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HOW TO USE THIS MANUAL

This manual explains how to install Novell Ethernet networking hardware on a NetWare network. It is a supplement to several main NetWare installation manuals.

If you haven't already done so, read and follow the instructions in the NetWare installation manual up to the point where it advises you to consult this supplement.

Chapters 1 through 3 of this supplement introduce the networking hardware you will be using. They also explain how to plan your own network and how to prepare and install the networking hardware.

If you are installing boards in a file server for NetWare 386, see the appendix for the board setting options.

IMPORTANT:

The NE/2-32 board can only be used in a NetWare 386 file server. For NE/2-32 file server board settings, see the appendix.

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Figure A.1 NE1000 (Assy. #950-054401) Board
Setting Options for NetWare 386 A-2

Figure A.2 NE1000 (Assy. #810-160-001) Board
Setting Options for NetWare 386 A-3

Figure A.3 NE2000 Board Setting Options for NetWare 386 A-4

1 PLANNING YOUR NETWORK

In this chapter, you will

- Learn common Ethernet network terminology;
- Learn the hardware and cable requirements for three types of Ethernet networks: thin-cable, thick-cable, and combination thin/thick-cable networks;
- Design your own network layout and make sure that you have all the hardware you need to set up your own network.

COMMON ETHERNET NETWORK TERMINOLOGY

An Ethernet network cables several network stations together so that they can communicate. (Network stations can be file servers, bridges, or workstations.) The network stations are connected at intervals to one long main cable, referred to as the *trunk segment cable*. The network stations and the main cable together form a *trunk segment*. (See Figure 1.1.)

The thin-Ethernet trunk segment cable is usually made up of a series of cable lengths connected together with connectors, rather than one continuous cable.

The trunk segment is limited. It has both a maximum length and a maximum number of stations it can accommodate. However, a network does not have to conform to the limitations of one trunk segment.

To extend the size of a network beyond the limitations of one trunk segment, you can link two or more trunk segments together with a *repeater*. (See Figure 1.2.) A repeater forms a passageway for network signals traveling from one trunk segment to another; it also strengthens network signals.

The *network trunk cable* is the sum of all the trunk segment cables. Just as a trunk segment cable is the backbone of a trunk segment, the network trunk cable is the backbone of the whole network.

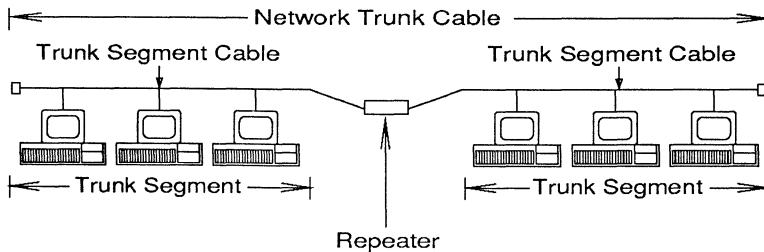


Figure 1.1
Parts of an Ethernet Network

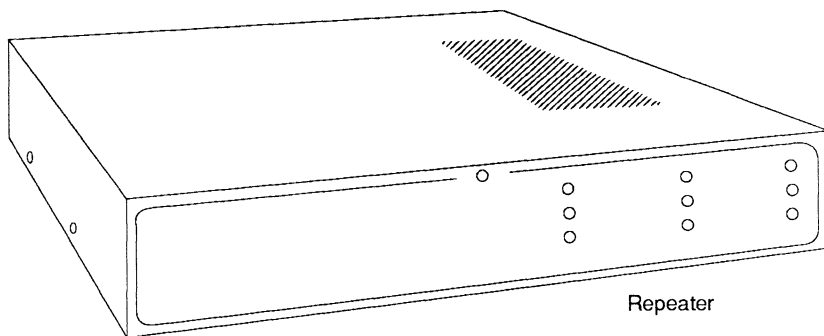


Figure 1.2
A Repeater

There are two kinds of Ethernet cables. The first is called thin-Ethernet cable or thin cable. It is less expensive than the second, which is called thick-Ethernet cable, thick cable, or standard Ethernet cable.

These two kinds of Ethernet cable build three kinds of Ethernet networks: thin-cable networks, thick-cable networks, and combination thin/thick-cable networks.

The chart below shows where each type of network is discussed.

Type	Page
Thin Cable	1-4
Thick Cable	1-8
Thin/Thick Cable	1-14

THIN-ETHERNET CABLE NETWORKS

THIN-ETHERNET CABLE NETWORK HARDWARE

The hardware needed to set up a thin-Ethernet cable network is described below and illustrated in Figure 1.3.

Network Interface Board. A network interface board is a printed circuit board. Network interface boards inserted into each network station and cabled together allow network stations to communicate.

BNC Connectors. BNC connector jacks and plugs connect network hardware. The BNC connector jack on a network interface board connects the board to the trunk segment cable. The BNC connector plugs, attached to both ends of thin-Ethernet cable lengths, connect the cable to T-connectors, barrel connectors, and other hardware.

Thin-Ethernet Cable. Thin-Ethernet cable is 0.2-inch RG-58A/U 50 ohm coaxial cable. It is available from Novell in pre-cut lengths of 20 feet, with standard BNC connector plugs attached to each end. Thin-Ethernet cable is also available from other industry suppliers in bulk quantities; however, bulk cable does not come with connectors attached.

BNC Barrel Connectors. BNC barrel connectors join two lengths of thin-Ethernet cable.

BNC T-Connectors. The two opposing jacks of the T-connector act as a barrel connector and join two lengths of thin-Ethernet cable. The remaining plug attaches to the BNC connector jack on a network interface board installed in a network station.

BNC Terminator. A BNC 50 ohm terminator "terminates" the network and blocks electrical interference on the network. It is attached to one of the two jacks on a T-connector when no other length of cable will be attached to that jack. Some BNC terminators also ground the network; these come with a grounding wire attached. You must use BNC terminators (one end with grounding wire and one end without grounding wire) to properly install an Ethernet network.

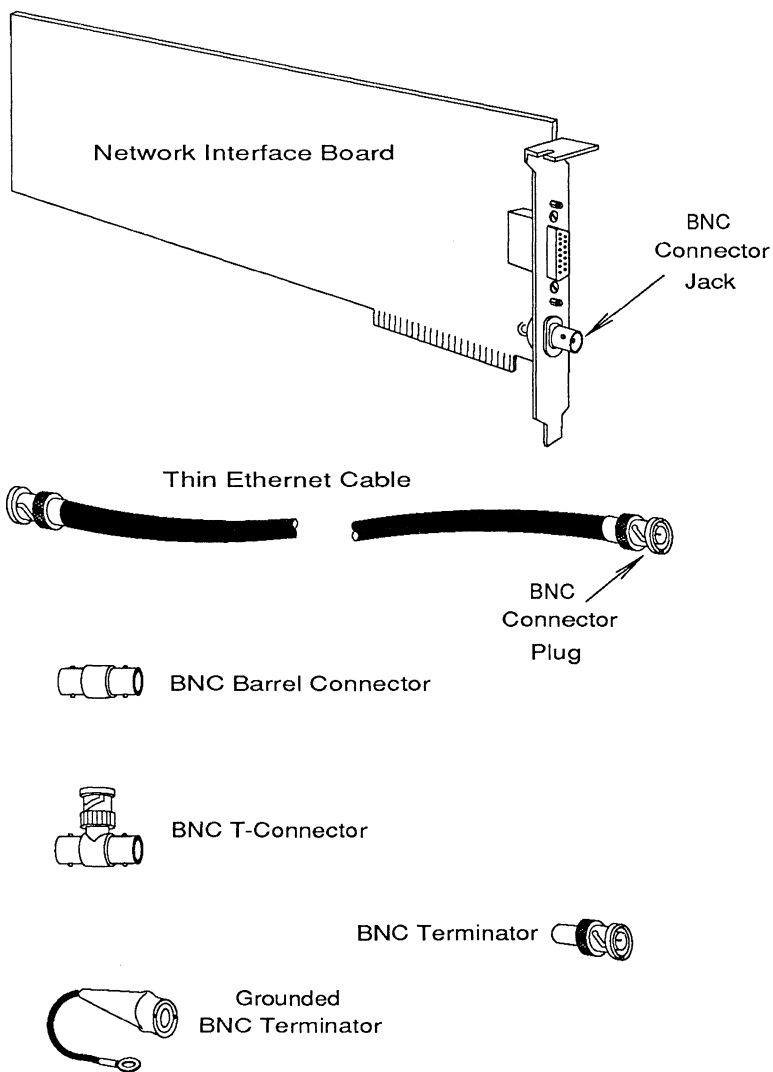


Figure 1.3
Thin-Ethernet Cable Network Hardware

THIN-ETHERNET CABLE NETWORK LAYOUT

Below is a summary of the limitations and rules pertaining to a thin-Ethernet cable network. Figure 1.4 illustrates this summary.

Limitations

- Maximum number of trunk segments: 5
- Maximum trunk segment length: 607 feet (185 meters)
- Maximum network trunk cable length: 3,035 feet (925 meters)
- Maximum number of stations connected to one trunk segment: 30 (Repeaters count as one station on each trunk segment.)
- Minimum distance between BNC T-connectors: 1.6 feet (0.5 meters)

Rules

- A BNC terminator must be attached to each end of each trunk segment. One of the two terminators on each segment must be grounded.
- Barrel connector splices should be kept to a minimum. Use unspliced cable lengths between network stations wherever possible. The fewer connections you make in your cable, the more reliable the network will be.

If you are sure you will never require a network trunk cable over 3,035 feet (925 meters) long, you will probably want to use thin-Ethernet cable, since this type of cable is less expensive and easier to install than thick-Ethernet cable.

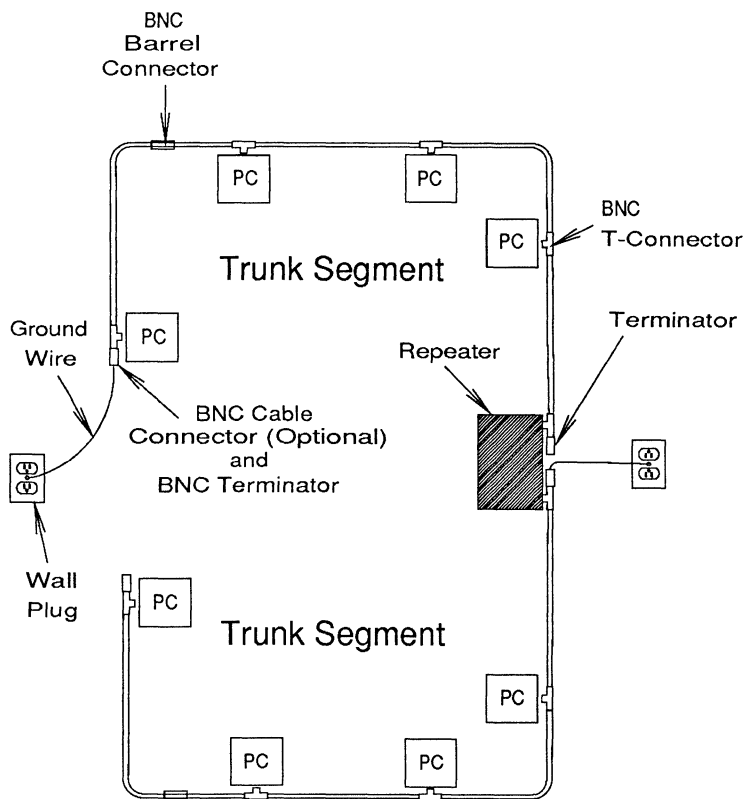


Figure 1.4
Example of a Thin-Ethernet Cable Network

THICK-ETHERNET CABLE NETWORKS

THICK-ETHERNET CABLE NETWORK HARDWARE

The hardware needed to set up a thick-Ethernet cable network is described below and on page 1-10. Each piece is illustrated in Figure 1.5 on pages 1-9 and 1-11.

Network Interface Board. A network interface board is a printed circuit board. Network interface boards are inserted into each network station and cabled together to allow network stations to communicate.

Transceiver. Stations on a thick-cable network communicate with the network through external transceivers attached to the trunk segment cable. External transceivers are required only when thick-Ethernet cable is used. Any standard Ethernet-style (IEEE 802.3) external transceiver can be used on a thick-cable network.

Transceiver Cable. The transceiver cable connects stations to external transceivers on a thick-cable Ethernet network. One transceiver cable is shipped with each transceiver.

DIX Connectors. A male DIX connector and a female DIX connector are attached to either end of the transceiver cable. The male DIX connector (characterized by several small pins) connects to a network interface board that has been installed in a network station. The female DIX connector connects to an external transceiver.

Slide Lock. A slide lock firmly secures the connection between a transceiver cable and a network interface board installed in a station.

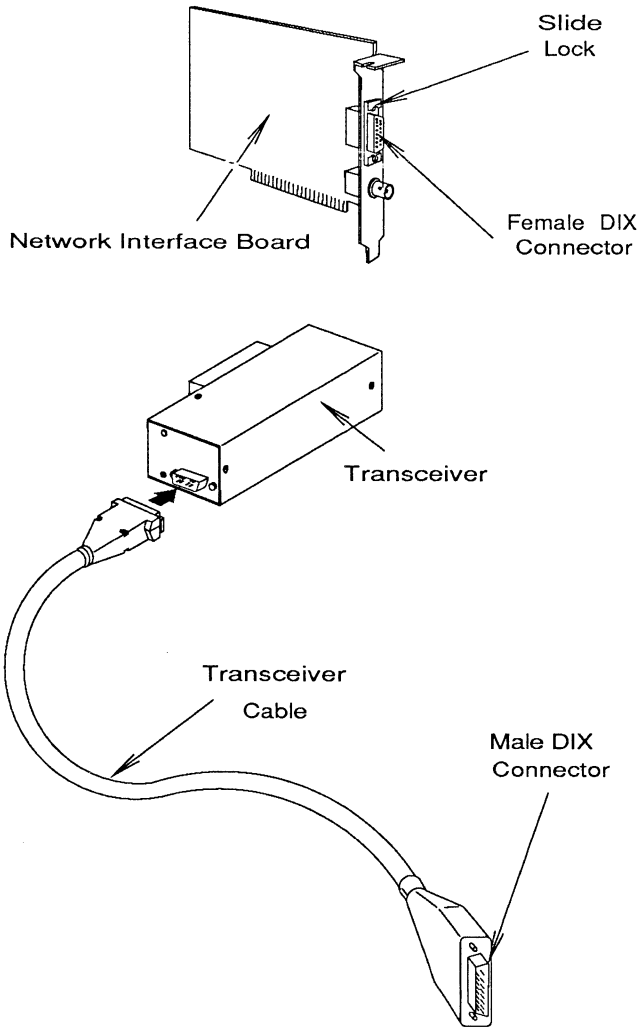


Figure 1.5
Thick-Ethernet Cable Network Hardware

Thick-Ethernet Cable. Thick-Ethernet cable is 0.4-inch diameter 50 ohm coaxial cable and is available in various pre-cut lengths with standard 0.4-inch diameter N-series male connectors attached to each end; it can be purchased from an authorized NetWare dealer. Thick-Ethernet cable is also available in bulk quantities. However, bulk cable does not come with connectors attached.

N-Series Male Connectors. N-series male connectors are installed on both ends of thick-Ethernet cable lengths.

N-Series Barrel Connectors. N-series barrel connectors join two lengths of thick-Ethernet cable.

N-Series Terminators. An N-series 50 ohm terminator “terminates” the network and blocks electrical interference on the network. It is attached to an N-series male connector on one end of a thick-Ethernet cable length. Some N-series terminators also ground the network; these come with a grounding wire attached. You must use N-series terminators at each end of the cable; one end of the cable must be earth grounded.

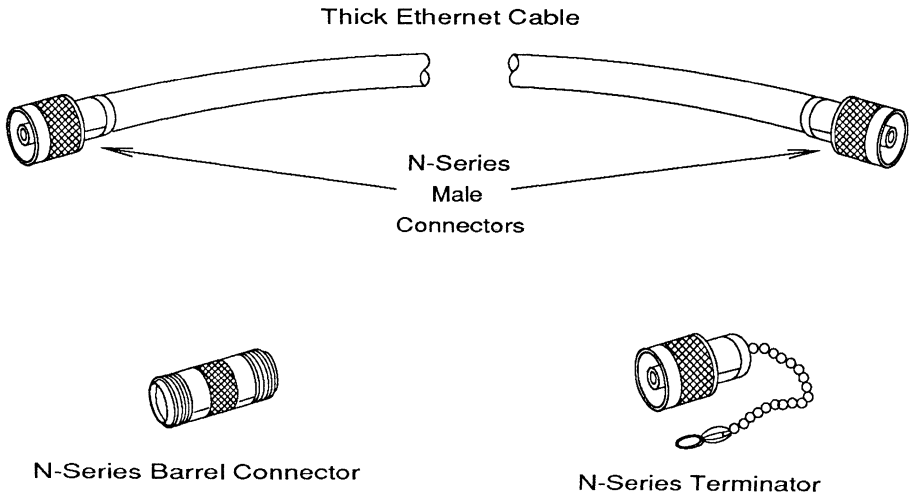


Figure 1.5 (Continued)
Thick-Ethernet Cable Network Hardware

THICK-ETHERNET CABLE NETWORK LAYOUT

Below is a summary of the limitations and rules pertaining to a thick-Ethernet cable network. Figure 1.6 illustrates this summary.

Limitations

- Maximum number of trunk segments: 5
- Maximum trunk segment length: 1,640 feet (500 meters)
- Maximum network trunk cable length: 8,200 feet (2,500 meters)
- Maximum number of stations connected to one trunk segment: 100 (Repeaters count as one station on each trunk segment.)
- Minimum distance between transceivers: 8 feet (2.5 meters)
- Maximum transceiver cable length: 165 feet (50 meters)

Rules

- A terminator must be attached to each end of each trunk segment. One of the two terminators on each segment must be grounded.
- Barrel connector splices should be kept to a minimum. Use unspliced cable lengths between network stations wherever possible. The fewer connections you make in your cable, the more reliable the network will be.

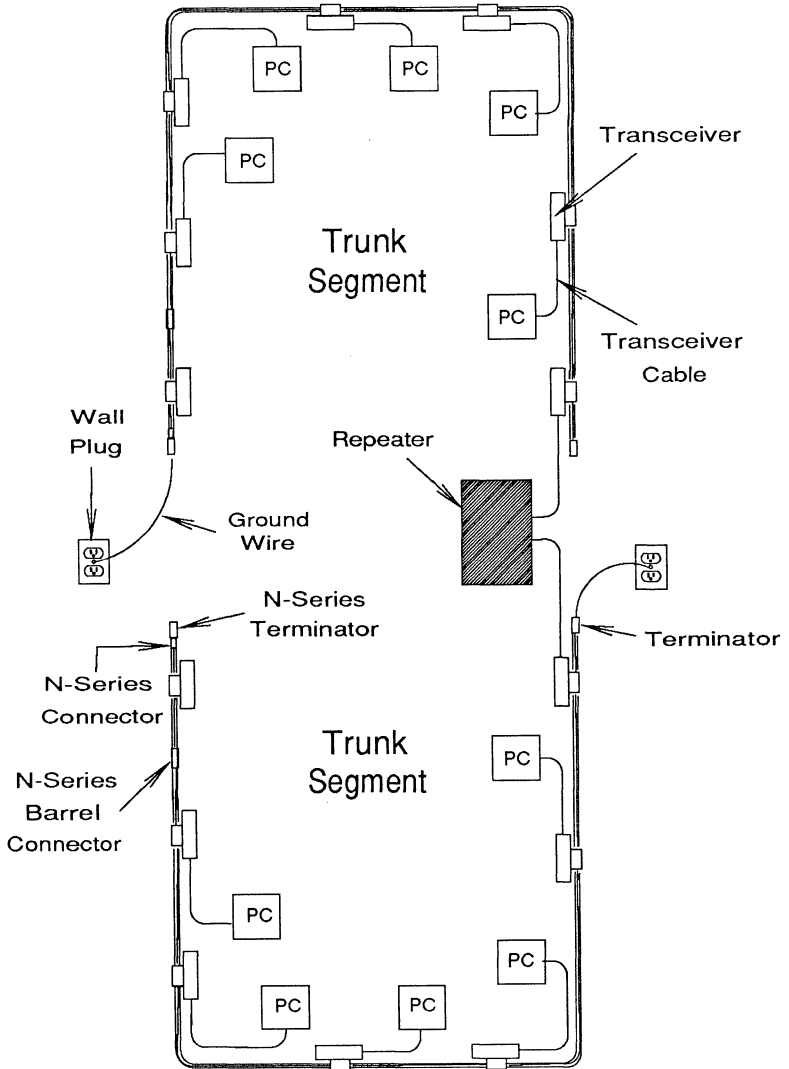


Figure 1.6
Example of a Thick-Ethernet Cable Network

COMBINATION THIN/THICK-CABLE NETWORKS

You can create a combination thin/thick-Ethernet cable network by using both thin and thick cable on the same network. Using a combination thin/thick-cable network can save money, since thin cable is less expensive than thick cable. However, thick cable can be used over greater distances before a repeater is required.

You can create a combination thin/thick-cable network in one of two ways:

- You can join a thin-cable trunk segment to a thick-cable trunk segment with a repeater. Up to five dissimilar trunk segments (using four repeaters) can be joined in this way. To create this kind of network, simply build each trunk segment according to the instructions described earlier in this chapter; then link the segments together with repeaters according to the instructions in Chapter 3.
- You can use both thin cable and thick cable within the same trunk segment. To build this kind of trunk segment, continue reading "Combination Thin/Thick-Cable Hardware."

COMBINATION THIN/THICK-CABLE HARDWARE

Thin/thick-cable networks use the same networking hardware as thin-cable and thick-cable networks (described beginning on page 1-4). In addition, however, you will need to use adapters to create the combination trunk segments. Two kinds of adapters are shown in Figure 1.7:

- BNC female to N-series female adapter
- BNC female to N-series male adapter

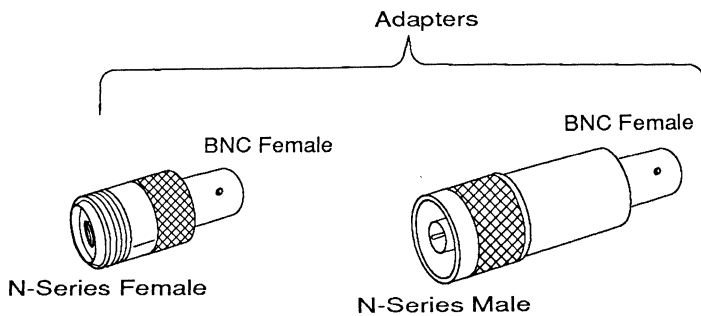


Figure 1.7
Adapters Used in Combination Trunk Segments

COMBINATION THIN/THICK-CABLE NETWORK LAYOUT

This section describes how to combine thin cable and thick cable within a single trunk segment, using as much thin cable as possible. (Refer to Figure 1.8 for an example of a combination thin/thick Ethernet cable network layout.)

Combination thin/thick-cable trunk segments are between 607 feet and 1,640 feet long. The minimum length is 607 feet because trunk segments shorter than 607 feet can be built with thin cable exclusively. And, as with all trunk segments, the maximum length is 1,640 feet.

To find the maximum amount of thin cable you can use in one combination trunk segment, use the following equation:

$$\frac{1,640 \text{ feet} - L}{3.28} = t$$

where

L = the length of the trunk segment you want to build

t = the maximum length of thin cable you can use

For example, if you want to build a trunk segment that is 1,500 feet long and you want to minimize the cost of hardware by using as much thin cable as possible, you would use the following equation:

$$\frac{1,640 \text{ feet} - 1,500 \text{ feet}}{3.28} = 43 \text{ feet}$$

You could use up to 43 feet of the less expensive thin cable. You would use thick cable for the remaining 1,457 feet of cable required in your trunk segment.

NOTE:

The maximum number of trunk segments that can be connected together is five.

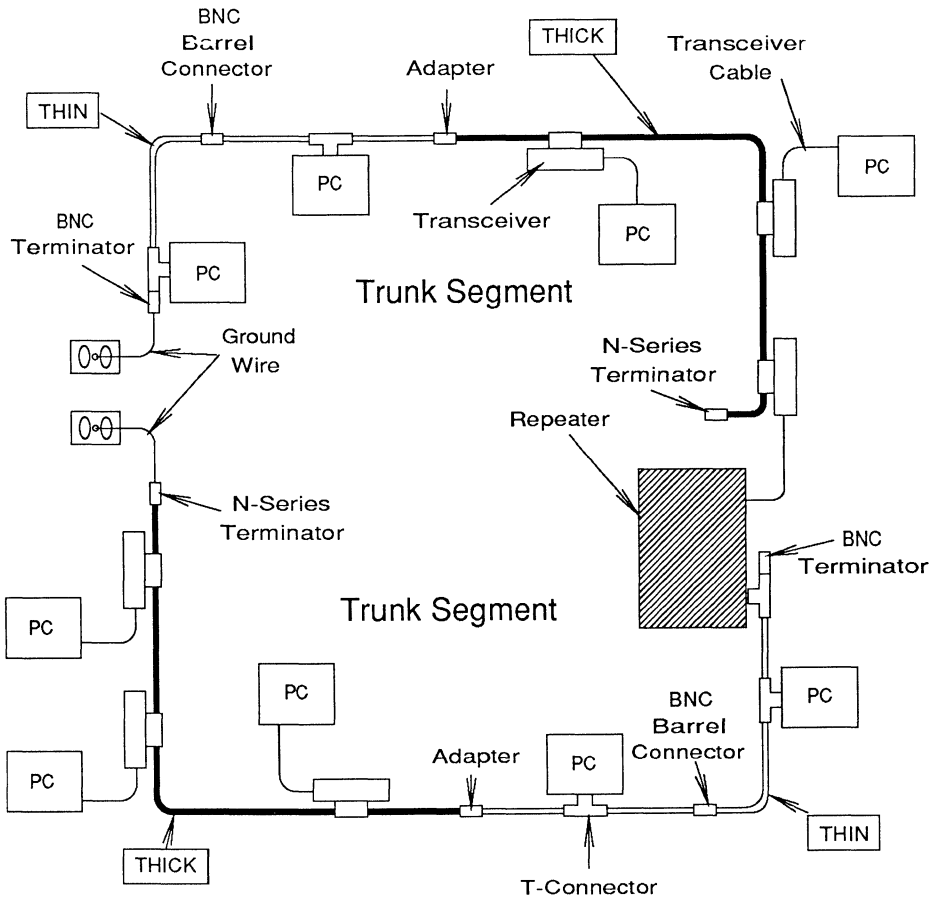


Figure 1.8
Example of a Combination Thin/Thick-Cable Network Layout

PLANNING YOUR NETWORK LAYOUT

EVALUATING YOUR NETWORK NEEDS

Now that you know the limitations of the different Ethernet cabling schemes, consider the following questions as you define your particular network needs:

- How large an area must the cabling system cover?
- How many trunk segments will best suit the physical layout of the site?
- How many network stations (file servers, bridges, and workstations) will be connected to the cabling system?
- How far apart will the network stations be?
- What potential growth in size and number of connections must the system accommodate?

DRAWING THE NETWORK PLAN

Draw your network plan, labeling each piece of hardware that will be included (such as stations, cables, transceivers, repeaters, and BNC terminators). Keep in mind the rules given in the preceding sections and:

- Measure the distances between all components and make sure they fall within the appropriate parameters;
- Ensure that the locations you choose for file servers have adequate room for any peripherals (such as printers or external disk drives) that will be attached.

SUMMARY

In this chapter, you

- Identified Ethernet network hardware;
- Examined thin-cable, thick-cable, and combination thin/thick-cable networks;
- Designed and sketched your own network.

The next chapter describes how to configure your network interface boards and install them in network stations.

2 SETTING AND INSTALLING NOVELL ETHERNET BOARDS

This chapter explains how to make the following settings on Novell Ethernet boards:

- Interrupt line (IRQ)
- Base I/O address
- Default settings
- Connector type
- Remote Reset

It also explains how to install the network interface boards in network stations.

Four Novell Ethernet boards are discussed in this manual:

- NE1000 board (Assy. #950-054401)
- NE1000 board (Assy. #810-160-001)
- NE2000 board
- NE/2 board

All of these boards can be used in workstations, file servers, and bridges on any size network.

You can use the NE1000 board in standard IBM PC XT and IBM PC AT systems, the NE2000 board in IBM PC AT systems, and the NE/2 board only in Micro Channel architecture file servers and workstations.

LABELING NETWORK INTERFACE BOARDS

Refer to the sketch of the network layout you made in Chapter 1 and to the worksheets you filled out when you generated the NetWare operating system or shell for each station. (The worksheets are in the main NetWare installation manual.) Then, using a string tag or some other form of identification, label each board with the following information:

- The specific network station into which the board will be inserted (for example, "Larry's workstation by the water fountain").
- The type of network station into which the board will be inserted: workstation, file server, or bridge.
- The configuration option (this includes the interrupt line, the base I/O address, and the base memory address).

If the board will be installed in a file server or bridge, record the configuration option that you chose when you generated the NetWare operating system. Novell Ethernet boards that will be installed in the same file server or bridge cannot have the same configuration option number. However, boards that will be installed in different file servers or bridges can have the same configuration option number.

If the board will be installed in a workstation, record the configuration option that you chose when you generated the NetWare shell for that particular workstation.

NOTE:

When you generated a NetWare shell and IPX for workstations containing NE/2 interface boards, you were not prompted to select a configuration option, since NetWare drivers for NE/2 boards are "auto-configuring."

Any given NE/2 shell can be used by a workstation regardless of the workstation's hardware configuration settings.

- **The connector type:** All Novell Ethernet boards can be connected to either thin- or thick-Ethernet cable. To allow this flexibility, the mounting bracket of each board has both a DIX connector and a BNC connector. The DIX connector is used with thick cable; the BNC connector is used with thin cable. You must set the jumpers on each board to enable either the DIX connector or the BNC connector. Write "DIX" (for thick cable) or "BNC" (for thin cable) on the label.
- **Remote Reset:** The Remote Reset option allows network interface boards to boot from a network (file server) disk instead of a local drive. This feature can be used with NE1000, NE2000, and NE/2 interface boards installed in workstations. If you plan to enable Remote Reset, write "Remote Reset" on the label.

SETTING NETWORK INTERFACE BOARDS

The instructions for setting Novell Ethernet boards are divided into the following sections:

- “Setting Options on NE1000 (Assy. #950-054401) Boards” (pages 2-5 to 2-11)
- “Setting Options on NE1000 (Assy. #810-160-001) Boards” (pages 2-12 to 2-20)
- “Setting Options on NE2000 Boards” (pages 2-21 to 2-31)
- “Inserting Novell Ethernet Network Interface Boards into Network Stations” (pages 2-32 and 2-33)
- “Inserting NE/2 Boards and Setting Options” (pages 2-34 to 2-42)

The settings and instructions for each board are explained in the following order:

- Default settings (where applicable)
- The configuration option, which includes interrupt line and base I/O address
- Connector type
- Remote Reset (where applicable), which includes Remote Reset EPROM and base memory address

Turn to the section that applies to the board type you are using and follow the instructions to make the proper settings on your network interface boards.

SETTING OPTIONS ON NE1000 (ASSY. #950-054401) BOARDS

The next section will list the default settings and explain how to make the following settings on NE1000 (Assy. #950-054401) interface boards:

- Configuration option
- Connector type
- Remote Reset

DEFAULT SETTINGS

The factory default settings for Novell NE1000 (Assy. #950-054401) boards are 300h, IRQ3, Remote Reset disabled, and thin-Ethernet connector enabled.

THE CONFIGURATION OPTION

Set the configuration options on your NE1000 (Assy. #950-054401) boards by completing the following steps for each board:

- 1) Locate the components used to make configuration option settings by referring to Figure 2.1.
- 2) Identify the configuration option you should use by checking the tag you attached to the board earlier in this chapter.
- 3) Refer to Figure 2.2 to find the appropriate configuration option.
- 4) Set the interrupt line and the base I/O address according to Figure 2.2. (To the right of the configuration option number in the table, you will see the proper jumper block settings for that configuration option.) Do not set the DMA channel.

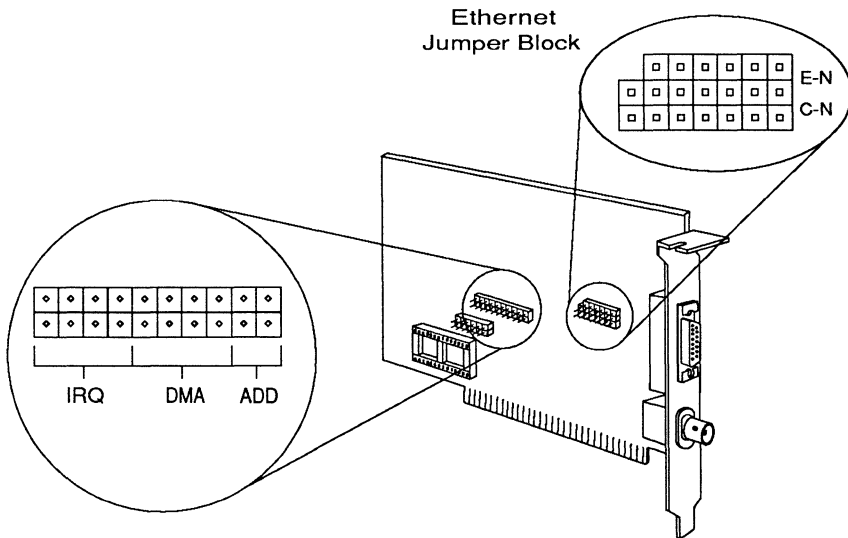


Figure 2.1
Location of NE1000 (Assy. #950-054401) Board
Configuration Option Components

Config. Option Number	Interrupt Line	Base I/O Address	Config. Option Number	Interrupt Line	Base I/O Address
0	IRQ 3	300h	6	IRQ 5	340h
1	IRQ 2	320h	7	IRQ 4	360h
2	IRQ 4	340h	8	IRQ 4	300h
3	IRQ 5	360h	9	IRQ 5	320h
4	IRQ 2	300h	10	IRQ 2	340h
5	IRQ 3	320h	11	IRQ 3	360h

Figure 2.2
NE1000 (Assy. #950-054401) Board
Configuration Option Table

CONNECTOR TYPE

Refer to Figure 2.3 and note the jumper block used to make the connector type setting. Then, depending on the type of cable you will be using, make the proper setting on each NE1000 (Assy. #950-054401) board as shown in Figure 2.3.

