Farallon™ PhoneNET® Connector User's Guide

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PhoneNET Connector User's Guide

Farallon Computing, Inc.

Credits

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Introduction

The PhoneNET System is a network solution that includes a complete line of hardware and software products to help you build your networks, manage them, and use them to their full potential. PhoneNET Connectors are an important component of the PhoneNET System. Each AppleTalk-compatible device (computer, printer, and so on) on your network requires a PhoneNET Connector.

A basic network is created by interconnecting these PhoneNET Connectors with ordinary telephone cabling. A more complex network may include hundreds of PhoneNET Connectors, miles of telephone cabling, and additional network devices such as PhoneNET StarControllers and PhoneNET Repeaters.

PhoneNET System products are designed to simplify network installation, maintenance and management. The PhoneNET System offers high reliability and maximum flexibility. You can configure devices in a variety of network topologies, including daisy chain and star topologies. You may be able to use existing telephone wiring for your network.

Farallon Computing is committed to providing its customers with reliable products and excellent technical support. Please call Farallon at (415) 849-2331 or write us with any questions, concerns or suggestions.

About this manual

The *PhoneNET Connector User's Guide* tells you how to design, install and test a network made of PhoneNET System components. This manual is divided into six chapters and includes a glossary and an index.

Chapter 1, *"About Networks"* describes some network terms and four network topologies. Read this chapter if you are new to networking or are designing a network for the first time.

Chapter 2, *"Designing a Network"* provides suggestions for planning a network and outlines some guidelines for each network configuration.

Chapter 3, *"Installing PhoneNET System Cabling"* provides step-by-step installation instructions for each network topology.

Chapter 4, *"Using Existing Wiring"* explains how to install PhoneNET System cabling using existing wiring.

Chapter 5, *"Testing a Network"* tells you how to test network wiring using an ohm meter.

Chapter 6, *"Reference"* includes troubleshooting hints, technical specifications and a recommended reading list.

Note: Boldface terms in this manual appear in the glossary.

Devices compatible with the PhoneNET System

Like Apple's LocalTalk Cable System, the PhoneNET System lets you connect many different AppleTalk-compatible devices. This includes devices that have built-in AppleTalk capability, such as Macintoshes and LaserWriters. This also includes IBM PCs, IBM PC-compatibles, Apple IIs and other types of devices equipped with an AppleTalk interface. Check with Farallon Computing or your dealer for information about connecting UNIX, Q-Bus and Multibus devices to a PhoneNET System.

PhoneNET Connectors are compatible with LocalTalk connector boxes. Both types of connectors can be used together on the same network.

If you want to get started immediately

If you are an experienced computer user and would like to set up your network immediately, follow these steps to create a simple daisy chain.

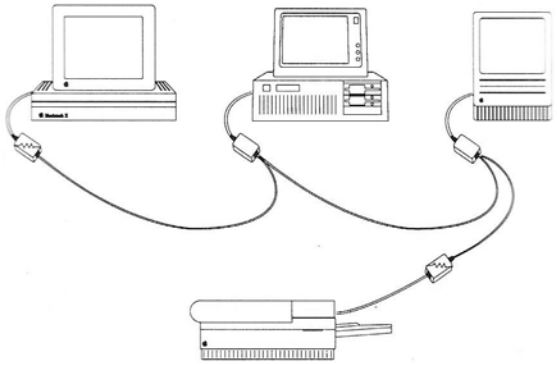
1. Purchase a PhoneNET Connector for each network device. PhoneNET Connectors come in three models, and all three are identical except they contain different plugs. The model you need depends on the device you wish to attach to the network. See *"PhoneNET Connectors"* in Chapter 1 if you don't know which model to purchase.

2. Plug a PhoneNET Connector into the AppleTalk port of each network device. Use the printer port on Macintosh computers.

Link each PhoneNET Connector to the next with modular extension cable. Each PhoneNET Connector comes with a 7-foot modular extension cable.

The RJ11 sockets on the PhoneNET Connector are identical, so it does not matter which socket you use.

4. Insert an RJ11-mounted terminating resistor into the unused socket on the first and last PhoneNET Connectors of the daisy chain. Do *not* create a circle by linking the first and last PhoneNET Connectors together.



Creating a simple daisy chain.

5. Power on all the equipment and test your installation by printing a one-page document from each device. If your network includes Macintoshes and one or more LaserWriters, follow these steps from each Macintosh:

a. Start up from a disk containing the latest System, Finder, LaserWriter and LaserPrep files.

b. Choose the Chooser desk accessory from the Apple menu.

c. Select a zone, click on the LaserWriter icon, and select a LaserWriter.

d. Click on the close box to quit the Chooser and return to the Finder.

e. Select Print Directory from the File menu in the Finder.

If you have trouble with the network, see *"Installing a daisy chain"* in Chapter 3 for complete installation instructions.

Chapter 1 – About Networks

This chapter discusses network terms, describes PhoneNET System network topologies, and explains why terminating your network is important.

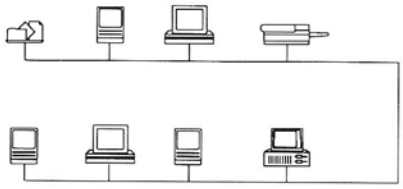
Network terms

It is important to understand some key network terms before you design and install your network. Refer back to these concepts as you go through the manual.

Protocols refer to a set of rules for communicating between devices. Protocols specify how information is addressed, sent, received and read over the network. The **AppleTalk network system** is a set of hardware and software specifications that allow Macintosh computers to communicate with printers, file servers, and other devices over a variety of cabling schemes. PhoneNET System cabling supports AppleTalk protocols at transmission speeds of 230.4 kilobits per second (kbps). PhoneNET System cabling will also support higher speeds of up to 1 Mbps.

Information is sent over a network in organized chunks called **packets.** A packet contains data, the sending address, the receiving address, and other information.

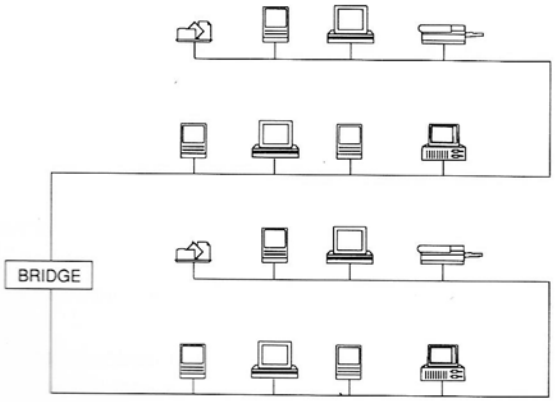
A **network** is a group of interconnected devices that share the same network number. A network often contains all of the devices in a work group, including **network services** (file servers, electronic mail servers and printer servers).



A network

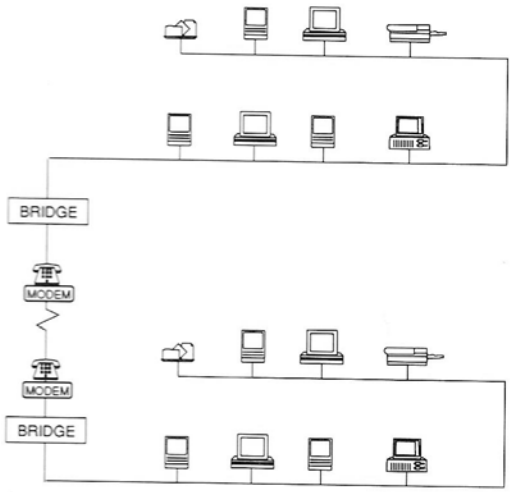
A **bridge** is a device that connects two networks. Bridges can be used to divide an internet into separate, interconnected networks. Bridges are often referred to as routers.

A **local bridge** connects two networks located in close proximity. Local bridges are often used to connect networks on different floors or areas of the same building.



A local bridge

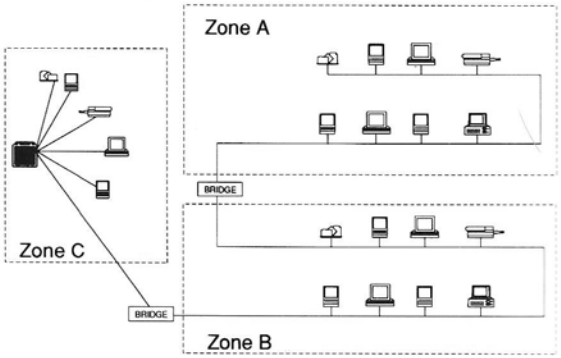
A **remote bridge** connects two networks that are in different geographic areas by modem or satellite link. Because modem throughput speeds (usually 1,200 to 19,200 bps) generally provide a slower throughput rate than on a local area network, a remote bridge with modem links may significantly slow down network signals.



A remote bridge

The **internet** refers to a collection of interconnected networks divided by gateways or bridges.

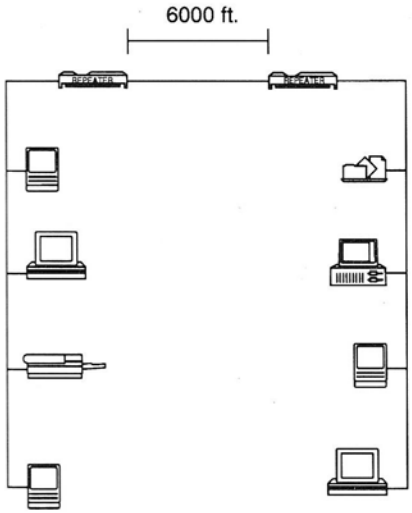
A **zone** is a selected group of networks. Zones help you organize users into logical work groups.



An internet divided into three zones.

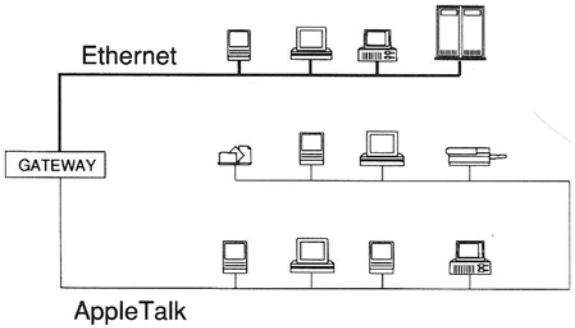
Zones are defined by bridges and gateways, and can contain a single network or an entire internet. Networks on either side of a bridge can be part of the same zone, or in different zones. Since bridges and gateways are used to isolate traffic, zones typically are used to group together users with shared network services. Users can still access the shared network services of other groups by selecting another zone with the Chooser.

