

ABOUT THIS GUIDE

This guide explains how to install and use the AppleTalk/IP Wide Area Extension for the Apple Internet Router. It provides information about AppleTalk tunneling through TCP/IP networks, configuring an IP Tunnel access method for an Ethernet or Token Ring port on the Apple Internet Router, and troubleshooting IP tunneling problems. It also includes information about configuring MacTCP.

What this guide contains

The chapters of this guide contain the following information:

- Chapter 1, "Installing the AppleTalk/IP Wide Area Extension," provides a brief introduction to the AppleTalk/IP Wide Area Extension and explains how to install the extension on a startup disk on which the Apple Internet Router software is installed.
- Chapter 2, "Tunneling Through TCP/IP Networks," provides information about using MacTCP to run TCP/IP over Ethernet or Token Ring, and explains how to configure an IP Tunnel access method for an Ethernet or Token Ring port on the Apple Internet Router.
- Chapter 3, "Troubleshooting," describes some problems that you might encounter with an IP tunnel -- including their symptoms, causes, and solutions -- and provides information about recovering from IP tunneling errors while using Router Manager.
- The Appendix, "Configuring MacTCP," explains how to configure the MacTCP driver using the MacTCP control panel.

What you need to know

Using the AppleTalk/IP Wide Area Extension assumes that you are familiar with Macintosh System 7 and the Apple Internet Router, including Router Manager. You should also understand TCP/IP (Transmission Control Protocol/ Internet Protocol) addressing conventions.

For information about using the Macintosh or System 7, refer to the manuals that came with your computer or with System 7. For information about the Apple Internet Router and Router Manager, see the Apple Internet Router Administrator's Guide included in the Basic Connectivity Package. When configuring an IP tunneling port, you may need to refer to the detailed instructions in the Apple Internet Router Administrator's Guide. See the MacTCP Administrator's Guide for background information about TCP/IP.

The AppleTalk/IP Wide Area Extension is an AppleTalk Phase 2-compatible routing product that implements AppleTalk tunneling through TCP/IP networks, extending the wide area networking capabilities of the Apple Internet Router. The AppleTalk/IP Wide Area Extension allows two or more AppleTalk networks or internets to communicate through a tunnel built on a TCP/IP network. This router extension provides an IP Tunnel access method for an Ethernet or Token Ring port on a router Macintosh.

This chapter provides information about system requirements that are specific to the AppleTalk/IP Wide Area Extension. It also explains how to install this router extension on a startup disk on which the Apple Internet Router software is installed.

System requirements

The AppleTalk/IP Wide Area Extension requires the following system components:

- system software version 7.0 or later
- an Apple Macintosh II or later model Macintosh computer that has an Ethernet or Token Ring port.
- at least four megabytes (MB) of random-access memory (RAM)

- a hard disk on which the Apple Internet Router Basic Connectivity Package is installed
- an installed network cabling system
- if the router Macintosh has an Ethernet port, EtherTalk version 2.5 or later, which you can install using the Installer disks
- if the router Macintosh has a Token Ring port, TokenTalk version 2.5 or later, which you can install using the Installer disks
- MacTCP version 1.1.1 or later

!! IMPORTANT You can use the Apple Internet Router only on internets in which all routers are compatible with AppleTalk Phase 2.

Running the router software on a Macintosh Portable or on a Macintosh PowerBook computer is not recommended. !!

Installing the router extension on a startup disk

This section describes how to use the Installer to install the AppleTalk/IP Wide Area Extension on the current startup disk of a router Macintosh. The current startup disk must be a hard disk on which you have already installed the Apple Internet Router Basic Connectivity Package, and System 7 or a later version of system software.

The AppleTalk/IP Wide Area Extension package includes one disk, Apple Internet Router AppleTalk/IP Wide Area Extension Installer. Before installing this router extension, you should lock the Installer disk, then make a backup copy of the disk. Lock your backup disk, then use it to install the router extension. Set the original Installer disk aside for use in the event that your backup disk becomes damaged.

To install the AppleTalk/IP Wide Area Extension, follow these steps:

1. Insert the Apple Internet Router AppleTalk/IP Wide Area Extension disk into a floppy disk drive and double-click the Router IP Extension icon to open it.

The Installer icon is in the window that appears.

2. Double-click the Installer icon to open the Installer program.

The Easy Install dialog box appears.

3. Make sure that the hard disk on which the Installer will place the AppleTalk/IP Wide Area Extension is the startup disk. If another hard disk is currently selected, click the Switch Disk button until the name of the startup disk appears.

4. Click Install to place the AppleTalk/IP Wide Area Extension on the startup disk.

The Installer begins installing the router extension on the startup disk. On-screen messages report the progress of the installation. You can cancel the installation at any time, leaving the startup disk unchanged.