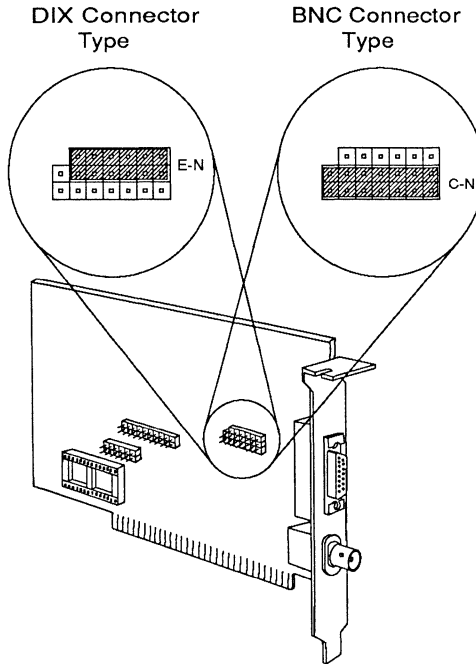


Figure 2.3
Connector Type Settings for
NE1000 (Assy. #950-054401) Boards

REMOTE RESET

Remote Reset must be enabled on all NE1000 (Assy. #950-054401) boards that will use the Remote Reset feature. To install and enable Remote Reset on an NE1000 (Assy. #950-054401) board, refer to Figure 2.4 and complete the following steps:

- 1) Insert the Remote Reset EPROM by aligning the notch and the pins on the EPROM with the notch and the pin receptacles on the EPROM socket. Gently push the EPROM into the socket, being careful not to bend the pins.
- 2) Enable Remote Reset by placing a shorting plug on jumper block A of the base memory address jumper block.
- 3) Set the proper base memory address with jumper blocks B through F on the base memory address jumper block J7. Set the interrupt line and base I/O address with jumper block J4. Figure 2.5 on page 2-11 lists possible settings.
 - If you are using an IBM PC AT or compatible as a workstation, you must use a base memory address between C800h and DE00h.
 - If you are using an IBM PC XT or compatible as a workstation, you cannot use base memory address C800h.

NOTE:

Place unused shorting plugs on the jumper blocks, covering only one pin with each shorting plug.

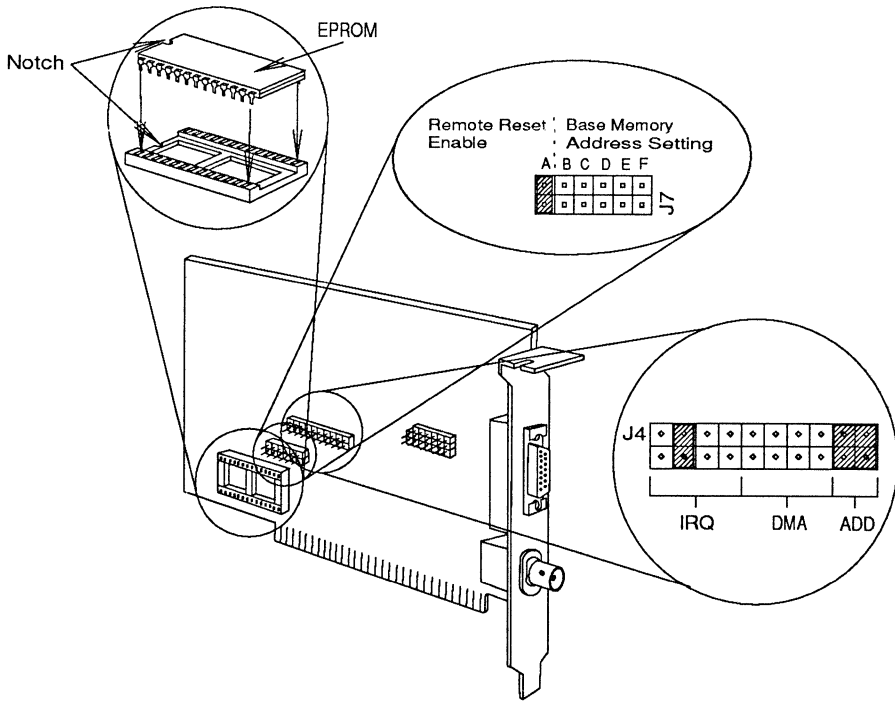
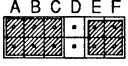
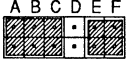
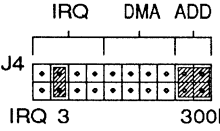
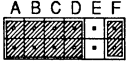
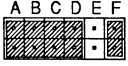
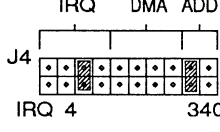
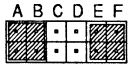
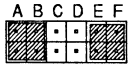
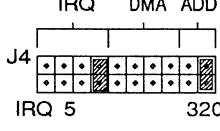


Figure 2.4
Installing a Remote Reset EPROM and
Enabling Remote Reset on an
NE1000 (Assy. #950-054401) Board

Config. Option Number	Base I/O Address	Base Memory Address	Interrupt Line	Base I/O Address
★ 0	 300h	 C800h		IRQ 3 300h
2	 340h	 D000h		IRQ 4 340h
★ 9	 320h	 CC00h		IRQ 5 320h

★ Not available in PC XT or equivalent when hard disk controller is present.

Figure 2.5
Configuration Option Settings for Remote Reset

Configuration options 0 and 9 are used with standard NetWare; configuration option 2 is used with Ethernet II versions of NetWare.

To insert an NE1000 (Assy. #950-054401) board into a network station, turn to "Inserting Novell Ethernet Boards into Network Stations" on page 2-32.

SETTING OPTIONS ON NE1000 (ASSY. #810-160-001) BOARDS

The next section will list the default settings and explain how to make the following settings on NE1000 (Assy.#810-160-001) interface boards:

- Configuration option
- Connector type
- Remote Reset

DEFAULT SETTINGS

The factory default settings for Novell NE1000 (Assy. #810-160-001) boards are 300h, IRQ3, Remote Reset disabled, and BNC connector enabled.

THE CONFIGURATION OPTION

Set the configuration options for your NE1000 (Assy. #810-160-001) boards by completing the following steps for each board:

- 1) Locate the components used to make configuration option settings by referring to Figure 2.6. ("Ethernet Jumper Block" refers to the connector type.)
- 2) Identify the configuration option you should use by checking the tag you attached to the board earlier in this chapter.
- 3) Refer to Figure 2.7 (beginning on page 2-14) to find the appropriate configuration option. Configuration option 0 is the default setting.
- 4) Set the interrupt line and the base I/O address according to Figure 2.7. (To the right of the configuration option number in the table, you will see the proper jumper block settings for that configuration option.)

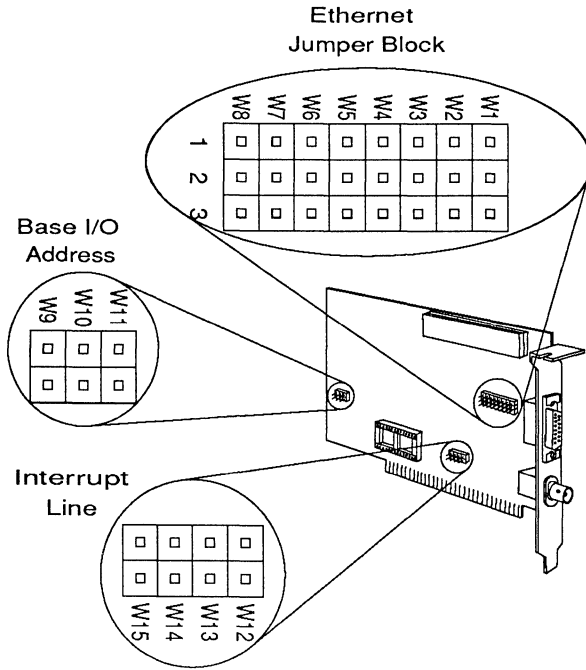
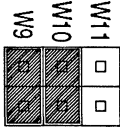
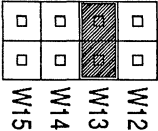
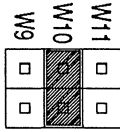
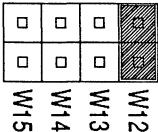

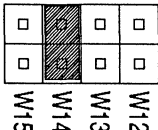
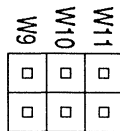
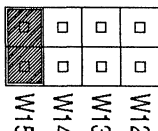


Figure 2.6
Location of NE1000 (Assy. #810-160-001) Board
Configuration Option Components

Config. Option Number	Base I/O Address	Interrupt Line
0	 <p>300h</p>	 <p>IRQ 3</p>
1	 <p>320h</p>	 <p>IRQ 2</p>
2	 <p>340h</p>	 <p>IRQ 4</p>
★ 3	 <p>360h</p>	 <p>IRQ 5</p>


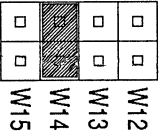
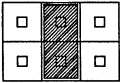
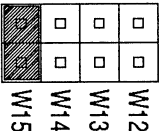
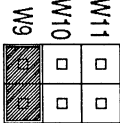
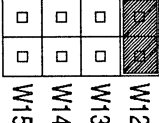
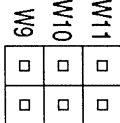
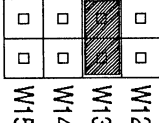
★ Not available in PC XT or equivalent when hard disk controller is present.

Figure 2.7
NE1000 (Assy. #810-160-001) Board
Configuration Option Table

Config. Option Number	Base I/O Address	Interrupt Line
4	<p>300h</p>	<p>IRQ 2</p>
5	<p>320h</p>	<p>IRQ 3</p>
★ 6	<p>340h</p>	<p>IRQ 5</p>
7	<p>360h</p>	<p>IRQ 4</p>

★ Not available in PC XT or equivalent when hard disk controller is present.

Figure 2.7 (Continued)
NE1000 (Assy. #810-160-001) Board
Configuration Option Table

Config. Option Number	Base I/O Address	Interrupt Line
8	 <p>300h</p>	 <p>IRQ 4</p>
★ 9	 <p>320h</p>	 <p>IRQ 5</p>
10	 <p>340h</p>	 <p>IRQ 2</p>
11	 <p>360h</p>	 <p>IRQ 3</p>

★ Not available in PC XT or equivalent when hard disk controller is present.

Figure 2.7 (Continued)
NE1000 (Assy. #810-160-001) Board
Configuration Option Table

CONNECTOR TYPE

Refer to Figure 2.8 and note the jumper block used to make the connector type setting. Then, depending on the type of cable you will be using, make the proper setting on each NE1000 (Assy. #810-160-001) board as shown in Figure 2.8. You can set the connector type using either one 8 by 2 shorting plug or eight 1 by 2 shorting plugs.

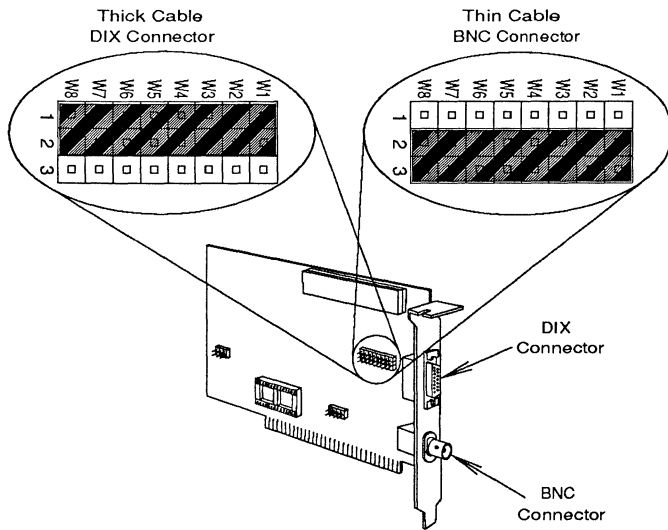


Figure 2.8
Connector Type Settings
for NE1000 (Assy. #810-160-001) Boards

REMOTE RESET

Remote Reset must be enabled on all NE1000 (Assy. #810-160-001) boards that will use the Remote Reset feature. To install the Remote Reset EPROM and enable Remote Reset on an NE1000 (Assy. #810-160-001) board, refer to Figure 2.9 and complete the following steps:

- 1) Insert the Remote Reset EPROM by aligning the notch and the pins on the EPROM with the notch and the pin receptacles on the EPROM socket. Gently push the EPROM into the socket, being careful not to bend the pins.
- 2) Enable Remote Reset by placing a shorting plug on jumper block W11 of the base memory address jumper block.
- 3) Set the base I/O address using jumper blocks W10 and W9 on the base memory address jumper block.
- 4) Set the interrupt line with jumper blocks W12 through W15 on the interrupt line jumper block. Refer to Figure 2.10 on page 2-20 to choose the base memory address, the base I/O address, and the interrupt line settings; then set the shorting plugs accordingly.

NOTE:

Place unused shorting plugs on the jumper blocks, covering only one pin with each shorting plug.

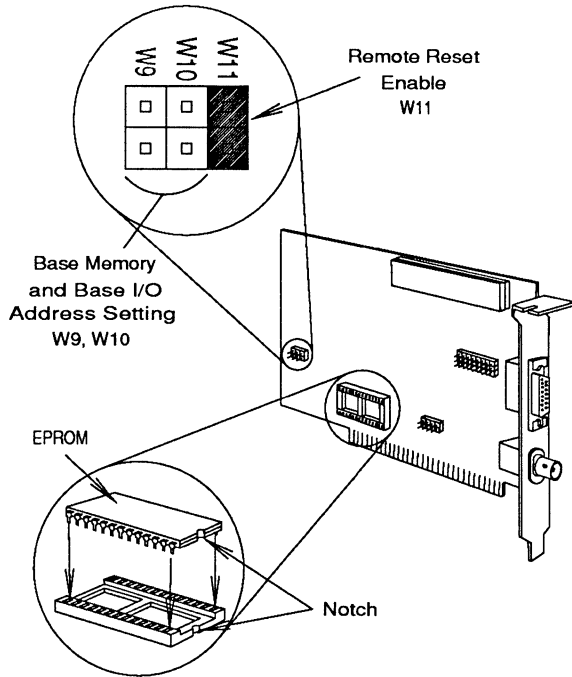
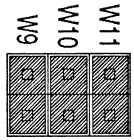
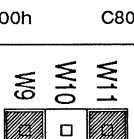
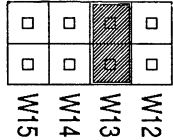
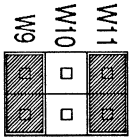
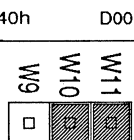
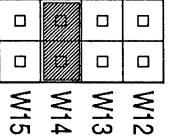
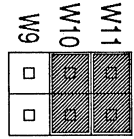
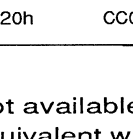
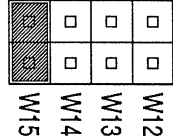


Figure 2.9
Installing a Remote Reset EPROM and Enabling Remote Reset on an
NE1000 (Assy. #810-160-001) Board

Config. Option Number	Base I/O Address	Base Memory Address	Interrupt Line
★ 0	 300h	 C800h	 W15 W14 W13 W12 IRQ 3
2	 340h	 D000h	 W15 W14 W13 W12 IRQ 4
★ 9	 320h	 CC00h	 W15 W14 W13 W12 IRQ 5

★ Not available in PC XT or equivalent when hard disk controller is present.

Figure 2.10
Configuration Option Settings
for Remote Reset

To insert an NE1000 board into a network station, turn to “Inserting Novell Ethernet Boards into Network Stations” on page 2-32.

SETTING OPTIONS ON NE2000 BOARDS

The next section will list the default settings and explain how to make the following settings on NE2000 interface boards:

- Timing compatibility
- Configuration option
- Connector type
- Remote Reset

DEFAULT SETTINGS

The factory default settings for Novell NE2000 boards are 300h, IRQ3, Remote Reset disabled, and BNC connector enabled.

TIMING COMPATIBILITY

The NE2000 interface board is designed for use with IBM PC AT-compatible buses. If you are installing the board in a COMPAQ Portable or in an IBM PC AT-compatible system that uses the Chips and Technologies chip set, you must change a shorting plug on jumper block W16 to maintain complete timing compatibility. (See Figure 2.11 for the location of jumper block W16.)

NOTE:

Only the Rev G or later NE2000 boards use a jumper to maintain timing compatibility. The Rev level is printed in the top center of the board. (See Figure 2.11 for the location of the Rev level.)

If you have a pre-Rev G NE2000 board, refer to *Read Me First*, part #123-000102-001 (shipped with the NE2000 board), for instructions.

If you are installing the Rev G NE2000 board in a COMPAQ 286 Portable computer or in an IBM PC AT-compatible system that uses the Chips and Technologies chip set, remove the shorting plug from jumper block W16.

NOTE:

Place unused shorting plugs on the jumper blocks, covering only one pin with each shorting plug.

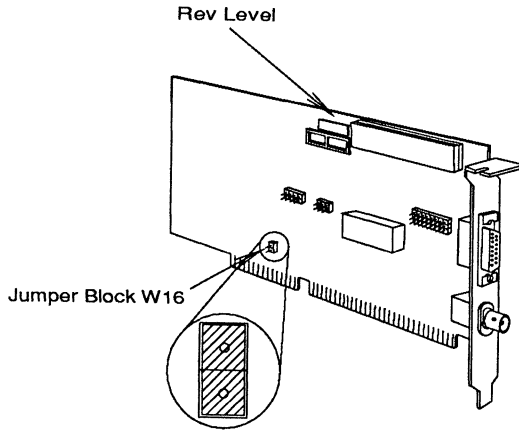


Figure 2.11
Location of Rev Level and
Jumper Block W16 on an NE2000 Board

THE CONFIGURATION OPTION

Set the configuration option for your NE2000 boards by completing the following steps for each board:

- 1) Locate the components used to make configuration option settings by referring to Figure 2.12. ("Ethernet Jumper Block" refers to the connector type.)
- 2) Identify the configuration option you should use by checking the tag you attached to the board earlier in this chapter.
- 3) Refer to Figure 2.13 (beginning on page 2-25) to find the appropriate configuration option. Configuration option 0 is the default setting.
- 4) Set the interrupt line and base I/O address according to Figure 2.13. (To the right of the configuration option number in the table, you will see the proper jumper block settings for that configuration option.)

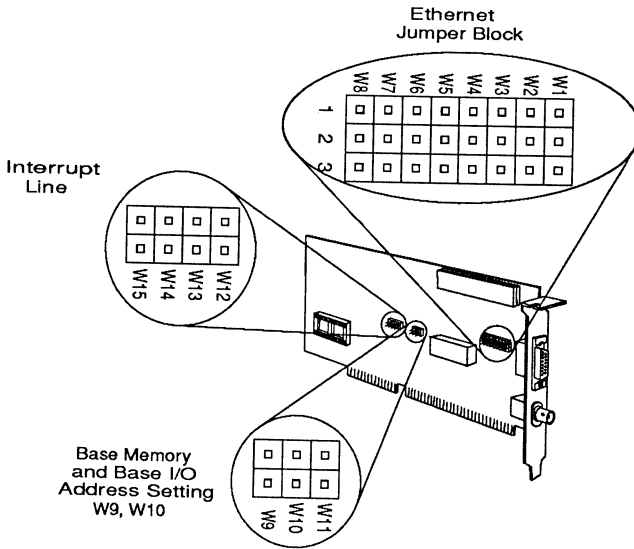


Figure 2.12
NE2000 Board
Configuration Option Components

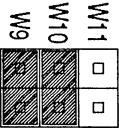
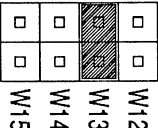
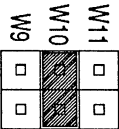
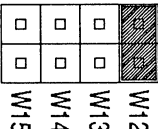

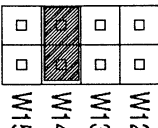
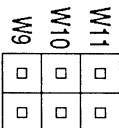
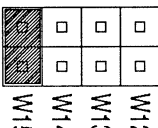
Config. Option Number	Base I/O Address	Interrupt Line
0	 <p>300h</p>	 <p>IRQ 3</p>
1	 <p>320h</p>	 <p>IRQ 2</p>
2	 <p>340h</p>	 <p>IRQ 4</p>
3	 <p>360h</p>	 <p>IRQ 5</p>

Figure 2.13
NE2000 Board
Configuration Option Table

Config. Option Number	Base I/O Address	Interrupt Line
4	<p>300h</p>	<p>IRQ 2</p>
5	<p>320h</p>	<p>IRQ 3</p>
6	<p>340h</p>	<p>IRQ 5</p>
7	<p>360h</p>	<p>IRQ 4</p>

Figure 2.13 (Continued)
 NE2000 Board
 Configuration Option Table

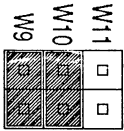
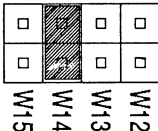
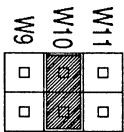
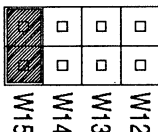

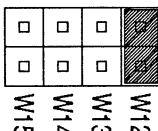
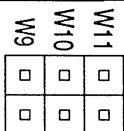
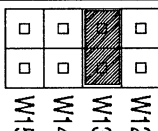
Config. Option Number	Base I/O Address	Interrupt Line
8	 <p>300h</p>	 <p>IRQ 4</p>
9	 <p>320h</p>	 <p>IRQ 5</p>
10	 <p>340h</p>	 <p>IRQ 2</p>
11	 <p>360h</p>	 <p>IRQ 3</p>

Figure 2.13 (Continued)
NE2000 Board
Configuration Option Table

CONNECTOR TYPE

Refer to Figure 2.14 and note the jumper block used to make the connector type setting. Then make the setting on each NE2000 board that corresponds to the type of cable you will be using. You can set the connector type using either one 8 by 2 shorting plug or eight 1 by 2 shorting plugs.

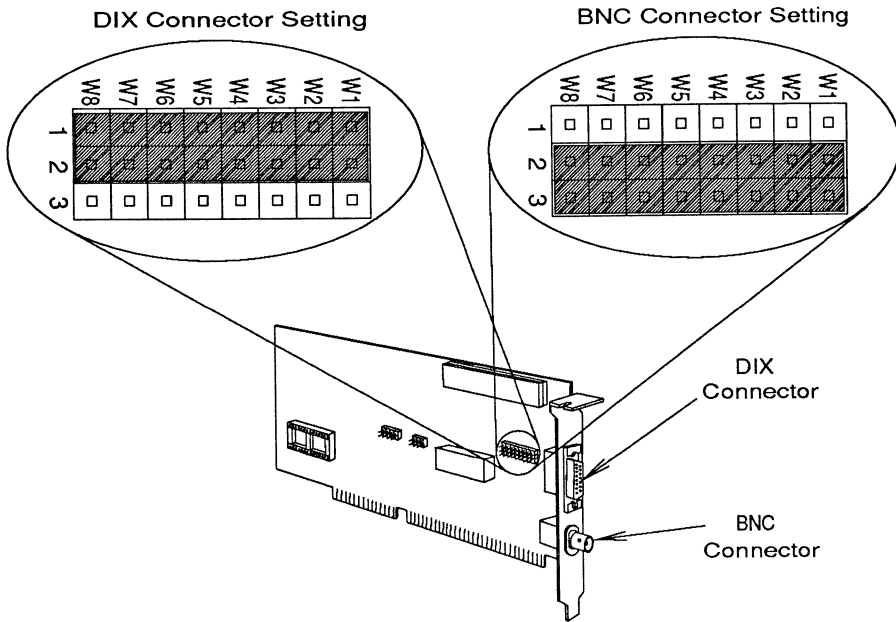


Figure 2.14
Connector Type Settings
for NE2000 Boards

REMOTE RESET

Remote Reset must be enabled on all NE2000 boards that will use the Remote Reset feature. To install a Remote Reset EPROM and enable Remote Reset on an NE2000 board, refer to Figure 2.15 and complete the following steps:

- 1) Insert the Remote Reset EPROM by aligning the notch and the pins on the EPROM with the notch and the pin receptacles on the EPROM socket. Gently push the EPROM into the socket, being careful not to bend the pins.
- 2) Enable Remote Reset by placing a shorting plug on jumper block W11 of the base memory address jumper block.
- 3) Set the proper base memory address and base I/O address using jumper blocks W10 and W9 on the base memory address jumper block.
- 4) Set the proper interrupt line with jumper blocks W12 through W15 on the interrupt line jumper block.

Refer to Figure 2.16 on page 2-31 to choose the base memory address, base I/O address, and interrupt line settings for your boards; then set the shorting plugs accordingly.

NOTE:

Place unused shorting plugs on the jumper blocks, covering only one pin with each shorting plug.

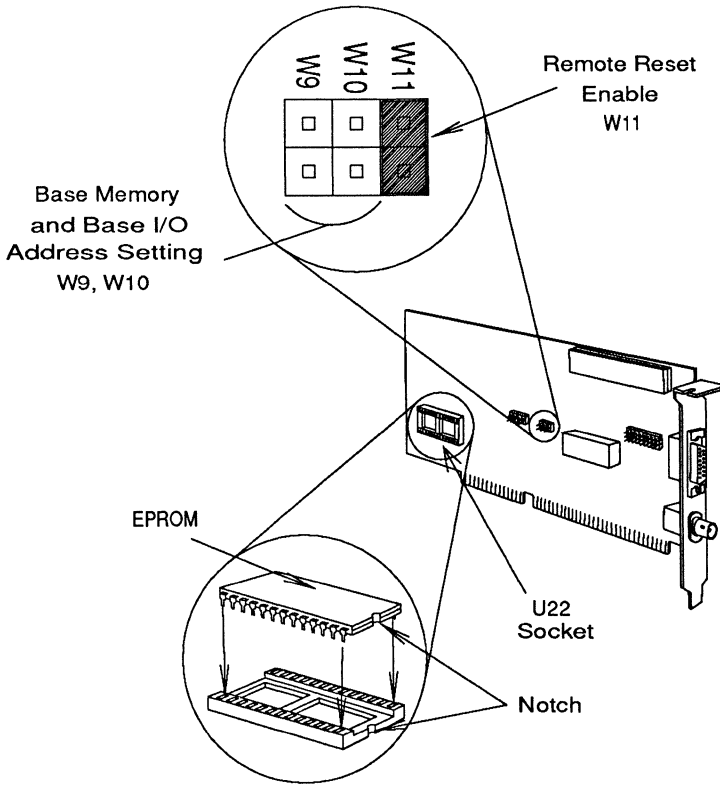


Figure 2.15
Installing a Remote Reset EPROM and
Enabling Remote Reset on an NE2000 Board

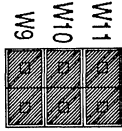
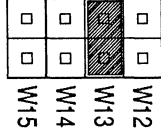
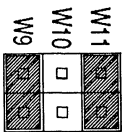
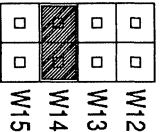
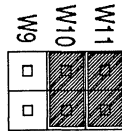
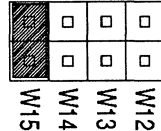
Config. Option Number	Base I/O Address	Base Memory Address	Interrupt Line
0	 300h C800h	 IRQ 3	
2	 340h D000h	 IRQ 4	
9	 320h CC00h	 IRQ 5	

Figure 2.16
Configuration Option Settings
for Remote Reset

Configuration options 0 and 9 are used with standard NetWare; configuration option 2 is used with Ethernet II versions of NetWare.

To insert an NE2000 board into a network station, continue with "Inserting Novell Ethernet Boards into Network Stations."

INSERTING NOVELL ETHERNET BOARDS INTO NETWORK STATIONS

After you have made the proper settings on your Novell NE1000 and NE2000 Ethernet boards, insert them into the appropriate network stations by completing the following steps.

- 1) Turn off the power switches on all stations and peripherals.
- 2) Remove the cover of each station according to the manufacturer's instructions.
- 3) Remove a metal expansion bracket as shown in the illustration below.

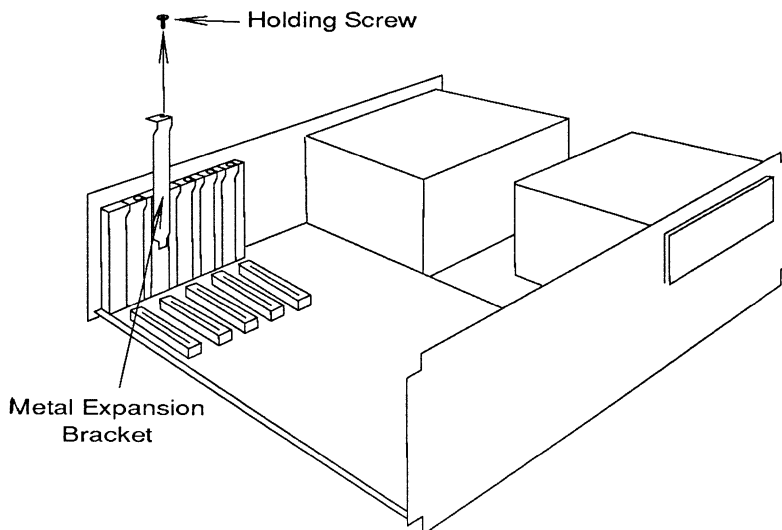


Figure 2.17
Removing a Metal Expansion Bracket
from a Network Station

- 4) Insert the appropriate Novell Ethernet board, as shown in Figure 2.18.

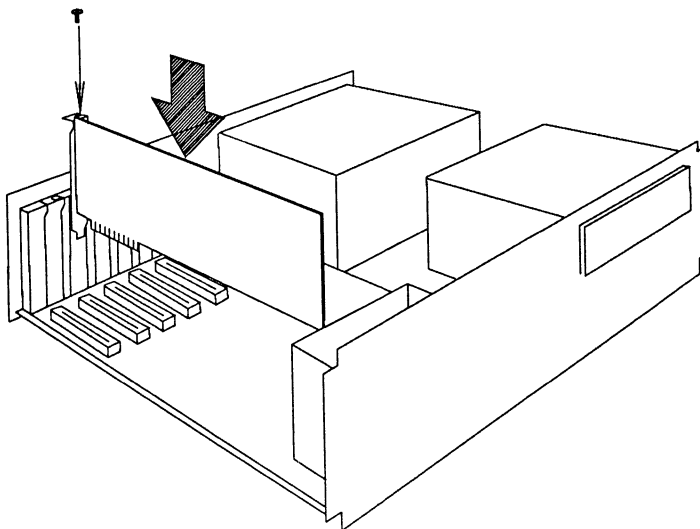


Figure 2.18
Inserting a Network Interface Board
into a Network Station

- 5) Replace the covers of your network stations at this time.

Once you have completed hardware installation of your NE1000 and NE2000 boards, skip to the chapter summary on page 2-42.

INSTALLING AN NE/2 BOARD

You will make most of the settings for the NE/2 interface board, using the appropriate driver installation diskette that was shipped with your Micro Channel architecture system, after the board is inserted into the network station.

Before you install the NE/2 board in a network station, however, you will need to enable your board to use either thick- or thin-Ethernet cable. If you want the workstation to boot from a network disk rather than a local hard disk drive or floppy disk drive, you will also need to install a Remote Reset EPROM.

ENABLING THICK- OR THIN-ETHERNET CABLE

The default cable setting on the NE/2 board is for thin-Ethernet cable. To change the setting to thick-Ethernet cable, refer to Figure 2.19. Then move the shorting plug on jumper block W1-W8 from the two bottom rows of shorting pins to the two top rows.

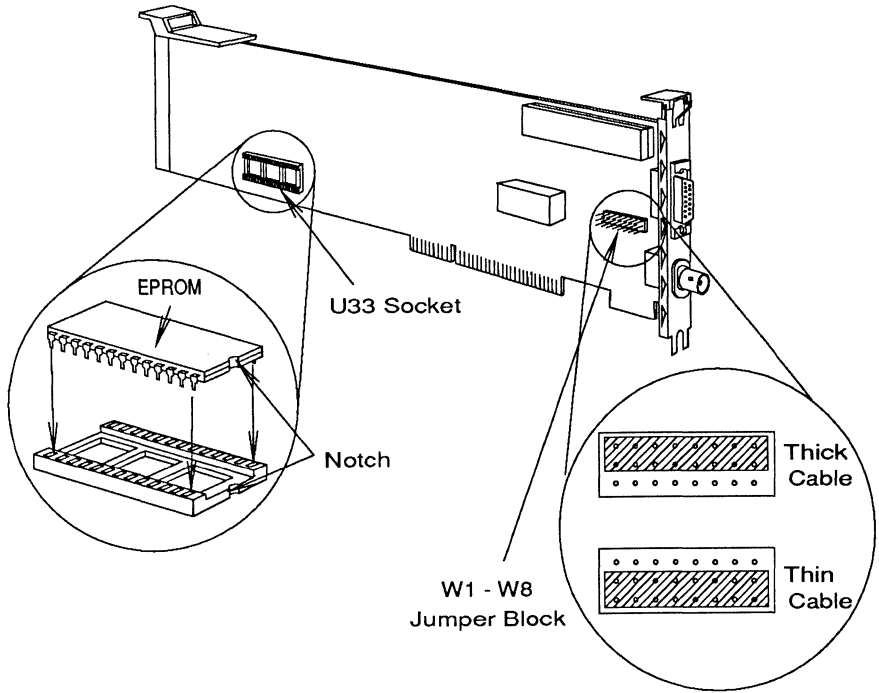


Figure 2.19
Locating Settings on the NE/2 Board

SETTING REMOTE RESET ON THE NE/2 INTERFACE BOARD

The Remote Reset feature allows workstations to boot from a network disk instead of from a local hard disk drive or floppy disk drive. You should enable Remote Reset in all workstations that will use this feature.

To add the Remote Reset feature to a workstation, insert the Remote Reset boot EPROM into socket U33, as shown in Figure 2.19. Be sure to align the notch and the pins on the EPROM with the notch and pin receptacles on the EPROM socket as shown. Gently push the EPROM into the socket, being careful not to bend the pins. You are now ready to insert the NE/2 board into your station.

INSERTING AN NE/2 BOARD

To insert an NE/2 board into a Micro Channel architecture system, complete the following steps.

- 1) Turn off the system.
- 2) Remove the cover according to the manufacturer's instructions.
- 3) Loosen the screw on any empty expansion slot cover as shown in Figure 2.20.
- 4) Pull out the expansion slot cover as shown in Figure 2.20. (Refer to the system that most closely resembles the one you are using.)