A **repeater** is a device that amplifies a network signal, allowing it to travel through several thousand feet of cable. Network segments on both sides of a repeater share the same network number and zone name. Repeaters have little effect on the speed of the network signal. The **PhoneNET Repeater** amplifies and reclocks a network signal. You can install multiple PhoneNET Repeaters to extend the length of the network to several miles.



A network with two PhoneNET Repeaters

A **gateway** connects two or more networks that use different protocols. The Kinetics FastPath, for example, is a gateway that can connect an AppleTalk network with an Ethernet network. Gateways provide the necessary translation between the two network protocols.



A gateway connecting an Ethernet network to an AppleTalk network.

About network addressing

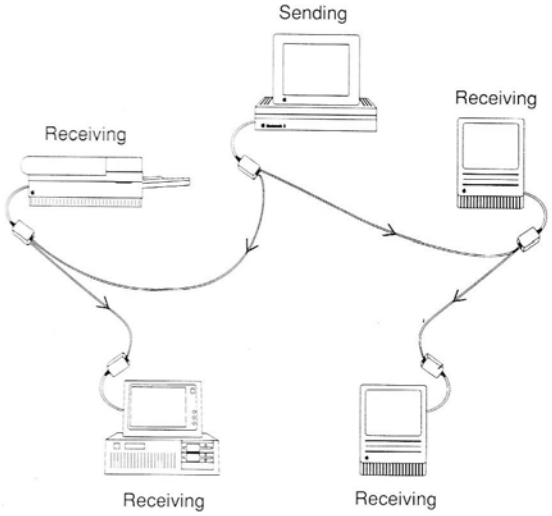
Each network on an internet has a unique **network number**. Some bridges and gateways set unique network numbers automatically, others must be assigned network numbers.

A **node** refers to an addressable device on the network. A node can be a computer, printer, or other device. Every node is automatically assigned a unique **node number** when the device first accesses the AppleTalk network.

A **socket number** is an address within a node. Socket numbers are assigned when a specific network task within a device is initiated. Multiple socket numbers are assigned to the same device if the device performs more than one network task.

Every packet sent on the network includes a detailed network address. Addressing information includes the network number, node number and socket number of the sending and receiving devices. Bridges and gateways keep track of network numbers and route packets to their destination.

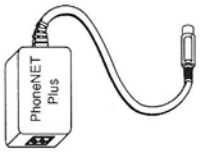
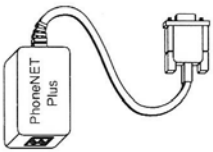
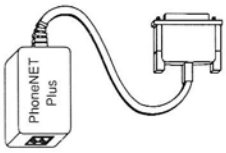
Only one device can send packets at a time. Other devices receive packets and wait until a short interval of no activity lapses before sending packets.



Only one device can send packets at a time.

PhoneNET Connectors

The PhoneNET Connector is the basic hardware unit that attaches a device to the network. PhoneNET Connectors come in three models, and all three are identical except they have different plugs. The model you need depends on the device you wish to attach to the network.

	DIN-8 plug
	DB9 plug
	DB25 plug

Three models of PhoneNET Connectors

Device	AppleTalk port socket
Macintosh Plus, SE, II Apple IIGS Apple IIe* ImageWriter II*, LQ* LaserWriter II NT, II NTX Other third-party AppleTalk devices	○ DIN-8
Macintosh 128K, 512K, 512Ke LaserWriter, LaserWriter Plus IBM PC, XT, AT, and compatibles* Kinetics FastPath Hayes InterBridge Other third-party AppleTalk devices	▭ DB9
Lisa/Macintosh XL	▭ DB25
* with AppleTalk card	

Select the appropriate PhoneNET Connector for each device.

PhoneNET System topologies

PhoneNET Systems can be configured in four basic network topologies: daisy chain, backbone, passive star and active star. A description of each topology along with a sample network diagram follows.

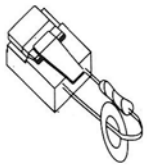
Important terms

terminating resistor: A small electrical component used to properly balance the electrical signal by adding resistance at the end of a length of cable. A terminating resistor is included with each PhoneNET Connector.

Terminating resistor

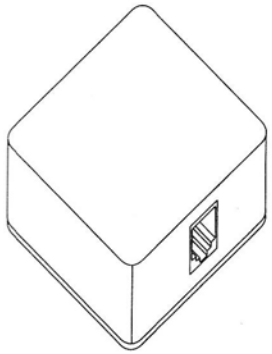
Note: You can identify any 120-ohm resistor by its four bands: brown, red, brown and gold.

RJ11-mounted terminating resistor: A terminating resistor mounted on an RJ11 plug. An RJ11-mounted terminating resistor is included with each PhoneNET Connector.



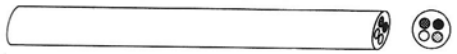
RJ11-mounted terminating resistor

wall jack: A small hardware component used to tap into telephone wall cable. Inside a wall jack are screw terminals for the four telephone wall cable wires. These screw terminals are connected to a female RJ11 socket on the outside of the wall jack.



Wall jack

telephone wall cable: Ordinary 4-wire, 22- or 24-gauge solid copper wire cable. Telephone wall cable is sometimes called telephone station cable or twisted-pair cable.

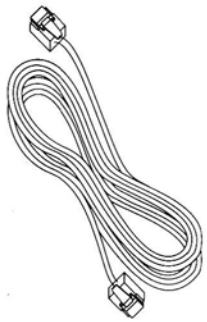


Telephone wall cable

modular extension cable: Ordinary 4-wire, 26-gauge stranded cable.

Modular extension cable

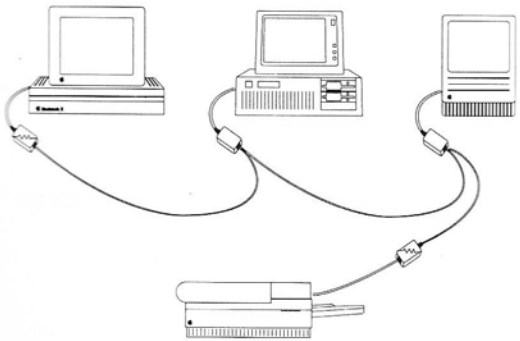
Each PhoneNET Connector comes with a 7-foot modular extension cable with an RJ11 plug mounted at each end.



7-foot modular extension cable

Daisy chain topology

A **daisy chain** is a network topology where multiple devices are linked one to another. In a daisy chain, each device has a PhoneNET Connector and is directly linked to the next with modular extension cable.



Daisy chain topology

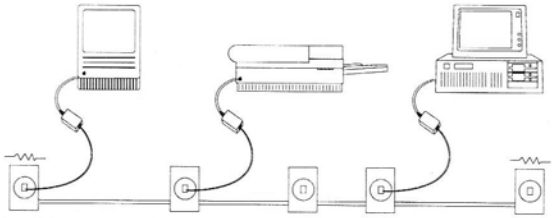
A daisy chain can be constructed quickly and easily, and is a good choice if you want to connect a few devices that are in the same room. A daisy chain is also useful for temporary installations.

There are a few important limitations to keep in mind when constructing a daisy chain. Modular extension cable isn't twisted and contains relatively thin, stranded wire. A daisy chain contains a separate length of wire and two contact points between each PhoneNET Connector. As a result, a daisy chain should contain no more than 24 PhoneNET Connectors and should be limited to 1800 feet of modular extension cable.

A daisy chain can be broken easily. Removing a PhoneNET Connector from the middle of a daisy chain splits the network into two separate networks. If you would like to create a larger or more permanent network, consider a backbone or star topology.

Backbone topology

A backbone consists of an unbroken length of cable with multiple network connection points. In a backbone many wall jacks are connected to a length of telephone wall cable. Each device has a PhoneNET Connector which is connected to a wall jack with modular extension cable.



Backbone topology

A backbone has many advantages over a daisy chain. You can create large, permanent, reliable networks of up to 4500 feet using telephone wall cable. You can plug or unplug a PhoneNET Connector from any wall jack on a backbone without affecting other devices.

You may need to pull new telephone wall cable and wire new wall jacks to install a backbone. A backbone is a good alternative if you plan to run new cabling and don't need the benefits of a star.

About star topologies

A star is a network topology where many network branches are connected at a central location. A star provides the most flexible network topology because the network can easily be reconfigured from a central location. The PhoneNET System supports two similar star topologies: passive star and active star. Each is described in the sections below.

Note: Telephones are usually installed in a star. Passive and active stars can often be incorporated into existing telephone wiring. See Chapter 4, *"Using Existing Wiring"* for more information.

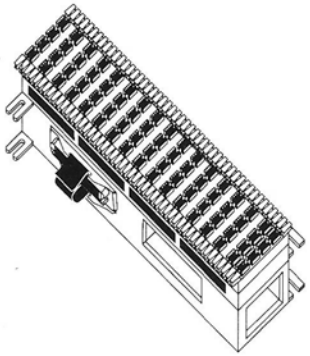
Important terms

PhoneNET StarController: A hardware device that lets you connect large amounts of cabling into one AppleTalk network. A StarController provides branch isolation, error rate reduction, continuous anti-jamming monitoring, and fault isolation.

PhoneNET StarController

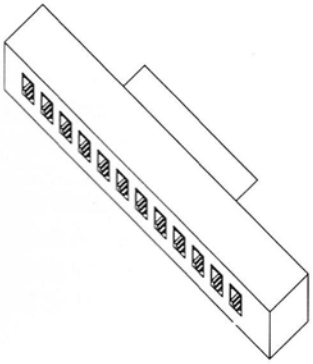
telephone closet: A central location where all the telephone wiring is connected. Telephone lines in a telephone closet branch out to individual extensions. The center of a star is usually located in the telephone closet.

punchdown block: A wall-mounted telephone wiring distribution block used to connect many pairs of wires. A punchdown block is often used at the center of a star to connect the branches together.

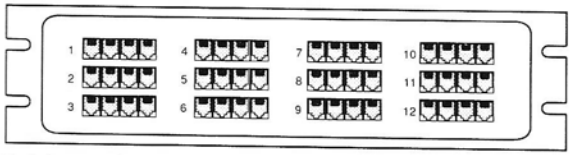


Punchdown block

harmonica block: A wiring distribution block with 12 RJ11 sockets on it. A harmonica block is used to connect a PhoneNET StarController to 12 network branches that use modular extension cable.

