet.

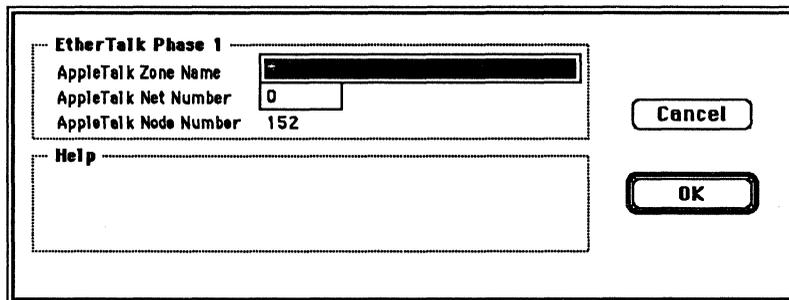
Node Number This field should contain the DECnet node number for the FastPath. This is a unique node number within the area.

Background Timer The number in this field determines how frequently routing packets are sent out. It has a default of 120 seconds, which should be reasonable for most sites. You can change this if necessary by typing in the new value (a decimal number representing the number of seconds between routing packets).

The number in this field determines determines how frequently “hello” packets are sent to end nodes on the network. It has a default of 30 seconds, which you can change if necessary.

Appletalk Phase 1 dialog box

Selecting ATalk Phase 1 from the Configuration menu places an ATalk Phase 1 listing in the Configuration area of the main dialog box. Double-click on this listing, or select it and click Edit, to access the AppleTalk Phase 1 dialog box. This dialog box is designed accept data for the Ethernet interface of the gateway only; the AppleTalk Phase 1 data for the LocalTalk interface should be supplied in the main dialog box.



AppleTalk Zone Name

This field must contain either the default asterisk (*) or a zone name, which is a character string between 1 and 32 characters which may include embedded spaces. The gateway considers a character to be invalid in a zone name if its ASCII value is less than hex 20 or equal to hex 7F. The asterisk causes the gateway to acquire a zone name from another gateway or (if no other gateway has a zone name assigned and the gateway is set up to autoconfigure) to use the name “Default Zone.” All gateways on the internet must agree about a particular network’s zone name.

AppleTalk Net Number

This field must contain the default zero (0) or a decimal number within the range of 1—65,279. The default 0 causes the gateway to get this information from another gateway (see itself) or, if the gateway is set up to autoconfigure, to find an unused AppleTalk net number and assign it to the Ethernet interface. A

decimal number entered in this field becomes the net number for the network connected to the gateway's Ethernet interface. The AppleTalk network number must be unique for every network on the internet, and all gateways on a network must agree on the net number for the network.

AppleTalk Node Number This field displays a number that is assigned automatically by AppleTalk when the gateway is started on the network. It cannot be changed manually.

IP Subsectioning dialog box



The gateway's PROM-resident IP implementation was previously referred to as the "IP Subnetting" configuration type. In this version of the FastPath Manager, it is called as "IP Subsectioning" to avoid confusion with standard IP subnetting. Note, however, that the PROM-resident code itself has not changed.

This configuration type is provided for backward compatibility only; please refer to your existing documentation for more information or see Chapter 3 on configuring K-STAR IP.

Selecting IP Subsectioning from the Configuration menu places a IP Subsectioning listing in the Configuration area of the main dialog box. Double-click on this listing, or select it and click Edit, to access the IP Subsectioning dialog box, which accepts configuration data for the PROM-resident IP code.

| IP Subnet Info | |
|---------------------------|----------------------|
| IP Subnet Mask | <input type="text"/> |
| Ethernet IP Address | 0.0.0.0 |
| LocalTalk IP Address | 0.0.0.0 |
| Default IP Router Address | 0.0.0.0 |

Class

Ether:

Local:

Help

Main IP Subnet dialog box. Use this window to specify the FastPath's IP address data for both networks to which it is connected.

Cancel

OK

| | |
|---------------------------|--|
| IP Subnet Mask | This field should contain a subnet mask in decimal-dot or hexadecimal format. This mask is used to define the LocalTalk net as a further subsection of the IP network, where the subnet number must be equal to the AppleTalk Network Number for the LocalTalk interface, and must be different from the Ethernet/IP subnet number. |
| Ethernet IP Address | The Ethernet IP Address field should contain the IP address for the gateway on Ethernet/IP network. This must be an unused IP address for that network. |
| LocalTalk IP Address | This field should contain the IP address for the gateway on its LocalTalk interface. The LocalTalk network will be seen as a logical sub-sectioning of the IP subnet, where the AppleTalk network number for the LocalTalk side must be equal to the subnet number in the IP Address. |
| Default IP Router Address | This field should contain the IP address for default IP router system (for example, a UNIX system that specifies efficient routes to other networks and subnets). This will cause packets to automatically be sent to that host. |
| Ether/Local | These fields automatically display the class of the network defined on the Ethernet and LocalTalk interfaces of the gateway (that is, whether the IP network number is class A, B, or C), based on the IP addresses you have entered. |

FastPath Manager menus

The FastPath Manager provides the following menus:

🍏 File Edit Gateways Configuration Windows

The Apple (🍏) menu is the standard menu for accessing Desk Accessories, the Chooser, Control Panel, and so forth.

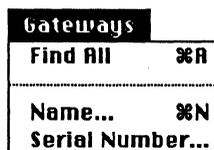
The Edit menu is not currently supported in the FastPath Manager; that is, you cannot cut and paste between fields.

The File menu

| File | |
|-------------------------|----|
| Download a File... | ⌘L |
| Open Configuration File | ⌘O |
| Save Configuration File | ⌘S |
| Page Setup... | |
| Print Configuration | ⌘P |
| Quit | ⌘Q |

- Download a File ... This entry is used for downloading a gateway program (such as K-STAR). It brings up a dialog box showing the contents of the current directory. To download K-STAR, select it and click on the Open button. **Note that the gateway will not accept download information while it is executing code. You must click Restart or Reset before downloading a file.**
- Open Configuration File This entry brings up a dialog box where you can select the configuration file you want to open. To open a configuration file, select it and click on the Open button. The file's configuration data will appear in the fields of the FastPath Manager's dialog boxes.
- Save Configuration File This entry brings up a dialog box where you assign a name to the configuration file before saving it to disk. Type a name for the configuration file and click Save to save the configuration to disk. This is recommended when you have configured a gateway.
- Page Setup... Currently not implemented.
- Print Configuration This entry sends a formatted page of the current configuration to a printer (including configuration data contained in windows other than the current window). A printer must be accessible to this Macintosh.
- Quit Exit the FastPath Manager application.

The Gateways menu



Find All

Queries the network for all gateways on that net, opens the gateway selection window, and displays the names of all responding gateways in the data field.

Name...

Brings up a dialog box where you can enter a name of no more than 20 characters for the gateway that is currently open. The gateway name you enter will appear in the header of the main configuration dialog box, in the Windows menu, and in the Gateway Selection window. **Because it appears in the Windows menu, Macintosh metacharacters can not be used in gateway names.**

The name you assign to a gateway is used by the gateway as the "name" field when it responds to DECnet or SNMP NBP lookups.

Serial Number...

This entry brings up a dialog box where you can enter the serial number for the gateway that is currently open. After you enter the serial number, it will appear in the Gateway Area of the main dialog box. This information is not used by the gateway in any way, but it is useful for reference when you are using dealer support.

The Configuration menu



- ATalk Phase 2** This is the default K-STAR configuration type for the gateway in that, when the main configuration dialog box comes up, it accepts AppleTalk Phase 2 configuration data. Selecting ATalk Phase 2 enters a listing in the Configuration area, but clicking on this listing does not open a new dialog box.
- K-STAR IP** Select this configuration type to enter a listing for K-STAR IP in the Configuration area of the main dialog box. Double-clicking on this listing opens the K-STAR IP dialog box.
- DECnet** Select this configuration type to enter a listing for DECnet in the Configuration area of the main dialog box. Double-clicking on this listing opens the DECnet dialog box.
- ATalk Phase 1** Select this configuration type to enter a listing for Atalk Phase 1 in the Configuration area of the main dialog box. Double-clicking on this listing opens the EtherTalk Phase 1 dialog box. The AppleTalk data for the LocalTalk interface must be entered in the main configuration dialog box. If you intend to download K-STAR (for example, to implement the zone security features or to configure another type of K-STAR routing in conjunction with AppleTalk Phase 1), you need to turn on Option 17 to use AppleTalk Phase 1. If you do not download K-STAR, the AppleTalk Phase 1 protocols in PROM will execute with the configuration data you supply.
- IP Subsectioning** The gateway's PROM-resident IP implementation was previously referred to as the "IP Subnetting" configuration type. In this version of the FastPath Manager, it is called as "IP Subsectioning" to avoid confusion with standard IP subnetting. Note, however, that the PROM-resident code itself has not changed. This configuration type is provided for backward compatibility only; please refer to your existing documentation for more information or see Chapter 3 on configuring K-STAR IP.

The Windows menu



The contents of the Windows menu changes when you open a gateway. The sample menu above shows one gateway open (gateway 1). The Diagnostics window is always one of the entries in this menu.

When you select a name from the this menu, the appropriate window opens.

Note: If you are viewing the Diagnostics window and wish to return to the dialog box that is open for a gateway, be sure to select the gateway's entry in this menu rather than close the Diagnostics window using the "close box" in the upper left corner of the window. If you close the Diagnostics window, it will not automatically re-open when you click Go in the main configuration dialog box. In this case, selecting Diagnostics from this menu will open the window again.

FastPath Diagnostic Messages

THIS APPENDIX LISTS THE DIAGNOSTIC MESSAGES GENERATED BY the FastPath gateway. Most of these messages can be generated when the gateway is running K-STAR Version 8.0, although some are generated from PROM (these are marked in the text). These messages appear in the far right column of the Diagnostics window of the FastPath Manager when the Macintosh is connected to the gateway's LocalTalk interface.

These messages are also stored in a buffer in the gateway that can be accessed by clicking the Log... button in the FastPath Manager (on LocalTalk or Ethernet). The Log... button allows you to view 586 or fewer characters, which are stored in the gateway's buffer until they are overwritten by new messages. You can use the Log... button to see messages that were generated before you launched the FastPath Manager.

Conventions and organization

The diagnostic messages in this section are listed according to the software module that produces them. In these messages, the following conventions are used:

| | |
|------------------|--|
| <i>N</i> | is a decimal number |
| <i>X</i> | is a hexadecimal number |
| <i>string</i> | is a character string |
| <i>interface</i> | is a character string indicating one of the gateway's interfaces, which may be one of the following: |

If the gateway is running K-STAR, *interface* can be one of the following:

| | |
|--------|---------------------------------|
| LTALK | the LocalTalk interface |
| ETALK1 | the EtherTalk Phase 1 interface |
| ETALK2 | the EtherTalk Phase 2 interface |
| IPTALK | the IPTalk interface |

If the gateway is running PROM-resident code, *interface* can be one of the following:

| | |
|-------|---------------------------------|
| ATALK | the LocalTalk interface |
| ETALK | the EtherTalk Phase 1 interface |

Table C-1 lists the gateway's diagnostic messages alphabetically, and references the page on which the message is documented in this Appendix.

Table C-1. Alphabetic Listing of Diagnostic Messages

ALL NODE NUMBERS IN USE ON ETHERNET FOR NET *N*, STILL TRYING / See page C-13

Atalkad: RESTART / See page C-23

Auto-configured *interface* net number *N* (0x*X*) / See page C-12

Auto-configured ETALK2 range *N*(0x*X*) - *N*(0x*X*) / See page C-12

bad DECnet checksum / See page C-25

Bad RTMP format, port *interface* / See page C-16

Conflicting information: local default zone=*string*; *string* reported on ETALK2 / See page C-19

DECnet routing on, my address = *N.N* / See page C-23

decnet - no route to addr *X* / See page C-25

decnet - no valid route. / See page C-25

decnet - too many hops / See page C-24

decnet - wrong area / See page C-24

decnet data() - wrong version / See page C-25

DUP IP ADDRESS *string*, sent from:*X.X.X.X.X.X* / See page C-22

DUPLICATE HARDWARE ADDRESS: *X.X.X.X.X.X* / See page C-22

ETALK2 seeded as range *N-N*, and chose net *N* / See page C-16

Ethernet Phase 1 net number is in the startup range. Ignoring configuration. / See page C-14

Ethernet Phase 2 range is in the startup range. Ignoring configuration / See page C-15

Ethernet Phase 2 range start is greater than range end. Setting range to *N-N* / See page C-15

Ethernet transmission error: *X* / See page C-10

FastPath AT node *N*, ET node *N*, *N* bytes memory, version *string*, *string* IP routing *string*, options=0x*X* / See page C-7

got routing pkt from unknown router at addr *X* / See page C-25

Table C-1. Alphabetic Listing of Diagnostic Messages (continued)

interface seeded as net *N* / See page C-17

i82586 NOT RESPONDING / See page C-11

i82586 TRANSMITTER HUNG / See page C-11

IP setup error *X* / See page C-26

K-STAR FastPath AT node *N*, ET node *N*, ET2.0 net *N*, ET2.0 node *N*, *N* buffers (*N* for ethernet), revision *string*, Option Flags: *string*. / See page C-9

K-STAR atalkatab configuration complete / See page C-23

KFPS AT# *N* ET# *N* PROM REV *string* (*string*) STATE=*string* HW STATUS=*X* / See page C-6

LocalTalk net number is in the startup range. Ignoring configuration.
/ See page C-14

Loop found. Restarting auto-config for *interface* / See page C-12

Mismatched net numbers: local=*N*; *N* reported on *interface* / See page C-17

Mismatched range numbers: local=*N-N*; *N* reported on ETALK2 / See page C-18

Net *N* went down / See page C-18

Option 17 is on, but the range is too wide. Setting range to *N-N* / See page C-15

Option 17 is on, but there is more than one zone name. Using only the default zone name. / See page C-15

REBOOT / See page C-8

REQUIRES PROM VERSION 4.1 OR GREATER!! / See page C-10

RESET / See page C-8

Range *N-N* went down / See page C-18

Restarting auto-config for *interface* / See page C-13

unknown decnet pkt from *interface* / See page C-24

Table C-1. Alphabetic Listing of Diagnostic Messages (continued)

Warning: net *N* for interface *interface* is in the startup range. / See page C-23

Warning: option 17 is not on but there is a Phase 1 router present on port LTALK / See page C-16

Warning: option 17 is on and there is more than one zone name for net *N* / See page C-20

Warning: there is more than one zone name for net *N* but there are AppleTalk Phase 1 routers present / See page C-20

Warning: unable to register multicast address X X X X X X / See page C-24

WARNING: *interface* has not acquired a net number / See page C-18

WARNING: invalid character in zone name converted to *character* / See page C-21

WARNING: received zip reply with invalid character in zone name / See page C-21

WARNING: zip bringup found invalid character in zone name / See page C-21

Gateway startup

The gateway generates the messages in this section as it is starting up; for example, following a reset or power cycle, or after you download K-STAR and click Go when you are configuring the gateway.

PROM startup

The PROM startup messages are the first diagnostics sent by the gateway when it is powered on and begins operations.

```
KFPS AT# N ET# N PROM REV string (string) STATE=string
HW STATUS=X
```

This is the initial gateway startup message from PROM:

| | |
|------------------------|---|
| KFPS | KFPS designates the Kinetics FastPath Standalone gateway. |
| AT# N | The AppleTalk node number of the gateway's LocalTalk interface. |
| ET# N | The AppleTalk Phase 1 node number of the gateway's Ethernet interface. |
| PROM REV <i>string</i> | The revision number of the gateway's PROM (<i>string</i> should be 4.1 or higher to run K-STAR Version 8.0). |
| (<i>string</i>) | The date the PROM was created. |
| STATE= <i>string</i> | The state of the gateway, where <i>string</i> is one of the following: |
| BE A BRIDGE | The gateway will begin working as an AppleTalk Phase 1 router running PROM-resident code after the 25-second delay, if no other code is downloaded. |

| | |
|----------------|--|
| BOOTME | The Remote Boot software switch has been set in the FastPath Manager and the gateway does not find a valid download module. The gateway will wait for you to download a valid gateway program. |
| DOWNLOAD VALID | The gateway will begin executing the downloaded gateway program after 25 seconds. |
| PAUSE | The gateway is "paused." It will remain in this state until you click Reset (to reconfigure the gateway) or Go (to use the current configuration) in the FastPath Manager main dialog box. |

HW STATUS=X

The status of the gateway, where X is the applicable status code described below. If more than one condition occurs, the status codes are logically ORed together.

| | |
|------|---|
| 0001 | AppleTalk controller chip is bad. |
| 0002 | Ethernet controller chip is bad. |
| 0004 | Voltage level of the built-in battery is low. |
| 0008 | Expansion RAM is installed. |
| 0010 | Ethernet transceiver fuse is blown. |
| 0020 | Latest memory test failed. |

If the HW STATUS=0, then the FastPath 4 hardware is normal.