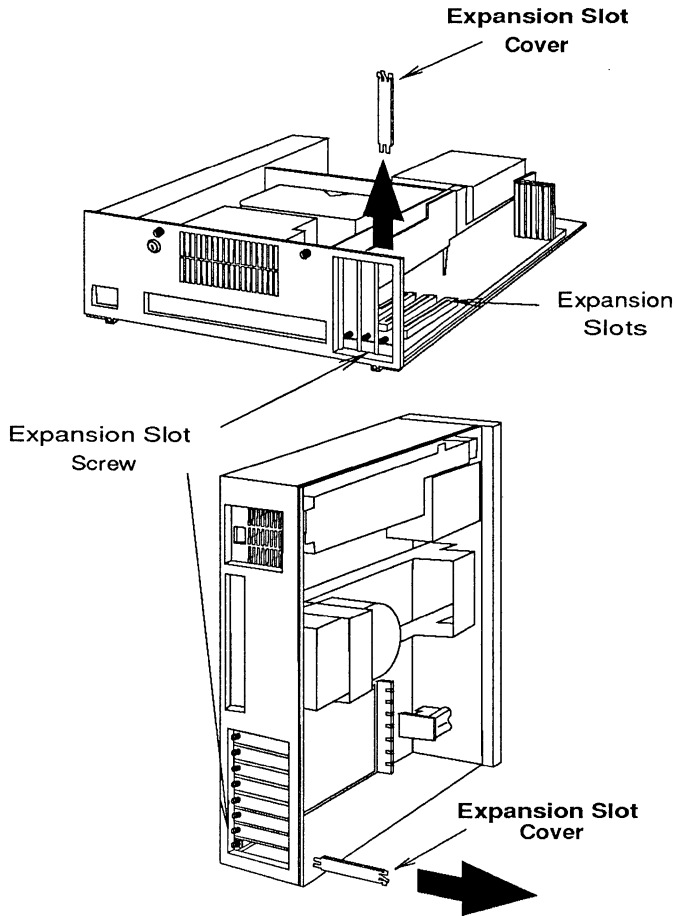


Figure 2.20
Removing an Expansion Slot Cover

- 5) Insert the NE/2 board into the slot, pressing it firmly into the expansion slot connector. (See Figure 2.21.)
- 6) Tighten the expansion slot screw so that the board will remain in place.
- 7) Replace the computer cover and tighten the cover screws.

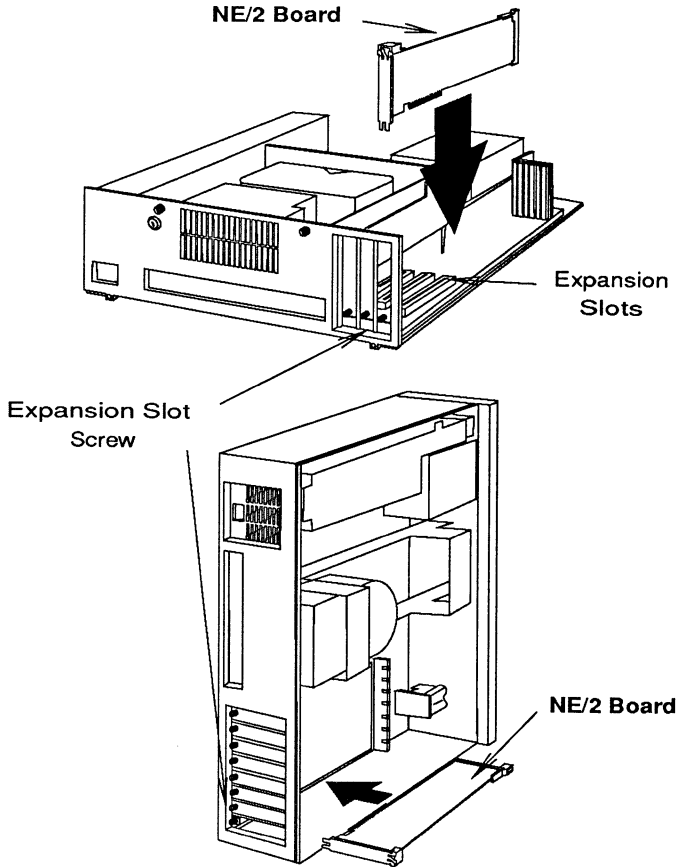


Figure 2.21
Inserting an NE/2 Board
into a Micro Channel Architecture System

MAKING SOFTWARE SETTINGS ON THE NE/2 BOARD

The instructions below explain how to set the interrupt line, base I/O address, and the boot EPROM address on NE/2 boards. Settings are made by running the reference diskette that was shipped with your Micro Channel architecture system.

To complete these instructions, you will need a working copy of the reference diskette. If you have not made a working copy of the diskette, do so before continuing with these instructions. You will also need the *LAN_DRV_109* diskette that you received with your NE/2 interface board.

Consult the manual that came with your Micro Channel architecture system in order to copy the NE/2 option files and view the station's board configuration.

The following section explains how to set the configuration option on the NE/2 board after you have copied the NE/2 option files to your reference diskette.

SETTING THE CONFIGURATION OPTION

The NE/2 configuration option setting consists of the interrupt line, the base I/O address, and the boot EPROM address. You must change the settings on the screen as necessary so that they match the station's configuration option. (You labeled each board with its configuration option earlier in this chapter.) You must change the settings on the screen as follows:

- If the board is installed in a file server or bridge, you must change the setting on the screen so that it matches the server or bridge's configuration option. The setting selected here should match the configuration option you chose when you generated the operating system.
- If the board is installed in a workstation, you can choose any combination of configuration option settings from the chart (except as noted below).

IMPORTANT:

Make sure you choose an interrupt line that does not conflict with the interrupt line of other boards in the station. (Some driver installation programs allow duplicate interrupt lines, but the NetWare operating system does not.)

Follow the manufacturer's instructions to change a configuration option setting on the screen.

Possible NE/2 board configuration option settings are listed in the chart below.

	Interrupt Line	Base I/O Address	EPROM Address*
Option 0:	3	1000h-102Fh	0C8000h-0C9FFFh
Option 1:	4	1000h-102Fh	0C8000h-0C9FFFh
Option 2:	5	1000h-102Fh	0C8000h-0C9FFFh
Option 3:	9	1000h-102Fh	0C8000h-0C9FFFh
Option 4:	3	2020h-204Fh	0CA000h-0CBFFFh
Option 5:	4	2020h-204Fh	0CA000h-0CBFFFh
Option 6:	5	2020h-204Fh	0CA000h-0CBFFFh
Option 7:	9	2020h-204Fh	0CA000h-0CBFFFh
Option 8:	3	8020h-804Fh	0CC000h-0CDFFFh
Option 9:	4	8020h-804Fh	0CC000h-0CDFFFh
Option 10:	5	8020h-804Fh	0CC000h-0CDFFFh
Option 11:	9	8020h-804Fh	0CC000h-0CDFFFh
Option 12:	3	A0A0h-A0CFh	0CE000h-0CFFFFh
Option 13:	4	A0A0h-A0CFh	0CE000h-0CFFFFh
Option 14:	5	A0A0h-A0CFh	0CE000h-0CFFFFh
Option 15:	9	A0A0h-A0CFh	0CE000h-0CFFFFh
Option 16:	3	B0B0h-B0DFh	0D0000h-0D1FFFh
Option 17:	4	B0B0h-B0DFh	0D0000h-0D1FFFh
Option 18:	5	B0B0h-B0DFh	0D0000h-0D1FFFh
Option 19:	9	B0B0h-B0DFh	0D0000h-0D1FFFh
Option 20:	3	C0C0h-C0EFh	0D2000h-0D3FFFh
Option 21:	4	C0C0h-C0EFh	0D2000h-0D3FFFh
Option 22:	5	C0C0h-C0EFh	0D2000h-0D3FFFh
Option 23:	9	C0C0h-C0EFh	0D2000h-0D3FFFh
Option 24:	3	C3D0h-C3FFh	0D4000h-0D5FFFh
Option 25:	4	C3D0h-C3FFh	0D4000h-0D5FFFh
Option 26:	5	C3D0h-C3FFh	0D4000h-0D5FFFh
Option 27:	9	C3D0h-C3FFh	0D4000h-0D5FFFh

* The EPROM address can be disabled for each option.

NOTE:

Configuration options 16 through 27 cannot be used in file servers running NetWare v2.0a. All the configuration options can be used in file servers running NetWare v2.1 and above.

After you have set the configuration option for your NE/2 board, save the changes and exit from the program.

Return to "Setting the Configuration Option" on page 2-40 and repeat the instructions for each station in your network that has an NE/2 board installed. Once you have completed hardware and software installation of your NE/2 boards, continue with the chapter summary below.

SUMMARY

In this chapter you set your Novell Ethernet network interface boards and installed them in network stations. The next chapter explains how to cable your network.

3 CABLING YOUR NETWORK

Now that you have set and installed each network interface board, you are ready to cable all network stations together. This chapter explains how to cable a thin-Ethernet cable network, a thick-Ethernet cable network, and a thin/thick-cable network. Follow the guidelines below as you install your cable network.

- Make sure each network station is turned off.
- Install one trunk segment at a time if you are installing more than one.
- Be careful not to crimp the cable, damage its insulation, or run the cable near heat sources, fluorescent light fixtures, or in heavy traffic areas where hand trucks or rolling chairs might damage it.

CABLING A THIN-ETHERNET CABLE NETWORK

The order of the steps you follow to assemble each trunk segment is not important. For example, you could place your network stations and peripherals first. Then, you could create your trunk segment cable(s). (Figure 3.1 illustrates a thin-Ethernet cable trunk segment.) Finally, you could connect the T-connectors directly to the BNC connector jacks on the network interface boards installed in each station.

Likewise, you could place your network stations and peripherals first, attach a T-connector to each network interface board in each station next, and then connect the T-connectors together with cables.

Remember to attach a BNC terminator to each end of the trunk segment. One of these terminators should have a grounding wire attached. Attach the end of the grounding wire to an earth ground (the middle screw of an AC outlet). If the grounding wire is too short to reach the outlet, use 16- or 18-gauge insulated wire to extend the grounding wire.

Trunk segments are connected to each other with repeaters. To connect two trunk segments to a repeater, attach one end of each trunk segment directly to the repeater (as if the repeater were another workstation).

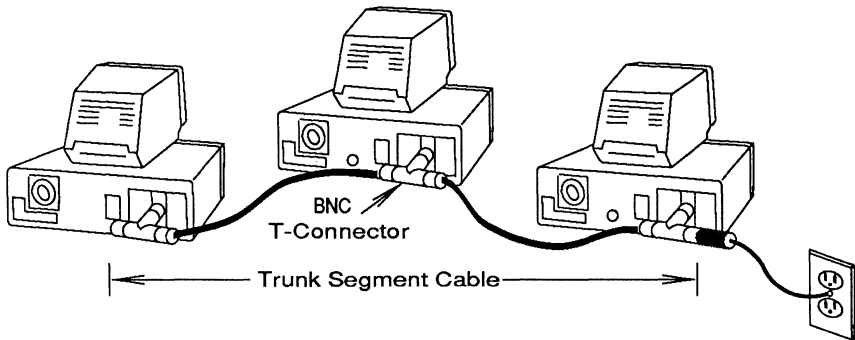


Figure 3.1
Thin-Ethernet Cable Network

CABLING A THICK-ETHERNET CABLE NETWORK

If you plan to use only thick-Ethernet cable, install each trunk segment as explained below.

- 1) Place the stations and peripherals in their predetermined locations, according to your network plan.
- 2) Install the transceivers according to the manufacturer's directions and your network plan.
- 3) Connect the transceivers to the thick cable.
- 4) Refer to Figure 3.2 to use the slide lock on the female DIX connector and attach the connector on the transceiver cable to the transceiver. Slide the lock to "open," attach it to the transceiver, and then slide the lock back to "lock." The slide lock prevents accidental disconnection.

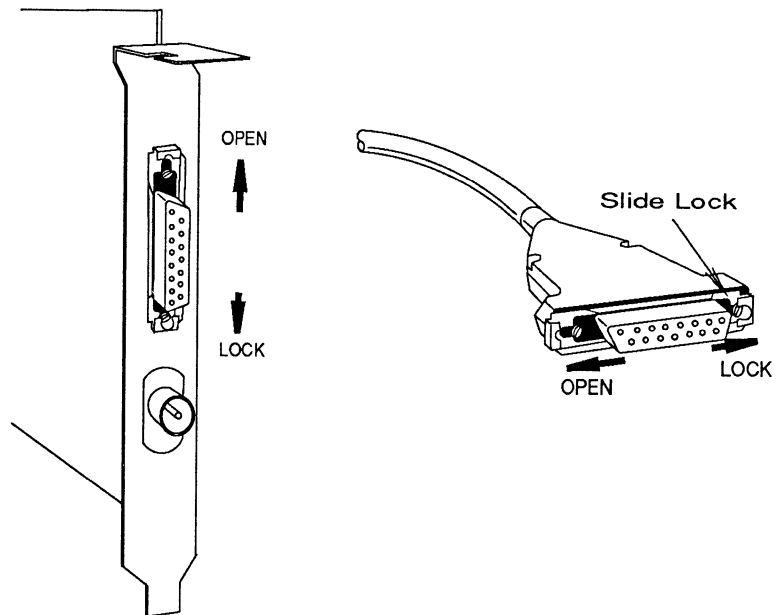


Figure 3.2
Using the Slide Lock

- 5) Attach the male DIX connector to the network interface board.
- 6) Attach an N-series terminator to each end of the trunk segment. One terminator should have a grounding wire attached as shown in Figure 3.3.

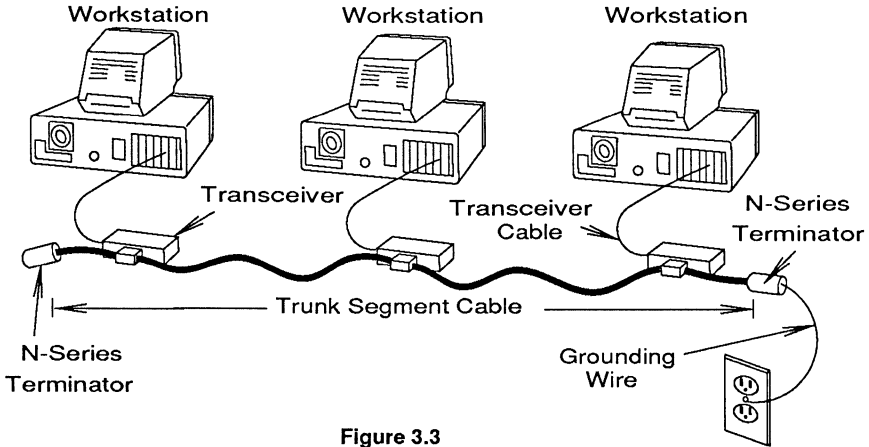


Figure 3.3
Attaching N-Series Terminators
to Trunk Segments

- 7) Ground one of these two terminators by attaching the end of the grounding wire to an earth ground (the middle screw of an AC power outlet). If the grounding wire is too short to reach the outlet, use 16- or 18-gauge insulated wire to extend the grounding wire.
- 8) To join two trunk segments together, connect one end of each trunk segment to the same repeater. Trunk segments are connected to repeaters in the same way that they are connected to stations (by means of a transceiver and a transceiver cable).

CABLING A THIN/THICK-CABLE NETWORK

If you plan to use thin and thick cable in the same trunk segment, read the directions on pages 3-1 through 3-4 before cabling your network. Be sure to follow the limits and rules that apply to your network layout. Remember to use adapters to connect thin and thick cable.

SUMMARY

This chapter explained how to cable the various types of Ethernet networks. Now return to the main NetWare manual that referred you to this supplement.

APPENDIX

Use this appendix to set file server boards on NetWare 386 networks. The following options are given for the Novell Ethernet NE1000 (Assy. #950-054401), NE1000 (Assy. #810-160-001), and NE2000 network interface boards:

- Interrupt line
- Base I/O address

One page is devoted to each board, with an illustration of the board, where the setting locations are for the various settings, and the setting options.

The NE/2-32 board must be installed in a 32-bit slot (refer to your computer manual).

To set NE/2 or NE/2-32 file server boards, run the *REFERENCE* or *SETUP* diskette to copy the option diskette that came with your board. Then continue running the *REFERENCE* or *SETUP* diskette to set the board.

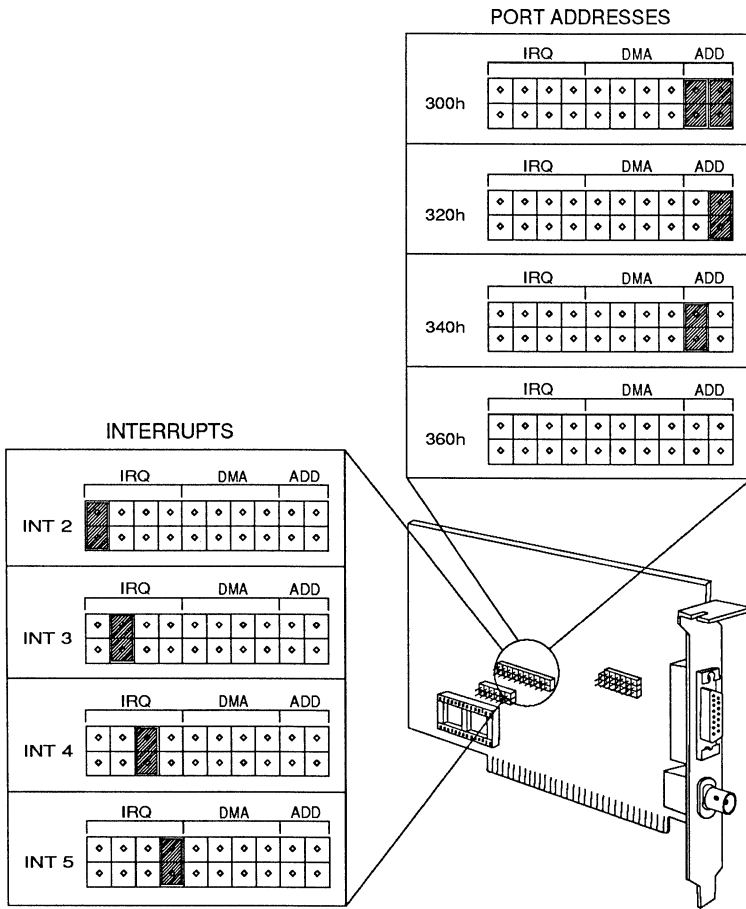


Figure A.1
NE1000 (Assy. #950-054401) Board
Setting Options for NetWare 386

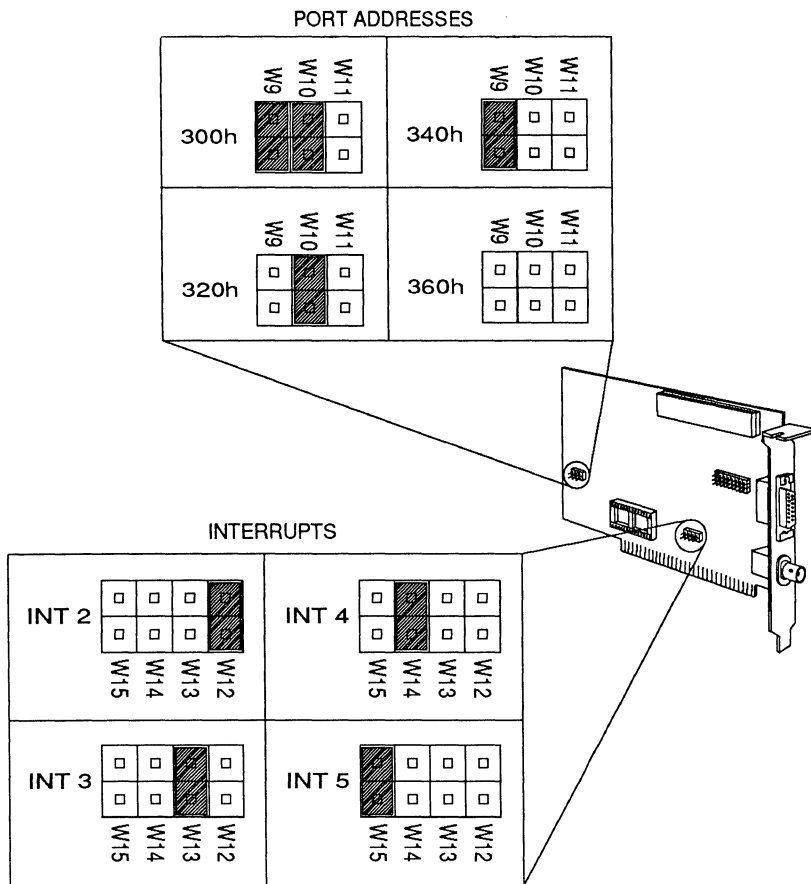


Figure A.2
NE1000 (Assy. #810-160-001) Board
Setting Options for NetWare 386

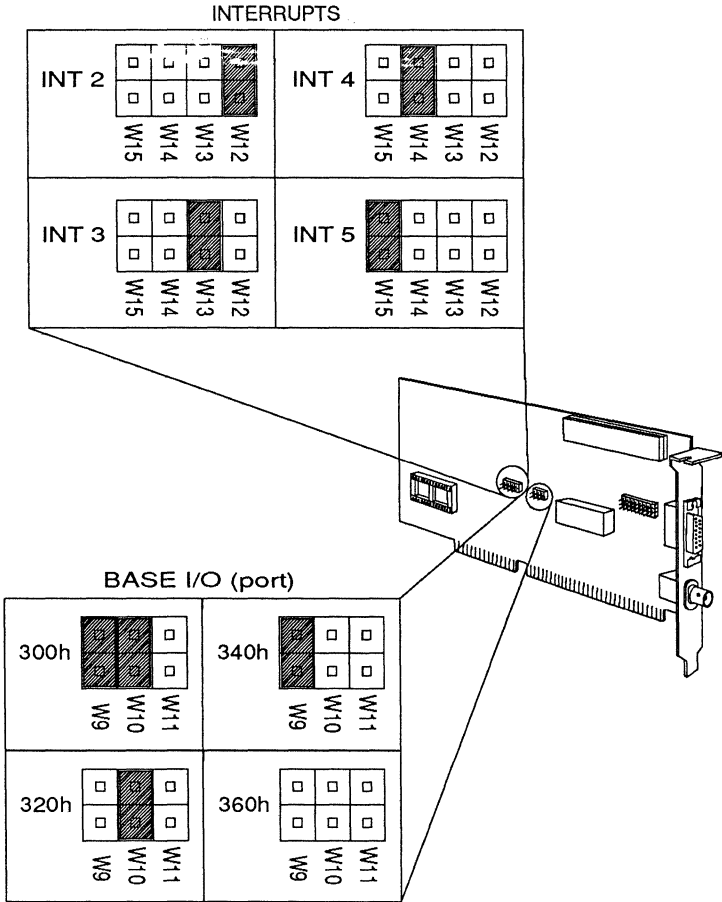


Figure A.3
NE2000 Board Setting Options for NetWare 386

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Manual Revision 1.03
For NetWare v2.12 and Above
Novell Part #100-000545-001**

HOW TO USE THIS MANUAL

This manual explains how to install IBM Token-Ring networking hardware on a NetWare network. It is a supplement to several NetWare installation manuals.

If you haven't already done so, read and follow the instructions in your NetWare installation manual up to the point where it advises you to consult this supplement.

This supplement introduces the networking hardware you will be using. It also explains how to plan your own network, and how to prepare and install the networking hardware.

In addition, Chapter 4 contains special instructions for creating Token-Ring workstation boot diskettes.

Appendix A of this supplement contains information about setting Token-Ring adapters for use with NetWare 386.

Appendix D of this supplement gives instructions on using the IBM Token-Ring Source Route Driver for NetWare communications across IBM Token-Ring Network Bridges.

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1 PLANNING YOUR NETWORK

In this chapter, you will

- Identify network hardware;
- Learn how each hardware component is used on the network;
- Learn the rules and limitations for using the hardware;
- Design your network layout and make sure that you have all the hardware you need to set up your network.

The hardware described in this chapter is for a network with a *small movable* cabling system. This type of cabling is used in networks with up to 96 stations (servers, bridges, and workstations) and up to 12 IBM 8228 units.

If your network will have more than 96 stations or more than 12 IBM 8228 units, you must use a *large nonmovable* cabling system. Refer to the appropriate IBM manuals listed in Appendix B for information on large nonmovable cabling systems.

NOTE:

In this supplement, the term *station* refers to servers, bridges, and workstations. This term is synonymous with the term *attaching device* used in IBM manuals.

IBM TOKEN-RING NETWORK HARDWARE

IBM Token-Ring network hardware components are described below, and illustrated in Figure 1.1.

Adapters. Token-Ring adapters are the network interface boards that enable stations to function on a Token-Ring network:

- The 16/4 Adapter and the PC Adapter II are for standard bus stations (such as the IBM PC, XT, AT, and PS/2 Model 30).
- The 16/4 Adapter/A and the PC Adapter/A are for Micro Channel stations (such as the IBM PS/2 Models 50, 60, 70, and 80).

IBM 8228 Multistation Access Units. An IBM 8228 Multistation Access Unit (MAU) is used to connect up to eight stations in a network. (This unit will be referred to in this manual as an "IBM 8228 unit" or "8228 unit.")

IBM 8228 Setup Aid. An IBM 8228 Setup Aid is used to test the 8228 unit before it is installed.

IBM Token-Ring Network PC Adapter Cables. An adapter cable is made of 8 feet of IBM type 6 cable. One end connects to the adapter port of a Token-Ring PC or TRN/A adapter. The other end connects to either a patch cable or an IBM 8228 unit.

Patch Cables. A patch cable is made of IBM type 6 cable and has a connector at each end. Patch cables can be connected to each other, to adapter cables, or to an IBM 8228 unit.

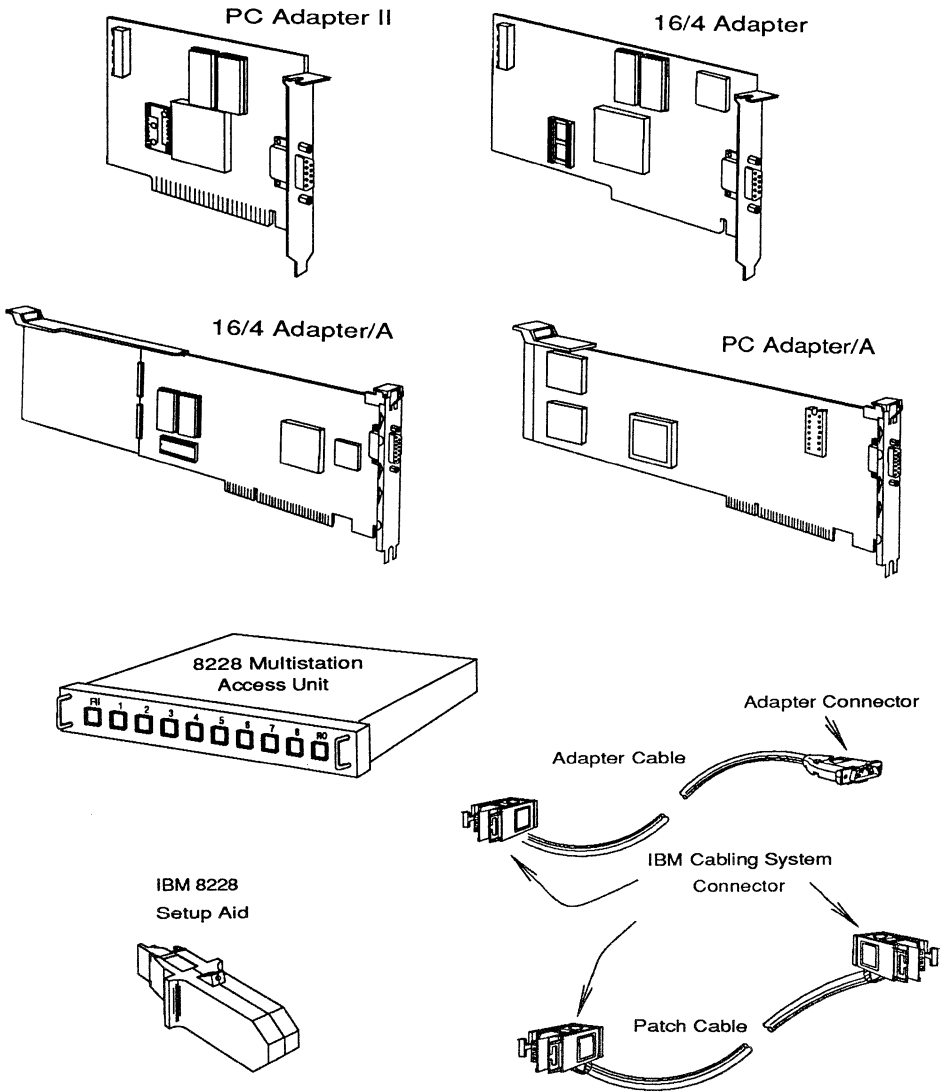


Figure 1.1
IBM Token-Ring Network Hardware

TOKEN-RING NETWORK LAYOUT

Below is a summary of limitations and rules for a Token-Ring network layout. As you review this summary, refer to Figure 1.2. (Remember, this chapter describes the *small movable* cabling system; the large nonmovable cabling system is outlined in Appendix B of this supplement.)

LIMITATIONS

- Maximum number of stations = 96
- Maximum number of 8228 units = 12
- Maximum patch cable distance between an 8228 unit and a station (not including the 8-foot adapter cable) = 150 feet (45 meters)
- Maximum patch cable distance between two 8228 units = 150 feet (45 meters)
- Maximum patch cable distance connecting all 8228 units = 400 feet (120 meters)

RULES

- Stations are connected to the 8228 unit at receptacles numbered 1 through 8. Stations located within 8 feet of an 8228 unit can be connected using just the 8-foot adapter cable. Stations farther than 8 feet from the 8228 unit are connected by using one or more patch cables as “extension cords.”
- The 8228 units in a Token-Ring network must be connected in a “ring” using patch cables. To form the ring, a patch cable is connected from the RO (Ring Out) receptacle of an 8228 unit to the RI (Ring In) receptacle of the next 8228 unit. This continues until a patch cord has been connected to the RI receptacle of the first 8228 unit. (If a network only has one 8228 unit, its RO and RI receptacles do not need to be connected with a patch cable.)

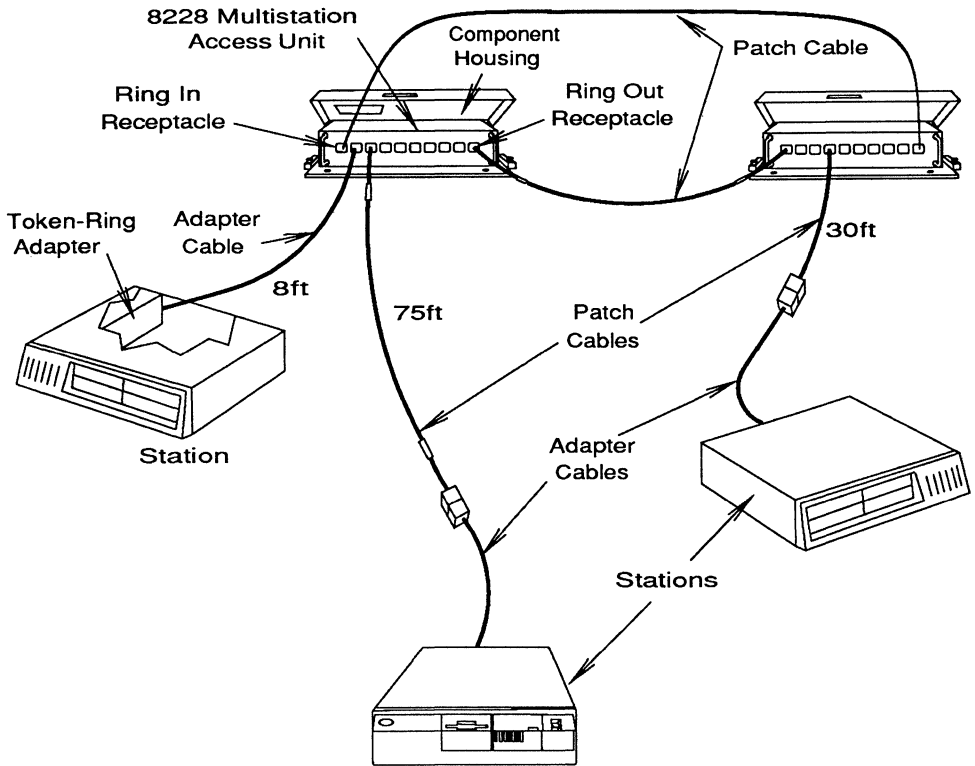


Figure 1.2
IBM Token-Ring Network Layout

RULES *(Continued)*

- Patch cables should not be spliced. (However, you may want to make your own patch cables using IBM type 6 cable and connectors.)
- In some areas, there are legal restrictions on the installation of IBM type 6 cable. Ensure that you adhere to any legal restrictions (for example, local building and fire codes) on this type of cable.
- Patch cables must not run outdoors or be exposed to temperatures above 167° F (75° Celsius).
- Patch cables must not be exposed to any source of electric or magnetic interference (such as fluorescent light fixtures).
- Cables that must be laid on the floor must be protected from damage and should not present a hazard to office traffic.
- Patch cables should not be installed in any duct, plenum, or other space used for air handling.

NOTE:

For more detailed information on requirements and restrictions on the Token-Ring network, see Chapter 3 of the *IBM Token-Ring Network Introduction and Planning Guide*. For information on making your own patch cables, see Appendix A of the same manual.

PLANNING YOUR NETWORK LAYOUT

EVALUATING YOUR NETWORK NEEDS

Now that you know the limitations for IBM Token-Ring networks, consider the following questions as you define your particular needs.

- How large an area must the cabling system cover?
- How many stations (file servers, bridges, and workstations) will be connected to the cabling system?
- What growth in size and connections must the system accommodate?

DRAWING THE NETWORK PLAN

Draw your network plan, labeling each piece of hardware—stations, 8228 units, and cables—that will be included. Keep in mind the rules given in the preceding sections. Measure the distances between all components and make sure they are all within the maximums. Record these distances on your sketch. Ensure that the locations you choose for file servers have adequate room for any peripherals (printers, external disk drives, etc.) that will be attached.

PLANNING THE NETWORK CABLING

After you sketch your network plan, the next step is to plan your specific network cabling and to make sure that you have all the cables you need.

You will need the following materials to plan and install your cabling:

- An 8228 Cabling Chart for each IBM 8228 unit in your network. You can photocopy these from Figure 1.3 of this manual, or you can make your own charts.
- An 8228 unit label for each IBM 8228 unit on your network. This is simply a label that you can attach to the 8228 unit to identify individual units.
- Ring sequence labels (orange and blue), which are supplied with each 8228 unit.

- A string tag for each Token-Ring adapter in your network. (You must provide these.)
- A label for each patch cable in your network. This can be any label that will adhere to the ends of patch cables.

Perform the following steps to plan your network cabling.

- 1) Assign a unique number to each IBM 8228 unit in your network. You might use numbers such as "8228-1," "8228-2," etc. Write this number on an 8228 unit label, and record the unit's number and location in Section 1 of the 8228 Cabling Chart. Also record this number next to the 8228 unit on the drawing you made of your network plan.