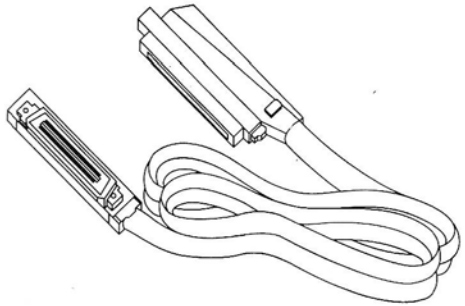


patch panel: A wiring distribution block with 12 sets of four RJ11 sockets. A patch panel is used to connect branches that use modular extension cable to a StarController.



Patch panel

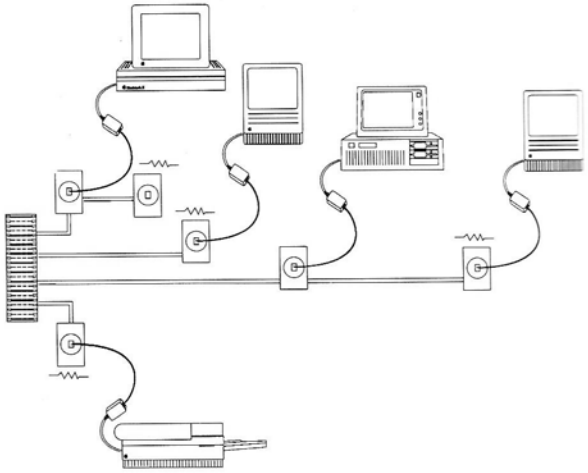
50-wire Amphenol cable: A 50-wire cable with Amphenol connectors used to connect a PhoneNET StarController to a punchdown block, harmonica block or patch panel.



50-wire Amphenol cable

Passive star topology

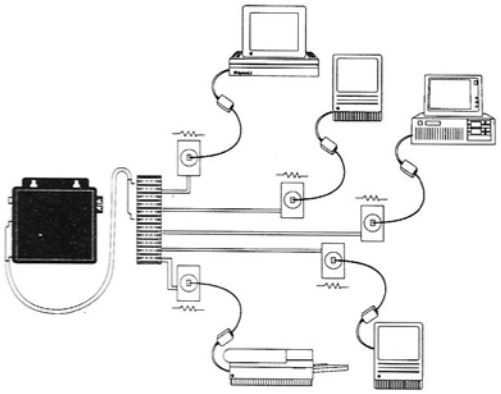
A passive star is a network topology where up to four network branches are connected at one central location. In a passive star each network branch usually contains one or more devices, and all the network branches are connected to a wiring distribution block such as a punchdown block.



Passive star topology

Active star topology

An active star consists of multiple network branches connected to a PhoneNET StarController. Often an active star consists of a StarController connected to a punchdown block with network branches radiating to telephone wall jacks.

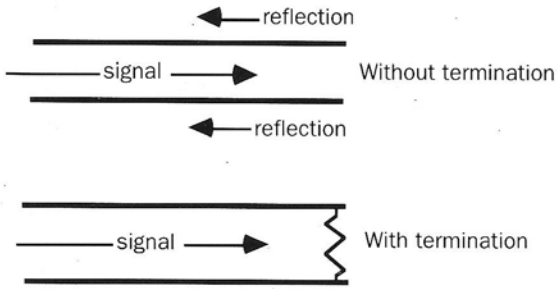


Active star topology

A StarController amplifies the signals between network branches, increases network reliability and increases cabling distances. Each of a StarController's 12 ports can support up to 3000 feet of cabling and up to four network branches. A StarController also comes with software to manage, test and troubleshoot the network.

About terminating a network

In order to understand why it is important to terminate a network, you first need to understand how data travels across network wires. The data in each packet travels across network wires on electrical impulses. When an electrical impulse reaches the end of a length of cable, the signal can either be absorbed or reflected. A reflected signal can cause errors. Errors make a network appear to be slow, or cause devices to occasionally disappear from the network. A resistor of the correct value placed at the end of a length of cable will absorb the signal and reduce reflections. Because resistors absorb network signals, however, placing too many resistors on a network reduces total network cabling lengths.



Terminating a network reduces reflections

Installing a 120-ohm resistor at the end of a length of cable to reduce reflections is called **terminating a network.** A properly terminated network will operate reliably. For convenience, each PhoneNET Connector includes two easily installed 120-ohm terminating resistors. Many of the diagrams in this manual include a resistor symbol (—∿∿∿—) to indicate the proper location of terminating resistors on a network. The following table tells you where you need to install terminating resistors.

Topology	Instructions for Terminating the Network
daisy chain	Install an RJ11-mounted terminating resistor in the PhoneNET Connector at each end of the daisy chain.
backbone	Install a terminating resistor inside the wall box at each end of the backbone.
passive and active star	Install a terminating resistor inside the wall box at the end of each network branch.

Note: Placing terminating resistors in wall jacks ensures that they are not accidentally removed even if the PhoneNET Connector in the wall box is removed. See "*Installing a terminating resistor in a wall jack*" in Chapter 3 for details.

Chapter 2 – Designing a Network

An efficient network that will serve your long term needs requires thorough research and planning. This chapter begins with a review of some key network design considerations, and then explains how devices such as gateways and PhoneNET StarControllers let you create networks to suit different needs. The last section outlines some wiring guidelines for PhoneNET System cabling.

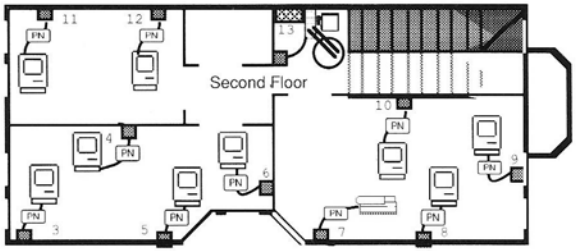
If you plan to install a small network with a few devices in one room, you may find this chapter has all the information you need. If you plan to implement a large network with hundreds or thousands of devices, this chapter may only serve as a starting point.

Network design considerations

Since every network is unique, it is impossible to list the exact steps involved in network design. Listed below are some general guidelines.

- **Assign a network manager**
  The network manager coordinates the design and installation of the network. The network manager is also responsible for adding new users to the network and troubleshooting problems. For small installations, the network manager's duties may only require a few hours a week. For larger installations, the network manager's position may be a full-time job.

- **Create a network map**
  A **network map** is a visual record of your network configuration. Create a network map by copying a floor layout diagram and adding graphics representing devices and cabling. You can modify the map as you change your plans, and use the completed map during installation. It is a good idea to create the map on a computer so you can easily modify it.



A network map showing floor layout, devices and cabling.

- **Determine if you can use existing wiring**
  The physical limitations or regulations on the use of your building's wiring can greatly affect your choice of network layouts. Have the building manager or a telephone installer determine whether you can use existing wiring in your office. In general, you can use existing wiring if you have an unused wire pair going to each office. See Chapter 4, *"Using Existing Wiring"* for more information.

- **Choose an appropriate network topology**
  The existing wiring scheme of your office and your particular network needs will determine which topology is appropriate. For example, if you plan to use existing telephone wiring, you will probably want to select a star topology.

- **Leave room for growth**
  As your network needs grow, your network should also grow. Hasty additions to your network will make network maintenance difficult and time-consuming. Plan to install more cabling than you think you will need. With adequate preparation, adding another device to the network can often be as simple as plugging in another PhoneNET Connector.

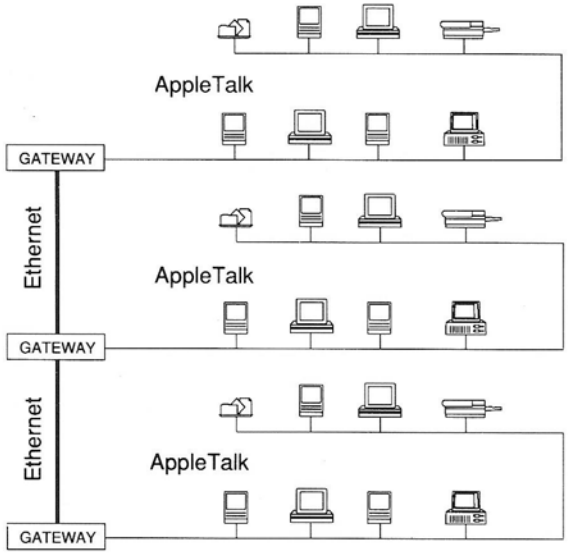
- **Do some research**
  Familiarize yourself with the numerous network hardware and software options available to you. See *"Recommended reading"* in Chapter 6.

Adding bridges, gateways, PhoneNET Repeaters and PhoneNET StarControllers

Designing a large internet involves a close look at how some key network hardware components can expand a network and improve performance.

- **Add bridges to reduce traffic in a network**
  Consider adding a bridge if your network appears to by slowed down by traffic. Use TrafficWatch to see the traffic patterns of your network and to find out which devices generate the most traffic.

- **Add gateways to create an Ethernet backbone**
  An Ethernet backbone provides a high-speed link between networks on a large internet. If one network requires frequent use of a device on another network, make sure both networks are contiguous or linked by an Ethernet backbone. Otherwise the networks placed between them will be slowed down by constant through traffic.



Add an Ethernet backbone to reduce through traffic and improve network performance.

- **Use PhoneNET Repeaters for extended network distances**
  For spanning distances of 4000 feet or more, such as multi-building networks, consider using PhoneNET Repeaters. You can install multiple PhoneNET Repeaters to carry a network signal several miles.

- **Add PhoneNET StarControllers to expand network size and improve performance**
  A PhoneNET StarController extends the total network length, improves performance, and provides convenient network management control functions.

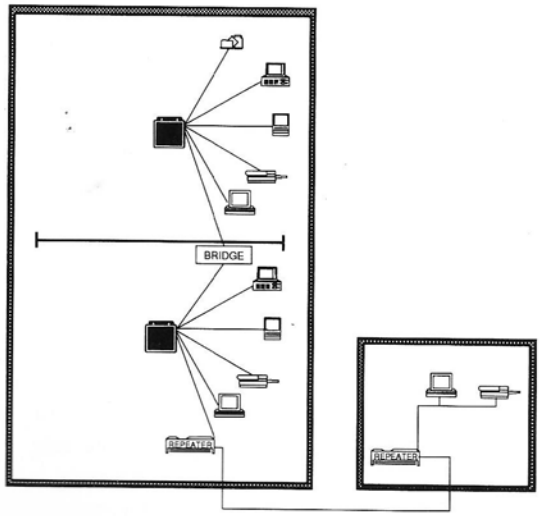
Two network design examples

The following sections describe two example network installations. These examples are designed to give an overview of the decisions involved when designing a network.