FastPath AT node N, ET node N, N bytes memory,
version *string*, *string* IP routing *string*, options=0xX

This is the startup message that the gateway sends when the gateway PROM code begins execution. *If K-STAR has not been downloaded*, this message should follow the message that begins KFPS AT#... , described above.

| | |
|--------------------------|---|
| <i>AT node N</i> | The AppleTalk node number of the gateway's LocalTalk port. |
| <i>ET node N</i> | The EtherTalk Phase 1 node number of the gateway's Ethernet port. |
| <i>N bytes memory</i> | The total amount of memory, in bytes, available for packet buffers in the gateway. |
| <i>version string</i> | The version number of the PROM. |
| <i>string IP routing</i> | The type of PROM-resident IP routing you have configured (as described in Appendix E); either <i>SUBNET</i> or <i>FIXED</i> . |
| <i>string</i> | An indication whether you have configured IP subsectioning using the PROM-resident IP code; either <i>ON</i> or <i>OFF</i> . |
| <i>options=string</i> | The current value of the options variable, in hexadecimal notation. Most of the time, this is 0 (zero). |

REBOOT

This message appears after you click on the Restart button in the main configuration window. After a 25-second delay, gateway operation restarts with the current configuration data.

RESET

This message appears after you click on the Reset button in the main configuration window. This clears all the memory locations in the gateway, including the downloaded gateway program (if any). After a 25-second delay, gateway operation restarts.

K-STAR startup

The K-STAR startup messages appear when the gateway begins executing the downloaded K-STAR software. They follow the startup messages stored in gateway PROM.

K-STAR FastPath AT node *N*, ET node *N*, ET2.0 net *N*, ET2.0 node *N*, *N* buffers (*N* for ethernet), revision *string*, Option Flags: *string*.

This is the startup message that the gateway sends when it begins executing K-STAR. It usually follows the message that begins KFPS AT#..., described above.

| | |
|-----------------------------|---|
| K-STAR FastPath | The gateway is running K-STAR (it is a "K-STAR gateway"). |
| AT node <i>N</i> , | The AppleTalk node number of the LocalTalk interface |
| ET node <i>N</i> , | The EtherTalk Phase 1 node number of the Ethernet interface. |
| ET2.0 net <i>N</i> | The EtherTalk Phase 2 network number chosen from a specified range for this gateway. If this is a non-seed gateway, the network number will be in the startup range. When the gateway acquires a network number that is valid for the cable, it will send another diagnostic. |
| ET2.0 node <i>N</i> | The EtherTalk Phase 2 node number of the Ethernet interface. |
| <i>N</i> buffers | The number of buffers in the gateway. |
| (<i>N</i> for ethernet) | The number of buffers that are dedicated to the Ethernet chip. |
| revision <i>string</i> | The version number of the K-STAR module. This should be "8.0" for K-STAR Version 8.0. |
| Option Flags: <i>string</i> | The option flags that have been turned on in the Options dialog box. If no options are turned on, <i>string</i> is "none." |

REQUIRES PROM VERSION 4.1 OR GREATER!!

If you download K-STAR Version 8.0 to an earlier revision of the gateway hardware (that is, a FastPath 1, 2, or 3) with PROMs earlier than version 4.1, you will see this message. These hardware units cannot support this release of K-STAR.

Ethernet initialization

These messages indicate a problem with the Ethernet interface.

Ethernet transmission error:*X*

This message means that an attempt to transmit on Ethernet was aborted. *X* is a hexadecimal code taken from the Intel 82586 Ethernet controller. The hexadecimal codes can be any of the following:

- | | |
|------|--|
| 8020 | This indicates excess collisions on Ethernet, and probably a very high traffic rate, perhaps a network test in progress. If this message appears frequently, it can indicate a problem with the transceiver or transceiver cabling. This code also indicates that the transceiver in use does not have the "heartbeat" test. |
| 8060 | The same as above (status 8020), if the transceiver in use has the "heartbeat" test. |
| 8400 | This probably indicates that the transceiver cable is disconnected or loose. |
| 8420 | This probably indicates that the Ethernet cable is not terminated or not connected to the transceiver. This code also indicates that the transceiver in use does not have the "heartbeat" test. |
| 8460 | The same as above (status 8420), if the transceiver in use has the "heartbeat" test. |

If you are connecting to a broadband network and you consistently see an Ethernet transmission error message, try selecting Option flag 2. See Appendix B for a description of setting Options. If you see an Ethernet transmission error message while configuring a gateway with a LocalTalk connection only (and the network selection switch is pushed toward the transceiver connection), you can ignore it until the gateway has been connected to Ethernet.

i82586 NOT RESPONDING

This indicates that the gateway code cannot communicate with the Ethernet controller chip.

Check the slide switch on the back panel to make sure that it is set to the connector that is actually attached to an Ethernet cable. Also, check that the Ethernet cable is properly terminated. If this error recurs despite a correct switch setting and proper network termination, contact your dealer as described in the chapter on "Troubleshooting."

i82586 TRANSMITTER HUNG

This message appears when the gateway's Ethernet controller chip cannot transmit. Check the slide switch on the back panel to make sure it is set to the connector that is actually attached to an Ethernet cable. Also, check that the Ethernet cable is properly terminated. If this error recurs despite a correct switch setting and proper network termination, contact your dealer as described in the chapter on "Troubleshooting."

AppleTalk

These messages are related to the AppleTalk protocols. They can appear when you are configuring the gateway, or if a problem develops after the gateway is up and running on the AppleTalk internet. You can see the messages relating to AppleTalk Phase 2 or Option 17 only when the gateway is running K-STAR.

Autoconfiguration

The autoconfiguration messages are related to both the PROM-resident AppleTalk protocols, and the K-STAR AppleTalk protocols if you have downloaded K-STAR and clicked Go. They occur only when the gateway is autoconfiguring.

Auto-configured *interface* net number N (0xX)

This message appears when AppleTalk autoconfiguration has successfully assigned a network number for a non-extended interface.

interface If the gateway is autoconfiguring using PROM-resident code, *interface* could be ATALK or ETALK, if it is autoconfiguring using K-STAR AppleTalk Phase 2 code, *interface* is LTALK.

N The network number in decimal (0xX is the same number in hex notation).

Auto-configured ETALK2 range N (0xX) - N (0xX)

This message appears when K-STAR AppleTalk Phase 2 autoconfiguration has successfully assigned a network range to the Ethernet interface.

$N - N$ The network range in decimal (0xX is the same range in hex notation).

Loop found. Restarting auto-config for *interface*

This message can appear when the gateway is autoconfiguring and finds a loop in the network design. Another bridge or gateway on the same network has reported a network number that conflicts with a network number that the gateway was trying to assign. This indicates that your hardware configuration includes a loop, allowing the gateway to reach a network through both its LocalTalk and its Ethernet interfaces. Such a loop is permissible with manual configuration, but not with the autoconfiguration feature.

interface If the gateway is autoconfiguring using PROM-resident code, *interface* could be ATALK or ETALK, if it is autoconfiguring using K-STAR AppleTalk Phase 2 code, *interface* is either LTALK or ETALK2.

If this message appears while the gateway is autoconfiguring, configure the gateway manually (see Chapter 2 for details on AppleTalk Phase 2 configuration).

Restarting auto-config for *interface*

The automatic configuration software has found a conflict with a network number that it assigned to an interface. The software begins the autoconfiguration process again for this interface.

interface If the gateway is autoconfiguring using PROM-resident code, *interface* could be ATALK or ETALK, if it is autoconfiguring using K-STAR AppleTalk Phase 2 code, *interface* is either LTALK or ETALK2.

Node-finding

These messages are related to both the PROM-resident AppleTalk protocols, and the K-STAR AppleTalk protocols if you have downloaded K-STAR and clicked Go. They appear when the gateway is acquiring its node number and beginning to communicate on the AppleTalk internet.

ALL NODE NUMBERS IN USE ON ETHERNET FOR NET *N*, STILL TRYING

AppleTalk automatically assigns node numbers to devices on the network. This message indicates that the gateway has been unable to acquire a valid AppleTalk node number on its Ethernet interface.

N A valid network number for the cable, or a network number in the startup range.

The maximum number of nodes for EtherTalk Phase 1 is 254. The gateway first tries to acquire a node number in the server

range (128-254); if this fails because these node numbers were already assigned, the gateway tries to acquire a node number in the non-server range. If both fail, you will see this message.

The maximum number of nodes for EtherTalk Phase 2 depends on the network range. If Ethernet is configured for AppleTalk Phase 2, the gateway will try to acquire a valid node number (first in the server range, then in the non-server range) on a given net before moving on to the next net if no nodes are available. It will cycle through all of the valid network numbers for the cable until it finds an unused node number to acquire.

If you see this message in the Diagnostics window of the FastPath Manager,

- Check whether the network is near the maximum number of nodes.
- If the network is not near the limit, then one or more nodes might be responding incorrectly to the gateway's address inquiry packets. Attach an Ethernet monitor, such as the Excelan LANalyzer system, to inspect the response packets.

LocalTalk net number is in the startup range.
Ignoring configuration.

The network numbers 65,280—65,534 are reserved for the AppleTalk Phase 2 startup range, and cannot be assigned to a network. If you see this message, you need to reconfigure the LocalTalk network number. If you do not reconfigure the network number, the gateway will act as a non-seed router on this interface.

Ethernet Phase 1 net number is in the startup range.
Ignoring configuration.

The network numbers 65,280—65,534 are reserved for the AppleTalk Phase 2 startup range, and cannot be assigned to a network. If you see this message, you need to reconfigure the EtherTalk Phase 1 network number. If you do not reconfigure the network number, the gateway will act as a non-seed router on this interface.

Ethernet Phase 2 range is in the startup range.
Ignoring configuration.

The network numbers 65,280—65,534 are reserved for the AppleTalk Phase 2 startup range, and cannot be assigned to a network. If you see this message, you need to reconfigure the EtherTalk Phase 2 network range. If you do not reconfigure the network number, the gateway will act as a non-seed router on this interface.

Ethernet Phase 2 range start is greater than range end. Setting range to $N - N$

The EtherTalk Phase 2 network range must be a contiguous range of decimal numbers; for example, 1-10. If you accidentally enter a larger number in the “range start” field than the number you enter in the “range end” field, you will see this message. K-STAR will automatically set the range to the “start range” number in both fields. You should return to the main configuration dialog box and reconfigure the network range correctly.

Option 17 is on, but the range is too wide. Setting range to $N - N$

When Option 17 is on, the gateway is running the transition bridge software. This requires that the network range be limited to only one element. If you entered a wider network range, K-STAR will automatically set the range to the “range start” number in both fields. If you did not intend to run the transition bridge software, open the FastPath Manager and turn off Option 17.

Option 17 is on, but there is more than one zone name. Using only the default zone name.

When Option 17 is ON, the gateway is running the transition bridge software. This requires that the zone list be limited to only one element. If you entered a list of more than one zone

name, K-STAR will automatically use only the name you selected as the default zone name. If you did not intend to run the transition bridge software, open the FastPath Manager and turn off Option 17.

RTMP

These messages are related to the Routing Table Maintenance Protocol supported by both the PROM-resident AppleTalk protocols and the K-STAR AppleTalk protocols. They appear when the gateway has acquired its addresses, or when it has encountered a conflict in AppleTalk addressing.

Bad RTMP format, port *interface*

This message indicates that at least one gateway or host on the internet is running bridge software that predates Apple's introduction of EtherTalk. In this case, you should update the software on the offending host.

interface If the gateway is using PROM-resident code, *interface* could be ATALK or ETALK, if it is using K-STAR AppleTalk code, *interface* is either LTALK or ETALK1.

Warning: option 17 is not on but there is a Phase 1 router present on port LTALK

This message indicates that there is at least one Phase 1 router on the LocalTalk interface. In this case, you need to use the transition bridge software. See Chapter 2 for instructions on configuring a transition bridge.

ETALK2 seeded as range *N-N*, and chose net *N*

This message indicates that the gateway has acquired its extended network address from a previously configured gateway on Ethernet.

- range *N-N* The network range seeded on the EtherTalk Phase 2 interface.
- chose net *N* The network number chosen for the gateway. *N* will be one of the networks in the network range.

interface seeded as net *N*

This message indicates that the gateway has acquired its non-extended network number from a previously configured gateway on the specified interface.

- interface* The interface, either LTALK or ETALK1.
- N* The network number acquired by the gateway.

Mismatched net numbers: local=*N*; *N* reported on *interface*

This message indicates a configuration error, in that all bridges and gateways on the internet must agree about the network number for a given network. It means the gateway received a routing packet from a bridge or gateway that disagrees about the network number on the indicated interface.

- local=*N* The AppleTalk network number of *interface*.
- N* reported The conflicting network number reported by another gateway or bridge on *interface*.
- interface* If the gateway is using PROM-resident code, *interface* could be ATALK or ETALK, if it is using K-STAR AppleTalk code, *interface* is either LTALK or ETALK1.

Mismatched range numbers: local= $N-N$; N reported on ETALK2

This message indicates a configuration error, in that all bridges and gateways on the internet must agree about the network range for a given network. It means the gateway received a routing packet from a bridge or gateway on Ethernet that reports a network number that is not in the valid range for that cable.

local= $N-N$ The network range of the Ethernet interface.

N reported The network number reported by another gateway or bridge that is not in the valid range for this cable.

WARNING: *interface* has not acquired a net number

This message can occur when you are manually configuring the gateway using the "seeding" feature. This message means that the gateway was unable to find a configured gateway to acquire the necessary configuration data.

interface If the gateway is using PROM-resident code, *interface* could be ATALK or ETALK, if it is using K-STAR AppleTalk code, *interface* is either LTALK or ETALK2.

If you see this message, you can explicitly supply the required data instead of using seeding. (See Chapter 2 for information on AppleTalk Phase 2 and Phase 1 configuration.)

Range $N - N$ went down

or

Net N went down

$N - N$ An AppleTalk Phase 2 network range.
 N An AppleTalk network number.

This message can appear when the gateway has not received any recent routing table update information for the indicated network. This implies an absence of communication between the remote network and the local network and it can indicate a broken or disconnected cable.

Check the bridge or gateway connected to the specified network to see if it is turned off, reconfigured, disconnected from the internet, or down due to a hardware fault. If none of these is the fault, check the local gateway to see if it is disconnected from the network or is no longer receiving packets due to a cabling or transceiver problem.

This message can also occur when there is consistently heavy traffic on the Ethernet and the gateway is unable to collect RTMP packets because of limited buffer space.

ZIP

These messages are related to the Zone Information Protocol, which is implemented in both the PROM-resident AppleTalk protocols and the K-STAR AppleTalk protocols. They can be generated by the gateway when it receives zone information from other gateways or bridges on the internet.

Conflicting information: local default zone = *string*;
string reported on ETALK2

string The conflicting zone name (a character string).

The gateway has detected inconsistent zone names on the internet. This can also mean that the gateways on Ethernet disagree about the default zone (the same zone was not selected as the default zone in each gateway on Ethernet). Check the zone names in the gateways on Ethernet. When you find the inconsistency, change it to match the zone information in all the other gateways on Ethernet.

When you change zone information in an AppleTalk Phase 2 gateway configuration, you need to download K-STAR to that gateway again. In addition, you should leave the gateway off

the internet (i.e., in a paused state) for at least a full 10 minutes (or more, if the internet is very large), to give ZIP time to stop propagating the old zone information.

Warning: option 17 is on and there is more than one zone name for net *N*

When Option 17 is on, the gateway is running the transition bridge software. This software requires that the AppleTalk Phase 2 network must observe the constraints of a non-extended network; that is, the network range and zone list must each contain only one element.

To solve this problem, return to the main configuration dialog box and reconfigure the EtherTalk Phase 2 interface with only one zone name. When you change zone information in an AppleTalk Phase 2 gateway configuration, you need to download K-STAR to that gateway again. In addition, you should leave the gateway off the internet (i.e., in a paused state) for at least a full 10 minutes (or more, if the internet is very large), to give ZIP time to stop propagating the old zone information.

Warning: there is more than one zone name for net *N* but there are AppleTalk Phase 1 routers present

The gateway is configured with more than one zone name, but it is not configured correctly for the transition bridge software (Option 17). If there is an AppleTalk Phase 1 router on the LocalTalk network, the EtherTalk Phase 2 configuration must observe the constraints of a non-extended network; that is, the network range and zone list must each contain only one element, and Option 17 must be enabled.