8228 Cabling Chart								
SECTION 1: Identification								
8228 Unit Number _____ Location _____								
SECTION 2: Receptacle Connections								
8228 Receptacle	1	2	3	4	5	6	7	8
Connect to Station								
SECTION 3: Ring Connections								
A. Connect RI of this 8228 to RO of _____								
B. Connect RO of this 8228 to RI of _____								

Figure 1.3
8228 Cabling Chart

- 2) Assign a unique number to each Token-Ring adapter in your network. For example, you might use "WS-2" to identify one of your workstations and "Server-1" to identify one of your servers. Write this number on a string tag, and attach the tag to the adapter. Also record this number next to the station on your drawing of the network plan.
- 3) In Section 2 of the 8228 Cabling Chart, record which station adapters will be attached to which receptacles on which IBM 8228 units.
- 4) In Section 3 of the 8228 Cabling Chart, record the patch cable connections between your 8228 units. Also record these connections on the ring sequence labels, and attach the labels to the 8228 units.

Remember, if you have more than one 8228 unit, the RO (Ring Out) receptacle of each 8228 unit must be connected with a patch cable to the RI (Ring In) receptacle of another 8228 unit.

- 5) Attach labels to the ends of each patch cable in your network, identifying which connection the cable is used for. For example, one patch cable might be connecting the RO receptacle of your "8228-1" unit to the RI receptacle of your "8228-2" unit. Another patch cable might be connecting the adapter cable of "WS-2" to receptacle 4 of the "8228-1" unit. (As you attach labels, make sure you have all the cables you need for your network layout.)

NOTE:

As mentioned, an IBM 8228 Setup Aid is shipped with each IBM 8228 unit. We suggest that you use the Setup Aid to test your 8228 unit at this time. Instructions for testing the 8228 units are included with the Setup Aid.

2 SETTING AND INSTALLING IBM TOKEN-RING ADAPTERS

To set and install adapters in your network stations, find the station and adapter type in the list below and skip to the page indicated.

Adapter Type	Page
Server or Bridge 16/4 Adapter or PC Adapter II (Standard Bus)	2-2
Workstation 16/4 Adapter or PC Adapter II (Standard Bus)	2-7
Server or Bridge 16/4 Adapter/A or PC Adapter/A (Micro Channel Bus)	2-17
Workstation 16/4 Adapter/A or PC Adapter/A (Micro Channel Bus)	2-22

NOTE:

Appendix A of this manual contains information about setting Token-Ring adapters for NetWare 386.

SERVER OR BRIDGE 16/4 ADAPTER AND PC ADAPTER II (STANDARD BUS)

You must set each standard bus adapter installed in a server or bridge to use a specific interrupt line and ROM address.

UNDERSTANDING SETTINGS

You must set your server and bridge adapters to the configuration option you chose when you generated the operating system or bridge software. Refer to the worksheets filled out during installation to find the configuration option chosen.

One Token-Ring adapter in each server or bridge must be set using a primary configuration option. All other Token-Ring adapters in the server must be set using an alternate configuration option.

You must set the adapters to use a specific shared RAM size. We recommend you set the Shared RAM Size at 16KB. Use the 8KB setting only if you have limited system memory.

If you are using the IBM Token-Ring Network 16/4 Adapter, you will need to set the data rate switch.

NOTE:

You must set all IBM Token-Ring Network 16/4 Adapters on a ring to use the same data rate (either 16Mbps or 4Mbps). Failure to do so can cause network errors. Older versions of IBM Token-Ring Network Adapters (that are set at 4Mbps) should not be used with 16/4 adapters set at 16Mbps.

Instructions for setting the 16/4 Adapter begin on the next page. To set the PC Adapter II, skip to page 2-5.

SETTING SERVER OR BRIDGE 16/4 ADAPTER

If you are using an IBM Token-Ring Network 16/4 Adapter, set your server or bridge adapters according to the switch settings given in Figures 2.1 or 2.2, depending on the configuration option chosen. Move the switch to the side indicated by the dark tab.

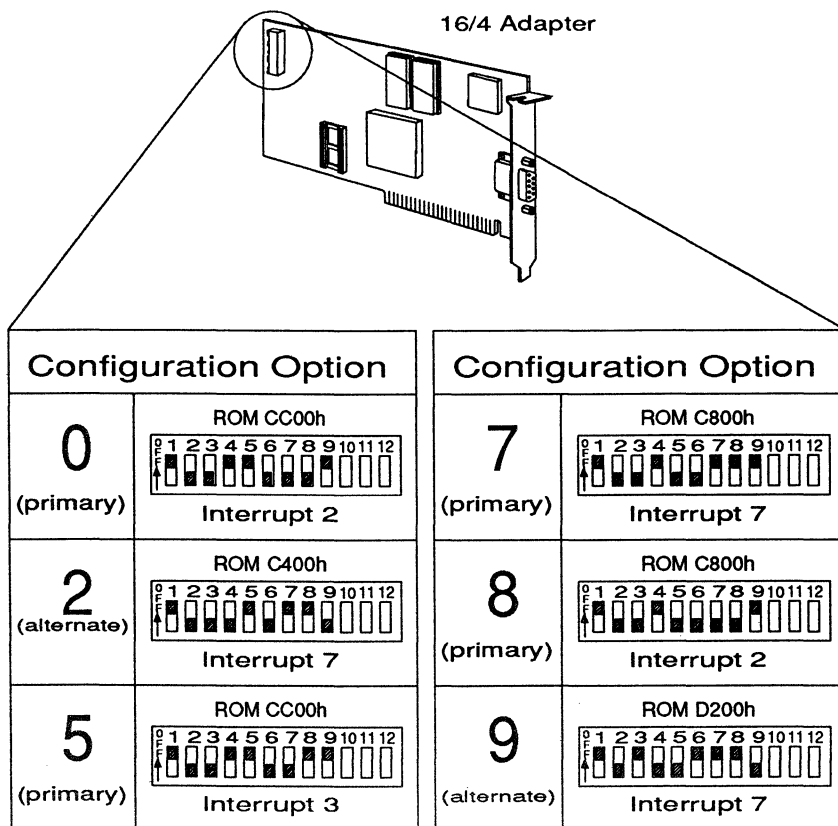


Figure 2.1
 Configuration Options for the
 IBM Token-Ring Network 16/4 Adapter

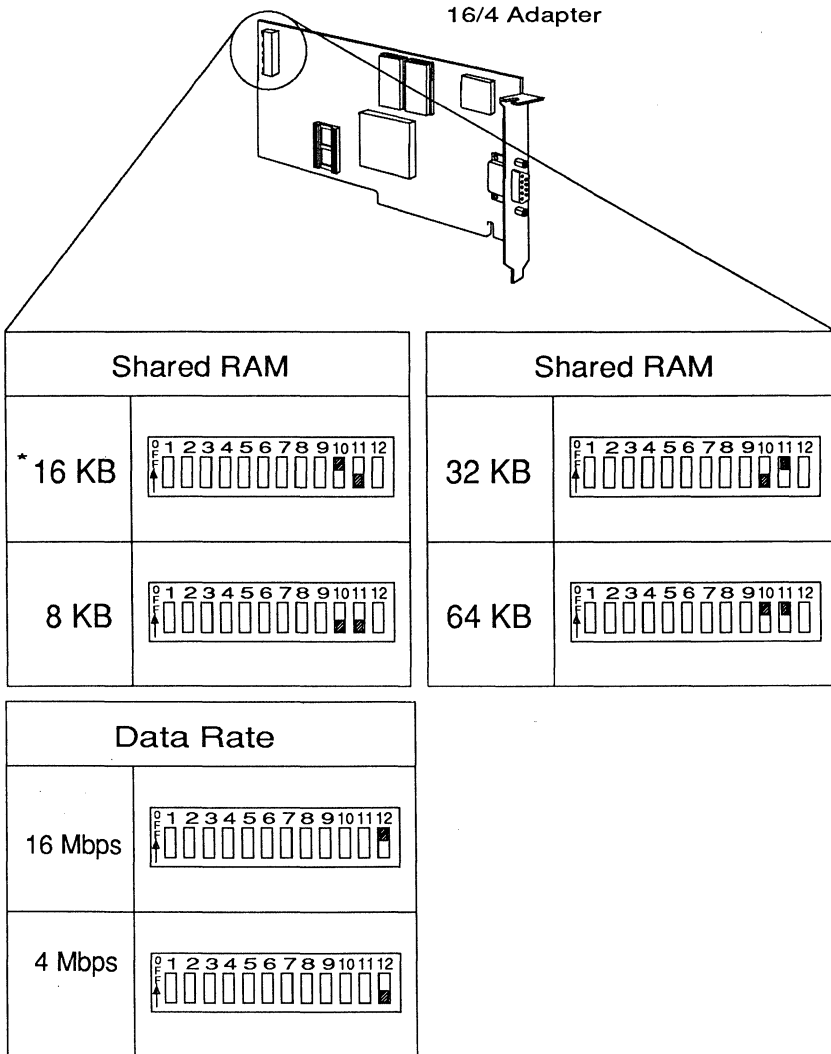


Figure 2.2
Shared RAM and Data Rate Settings
for the IBM Token-Ring Network 16/4 Adapter

SETTING SERVER OR BRIDGE PC ADAPTER II

If you are using an IBM Token-Ring Network PC Adapter II, set your server or bridge adapters according to the switch settings given in Figures 2.3 or 2.4, depending on the configuration option chosen. Move the switch to the side indicated by the dark tab.

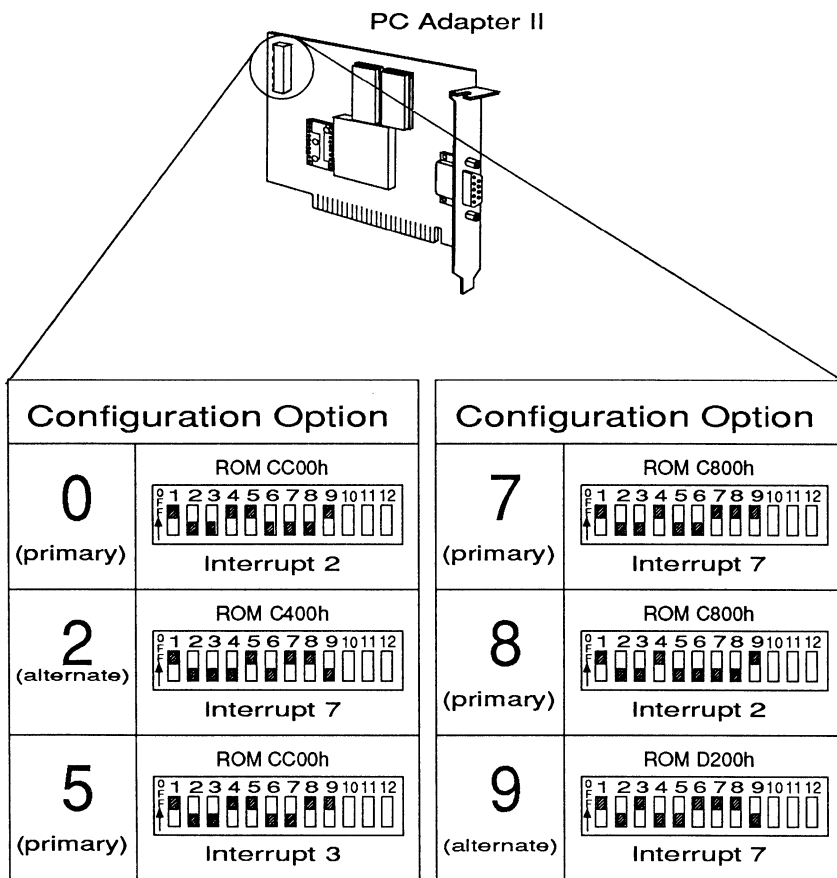


Figure 2.3
Configuration Options for the
IBM Token-Ring Network PC Adapter II

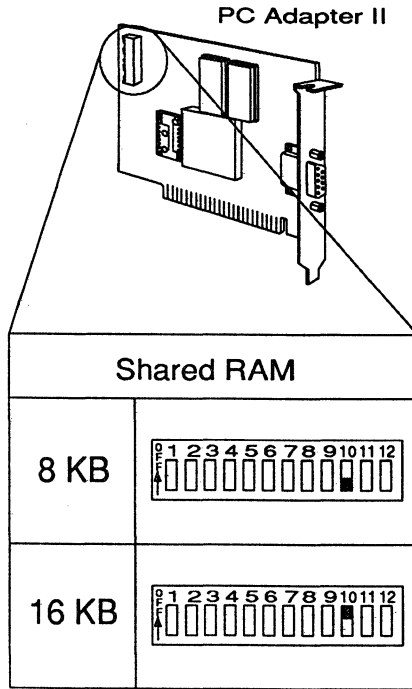


Figure 2.4
Shared RAM Settings for the
IBM Token-Ring Network PC Adapter II

INSERTING ADAPTERS INTO SERVERS AND BRIDGES

Before inserting a Token-Ring adapter into a server or bridge, complete the following steps.

- 1) Turn off the power switches and unplug the power cords of the station and peripherals.
- 2) Disconnect all cables from the back of the station. (Label each cable so that you will know where to reconnect it.)
- 3) Remove the station's cover according to the manufacturer's instructions.
- 4) Insert the adapter into the station according to the manufacturer's instructions.

WORKSTATION 16/4 ADAPTER AND PC ADAPTER II (STANDARD BUS)

You must set each standard bus adapter to use an interrupt line and ROM address. You must also set each adapter as primary or alternate. You must set the adapters to use a specific shared RAM size. In addition, you will need to set the data rate switch on the IBM Token-Ring Network 16/4 Adapter. Use the following guidelines as you select the settings for your network adapters.

- You must select the primary address for the first Token-Ring board installed in each workstation.
- You can use any combination of the settings given for the interrupt line and ROM address, as long as they do not conflict with other hardware settings in the workstation.
- You can use different settings in different workstations or the same setting for each workstation in your network.
- We recommend you set the Shared RAM Size at 16KB. Use the 8KB setting only if you have limited system memory.

NOTE:

You must set all IBM Token-Ring Network 16/4 Adapters on a network to use the same data rate (either 16Mbps or 4Mbps). Failure to do so can cause network errors. Older versions of IBM Token-Ring Network Adapters (that are set at 4Mbps) should not be used with 16/4 Adapters set at 16Mbps.

Instructions for setting the 16/4 Adapter begin on the next page. To set the PC Adapter II, skip to page 2-12.

SETTING WORKSTATION 16/4 ADAPTER

If you are using an IBM Token-Ring Network 16/4 Adapter, set your workstation adapters according to the switch settings given in Figures 2.5 or 2.6. Move the switch to the side indicated by the dark tab.

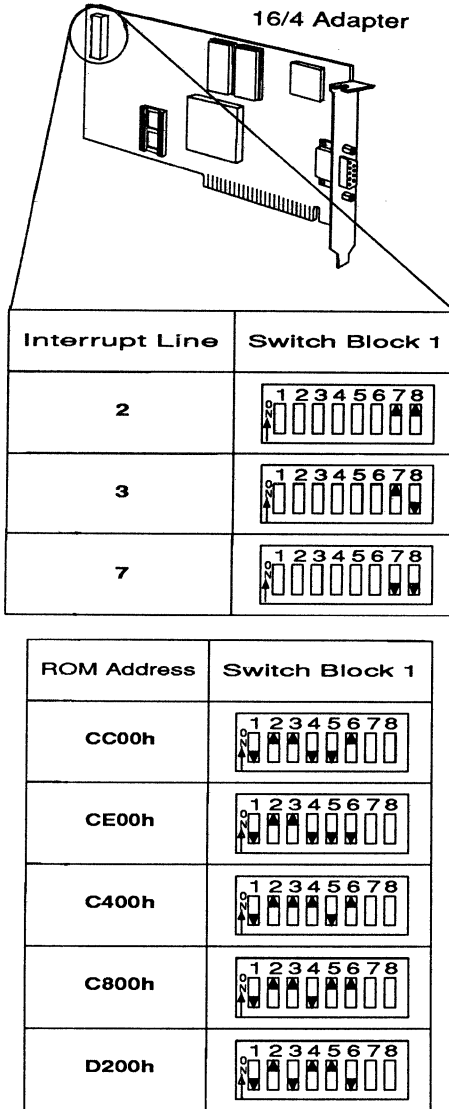


Figure 2.5
ROM Addresses and Interrupt Line Settings
for the IBM Token-Ring Network 16/4 Adapter

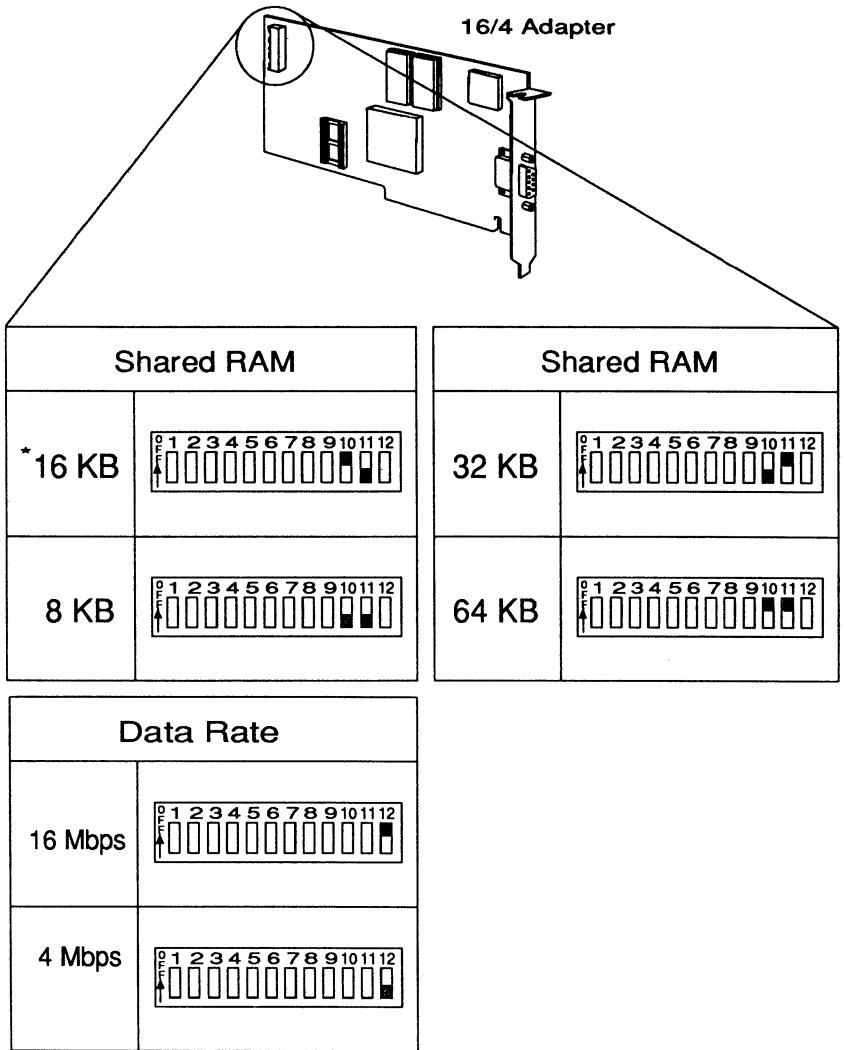


Figure 2.6
Shared RAM and Data Rate Settings
for the IBM Token-Ring Network 16/4 Adapter

SETTING WORKSTATION PC ADAPTER II

If you are using an IBM Token-Ring Network PC Adapter II, set your workstation adapters according to the switch settings given in Figures 2.7 or 2.8. Move the switch to the side indicated by the dark tab.

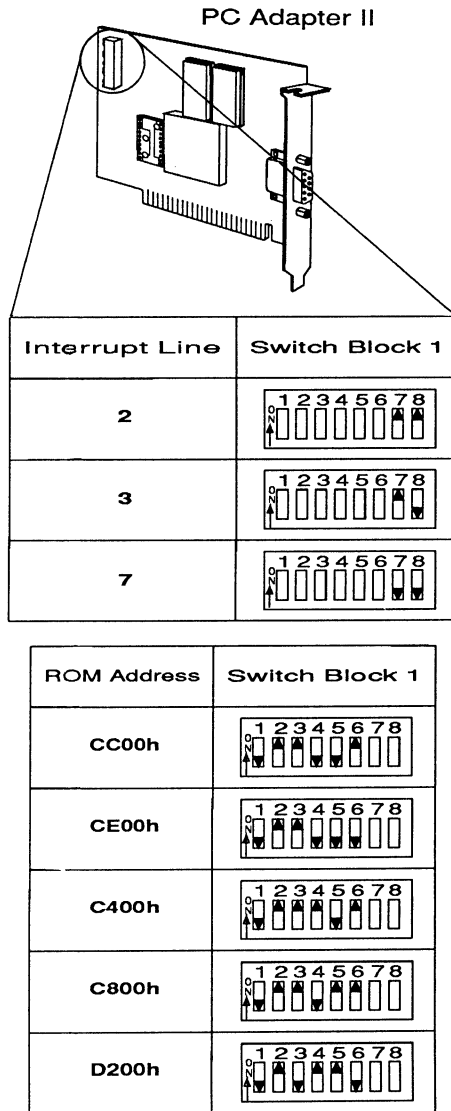


Figure 2.7
ROM Addresses and Interrupt Line Settings
for the IBM Token-Ring Network PC Adapter II

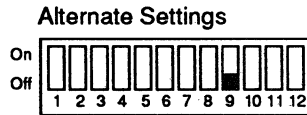
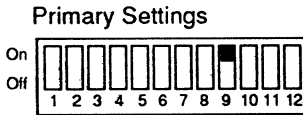
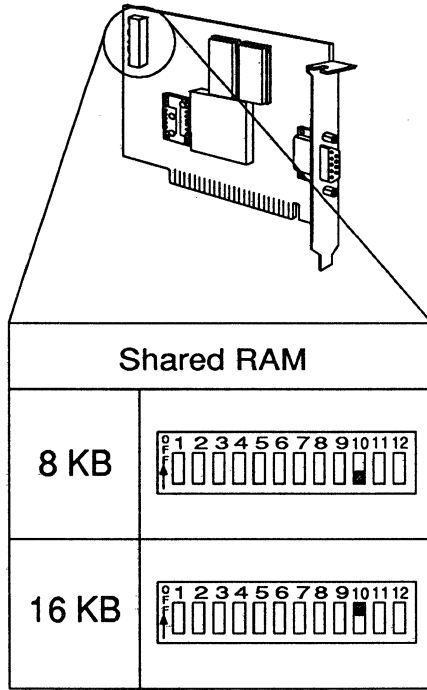


Figure 2.8
Shared RAM Settings for the
IBM Token-Ring Network PC Adapter II

INSTALLING REMOTE RESET BOOT PROMS

The Remote Reset feature allows IBM workstations and many compatibles to boot from a network hard disk.

If you are not using the Remote Reset feature, skip to "Inserting Adapters into Workstations" on page 2-17.

Remote Reset can be used only if

- The workstation does not contain a hard disk;
- The adapter has an IBM Remote Reset PROM installed;
- The workstation operates at 6Mhz or slower and uses 1 wait state.

Insert the Remote Reset PROM into the socket as shown in Figure 2.9. Be sure to line up the notches on the PROM and the socket.

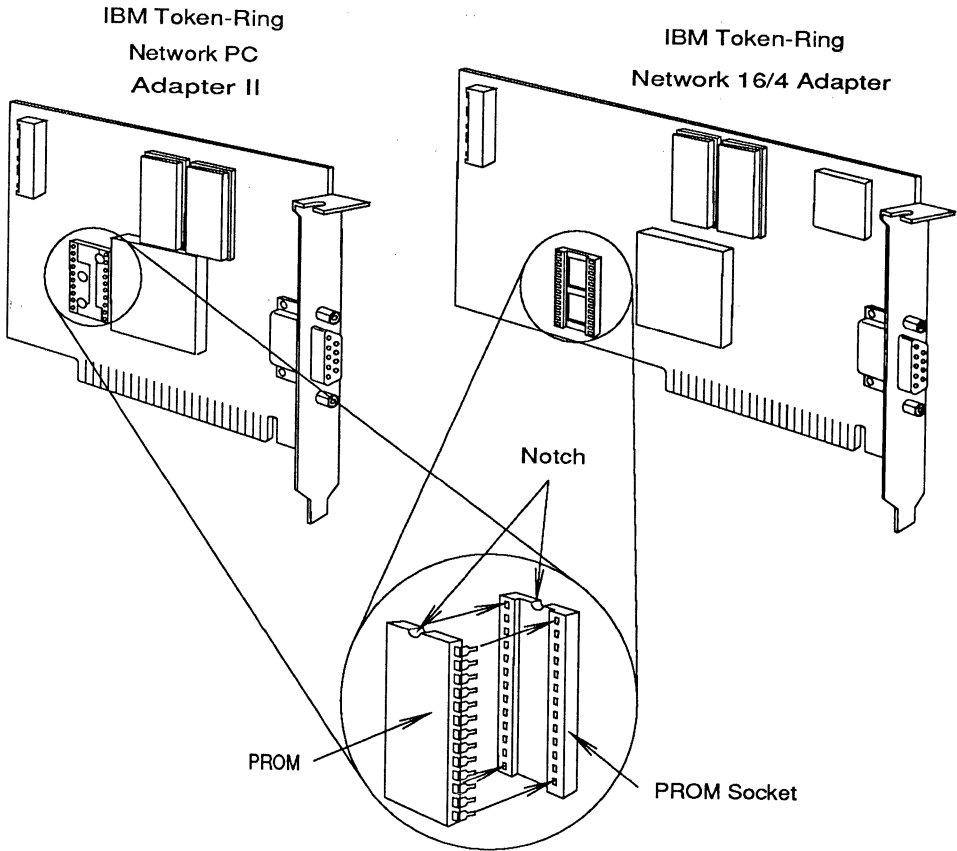


Figure 2.9
Installing Remote Reset PROMs on Standard Bus Adapters

INSERTING ADAPTERS INTO WORKSTATIONS

Before inserting a Token-Ring adapter into a workstation, complete the following steps.

- 1) Turn off the power switches and unplug the power cords of the workstation and peripherals.
- 2) Disconnect all cables from the back of the workstation. (Label the cables so that you will know where to reconnect them.)
- 3) Remove the workstation's cover according to the manufacturer's instructions.
- 4) Insert the adapter into the workstation according to the manufacturer's instructions.

SERVER OR BRIDGE 16/4 ADAPTER/A AND PC ADAPTER/A (MICRO CHANNEL)

Insert each Micro Channel adapter into its station; then use the IBM *REFERENCE* diskette to set each adapter to use a specific interrupt line, ROM address, and RAM address. In addition, you will need to use the *REFERENCE* diskette to set the data rate on the IBM Token-Ring Network 16/4 Adapter/A.

INSERTING ADAPTERS INTO SERVERS AND BRIDGES

Before inserting a Token-Ring adapter into a server or bridge, complete the following steps.

- 1) Turn off the power switches and unplug the power cords of the station and peripherals.
- 2) Disconnect all cables from the back of the station. (Label the cables so that you will know where to reconnect them.)
- 3) Remove the station's cover according to the manufacturer's instructions.
- 4) Insert the adapter into the station according to the manufacturer's instructions.

UNDERSTANDING SETTINGS

You must set your server and bridge adapters to the same configuration option you chose when you generated the operating system or bridge software. Refer to the worksheets filled out during installation to find the configuration option chosen.

Note that one Token-Ring adapter in each server or bridge must be set using a primary configuration option. All other adapters must use an alternate configuration option.

NOTE:

You must set all IBM Token-Ring Network 16/4 Adapters on a network to use the same data rate (either 16Mbps or 4Mbps). Failure to do so can cause network errors. Older versions of IBM Token-Ring Network Adapters (that are set at 4Mbps) should not be used with 16/4 adapters set at 16Mbps.

PREPARING THE *REFERENCE* DISKETTE

You should use a backup copy of the *REFERENCE* diskette to set Micro Channel adapters. If you already have a backup copy, skip to Step 2.

- 1) Make a backup copy of the IBM *REFERENCE* diskette by following the instructions in the *IBM Personal System/2 Quick Reference* that came with the station.

NOTE:

If you have previously added or removed a network interface board, you may see a heading and a message similar to the following:

Adapter Configuration Error – 00165 Page 1 of 2

(Help information about error 00165)

Automatically configure the system? (Y/N)

One or two pages of help information will be available. You can press the PageDown key to view any additional screens. Answer “No” to the prompt.

- 2) Copy the *TRN/A OPTION* diskette onto the backup *REFERENCE* diskette. Follow the instructions given in the *IBM Personal System/2 Quick Reference*.

SETTING ADAPTERS (MICRO CHANNEL)

To set Micro Channel adapters, use the *REFERENCE* diskette. The following table lists the NetWare-supported configuration options for Micro Channel adapters. Instructions for selecting adapter settings follow the table.

NETWARE-SUPPORTED CONFIGURATION OPTIONS

Configuration Option	Primary/ Alternate	ROM Address	RAM Address	Interrupt Line
0	P	CC00h	D800h	2
1	A	CE00h	D400h	3
3	P	D000h	D800h	10
4	A	D200h	DC00h	11
5	P	CC00h	D800h	3
6	P	CE00h	D400h	3
8	P	C800h	CC00h	2

Complete the following steps at each station to set its configuration.

- 1) Insert the backup *REFERENCE* diskette into drive A.
- 2) Boot the station by turning it on, or, if the station is already on, press the Control, Alt, and Delete keys at the same time. A screen with a large IBM logo will appear, and a prompt similar to the following will appear in the lower left-hand corner:

Press Enter (<--|) to continue:

Press < Enter > .

- 3) Since you have just installed an adapter, you will probably see a message similar to the following:

Adapter Configuration Error – 00165 Page 1 of 2

(Help information about error 00165)

Automatically configure the system? (Y/N)

You will see one or two pages of help information. Press the PageDown key to view any additional screens.

Answer “No” to the prompt.

- 4) The *REFERENCE* diskette’s “Main Menu” will appear.

Use the Up- and Down-arrow keys to highlight Option 3 (“Set Configuration”), and press < Enter > .

- 5) The *REFERENCE* diskette’s “Set Configuration” screen will appear.

Use the Up- and Down-arrow keys to highlight Option 2 (“Change Configuration”), and press < Enter > .

- 6) A screen similar to the following will appear. Use the Up- and Down-arrow keys to scroll through the entire screen. Use any settings that do not conflict with other hardware settings.

Configuration data that can be changed is shown in brackets.

The configuration data shown on this page is for Option 0.

Change configuration			
Total System Memory			
Installed Memory	1024 KB	(1.0 MB)	
Usable Memory	1024 KB	(1.0 MB)	
Built In Features			
Installed Memory	1024 KB	(1.0 MB)	
Diskette Drive A Type	[1.44MB 3.5"]		
Diskette Drive B Type	[Not Installed]		
Math Coprocessor	Not Installed		
Serial Port	[SERIAL_1]		
Parallel Port.....	[PARALLEL_1]		
Slot1 - PC Network Adapter			
Type, Memory Location, Interrupt Level	[Primary, Mem2, Int3]		
Slot2 - IBM Token-Ring Network Adapter/A			
Primary or Alternate adapter	[Primary]		
ROM Address range	[CC000 - CDFFF]		
RAM Address range	[D8000 - DBFFF]		
Interrupt Level	[Interrupt 2]		
Slot3 - Empty			
Slot4 - IBM Fixed Disk Adapter			
Type of first drive	[31]		
Type of second drive	[0]		
Arbitration Level	[Level_3]		
Esc=Quit	F5=Previous	F10=Save	↑ Home
F1=Help	F6=Next		↓ Down PageDown

- 7) If the settings shown on the “Change Configuration” screen are correct, exit the screen by pressing < Escape >.

If the settings shown are incorrect, highlight the incorrect information (using the Up- and Down-arrow keys). Use the F5 and F6 function keys to scroll through the available settings.

Press the F10 function key to save the changes and exit the screen.

- 8) The “Main Menu” will appear. Press < Escape > to exit the *REFERENCE* diskette program.

WORKSTATION 16/4 ADAPTER/A and PC ADAPTER/A (MICRO CHANNEL BUS)

Insert each Micro Channel adapter into its station; then use the IBM *REFERENCE* diskette to set each adapter to use a specific interrupt line, ROM address, and RAM address. In addition, you will need to use the *REFERENCE* diskette to set the data rate on the IBM Token-Ring Network 16/4 Adapter/A. If the workstation will not use the Remote Reset feature, return to “Inserting Adapters into Workstations” on page 2-17.

INSTALLING REMOTE RESET BOOT PROMS

The Remote Reset feature allows IBM workstations and many compatibles to boot from a network hard disk.

Remote Reset can be used only if

- The workstation does not contain a hard disk;
- The adapter has an IBM Remote Reset PROM installed.

Insert the Remote Reset PROM into the socket as shown in Figure 2.10. Be sure to line up the notches on the PROM and the socket.

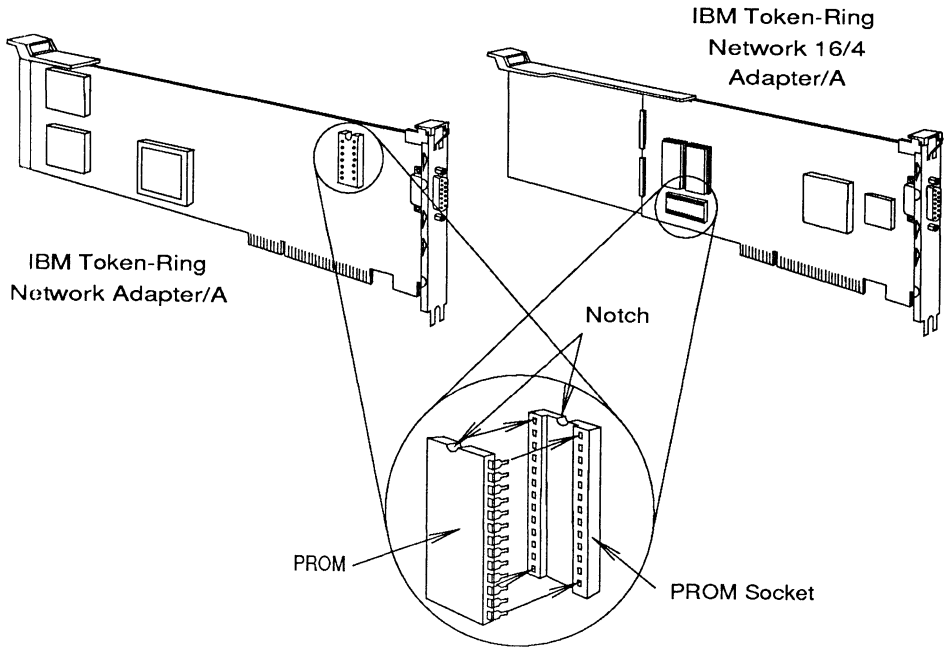


Figure 2.10
Installing Remote Reset PROMs on Micro Channel Adapters

INSERTING ADAPTERS INTO WORKSTATIONS

Before inserting a Token-Ring adapter into a workstation, complete the following steps.