If other application programs are currently running on the Macintosh, a message appears, informing you that the Installer cannot install the router extension on the startup disk while other application programs are running. To quit the other programs automatically and install the router extension, click Continue.

If you do not want to quit the other programs to install the router extension at this time, click Cancel. The startup disk will remain unchanged.

5. When you see a message reporting that the installation was successful, click Quit.

Customizing your installation

To customize your installation of the AppleTalk/IP Wide Area Extension, follow these steps:

1. Insert the Apple Internet Router AppleTalk/IP Wide Area Extension Installer disk into a floppy disk drive and double-click the Router IP Extension icon to open it.
2. Double-click the Installer icon to open the Installer program.

The Easy Install dialog box appears.

3. Make sure that the hard disk on which the Installer will place the AppleTalk/IP Wide Area Extension is the startup disk. If another hard disk is currently selected, click the Switch Disk button until the name of the startup disk appears.

4. Click Customize to select specific software options for installation.

The Customize dialog box shown in the following figure appears. It lists all of the software options available for installation.

5. Select "AppleTalk/IP Wide Area Extension" from the list to install the router extension, then Shift-click any additional items that you want to install.

When you select "AppleTalk/IP Wide Area Extension," the Installer also places MacTCP on the startup disk.

To configure the IP Tunnel access method on a Token Ring port, you must also install the Token Ring Extension.

6. Click Install to place the selected software on the startup disk.

The Installer begins installing the selected software on the startup disk. On-screen messages report the progress of the installation. You can cancel the installation at any time, leaving the startup disk unchanged.

If other application programs are currently running on the Macintosh, a message appears, informing you that the Installer cannot install the router extension on the startup disk while other application programs are running. To quit the other programs automatically and install the router extension, click Continue.

If you do not want to quit the other programs to install the router extension at this time, click Cancel. The startup disk will remain unchanged.

7. When you see a message reporting that the installation was successful, click Quit.

You can use the AppleTalk/IP Wide Area Extension to achieve wide area connectivity through a tunnel built on a TCP/IP network. This chapter describes the wide area networking capabilities provided by this extension to the Apple Internet Router and explains how to configure an IP Tunnel access method for an Ethernet or Token Ring port.

IP tunneling

Configuring two or more Apple Internet Routers as nodes on both an AppleTalk internet and on a TCP/IP internet allows you to connect AppleTalk networks through a TCP/IP tunnel. The routers use the TCP/IP internet only to connect with one another. A router encapsulates AppleTalk packets in IP packets, then sends them across the TCP/IP internet to the next forwarding router. That router decapsulates the packets, then forwards them to their destination AppleTalk networks.

Using MacTCP to run TCP/IP over an Ethernet or Token Ring network

When installing the AppleTalk/IP Wide Area Extension, the Installer also installs MacTCP on the startup disk of the router Macintosh. MacTCP is Apple Computer's implementation of TCP/IP. Before configuring the IP Tunnel access method for an Ethernet or Token Ring port, the MacTCP driver must be configured. If MacTCP was installed on the router Macintosh prior to installing the AppleTalk/IP Wide Area Extension, the MacTCP driver may already be configured. For information about using the MacTCP control panel to configure the MacTCP driver, see the Appendix, "Configuring MacTCP."

Configuring an IP tunneling port

Once you have configured the MacTCP driver, you can configure an IP tunneling port. An IP Tunnel access method is available for each Ethernet and Token Ring port on the router. However, you can configure an IP Tunnel access method for only one of these ports -- that specified in the MacTCP control panel.

To configure an IP tunneling port, follow these steps:

1. Open a setup document.
2. In the Setup window, double-click the physical port that you want to configure to display the access methods that are available for that port.

An IP Tunnel access method is available for each Ethernet and Token Ring port. The following figure shows a setup window with an IP Tunnel access method selected.

3. Double-click an IP Tunnel access method to open an IP Tunnel Port Info dialog box.

An IP Tunnel Port Info dialog box similar to that shown in the following figure appears.

4. In the IP Tunnel Port Info dialog box, type a port description in the Port Description text box.

The name of the physical port appears in the Port Description text box by default. You can specify an optional port description to help you to identify the network connected to the port. A port description can be up to 31 characters in length and can contain any characters, including the space character.

5. Select the "Use only the host IDs listed" checkbox to establish connections only with routers for which host IDs appear in the host list, if it's not already selected.

Alternatively, you can route information to any router that has the host ID for your Apple Internet Router in its host list. It is not necessary to include such a router's host ID in the host list. To route information to any router configured with the Apple Internet Router's host ID, deselect the "Use only the host IDs listed" checkbox.

6. Type a host ID in the Host ID text box, then click Add to add the host ID to the host list for the network connected to the port.