To solve this problem, reconfigure the gateway with only one zone name, and (if necessary) turn on Option 17, as described in Chapter 2. When you change zone information in an AppleTalk Phase 2 gateway configuration, you need to download K-STAR to that gateway again. In addition, you should leave the gateway off the internet (i.e., in a paused state) for at least a full

10 minutes (or more, if the internet is very large), to give ZIP time to stop propagating the old zone information.

WARNING: received zip reply with invalid character
in zone name

Another bridge or gateway has sent a ZIP packet with an illegal character in the zone name. The gateway considers a character invalid in a zone name if its ASCII value is less than hex 20 or equal to hex 7F. In this case, you should locate the offending gateway and fix the zone names in use on its networks. In addition, you should leave the gateway off the internet (i.e., in a paused state) for at least a full 10 minutes (or more, if the internet is very large), to give ZIP time to stop propagating the old zone information.

WARNING: invalid character in zone name converted to
character

character A legal printing character (\geq hex 20, \neq 7F).

The gateway considers a character invalid in a zone name if its ASCII value is less than hex 20 or equal to hex 7F. K-STAR has detected an illegal character in a zone name and converted it to a legal character.

WARNING: zip bringup found invalid character in zone
name

A node has disabled a zone and, in re-enabling it, has sent a ZIP packet with an illegal zone name. The gateway considers a character invalid in a zone name if its ASCII value is less than hex 20 or equal to hex 7F. In this case, you should locate the offending gateway and fix the zone names in use on its networks. In addition, you should leave the gateway off the internet (i.e., in a paused state) for at least a full 10 minutes (or more, if the internet is very large), to give ZIP time to stop propagating the old zone information.

IP

The gateway can generate these messages when it is running K-STAR and is configured for K-STAR IP routing.

Address resolution: ARP

The Address Resolution Protocol resolves IP addresses into hardware addresses on the IP internet. These messages occur when the gateway encounters duplicate IP or hardware address.

DUP IP ADDRESS *string*, sent from: X.X.X.X.X.X

This message means that the gateway has come up on the IP internet and the address resolution module has detected its IP address attributed to another node.

string The duplicated IP address (in decimal dot notation).

X.X.X.X.X.X The 6-byte Ethernet address (in hex) of the node that sent the packet containing the duplicated address.

DUPLICATE HARDWARE ADDRESS: X.X.X.X.X.X

This message means that the gateway has come up on Ethernet and ARP has detected its Ethernet address attributed to another node.

X.X.X.X.X.X The 6-byte duplicated Ethernet address (in hex).

The gateway restarts continually until the misconfigured address is corrected. In earlier models of the gateway (and earlier versions of the FastPath Manager), you could modify the last three bytes of the Ethernet Address field. If the internet contains such a gateway (or other hardware with modifiable Ethernet addresses), modify the Ethernet address field that is duplicated. Note that the FastPath 4 gateway obtains its Ethernet address from PROM, and it is not modifiable.

Atalkad

Atalkad: RESTART

When the gateway uses an administrator host to acquire its configuration data, it will display this message when it has been restarted by the remote daemon.

K-STAR atalkatab configuration complete

When the gateway is accessing an administrator host to acquire its configuration data, it will display this message when it has successfully acquired its configuration data.

Warning: net *N* for interface *interface* is in the startup range.

This message is displayed when the gateway receives a net number from atalkad which is in the startup range (65,280 - 65,534). The gateway will use this information to configure itself, but the routing will not work properly. You should choose new net numbers from the range 1-65,279, change the atalkatab file, and issue an atalkad restart command.

DECnet

These messages can be generated when you have configured the gateway for K-STAR DECnet routing in a working DECnet area.

DECnet routing on, my address = *N.N*

This is the startup message you will see when you have configured the gateway for DECnet routing.

N.N The gateway's DECnet address (its area number and node number).

Warning: unable to register multicast address X X X
X X X

The gateway is unable to register a multicast address for its own Ethernet chip.

X.X.X.X.X.X The 6-byte Ethernet address (in hex).

unknown decnet pkt from *interface*

The gateway has received what it thinks is a DECnet packet, but it does not understand the DECnet header in the packet.

interface The interface, either LTALK or ETALK1.

If the packet is from Ethernet, the first 34 bytes of the packet will be dumped out in hexadecimal notation.

decnet - too many hops

The gateway has received a packet that has exceeded the maximum number of hops allowed on Ethernet, and has dropped the packet. There is probably a faulty router somewhere on the DECnet internet.

decnet - wrong area

The gateway is attempting to route a DECnet packet that is destined for an area other than the gateway's area, and it does not find a Level-2 DECnet "area" router to which it can send the packet. Depending on information in the packet, it will either return the packet or drop it.

decnet - no route to addr X

The gateway is attempting to route a DECnet packet to the specified address and it cannot locate the node. Depending on information in the packet, it will either return the packet or drop it.

X The 16-bit hexadecimal area, node number in hexadecimal.

decnet - no valid route.

The gateway is attempting to route a DECnet packet to a DECnet address that has timed out, and there are no other available routers. The target node will be invisible until the gateway receives a routing packet pointing to the target node.

got routing pkt from unknown router at addr X

The gateway has received a packet from a DECnet router before hearing its "Hello" packet. You can usually ignore this message. If it keeps occurring, you should investigate the router at address X.

X The 16-bit hexadecimal area, node number in hexadecimal.

decnet data() - wrong version

A version of DECnet that is not recognized by the gateway is running on the Ethernet.

bad DECnet checksum

A routing packet with a bad checksum was received. This message can indicate that an incompatible version of DECnet is being used on the network.

IP Subsectioning

This message appears only if the gateway is configured for the IP Subsectioning method using the gateway's PROM-resident IP code. It will not appear if K-STAR has been downloaded.

IP setup error X

There is an error in the IP routing configuration, so the gateway has disabled IP routing. X is a hexadecimal number indicating one or more specific errors. This number is the ORed product of the applicable error codes described below:

- | | |
|------|--|
| 0002 | The shift and mask parameters put the subnet field out of the host portion for a class A network. |
| 0004 | The shift and mask parameters put the subnet field out of the host portion for a class B network. |
| 0008 | The shift and mask parameters put the subnet field out of the host portion for a class C network. |
| 0010 | You have chosen an illegal IP network number. The first byte of the address cannot be zero or 255. |
| 0020 | You have chosen an IP broadcast address for either the LocalTalk or the Ethernet side of the gateway. The host portion of the address cannot be all zeros or all ones. |
| 0040 | The IP subnet address does not agree with network number of the LocalTalk side. |
| 0080 | The IP subnet mask is too large. It cannot be more than 16 bits long. |
| 0100 | You have defined an illegal subnet. The subnet mask cannot extend its zeros into the network portion of the IP address. |

Kinetics FastPath Management Information Base for SNMP

THIS VERSION OF K-STAR INCLUDES THE SIMPLE NETWORK Management Protocol (SNMP) and a Kinetics FastPath Management Information Base (MIB). The Kinetics FastPath MIB is a virtual information store providing access to managed objects. It consists of defined (declared) variables stored in the gateway. The values of these variables can then be accessed using network management tools to obtain network statistics.

It should be noted that, at this release, Kinetics does not support network management tools for accessing the data stored in the Kinetics FastPath MIB. However, the MIB provides a standardized mechanism for accessing network management data in the gateway, which will be supported in the future by Kinetics network management products.

The Kinetics FastPath MIB is defined in this Appendix, along with relevant structural definitions and object descriptions from the RFCs listed opposite.

Related RFCs

The following references are companion RFCs (Requests for Comment) that describe SNMP and the MIB structures. These RFCs are recommended reading for thorough understanding of the MIB and how it can be used with network management tools.

- Rose, M., McCloghrie, K., *Structure and Identification of Management Information for TCP/IP-based Internets*, RFC 1065, August 1988. This RFC provides the common definitions for the structure and identification of management information for TCP/IP-based internets.
- McCloghrie, K., Rose, M., *Management Information Base for Network Management of TCP/IP-based Internets*, RFC 1066, August 1988. This RFC provides the initial version of the Management Information Base (MIB) for use with network management protocols in TCP/IP-based internets in the short-term.
- Case, J., Fedor, M., Schoffstall, M., Davin, J., *A Simple Network Management Protocol*, RFC 1067, August 1988. This RFC defines a simple protocol by which management information for a network element may be inspected or altered by logically remote users.

These RFCs are available from the DDN Network Information Center (NIC), SRI International, 333 Ravenswood Avenue, Room EJ291, Menlo Park, CA 94025 for \$5.00 each (\$10.00 for RFCs longer than 100 pages). The NIC telephone number is (415) 859-3695. These RFCs are also available via e-mail or ftp if you have access to the DDN networks. The UNIX e-mail address is operators@sri-nic.arpa.

Managed objects

An **object type** is a definition (declarative in nature) of a kind of managed object; for example, a “routing table entry” object type. A collection of object types is defined in the first internet MIB (RFC 1066), and additional object types are defined in the Kinetics FastPath MIB, as described in the section on “Definitions” below.

The means of referencing actual values bound to these object types, or object instances (for example an actual routing table entry, bound to the routing table entry object type) is not defined in the MIB; this is handled by SNMP.

Objects defined in the MIB are referenced in two ways:

- A unique, mnemonic, printable string describing the object’s type (called the **OBJECT DESCRIPTOR**) intended to be a clear label for people reading the MIB and writing user interfaces that will access instances of that object.
- A unique sequence of integers (called the **OBJECT IDENTIFIER**). The object identifier specifies the object’s location in the global tree structure shown in Figure D-1 below.

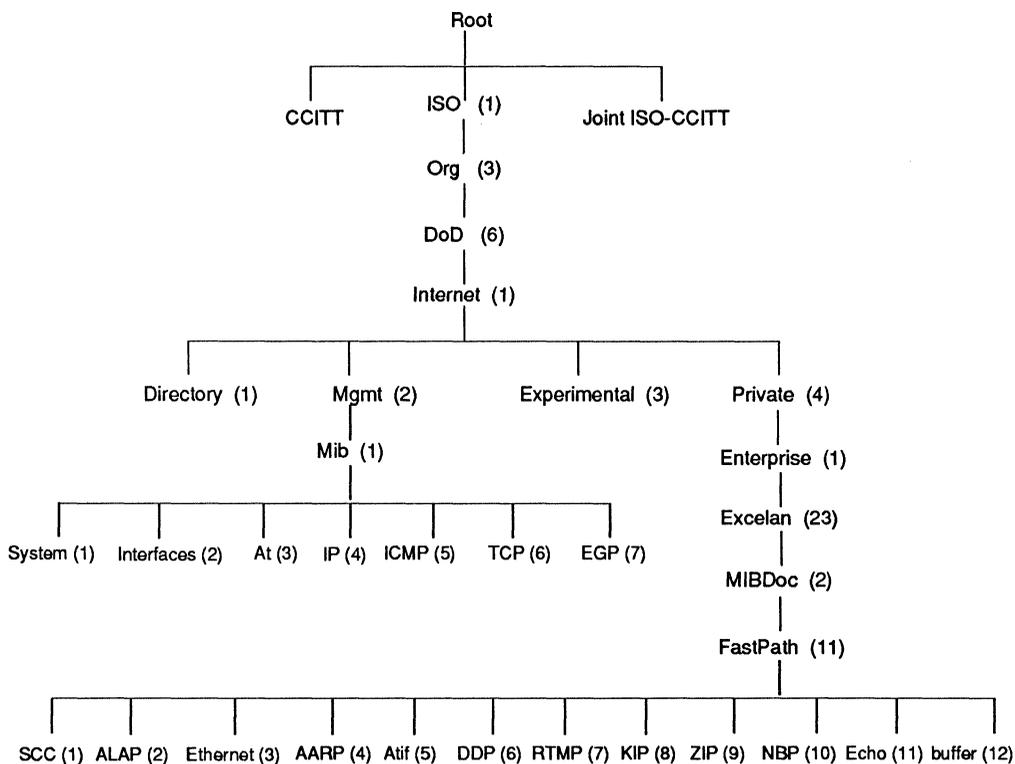


Figure D-1. Global object identifier tree

The “Internet” subtree of object identifiers starts with the prefix:

1.3.6.1.

and initially contains four nodes: Directory (1), Mgmt (2), Experimental(3), and Private(4). The “path” to one of these nodes, for example, the Private(4), can be represented as integers or strings. For example,

1.3.6.1.4

is the equivalent of

ISO.Org.DoD.Internet.Private

or any combination of the two, for example,

1.3.DoD.Internet.4

The Private(4) subtree is used to identify objects defined unilaterally. Initially, this subtree has at least one child, Enterprises (1). Below the Enterprises subtree is the Kinetics MIB (Kinetics(23)). An object identifier prefix for an object type defined in the Kinetics FastPath MIB is:

1.3.6.1.4.1.23.2.11

Object type syntax

The syntax for an object type defines the abstract data structure (using a restricted set of ASN.1 constructs) that corresponds to that object type.

Only the following ASN.1 primitive types (sometimes referred to as non-aggregate types) are permitted:

| | |
|---------------------|--|
| INTEGER | ASN.1 integer. |
| OCTET STRING | An indefinite-length string of 8-bit bytes (octets). |
| OBJECT IDENTIFIER | An identifier for a particular object, encoded as a unique sequence of integers. |
| NULL | A valueless placeholder. |
| Enumerated INTEGERS | If an enumerated INTEGER is listed as an object type, then a named- number having the value 0 shall not be present in the list of enumerations. Use of this value is prohibited. |
| NetworkAddress | This represents an address from one of possibly several protocol families. |

| | |
|-----------|---|
| IpAddress | This application-wide type represents a 32-bit internet address. It is represented as an OCTET STRING of length 4, in network byte-order. |
| Counter | This application-wide type represents a non-negative integer which monotonically increases until it reaches a maximum value, when it wraps around and starts increasing again from zero. RFC 1065 specifies a maximum value of $2^{32}-1$ (4294967295 decimal) for counters. |
| Gauge | This application-wide type represents a non-negative integer, which may increase or decrease, but which latches at a maximum value. This memo specifies a maximum value of $2^{32}-1$ (4294967295 decimal) for gauges. |
| TimeTicks | This application-wide type represents a non-negative integer which counts the time in hundredths of a second since some epoch. When object types are defined in the MIB which use this ASN.1 type, the description of the object type identifies the reference epoch. |
| Opaque | This application-wide type supports the capability to pass arbitrary ASN.1 syntax. A value is encoded using the ASN.1 basic rules into a string of octets. This, in turn, is encoded as an OCTET STRING, in effect "double-wrapping" the original ASN.1 value. (Note that this Kinetics implementation only accepts and recognizes opaquely-encoded data; it does not unwrap the data and then interpret its contents. This is in accordance with the standard definition. Further note that by use of the ASN.1 EXTERNAL type, encodings other than ASN.1 may be used in opaquely-encoded data.) |

Kinetics FastPath MIB definitions

Managed objects are accessed via a virtual information store, termed the Management Information Base or MIB. Objects in the MIB are defined using Abstract Syntax Notation One (ASN.1) [9]. This section defines a list of managed objects for the Kinetics FastPath gateway.

Objects

The mechanisms used for describing these objects are specified in RFC 1065, which defines a Structure for Management Information (SMI) for use by the managed objects contained in the MIB. In particular each object defined has a name, a syntax, and an encoding. The name is an object identifier, an administratively assigned name, which specifies an object type. The object type together with an object instance serves to uniquely identify a specific instantiation of the object. For human convenience, we often use a textual string, termed the OBJECT DESCRIPTOR, to also refer to the object type.

The syntax of an object type defines the abstract data structure corresponding to that object type. The ASN.1 language is used for this purpose. However, the SMI purposely restricts the ASN.1 constructs which may be used. These restrictions are explicitly made for simplicity.

The encoding of an object type is simply how that object type is represented using the object type's syntax. Implicitly tied to the notion of an object type's syntax and encoding is how the object type is represented when being transmitted on the network. This section specifies the use of the basic encoding rules of ASN.1.

Object Groups

Since this list of managed objects contains only the essential elements, there is no need to allow individual objects to be optional. Rather, the objects are arranged into the following groups:

SCC
ALAP
Ethernet
AARP
Atif
DDP
RTMP
KIP
ZIP
NBP
Echo
buffer

There are two reasons for defining these groups: one, to provide a means of assigning object identifiers; two, to provide a method for implementations of managed agents to know which objects they must implement. This method is as follows: if the semantics of a group is applicable to an implementation, then it must implement all objects in that group. For example, an implementation must implement the KIP group if and only if it implements the KIP protocol.