- 1) Turn off the power switches and unplug the power cords of the workstation and peripherals.
- 2) Disconnect all cables from the back of the workstation. (Label the cables so that you will know where to reconnect them.)
- 3) Remove the workstation's cover according to the manufacturer's instructions.
- 4) Insert the adapter into the workstation according to the manufacturer's instructions.

UNDERSTANDING SETTINGS

You must set each Micro Channel adapter installed in a workstation to use a specific interrupt line, ROM address, and RAM address.

You can use any combination of the settings available for the interrupt line and ROM address, as long as they do not conflict with other hardware settings in the workstation.

NOTE:

You must set all IBM Token-Ring Network 16/4 Adapters on a network to use the same data rate (either 16Mbps or 4Mbps). Failure to do so can cause network errors. Older versions of IBM Token-Ring Network Adapters (that are set at 4Mbps) should not be used with 16/4 adapters set at 16Mbps.

PREPARING THE REFERENCE DISKETTE

Use a backup copy of the *REFERENCE* diskette to set Micro Channel adapters. If you already have a backup copy, skip to Step 2.

- 1) Make a backup copy of the IBM *REFERENCE* diskette by following the instructions in the *IBM Personal System/2 Quick Reference* that came with the station.

NOTE:

If you have previously added or removed a network interface board, you may see a heading and a message similar to the following:

Adapter Configuration Error – 00165 Page 1 of 2

(Help information about error 00165)

Automatically configure the system? (Y/N)

You will see one or two pages of help information. You can press the PageDown key to view any additional screens. Answer “No” to the prompt.

- 2) Copy the *TRN/A OPTION* diskette onto the backup *REFERENCE* diskette. Follow the instructions given in the *IBM Personal System/2 Quick Reference*.

SETTING WORKSTATION ADAPTERS

Set Micro Channel adapters using the *REFERENCE* diskette. Complete the following steps at each station to set its configuration.

- 1) Insert the backup *REFERENCE* diskette into drive A.
- 2) Boot the station by turning it on, or, if the station is already on, press the Control, Alt, and Delete keys at the same time. A screen with a large IBM logo will appear, and a prompt similar to the following will appear in the lower left-hand corner:

Press Enter (<--|) to continue:

Press < Enter > .

- 3) Since you have just installed an adapter, you will probably see a message similar to the following:

Adapter Configuration Error – 00165 Page 1 of 2

(Help information about error 00165)

Automatically configure the system? (Y/N)

You will see one or two pages of help information. Press the PageDown key to view any additional screens.

Answer “No” to the prompt.

- 4) The *REFERENCE* diskette’s “Main Menu” will appear.
Use the Up- and Down-arrow keys to highlight Option 3 (“Set Configuration”), and press < Enter > .
- 5) The *REFERENCE* diskette’s “Set Configuration” screen will appear.
Use the Up- and Down-arrow keys to highlight Option 2 (“Change Configuration”), and press < Enter > .

- 6) A screen similar to the one below will appear. Use the Up- and Down-arrow keys to scroll through the entire screen. Use any settings that do not conflict with other hardware settings.

Configuration data that can be changed is shown in brackets.

Change configuration				
Total System Memory				
Installed Memory	1024 KB (1.0 MB)			
Usable Memory	1024 KB (1.0 MB)			
Built In Features				
Installed Memory	1024 KB (1.0 MB)			
Diskette Drive A Type	[1.44MB 3.5"]			
Diskette Drive B Type	[Not Installed]			
Math Coprocessor	Not Installed			
Serial Port	[SERIAL_1]			
Parallel Port.....	[PARALLEL_1]			
Slot1 - PC Network Adapter				
Type, Memory Location, Interrupt Level	[Primary, Mem2, Int3]			
Slot2 - IBM Token-Ring Network Adapter/A				
Primary or Alternate adapter	[Primary]			
ROM Address range	[CC000 - CDFFF]			
RAM Address range	[D8000 - DBFFF]			
Interrupt Level	[Interrupt 2]			
Slot3 - Empty				
Slot4 - IBM Fixed Disk Adapter				
Type of first drive	[31]			
Type of second drive	[0]			
Arbitration Level	[Level_3]			
Esc=Quit	F5=Previous	F10=Save	↑ Home	
F1=Help	F6=Next		↓ Down	PageDown

- 7) If the settings shown on the “Change Configuration” screen are correct, exit the screen by pressing < Escape > .

If the settings shown are incorrect, highlight the incorrect information (using the Up- and Down-arrow keys). Use the F5 and F6 function keys to scroll through the available settings.

Press the F10 function key to save the changes and exit the screen.

- 8) The “Main Menu” will appear. Press < Escape > to exit the *REFERENCE* diskette program.

Repeat these steps at another station with a PC Adapter/A installed. When you have installed and configured all your Micro Channel adapters, continue with Chapter 3.

3 CABLING YOUR NETWORK

This chapter explains a few simple practices to observe when you connect your network stations.

NOTE:

This chapter, like Chapter 1, describes the networking hardware and layout for a network with a *small movable* cabling system. This type of cabling is used for networks with up to 96 stations and up to 12 IBM 8228 units.

If your network uses a *large nonmovable* cabling system (for more than 96 stations or more than 12 IBM 8228 units), you should cable your network according to the instructions in the IBM manuals.

CONNECTING STATIONS

After you have identified the network hardware components (Chapter 1), and set and installed Token-Ring network adapters in each station (Chapter 2), you should connect the stations and other Token-Ring network hardware with the appropriate cabling. Follow the steps listed below.

- 1) Place all network stations and other components in the locations you have chosen for them.
- 2) Run the appropriate lengths and types of cables between network stations and the IBM 8228 units. (Chapter 1 defines the types of cabling.)
- 3) Before connecting cables to the 8228 ports, initialize each port that will be used by plugging in the Setup Aid.
- 4) Connect all stations and IBM 8228 units with network cables. Adapter cables are connected to stations using the Token-Ring adapter ports, as shown in Figure 3.1 on the next page.

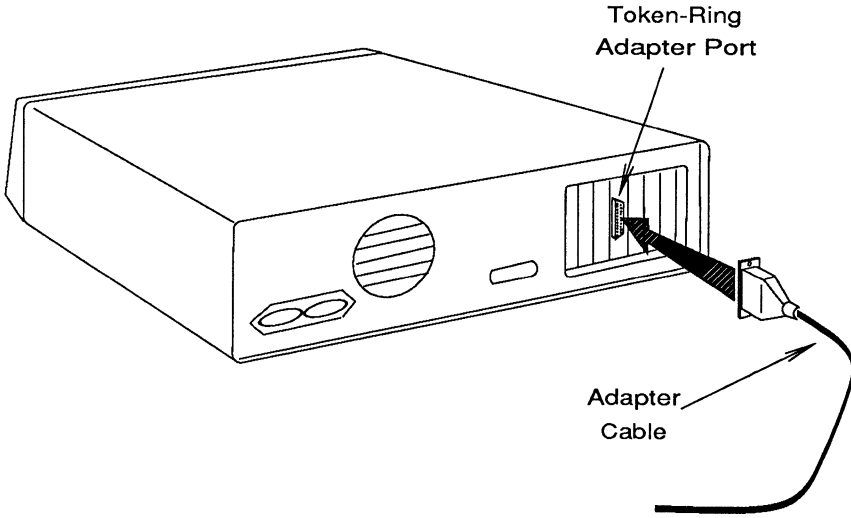


Figure 3.1
Connecting Adapter Cables to Token-Ring Adapter Ports

4 BOOTING TOKEN-RING WORKSTATIONS

This chapter explains how to prepare IBM Token-Ring workstations for booting. Workstations can be booted from

- A boot diskette;
- A Remote Reset file;
- A local hard disk.

To use the first two methods, you must create boot diskettes. To use the third method, you should substitute the local hard disk for the boot diskette in the instructions. Keep in mind that many references to boot diskettes also apply to any local hard disks which will contain the workstation boot files.

The instructions in this chapter replace those under the heading “Creating Workstation Boot Diskettes” in Chapter 9 of the *NetWare Getting Started: Supervisor’s Guide*. Although the instructions are similar, Token-Ring workstation boot diskettes require additional preparation steps which are explained in this chapter.

To complete the instructions in this chapter, you should be familiar with common DOS commands, such as CHDIR or CD, COPY, COPY CON, FORMAT, and TYPE.

Follow the steps in the chart on the next page to make boot diskettes for Token-Ring workstations. If you are familiar with the steps, you may want to use the chart as a checklist. If you have any questions about a particular step, refer to the page listed.

Page	Essential Steps	Additional Steps
4-4	Gather needed materials.	
4-5	Understand files involved.	
4-9	Format boot diskettes with DOS.	
4-10	Run DXMAID program.	
4-14	Copy shell files.	If using NetWare's NetBIOS emulator, copy NETBIOS.COM and INT2F.COM to boot diskette.
4-15	Determine if workstation is brand other than IBM.	If workstation is brand other than IBM, type COPY CON SHELL.CFG at DOS prompt to create SHELL.CFG file and set machine type.
4-16	Determine if workstation will use AUTOEXEC.BAT file.	If workstation will use AUTOEXEC.BAT file, type COPY CON AUTOEXEC.BAT at DOS prompt to create AUTOEXEC.BAT file.

Page Essential Steps

Additional Steps

4-18 Determine if workstation will use Remote Reset

If workstation will use Remote Reset

- Copy TOKEN.RPL file to SYS:SYSTEM directory;
- Bring down server and reboot to load TOKEN.RPL;
- Run DOSGEN to create NET\$DOS.SYS file in SYS:LOGIN directory;
- Flag NET\$DOS.SYS Shareable/Read-Write (SRW).

4-20 Boot workstations.

PREPARING TO CREATE BOOT DISKETTES

Before you create the boot diskettes for your Token-Ring network, you must

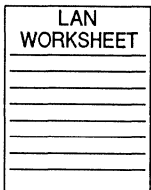
- Locate the “NetWare File Server LAN Worksheet” and certain resource diskettes that contain files needed for the boot diskettes;
- Understand the basic function of various files found on Token-Ring boot diskettes.

GATHERING NEEDED MATERIALS

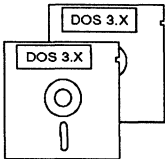
You should gather the following materials before preparing boot diskettes.

ITEM

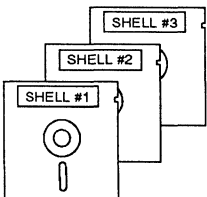
CONTENTS



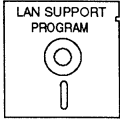
You should have received the “NetWare File Server LAN Worksheet” from the installer. (If you do not have the worksheet, make a list of your workstations by number or name. List the DOS version each workstation will be using.)



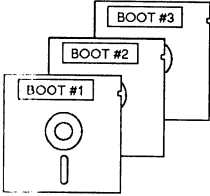
DOS files for each version of DOS to be used on the network.



NetWare shell files for each workstation. (The main NetWare installation manual contains instructions for creating them.)



IBM Token-Ring files (contained on the *LAN SUPPORT PROGRAM* diskette).



Newly formatted, blank diskettes for each workstation. Label each diskette with the name of its respective workstation.

AN OVERVIEW OF FILES

Each workstation on your network must have access to certain files in order to boot. You must create a boot diskette for each workstation on your network that will boot from a floppy disk or a Remote Reset boot file. Workstations that boot from a local hard disk must have the same files on the local hard disk.

The following files are required for each workstation.

Filename	Source
DOS system files	Created when the diskette is formatted. Must be DOS 3.3 or above.
NET3.COM IPX.COM	NetWare shell files generated with SHGEN and found on the shell diskettes.
DXMA0MOD.SYS DXMC0MOD.SYS CONFIG.SYS	IBM Token-Ring files from the <i>LAN SUPPORT PROGRAM</i> diskette.

You may also need to include the following files:

Filename	Source
NETBIOS.COM INT2F.COM	Novell's NetBIOS emulator programs found on the shell diskettes. A more detailed explanation of these files is given in the next section.
DXMT0MOD.SYS	IBM's NetBIOS emulator program found on the <i>LAN SUPPORT PROGRAM</i> diskette. More detail about this file is given in the next section.
SHELL.CFG	File used to configure shell for workstations. You will need to create this file if you are using workstations that are a brand other than IBM.
AUTOEXEC.BAT	Created at the DOS command line. This file will load the shell files and change to the first network drive automatically.

NETBIOS EMULATOR FILES

Some application programs require the use of a NetBIOS emulator program that allows workstations to run applications written for IBM-type networks. Two NetBIOS emulator programs are available—one from Novell and one from IBM. They cannot be used simultaneously in a workstation.

Filename	Explanation
NETBIOS.COM INT2F.COM	Novell's NetBIOS emulator programs. These files are found on the shell diskettes. Use these files if either of the following applies: <ul style="list-style-type: none">• You plan to run an application program requiring <u>Novell's</u> NetBIOS emulator program.

- You plan to use a nondedicated file server or bridge. (NetWare does not support IBM-style intersegment bridges. If you want to use a bridge, you must use a NetWare bridge.)

For instructions on copying these files, refer to “Copying the Shell Files” on page 4-14.

DXMT0MOD.SYS IBM NetBIOS emulator program

The file is found on the *LAN SUPPORT PROGRAM* diskette.

Use this program if your application programs require IBM's NetBIOS emulator program.

This file is copied when you use the IBM NetBIOS emulator program while running the DXMAID program. (See “Copying the DXMAID Files” on page 4-10.)

You may determine that you do not need a NetBIOS emulator program. If you later obtain an application program that does require a NetBIOS emulator program, use the instructions in the sections indicated to copy the program onto the workstation boot diskettes.

CREATING TOKEN-RING WORKSTATION BOOT DISKETTES

Figure 4.1 on the next page illustrates the steps involved in creating Token-Ring boot diskettes. If you need more information about one of the steps, refer to the page listed below the command instructions.

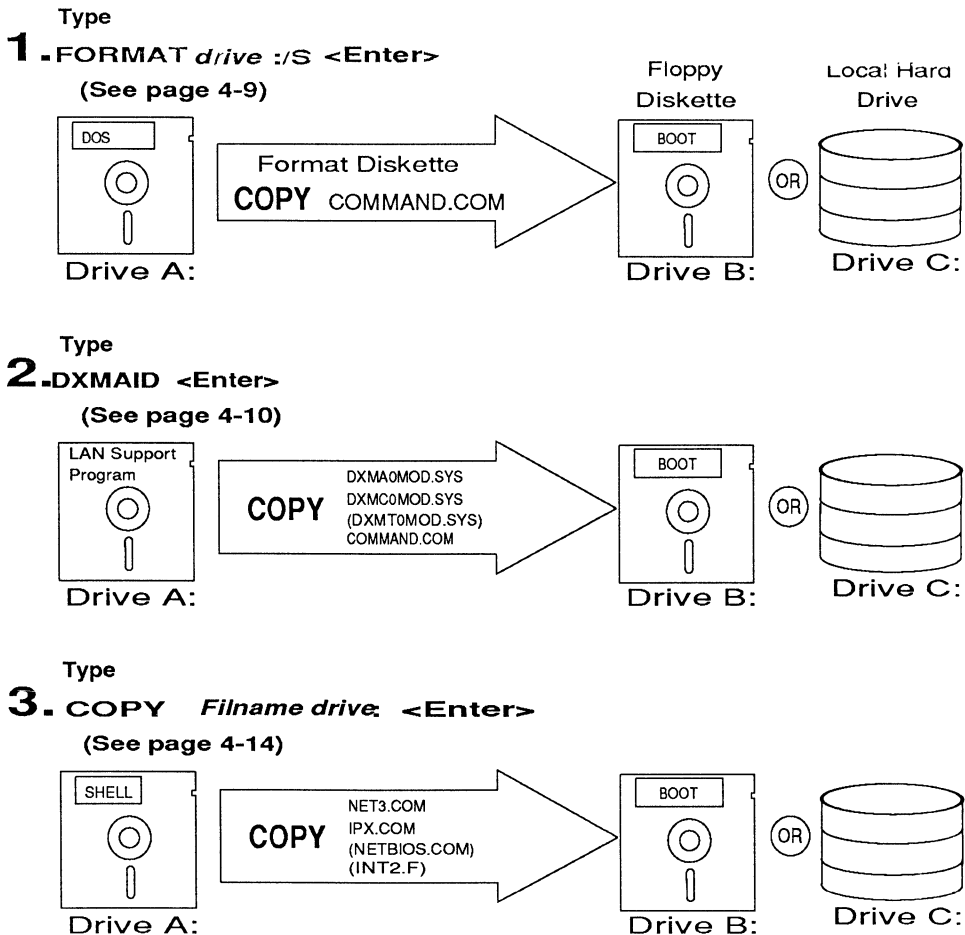


Figure 4.1
Copying Basic Boot Diskette Files

FORMATTING WITH DOS

To create workstation boot diskettes, you will need to

- Use a personal computer that has at least one floppy disk drive (preferably two);
- Use the DOS FORMAT command, including the /S parameter;
- Ensure that each boot diskette is formatted using the correct DOS version for the workstation it will be used with. This must be DOS 3.3 or above.

NOTE:

If you are using a computer that has only one floppy disk drive, you will need to insert the appropriate diskette into the drive when prompted.

Follow the steps below to format diskettes and hard drives.

- 1) Insert the DOS system diskette into drive A.

If the version of DOS on the diskette in drive A is different from the version already booted in the workstation, reboot the computer.

- 2) Insert the workstation's blank boot diskette into drive B.
- 3) To format a standard boot diskette, type the following at the DOS prompt:

```
FORMAT B: /S <Enter>
```

If you are using a 1.44MB drive and want to format a diskette for 720KB, type the following FORMAT command instead:

```
FORMAT B: /S /N:9 /T:80 <Enter>
```

If you are using a fixed disk that has not already been formatted with the /S parameter, type:

```
FORMAT C: /S <Enter>
```

- 4) Respond to the prompts until the formatting process is complete.

- 5) Switch to drive B (or C) and enter the DIR command at the DOS prompt to verify that the COMMAND.COM file was copied.
- 6) Remove the diskette from drive B, and label it so that you know what version of DOS it has been formatted with.

Repeat Steps 1 through 6 for each workstation, including those workstations that will use Remote Reset. Be sure to format each workstation's boot diskette using the DOS version that will run on that workstation.

COPYING THE DXMAID FILES

You must use the DXMAID program found on the *LAN SUPPORT PROGRAM* diskette to copy the following files onto the formatted boot diskette or hard disk:

DXMA0MOD.SYS
DXMC0MOD.SYS
CONFIG.SYS
DXMT0MOD.SYS (optional—IBM's NetBIOS emulator program)

- 1) Switch to drive A, place the *LAN SUPPORT PROGRAM* diskette in drive A, and type

DXMAID < Enter >

NOTE:

Please read all the information that appears on the screen as you go through the DXMAID program, to ensure that you are running the program correctly. If you have questions, use the F1 key for help.

- 2) As you run the DXMAID program, you will be asked to respond to several prompts. The first prompt, similar to the following, will appear :

Will this copy of the program be used in THIS computer?
(Y/N) [Y]

Answer "Yes" to this prompt.

- 3) The following prompt will appear:

Will the 3270 Workstation Program be used? (Y/N) [N]

Answer "No" to this prompt.

- 4) You will then see the following prompt:

Will programs that need the NETBIOS interface be used?
(Y/N) [Y]

If you will be using IBM's NetBIOS emulator program (DXMT0MOD.SYS), answer "Yes."

Otherwise, answer "No."

NOTE:

If your workstation will boot by Remote Reset, answer "No" to the above prompt. IBM's NetBIOS emulator program will not work with your workstation's Remote Reset PROM.

- 5) You will then see the following prompt:

What drive do you want the Support Program copied onto?
(A, B, C, . . .) []

If the workstation will boot from a floppy diskette or by Remote Reset, specify drive A by typing A and pressing the Enter key.

If the workstation will boot from a hard disk, type the drive letter of the hard disk (usually C), and press the Enter key.

- 6) A screen similar to the following will appear, listing your responses to the four prompts.

NSMP		Support Software Parameters																					
Configure the LAN Support Program for THIS computer?.....: Yes																							
Create a configuration for use with the 3270 Workstation Program?: No																							
Copy the NETBIOS interface.....: Yes																							
Copy the files onto drive.....: C																							
<table border="1"><tr><td colspan="2">Choose which adapters you want the Support Program for.</td><td colspan="2">(Y/N)</td></tr><tr><td colspan="4">Token-Ring Network family card(s)..... [Y]</td></tr><tr><td colspan="4">Press F1 for a list of supported cards.</td></tr><tr><td colspan="4">PC Network adapter family card(s)..... [N]</td></tr><tr><td colspan="4">Press F1 for a list of supported cards.</td></tr></table>				Choose which adapters you want the Support Program for.		(Y/N)		Token-Ring Network family card(s)..... [Y]				Press F1 for a list of supported cards.				PC Network adapter family card(s)..... [N]				Press F1 for a list of supported cards.			
Choose which adapters you want the Support Program for.		(Y/N)																					
Token-Ring Network family card(s)..... [Y]																							
Press F1 for a list of supported cards.																							
PC Network adapter family card(s)..... [N]																							
Press F1 for a list of supported cards.																							
F1=Help		F6=Save and Exit																					
		F3=End/No Save																					

- 7) You must specify which IBM adapter you have installed in the workstation. Answer "Yes" to the prompt for the Token-Ring network family.

- 8) If you have answered all the prompts correctly, press the F6 key to save your configuration choices.

If you made a mistake, press the F3 key to end the program without saving the configuration. Then return to Step 2 on page 4-10 and answer the prompts again.

If you specified a hard disk in Step 5, the configuration you specified will be copied to the disk. If you specified a hard disk, skip Step 9.

- 9) If you specified a floppy disk drive in Step 5, a prompt similar to the following will appear:

Place a formatted system diskette in Drive A. The configuration you requested will be created on this diskette.

(If you specified a different drive in Step 5, the prompt will show the drive you specified instead of drive A.)

Place a boot diskette formatted with DOS in the drive you specified, and press the Enter key.

Once the necessary files are copied to your workstation's boot diskette, the DOS prompt will appear on the screen.

IMPORTANT:

If you are using the *LAN SUPPORT PROGRAM* diskette and the BIOS date of your IBM-type workstation is prior to June 1985, you must load a special driver. Appendix B of this manual contains instructions for loading this driver (and for determining the BIOS date).

Repeat Steps 1 through 9, beginning on page 4-10, for each workstation in your network. Then continue with the following instructions.

COPYING THE SHELL FILES

After you have formatted the boot diskette or hard drive for each workstation, you must copy files onto each diskette or hard disk.

- 1) Insert the appropriate workstation shell diskette into drive A.
- 2) If copying files to a boot diskette, insert the newly formatted boot diskette into drive B if you have two drives. If you have only one floppy disk drive, insert the boot diskette and follow the instructions given at the prompts.

If copying files to a hard disk, enter the appropriate drive letter (usually C) when prompted.

- 3) Use the DOS COPY command to copy the IPX.COM file and either the NET3.COM or the NET4.COM file from the workstation shell diskette to the floppy diskette or hard disk.

If you are using NetWare's NetBIOS emulator programs, you should also copy NETBIOS.COM and INT2F.COM.

- 4) Repeat Steps 2 and 3 until all needed files have been copied.
- 5) Change to drive B (or C) and use the DIR command to check the files on your diskette or drive. You should see the following files:

```
COMMAND.COM
DXMA0MOD.SYS
DXMC0MOD.SYS
CONFIG.SYS
NET3.COM or NET4.COM
IPX.COM
DXMT0MOD.SYS (optional—IBM's NetBIOS emulator program)
NETBIOS.COM (optional—Novell's NetBIOS emulator program)
INT2F.COM (used with Novell's NetBIOS.COM.)
```

Repeat Steps 1 through 5 for each workstation on your Token-Ring network.

COPYING OPTIONAL FILES

In addition to the files you have just copied, you may need to include one or both of the following files:

SHELL.CFG	Shell configuration file if you are using non-IBM workstations.
AUTOEXEC.BAT	Created at the DOS command line. This file will load the shell files and change to the first network drive automatically.

The following sections explain each file and tell when it should be used.

SHELL CONFIGURATION FILES

The NetWare shell must be able to tell what workstation type is requesting DOS files. One portion of the shell indicates the long machine type of the workstation. The long machine type is the six-letter name you gave to each brand of workstation when you created your DOS directories (as explained in Chapter 8 of the *NetWare Getting Started: Supervisor's Guide*). One function of the SHELL.CFG file is to allow you to change the long machine type.

NOTE:

There are several options for configuring the NetWare shell. You can choose to set internal variables and counters through the SHELL.CFG file. However, this section deals only with the Long Machine Type option. For a complete list of options, see Appendix B in the *NetWare Supervisor Reference*.

The long machine type is set for "IBM_PC." If you are using only IBM PC type workstations you will not need to change the long machine type by creating a SHELL.CFG file. If this is the case, skip to "Creating AUTOEXEC.BAT Files" on the next page.

If you are using other machine types, complete the following steps for each workstation that is not an IBM PC type.

- 1) Insert a workstation boot diskette into drive A.
- 2) Type

```
COPY CON SHELL.CFG <Enter>
LONG MACHINE TYPE = "machine" <Enter>
^Z
```

(To type ^Z, press the Control and Z keys at the same time, or press the F6 function key.)

For example, if workstation #1 is a COMPAQ machine, the file would contain the following single line:

```
LONG MACHINE TYPE = "COMPAQ"
```

If you want to set other options (as explained in Appendix B of the *NetWare Supervisor Reference*), include them in the file as you are creating it.

Repeat Steps 1 and 2 for the boot diskette or hard disk for each non-IBM PC type workstation.

CREATING AUTOEXEC.BAT FILES

In addition to the NetWare shell files, you may find it useful to add AUTOEXEC.BAT files to workstation boot diskettes.

The instructions below create an AUTOEXEC.BAT file that loads the NetWare shell and changes to the first network drive. To create a different AUTOEXEC.BAT file, refer to the instructions in your DOS manual.

- 1) Insert a workstation boot diskette into drive A.
- 2) Type the following text:

```
COPY CON AUTOEXEC.BAT <Enter>
IPX <Enter>
NETBIOS <Enter> (optional NetWare emulator program, see note
                  on the following page)
NET3 <Enter>
F: <Enter> (or first network drive)
^Z <Enter>
```

(To type ^Z, press the Control and Z keys at the same time, or press the F6 function key.)

NOTE:

If you will be using NetWare's emulator program, include the NetBIOS line in the AUTOEXEC.BAT file. Do not include NetBIOS if you are using IBM's emulator program. The necessary information for IBM's emulator program was copied when you ran the *LAN SUPPORT PROGRAM*.

- 3) To verify that you have entered the AUTOEXEC.BAT file correctly, type

TYPE AUTOEXEC.BAT <Enter>

The workstation screen should display the proper version of the shell (NET3.COM or NET4.COM), as well as the drive letter that is mapped to the first network drive. If the information displayed is incorrect, return to Step 1 and repeat the process.

Use the DOS DIR command to list the files on the boot diskettes. You should see the following files:

COMMAND.COM
NETBIOS.COM and INT2F.COM (NetWare's optional emulator program)
or
DXMT0MOD.SYS (IBM's optional emulator program)
DXMA0MOD.SYS
DXMC0MOD.SYS
CONFIG.SYS
IPX.COM
NET3.COM
SHELL.CFG (if appropriate)
AUTOEXEC.BAT

Once the information on the boot diskette is correct, the computer should boot DOS, load the NetWare shell files, and change to the specified network drive when booted.

If you are not installing Remote Reset in any workstations, skip to “Where To Go from Here” on page 4-21.

If you are installing Remote Reset, continue with the next section.

SETTING UP THE REMOTE RESET FEATURE

This section explains how to set up Remote Reset for Token-Ring workstations. Remote Reset allows IBM workstations and many compatibles to boot from a network (file server) disk.

Remote Reset can be used only if

- The workstation does not contain a hard disk;
- The adapter has an IBM Remote Reset PROM installed.

This section explains how to use the LAN drivers and the Remote Reset file located on the *LAN_DRV_050* diskette.

COPYING AND LOADING THE REMOTE RESET LOAD FILE

- 1) Copy the *TOKEN.RPL* file from the *LAN_DRV_050* diskette into the *SYS:SYSTEM* directory by completing the following steps.
 - A) Insert the *LAN_DRV_050* diskette into drive A.
 - B) Log in to the server as SUPERVISOR.
 - C) Type
F:NCOPY A:TOKEN.RPL <Enter>

2) Load the TOKEN.RPL file by completing the following steps.

A) Log out of the network.

B) Bring down the file server by typing

DOWN <Enter>

at the server console or by using the FCONSOLE utility.

NOTE:

Make sure that all users on the network are logged out before bringing down the server.

C) Reboot the file server by turning the server off, waiting a few seconds, and then turning the server back on. (Rebooting the file server loads the TOKEN.RPL file.)

CREATING REMOTE RESET BOOT FILES

The remote boot file you will put in the SYS:LOGIN directory contains the same information as the boot diskette you created. Copy a remote boot file into the SYS:LOGIN directory by completing the following steps.

NOTE:

Instructions on customizing remote boot files (if all your Remote Reset stations cannot boot from identical boot diskettes) are in Chapter 9 of the *NetWare Getting Started: Supervisor's Guide*.

- 1) Insert the workstation's boot diskette into drive A of the workstation.
- 2) Log in as SUPERVISOR.

3) Generate DOSGEN image files by completing the following steps.

A) Change to the SYS:LOGIN directory by typing

G: <Enter>

B) At the DOS prompt, type

F:DOSGEN <Enter>

The F: tells the file server where to find the DOSGEN file. DOSGEN will create a boot image file called NET\$DOS.SYS (from the boot diskette in drive A) and copy the boot image file into the SYS:LOGIN directory.

This message will now be displayed at the bottom of the screen:

Transferring Data to "NET\$DOS.SYS"

The NET\$DOS.SYS file is the default boot file. When the workstation is turned on, Remote Reset searches for this file in the SYS:LOGIN directory to find out which files to load into the workstation's memory so the workstation can boot.

C) The NET\$DOS boot image needs to be flagged Shareable/Read-Write (SRW). At the DOS prompt, type

FLAG NET\$DOS.SYS SRW <Enter>

USING REMOTE BOOT

You are now ready to use Remote Reset.

Remove all diskettes from a workstation with floppy drives.

To perform a remote boot, turn the workstation on. The workstation will automatically boot from the file server.

APPENDIX A: SETTING IBM TOKEN-RING ADAPTERS FOR NETWARE 386

This appendix shows settings for IBM Token-Ring adapters used with NetWare 386. These settings are to be used with Token-Ring adapters installed in a file server only.

Before setting Micro Channel adapters (PC Adapter/A or 16/4 Adapter/A), refer to Chapter 2 of this manual for instructions on installing adapters in the server.

To set adapters, find the adapter type in the list below and skip to the page indicated.

Adapter Type	Page
IBM Token-Ring PC Adapter	A-2
IBM Token-Ring PC Adapter II	A-4
IBM Token-Ring 16/4 Adapter	A-6
IBM Token-Ring PC Adapter/A	A-9
IBM Token-Ring 16/4 Adapter/A	A-11

After setting standard bus adapters (PC Adapter, PC Adapter II, or 16/4 Adapter), refer to Chapter 2 of this manual for instructions on installing adapters in the server.

IMPORTANT:

This appendix gives ROM address settings only. You can use any RAM address and interrupt line that do not conflict with other settings. Refer to your IBM documentation to set the adapter interrupt line.

SETTING THE IBM TOKEN-RING PC ADAPTER

Figure A.1 shows the IBM Token-Ring PC Adapter and the recommended ROM address settings. Figure A.1 also shows how to set the adapter as primary or alternate.

Each Token-Ring adapter in a server must be designated as a primary or alternate adapter. You can use a maximum of two Token-Ring adapters in a server. If you are using two adapters, one adapter must be designated as primary and the other adapter as alternate. If you are only using one Token-Ring adapter, you can designate the adapter as either primary or alternate.

IMPORTANT:

If you are using only one Token-Ring adapter in a NetWare 386 server, the adapter is automatically set to the primary setting. If you want to use the alternate setting for the adapter, you must designate the adapter as alternate when running the NetWare Loadable Module (NLM) for IBM Token-Ring.

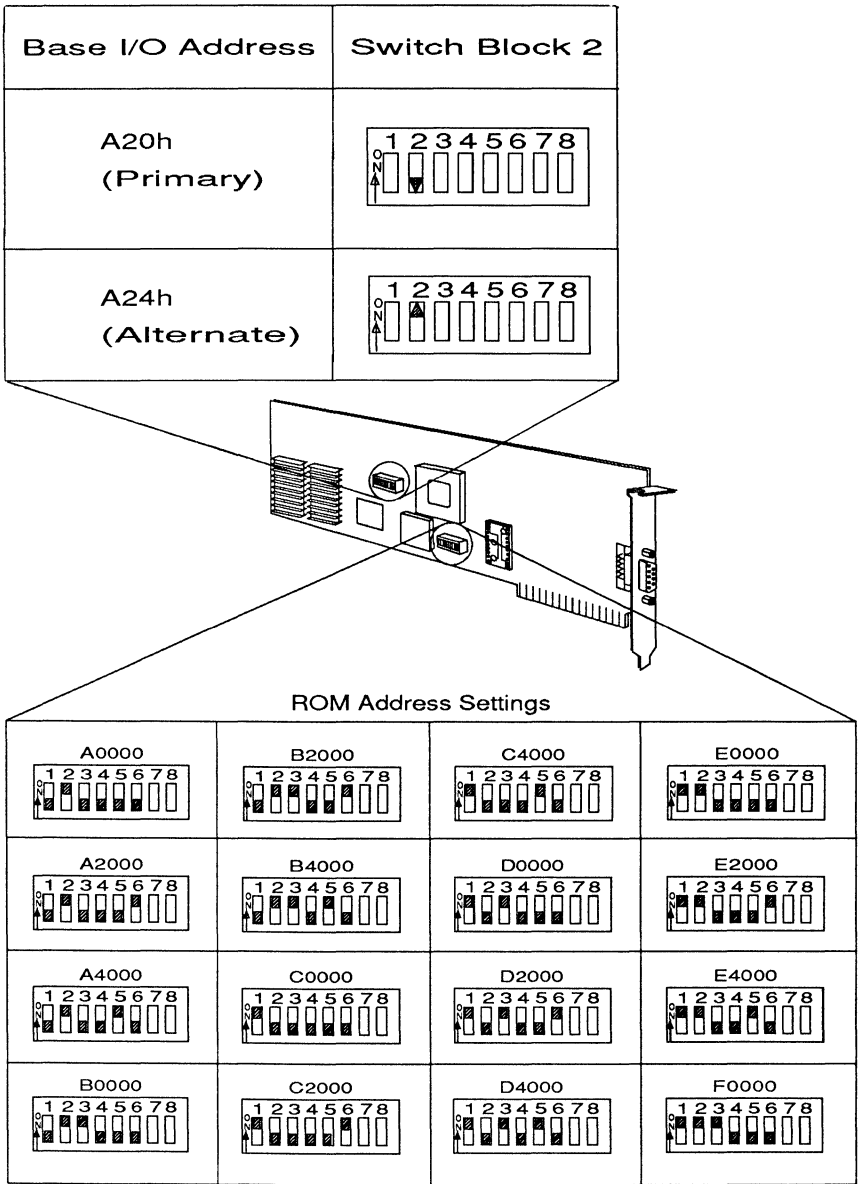


Figure A.1
IBM Token-Ring PC Adapter Settings

SETTING THE IBM TOKEN-RING PC ADAPTER II

Figure A.2 on the next page shows the IBM Token-Ring PC Adapter II and the recommended ROM address settings.