Example 1 – L&B Packaging

L&B Packaging occupied a 2-story building. The sales and marketing departments had offices on the first floor; the research and accounting departments were on the second floor. Each floor had their own network of Macintoshes connected to a LaserWriter. L&B's warehouse was located in a building a mile and a half away. Although most L&B employees had Macintoshes, they spent quite a bit of time hand-delivering telephone messages, routing invoices, and exchanging floppy disks. After growing to 40 employees, L&B decided it was time to install a company-wide network so they could access electronic mail, centralize inventory, and improve communications.

L&B decided to install an AppleTalk network with two PhoneNET StarControllers, one bridge, two PhoneNET Repeaters, and an AppleShare file server. A star topology allowed them to use existing telephone wiring and gave them the flexibility to reorganize the network as their needs changed. PhoneNET StarControllers added reliability to the network and provided useful network management functions. A bridge between the PhoneNET StarControllers reduced unnecessary traffic between the networks on each floor. Using PhoneNET Repeaters allowed them to have a high-speed AppleTalk network between headquarters and the warehouse. All employees had access to the file server, so they could send electronic mail to one another and check the inventory database from any computer.



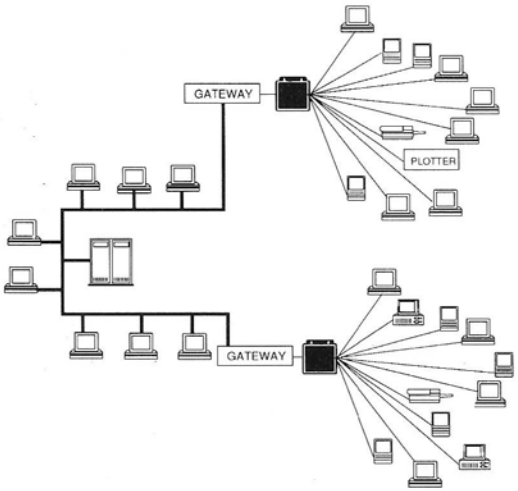
L&B Packaging's network

Example 2 – HiTech Engineering

HiTech Engineering was a small, but fast-growing engineering design firm. They occupied a large one-story building which they expected would meet their needs for the next several years.

HiTech employees used IBM PCs and Macintoshes for their design work and document processing. Only a few of these computers were networked. HiTech employees used the network primarily for printing and transferring files between the PCs and Macintoshes. HiTech finally decided to invest in a VAX to assist with the design work. They planned a network that would link all of the workstations to make the most efficient use of this new corporate asset.

HiTech installed new telephone wall cable to all existing and future workstations. At each workstation they installed dual wall jacks: one jack dedicated to the telephone system and the other for the network. In the telephone closet they installed two StarControllers. One StarController was for 7 Macintoshes, 2 PCs, a plotter, and a LaserWriter in the Finance department. The second StarController was for 7 Macintoshes, 2 PCs, and a LaserWriter in the Sales department. Each StarController was connected to the Ethernet backbone with its own Kinetics FastPath. HiTech put 8 Macintoshes and the VAX on Ethernet.



HiTech's network

HiTech installed file service software on the VAX to provide all users with access to archival storage. The network manager installed Timbuktu on each Macintosh so that he could assist users with the new network services without leaving his desk. With Timbuktu he could also install and manage an electronic mail server in a Macintosh II without a keyboard, monitor or video card. Over time, HiTech employees began to use the network to work together more effectively, sharing ideas and information with their computers.

Wiring guidelines for PhoneNET System cabling

This section outlines some conservative guidelines for wiring PhoneNET System cabling. These guidelines will produce reliable networks under most circumstances. Deviations from the guidelines may also produce properly operating networks. Because you can create an almost infinite number of topological variations with PhoneNET System cabling, and because installation quality cannot be assured, it is impossible to provide definitive wiring rules.

The tables below list the recommended maximum amount of cabling and number of devices for various wire gauges and network topologies. The first table lists guidelines for networks operating at normal LocalTalk speeds (230.4 kbps), and the second table lists guidelines for networks operating at higher speeds (such as FlashTalk at 768 kbps).

Topology (230.4 kbps)	22 gauge	24 gauge	26 gauge	Max # nodes
daisy chain	n/a	n/a	1800 ft	24
backbone	4500 ft	3000 ft	1800 ft	48
3-branch passive star (each branch)	1500 ft	1000 ft	600 ft	16
4-branch passive star (each branch)	1125 ft	750 ft	450 ft	12

PhoneNET System wiring guidelines at LocalTalk speeds (230.4 kbps)

Topology (768 kbps)	22 gauge	24 gauge	26 gauge	Max # nodes
daisy chain	n/a	n/a	600 ft	18
backbone	1500 ft	1000 ft	600 ft	36
3-branch passive star (each branch)	500 ft	333 ft	200 ft	12
4-branch passive star (each branch)	375 ft	250 ft	150 ft	9

PhoneNET System wiring guidelines at higher speeds (such as FlashTalk at 768 kbps)

Cabling hints

- Each branch of a star is treated as a separate length of cable. You cannot borrow cable from one branch of a star to exceed the recommended limits on another branch of the same star.

- When wiring backbone and star networks, always install wall boxes or line taps as close as possible to each device location. Use as little modular extension cable between the device and the wall jack or line tap as possible. The length of any one piece of modular extension cable connected to a backbone or star should not exceed 50 feet.

- For every one foot of modular extension cable attached to a backbone or branch of a star, diminish the recommended maximum lengths given in the tables by four feet.

Chapter 3 – Installing PhoneNET System Cabling

This chapter gives instructions for installing a daisy chain, backbone, passive star and active star. Just as every network is different, the exact steps for installing your network will vary. The instructions in this chapter illustrate some example installations. You may need to combine information from two or more sections to create your network.

Each section begins by listing the hardware you need to create the network. You always need one PhoneNET Connector for each network device. Most of the other wiring accessories are available from Farallon. For example, Farallon offers a Modular Cable Construction Kit to create custom cable lengths. See the Farallon Product Catalog for a complete list of PhoneNET System products. Many wiring accessories are also available from an electronics store.

You don't need any special tools to create a daisy chain, but you will need a few tools to create a backbone or star. A pocketknife is useful for stripping wire, and a small screwdriver is needed to wire wall jacks. You may also need wire cutters and a punchdown tool.

Installing a daisy chain

A daisy chain is easy to install. You need a piece of modular extension cable (with RJ11 plugs at both ends) to interconnect adjacent PhoneNET Connectors, and two RJ11-mounted terminating resistors.

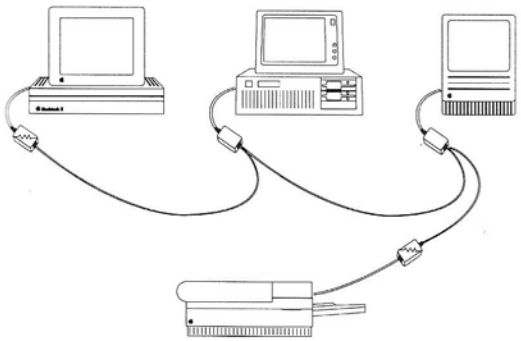
1. Plug a PhoneNET Connector into the AppleTalk port of each network device.

2. Locate or make a piece of modular extension cable (with RJ11 plugs at both ends) long enough to link each PhoneNET Connector to the next, or use the 7-foot modular extension cable that came with the PhoneNET Connector.

3. Link each PhoneNET Connector to the next by plugging the modular extension cable into an RJ11 socket in each PhoneNET Connector. Repeat this step until all PhoneNET Connectors are linked.

   Do *not* create a circle by linking the first and last PhoneNET Connectors together. The PhoneNET Connectors at each end of the daisy chain should have only one modular extension cable plugged into them. The other PhoneNET Connectors in the middle of the daisy chain should have two modular extension cables plugged into them.

4. Insert an RJ11-mounted terminating resistor into the unused RJ11 socket on the first and last PhoneNET Connectors of the daisy chain.



A daisy chain with RJ11-mounted terminating resistors properly installed.

5. Test the network by printing a document from each device, or by running diagnostic software such as CheckNET. See *"Testing to see that the network functions properly"* in Chapter 5.

Installing a backbone

To install a backbone you need wall jacks, modular extension cable, and enough telephone wall cable to reach each wall jack. The most reliable backbone is created by using one continuous length of telephone wall cable and wiring wall jacks *without* cutting the telephone wall cable.

The instructions below tell you how to create a backbone.

1. Pull one continuous length of telephone wall cable along the route of your network.

2. Position the wall jacks along the wall cable.

3. At each wall jack, follow these steps to strip the insulation off the yellow and black wires without cutting them:

   a. Make a cut all the way around the outer insulation without cutting the wires inside. Make a second cut all the way around the outer insulation 2 inches from the first cut. Now make a cut lengthwise between the first two cuts.

   b. Remove the 2-inch piece of insulation and discard it. You will see four wires colored yellow, black, red and green.

   c. Strip about 1 inch of insulation from the yellow and black wires. Again, be careful not to cut the wires.

Expose the yellow and black wires without cutting them.

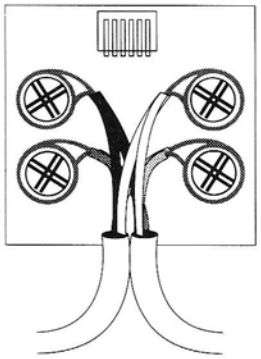
4. Follow these steps to loop the exposed section of the yellow and black wires around the screw terminals labeled "Y" and "B" in the wall jack:

   a. Loosen the screw terminals labeled "Y" and "B" in the wall jack.

   b. Loop the exposed yellow wire around the screw terminal labeled "Y" inside the wall jack.

   c. Loop the exposed black wire around the screw terminal labeled "B" inside the wall jack.

   d. Tighten the screw terminals and replace the wall jack covers. Be careful not to dislodge the spade lugs connecting the screw terminals to the RJ11 socket.



Loop the yellow and black wires around the yellow and black screw terminals in a wall jack.

5. Install a terminating resistor between the yellow and black screw terminals of the wall jacks at each end of the backbone. See *"Installing a terminating resistor in a wall jack"* later in this chapter.