Format of Definitions

The next section contains the specification of all object types contained in the MIB. Following the conventions of the RFC 1065, the object types are defined using the following fields:

- OBJECT :** A textual name, termed the OBJECT DESCRIPTOR, for the object type, along with its corresponding OBJECT IDENTIFIER.
- Syntax :** The abstract syntax for the object type, presented using ASN.1. This must resolve to an instance of the ASN.1 type ObjectSyntax defined in RFC 1065.
- Definition :** A textual description of the semantics of the object type. Implementations should ensure that their interpretation of the object type fulfills this definition since this MIB is intended for use in multi-vendor environments. As such it is vital that object types have consistent meaning across all machines.
- Access :** One of read-only, read-write, write-only, or not-accessible.
- Status :** One of mandatory, optional, or obsolete.

Object Definitions

FASTPATH-MIB {private(4) enterprises(1) excelan(23) mibDoc(2) fastpath(11)}

```
DEFINITIONS ::= BEGIN
IMPORTS
    OBJECT-TYPE, NetworkAddress, IpAddress,
    Counter, Gauge, TimeTicks
FROM RFC1065-SMI;

excelan          OBJECT IDENTIFIER ::= { enterprises 23 }
mibDoc           OBJECT IDENTIFIER ::= { excelan 2 }
fastpath         OBJECT IDENTIFIER ::= { mibDoc 11 }
scc              OBJECT IDENTIFIER ::= { fastpath 1 }
alap             OBJECT IDENTIFIER ::= { fastpath 2 }
ethernet         OBJECT IDENTIFIER ::= { fastpath 3 }
aarp             OBJECT IDENTIFIER ::= { fastpath 4 }
atif             OBJECT IDENTIFIER ::= { fastpath 5 }
ddp              OBJECT IDENTIFIER ::= { fastpath 6 }
rtmp             OBJECT IDENTIFIER ::= { fastpath 7 }
kip              OBJECT IDENTIFIER ::= { fastpath 8 }
zip              OBJECT IDENTIFIER ::= { fastpath 9 }
nbp              OBJECT IDENTIFIER ::= { fastpath 10 }
echo             OBJECT IDENTIFIER ::= { fastpath 11 }
buffer           OBJECT IDENTIFIER ::= { fastpath 12 }
END
```

- The SCC Group

OBJECT: sccInterruptCount { scc 1 }
Syntax: Counter
Definition: The total number of receive interrupts on this interface.
Access: read-only
Status: mandatory

OBJECT: sccAbortCount { scc 2 }
Syntax: Counter
Definition: The total number of abort interrupts on this interface.
Access: read-only
Status: mandatory

OBJECT: sccSpuriousCount { scc 3 }
Syntax: Counter
Definition: The total number of spurious interrupts on this interface.
Access: read-only
Status: mandatory

OBJECT: sccCRCCount { scc 4 }
Syntax: Counter
Definition: The total number of CRC errors on this interface.
Access: read-only
Status: mandatory

OBJECT: sccOverrunCount { scc 5 }
Syntax: Counter
Definition: The total number of receive overrun errors on this interface.
Access: read-only
Status: mandatory

OBJECT: sccUnderrunCount{ scc 6 }
Syntax: Counter
Definition: The total number of receive underrun errors on this interface.
Access: read-only
Status: mandatory

- The ALAP Group

OBJECT: alapReceiveCount { alap 1 }
Syntax: Counter
Definition: The total number of good packets received on this LocalTalk interface.
Access: read-only
Status: mandatory

OBJECT: alapTransmitCount { alap 2 }
Syntax: Counter
Definition: The total number of packets transmitted on this LocalTalk interface.
Access: read-only
Status: mandatory

OBJECT: alapNoHandlerCount { alap 3 }
Syntax: Counter
Definition: The total number of packets received on this LocalTalk interface for which there was no protocol handler.
Access: read-only
Status: mandatory

OBJECT: alapLengthErrorCount { alap 4 }
Syntax: Counter
Definition: The total number of packets received on this LocalTalk interface whose actual length did not match the length in its header.
Access: read-only
Status: mandatory

OBJECT: alapBadCount { alap 5 }
Syntax: Counter
Definition: The total number of bad packets received on this LocalTalk interface.
Access: read-only
Status: mandatory

OBJECT: alapCollisionCount { alap 6 }
Syntax: Counter
Definition: The total number of collisions assumed on this LocalTalk interface.
Access: read-only
Status: mandatory

OBJECT: alapDeferCount { alap 7 }
Syntax: Counter
Definition: The total number of times this LocalTalk interface deferred to other packets.
Access: read-only
Status: mandatory

OBJECT: alapNoDataCount { alap 8 }
Syntax: Counter
Definition: The total number of times this LocalTalk interface received an RTS packet and expected a data packet, but did not receive any data packet.
Access: read-only
Status: mandatory

OBJECT: alapRandomCTS { alap 9 }
Syntax: Counter
Definition: The total number of times this LocalTalk interface received a CTS packet that was not solicited by an RTS packet.
Access: read-only
Status: mandatory

- The Ethernet Group

OBJECT: etherCRCErrors { ethernet 1 }
Syntax: Counter
Definition: The total number of CRC errors on this ethernet interface.
Access: read-only
Status: mandatory

OBJECT: etherAlignErrors { ethernet 2 }
Syntax: Counter
Definition: The total number of alignment errors on this ethernet interface.
Access: read-only
Status: mandatory

OBJECT: etherResourceErrors { ethernet 3 }
Syntax: Counter
Definition: The total number of errors due to lack of resources on this ethernet interface.
Access: read-only
Status: mandatory

OBJECT: etherOverrunErrors { ethernet 4 }
Syntax: Counter
Definition: The total number of overrun errors on this ethernet interface.
Access: read-only
Status: mandatory

OBJECT: etherInPackets { ethernet 5 }
Syntax: Counter
Definition: The total number of input packets on this ethernet interface.
Access: read-only
Status: mandatory

OBJECT: etherOutPackets { ethernet 6 }
Syntax: Counter
Definition: The total number of output packets on this ethernet interface.
Access: read-only
Status: mandatory

OBJECT: etherBadTransmits { ethernet 7 }
Syntax: Counter
Definition: The total number of transmission errors on this ethernet interface.
Access: read-only
Status: mandatory

OBJECT: etherOversizeFrames { ethernet 8 }
Syntax: Counter
Definition: The total number of oversize frame errors on this ethernet interface.
Access: read-only
Status: mandatory

OBJECT: etherSpurRUReadys { ethernet 9 }
Syntax: Counter
Definition: The total number of spurious RU Ready interrupts on this ethernet interface.
Access: read-only
Status: mandatory

OBJECT: etherSpurCUActives { ethernet 10 }
Syntax: Counter
Definition: The total number of spurious CU Active interrupts on this ethernet interface.
Access: read-only
Status: mandatory

OBJECT: etherSpurUnknown { ethernet 11 }
Syntax: Counter
Definition: The total number of unknown spurious interrupts on this ethernet interface.
Access: read-only
Status: mandatory

OBJECT: etherBcastDrops { ethernet 12 }
Syntax: Counter
Definition: The total number of broadcast packets dropped to free resources on this ethernet interface.
Access: read-only
Status: mandatory

OBJECT: etherReceiverRestarts { ethernet 13 }
Syntax: Counter
Definition: The total number of receiver restarts on this ethernet interface.
Access: read-only
Status: mandatory

OBJECT: etherReinterrupts { ethernet 14 }
Syntax: Counter
Definition: The total number of reinterrupts on this ethernet interface.
Access: read-only
Status: mandatory

OBJECT: etherBufferReroutes { ethernet 15 }
Syntax: Counter
Definition: The total number of buffers taken off of queues to service incoming packets on this ethernet interface.
Access: read-only
Status: mandatory

OBJECT: etherBufferDrops { ethernet 16 }
Syntax: Counter
Definition: The total number of buffers dropped on this ethernet interface.
Access: read-only
Status: mandatory

OBJECT: etherCollisions { ethernet 17 }
Syntax: Counter
Definition: The total number of collisions encountered on this ethernet interface.
Access: read-only
Status: mandatory

OBJECT: etherDefers { ethernet 18 }
Syntax: Counter
Definition: The total number of deferrals encountered on this ethernet interface.
Access: read-only
Status: mandatory

OBJECT: etherDMAUnderruns { ethernet 19 }
Syntax: Counter
Definition: The total number of DMA Underruns on this ethernet interface.
Access: read-only
Status: mandatory

OBJECT: etherMaxCollisions { ethernet 20 }
Syntax: Counter
Definition: The total number of packets dropped on this ethernet interface because they encountered more than 16 collisions.
Access: read-only
Status: mandatory

OBJECT: etherNoCarriers { ethernet 21 }
Syntax: Counter
Definition: The total number of no carrier errors experienced on this ethernet interface.
Access: read-only
Status: mandatory

OBJECT: etherNoCTS { ethernet 22 }
Syntax: Counter
Definition: The total number of no CTS errors experienced on this ethernet interface.
Access: read-only
Status: mandatory

OBJECT: etherNoSQEs { ethernet 23 }
Syntax: Counter
Definition: The total number of no SQE errors experienced on this ethernet interface.
Access: read-only
Status: mandatory

- The ARP Group

OBJECT: aarpTable { aarp 1 }
Syntax: SEQUENCE OF aarpEntry
Definition: The AppleTalk Address Resolution Table contains an equivalence of AppleTalk Network Addresses to the link layer "physical" address.
Access: read-write
Status: mandatory

OBJECT: aarpEntry { aarpTable 1 }
Syntax: aarpEntry ::= SEQUENCE {
 aarpIfIndex INTEGER,
 aarpPhysAddress OCTET STRING,
 aarpNetAddress OCTET STRING
}

Definition: Each entry contains one AppleTalk Network Address to "physical" address equivalence.

Access: read-write
Status: mandatory

OBJECT: aarpIfIndex { aarpEntry 1 }
Syntax: INTEGER
Definition: The interface on which this entry's equivalence is effective. The interface identified by a particular value of this index is the same interface as identified by the same value of ifIndex.

Access: read-only
Status: mandatory

OBJECT: aarpPhysAddress { aarpEntry 2 }
Syntax: OCTET STRING
Definition: The media-dependent "physical address."
Access: read-only
Status: mandatory

OBJECT: aarpNetAddress { aarpEntry 3 }
Syntax: OCTET STRING
Definition: The AppleTalk Network Address corresponding to the media-dependent "physical address."
Access: read-only
Status: mandatory

- The Atif Group

OBJECT: atifTable { atif 1 }
Syntax: SEQUENCE OF atifEntry
Definition: The description of one of the logical interfaces on this entity.
Access: read-write
Status: mandatory

OBJECT: atifEntry { atifTable 1 }
Syntax: atifEntry ::= SEQUENCE {
 atifIndex INTEGER,
 atifDescr OCTET STRING,
 atifType INTEGER,
 atifNetStart OCTET STRING,
 atifNetEnd OCTET STRING,
 atifNetAddress OCTET STRING
 atifStatus INTEGER,
 atifNetConfig INTEGER,
 atifZoneConfig INTEGER,
 atifZone OCTET STRING,
 atifIfIndex INTEGER
}

Definition: The description of one of the logical appletalk interfaces on this entity.
Access: read-write
Status: mandatory

OBJECT: atifIndex { atifEntry 1 }
Syntax: INTEGER
Definition: A unique value for each logical AppleTalk interface. Its value is between 1 and the total number of logical AppleTalk interfaces.
Access: read-only
Status: mandatory

OBJECT: atifDescr { atifEntry 2 }
Syntax: OCTET STRING
Definition: A text string containing information about the interface. This string is intended for presentation to a human; it must not contain anything but printable ASCII characters.
Access: read-only
Status: mandatory

OBJECT: atifType { atifEntry 3 }
Syntax: INTEGER {
 other(1), - none of the following
 localtalk(2),
 ethertalk1(3),
 ethertalk2(4),
 tokentalk(5),
 iptalk(6)
}
Definition: The type of interface, distinguished by the protocol immediately "below" DDP in the protocol stack.
Access: read-only
Status: mandatory

OBJECT: atifNetStart { atifEntry 4 }
Syntax: OCTET STRING
Definition: The first Appletalk network address in the range configured for this interface, or the single network number configured for this interface.
Access: read-write
Status: mandatory

OBJECT: atifNetEnd { atifEntry 5 }
Syntax: OCTET STRING
Definition: The last Appletalk network address in the range configured for this interface, or zero if a single network number is configured.
Access: read-write
Status: mandatory

OBJECT: atifNetAddress { atifEntry 6 }
Syntax: OCTET STRING
Definition: The Appletalk network address configured for this
 interface.
Access: read-write
Status: mandatory

OBJECT: atifStatus { atifEntry 7 }
Syntax: INTEGER {
 operational(1),
 unconfigured(2),
 off(3)
 }
Definition: The configuration status of this interface.
Access: read-only
Status: mandatory

OBJECT: atifNetConfig { atifEntry 8 }
Syntax: INTEGER {
 configured(1),
 garnered(2),
 guessed(3)
 unconfigured(4)
 }
Definition: The configuration status of the DDP network number(s)
 for this interface.
Access: read-only
Status: mandatory

OBJECT: atifZoneConfig { atifEntry 9 }
Syntax: INTEGER {
 configured(1),
 garnered(2),
 guessed(3)
 unconfigured(4)
 }
Definition: The configuration status of AppleTalk zone name(s)
 for this interface.
Access: read-only
Status: mandatory

OBJECT: atifZone { atifEntry 10 }
Syntax: OCTET STRING
Definition: The zone name configured for this logical interface.
 In Phase 2 networks, this is the "default" zone for
 this interface.
Access: read-write
Status: mandatory

OBJECT: atifIfIndex { atifEntry 11 }
Syntax: INTEGER
Definition: The physical interface associated with this logical
 interface. A particular value of this index
 identifies the same interface as is identified by the
 same value of ifIndex.
Access: read-write
Status: mandatory

- The DDP Group

OBJECT: ddpOutRequests { ddp 1 }
Syntax: Counter
Definition: The total number of DDP datagrams which were supplied
 to DDP in requests for transmission.
Access: read-only
Status: mandatory

OBJECT: ddpOutShort { ddp 2 }
Syntax: Counter
Definition: The total number of short DDP datagrams which were
 transmitted from this entity.
Access: read-only
Status: mandatory

OBJECT: ddpOutLong{ ddp 3 }
Syntax: Counter
Definition: The total number of long DDP datagrams which were
 transmitted from this entity.
Access: read-only
Status: mandatory

OBJECT: ddpReceived { ddp 4 }
Syntax: Counter
Definition: The total number of input datagrams received by DDP.
Access: read-only
Status: mandatory

OBJECT: ddpToForward { ddp 5 }
Syntax: Counter
Definition: The number of input datagrams for which this entity was not their final DDP destination, as a result of which an attempt was made to find a route to forward them to that final destination.
Access: read-only
Status: mandatory

OBJECT: ddpForwards { ddp 6 }
Syntax: Counter
Definition: The number of input datagrams for which this entity was not their final DDP destination, as a result of which they were forwarded to their final destination.
Access: read-only
Status: mandatory

OBJECT: ddpForMe { ddp 7 }
Syntax: Counter
Definition: The total number of input DDP datagrams for which this entity was their final DDP destination.
Access: read-only
Status: mandatory

OBJECT: ddpNoProtocolHandler { ddp 8 }
Syntax: Counter
Definition: The total number of DDP datagrams addressed to this entity that were addressed to an upper layer protocol for which no protocol handler existed.
Access: read-only
Status: mandatory

OBJECT: ddpOutNoRoutes { ddp 9 }
Syntax: Counter
Definition: The total number of DDP datagrams dropped because a route could not be found to their final destination.
Access: read-only
Status: mandatory

OBJECT: ddpTooShortDrops { ddp 10 }
Syntax: Counter
Definition: The total number of input DDP datagrams dropped because the received data length was less than the data length in the DDP header.
Access: read-only
Status: mandatory

OBJECT: ddpTooLongDrops { ddp 11 }
Syntax: Counter
Definition: The total number of input DDP datagrams dropped because they exceeded the maximum DDP datagram size or because their header size was greater than their length.
Access: read-only
Status: mandatory

OBJECT: ddpBroadcastDrops { ddp 12 }
Syntax: Counter
Definition: The total number of input DDP datagrams dropped because this entity was not their final destination and they were addressed to the link level broadcast.
Access: read-only
Status: mandatory

OBJECT: ddpShortDDPDrops { ddp 13 }
Syntax: Counter
Definition: The total number of input DDP datagrams dropped because this entity was not their final destination and their type was short DDP.
Access: read-only
Status: mandatory

OBJECT: ddpHopCountDrops { ddp 14 }
Syntax: Counter
Definition: The total number of input DDP datagrams dropped because this entity was not their final destination and their hop count would exceed 16.
Access: read-only
Status: mandatory

- The RTMP Group

OBJECT: rtmpTable { rtmp 1 }
Syntax: SEQUENCE OF rtmpEntry
Definition: This entity's RTMP table.
Access: read-write
Status: mandatory