The PC Adapter should be set to use 16KB of shared RAM. Although the adapter can be set to use other sizes of shared RAM, 16KB is the setting recommended for optimum use of the adapter. The ROM address settings shown are to be used with the 16KB shared RAM setting. If you are setting your adapter to use a different shared RAM size, consult the IBM documentation you received with your adapter for ROM address settings. Figure A.2 shows how to set the adapter to use 16KB of shared RAM.

Figure A.2 also shows how to set the adapter as primary or alternate.

Each Token-Ring adapter in a server must be designated as a primary or alternate adapter. You can use a maximum of two Token-Ring adapters in a server. If you are using two adapters, one adapter must be designated as primary and the other adapter as alternate. If you are only using one Token-Ring adapter, you can designate the adapter as either primary or alternate.

IMPORTANT:

If you are only using one Token-Ring adapter in a NetWare 386 server, the adapter is automatically set to the primary setting. If you want to use the alternate setting for the adapter, you must designate the adapter as alternate when running the NetWare Loadable Module (NLM) for IBM Token-Ring.

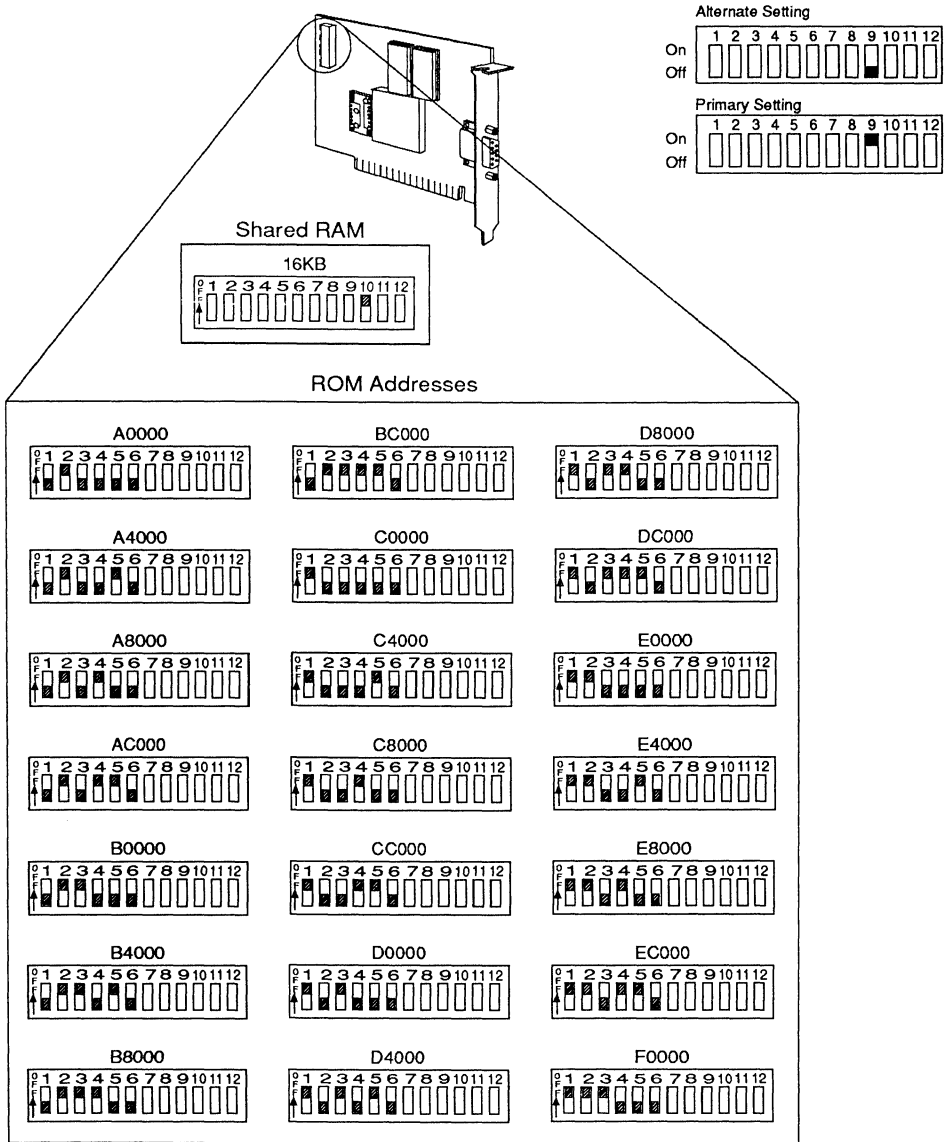


Figure A.2
IBM Token-Ring PC Adapter II Settings

SETTING THE IBM TOKEN-RING 16/4 ADAPTER

Figure A.3 shows the IBM Token-Ring 16/4 Adapter and the recommended ROM address settings.

The 16/4 Adapter should be set to use 16KB of shared RAM. Although the adapter can be set to use other sizes of shared RAM, 16KB is the setting recommended for optimum use of the adapter. The ROM address settings shown are to be used with the 16KB shared RAM setting. If you are setting your adapter to use a different shared RAM size, consult the IBM adapter documentation for ROM address settings.

Figure A.3 shows how to set the adapter to use 16KB of shared RAM, and how to set the data rate switch.

IMPORTANT:

You must set all IBM Token-Ring Network 16/4 Adapters on a ring to use the same data rate (either 16Mbps or 4Mbps). Failure to do so can cause network errors. Older versions of IBM Token-Ring Network Adapters (that are set at 4Mbps) should not be used with 16/4 adapters set at 16Mbps.

Figure A.3 also shows how to set the adapter as primary or alternate.

Each Token-Ring adapter in a server must be designated as a primary or alternate adapter. You can use a maximum of two Token-Ring adapters in a server. If you are using two adapters, one adapter must be designated as primary and the other adapter as alternate. If you are using only one Token-Ring adapter you can designate the adapter as either primary or alternate.

IMPORTANT:

If you are using only one Token-Ring adapter in a NetWare 386 server, the adapter is automatically set to the primary setting. If you want to use the alternate setting for the adapter, you must designate the adapter as alternate when running the NetWare Loadable Module (NLM) for IBM Token-Ring.

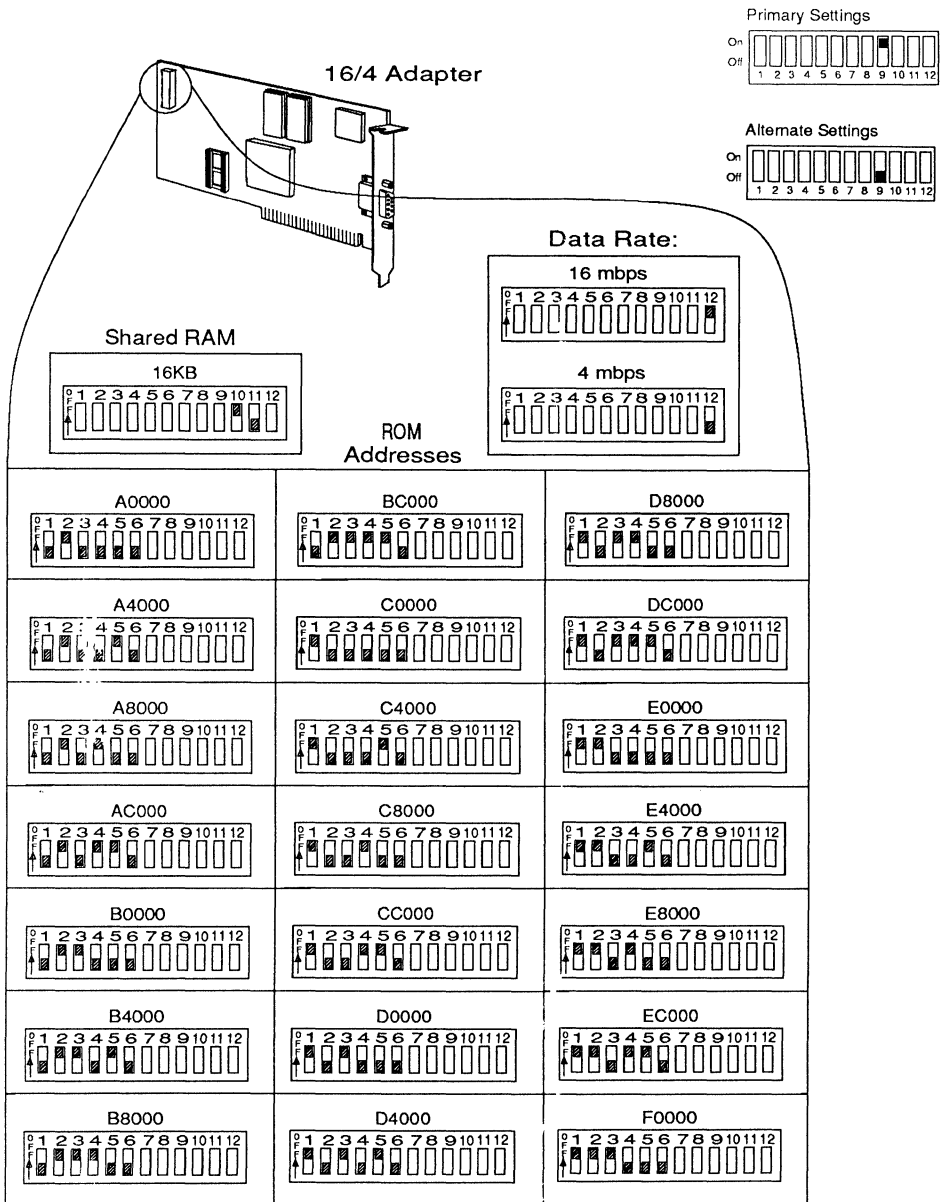


Figure A.3
 IBM Token-Ring 16/4 Adapter Settings

SETTING THE IBM TOKEN-RING PC ADAPTER/A

The IBM Token-Ring PC Adapter/A is a Micro Channel adapter and is set with the IBM *REFERENCE* diskette.

After inserting the PC Adapter/A into the server, use the IBM *REFERENCE* diskette to set the adapter.

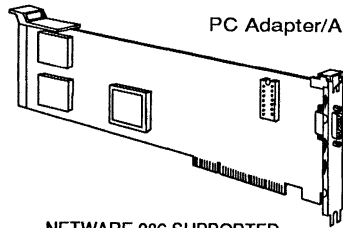
The PC Adapter/A should be set to use 16KB of shared RAM. Although the adapter can be set to use other sizes of shared RAM, 16KB is the setting recommended for optimum use of the adapter. The ROM address settings shown are to be used with the 16KB shared RAM setting.

Each Token-Ring adapter in a server must be designated as a primary or alternate adapter. You can use a maximum of two Token-Ring adapters in a server. If you are using two adapters, one adapter must be designated as primary and the other adapter as alternate. If you are using only one Token-Ring adapter, you can designate the adapter as either primary or alternate.

IMPORTANT:

If you are only using one Token-Ring adapter in a NetWare 386 server, the adapter is automatically set to the primary setting. If you wish to use the alternate setting for the adapter, you must designate the adapter as alternate when running the NetWare Loadable Module (NLM) for IBM Token-Ring.

Figure A.4 shows the PC Adapter/A and the recommended ROM address settings.



NETWARE 386 SUPPORTED
ROM ADDRESSES

(16KB Shared RAM)			
A0000	B4000	C8000	E0000
A4000	B8000	CC000	E4000
A8000	BC000	D0000	E8000
AC000	C0000	D4000	EC000
B0000	C4000	D8000	F0000

Figure A.4
IBM Token-Ring PC Adapter/A Settings

SETTING THE IBM TOKEN-RING 16/4 ADAPTER/A

The IBM Token-Ring 16/4 Adapter/A is a Micro Channel adapter and is set with the IBM *REFERENCE* diskette. After inserting the 16/4 Adapter/A into the server, use the IBM *REFERENCE* diskette to set the adapter.

The 16/4 Adapter/A should be set to use 16KB of shared RAM. Although the adapter can be set to use other sizes of shared RAM, 16KB is the setting recommended for optimum use of the adapter. The ROM address settings shown are to be used with the 16KB shared RAM setting.

IMPORTANT:

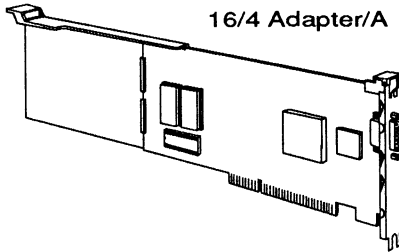
You must set all IBM Token-Ring Network 16/4 Adapters on a ring to use the same data rate (either 16Mbps or 4Mbps). Failure to do so can cause network errors. Older versions of IBM Token-Ring Network Adapters (that are set at 4Mbps) should not be used with 16/4 adapters set at 16Mbps.

Each Token-Ring adapter in a server must be designated as a primary or alternate adapter. You can use a maximum of two Token-Ring adapters in a server. If you are using two adapters, one adapter must be designated as primary and the other adapter as alternate. If you are using only one Token-Ring adapter, you can designate the adapter as either primary or alternate.

IMPORTANT:

If you are using only one Token-Ring adapter in a NetWare 386 server, the adapter is automatically set to the primary setting. If you wish to use the alternate setting for the adapter, you must designate the adapter as alternate when running the NetWare Loadable Module (NLM) for IBM Token-Ring.

Figure A.5 shows the 16/4 Adapter/A and the recommended ROM address settings.



NETWARE 386 SUPPORTED
ROM ADDRESSES

(16KB Shared RAM)			
A0000	B4000	C8000	E0000
A4000	B8000	CC000	E4000
A8000	BC000	D0000	E8000
AC000	C0000	D4000	EC000
B0000	C4000	D8000	F0000

Figure A.5
IBM Token-Ring 16/4 Adapter/A Settings

APPENDIX B: LARGE NONMOVABLE CABLING SYSTEM

This appendix identifies

- Network hardware for the nonmovable cabling system;
- The IBM manuals that contain installation instructions for the large nonmovable cabling system.

Chapter 1 of this manual identified the network hardware for the small movable cabling system, which is used for a network with up to 96 stations and up to 12 IBM 8228 units. If your network will have more than 96 stations or 12 IBM 8228 units, you should use this appendix instead of Chapter 1 for an overview of the large nonmovable cabling system.

IMPORTANT:

In this supplement, the term *station* refers to servers, bridges, and workstations. This term is synonymous with the term *attaching device* used in IBM manuals.

This appendix does not provide installation instructions for the large nonmovable cabling system. It does, however, list all necessary network hardware, and outlines the IBM manuals that you will need to use.

IMPORTANT:

The large nonmovable cabling system is a very complex system. We recommend that only experienced installers attempt to install it.

HARDWARE FOR A LARGE NONMOVABLE CABLING SYSTEM

Much of the network hardware used in a large nonmovable cabling system is the same as hardware used in a small movable cabling system. The information under the following subheadings describes both groups of network hardware.

HARDWARE COMMON TO THE SMALL MOVABLE AND LARGE NONMOVABLE CABLING SYSTEMS

Below is a list of IBM Token-Ring network hardware used in both small movable and large nonmovable cabling systems. Each item is illustrated in Figure 1.1 in Chapter 1.

Adapters. Token-Ring adapters are the network interface boards that enable stations to function on a Token-Ring network.

- The 16/4 Adapter and the PC Adapter II are for standard bus stations (such as the IBM PC, XT, AT, and PS/2 Model 30).
- The 16/4 Adapter/A and the PC Adapter/A are for Micro Channel stations (such as the PS/2 Models 50, 60, 70, and 80).

IBM 8228 Multistation Access Units. An IBM 8228 Multistation Access Unit (MAU) is used to connect up to eight stations in a network.

IBM 8228 Setup Aid. An IBM 8228 Setup Aid is used to test the 8228 unit before it is installed.

IBM Token-Ring Network PC Adapter Cables. An adapter cable is made of 8 feet of IBM type 6 cable. One end connects to the adapter port of a Token-Ring PC or TRN/A adapter. The other end connects to either a patch cable or an IBM 8228 unit.

Patch Cables. A patch cable is made of IBM type 6 cable and has a connector at each end. Patch cables may be connected to each other, to adapter cables, or to an IBM 8228 unit.

HARDWARE SPECIFIC TO THE LARGE NONMOVABLE CABLING SYSTEM

The items listed below are used only in the large nonmovable cabling system. The items are illustrated in the IBM manuals listed.

Distribution Panels. A distribution panel is mounted in an equipment rack and holds up to 64 data connectors. It performs a patch panel function for the network cables. A distribution panel is illustrated in Chapter 2 of the *IBM Cabling System Planning and Installation Guide*, and in Chapter 1 of the *IBM Token-Ring Network Installation Guide*.

Equipment Racks. Equipment racks hold distribution panels and 8228 units. An equipment rack is illustrated in Chapter 2 of the *IBM Token-Ring Network Introduction and Planning Guide*.

Cable Brackets. A cable bracket is packaged with each 8228 unit and is used if the unit is installed in an equipment rack. When patch cables (or adapter cables) are connected to an 8228 unit in an equipment rack, the cables snap into the underside of the bracket. A cable bracket is illustrated in Chapter 1 of the *IBM Token-Ring Network Installation Guide*.

IBM Type 1 and Type 2 Cable. IBM type 1 or type 2 cable is used to connect a work area to a wiring closet or to connect one wiring closet to another wiring closet. IBM type 1 and 2 cables are illustrated in Chapter 2 of the *IBM Cabling System Planning and Installation Guide*.

Faceplates. Faceplates are used for attaching network stations to the cabling system. Faceplates are illustrated in Chapter 2 of *IBM Cabling System Planning and Installation Guide*.

PLANNING YOUR NETWORK

The following is a list of IBM manuals that will instruct you in installing a large nonmovable cabling system. This is not necessarily a comprehensive list of all the applicable IBM manuals available.

- *IBM Token-Ring Network Introduction and Planning Guide*
- *IBM Token-Ring Network Installation Guide*
- *IBM Cabling System Planning and Installation Guide*
- *IBM Token-Ring Network Telephone Twisted-Pair Media Guide*
- *A Building Planning Guide for Communication Wiring*

Using these manuals, plan your network. Make sure that you have all the necessary hardware and that you know where each hardware component will be used in the network layout.

When you have finished planning your network layout, go to Chapter 2 in this supplement, which explains how to set Token-Ring adapters and install them in network stations.

APPENDIX C: THE TIMERINT.SYS FILE

You need to use this appendix if the BIOS date of one or more of the IBM PCs, PC XTs, or PC ATs that will be used as workstations is earlier than June 1985. (This does not apply to IBM-compatible computers.)

IMPORTANT:

If you are not sure of the BIOS date of a workstation, insert the *LAN SUPPORT PROGRAM* diskette into drive A. At the prompt, type

```
BIOSDATE <Enter>
```

The BIOS date will appear on the screen.

The *LAN SUPPORT PROGRAM* diskette includes a device driver in a file called *TIMERINT.SYS*. This device driver is used to replace the interrupt code on the IBM BIOS (Basic Input/Output System) and lessens the likelihood of the DOS internal stack error.

For each workstation with a BIOS date before June 1985, you must copy the *TIMERINT.SYS* file from the *LAN SUPPORT PROGRAM* diskette to the workstation boot diskette. To copy the *TIMERINT.SYS* file, complete the following steps.

- 1) Insert the *LAN SUPPORT PROGRAM* diskette into drive A, and insert the workstation boot diskette into drive B. (If your computer has only one floppy disk drive, change diskettes as prompted.)
- 2) At the DOS prompt, type

```
COPY A:\TIMERINT.SYS B: <Enter>
```

- 3) After you have copied the `TIMERINT.SYS` file onto your workstation boot diskette, add the following line to your `CONFIG.SYS` file:

```
DEVICE=TIMERINT.SYS <Enter>
```

IMPORTANT:

When you add this line to your `CONFIG.SYS` file, make sure you do not change the content and order of existing lines in the file. (Add the line to the end of the `CONFIG.SYS` file.)

For more information on `CONFIG.SYS` files and the `DEVICE` command, see your DOS manual.

APPENDIX D: USING THE IBM TOKEN-RING SOURCE ROUTE DRIVER

This appendix explains the use of the IBM Token-Ring Source Route Driver on NetWare networks. It does not replace the instructions for software generation contained in your NetWare installation manuals.

The IBM Token-Ring Source Route Driver enables NetWare communication across IBM Token-Ring Network Bridges.

Complete the following tasks to understand and use the Source Route Driver.

- Review the guidelines given below for using the Source Route Driver.
- Prepare your NetWare generation software to use the Source Route Driver. (This is only necessary if your Source Route Driver is contained on a NetWare *LAN_DRV_053* diskette.)
- Select the Source Route Driver during software generation.

GUIDELINES FOR USING THE SOURCE ROUTE DRIVER

You should understand the following general guidelines before attempting to use the IBM Token-Ring Source Route Driver on your NetWare network.

- All stations attached to the same ring as an IBM Token-Ring Network Bridge must use the IBM Token-Ring Source Route Driver.
- On existing Token-Ring networks, all network station software (shells, operating systems, and bridge software) must be upgraded to the Source Route Driver at the same time.
- All file servers and NetWare bridges connected through an IBM Token-Ring Network Bridge must use the same network address. The IBM Token-Ring Network Bridge is transparent to NetWare. Rings that are linked together through the bridge are viewed as one ring.

NOTE:

Do not confuse the ring number used when generating the IBM software with the network address used when generating NetWare software. Network addresses for file servers and bridges linked through IBM bridges must be the same; ring numbers (for each ring) must be unique.

Figure D.1 shows how networks connected through an IBM Token-Ring Network bridge use the same network address.

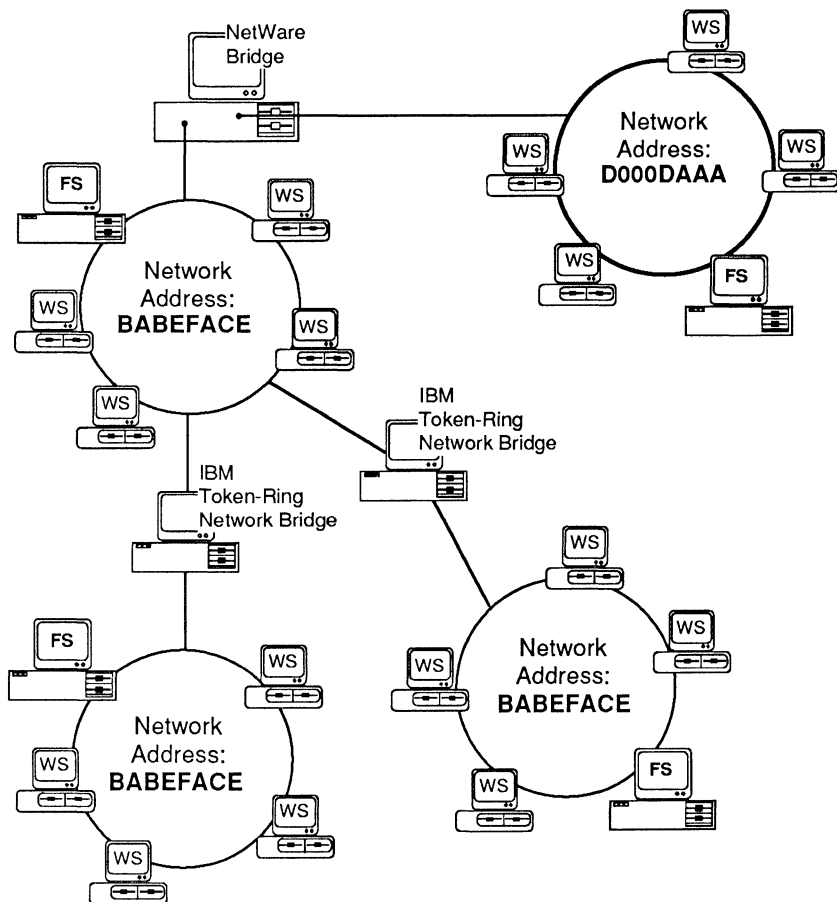


Figure D.1
Using the Source Route Driver
with an IBM Token-Ring Network Bridge

PREPARING THE NETWARE GENERATION SOFTWARE

If you received this installation supplement in a NetWare Source Route Driver kit, continue with the next paragraph. Otherwise, skip to “Selecting the Source Route Driver” below.

If you are generating software using the Network Drive or Hard Disk method and have previously uploaded the NetWare software to the network drive or hard disk, continue with this section. Otherwise, skip to “Selecting the Source Route Driver” below.

Complete the following steps to copy the Source Route Driver to an existing NETWARE work directory.

- 1) In your existing NETWARE work directory, create a “LAN_DRV_.053” subdirectory.
- 2) Copy the files from your *LAN_DRV_053* diskette to the LAN_DRV_.053 subdirectory you just created.

SELECTING THE SOURCE ROUTE DRIVER

Use NETGEN, ELSGEN, BRGEN, or SHGEN to generate new software for all network stations requiring the Source Route Driver.

Follow the instructions in your NetWare installation manual. The name of the driver to select is “IBM Token Ring Source Routing.”

If you are running SHGEN using the Standard Floppy Disk method, you must select “Custom Configuration” in the “Shell Configuration” menu to be able to upload the Source Route Driver.

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NOVELL

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Supplement

NetWare

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HOW TO USE THIS MANUAL

This manual explains how to install IBM PC networking hardware on a NetWare network. It is a supplement to your main NetWare manual.

If you haven't already done so, read and follow the instructions in the main NetWare manual up to the point where it advises you to consult this supplement.

Five adapters are discussed in this supplement. The IBM PC Network Adapter, the IBM PC Network Adapter II, and the IBM PC Network Baseband Adapter are standard-bus adapters for use in the IBM PC, PC XT, PC AT, or compatibles, as well as in the IBM Personal System/2 Model 30.

The IBM PC Network Adapter II/A and the IBM PC Network Baseband Adapter/A are Micro Channel adapters for use in the IBM Personal System/2 Models 50, 60, and 80.

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1 THE IBM PC BROADBAND NETWORK

This chapter is divided into four main sections:

- “Understanding the IBM PC Broadband Network”
- “Planning Your Network Layout”
- “Setting and Installing Adapters”
- “Cabling Your Network”

NOTE:

Broadband and baseband hardware cannot be used on the same network. However, a broadband network and a baseband network can be connected by means of a bridge.

UNDERSTANDING THE IBM PC BROADBAND NETWORK

Below is a brief introduction to help you become familiar with the broadband PC network.

Figure 1.1 on the facing page shows a basic broadband PC network. Two frequencies are used on a broadband PC network to allow stations to communicate. When a network station or device transmits a data signal, it travels to the translator unit at a certain frequency. There, it is converted to a higher frequency and rebroadcast over the network. Although all stations on the network can "hear" the rebroadcast signal, only the station specifically addressed will receive the data.

The basic broadband network can support from two to eight stations. Stations are connected to the 8-way splitter with coaxial cable up to 200 feet in length, like the station shown in Figure 1.1 on the facing page. Additional hardware can be purchased in kits called "distance kits" which can be added to the basic network to expand the number of stations up to 72 and extend the distances between them. These kits will be discussed later in this section.

Now that you have a general idea of what a broadband PC network looks like, turn to page 1-4 for a more detailed description of each piece of hardware necessary to set up the basic network.

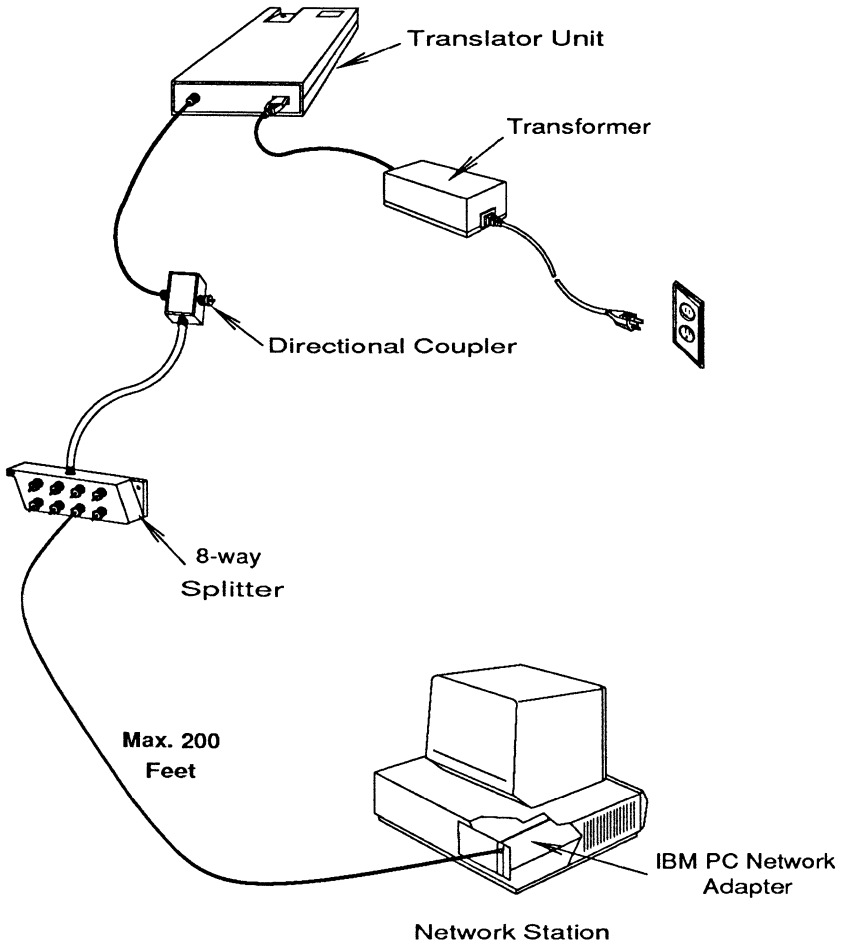


Figure 1.1
Basic Broadband PC Network

BROADBAND NETWORK HARDWARE

IBM PC broadband network hardware is described in the list below and illustrated in Figures 1.2 through 1.4 beginning on the facing page.

Translator Unit. The translator unit receives signals from network stations, converts them to a higher frequency, and rebroadcasts the signals to the proper stations. Each broadband network needs only one translator unit.

Transformer. The transformer supplies power to the translator unit.

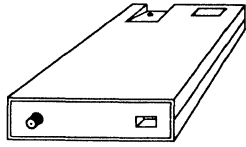
Directional Coupler. The directional coupler connects the 8-way splitter to the translator unit. The directional coupler is also used to attach the additional hardware needed to expand the basic network beyond eight stations. This is discussed in "Adding to the Basic Broadband Network" on page 1-8.

8-Way Splitter. To distinguish this 8-way splitter from others that can be attached to the network, this 8-way splitter is called the "primary" 8-way splitter. From two to eight stations can be connected to this 8-way splitter.

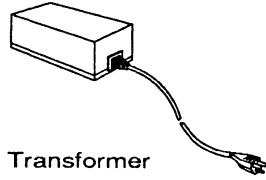
Terminator. All unused ports on the directional coupler and the 8-way splitter require 75 ohm terminators. Terminators block interference on the network.

Cable. Three types of cables are used on the basic broadband network: A 5-foot black RG-6/U coaxial cable is used to connect the translator unit and the directional coupler; a one-foot beige RG-6/U coaxial cable is used to connect the directional coupler and the 8-way splitter; and lengths of RG-11/U or RG-59/U coaxial (station) cable up to 200 feet in length are used to connect stations to the 8-way splitter. Station cables come in lengths of 25, 50, 100, and 200 feet.

Cable Adapter. Cable adapters (not pictured here) are used to connect two lengths of station cable.



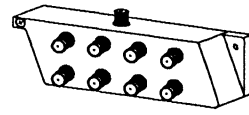
Translator Unit



Transformer



Directional Coupler



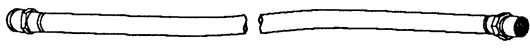
8-Way Splitter



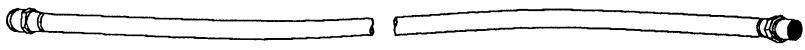
Terminator



5' RG-6/U Coaxial Cable



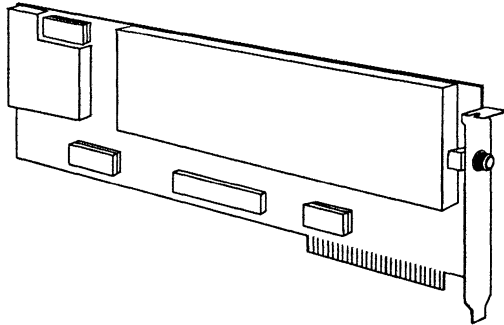
1' RG-6/U Coaxial Cable



RG-11/U or RG-59/U Coaxial Cable

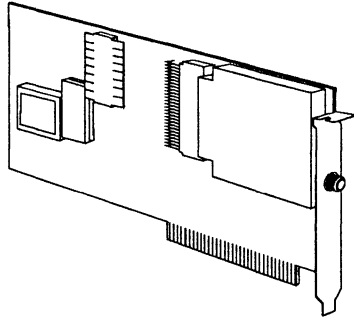
Figure 1.2
Broadband Network Hardware

PC Network Adapters. PC network adapters are network interface boards. There are three PC network adapters available for use on IBM PC broadband networks: the IBM PC Network Adapter and the IBM PC Network Adapter II for use in stations with standard buses, and the IBM PC Network Adapter II/A for use in stations with Micro Channel buses. One adapter must be installed in each network station in order to facilitate communication on the network. See Figures 1.3 below and 1.4 on the facing page.