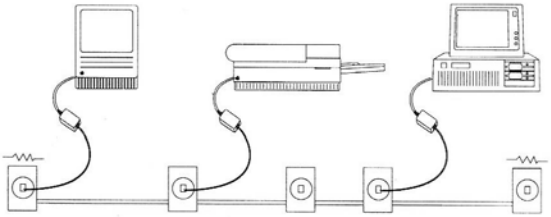
6. Mount the wall jacks. The wall jacks supplied by Farallon have adhesive backs; remove the backing piece and stick the jacks in place. Other wall jacks may have screw mounts.

7. Test your network for shorts and proper termination. See *"Testing installed cabling"* in Chapter 5.

8. Plug a PhoneNET Connector into the AppleTalk port of each network device.

9. Locate or make a piece of modular extension cable (with RJ11 plugs at both ends) long enough to link each PhoneNET Connector to a wall jack, or use the 7-foot modular extension cable that came with the PhoneNET Connector.

10. Test the network by printing a document from each device, or by running diagnostic software such as CheckNET. See *"Testing to see that the network functions properly"* in Chapter 5.



A properly terminated backbone.

Installing a passive star

To install a passive star you need wall jacks, telephone wall cable and modular extension cable. You also need a wiring distribution block to connect the network branches together at the center of the star. Punchdown blocks are often used at the center of a star because they keep your wiring well organized, allow easy wiring modifications, and can accommodate a PhoneNET StarController should your network need one. If you only have a few network branches, consider using a terminal block.

The instructions below describe the installation of a passive star using wall jacks, telephone wall cable and a punchdown block. You should be familiar with the use of a punchdown tool for this installation. Consult a qualified network installer if necessary.

1. Install a punchdown block at a central location such as a telephone closet.

2. Pull or locate a separate length of telephone wall cable from the punchdown block to each wall jack.

3. Wire each wall jack.

   If you are installing more than one wall jack on a network branch, wire the wall jacks along the network branch without cutting the telephone wall cable. See steps 3 and 4 of *"Installing a backbone"* in the previous section.

   Follow these steps to wire the last wall jack on a network branch.

   a. Remove a 2-inch piece of the outer insulation. You will see four wires colored yellow, black, red and green.

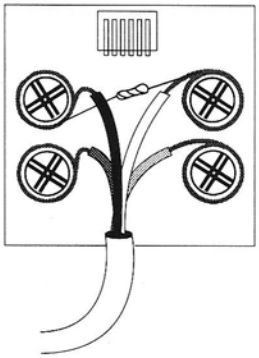
   b. Strip about 3/4 inch of insulation from the yellow and black wires.

   c. Attach the exposed yellow wire around the screw terminal labeled "Y" inside the wall jack.

   d. Attach the exposed black wire around the screw terminal labeled "B" inside the wall jack.

e. Wrap one end of the resistor clockwise around the screw terminal labeled "Y", and wrap the other end of the resistor clockwise around the screw terminal labeled "B." Be careful not to dislodge the yellow and black screw lugs leading to the RJ11 socket.

f. Tighten the screw terminals and replace the wall jack covers.



A wall jack with a terminating resistor installed.

4. Connect the wires coming from each wall jack to the punchdown block. Be sure to connect yellow wires to one row of pins, and black wires to the other row of pins.

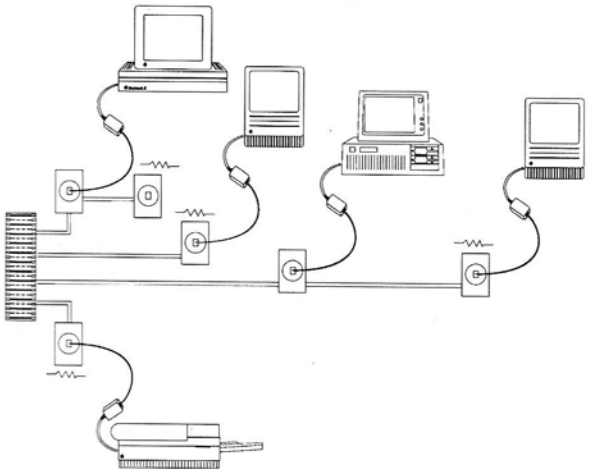
5. Jumper all of the yellow wires together, and jumper all of the black wires together. If you are using Farallon's Passive Star Wiring Kit, simply insert the jumper plug into the punchdown block's 50-pin Amphenol socket. Otherwise, jumper the yellow rows together, and jumper the black rows together.

6. Test your network for shorts and proper termination. See *"Testing installed cabling"* in Chapter 5.

7. Plug a PhoneNET Connector into the AppleTalk port of each network device.

8. Locate or make a piece of modular extension cable (with RJ11 plugs at both ends) long enough to link each PhoneNET Connector to a wall jack, or use the 7-foot modular extension cable that came with the PhoneNET Connector.

9. Test the network by printing a document from each device, or by running diagnostic software such as CheckNET. See *"Testing to see that the network functions properly"* in Chapter 5.



A properly terminated passive star.

Installing an active star

Although you can create much larger networks with an active star than a passive star, the basic steps for installing both are the same. Unlike the center of a passive star, the center of an active star must have a wiring distribution block with a 50-pin Amphenol socket so you can connect a PhoneNET StarController. Farallon offers three types of wiring distribution blocks: a punchdown block, a patch panel and a harmonica block. All three of these have a 50-pin Amphenol socket for connecting a StarController.

The instructions below describe the installation of a simple active star using wall jacks, telephone wall cable, a punchdown block, a StarController, and 50-wire Amphenol cable. You should be familiar with the use of a punchdown tool for this installation. Consult a qualified network installer if necessary. Instructions for installing more sophisticated active stars appear in the *PhoneNET StarController User's Guide.*

1. Install a punchdown block and a PhoneNET StarController at a central location such as a telephone closet. Connect the two together with a 50-wire Amphenol cable.

2. Pull or locate a separate length of telephone wall cable from the punchdown block to each wall jack.

3. Wire each wall jack. See step 3 in *"Installing a passive star"* above for details.

4. Mount the wall jacks. The wall jacks supplied by Farallon have adhesive backs; remove the backing piece and stick the jacks in place. Other wall jacks may have screw mounts.

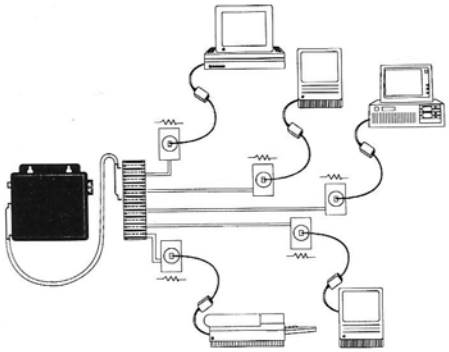
5. Connect the wires coming from each wall jack to the punchdown block. Be sure to connect yellow wires to one row of pins, and black wires to the other row of pins.

6. Test your network for shorts and proper termination. See *"Testing installed cabling"* in Chapter 5.

7. Plug a PhoneNET Connector into the AppleTalk port of each network device.

8. Locate or make a piece of modular extension cable (with RJ11 plugs at both ends) long enough to link each PhoneNET Connector to a wall jack, or use the 7-foot modular extension cable that came with the PhoneNET Connector.

9. Test the network by printing a document from each device, or by running diagnostic software such as CheckNET. See *"Testing to see that the network functions properly"* in Chapter 5.



A properly terminated active star.

Installing a terminating resistor in a wall jack

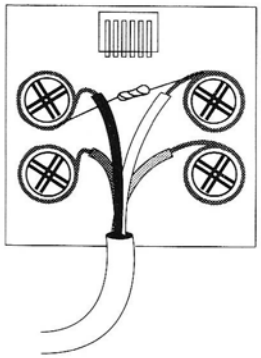
Follow these steps to install a terminating resistor in a wall jack.

1. Remove the wall jack's cover.

2. Loosen the screw terminals labeled "Y" and "B" in the wall jack.

3. Wrap one end of the resistor clockwise around the screw terminal labeled "Y", and wrap the other end of the resistor clockwise around the screw terminal labeled "B." Be careful not to dislodge the yellow and black screw lugs leading to the RJ11 socket.

4. Tighten the screw terminals and replace the wall jack cover.



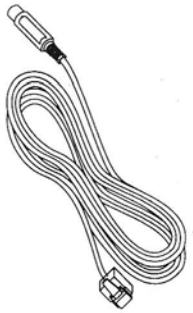
A wall jack with a terminating resistor installed.

Chapter 4 – Using Existing Wiring

This section tells you how you can install a PhoneNET System using existing wiring. Existing wiring includes telephone wiring, LocalTalk cabling, and RS232 terminal wiring.

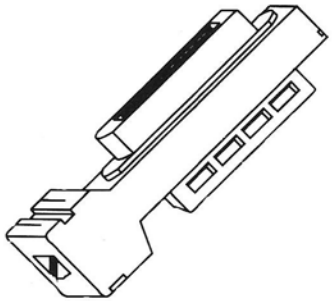
Important terms

PhoneNET to LocalTalk Adapter Cable: A cable that connects a PhoneNET Connector to a LocalTalk connector box. This adapter has an RJ11 plug at one end, and a DIN-3 at the other.



PhoneNET to LocalTalk Adapter Cable

50-pin line tap: A device that taps into pair 21 of ordinary 50-wire (25 pair) office telephone cable. A 50-pin line tap can be reconfigured to tap into any wire pair.



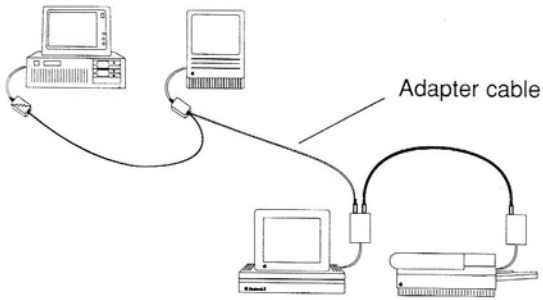
50-pin line tap

LocalTalk cabling

PhoneNET Connectors and LocalTalk connector boxes can be mixed on the same internet by using a PhoneNET to LocalTalk Adapter Cable.

Avoid using more than one adapter cable on a network. With multiple LocalTalk connector boxes, the maximum network distance is limited to LocalTalk's cabling limit of 1000 feet.