OBJECT: rtmpEntry { rtmpTable 1 }
Syntax: rtmpEntry ::= SEQUENCE {
 rtmpRangeStart OCTET STRING,
 rtmpRangeEnd OCTET STRING,
 rtmpNextHop OCTET STRING,
 rtmpInterface INTEGER,
 rtmpHops INTEGER,
 rtmpState INTEGER
}

Definition: The route entry to a particular range of networks.
Access: read-write
Status: mandatory

OBJECT: rtmpRangeStart { rtmpEntry 1 }
Syntax: OCTET STRING
Definition: The first DDP network address in the range of networks that this routing entry pertains to, or the single network number that this routing entry pertains to. This is a two octet DDP network address.
Access: read-write
Status: mandatory

OBJECT: rtmpRangeEnd { rtmpEntry 2 }
Syntax: OCTET STRING
Definition: The last DDP network address in the range of networks that this routing entry pertains to, or zero if this routing entry pertains to a single network number. This is a two octet DDP network address.
Access: read-write
Status: mandatory

OBJECT: rtmpNextHop { rtmpEntry 3 }
Syntax: OCTET STRING
Definition: The next hop in the route to this entry's destination network.
Access: read-write
Status: mandatory

OBJECT: rtmpInterface { rtmpEntry 4 }
Syntax: INTEGER
Definition: The index of the logical appletalk interface over which this route points.
Access: read-write
Status: mandatory

OBJECT: rtmpHops { rtmpEntry 5 }
Syntax: INTEGER
Definition: The number of hops required to reach the destination network that this entry pertains to.
Access: read-write
Status: mandatory

OBJECT: rtmpState { rtmpEntry 6 }
Syntax: INTEGER {
 good(1),
 suspect(2),
 bad(3),
}

Definition: The status of the information contained in this route entry.
Access: read-write
Status: mandatory

- The KIP Group

OBJECT: kipTable { kip 1 }
Syntax: SEQUENCE OF kipEntry
Definition: The table of routing information for KIP networks.
Access: read-write
Status: mandatory

OBJECT: kipEntry { kipTable 1 }
Syntax: kipEntry ::= SEQUENCE {
 kipNet OCTET STRING,
 kipNextHop IPADDRESS,
 kipHopCount INTEGER,
 kipBCastAddr IPADDRESS,
 kipCore INTEGER,
 kipKfps INTEGER
}

Definition: An entry in the routing table for KIP networks.
Access: read-write
Status: mandatory

OBJECT: kipNet { kipEntry 1 }
Syntax: OCTET STRING
Definition: The appletalk network address for this routing entry.
Access: read-write
Status: mandatory

OBJECT: kipNextHop { kipEntry 2 }
Syntax: IPADDRESS
Definition: The IP address of the next hop for this routing entry.
Access: read-write
Status: mandatory

OBJECT: kipHopCount { kipEntry 3 }
Syntax: INTEGER
Definition: The distance in hops to the destination of this route.
Access: read-write
Status: mandatory

OBJECT: kipBCastAddr { kipEntry 4 }
Syntax: IPADDRESS
Definition: The form of the IP address used to broadcast on this network.
Access: read-write
Status: mandatory

OBJECT: kipCore { kipEntry 5 }
Syntax: INTEGER {
 core(1),
 notcore(2)
}
Definition: The status of this network as a Core network.
Access: read-write
Status: mandatory

OBJECT: kipKfps { kipEntry 6 }
Syntax: INTEGER {
 kfps(1),
 notkfps(2)
}
Definition: The type of the device that this network resides on.
Access: read-write
Status: mandatory

- The ZIP Group

OBJECT: zipTable { zip 1 }
Syntax: SEQUENCE OF zipEntry
Definition: The table of zone information for reachable AppleTalk networks.
Access: read-write
Status: mandatory

OBJECT: zipEntry { zipTable 1 }
Syntax: zipEntry ::= SEQUENCE {
zipZoneName OCTET STRING,
zipZoneIndex INTEGER,
zipNetStart OCTET STRING,
zipNetEnd OCTET STRING
}
Definition: An entry of zone information for a particular zone and network combination.
Access: read-write
Status: mandatory

OBJECT: zipZoneName { zipEntry 1 }
Syntax: OCTET STRING
Definition: The ASCII zone name of this entry.
Access: read-write
Status: mandatory

OBJECT: zipZoneIndex { zipEntry 2 }
Syntax: INTEGER
Definition: An integer that is unique to the zipZoneName that is present in this entry. For any given zone name, every zipEntry that has that zone name will have the same zipZoneIndex (in a given FastPath, as long as it has not been rebooted).
Access: read-only
Status: mandatory

OBJECT: zipZoneNetStart { zipEntry 3 }
Syntax: OCTET STRING
Definition: The network that starts the range for this entry, or the single network number for this entry.
Access: read-write
Status: mandatory

OBJECT: zipZoneNetEnd { zipEntry 4 }
Syntax: OCTET STRING
Definition: The network that ends the range for this entry, or zero if this entry refers to a single network number.
Access: read-write
Status: mandatory

- The NBP Group

OBJECT: nbpTable { nbp 1 }
Syntax: SEQUENCE OF nbpEntry
Definition: The table of NBP services registered on this entity.
Access: read-write
Status: mandatory

OBJECT: nbpEntry { nbpTable 1 }
Syntax: nbpEntry ::= SEQUENCE {
 nbpIndex INTEGER,
 nbpObject OCTET STRING,
 nbpType OCTET STRING,
 nbpZone OCTET STRING
}
Definition: The description of an NBP service registered on this entity.
Access: read-write
Status: mandatory

OBJECT: nbpIndex { nbpEntry 1 }
Syntax: INTEGER
Definition: The index of this NBP entry. This value ranges from 1 to the number of NBP entries registered on this entity.
Access: read-only
Status: mandatory

OBJECT: nbpObject { nbpEntry 2 }
Syntax: OCTET STRING
Definition: The name of the service described by this entity.
Access: read-write
Status: mandatory

OBJECT: nbpType { nbpEntry 3 }
Syntax: OCTET STRING
Definition: The type of the service described by this entity.
Access: read-write
Status: mandatory

OBJECT: nbpZone { nbpEntry 4 }
Syntax: OCTET STRING
Definition: The zone the service described by this entity is registered in.
Access: read-write
Status: mandatory

- The Echo Group

OBJECT: echoRequests { echo 1 }
Syntax: Counter
Definition: The number of echo requests received.
Access: read-only
Status: mandatory

OBJECT: echoReplies { echo 2 }
Syntax: Counter
Definition: The number of echo replies sent.
Access: read-only
Status: mandatory

- The Buffer Group

OBJECT: bufferSize { buffer 1 }
Syntax: INTEGER
Definition: The size of a buffer including the header.
Access: read-only
Status: mandatory

OBJECT: bufferAvail { buffer 2 }
Syntax: INTEGER
Definition: The total number of buffers initialized.
Access: read-only
Status: mandatory

OBJECT: bufferDrops { buffer 3 }
Syntax: Counter
Definition: The total number of requests for a buffer that were denied.
Access: read-only
Status: mandatory

OBJECT: bufferTypeTable { buffer 4 }
Syntax: SEQUENCE OF bufferTypeEntry
Definition: The information about each buffer type.
Access: read-only
Status: mandatory

OBJECT: bufferTypeEntry { bufferTypeTable 1 }
Syntax: bufferTypeEntry ::= SEQUENCE {
 bufferTypeIndex INTEGER,
 bufferType INTEGER,
 bufferTypeDescr OCTET STRING,
 bufferTypeCount INTEGER
}

Definition: The information about a buffer of this type.
Access: read-only
Status: mandatory

OBJECT: bufferTypeIndex { bufferTypeEntry 1 }
Syntax: INTEGER
Definition: The internal index of this type of buffer. This value ranges from 1 to the total number of buffer types defined on this entity.
Access: read-only
Status: mandatory

OBJECT: bufferType { bufferTypeEntry 2 }
Syntax: INTEGER {
 other(1),
 free(2),
 localtalk(3),
 ethernet(4),
 arp(5),
 data(6), - general data
 erbf(7), - ethernet receive
 etbf(8), - ethernet transmit complete
 malloc(9),
 tkbf(10), - token ring receive packet
 token(11) - token ring packet
}

Definition: The type of this type of buffer.
Access: read-only
Status: mandatory

OBJECT: bufferTypeDescr { bufferTypeEntry 3 }
Syntax: OCTET STRING
Definition: A printable ASCII text description of this type of buffer.
Access: read-only
Status: mandatory

OBJECT: bufferTypeCount { bufferTypeEntry 4 }
Syntax: INTEGER
Definition: The number of buffers of this type currently allocated.
Access: read-only
Status: mandatory

PROM-Resident Configuration: AppleTalk Phase 1

THIS APPENDIX DESCRIBES HOW TO CONFIGURE THE GATEWAY USING the AppleTalk Phase 1 protocols stored in the gateway's PROM.

PROM-resident AppleTalk Phase 1 performs standard Phase 1 routing just as K-STAR AppleTalk Phase 1 does, and the two Phase 1 implementations are fully compatible on an internet. Because it is contained in PROM, it is the default routing code used by the gateway if K-STAR has not been downloaded.



The gateway's PROM-resident IP implementation, previously referred to as the "IP Subnetting" configuration type, is supported in the FastPath 4 gateway for backward compatibility only, and is not described in this guide. In this version of the FastPath Manager, it is called "IP Subsectioning" to avoid confusion with standard IP subnetting. Note, however, that the PROM-resident code itself has not changed. Gateways configured with PROM-resident IP Subsectioning can operate on internets that also support K-STAR IP gateways, and K-STAR IP is the recommended method of IP configuration. If you are using the PROM-resident IP protocols, please refer to your existing documentation.

PROM-resident AppleTalk Phase 1

When the gateway is connected to LocalTalk and Ethernet and powered on, it follows the state diagram shown in Figure A-1 in Appendix A. After the initial 25-second waiting period, if the gateway does not find a valid gateway program, it begins execution of the PROM-resident AppleTalk Phase 1 protocols.

In this state, it identifies itself to the network, obtains a zone name from other gateways on one or both interfaces (or uses the zone name "Default Zone" for both interfaces), and begins routing AppleTalk Phase 1 network traffic.

If you do not need to supply any specific Phase 1 configuration data (such as network numbers or zone names that are meaningful for your site), you can follow the hardware installation procedure described in Chapter 1 and allow the gateway to autoconfigure. Simply connect the gateway to LocalTalk and Ethernet and power it on. The gateway will begin executing PROM-resident AppleTalk Phase 1 code without any interaction from the FastPath Manager.

Supplying configuration data

If you do need to supply specific configuration data, you can follow the rules and examples in this Appendix to configure the gateway's PROM-resident code for AppleTalk Phase 1 routing. **Just as in the K-STAR AppleTalk configurations, the gateway can acquire seed data if it finds another AppleTalk Phase 1 gateway (K-STAR or PROM-resident) on one or both of its interfaces.**



Remember that you never download K-STAR when using the PROM-resident configurations.

Addressing rules

The AppleTalk addressing rules for PROM-resident AppleTalk Phase 1 are the same as for K-STAR AppleTalk Phase 1.

- An AppleTalk zone name can be 1 to 32 characters, including embedded spaces. All gateways on the internet must agree about the zone name assigned to a particular network. Each interface can be assigned only one zone name.
- An AppleTalk network number can be any decimal number between 1 and 65,279. An AppleTalk network number must be unique to a cable (you can not repeat the number on more than one network), and all gateways must agree about what number is assigned to a particular cable.
- AppleTalk node numbers cannot be assigned explicitly; AppleTalk automatically assigns a node number when a device boots up.

Required configuration data

If you are supplying configuration data for the PROM-resident protocols, you should supply all of the following:

- One AppleTalk zone name for the gateway's LocalTalk interface.
- One AppleTalk network number for the gateway's LocalTalk interface.
- One AppleTalk zone name for the gateway's EtherTalk Phase 1 interface. ("EtherTalk" is AppleTalk on Ethernet.)
- One AppleTalk network number for the gateway's EtherTalk Phase 1 interface.

PROM-resident Phase 1 configuration

To supply a full Phase 1 configuration explicitly (that is, without using seed data from another gateway), first follow the general procedure outlined in Chapter 1. After connecting the gateway to a Macintosh via LocalTalk, launch the FastPath Manager, and select and open the gateway. In the main configuration dialog box,

- Click the Reset button, then open the gateway again.
- Click the Pause button.
- Enter the AppleTalk configuration data for the gateway's LocalTalk interface.
- Select ATalk Phase 1 from the Configuration menu and double-click on the ATalk Phase 1 listing in the Configuration area.
- Enter the AppleTalk configuration data for the gateway's EtherTalk Phase 1 interface.
- Click the Go button.
- Save the configuration data in a file (optional).



Note that you do not download K-STAR when using the PROM-resident protocols.

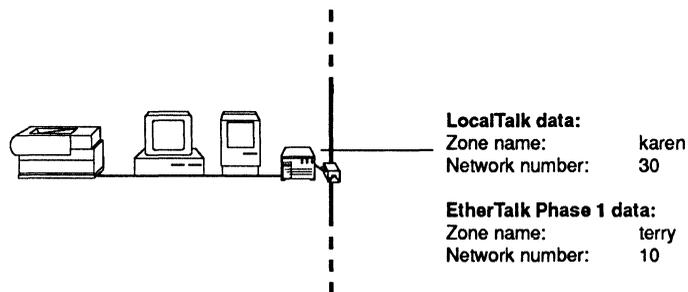


Figure E-1. A Phase 1 configuration

This example uses the data shown in Figure E-1:

| | |
|---------------------------------|-------|
| LocalTalk Interface Zone Name: | karen |
| LocalTalk Interface Net Number: | 30 |
| EtherTalk Phase 1 Zone Name: | terry |
| EtherTalk Phase 1 Net Number: | 10 |

After selecting Reset and then Pause,

1. Type **karen** in the AppleTalk Zone name field for the LocalTalk side, then press *tab*.
2. Type the net number for the LocalTalk side: **30**, then press *tab*.
3. Select ATalk Phase 1 from the Configuration menu and double-click the ATalk Phase 1 listing in the Configuration area. This opens the EtherTalk Phase 1 dialog box.
4. Type **terry** in the AppleTalk Zone name field in the EtherTalk Phase 1 dialog box, then press *tab*.
5. Type the net number for the EtherTalk Phase 1 interface: **10**, then press *tab*.
6. Click OK to return to the main configuration dialog box.
7. Click the Go button. The Go button sends the gateway all information that is currently in the FastPath Manager and tells the gateway to start executing code. Because you have not downloaded K-STAR, the gateway will start executing PROM code.
8. If you wish, select Save Configuration File... from the File menu and type a name for the configuration, then click the Save button to save the configuration file to disk.

At this point, turn off the gateway, unplug it, and move it to its permanent location on the internet.

Using seed data

When you add a second gateway to the Ethernet in this example it can acquire seed data on its Ethernet interface. Note that AppleTalk Phase 1 seeding works consistently whether one or both gateways are running K-STAR or PROM-resident AppleTalk Phase 1 code.

After connecting the gateway to a Macintosh via LocalTalk, launch the FastPath Manager, and select and open the gateway. In the main configuration window,

- Click the Reset button, then open the gateway again.
- Click the Pause button.
- Enter the AppleTalk zone name and network number required for the LocalTalk side of the gateway.
- Click the Go button.
- Save the configuration data in a file (optional).

This example assumes that gateway 2 is on the same Ethernet network as gateway 1, as shown in Figure E-2. Seeded data is shown in italic type.

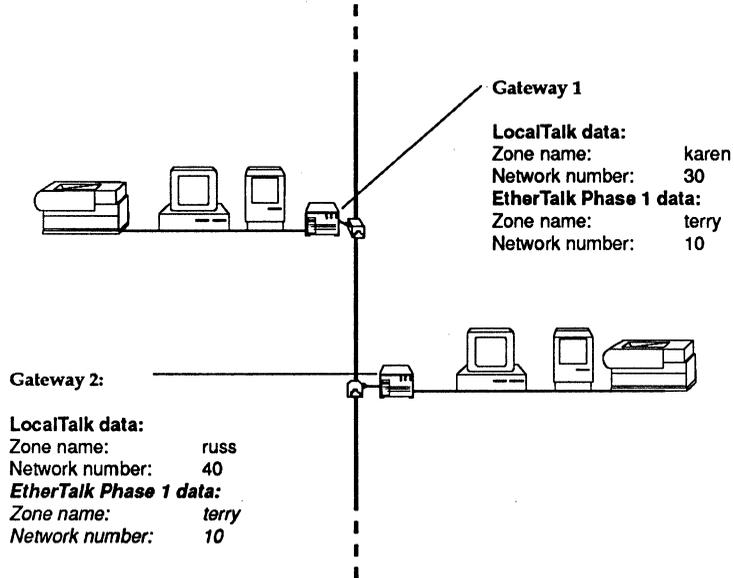


Figure E-2. Seeding on the Ethernet interface

This example uses the data shown in Figure E-2:

LocalTalk Side Zone Name: russ
LocalTalk Side Network Number: 40
Ethernet configuration: seeded from gateway 1

Because you only need to enter two data in this example, it may not be necessary to click Pause in the FastPath Manager; however, if you think it will take longer than 25 seconds from the initial Reset, click Pause anyway.