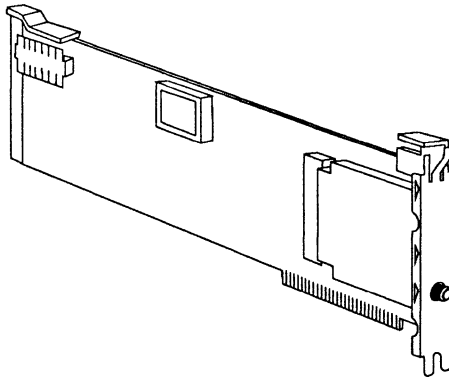


IBM PC Network
Adapter

Figure 1.3
IBM PC Network Adapter



IBM PC Network
Adapter II



IBM PC Network
Adapter II/A

Figure 1.4
IBM PC Network Adapter II and II/A

ADDING TO THE BASIC BROADBAND NETWORK

A basic broadband network can support up to eight stations connected directly to the 8-way splitter with cable up to 200 feet long. In order to expand your network beyond eight stations and extend cable lengths beyond 200 feet, distance kits can be connected to the network by means of a base expander.

BASE EXPANDER

A base expander is nothing more than an 8-way splitter and a male connector (see Figure 1.5 below). The male connector connects the base expander to the "OUT" tap on the directional coupler (after the tap's terminator is removed). See Figure 1.6 on the facing page.

Stations cannot be connected directly to the base expander as they can to the primary 8-way splitter. Instead, up to eight distance kits can be connected to the eight taps on the base expander. Distance kits are explained on page 1-10.

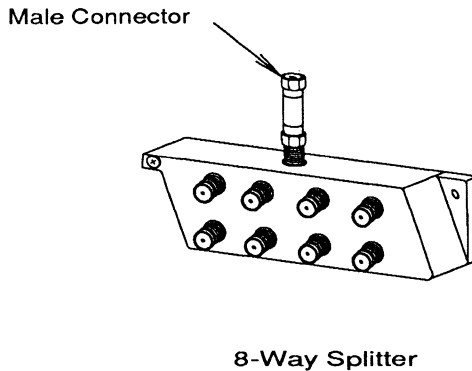


Figure 1.5
Base Expander

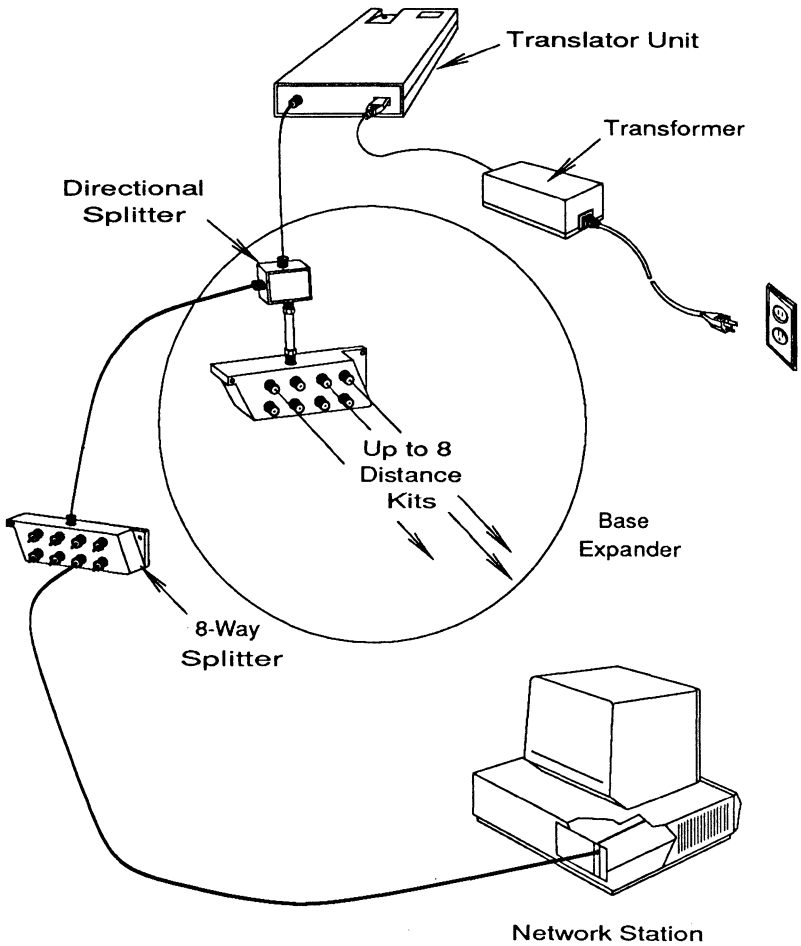


Figure 1.6
Broadband PC Network with
Base Expander and Distance Kits

DISTANCE KITS

There are three types of distance kits: short distance kits, medium distance kits, and long distance kits. Each distance kit attaches to one of the taps on the base expander, and each allows the addition of eight more stations to the network. If you plan to limit your network to eight stations, turn to "Planning Your Network Layout" on page 1-14.

All three kits are described below and pictured in Figure 1.7 on the facing page. Note that each distance kit includes at least one attenuator or tilt attenuator. Attenuators and tilt attenuators control network frequency in order to ensure that network signals are not distorted. Also note that the base expander is not included in the distance kits and must be purchased separately.

Short Distance Kit. A short distance kit is connected to the base expander with a one-foot RG-6/U coaxial cable. The kit also includes one 20-dB attenuator and an 8-way splitter. Eight stations can be connected to the 8-way splitter using cables up to 200 feet long.

Medium Distance Kit. A medium distance kit is connected to the base expander with 400 feet of RG-11/U coaxial cable (two 200-foot lengths of cable not included with the kit). The kit includes one 10-dB tilt attenuator, one 8-dB attenuator, a one-foot length of RG-6/U coaxial cable, and an 8-way splitter. Eight stations can be connected to the 8-way splitter using cables up to 200 feet long.

Long Distance Kit. A long distance kit is connected to the base expander with 800 feet of RG-11/U coaxial cable (four 200-foot lengths of cable not included with the kit). The kit includes one 10-dB tilt attenuator, one 5-dB tilt attenuator, one male connector, a one-foot length of RG-6/U coaxial cable, and an 8-way splitter. Eight stations can be connected to the 8-way splitter using cables up to 200 feet long.

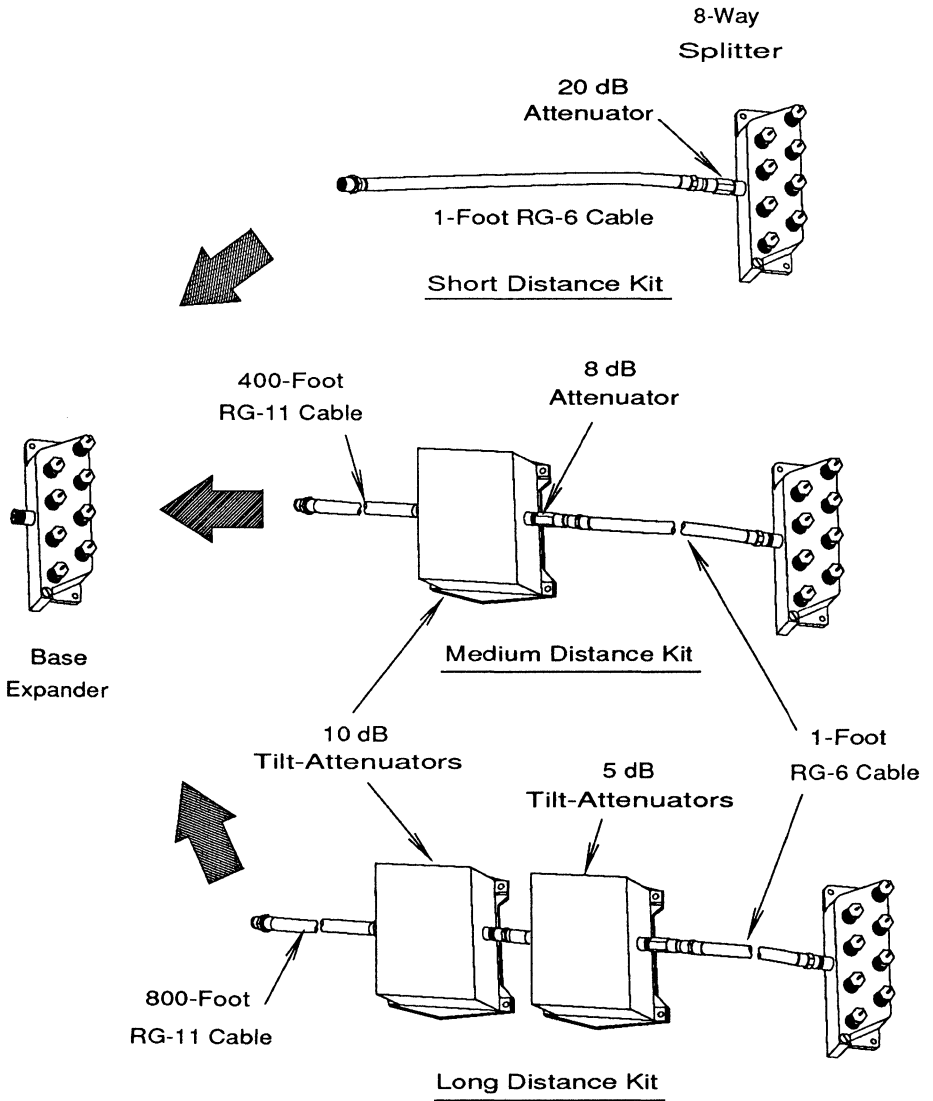


Figure 1.7
Distance Kits

BROADBAND NETWORK SUMMARY

Below is a summary of the limitations and rules that apply to a broadband PC network. Refer to Figure 1.8 on the facing page as you review the summary.

LIMITATIONS

- Maximum number of stations = 72 (using eight distance kits plus the primary 8-way splitter)
- Maximum distance between an 8-way splitter and a station = 200 feet
- Maximum distance between two stations = 2,000 feet (using two long distance kits)

RULES

- All unused taps on directional couplers and 8-way splitters must be terminated using 75 ohm terminators.
- The transformer that powers the translator unit must be connected to an AC power source.
- The file server can be connected anywhere on the network.
- Be careful not to crimp the cable, damage its insulation, or run it near heat sources or in heavy traffic areas where hand trucks or rolling chairs might damage it.

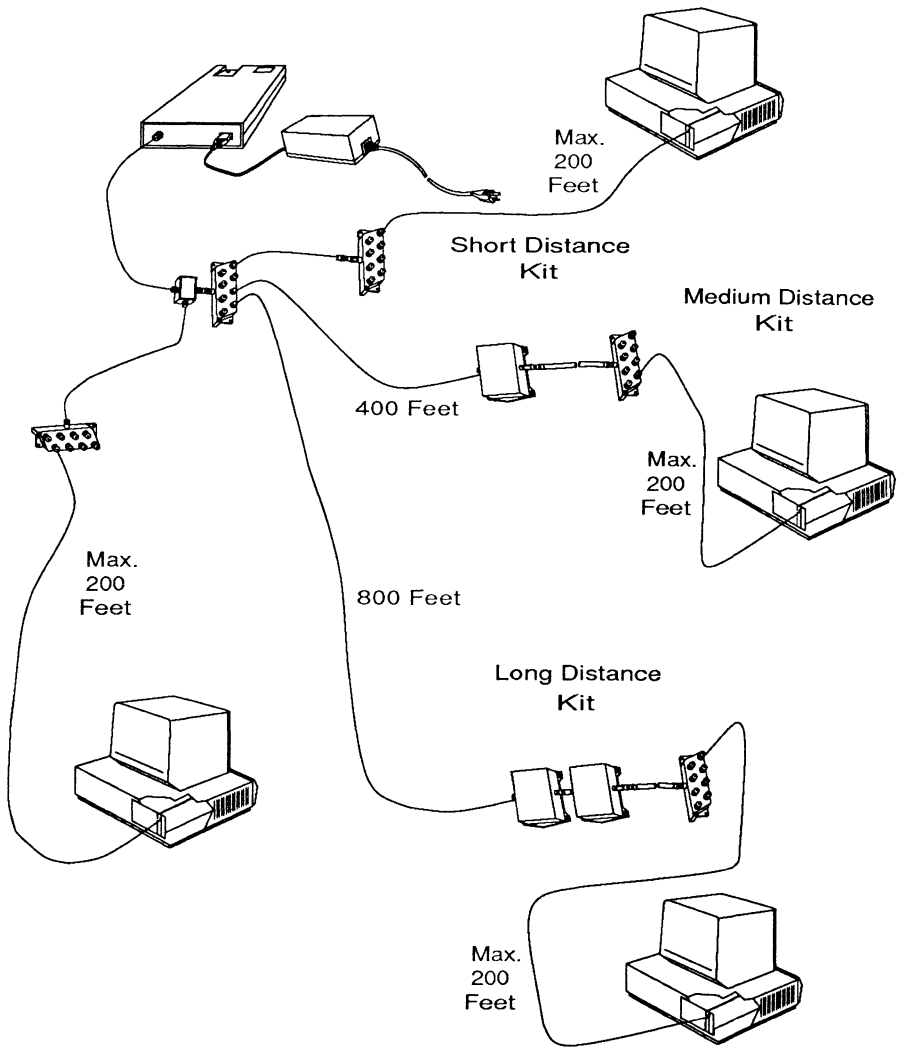


Figure 1.8
Broadband PC Network

PLANNING YOUR NETWORK LAYOUT

Now that you are familiar with broadband PC network hardware, limitations, and rules, consider the following questions as you define your particular network needs and begin to design your own network.

- How large an area must the cabling system cover?
- How many stations (file servers, bridges, and workstations) will be connected to the cabling system?
- How far apart will the stations be?
- What potential growth in size and connections must the system accommodate?

Now, draw your network plan, labeling each piece of hardware that will be included. Also label the kind of PC adapter used in each station. Keep in mind the rules given in the preceding sections. Measure the distances between all components and make sure they fall within the appropriate maximums. Record these distances on your sketch. Ensure that the locations you choose for file servers have adequate room for any peripherals (printers, external disk drives, etc.) that will be attached.

SETTING AND INSTALLING ADAPTERS

If you are using Micro Channel adapters, turn to page 1-26 to install and set your adapters. If you are using standard-bus adapters, continue reading “Standard-Bus Adapters” below.

STANDARD-BUS ADAPTERS

This section explains how to set the configuration option and either enable or disable ROM BIOS on the following adapters. It also explains how to install the adapters in network stations. (Both of these models can be used in file servers, bridges, or workstations.)

- IBM PC Network Adapter
- IBM PC Network Adapter II

Before you set and install the adapters, use a string tag to label each adapter with the following information:

- The specific station in which the adapter will be installed (for example, “the file server,” “the bridge,” or “Jack’s workstation”).
- The configuration option—If the adapter will be installed in a file server or bridge, this is the configuration option you chose when you generated the NetWare operating system. If the adapter will be installed in a workstation, this is the configuration option you chose when you generated the NetWare shell.

If you plan to install two adapters in the same network station in order to create a bridge or for some other reason, you should have already designated one as the *primary* adapter and the second as the *alternate* adapter when you generated the NetWare operating system. As a general rule, remember that ROM BIOS must be *enabled* on the primary adapter and *disabled* on the alternate adapter.

SETTING THE IBM PC NETWORK ADAPTER

Refer to Figure 1.9 below to locate the components used to set the configuration option and enable or disable ROM BIOS on the IBM PC Network Adapter.

The configuration option for the IBM PC Network Adapter includes the base I/O address and the interrupt line. The DMA channel is also part of the configuration option, but it is hard-coded at "3" on the adapter and cannot be set manually.

Check the tag on each IBM PC Network Adapter to find the configuration option you chose for that adapter. Find that configuration option number in the table in Figure 1.10 on the facing page and set the base I/O address and the interrupt line according to the table.

Finally, disable ROM BIOS on all alternate adapters and enable ROM BIOS on all other adapters. (See Figure 1.9 below.)

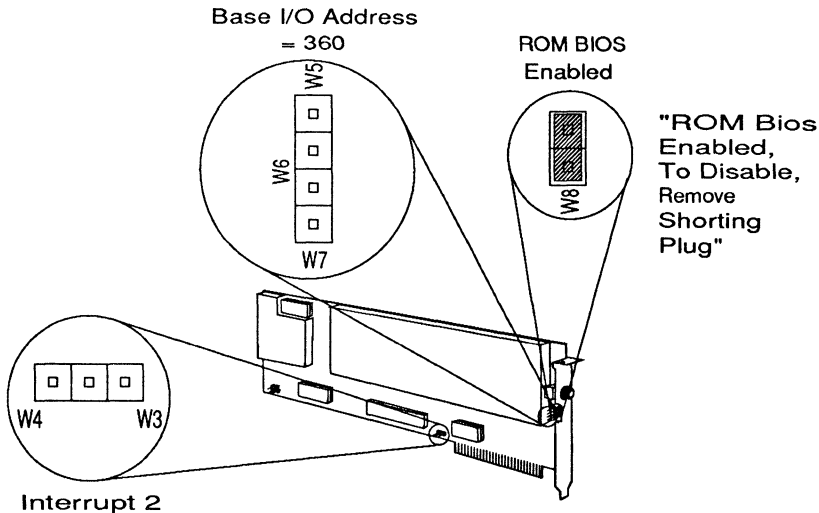


Figure 1.9
Components Used to Make Settings on
the IBM PC Network Adapter


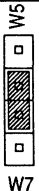

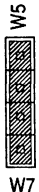

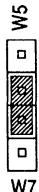


Config. Option	Interrupt Line	Base I/O Address
0	 <p>W4 W3</p> <p>Interrupt 2</p>	 <p>W5</p> <p>W6</p> <p>360h W7</p>
1	 <p>W4 W3</p> <p>Interrupt 3</p>	 <p>W5</p> <p>W6</p> <p>368h W7</p>
2	 <p>W4 W3</p> <p>Interrupt 3</p>	 <p>W5</p> <p>W6</p> <p>360h W7</p>
3	 <p>W4 W3</p> <p>Interrupt 2</p>	 <p>W5</p> <p>W6</p> <p>368h W7</p>

Figure 1.10
 IBM PC Network Adapter
 Configuration Option Table

INSTALLING THE IBM PC NETWORK ADAPTER

To install an IBM PC Network Adapter in a network station, complete the following steps.

- 1) Turn off each network station and remove its cover according to the manufacturer's instructions.
- 2) Remove the metal dummy bracket from any open slot in the station, as shown in Figure 1.11 below. (Refer to the station shown that most closely resembles the station you are using.)

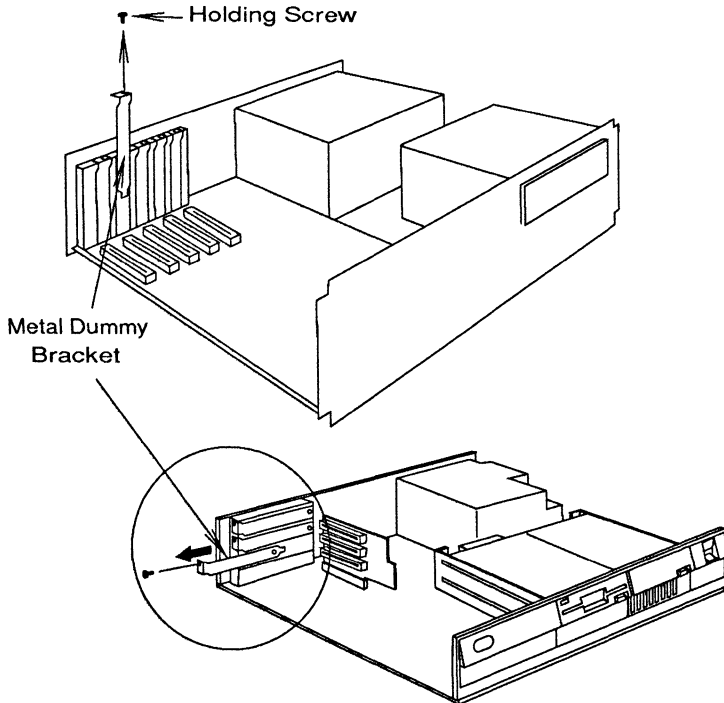


Figure 1.11
Removing a Metal Dummy Bracket

- 3) Insert each adapter into the station as shown in Figure 1.12 below.

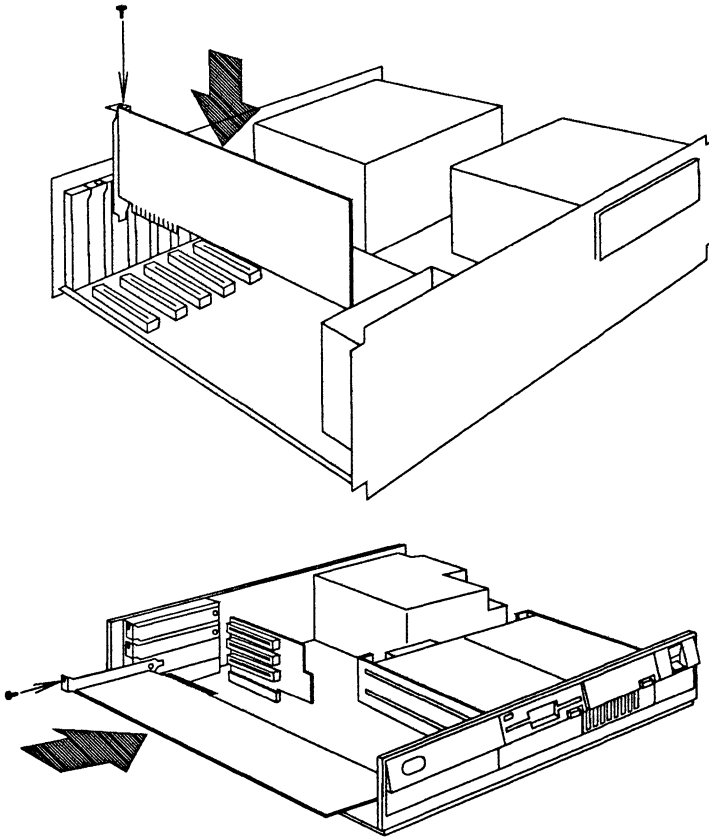


Figure 1.12
Inserting an IBM PC Network Adapter
into a Network Station

- 4) Replace the station's cover.

If you have set and installed all the adapters you intend to use on your broadband network, turn to "Cabling Your Network" on page 1-35.

SETTING THE IBM PC NETWORK ADAPTER II

Refer to Figure 1.13 on the facing page to locate the components used to set the configuration option and enable or disable ROM BIOS on the IBM PC Network Adapter II.

The configuration option for the IBM PC Network Adapter II includes the base I/O address, the interrupt line, and the base memory address.

Check the tag on each IBM PC Network Adapter II to find the configuration option you chose for that adapter.

If you intend to install the adapter in a file server or bridge, refer to the configuration option table in Figure 1.14 on page 1-22 and set the base I/O address, the interrupt line, and the base memory address according to the table.

If you intend to install the adapter in a workstation, refer to the configuration option table in Figure 1.15 on page 1-23 and set the base I/O address, the interrupt line, and the base memory address according to the table.

Disable ROM BIOS on all "alternate" adapters and enable ROM BIOS on all other adapters. (See Figure 1.13 on the facing page.)

Finally, disable jumper block W6 on all adapters as shown in Figure 1.13 on the facing page.

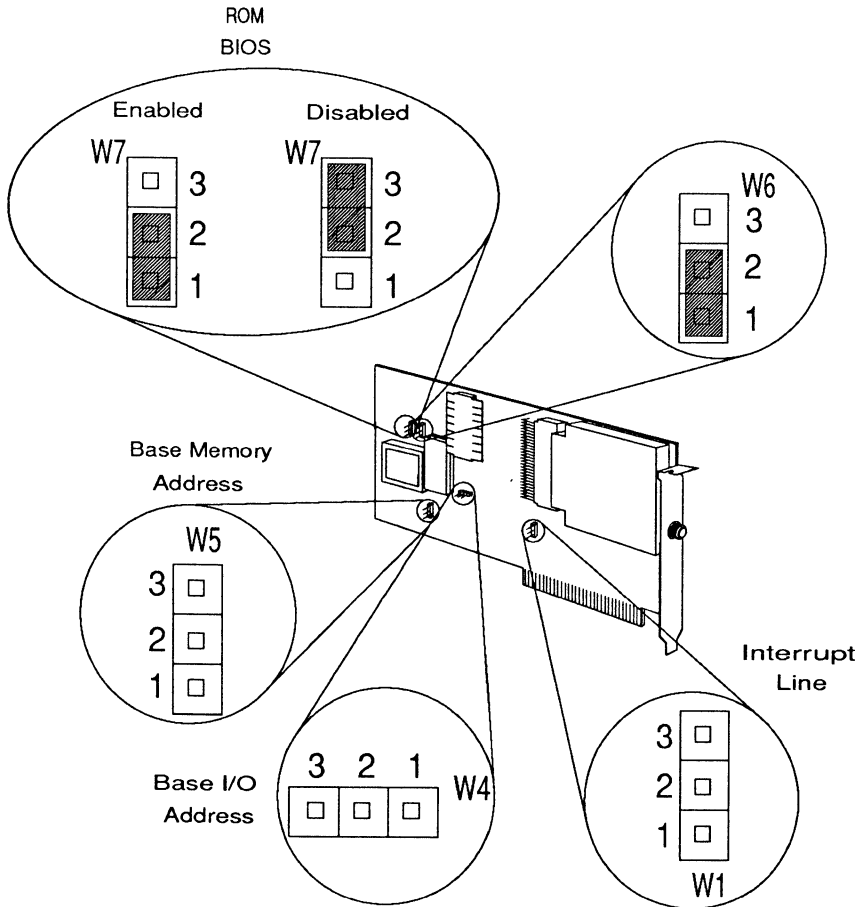


Figure 1.13
 Components Used to Make Settings on
 the IBM PC Network Adapter II

Config Option	Interrupt Line	Base I/O	Base Memory (RAM)
0 Primary			
1 Primary			
2 Primary			
3 Primary			
0 Alternate			
1 Alternate			
2 Alternate			
3 Alternate			

Figure 1.14
IBM PC Network Adapter II
Configuration Option Table
for File Servers and Bridges

Config Option	Interrupt Line	Base I/O	Base Memory (RAM)
0			
1			
2			
3			

Figure 1.15
IBM PC Network Adapter II
Configuration Option Table for Workstations

INSTALLING THE IBM PC NETWORK ADAPTER II

To install an IBM PC Network Adapter II in a network station, complete the following steps.

- 1) Turn off each network station and remove its cover according to the manufacturer's instructions.
- 2) Remove the metal dummy bracket from any open slot in the station, as shown in Figure 1.16 below. (Refer to the station shown that most closely resembles the station you are using.)

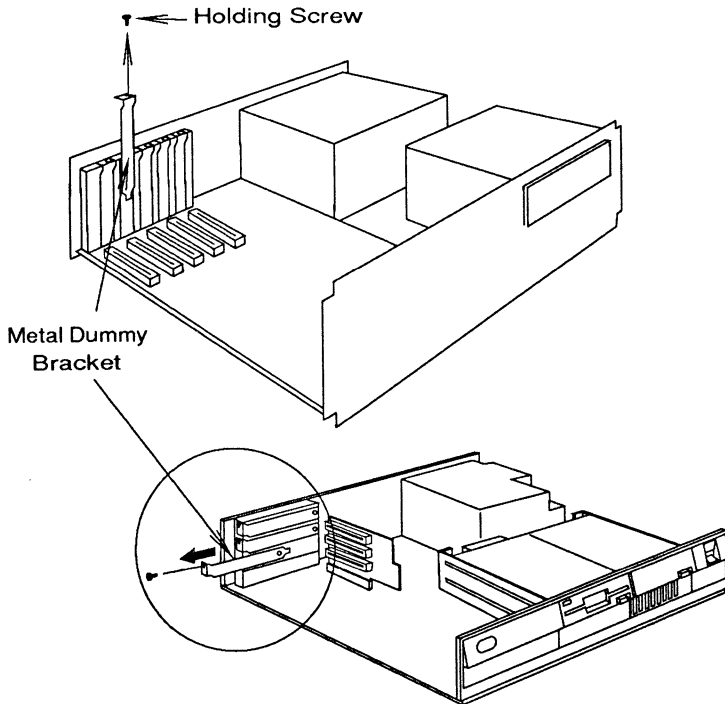


Figure 1.16
Removing a Metal Dummy Bracket

- 3) Insert each adapter into the station as shown in Figure 1.17 below.

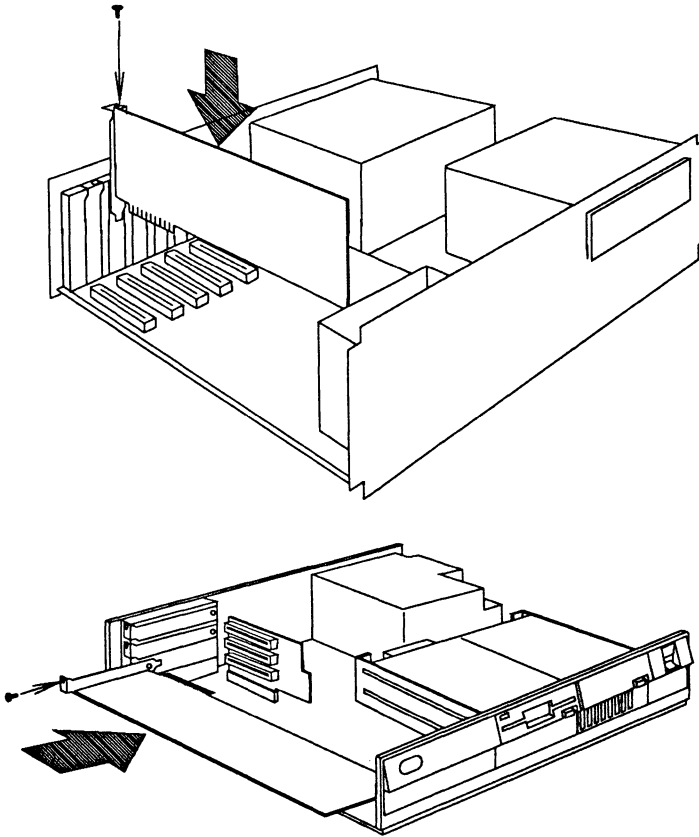


Figure 1.17
Inserting an IBM PC Network Adapter II
into a Network Station

- 4) Replace the station's cover.

If you have set and installed all the adapters you intend to use on your broadband network, turn to "Cabling Your Network" on page 1-35.

MICRO CHANNEL ADAPTERS

This section explains how to install an IBM PC Network Adapter II/A in a network station and make the proper software configuration option settings.

When you first bought your PS/2 Model 50, 60, or 80, you received a reference diskette with your computer called "PERSONAL SYSTEM/2 MODEL 50/60/80 REFERENCE DISKETTE." You will need a copy of this diskette in order to complete this section.

If you have already made a working copy of the reference diskette, use that copy. If you have not made a copy yet, do so now before continuing with "Installing the IBM PC Network Adapter II/A" on the facing page.

If you plan to install two adapters in the same network station in order to create a bridge or for some other reason, you should have already designated one as the *primary* adapter and the second as the *alternate* adapter when you generated the NetWare operating system.

INSTALLING THE IBM PC NETWORK ADAPTER II/A

To install an IBM PC Network Adapter II/A in a PS/2 Model 50, 60, or 80, complete the following steps.

- 1) Turn off the computer.
- 2) Remove the cover according to the manufacturer's instructions.
- 3) Loosen the screw on any empty expansion slot cover. Then pull out the expansion slot cover as shown in Figure 1.18 below. (Refer to the station shown that most closely resembles the station you are using.)

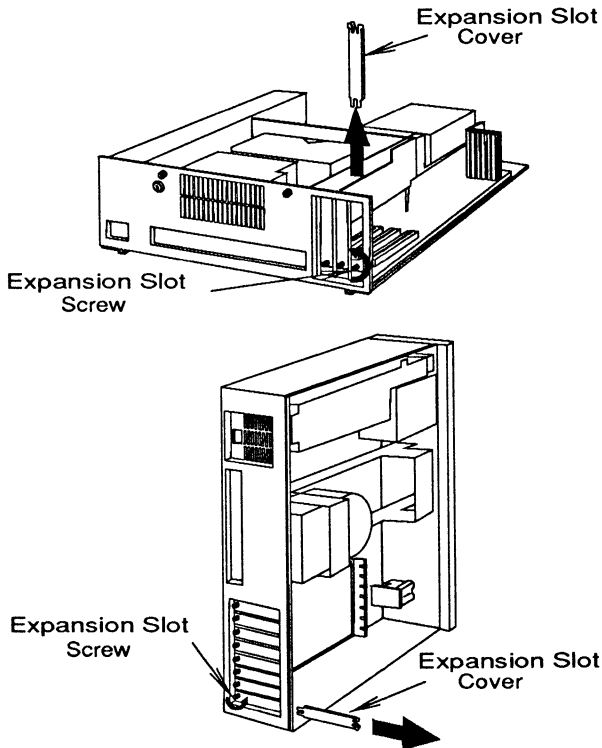


Figure 1.18
Removing an Expansion Slot Cover

- 4) Insert the PC Network Adapter II/A into the slot, pressing it firmly into the expansion slot connector. (See Figure 1.19 below.)
- 5) Tighten the expansion slot screw so that the adapter will remain in place.
- 6) Replace the computer cover and tighten the cover screws.