The following diagram shows a daisy chain with both PhoneNET Connectors and LocalTalk connector boxes.



A daisy chain with a PhoneNET to LocalTalk Adapter Cable.

Warning: Do not plug a LocalTalk connector box directly into a wall jack with an adapter cable. LocalTalk connector boxes do not have adequate surge protection to attach directly to telephone wall cable. Plug a PhoneNET Connector into the wall jack, then plug the LocalTalk connector box into the PhoneNET Connector with an adapter cable.

Telephone cabling

The information in this section is only an introduction to how a PhoneNET System can be combined with existing telephone cabling. You should consult a qualified telephone installer to ensure proper wiring. Be sure to provide the telephone installer with a copy of this manual.

Most residential and commercial telephone installations can accommodate a PhoneNET System. It doesn't matter what type of telephone cabling is installed as long as there is an unused wire pair for the network. PhoneNET System cabling is compatible with both analog and digital telephone systems. If the telephone wiring in your building does not have an unused wire pair going to each office, you may have to pull new cabling for the network.

Telephones are usually wired in a star. Telephone cables run from a central location such as a telephone closet to each telephone extension. In large, multi-story buildings each floor often has a wiring distribution center, and all of these are linked to a main wiring distribution center in the basement. Telephone cables are usually wired to either a terminal block or a punchdown block which is connected to the telephone company's central office.

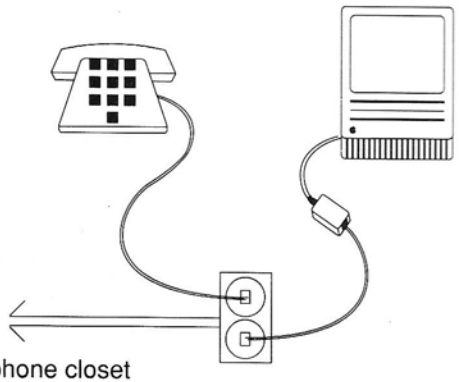
Most single-line telephones are installed using 4-wire cable and often have a pair of unused wires. A single telephone line uses only a single wire pair, typically the red and green wires, leaving the yellow and black wires unused and available for the network.

Multi-line telephone systems are installed using 4-, 6-, 8-, or 50-wire cables and often have many unused wire pairs. Multi-line telephones using 50-wire cable, for example, typically use wire pairs 1-20 for telephone extensions. Wire pairs 23-25 are often used for intercom lines. Wire pairs 21 and 22 are rarely used and are available for the network.

Wiring a PhoneNET System using existing telephone cabling

You need to make an RJ11 socket available at each device location. You may need to install new wall jacks, rewire the existing wall jacks, or add some other type of connector with an RJ11 socket on it.

There are three different ways to connect both a telephone and a PhoneNET Connector to 4-wire telephone wall cable. One way is to replace the existing single wall jacks with dual wall jacks. A second way is to install an additional wall jack at each device location. In a single line telephone that uses the center wire pair, you have a third option. You can plug the PhoneNET Connector into the existing wall jack, and plug the telephone directly into the second RJ11 socket on the PhoneNET Connector.



A PhoneNET Connector and telephone plugged into the same wall jack.

If you are using 50-wire cable, you need to install a 50-pin line tap at each device location. Farallon also offers hardware that lets you tap into other existing wiring schemes.

Once you've installed wall boxes or line taps, you need to wire all of the network wire pairs together at the center of the star. Often a punchdown block or terminal block is used at the center of a star. Consider hiring a qualified telephone installer to wire a punchdown block or terminal block.

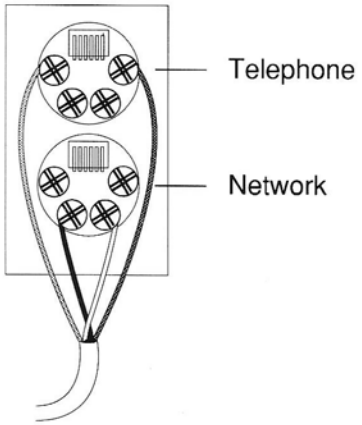
Examples of existing wiring installations

The following two examples describe the installation for two common wiring configurations.

Example 1 – Tapping into 4-wire cabling connected at a terminal block

A two-story residence has one telephone line with two extensions (one on each floor) and would like to add PhoneNET Connectors. Each extension runs on its own 4-wire cable and both cables are connected to a terminal block in the basement. This installation requires dual wall jacks, a terminal block, and modular extension cable.

1. Replace the single wall jacks with dual wall jacks and rewire. One RJ11 socket should be wired with the yellow and black wires for the network, and the other should be wired with red and green wires for the telephone. Refer to the wiring diagram below:



Wiring a dual wall jack

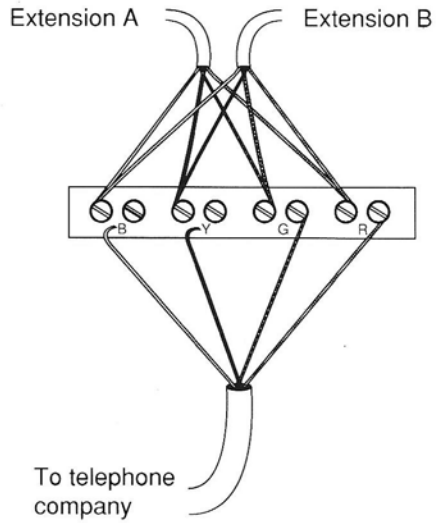
2. Put a terminating resistor across the screw terminals labeled "Y" and "B" in each wall jack.

3. Modify the wiring on the terminal block to accommodate the network wire pairs.

   a. Locate the yellow and black wires coming from each extension.

   b. Attach both yellow wires to the screw terminal labeled "Y", and attach both black wires to the screw terminal labeled "B."

   Note: Be sure to disconnect any wires going from the screw terminals labeled "Y" and "B" to the telephone company's central office. Otherwise your network may be disrupted by voltage from these wires.



Wiring two extensions into a terminal block.

4. Test your network for shorts and proper termination. See *"Testing installed cabling"* in Chapter 5.

5. Plug a PhoneNET Connector into the AppleTalk port of each network device.

6. Locate or make a piece of modular extension cable (with RJ11 plugs at both ends) long enough to link each PhoneNET Connector to a wall jack, or use the 7-foot modular extension cable that came with the PhoneNET Connector.

7. Test the network by printing a document from each device, or by running diagnostic software such as CheckNET. See *"Testing to see that the network functions properly"* in Chapter 5.

Example 2 – Tapping into 50-wire cabling connected at a punchdown block

A large office has 50-wire cabling going to four offices and would like to add PhoneNET Connectors. A separate 50-wire cable runs from a punchdown block in the basement to each office. This installation requires four 50-pin line taps.

1. Determine which wire pair you want to use for the network. 50-pin line taps from Farallon are preconfigured to tap into wire pair 21. If necessary, reconfigure each 50-pin line tap to use a different wire pair.

2. Unplug the 50-pin Amphenol connector at each telephone extension and plug in a 50-pin line tap. You may need a screwdriver to detach the Amphenol connector.

3. Modify the wiring at the punchdown block to accommodate the network wires.

   a. Locate the network wire pairs in the 50-wire cable coming from each office.

   b. Connect all the wire pairs in common. This is equivalent to jumpering all of the yellow wires together and all of the black wires together in a 4-wire installation.

      If you have a large installation or plan to install a PhoneNET StarController, consider purchasing a Passive Star Wiring Kit and running the network wires to the punchdown block.

Note: Be sure the network wire pairs aren't linked to the telephone company's central office. Otherwise your network may be disrupted by voltage from these wires.

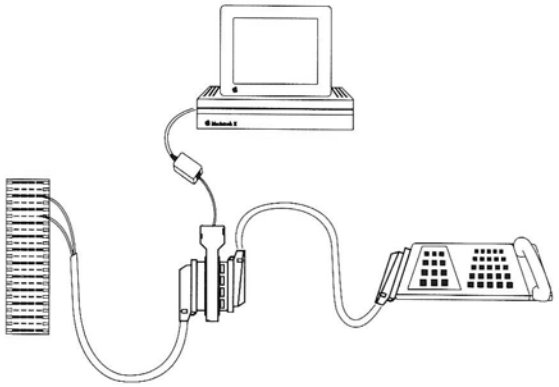
4. Insert an RJ11-mounted terminating resistor in the 50-pin line tap.

5. Test your network for shorts and proper termination. See *"Testing installed cabling"* in Chapter 5.

6. Remove the RJ11-mounted terminating resistor, plug a PhoneNET Connector into the AppleTalk port of each network device, a plug a RJ11-mounted terminating resistor into each PhoneNET Connector.

7. Locate or make a piece of modular extension cable (with RJ11 plugs at both ends) long enough to link each PhoneNET Connector to a wall jack, or use the 7-foot modular extension cable that came with the PhoneNET Connector.

8. Test the network by printing a document from each device, or by running diagnostic software such as CheckNET. See *"Testing to see that the network functions properly"* in Chapter 5.



Use a 50-pin line tap to link a PhoneNET Connector to a 50-wire cable

Compatibility with other cabling schemes

You can install a PhoneNET System using other types of cabling including RS-232 terminal wiring, DECconnect cabling, and the IBM Cabling System. It doesn't matter what type of cabling is installed, as long as there is an unused wire pair for the network. Find out if line taps or adapters are available tc interconnect your wiring scheme with RJ11 jacks of the PhoneNET System. Farallon offers line taps to connect to the IBM Cabling System and ordinary 50-wire telephone cabling. Contact Farallon for information about using other cabling schemes.

Chapter 5 – Testing a Network

This chapter describes how to test a network. Included are procedures for testing installed cabling and testing to see that a network functions properly.

Testing installed cabling

It is important to test the network wiring for shorts and to see that terminators are properly installed. When testing branch cables, use a digital ohm meter since most analog ohm meters cannot accurately display small resistances.

Setting a digital ohm meter to measure resistance

This section tells you how to set up a digital ohm meter to measure resistance. If you already know how to use an ohm meter, refer to the next section.

1. Turn on the ohm meter.

2. Insert the probes into the ohm meter. Insert one of the probes into the socket labeled Ground, GND or Common. Insert the other probe into the socket labeled ohms, resistance or Ω.