After selecting Reset (and Pause, if required),

1. Click in the AppleTalk Zone name field for the LocalTalk side and type russ, then press *tab*.
2. Type the net number for the LocalTalk side: 40, then press *tab*.
3. Click the Go button. After you select Go, the Diagnostics window displays in the foreground.
4. If you wish, select Save Configuration File... from the File menu and type a name for the configuration, then click the Save button to save the configuration file to disk.

At this point, turn off the gateway, unplug it, and move it to its permanent location on the internet.

Network Hardware Issues

IF YOU ARE CONFIGURING A LARGE INTERNETWORK, YOU NEED TO consider the physical limitations of each network based on electrical parameters, the total length of the cable, the number of devices connected to it, and the use of interconnection devices.

This Appendix discusses the physical restrictions imposed on network design by the medium you use to implement it.

Network size restrictions

AppleTalk networks are often implemented using LocalTalk cable (shielded, twisted pair wire manufactured by Apple Computer, Inc.), PhoneNET (unshielded, twisted pair wire manufactured by Farallon Computing, Inc.), or Fiber Optic System (fiber optic cable manufactured by DuPont). Each of these media has an upper limit on the length of cable and number of nodes that can be supported, as shown in Table F-1.

Table F-1. AppleTalk Network Size Restrictions

| Transmission Medium | Maximum Number of Nodes | Maximum Network Length* |
|---------------------|-------------------------|-------------------------|
| LocalTalk | 32 | 984 ft (300 meters) |
| PhoneNET | 32 | 2952 ft (900 meters) |
| Fiber Optic System | approx. 100 | 4,900 ft (1500 meters) |

*The maximum network length is the length of cable between repeaters or bridges, or per branch of a PhoneNET star configuration.

An Ethernet network can be implemented using thick Ethernet, thin Ethernet, or a combination of the two. Table F-2 shows size restrictions for a network using only thick or only thin Ethernet cable.

Table F-2. Ethernet Network Size Restrictions

| Transmission Medium | Maximum Number of Nodes | Maximum Network Length* |
|---------------------|-------------------------|-------------------------|
| Thin Ethernet | See below** | 984 ft (300 meters) |
| Thick Ethernet | See below** | 1640 ft (500 meters) |

*The maximum network length is the length of cable between repeaters or bridges.

**Thin Ethernet requires 3 feet (0.9 meters) of cable between adjacent nodes, thick Ethernet requires 7.5 feet (2.3 meters) between adjacent nodes. These restrictions, and the possible use of combined networks, interconnection devices, and so forth, determine the maximum number of nodes. In general, you can connect as many as 100 devices in a single thick- or thin-Ethernet network.

When you combine thick and thin Ethernet cable, you can calculate the maximum *total* network length in the combined network using the formula

$$E = 500 - (2.70 \times T)$$

where

T = the total length of thin-Ethernet cable, in meters

E = the total length of thick-Ethernet cable, in meters

Table F-3 shows several combinations of thin-Ethernet and thick-Ethernet network lengths that meet the combined maximum cable lengths.

Table F-3. Combined Ethernet Network Size Restrictions

| Thin Ethernet Cable | | (combined with) | Thick Ethernet Cable | |
|---------------------|----------|-----------------|----------------------|----------|
| (Feet) | (Meters) | | (Feet) | (Meters) |
| 0 | 0 | | 1640 | 500 |
| 82 | 25 | | 1418 | 432 |
| 164 | 50 | | 1197 | 365 |
| 246 | 75 | | 975 | 297 |
| 328 | 100 | | 754 | 230 |
| 410 | 125 | | 532 | 162 |
| 492 | 150 | | 310 | 95 |
| 574 | 175 | | 89 | 27 |
| 607 | 185 | | 0* | 0* |

* Note that a network becomes a combined network when any node is connected through an external transceiver, even if no thick Ethernet cable is used. If any external transceivers are attached to a thin-Ethernet network, the network's maximum length becomes 185 meters (607 feet).

Ethernet topology

Ethernet does not support branching or looping; it requires a single line topology with both ends of the cable terminated. Where required by local electrical codes, the cable should be grounded at one point only, usually at a terminator.

Whether the Ethernet cable is grounded or not does not affect signal transmission.

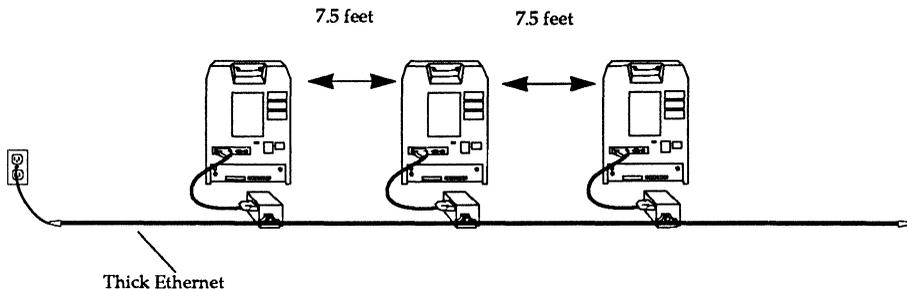


Figure F-1. Grounded and terminated Ethernet cable

Combining networks

You can change Ethernet topology and increase its effective size using network interconnection devices. The FastPath 4 gateway changes the topology of the network by adding LocalTalk or equivalent cables, each supporting up to 32 nodes. Other bridge and routing systems are also commonly used to increase the effective size of the Ethernet.

In addition to these, repeaters and connectors can be used to extend the physical Ethernet as described in the next section.

Repeaters and connectors

Repeaters are used to amplify or regenerate electrical signals on the cable, while connectors are used to connect one type of cable to another. Both of these can be used to alter the topology of a network or increase its effective size.

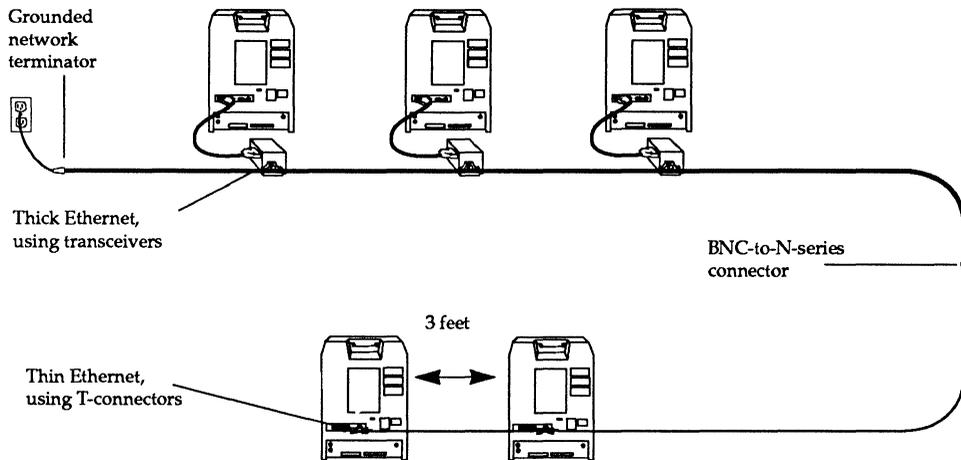


Figure F-2. Using a connector to combine Ethernet cables

You can combine thin-Ethernet and thick-Ethernet networks end to end, using only a “BNC female to N-series female” connector, as shown in Figure F-2. This is useful if you are combining the networks at the end of each cable. You can simply remove a terminator on each cable, and plug the cables into the BNC-to-N-series connector (thin Ethernet in the BNC side and thick Ethernet in the N-series side).

In this case, the combined lengths of cable shown in Table F-3 apply.

This combined network can now be further combined with other networks.

If you need to combine the networks in the middle of a cable, (as shown in Figure F-3), you will need a repeater and two transceivers. If two networks are joined through a repeater, each should independently have the required grounding.

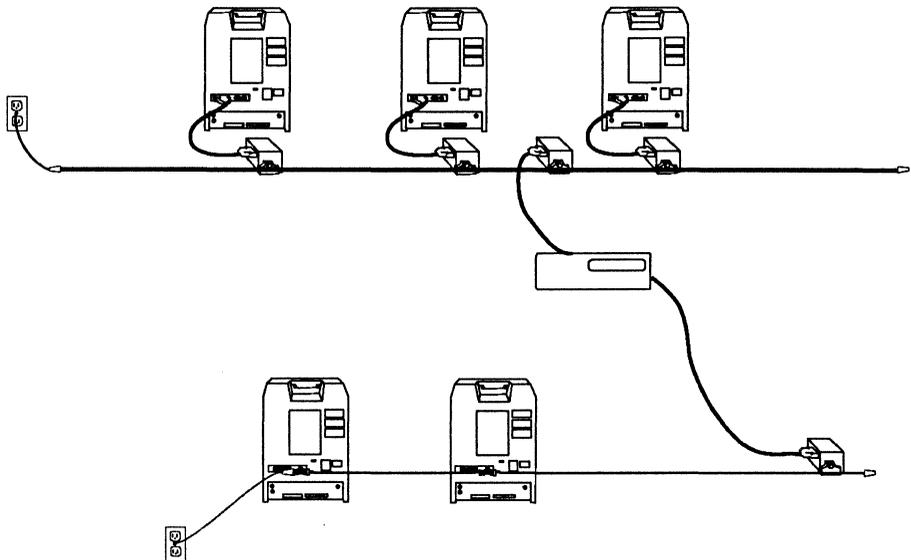


Figure F-3. Using a repeater to combine Ethernet cables

To connect two networks using a repeater, remove the terminator from thin Ethernet and connect a transceiver in its place, attaching the terminator to the transceiver when you have finished. Both networks need to be terminated and grounded as they were before you combined them.

You can place the additional transceiver on thick Ethernet just as if you were adding a new computer to the network, and then connect both the new transceivers to the repeater.

Note that the repeater electrically isolates the two segments of the overall network. One segment is all thin Ethernet and the

other is all thick Ethernet. Thus, the maximum cable lengths listed in Table F-2 apply to each segment.

Adding a node to Ethernet

Within the size and spacing restrictions described above, you can connect a gateway anywhere on the Ethernet. Before you add any device to an existing network, make sure no one is using the network. When you disconnect any terminator or network cable, the entire network stops working. You can, however, remove a T-connector or transceiver cable from a computer's controller board without disrupting the rest of the network.

If you are adding a gateway at the end of an Ethernet cable,

- Remove the terminator from the end of the cable. (This will cause disruption of network traffic and should be done at a non-critical time for users.)
- Connect a new length of network cable to the terminator's former position and to the transceiver or T-connector that will connect to the gateway.
- Attach the terminator to the other end of the gateway's transceiver or T-connector.

If you are adding a gateway on the middle of an Ethernet cable,

- Disconnect the cable from one end of an existing computer's transceiver or T-connector. (This will cause disruption of network traffic and should be done at a non-critical time for users.)
- Connect that cable to the transceiver or T-connector that will connect to the gateway.
- Connect a new cable between those two transceivers or T-connectors.

Make sure you do not introduce any branches or loops in the network.

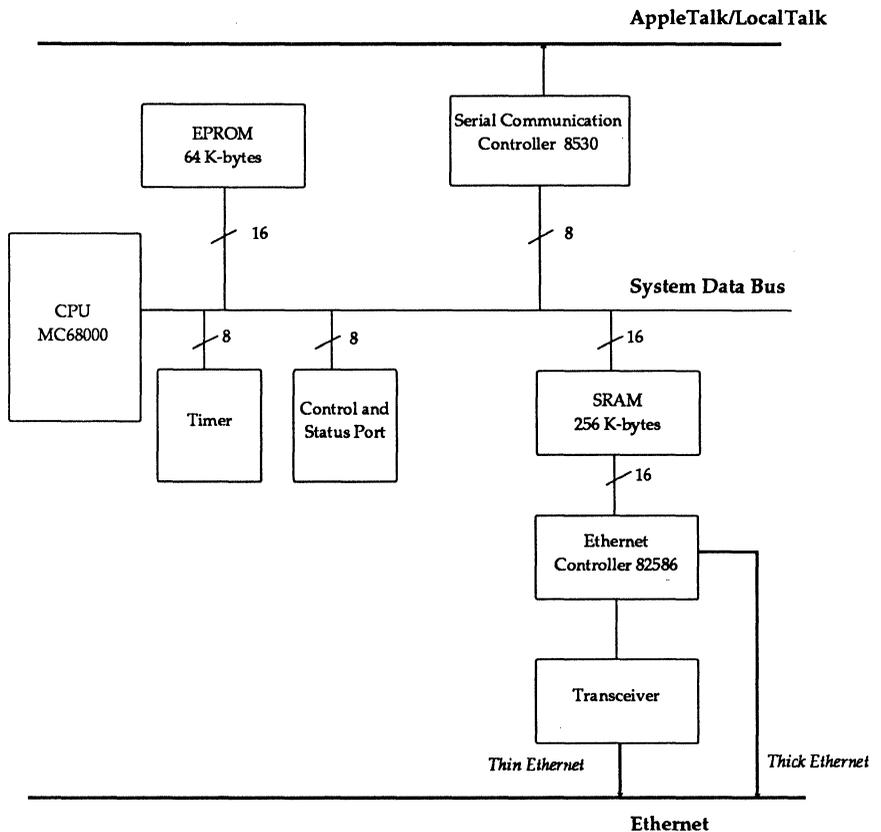
Technical Specifications

THIS APPENDIX PROVIDES THE TECHNICAL SPECIFICATIONS FOR THE FastPath 4 gateway.

Internal components

The FastPath 4 hardware (Model Number KFPS-4) contains the following components:

| | |
|-------------------------|------------------------|
| CPU | Motorola 68000 (8 MHz) |
| Ethernet controller | Intel 82586 |
| Serial comm. controller | Zilog 8530 SCC |
| RAM | 256K bytes |
| EPROM | 64K bytes |



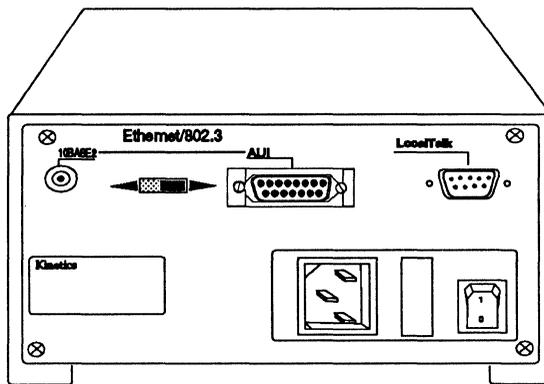
Power and environmental requirements

The FastPath 4 has the following power and environmental characteristics:

| | |
|--------------------------|---|
| AC Input voltage: | 90 to 135 VAC or 180 to 270 VAC |
| AC Input frequency: | 47 to 63 Hz |
| AC Surge current: | 0.8A rms (max.) @ 110 VAC 0.5A rms (max.) @ 220 VAC |
| AC Input power: | 20 watts |
| Battery: | Built-in battery protects 256 K-bytes of built-in RAM from data loss during power outage, but does not protect optional expansion RAM. The battery is intended to last for the life of the product. |
| Fuse: | 5x20 mm, 250V, 1A slow-blow fuse; held by a plastic clip between the power switch and power cord on back panel. |
| Internal fuses: | Internal AC power, DC power, and Ethernet transceiver fuses. |
| Operational Temperature: | +10 to +40 degrees Celsius |
| Relative Humidity: | Less than 90% non-condensing |

External components

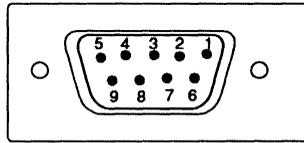
The back panel of the case includes a power switch (rocker switch marked with the internationally recognized designations of 1 for ON and 0 for OFF), a slide switch, connectors for LocalTalk, standard Ethernet, and thin Ethernet, a fuse clip, and a power cord connector.



LocalTalk connector

The 9-pin D-connector is for connection to a 9-socket female D subminiature, sometimes called "DB-9" (same as Macintosh 512K) for LocalTalk (shielded twisted-pair wire), PhoneNET (unshielded twisted-pair wire), DuPont FiberOptic, or other compatible cabling system running at 230.4 k-bits/second.