You can specify a host ID as a dotted decimal number that conforms to the standard IP address format. The IP address format is ###.###.###.###, in which each group of three numbers has a value between 0 and 255. Alternatively, you can specify a host ID as a domain name that is a maximum of 255 characters in length.

You can add host IDs to the host list in any order. Repeat this step until you have added all of the network's host IDs to the host list.

You can rename a router host in the host list or remove a host ID from the host list, as described in the sections "Renaming a Router Host" and "Removing a Host ID From the Host List" later in this chapter.

7. To activate the IP tunneling port, select the Active button. To deactivate the IP

tunneling port, select the Inactive button.

When you first configure a port, its status is active by default. When the router is running, it routes data packets through all active ports. You can change the status of the port from active to inactive at any time.

8. To configure various options for the IP tunneling port, click Options.

The Options dialog box appears.

Follow the instructions in the Apple Internet Router Administrator's Guide, Chapter 7, "Configuring the Wide Area Routing Options," to configure these options.

9. When you have finished specifying the IP tunneling port information, click Define to close the IP Tunnel Port Info dialog box.

Renaming a router host

To rename or assign a different host ID to a router host in the host list, follow these steps:

1. In the IP Tunnel Port Info dialog box, select the host ID in the host list.

The host ID appears in the Host ID text box.

2. Type the new host ID in the Host ID text box.

3. Click Rename.

The new host ID replaces the old one in the host list.

Removing a host ID from the host list

To remove a host ID from the host list, follow these steps:

1. In the IP Tunnel Port Info dialog box, select the host ID in the host list.

The host ID appears in the Host ID text box.

2. Click Delete.

The host ID no longer appears in the host list.

During router operation, you may encounter IP tunneling problems that require troubleshooting. This chapter describes how to recognize and solve some problems that you might have with an IP tunnel on your wide area internet.

If you specify invalid or conflicting information when configuring an IP Tunnel access method for an Ethernet or Token Ring port, a message informs you about the error and describes how to correct it. This chapter also provides additional information about IP tunneling error messages that may appear in Router Manager.

IP tunneling problems

This section describes the symptoms, causes, and solutions for some IP tunneling problems that you might encounter during router operation, if an IP tunnel exists on your wide area internet.

!! IMPORTANT If solving a problem requires that you modify a port configuration in the startup document, you must first stop the router. Use Router Manager to modify the router's startup document, then restart the router. **!!**

One or more zones or networks do not appear in the Network Information window in Router Manager or in the Chooser on computers on the AppleTalk internet.

Causes-Solutions

When configuring the IP tunneling ports on both exterior routers that are attempting to communicate over the IP tunnel, select "Use only the host IDs listed" and add the host ID of the other exterior router to the host list. See "Configuring an IP Tunneling Port" in Chapter 2.

When configuring the IP tunneling port on one of two exterior routers that are attempting to communicate over the IP tunnel, select "Use only the host IDs listed" and add the host ID of the other exterior router to the host list. When configuring the IP tunneling port on the other exterior router, deselect "Use only the host IDs listed." See "Configuring an IP Tunneling Port" in Chapter 2.

When configuring the IP tunneling port on each of two exterior routers that are attempting to communicate over the IP tunnel, identify any invalid host IDs in the host lists and specify the correct host IDs. See "Configuring an IP Tunneling Port" in Chapter 2.

Determine whether any router on the path from the network to this router is hiding the network. Remove the network from the list of hidden networks in that router's port configuration. See the Apple Internet Router Administrator's Guide.

Consult with the IP network administrator about solving the problem.

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Check the Router Log to verify the problem. Change the network topology to eliminate all loops.

Turn off network-number remapping in the Options dialog box. See the Apple Internet Router Administrator's Guide.

None of the zones or networks connected to any of the exterior routers across an IP tunnel appear in the Network Information window in Router Manager or in the Chooser on computers on the AppleTalk internet.

Causes-Solutions

Use the MacTCP control panel to configure the port. See the Appendix, "Configuring MacTCP."

In the startup document, select an IP Tunnel access method for a different port that was properly configured using the MacTCP control panel.

Use the MacTCP control panel to configure the port correctly. See the Appendix, "Configuring MacTCP."

Consult with the IP network administrator about solving the problem.

When starting the router with the IP Tunnel access method configured on a port, there is a delay before the information about networks connected to that port appears in the Network Information window.

Causes-Solutions

Start the seed router prior to starting any nonseed routers on a network.

IP tunneling error messages

This section describes IP tunneling error messages that you might encounter when creating a setup document.

The TCP/IP host address that you typed is invalid. The correct format for a host address is ###.###.###.###, in which each group of three numbers has a value between 0 and 255. Please specify a valid host ID.

Alternatively, you can type a host name in the Host ID text box. A host name cannot begin with a number.