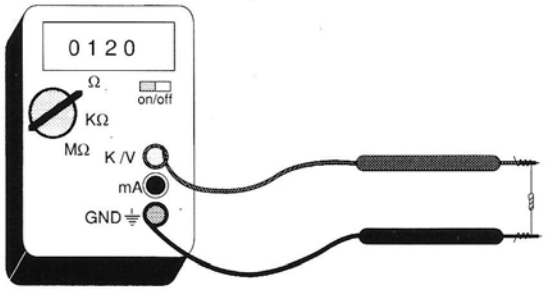
3. Rotate the measurement selection knob to the selection labeled ohms or Ω.

4. Test to see that the ohm meter is properly set to measure resistance.

   Hold both probes so they are not touching each other. The display should read all nines (99999), infinity (∞) or 1.

Touch the probes together. The display should show all zeros (00000). If the display does not indicate zero when the probes are touching, try another selection knob setting.

5. Wrap a 120-ohm resistor around the ends of the probes as shown below to see that the settings are correct.



A 120-ohm resistor wrapped around probe ends.

The value on the meter should be 120 ohms. If the reading on your ohm meter includes a decimal point (1.20 or .120), move the selection knob to a different Ω setting until the reading is 120 ohms.

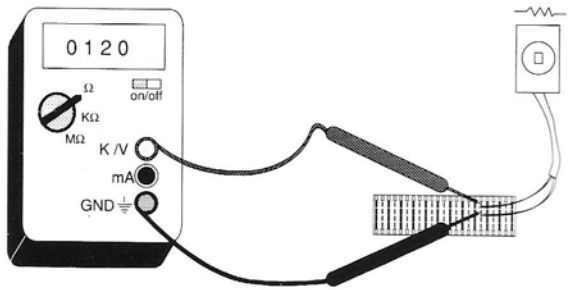
Testing a branch of a star

After installing a terminating resistor in the wall jack at the end of each branch cable, test the cables to confirm that the wall jacks are wired correctly. Before you test the cables, make sure that no PhoneNET Connectors are connected to any of the wall jacks.

Use a digital ohm meter and a PhoneNET Connector to test each network branch cable from the telephone closet.

1. Attach the ohm meter to a network branch cable in the telephone closet.

2. Measure the resistance. The resistance should be 120 ohms, plus approximately 30 to 50 ohms more for every 1,000 feet of cable.



Measuring the resistance in a network branch.

If the resistance is infinite, then the cable is cut, damaged or not terminated. Inspect the cable carefully. Check the wall jack at the end of the cable to make sure that a terminating resistor is correctly installed.

If the resistance is close to zero or approximately 30 to 50 ohms for every 1,000 feet of cable, either the cable has a short or a PhoneNET Connector is plugged into a wall jack along the cable. Check the cable for snapped wires or wires that are crimped together.

3. Measure the DC voltage. There should be no DC voltage. If there is DC voltage, the network branch cable is probably connected to a pair of wires used by a live telephone line. Locate the telephone circuit and disconnect it from the network wires or choose another pair of wires for the network.

4. Measure the AC voltage. There should be no AC voltage. If there is AC voltage, the network branch cable is probably connected to a wire pair used by a non-network device. Locate the AC voltage source and disconnect it from the network, or choose another wire pair for the network.

5. Plug a PhoneNET Connector into the wall jack at the end of a network branch cable.

6. Attach the ohm meter to the corresponding network branch cable in the telephone closet and measure the resistance. The resistance should be between 0 and 100 ohms.

   If the resistance is greater than 100 ohms, you may have a bad connection or you may have exceeded the recommended cable length.

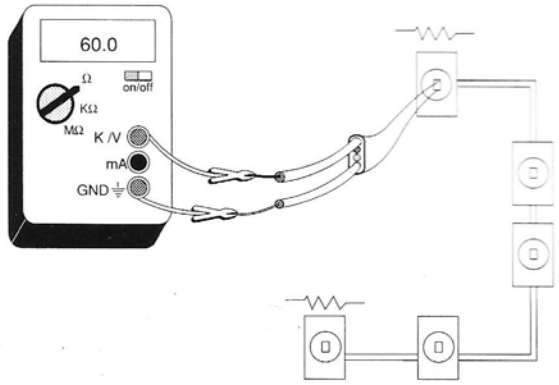
   If the resistance is the same as it was before you plugged in the PhoneNET Connector, either you have connected the 120-ohm terminating resistor to the wrong pair of wires inside the RJ11 wall jack, or you are measuring the wrong network branch cable.

Testing a backbone

1. Create a test cable from a short piece (1-3 feet) of modular extension cable. Put an RJ11 plug on one end, and strip about 1 inch of insulation from the yellow and black wires at the other end. Attach the leads of the ohm meter to the yellow and black wires.

2. Insert the test cable's RJ11 plug into any wall socket on the backbone.

3. Measure the resistance. The resistance should be 60 ohms, plus approximately 30 to 50 ohms for every 1,000 feet of cable.



Measuring the resistance in a backbone.

If the resistance is infinite, then the cable is cut, damaged or not terminated. Inspect the cable carefully. Check the wall jack at the end of the cable to make sure that a terminating resistor is correctly installed.

If the resistance is close to zero or approximately 30 to 50 ohms for every 1,000 feet of cable, either the cable has a short or a PhoneNET Connector is plugged into a wall jack along the cable. Check the cable for snapped or crimped wires.

Testing to see that the network functions properly

Once you've testing the wiring, it is a good idea to print a test document from each network device. A more thorough way to test your network is to run a diagnostic software such as PhoneNET CheckNET. CheckNET displays the name, address, and type of every device on the network. CheckNET can search for particular devices (even across multiple bridges and zones) and can sort by name, address, or device type.

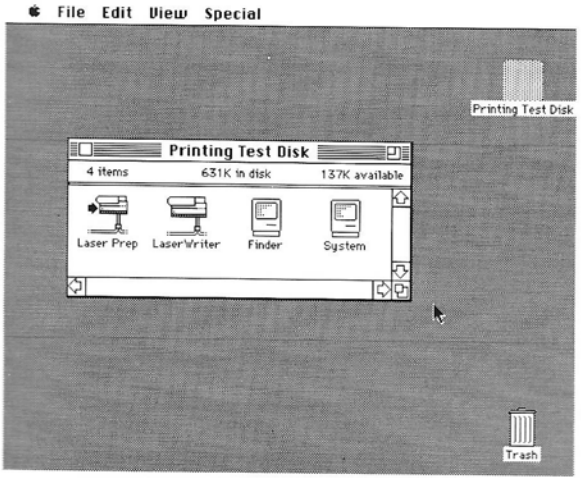
The following steps describe how to set up a Macintosh to print a test document to a LaserWriter.

1. Check to see that all devices are properly connected to the network.

2. Power on the LaserWriter.

3. Power on a Macintosh.

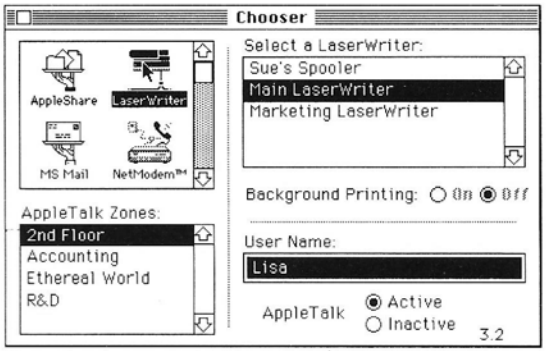
4. Start up a Macintosh with a disk containing the latest System, Finder, LaserWriter and LaserPrep files.



5. Choose the Chooser desk accessory from the Apple menu.

6. Check to see that the AppleTalk Active box is selected. If necessary, click to make AppleTalk active.

7. Select a zone, click on the LaserWriter icon, and select a LaserWriter.



Selecting a network printer using the Chooser desk accessory

8. Close the Chooser to return to the Finder.

9. Choose Print Directory from the File menu. A one-page document should print.

10. Repeat steps 3 to 9 for each Macintosh.

Chapter 6 – Reference

Troubleshooting Tips

This section provides information to help you solve network problems. This section only provides general troubleshooting tips. If you are unable to solve a problem yourself, call Farallon customer service at (415) 849-2331.

Wiring tips

- Make sure that the terminating resistors are installed properly. Terminating resistors should be placed at each end of a daisy chain or backbone, and the end of each branch of a star.

- Make sure that all PhoneNET Connectors are plugged into the *printer ports* of Macintoshes and the AppleTalk port of other devices.

- Test the network for shorts, proper termination, and to see that the network is functioning properly. See Chapter 5, *"Testing a Network."*

- Be sure you haven't exceeded the maximum recommended cable distances, number of branches, or number of devices. See *"Wiring guidelines for PhoneNET System cabling"* in Chapter 2.

Software tips

- Make sure that all Macintoshes start up from a disk containing the same version of the System, Finder, LaserWriter and LaserPrep files.

- Be sure that AppleTalk is active in the Chooser desk accessory. Also be sure the appropriate network service icon (AppleShare, LaserWriter and so on) is selected in the Chooser.

Traffic tips

- Analyze network traffic patterns to locate high traffic areas and evaluate error rates. TrafficWatch collects traffic data and includes utilities to analyze the data, providing the necessary information to optimize network performance.

- Consider adding a bridge to split a network into two separate but interconnected networks. If you already have two or more bridges, consider configuring your bridges to create an AppleTalk backbone.

- Consider adding gateways to create an Ethernet backbone.

- Consider purchasing a separate computer (preferably a Macintosh II) for each network service, instead of running all network services on the same computer.

Network management software from Farallon

PhoneNET CheckNET displays the name, address, and type of every device on the network. CheckNET can search for particular devices (even across multiple bridges and zones) and can sort by name, address, or device type. PhoneNET CheckNET is a powerful tool for network troubleshooting.

TrafficWatch is a network analysis package that displays network traffic in real time. TrafficWatch tracks packets sent between devices. An Excel macro lets you plot the data as graphs or charts.

Timbuktu is a collaborative software package that lets you share screens and operate Macintosh computers across an AppleTalk network for conferencing, network management, training, and on-line network support.

Technical specifications

Topology: parallel bus, low-resistance transformer isolated, floating ground

Signaling standard: EIA modified RS-422, balanced voltage

Signaling speed: 230,400 bits per second

Network signal rates: Speed independent. Speeds in excess of 1M Baud

Signal encoding: FMO (bi-phase) space

Frame format: SDLC (Synchronous Data Link Control)

Maximum distance between devices: ~4500 feet

Maximum number of nodes per network: Limited by traffic.