This type of connector is required for the FastPath. (It is also used to connect to LaserWriter or LaserWriter Plus printers, and to Macintosh 128K or 512K computers.)



| Pin | Use |
|-----|--------------------------|
| 1 | Ground |
| 2 | +5 volts |
| 3 | Ground |
| 4 | Transmit data + |
| 5 | Transmit data - |
| 6 | +12 volts |
| 7 | Handshake/external clock |
| 8 | Receive data + |
| 9 | Receive data - |

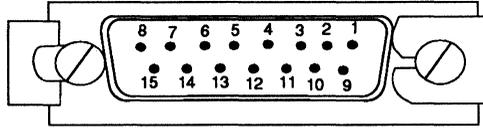
Ethernet connectors

The FastPath 4 complies with Ethernet standards (versions 1.0 and 2.0), including ANSI/IEEE Standard 802.3-1985 (ISO/DIS 8802/3) and subsequent revisions.

The circular BNC connector is for connection to a T-connector on a cable that conforms to IEEE 802.3 10BASE2 with a data rate of 10 megabits/second.

| | |
|---------------|--|
| Tap impedance | Less than 8pF and greater than 100K Ohms |
| Shield | 1M Ohm |
| Isolation | Greater than 250v rms |

The AUI 15-pin D-connector is for connection to an external Type A transceiver that uses a Canon DB15 with slide lock which connects to standard Ethernet cable that conforms to IEEE 802.3 10BASE5. The following table shows the assignment of circuits to connector pins in the AUI connector.



| Pin | Circuit | Use |
|-------|---------|--------------------------------------|
| 3 | DO-A | Data Out circuit A |
| 10 | DO-B | Data Out circuit B |
| 11 | DO-S | Data Out circuit Shield |
| 5 | DI-A | Data In circuit A |
| 12 | DI-B | Data In circuit B |
| 4 | DI-S | Data In circuit Shield |
| 7 | CO-A | Control Out circuit A (not used) |
| 15 | CO-B | Control Out circuit B (not used) |
| 8 | CO-S | Control Out circuit Shield |
| 2 | CI-A | Control In circuit A |
| 9 | CI-B | Control In circuit B |
| 1 | CI-S | Control In circuit Shield |
| 6 | VC | Voltage Common |
| 13 | VP | Voltage Plus |
| 14 | VS | Voltage Shield |
| Shell | PG | Protective Ground (Conductive Shell) |

- address** A unique destination for a message sent across a network.
- ALAP** (AppleTalk Link Access Protocol) The underlying protocol for packet transmission between nodes on a single AppleTalk network. ALAP describes the Link Access layer details of AppleTalk on LocalTalk, and corresponds to the Data Link layer of the ISO reference model.
- AppleTalk** The term AppleTalk is used to describe a suite of protocols, defined in *Inside AppleTalk*. EtherTalk (AppleTalk on Ethernet) is part of the AppleTalk protocol suite and describes the Link Access layer details of AppleTalk on Ethernet.
- atalkad** A daemon that lets a UNIX host serve as a network administrator.
- atalkatab** A database file containing configuration data for the gateway, accessed by the atalkad daemon.
- AUI** (Attachment Unit Interface) The type of connector used with thick Ethernet cable, defined in the 802.3 Ethernet standard. The FastPath back panel includes an AUI interface. See transceiver cable.
- backbone** Ethernet cable used to bridge two or more LocalTalk networks.
- BNC connector** The type of connector used with thin Ethernet cable, defined in the 802.3 Ethernet standard. The FastPath back panel includes a BNC connector.
- bridge** A device used to connect two or more networks at the Data Link layer of the ISO reference model. When you install a FastPath box on Ethernet and LocalTalk, the FastPath functions as a bridge in that it can forward AppleTalk packets in an Ethernet frame (EtherTalk packets) and vice versa (it can strip off an Ethernet frame and forward the AppleTalk packet onto LocalTalk). This involves both the physical and data link layers. Bridges are also used to connect networks that use the same medium and protocol. See gateway, router, repeater, and ISO model.

| | |
|-------------------------|---|
| Chooser | The Macintosh desk accessory that allows a user to select and use devices in any zone of an AppleTalk network or AppleTalk services available on an Ethernet network. |
| connection box | The small box that is part of a LocalTalk or PhoneNET connection. The box has two connector sockets for the appropriate type of network cable, as well as a connection for the Macintosh port. |
| datagram | The unit of transmission in the IP protocol. See also packet. |
| DDP | (Datagram Delivery Protocol.) The protocol that provides delivery of ALAP packets over an internet. DDP corresponds to the Network layer of the ISO reference model. |
| daemon | A background process that is continually running on a UNIX-based host computer. Daemons process requests for specific services. |
| Echo Protocol | (EP) The protocol that lets any node send a test packet to any other node on the internet and receive an echoed copy of that packet. |
| Ethernet | A set of standards defining a type of local area network characterized by a very fast data transmission rate, 10 megabits per second. An Ethernet network can include any of several kinds of physical transmission media, as discussed in "Ethernet Connection" in Appendix D. See also thin Ethernet. |
| EtherPort | An internal Ethernet controller board that allows Macintosh computers to connect directly to Ethernet. The EtherPort option card sets are Kinetics products. |
| EtherTalk | AppleTalk protocol for communication over Ethernet or thin Ethernet cable. AppleTalk devices can be connected to Ethernet cable directly, through an EtherSC connection box or EtherPort option cards, or indirectly through a gateway. |
| FastPath Manager | A Macintosh application program that loads a gateway program and configuration information into a FastPath gateway. |
| fiber optics | A data transmission medium consisting of glass fibers encased in a protective sheath, that can carry enormous quantities of |

data. Fiber-optic cable is not subject to eavesdropping, electromagnetic interference, or radioactivity.

- gateway** A device used to connect two or more networks at the upper protocol layers of the ISO reference model. The networks can use different protocols and different physical media. The FastPath operates as a gateway in that it can receive one type of packet (for example, an AppleTalk packet), and encapsulate it in another type of packet (for example, UDP), for transmission across the LocalTalk or Ethernet medium. This involves the higher levels of the ISO model. See also bridge, repeater, and router.
- gateway code** A program that resides in a FastPath gateway to convert packets between AppleTalk and other protocols.
- header** Information at the beginning of a data packet, indicating the addressee node and assisting in the message routing.
- hop** A measure of distance between networks within an internet. One hop consists of passage through one bridge between networks. For example, consider two LocalTalk networks, each with a bridge to the same Ethernet network. A node on one LocalTalk network is two hops away from a node on the other LocalTalk network, because a packet must travel through two bridges (LocalTalk network 1 to Ethernet, Ethernet to LocalTalk network 2) to get from one node to the other.
- host** A device that provides services to other devices on a network or an internet. With the appropriate software, a host can operate as an AppleTalk node.
- internet** A network created by linking two or more smaller networks of the same or different types. An internet can be as small as two LocalTalk networks or it can comprise a combination of several LocalTalk and Ethernet networks joined by gateways, bridges, repeaters or routers.
- ICMP** (Internet Control Message Protocol) The part of IP that governs control and error messages. Gateways and other network nodes send ICMP messages for two purposes: to test communication with another node and, if a packet has an error, to report the error to the packet's originator.

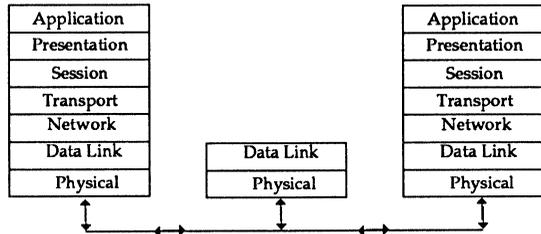
IP

(Internet Protocol) A transmission protocol used on Ethernet networks, in conjunction with TCP. IP corresponds to the Network layer of the ISO reference model.

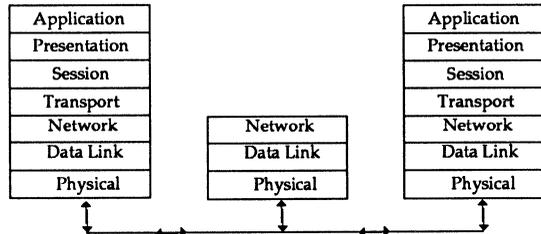
ISO model

A seven-layer logical structure of protocols, as defined by the Open Systems Interconnection (OSI) model created by the International Standards Organization (ISO). Each layer of the model defines a different level of communication. Figure G-1 shows the relationship between the ISO model and FastPath functionality.

The FastPath can operate as a bridge, using the Physical and Data Link layers of the ISO model. See the definition for "bridge" above.



The FastPath can operate as a router, using the Physical, Data Link, and Network layers of the ISO model. See the definition for "router" below.



The FastPath can operate as a gateway, using all of the layers defined in the ISO model. See the definition of "gateway" above.

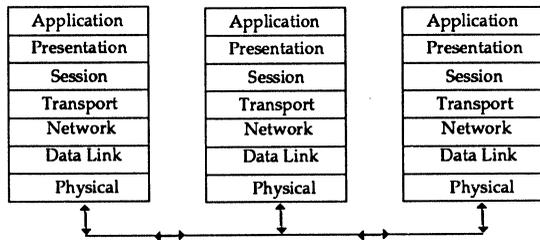


Figure G-1. Bridges, gateways and routers in the ISO model

| | |
|------------------|---|
| K-STAR | The FastPath gateway program, which contains modules implementing AppleTalk Phase 1 and Phase 2 protocols, "transition bridge" software, TCP/IP protocols derived from the Kinetics Internet Protocol (KIP) software implemented at Stanford University (which provides a flexible IP addressing scheme for AppleTalk devices), DECnet, and SNMP protocols. |
| K-Talk | An independent implementaton of AppleTalk protocols for use with the UNIX operating system. |
| LAP | A link-access protocol. See also ALAP. |
| LocalTalk | A brand of AppleTalk hardware that uses shielded, twisted-pair cable to interconnect Macintosh computers and other AppleTalk devices. LocalTalk kits are manufactured by Apple Computer. Generally, where this manual refers to a LocalTalk connection, you can use any system of cable and connectors that supports AppleTalk protocols at 230.4 kbits/second to interconnect Macintosh computers and other AppleTalk devices. |
| mask | See subnet mask. |
| MAU | (Medium Attachment Unit) See transceiver. |
| node | On a network, a point where a device is connected; often used to refer to the device itself. Some examples of AppleTalk nodes are Macintosh or Apple II computers, LaserWriter or Imagewriter printers, and FastPath gateways. |
| OSI model | See ISO model. |
| packet | A collection of information sent over a network, comprising a core of data surrounded by the encapsulating information required by the applicable protocols. A packet is the unit of transmission on a physical network; a datagram is the unit of transmission in the IP protocol. |
| PhoneNET | A brand of AppleTalk hardware that uses unshielded, twisted-pair cable (ordinary telephone wire) to interconnect Macintosh computers and other AppleTalk devices. PhoneNET kits are manufactured by Farallon Computing. |

| | |
|-----------------------|---|
| printer port | The port on the back of the Macintosh to which LocalTalk or equivalent connectors are attached. |
| protocol | A set of rules for communicating data within a network or internet. The protocol specifies the format, timing, and sequence in which information is transmitted. Common protocols include ALAP, RTMP, TCP and IP. |
| protocol suite | A group of related protocols, designed to work with each other. Common protocol suites include AppleTalk and TCP/IP. |
| repeater | A device used to connect two or more networks at the Physical layer of the ISO reference model. The networks connected to a repeater must use the same physical medium (Ethernet cable, for example). The repeater is insensitive to the protocols used on that medium. The principal use of a repeater is to amplify or regenerate signals, to alter the topology or extend the effective length of a network. See also bridge, gateway, and router. |
| RIP | (Routing Information Protocol) A protocol that lets an IP bridge or gateway dynamically discover routes to the various IP networks within an internet. |
| router | A device used to connect two or more networks at the Network layer of the ISO reference model. The FastPath functions as a router by routing packets between networks, operating at the data link and network layers. Normally, the networks connected to a router must use the same protocol and physical medium. The router must understand the protocol, because it uses information within each packet to determine how to route that packet. See also bridge, gateway, and repeater. |
| routing table | A collection of routes to the various networks within an internet. Each entry in a gateway's routing table comprises a network's identifying number and the distance (hops) between that network and the gateway. AppleTalk and IP routers periodically send RTMP and RIP packets, respectively, to update routing tables. |
| RTMP | (Routing Table Maintenance Protocol) The protocol that lets an AppleTalk bridge or gateway dynamically discover routes to the various AppleTalk networks within an internet. RTMP corresponds to the Transport layer of the ISO model. |

| | |
|-----------------------|--|
| subnet | A subset of an IP network's address space. Subnet addressing is discussed in Chapter 3 and Appendix E. |
| subnet mask | A 32-bit binary number that defines which bits of an IP address are to be used as a subnet address. In the mask, each 1-bit corresponds to a subnet-address bit and each 0-bit corresponds to a host-number bit. |
| TCP | (Transmission Control Protocol) A transmission protocol used on Ethernet networks, in conjunction with IP. TCP corresponds to the Transport layer of the ISO reference model. |
| TCP/IP | A protocol family based on TCP and IP. It also includes UDP (User Datagram Protocol), Telnet protocol, and FTP (File Transfer Protocol). TCP/IP was developed by the U.S. Defense Department to connect widely differing computers while providing data correction, security, and protection against line failures. |
| T-connector | A "T"-shaped connector used with thin-Ethernet cable. |
| terminator | A device, consisting primarily of a 50-ohm resistor, that must be attached to each end of an Ethernet cable. An Ethernet network does not function properly if one or both of its terminators are absent. |
| thick Ethernet | Sometimes called "standard" Ethernet: a type of cable that conforms to IEEE 802.3 standards and uses the AUI interface. Thick Ethernet is often installed in the ceiling with drop cables for each device. It requires an external transceiver and transceiver cable to connect a device. It connects to a device using a trapezoidal D-connector. |
| thin Ethernet | A variety of Ethernet that conforms to IEEE 802.3 standards and uses a round BNC connector that connects to a device via a T-connector. Thin-Ethernet transceivers are usually internal to the device, and it is physically thinner than thick Ethernet cable, with a shorter maximum length. |
| trailer | Information at the end of a data packet indicating the conclusion of the packet. |

| | |
|--------------------------|--|
| transceiver | A small box, attached to network cable and connected to a computer or other device, that provides the drive, reception, and collision detection between physical network media, especially on Ethernet networks. A transceiver is sometimes called a medium attachment unit (MAU). |
| transceiver cable | A cable connecting an Ethernet device to a transceiver, which in turn is attached to the Ethernet cable. A transceiver cable is sometimes called an attachment unit interface (AUI). |
| UDP | (User Datagram Protocol) The part of IP that lets an application program, on one node of the internet, send a packet (datagram) to another node. A UDP packet includes a protocol port number, so it can be addressed to a specific application process on the receiving node. |
| zone | A grouping of one or more AppleTalk networks, based on usage patterns rather than physical connections. |
| ZIP | (Zone Information Protocol) The protocol that governs the mapping of AppleTalk networks to zone names throughout an internet. |

A

address resolution:

- AppleTalkA-11
- IP, for client Macs3-38, A-16

addresses:

- assigned to client Macs, IP3-8
- EthernetB-7, C-22
- zone multicast in Phase 2A-13

addressing conventions (IP)3-2 to 3-6

addressing rules:

- AppleTalk Phase 12-32, E-3
- AppleTalk Phase 22-3 to 2-4
- Transition bridge2-17
- K-STAR IP3-7 to 3-8
- DECnet4-2

(*see also: configuration data*)

adding nodes:

- to EthernetF-7
- to LocalTalk1-4

AppleTalk:

- configuration features2-2
- enabled in Chooser1-6, 5-6
- socket numbers and UDP3-40
- Transition bridge software2-17
 - configuration (*see: configuration data*)
 - maximum devices on Ethernet2-17
 - network range2-17
 - (*see also: network startup range, Phase 2*)
 - turning on2-17
 - zone list2-17
 - changing the zone list1-17

AppleTalk Phase 1:

- addressing (*see: addressing rules*)
- autoconfiguration;
 - algorithmA-7 to A-9
 - Phase 1, PROM code1-2, E-2
- configuration (*see: configuration data*)
- encapsulated in UDP (*see: IPTalk*)
- maximum devices on Ethernet2-32
- network numbers2-32, E-3

(*see also: network startup range, Phase 2*)

- node numbers2-32, E-3
 - and IPTalk3-29
 - node ID, default1-7, B-3
 - node-findingC-13 to C-16
 - server range and client rangeC-13
- on Ethernet (EtherTalk)A-10
- routingA-10, A-14
- seeding2-2
- turning on Phase 1 routing in K-STAR
 -B-16
 - turning off Phase 2 routing in K-STAR
 -B-16
- zone names:
 - default asteriskB-24
 - invalid charactersB-24
- zone security2-47 to 2-53