You can use the IP Tunnel access method on only one port and have already defined that access method on the [physical] port. Defining the IP Tunnel access method on this port will delete the existing port information. Are you sure you want to define the IP Tunnel access method?

You can configure an IP Tunnel access method on only one port.

Before configuring the IP Tunnel access method for an Ethernet or Token Ring port, you must configure MacTCP. This appendix explains how to use the MacTCP control panel to configure the MacTCP driver.

To configure the MacTCP driver, follow these steps:

1. Choose Control Panels from the Apple menu.

The MacTCP icon is in the Control Panels window that appears.

2. Double-click the MacTCP icon to open the MacTCP control panel.

The MacTCP control panel appears. The current AppleTalk connection appears in the upper-left corner of the control panel and is selected by default. The control panel also displays a network interface icon for each Ethernet and Token Ring port available on the router Macintosh.

3. In the MacTCP control panel, select the network interface icon that corresponds to the Ethernet or Token Ring port for which you are configuring the IP Tunnel access method.

4. Click More to open the Administrator dialog box.

The Administrator dialog box appears.

5. In the Obtain Address area of the Administrator dialog box, click the Manually button to set the IP address manually, then click OK to return to the MacTCP control panel.

The MacTCP driver will obtain the host's IP address from the settings in the MacTCP control panel.

6. In the MacTCP control panel, type an IP address for the router in the IP Address text box, using dotted decimal notation.

Each host, or node, on a TCP/IP internet has a unique 32-bit IP address that consists of two fields. The network field identifies the network on the internet to which the host is connected. The host field uniquely identifies each host on a network. One or more of the three high-order bits in an IP address determines whether it is a Class A, B, or C address.

When typing the router's IP address in the IP Address text box, specify that address as four decimal integers separated by decimal points, as shown in the following figure. Each decimal integer corresponds to an octet of the 32-bit binary address.

7. Click More.

The Administrator dialog box appears. This dialog box now contains information derived from the IP address that you specified, including

- the IP address itself
- an address class, which appears selected in the Class pop-up menu
- a network identifier
- a node, or host, identifier

If your network doesn't require subnetwork addressing, skip step 8.

8. If your network requires subnetwork addressing, set the subnet mask and subnet address by dragging the Subnet Mask slider in the Administrator dialog box.

On a network that requires subnetwork addressing, an IP address consists of a network field and a local field, rather than a host field. The local field consists of a subnet field and a host field. A 32-bit subnetwork mask allows the MacTCP driver to distinguish bits in the network and subnet fields from those in the host field.

Each increment on the slider represents one bit of the 32-bit IP address. A dividing line separates the Net Bits from the Subnet and Node Bits. When a network doesn't use subnetwork addressing, the Subnet Mask slider is at the dividing line and the Subnet text box appears dimmed. When you move the slider to the right of this dividing line, its position determines the number of bits in the subnet field and the node field. As you drag the Subnet Mask slider, the values of the Subnet Mask and the Subnet and Node Bits change, as do the values in the Subnet and Node text boxes.

Note Once you have set the network, subnet, and node identifiers, you can prevent others from changing their values by clicking the Lock checkbox to the right of each identifier.

If the Routing Information Protocol is not implemented on the network, type the gateway address in the Gateway Address text box, using dotted decimal notation.

If the Routing Information Protocol (RIP) is implemented on the network, MacTCP automatically obtains the address of an active gateway by monitoring RIP traffic.

10. If your network supports the domain name system, type the name of a domain for which your organization maintains a domain name server in the Domain text box.

The domain name system provides a hierarchical naming scheme. A domain name consists of a sequence of subnames, or labels, separated by periods. It includes a label for each locally administrated subdomain, followed by a second-level domain label and a top-level domain label that are administrated by the Network Information Center.

A domain name server maps domain names to IP addresses. The MacTCP driver includes a domain name resolver, which obtains the IP address associated with a domain name from the local domain name server. The local domain name server may obtain an IP address from another domain name server.

11. Type the IP address of that domain name server in the IP Address text box.

When you enter the IP address, Domain and IP Address text boxes for an additional domain name server appear at the bottom of the list.

To specify the information for another domain name server, repeat steps 10 and 11.

12. Designate a domain name server as the default domain name server by clicking its Default button.

Select a domain name server that has been configured with the appropriate subdomain, second-level domain, and top-level domain labels as the default domain name server. Subsequently, you can type just a subdomain name in a Domain text box when specifying the information for a domain name server that is in a subdomain of the default domain name server. The domain name resolver appends the subdomain, second-level domain, and top-level domain labels of the default domain name server to the subdomain name.

The following figure shows an Administrator dialog box in which subnetwork addressing, a gateway address, and domain name server information have been configured.

13. Click OK to save your changes and close the Administrator dialog box.

14. Close the MacTCP control panel.