Node Identification: AppleTalk logical address is self-configuring, no user action required

RFI and Noise immunity: No RFI passive taps, noise immunity greater than 600 Volts

FCC Class: Verified to comply within FCC class A limits

Cabling: 22- 24-gauge telephone wall cable

ordinary 4-conductor flat telephone extension cable

Connectors: modular RJ11 four-pin connectors

AppleTalk compatibility: 100%

Recommended reading

Installing Your Own Telephones by Master Publishing, Inc. This book contains step-by-step installation instructions for replacing or adding telephones.

Technical Introduction to the Macintosh Family by Apple Computer, Inc. This book contains an overview of the technical features of the Macintosh family of computers. Published by Addison Wesley Publishing Company, Inc.

Inside AppleTalk by Apple Computer, Inc. This book discusses the technical and theoretical aspects of AppleTalk.

The Well-Connected Macintosh by Tony Bove and Cheryl Rhodes. This book provides a general overview of desktop communications. Published by Harcourt Brace Jovanovich Publishers.

Designing and Implementing Ethernet Networks by Bill Hancock. This books cover the theory and steps to install an Ethernet network. Published by QED Publishing.

Connections Magazine. A quarterly magazine reviewing recent topics in AppleTalk networking. Published by D.R. Kosiur, PO Box 5894 Fullerton, CA 92635.

Glossary

50-pin line tap: A device that taps into pair 21 of ordinary 50-wire (25 pair) office telephone cable. A 50-pin line tap can be reconfigured to tap into any wire pair.

active star: A network topology where the center of the star is a PhoneNET StarController with network branch cables radiating outwards.

Amphenol: A telephone industry 50-wire connector type. An Amphenol cable is used to connect a PhoneNET StarController to a wiring distribution block.

AppleTalk network system: A set of hardware and software specifications that allow Macintosh computers to communicate with printers, file servers, and other devices over a variety of cabling schemes.

AppleTalk port: A serial port on a Macintosh or AppleTalk-compatible device used for network communications. The AppleTalk port on a Macintosh is the printer port.

backbone: A network topology consisting of an unbroken length of cable with multiple network connection points. In a backbone, many wall jacks are connected to a length of telephone wall cable. Each device has a PhoneNET Connector which is connected to a wall jack with modular extension cable.

branch: A length of cable in a star network that goes from the center of the star to one or more wall jacks.

bridge: A device that connects two AppleTalk networks. Bridges are often used to divide a network into separate, interconnected networks. *See also* **local bridge** and **remote bridge.**

CheckNET: *See* **PhoneNET CheckNET**

daisy chain: A network topology where multiple devices are linked one to another. In a daisy chain, each device has a PhoneNET Connector directly linked to the next with modular extension cable.

Ethernet: A high-speed network protocol.

gateway: A device which connects two or more networks that use different protocols. Gateways provide the necessary translation between the two network protocols.

harmonica block: A wiring distribution block with 12 RJ11 sockets on it. A harmonica block is used to connect a PhoneNET StarController to 12 network branches that use modular extension cable.

internet: A collection of interconnected networks.

line tap: A hardware connector that lets you access a pair of wires in a cable. *See also* **50-pin line tap**.

local bridge: A hardware device that connects two networks located in close proximity. Local bridges are often used to connect networks on different floors of the same building.

LocalTalk connector box: Apple Computer's connector for adding a device to an AppleTalk network.

modem: A hardware device that converts digital computer data into analog tones that can be transmitted over dial-up telephone circuits. Modem throughput speeds typically range from 1,200 bps to 19,200 bps.

modular extension cable: Ordinary 4-wire 26-gauge stranded cable. Modular extension cable is sometimes called modular flat cable. RJ11 plugs can be easily crimped onto the ends of modular extension cable.

network: A group of interconnected devices that share the same network number. A network often contains a file server, printer and individual workstations.

network manager: A person who coordinates the design, installation and management of a network. A network manager is also responsible for adding new users to the network, and troubleshooting problems.

network service: A network device that provides services such as file serving, electronic mail or print spooling to other devices on a network.

network topology: The physical layout of network devices. Network topologies include daisy chain, backbone, and star.

node: An addressable device on a network. A node can be a computer, printer or other device.

node number: A number that identifies a node. A node is automatically assigned a unique node number when the device first accesses the AppleTalk network.

ohm meter: A device that measures the resistance of electrical current flowing through a wire.

passive star: A network topology where up to four network branches are connected at one central location. A passive star branch usually contains one or more devices, and all the branches are connected to a wiring distribution block such as a punchdown block or terminal block.

patch panel: A wiring distribution block with 12 sets of four RJ11 sockets. A patch panel is used to connect branches that use modular extension cable to a StarController.

PhoneNET Connector: The basic hardware unit that attaches a device to the network. The connector provides the necessary signal link for communicating between devices.

PhoneNET CheckNET: Diagnostic software available from Farallon for setting up and testing a network.

PhoneNET Repeater: A device which amplifies and reclocks a network signal. You can install multiple PhoneNET Repeaters to extend the length of a network to several miles.

PhoneNET to LocalTalk Adapter Cable: A cable which connects a PhoneNET Connector to a LocalTalk connector box. This adapter has an RJ11 plug at one end, and a DIN-3 at the other.

PhoneNET StarController: A hardware device that lets you connect large amounts of cabling into one AppleTalk network. A StarController provides branch isolation, error rate reduction, continuous anti-jamming monitoring, and fault isolation.

PhoneNET System: A network solution that includes a complete line of hardware and software products to help you build your networks, manage them, and use them to their full potential.

punchdown block: A wall-mounted telephone wiring distribution block used to connect many pairs of wires.

punchdown tool: A tool used by telephone installers to attach wires to a punchdown block.

remote bridge: A hardware device that connects two networks that are in different geographic areas by modem or satellite link.

repeater: A device that reamplifies a network signal allowing it to travel through several thousand feet of cable. Network segments on both sides of a repeater share the same network number and zone name. Repeaters have little affect on the speed of the network signal.

RJ11: A telephone industry connector type.

RJ11 plug: A clip that is crimped onto the end of a piece modular extension cable.

RJ11-mounted terminating resistor: A terminating resistor mounted on an RJ11 plug. *See also* **terminating resistor**.

server: A network device that provides services such as file serving or print spooling to multiple workstations on a network.

socket number: An address within a node. Socket numbers are assigned when a specific network task within a device is initiated. Multiple socket numbers are assigned to the same device if the device performs more than one network task.

star: A network topology where several network branch cables are connected at one central location. *See also* **passive star, active star**.

StarController: *See* **PhoneNET StarController**

telephone tone tester: A device used to determine which wires in a wall jack are connected to which wires in a telephone closet. Includes a tone generator and tone receiver.

telephone closet: A central location where all the telephone wiring is connected. Telephone lines in a telephone closet branch out to individual extensions. The center of a star is usually located in the telephone closet.

telephone wall cable: Ordinary 4-wire, 22- or 24-gauge solid copper wire cable. Telephone wall cable is sometimes called telephone station cable or twisted-pair cable.

terminal block: A wiring distribution block often used in residential telephone installations.

terminating a network: Installing a 120-ohm resistor at the end of a length of cable to reduce reflections and increase network reliability.

terminating resistor: A small electrical component used to properly balance the electrical signal by adding resistance to the end of a length of cable.

Timbuktu: A collaborative software package that lets you share screens and operate Macintosh computers across an AppleTalk network for conferencing, network management, training, and on-line network support.

TrafficWatch: A network analysis package that displays network traffic in real time. TrafficWatch tracks packets sent between devices. An Excel macro lets you plot the data as graphs or charts.

trunk: *See* **Backbone.**

wall jack: A small hardware component used to tap into telephone wall cable. Inside a wall jack are screw terminals for the four telephone wall cable wires. These screw terminals are connected to a female RJ11 socket on the outside of the wall jack.

wiring distribution block: Hardware used to interconnect many pairs of wires. *See also* **punchdown block, harmonica block, patch panel** and **terminal block.**

zone: A selected group of networks defined by bridges and gateways. A zone can contain a single network or the entire internet. Zones are typically used to group users together with shared network services.

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Limited Warranty and Disclaimer

Farallon Computing, Inc. warrants the PhoneNET Connector and cabling against defects in materials and workmanship for five years from the date of original purchase. If you discover a defect, Farallon will, at its option, repair, replace, or refund the purchase price provided you return the defective part within the warranty period, along with satisfactory proof of purchase. This warranty is exclusive of all others, whether written, expressed or implied and Farallon hereby expressly disclaims all implied warranties including the warranties of merchantability and fitness for a particular purpose. Farallon is not responsible for special, incidental or consequential damages resulting from the use of this product, including, but not limited to, lost profits, down time, loss of goodwill, damage to equipment or property, or any costs of recovering, reprogramming, or reproducing any program or data. Farallon is not responsible for the safety, quality or integrity of the cabling in your building, and will not be responsible for any result of improper installation of a PhoneNET System product. Farallon is not responsible for incidental damage caused to persons, data, or equipment resulting from extraordinary circumstances (e.g., lightning strikes) or improper installation of the PhoneNET System.

Farallon *PhoneNET® Connector*

Any questions about your Farallon products?
Call Customer Service at (415) 596-9000

Please retain this portion for your records

PhoneNET® Connector Registration Card

Name .....

Company .....

Address .....

City, State, Zip Code, Country ..... Telephone .....

Place of purchase _____ Date of purchase ___ /___ /
__ Dealer __ Mail Order __ VAR __ Installer __ Other _____

I own the following computers: (Check all that apply)
__ Macintosh Plus __ SE __ II __ IIcx __ IIx __ IIci
__ IBM PC __ IBM/AT __ IBM/XT __ Other _____

My computer's System contains the following amount of memory
__ 1 MB __ 2 MB __ 4 MB __ 8 MB __ More

I plan on upgrading to Apple System Software version 7.0
__ Yes __ No __ I don't know

I use the following network hardware and software: (Check all that apply)
__ Bridges, Routers & Gateways
__ File Servers
__ Printers
__ Electronic Mail
__ Modems
__ Remote Network Access

I buy products to do the following: (Check all that apply)
__ File Transfer
__ Multimedia
__ Presentations
__ Training
__ Mainframe Access
__ Network Management
__ Sound/Music
__ User Support

I own the following Farallon products: (Check all that apply)
__ PhoneNET® System __ Collaborative Products __ Multimedia Products

I would like more information on: (Check all that apply)
__ PhoneNET® System __ Collaborative Products __ Multimedia Products

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