AppleTalk Phase 2:

- addressing (*see: addressing rules*)
- autoconfiguration;
 - algorithmA-7 to A-9
 - Phase 2 using K-STAR2-2
- configuration (*see: configuration data*)
- encapsulated in UDP (*see: IPTalk*)
- maximum devices on Ethernet2-3
- network range2-3
 - and node-finding; Phase 2...2-3, A-10
 - startup rangeA-13
- node numbers2-3
 - and IPTalk3-29
 - node ID, default1-7, B-3
 - node-findingC-13 to C-16
 - server range and client rangeC-13
- turning on Phase 1 routing in K-STAR
 -B-16
 - turning off Phase 2 routing in K-STAR
 -B-16
- zone list2-4
 - changing the zone list1-17
- zone names:
 - asteriskB-10
 - invalid charactersB-10

Apple UNIX File System (AUFS) (*see: IPTalk*)
 areas, DECnet (*see: DECnet*)
 assignments, pin (*see: pin assignments*)
 assistance, Kinetics dealers5-2
 ASN.1D-5
 atalkad:
 administrator host3-29, 3-33 to 3-36
 required IP data3-34
 required documentationP-7
 with Phase 23-34
 atalkatab (*see: atalkad*)
 Auto Config switch1-11, B-11
 autoconfiguration (*see: AppleTalk*)
 automatic restart after a power failureA-2
 AUI connector, thick Ethernet1-13, G-6

B

backbone, Ethernet1-2, E-4
 Background Timer (*see: DECnet*)
 backward compatibility:
 early IP routingE-1
 early versions of K-TalkB-14
 battery backed-up RAMA-2, G-3
 Berkeley subnets3-3 to 3-5
 BOOTME packetsA-3
 BOOTP (Boot Protocol) servers3-38
 branching or looping in cablesC-12
 bridge:
 transition2-17
 LocalTalk-to-LocalTalk2-17
 AppleTalk-to-EtherTalk, Phase 1E-2
 broadband networks, CRS signal ...C-11, B-13
 broadcast address, IP:
 standard calculated by K-STAR3-6
 4.2 BSD-compatible3-6, B-13
 broadcasts, NBP2-47, A-13
 buffers, EthernetC-9
 Built-in icon (*see: Macintosh*)

C

cabling issues:
 LocalTalk1-4, F-2
 Thick EthernetF-3
 Thin EthernetF-2
 calling for assistance5-2
 centralized configuration (*see: atalkad*)
 changing configuration data:
 procedure for1-16 to 1-18
 AppleTalk Phase 2 zone names1-17
 characters, illegal:
 in gateway namesB-28
 in zone namesB-24
 in zone listsB-10
 Chooser (*see: Macintosh*)
 classes of IP network numbers3-3
 clearing gateway RAM:
 all memory locations1-8, A-3
 unprotected memory only1-17, A-3
 client Macs on IP networks3-7 to 3-9
 Columbia AppleTalk Protocols (CAP) systems
 (*see: IPTalk*)
 combining Ethernet cablesF-3
 configuration data, required:
 administrator host3-34
 AppleTalk Phase 12-33, E-3
 AppleTalk Phase 22-5
 Transition bridge2-18
 K-STAR IP3-7 to 3-9
 DECnet4-2
 IPTalk3-30
 configuration files:
 old, with new FastPath Manager1-17
 openingB-27
 saving1-12, B-27
 connecting gateway to a Mac1-4
 Control Panel (*see: Macintosh*)
 corrupted memory locations (*see: Remote Boot*)

D

- daemon, atalkad (*see: atalkad*)
- data transmission rates:
 - LocalTalk.....G-4
 - Thick Ethernet.....G-5
 - Thin Ethernet.....G-5
- data encapsulation.....A-15
- dealer support.....5-2
- decimal-dot notation (*see: IP*)
- DECnet:
 - addressing (*see: addressing rules*)
 - background timer.....4-,5 B-23
 - hello timer.....4-5, B-24
 - Level-1 routing.....4-3
 - routing packets.....4-5, C-23 to C-25
- default values:
 - AppleTalk
 - Phase 1.....B-24
 - Phase 2.....B-8 to B-9
 - DECnet.....B-23 to B-24
 - gateway name.....B-3
 - Options.....B-12
 - Switches.....B-11
- Diagnostic messages
 - Alphabetic listing.....C-3
- AppleTalk:
 - autoconfiguration.....C-12 to C-13
 - while node-finding.....C-13 to C-16
 - routing.....C-16 to C-19
 - zone information.....C-19 to C-21
- Ethernet startup.....C-10
- from K-STAR at startup.....C-9 to C-10
- from PROM at startup.....C-6 to C-9
- DECnet routing.....C-23 to C-26
- IP routing
 - duplicate address.....C-22
 - from atalkad.....C-23
- IP Subsectioning.....C-26
- Diagnostics window.....1-12, B-4, C-1
- different types of traffic, concurrent.....A-14
- downloading to the gateway.....A-4 to A-5
- dynamic IP addressing.....3-38

E

- encapsulation and routing:
 - K-STAR.....A-14
 - PROM-resident AppleTalk.....A-10
 - PROM-resident IP.....A-17
- end node addresses in DECnet.....4-2
- equivalent cables.....F-2
- Ethernet:
 - adding a node.....F-7
 - combining cables.....F-3
 - controller chip in gateway.....G-2
 - device spacing restrictions.....F-4, F-5
 - EtherTalk.....A-10
 - extended networks.....2-3
 - grounding cable.....F-4
 - network size restrictions.....F-2 to F-3
 - standards.....G-5
 - terminating cables.....F-4
 - thick cable.....1-13
 - thin cable.....1-14
 - topology.....F-4 to F-6
 - transmission errors.....C-10
- Examples:
 - CAP or AUFS on local Ethernet.....3-30
 - DECnet on Macintoshes.....4-3 to 4-7
 - Installation.....1-4, 1-13 to 1-16
 - IP on Macs on LocalTalk.....3-11
 - IP on Macs with noncontiguous
 - range of IP addresses.....3-15
 - IP on Macs as separate IP net.....3-20
 - IP on distributed Macs on LocalTalk
 - and Ethernet.....3-25
 - Mixed Phase 1 and Phase 2 internet
 - (*see: Transition Bridge*)
 - Phase 1 internet (K-STAR).....2-34 to 2-35
 - explicit configuration.....2-36 to 2-39
 - seeding.....2-39 to 2-44
 - Phase 1 internet (PROM).....E-4, E-6
 - autoconfiguration.....E-2
 - explicit configuration.....E-4 to E-6
 - seeding.....E-6 to E-7
 - Phase 2 internet.....2-6 to 2-7
 - autoconfiguration.....2-2

- explicit configuration.....2-8 to 2-12
- seeding.....2-12 to 2-16
- Remote configuration (atalkad)3-34
- Transition Bridge2-19 to 2-20
 - explicit configuration.....2-21 to 2-27
 - seeding.....2-27 to 2-31
- Using the FastPath Manager....1-5 to 1-12

F

FastPath (*see: gateway*)

FastPath Manager:

- AppleTalk Phase 1 screenB-24 to B-25
- DECnet screen.....B-23 to B-24
- Diagnostics windowB-4 to B-5
- Gateway selection windowB-3
- K-STAR IP screenB-18 to B-22
- K-STAR IP "More" screen ...B-22 to B-23
- IP Subsectioning (previously called "IP Subnetting").....B-25 to B-26

launching:

- on Ethernet.....1-6, B-2
- on LocalTalk.....1-6, B-2

main configuration screenB-6

- buttonsB-12 to B-18
- configuration area.....B-10
- EtherTalk Phase 2 areaB-9
- Gateway area.....B-7
- LocalTalk interface areaB-8
- Switches areaB-11

Menus.....B-26 to B-30

Option flagsB-13 to B-16

using1-5 to 1-12

FastPath MIB; KineticsD-9 to D-33

FastPath PROM-resident code.....E-1

filtering, NBP.....2-48

fusesC-7, G-3

G

gateway:

- addresses (*see: configuration data*)
- autoconfiguration (*see: AppleTalk*)

- components.....G-2 to G-4
- configuration (*see: configuration data, examples*)
- encapsulation operations.....A-10, A-15
- hardware self-testsA-5 to A-7
- installation, hardware.....1-4, 1-13 to 1-16
- power-on sequenceA-2 to A-4
- routing operations.....A-10, A-15, A-17
- Go button.....1-12, B-18

H

hardware interfaces (*see: interfaces*)

hardware self-tests (*see: gateway*)

Hello Timer field (*see: DECnet*)

help:

- Dealer support5-2
- Kinetics Technical Support5-2

hexadecimal notation (*see: IP*)

I

interfaces, hardware:

- LocalTalk1-4, G-5
- Ethernet1-13 to 1-14, G-5

interfaces, software:

AppleTalk:

- on LocalTalk interfaceB-8
- EtherTalk Phase 12-32, B-24 to B-25
- EtherTalk Phase 2 interface2-5, B-9

DECnet.....4-1, B-23 to B-24

IPTalk3-28, B-20 to B-21

IP3-7 to 3-9, B-19, B-21 to B-22

IP (Internet Protocol):

- addressing3-2 to 3-6
- administered for clients.....3-7 to 3-8
 - dynamic3-38
 - static.....3-38
 - maximum range.....3-8
- broadcast3-7
- encapsulated in DDPA-15
- notations:
 - decimal-dot3-2
 - hexadecimal3-2

- routing:
 - default routers.....B-19
 - K-STAR.....A-14
 - information, RIP3-20, A-17
 - PROM-residentA-17
 - software on a Mac3-37 to 3-38
 - split addressing.....3-14 to 3-24
 - subnet masks.....3-3 to 3-6
 - acquired by K-STAR3-7 to 3-8
- IP Subsectioning, (previously called
 - IP Subnetting).....E-1, B-25 to B-26
- IPTalk:
 - addressing restrictions.....3-29, B-21
 - AppleTalk encapsulated in UDP.....A-15
 - with AUFS or CAP hosts2-46, 3-29
- ISO model.....Glossary-4

K

- K-STAR gateway program:
 - configuration (*see: configuration data*)
 - encapsulation.....A-14 to A-15
 - options.....B-13 to B-16
 - protocols.....1-10, A-14
 - routingA-14
 - split addressing.....3-14 to 3-24
 - UDP port numbers.....3-40
 - zone security2-47 to 2-54
- Kinetics FastPath MIB (*see: FastPath MIB*)
- KIP, required documentation for atalkatab.P-7

L

- LAN Ranger, with Phase 15-1
- LaserWriter security2-48, 2-51 to 2-52
- launching the FastPath Manager
 - (*see: FastPath Manager*)
- LEDs on gateway front panel.....A-6
- Level-1 DECnet routing (*see: DECnet*)
- LocalTalk:
 - connection to gateway.....1-4
 - bridges on Phase 2 internets2-17
 - cables and connector kits 1-4, G-4

- loose connections5-5
- Log buffer and messages.....B-12, C-1
- Lookups, NBP (*see: NBP*)

M

- Macintosh:
 - Chooser;
 - AppleTalk enabled.....1-6, 5-6
 - network services visible ...2-47 to 2-54
 - zones visible.....2-4
 - Control Panel;
 - Built-in and Network icons5-6
 - TCP/IP configuration.....3-38
 - with FastPath Manager5-6
 - zone list in Phase 2.....2-4
 - on LocalTalk;
 - Diagnostics1-12, B-4
 - with more than one gatewayB-4
 - IP address management3-38
 - on Ethernet;
 - IP address management.....3-38
 - performance.....3-38
 - printer port for LocalTalk1-4, 5-5
 - managing AppleTalk services2-47 to 2-54
 - masks, IP subnet.....3-3 to 3-6
 - maximum cable lengths.....F-2 to F-3
 - maximum number:
 - ATalk devices on Ethernet (*see: AppleTalk*)
 - of client Macs on TCP/IP (*see: IP*)
 - messages from the gateway
 - (*see: Diagnostic messages*)
 - model, OSI (*see: ISO model*)
 - multicasting and net-specific broadcasts:
 - NBPA-12 to A-13
 - RTMP.....A-11
 - multiple zones on a network.....2-4

N

- naming the gateway1-9
- NBP:
 - lookups2-47, A-12

forward requests in Phase 2.....A-13
 filters for zone security2-47 to 2-48
 relation to the Chooser2-47

network:
 administrator host (*see: atalkad*)
 cables.....F-2 to F-3
 class (IP).....3-3
 extended and non-extended2-3 to 2-4
 management issues;
 AppleTalk2-45 to 2-54
 IP.....3-37 to 3-40
 numbers (*see: AppleTalk, IP, or DECnet*)
 selection switch1-13, 1-14
 statisticsD-1
 termination.....F-4
 topologyF-4 to F-6
 traffic lights on gateway.....A-6
 nodes (*see: AppleTalk, IP, or DECnet*)

O

Objects in the FastPath MIBD-9 to D-33
 ON/OFF switch on the back panel G-4
 opening a configuration file.....B-27
 opening the gateway1-7, B-3
 problems finding gateway5-4 to 5-6
 Option flags.....B-13 to B-16
 OSI model (*see: ISO model*)

P

pausing the gateway1-9, A-3
 Phase 1, Phase 2 (*see: AppleTalk*)
 pin assignments:
 LocalTalk connectorG-5
 Ethernet connectorG-6
 port numbers, using new range.....3-40
 power failures, automatic restart.....A-2
 preventing network access to AppleTalk
 services.....2-47 to 2-54
 PROM-resident routing code.....A-10, A-17
 proxy ARP, turning off.....B-14

Q

quitting the FastPath Manager.....1-12

R

range of IP addresses for client Macs (*see: IP*)
 range of well-known UDP ports.....3-40
 RARP (Reverse ARP) servers3-38
 reconfiguring zone names on a Phase 2
 gateway.....1-17
 Remote Boot switch1-10, A-3, B-11
 remote configuration (*see: atalkad*)
 reserved net numbers (*see: AppleTalk, startup*)
 Reset1-8, A-3 to A-5
 Restart1-17, A-3 to A-5
 restricting users from services.....2-47 to 2-50
 routers, default (*see: IP*)
 routing:
 and encapsulation in K-STAR.....A-14
 AppleTalk packets to IP hosts (*see: IPTalk*)
 AppleTalk packets on Ethernet A-10, A-14
 DECnet packets to AppleTalk nodes A-14
 IP packets to AppleTalk nodes.....A-14
 multiple protocols in K-STARA-14
 packet frequency in DECnet.....4-5
 to remote AppleTalk nets
 through an IP router (*see: atalkad*)

S

sample configurations (*see: examples*)
 saving configuration data1-12, B-27
 security features in K-STAR.....2-47 to 2-54
 seeding AppleTalk data2-2
 self-tests at startup.....A-5 to A-7
 sending configuration data
 to the gateway1-12, A-4, B-18
 server range of nodes; AppleTalk.....A-13

services listed in the Chooser2-47
 SNMPD-1 to D-5
 software switches:
 Auto Config1-11, B-11
 Remote Boot1-11, B-11
 specifications, technicalG-2 to G-6
 split addressing, IP3-14 to 3-24
 standard IP broadcast address3-6
 standards complianceG-5
 startup range (*see: AppleTalk Phase 2*)
 starting up the gateway:
 autoconfigurationA-7 to A-9
 configuration overview1-6 to 1-12
 initial sequencesA-3
 static IP addresses on client Macs3-38
 status, hardwareC-7
 subnet mask (*see: IP*)
 subsectioning, IP (previously
 called IP Subnetting)E-1, B-25 to B-26
 suspending operation if memory becomes
 corrupted (*see: Remote Boot*)

T

T-connector1-5, G-5
 TCP/IP (*see: IP*)
 testing a configuration1-17
 transition bridge software (*see: AppleTalk*)
 troubleshooting:
 autoconfiguration (*see: AppleTalk*)
 configuration data5-8 to 5-11
 (*see also: configuration data, examples*)
 downloading K-STAR5-7 to 5-8
 installation, hardware5-2 to 5-3
 opening the gateway5-4 to 5-6

U

UDP
 encapsulation for CAP or AUFS
 (*see: IP*)
 port numbers3-40
 (*see also: IP*)

UNIX:
 daemon (*see: atalkad*)
 host routing tables3-20
 updating a network to Phase 2 2-45

W

wide area AppleTalk routing through IP
 routers (*see: atalkad*)

Z

ZIP (Zone Information Protocol)A-12,
 C-19 to C-21
 changing zone names2-46
 zone multicasting in Phase 2A-12, A-13
 zone names (*see: AppleTalk*)
 zone security features in K-STAR2-47

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