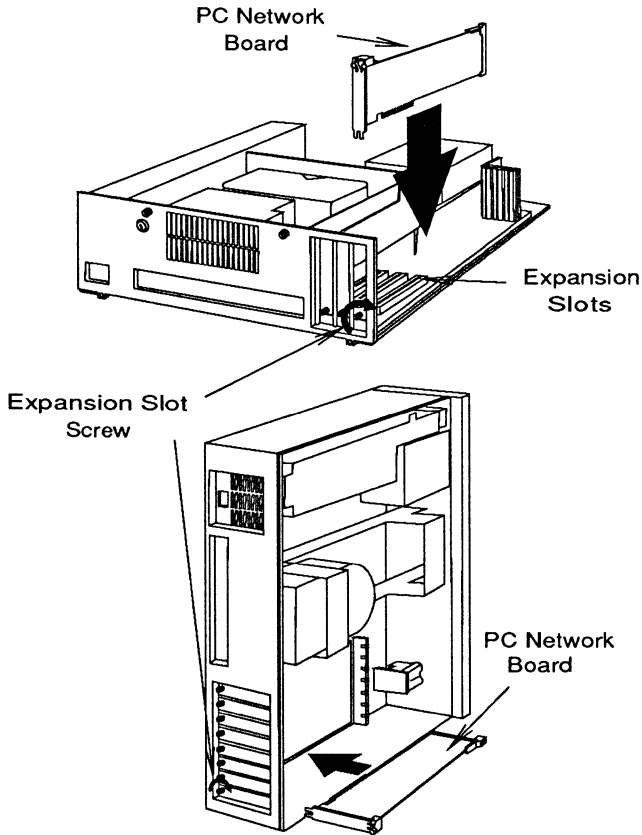


Figure 1.19
Inserting an IBM PC Network
Adapter II/A into a Network Station

SETTING THE IBM PC NETWORK ADAPTER II/A

To make settings on the IBM PC Network Adapter II/A you have installed, complete the following steps:

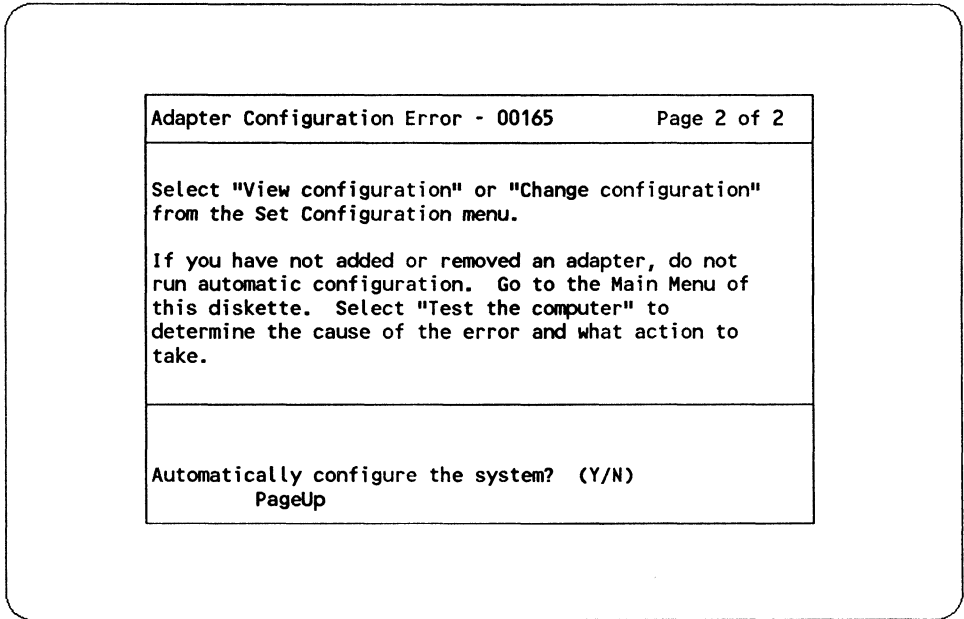
- 1) Boot the station with its working copy of the "REFERENCE" diskette.
After the station has been booted, the screen will display an IBM logo. A prompt *similar* to the following will also appear in the lower left-hand corner:

Press Enter to continue:

- 2) Press the Enter key to continue to the next screen. Because you have added a new adapter to the station, you will receive the error message shown below.

Adapter Configuration Error - 00165	Page 1 of 2
The computer's internal self-tests found an option adapter that is different from the option adapters indicated in the computer's configuration.	
This error occurs if option adapters are added, removed, or are not working properly.	
If you have added or removed an adapter, run automatic configuration. To view or change the results of automatic configuration, go to the Main Menu of this diskette and select "Set configuration."	
PageDown	

- 3) Press the PageDown key (as directed at the bottom of the screen). The following screen will appear:



- 4) Type "N" and press the Enter key. The "REFERENCE" diskette's Main Menu will appear:

Main Menu	
1.	Learn about the computer
2.	Backup the Reference Diskette
3.	Set configuration
4.	Set features
5.	Copy an option diskette
6.	Move the computer
7.	Test the computer
Use ↑ or ↓ to select. Press Enter. Esc=Quit F1=Help	

- 5) Use the Up- and Down-arrow keys to highlight Option 3 (“Set configuration”) and press the Enter key. A screen *similar* to the one shown below will appear:

Set Configuration	
1.	View configuration
2.	Change configuration
3.	Backup configuration
4.	Restore configuration
5.	Run automatic configuration
Press a number to select Esc=Quit F1=Help	

- 6) Choose Option 2 ("Change configuration") and press the Enter key. A screen *similar* to the following will appear. (Although the whole screen is shown on this page, you must scroll down to see all of it at your station.)

Any information in brackets can be changed.

Change Configuration	
Total System Memory	
Installed Memory.....	1024 KB (1.0 MB)
Usable Memory.....	1024 KB (1.0 MB)
Built In Features	
Installed Memory.....	1024 KB (1.0 MB)
Diskette Drive A Type.....	[1.44 MB 3.5"]
Diskette Drive B Type.....	[Not installed]
Math Coprocessor.....	Not installed
Serial Port.....	[SERIAL_1]
Parallel Port.....	[PARALLEL_1]
Slot1 - PC Network Adapter	
Type, Memory Location, Interrupt Level	
[Primary, Mem 1, In 2]	
Slot2 - Empty	
Slot3 - Empty	
Slot4 - IBM Fixed Disk Adapter	
Type of first drive.....	[30]
Type of second drive.....	[0]
Arbitration level.....	[Level_3]
Esc=Quit F5=Previous F10=Save ↑ Home PageUp	
F1=Help F6=Next ↓ End	

- 7) Using the Up- and Down-arrow keys, scroll through the settings on the screen, making sure that the settings match the settings you chose when you ran NETGEN or BRGEN.

The NETGEN and BRGEN settings are listed in the chart below. Note that the "Primary" in brackets on your screen corresponds to I/O address 620-627 below; "Alternate" in brackets on your screen corresponds to I/O address 628-62F below. "Mem 1," "Mem 2," or "Mem 3" in brackets on your screen correspond to memory addresses CE000-CFFFF, D6000-D7FFF, and DE000-DFFFF below, respectively. "Int 2" or "Int 3" in brackets on your screen correspond to IRQ 2 or 3 below.

	IRQ	I/O Address	Memory Address
Option P4:	2	620-627	CE000-CFFFF
Option P5:	2	620-627	D6000-D7FFF
Option P6:	2	620-627	DE000-DFFFF
Option P7:	3	620-627	CE000-CFFFF
Option P8:	3	620-627	D6000-D7FFF
Option P9:	3	620-627	DE000-DFFFF
Option A4:	2	628-62F	CE000-CFFFF
Option A5:	2	628-62F	D6000-D7FFF
Option A6:	2	628-62F	DE000-DFFFF
Option A7:	3	628-62F	CE000-CFFFF
Option A8:	3	628-62F	D6000-D7FFF
Option A9:	3	628-62F	DE000-DFFFF

NOTE:

Options P4 through P9 can be used for primary adapters only;
options A4 through A9 can be used for alternate adapters only.

- 8) If the settings are *correct* for this network station (file server, bridge, or workstation), exit the Configuration screen by pressing the Escape key.

If any setting is *incorrect*, highlight the incorrect setting and use the F5 and F6 keys to scroll through the available settings. An asterisk will appear to the right of any available setting when it conflicts with other settings in use. If this happens, choose an available setting that does not create a conflict.

- 9) After you have changed any incorrect settings, press F10 to save the changes and exit the Configuration screen.

CABLING YOUR NETWORK

After you have planned the network layout and installed properly set PC Network Adapters in each network station, you should connect the network stations and other PC Network hardware with the appropriate broadband cabling. As you do so, follow the steps listed below.

- 1) If there are any network stations or other components that you have not yet placed in the locations you have chosen for them, put these items in place now.
- 2) Next, run the appropriate lengths and types of broadband cables between network stations and components.
- 3) Then, connect all stations and components with network cables. Remove terminators where necessary, but leave them on unused ports. Screw the cable connectors onto the threaded ports on the various network devices in a clockwise motion, tightening each one finger-tight.
- 4) Finally, connect the transformer (for the translator unit) to an appropriate AC power source. Then return to your main NetWare manual.

2 THE IBM PC BASEBAND NETWORK

This chapter is divided into four main sections:

- “Understanding the IBM PC Baseband Network”
- “Planning Your Network Layout”
- “Setting and Installing Adapters”
- “Cabling Your Network”

NOTE:

Broadband and baseband networks cannot be used on the same network. However, a broadband network and a baseband network can be connected by means of a bridge.

UNDERSTANDING THE IBM PC BASEBAND NETWORK

The brief introduction below and the illustration in Figure 2.1 on the facing page are intended to help you become familiar with a basic IBM PC baseband network. After reading the following paragraph and glancing at the illustration, turn the page for a more detailed look at the IBM PC baseband network.

The basic baseband PC network supports between two and eight stations, and the maximum distance between the first and the last station varies between 200 and 300, feet depending on the number of stations. The number of stations can be expanded to 80 and the cable distances extended using a device called a baseband extender (discussed later in this section).

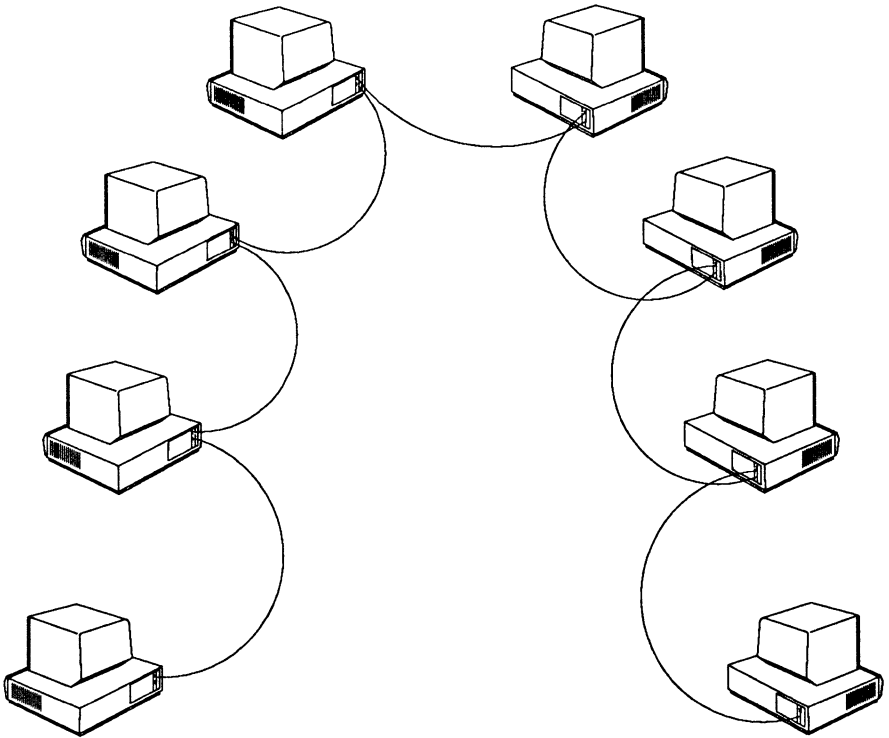


Figure 2.1
A Basic Baseband PC Network

BASEBAND NETWORK HARDWARE

IBM PC baseband network hardware is described in the list below and illustrated in Figure 2.2 on the facing page.

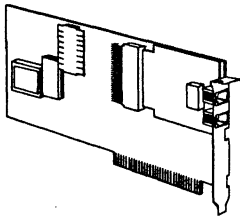
PC Network Adapters. PC network adapters are network interface boards. One adapter must be installed in each network station in order to facilitate communication on the network. Two PC network adapters are available for use on PC baseband networks: the IBM PC Network Baseband Adapter for use in stations with standard buses, and the IBM PC Network Baseband Adapter/A for use in stations with Micro Channel buses.

Cable. The cabling used on a baseband PC network is twisted-pair cabling, which consists of two wires twisted together and sealed inside an insulated coating. Cables are available in 25-foot lengths. If you need longer lengths of cable you can join several lengths of cable using modular couplers (described below), or you can buy a spool of cable, cut the cable to suitable lengths, and attach connectors to the ends of the cable lengths yourself.

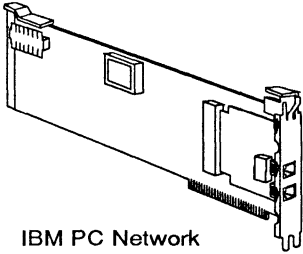
Modular Connectors and Couplers. Modular connectors are attached to both ends of baseband cable lengths; modular couplers are used to join baseband cable lengths. Although baseband network cabling and telephone cabling are similar, the IBM baseband PC network uses 8-conductor connectors and couplers while typical telephone wiring uses 4-conductor connectors and couplers.

Terminator. Terminators insure that network transmissions don't "bounce" back down the network cable and interfere with other transmissions.

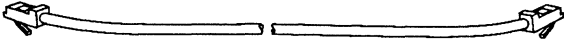
Wrap Plug. Wrap plugs allow network signals traveling to one end of the network cable to continue back down the second of the two twisted wires inside the cable.



IBM PC Network
Baseband
Adapter



IBM PC Network
Baseband
Adapter/A

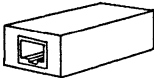


Cable

Modular
Connector



Wrap
Plug



Modular
Coupler



Terminator

Figure 2.2
Baseband Network Hardware

BASIC BASEBAND NETWORK DISTANCES

The basic baseband network supports from two to eight stations and is limited in total network cable length, depending on the number of stations. If you plan to make a two-station network, the maximum cable length between the two stations is 300 feet. If you decide to make a three-station network, the maximum distance between the first and the last station is 275 feet. In this way, as the number of stations on the network increases the total network cable length decreases. This relationship between number of stations and total network cable length is summarized in Figure 2.3.

Number of Stations	Maximum Cable Distances
2	300 ft. total
3	275 ft. total
4	250 ft. total
5	225 ft. total
6	225 ft. total
7	200 ft. total
8	200 ft. total

Figure 2.3
Maximum Network Size
for a Basic Baseband Network

EXPANDING THE BASIC BASEBAND NETWORK

A basic baseband network is limited to eight stations and strict maximum cable lengths. However, a larger baseband network can be built with the help of a baseband extender. (See Figure 2.4 below.) This device allows you to connect as many as ten separate chains of eight stations for a total of 80 network stations. Each chain may be as long as 400 feet, whether it has one station or eight stations.

Figure 2.4 below shows how a baseband extender is used in an extended baseband network. Note that a terminator is used in the "OUT" port of the baseband extender and in the last station of each chain. Also note that one wrap plug is used in the other "OUT" port of the baseband extender.

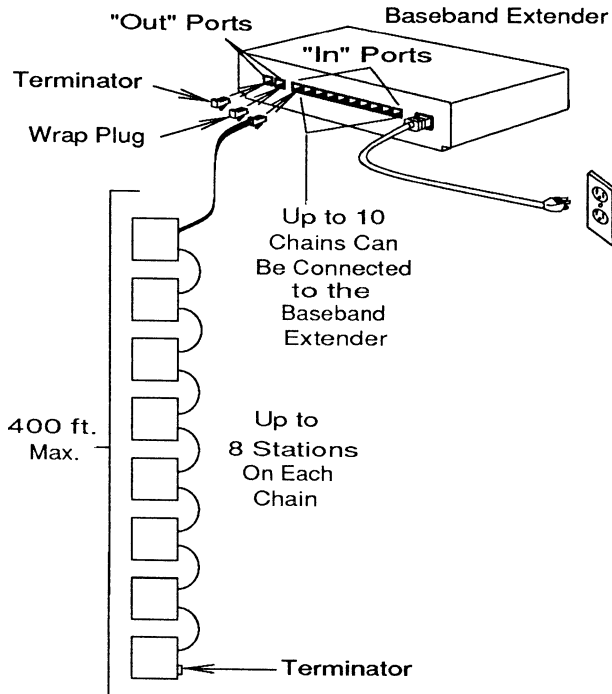


Figure 2.4
Extended Baseband PC Network

BASEBAND NETWORK SUMMARY

Below is a summary of information pertaining to a basic baseband PC network and an extended baseband PC network. Refer to Figure 2.5 on the facing page as you review the summary.

BASIC BASEBAND NETWORK

- Maximum number of stations: 8
- Maximum cable lengths: see page 2-6
- One end of the network must be terminated with an 8-conductor terminator.
- A wrap plug must be installed in the station on the other end of the network. (The end opposite the terminator.)
- Be careful not to crimp the cable, damage its insulation, or run it near heat sources or in heavy traffic areas where hand trucks or rolling chairs might damage it.

EXTENDED BASEBAND NETWORK

- Maximum number of stations: 80
- Maximum cable length for each series of stations: 400 feet
- One end of each series of stations must be terminated with an 8-conductor terminator.
- The other end of each series of stations must be inserted into one of the "IN" ports on the baseband extender.
- One wrap plug and one terminator must be inserted into the two "OUT" ports on the baseband extender.
- Be careful not to crimp the cable, damage its insulation, or run it near heat sources or in heavy traffic areas where hand trucks or rolling chairs might damage it.

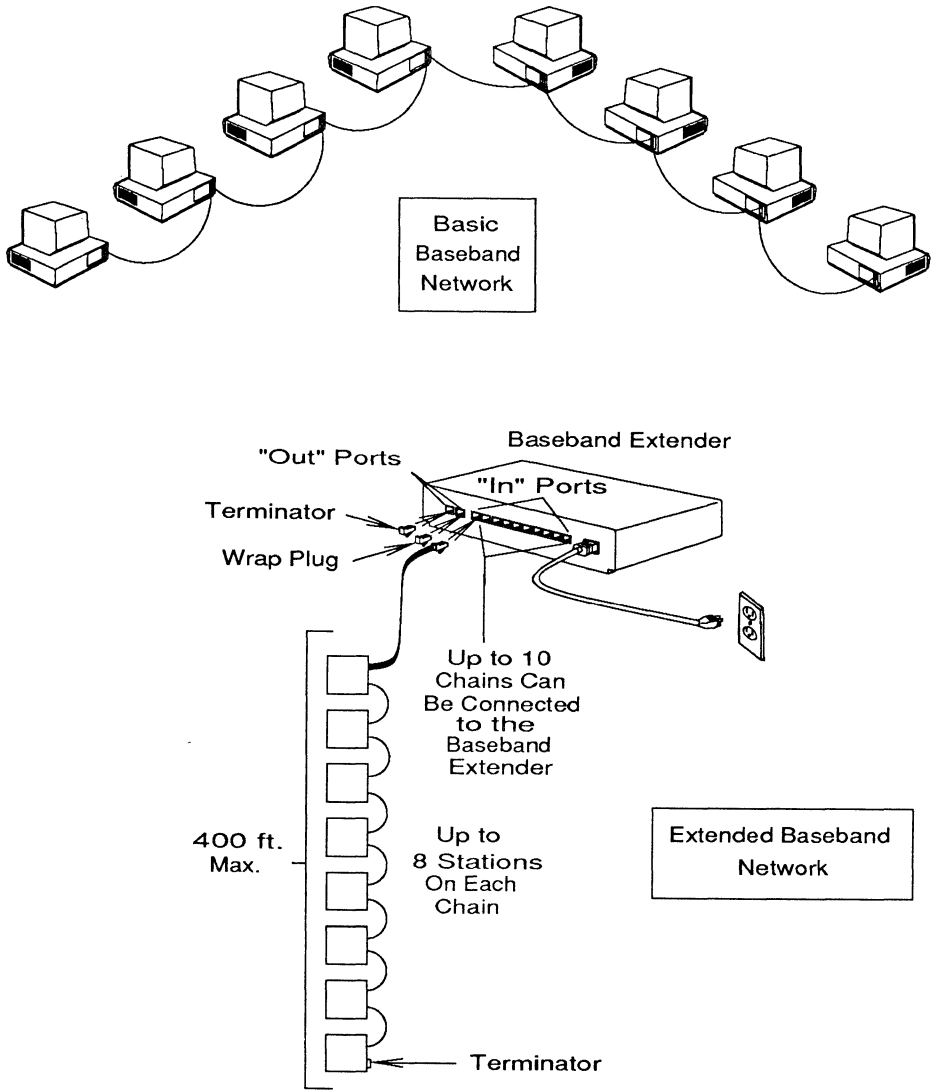


Figure 2.5
A Basic and an Extended Baseband Network

PLANNING YOUR NETWORK LAYOUT

Now that you are familiar with baseband PC network hardware, limitations, and rules, consider the following questions as you define your particular network needs and begin to design your own network.

- How large an area must the cabling system cover?
- How many stations (file servers, bridges, and workstations) will be connected to the cabling system?
- How far apart will the stations be?
- What potential growth in size and connections must the system accommodate?

Now, draw your network plan, labeling each piece of hardware that will be included. Also label the kind of PC adapter used in each station. Keep in mind the rules given in the preceding sections. Measure the distances between all components and make sure they fall within the appropriate maximums. Record these distances on your sketch. Insure that the locations you choose for file servers have adequate room for any peripherals (printers, external disk drives, etc.) that will be attached.

SETTING AND INSTALLING ADAPTERS

If you are installing and setting Micro Channel adapters, turn to page 2-18. If you are setting and installing standard-bus adapters, continue reading “Standard-Bus Adapters” below.

STANDARD-BUS ADAPTERS

This section explains how to set the configuration option and either enable or disable ROM BIOS on IBM PC Network Baseband Adapters, and install the adapters in network stations. (IBM PC Network Baseband Adapters can be used in file servers, bridges, or workstations.)

Before you set and install the adapters, label each adapter with the following information using a string tag.

- The specific station in which the adapter will be installed (for example, “the file server,” “the bridge,” or “Jack’s workstation”)
- The configuration option—If the adapter will be installed in a file server or bridge, this is the configuration option you chose when you generated the NetWare operating system. If the adapter will be installed in a workstation, this is the configuration option you chose when you generated the NetWare shell.

If you plan to install two adapters in the same network station in order to create a bridge or for some other reason, you should have already designated one as the *primary* adapter and the other as the *alternate* adapter when you generated the NetWare operating system. As a general rule, remember that ROM BIOS must be *enabled* on the primary adapter and *disabled* on the alternate adapter.

SETTING THE IBM PC NETWORK BASEBAND ADAPTER

Refer to Figure 2.6 on the facing page to locate the components used to set the configuration option and enable or disable ROM BIOS on the IBM PC Network Baseband Adapter.

The configuration option for the IBM PC Network Baseband Adapter includes the base I/O address, the interrupt line, and the base memory address.

Check the tag on each IBM PC Network Baseband Adapter to find the configuration option you chose for that adapter.

If you intend to install the adapter in a file server or bridge, refer to the configuration option table in Figure 2.7 on page 2-14 and set the base I/O address, the interrupt line, and the base memory address according to the table.

If you intend to install the adapter in a workstation, refer to the configuration option table in Figure 2.8 on page 2-15 and set the base I/O address, the interrupt line, and the base memory address according to the table.

Disable ROM BIOS on all alternate adapters and enable ROM BIOS on all other adapters. (See Figure 2.6 on the facing page.)

Finally, disable jumper block W6 on all adapters as shown in Figure 2.6 on the facing page.

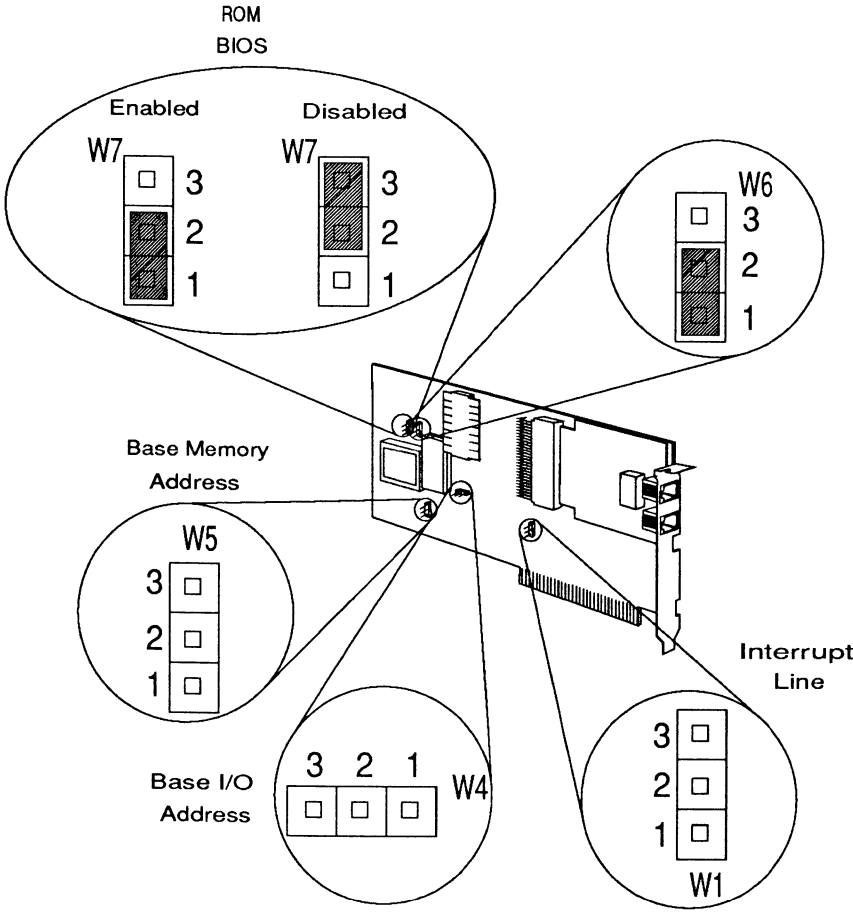


Figure 2.6
Components Used to Make Settings on
the IBM PC Network Baseband Adapter

Config Option	Interrupt Line	Base I/O	Base Memory (RAM)
0 Primary			
1 Primary			
2 Primary			
3 Primary			
0 Alternate			
1 Alternate			
2 Alternate			
3 Alternate			

Figure 2.7
IBM PC Network Baseband Adapter
Configuration Option Table
for File Servers and Bridges

Config Option	Interrupt Line	Base I/O	Base Memory (RAM)
0			
1			
2			
3			

Figure 2.8
IBM PC Network Baseband Adapter
Configuration Option Table
for Workstations

INSTALLING THE IBM PC NETWORK BASEBAND ADAPTER

To install an IBM PC Network Baseband Adapter in a network station, complete the following steps.

- 1) Turn off each network station and remove its cover according to the manufacturer's instructions.
- 2) Remove the metal dummy bracket from any open slot in the station, as shown in Figure 2.9 below. (Refer to the station shown that most closely resembles the station you are using.)

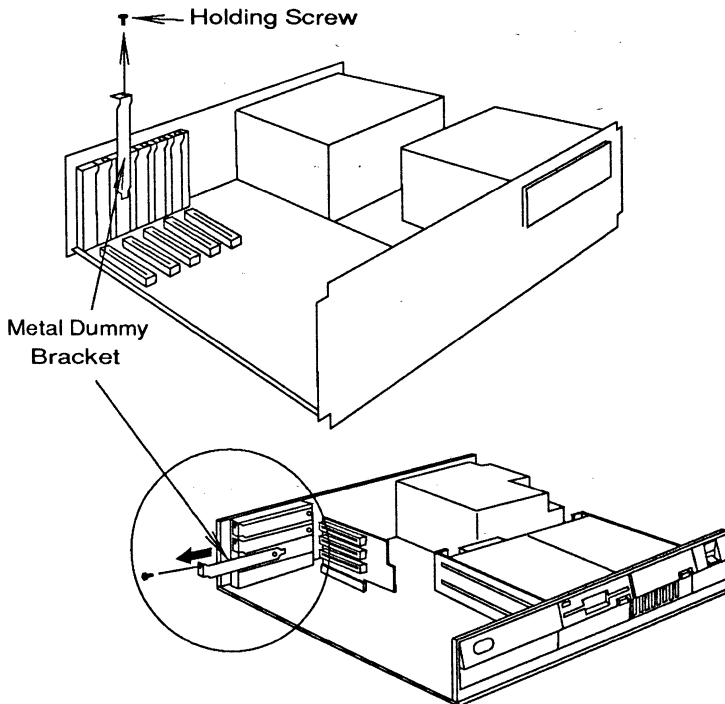


Figure 2.9
Removing a Metal Dummy Bracket

- 3) Insert each adapter into the station as shown in Figure 2.10 below. (Refer to the station shown that most closely resembles the station you are using.)

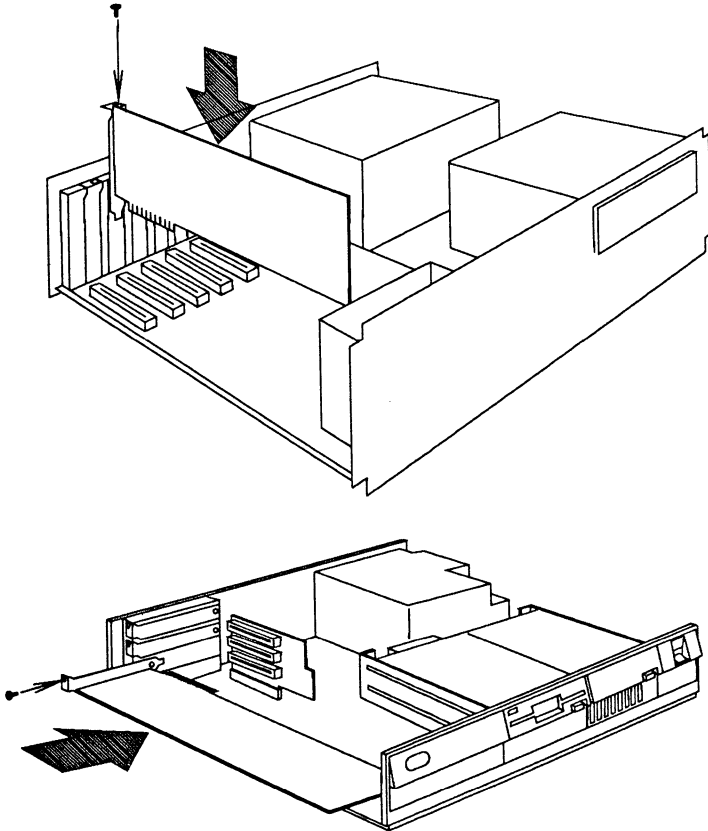


Figure 2.10
Inserting an IBM PC Network Baseband Adapter
into a Network Station

- 4) Replace the station's cover.

If you have set and installed all the adapters you intend to use on your broadband network, turn to "Cabling Your Network" on page 2-28.

MICRO CHANNEL ADAPTERS

This section explains how to install an IBM PC Network Baseband Adapter/A in a network station and how to make the proper software configuration option settings.

When you first bought your PS/2 Model 50, 60, or 80, you received a reference diskette with your computer called "PERSONAL SYSTEM/2 MODEL 50/60/80 REFERENCE DISKETTE." You will need a copy of this diskette in order to complete this section.

If you have already made a working copy of the reference diskette, use that copy. If you have not made a copy yet, do so now before continuing with "Installing the IBM PC Network Baseband Adapter/A" on the facing page.

If you plan to install two adapters in the same network station in order to create a bridge or for some other reason, you should have already designated one as the *primary* adapter and the second as the *alternate* adapter when you generated the NetWare operating system.

INSTALLING THE IBM PC NETWORK BASEBAND ADAPTER/A

To install an IBM PC Network Baseband Adapter/A in a PS/2 Model 50, 60, or 80, complete the following steps.

- 1) Turn off the computer.
- 2) Remove the cover according to the manufacturer's instructions.
- 3) Loosen the screw on any empty expansion slot cover. Then pull out the expansion slot cover as shown in Figure 2.11 below. (Refer to the station shown that most closely resembles the station you are using.)

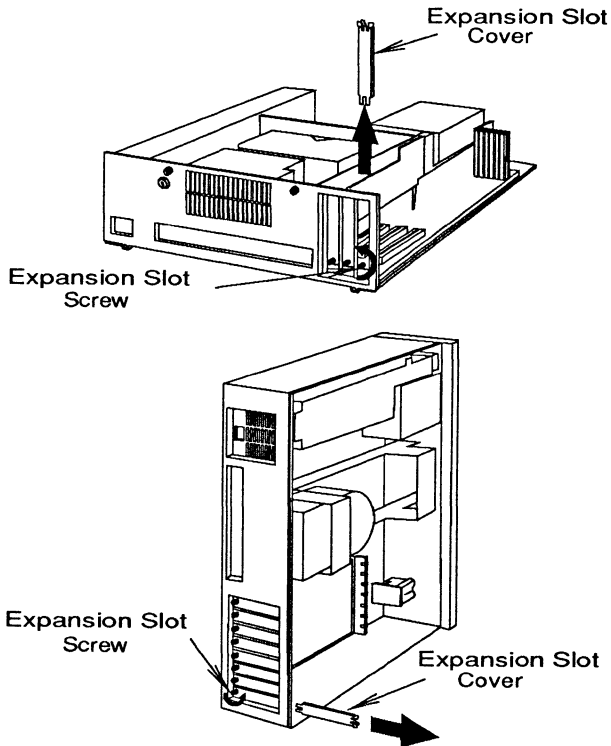


Figure 2.11
Removing an Expansion Slot Cover

- 4) Insert the PC Network Baseband Adapter/A into the slot, pressing it firmly into the expansion slot connector. (See Figure 2.12 below.)
- 5) Tighten the expansion slot screw so that the adapter will remain in place.
- 6) Replace the computer cover and tighten the cover screws.

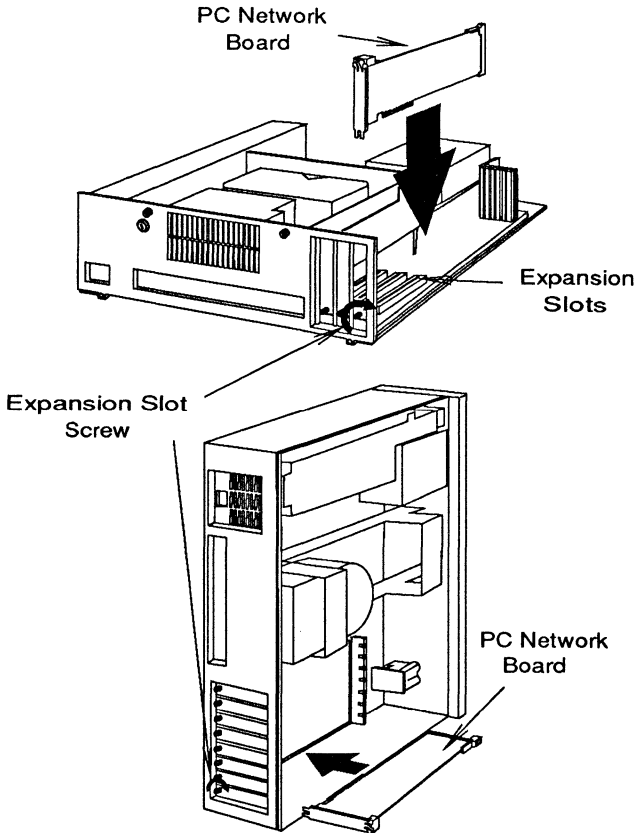


Figure 2.12
Inserting an IBM PC Network Baseband Adapter/A
into a Network Station

SETTING THE IBM PC NETWORK BASEBAND ADAPTER/A

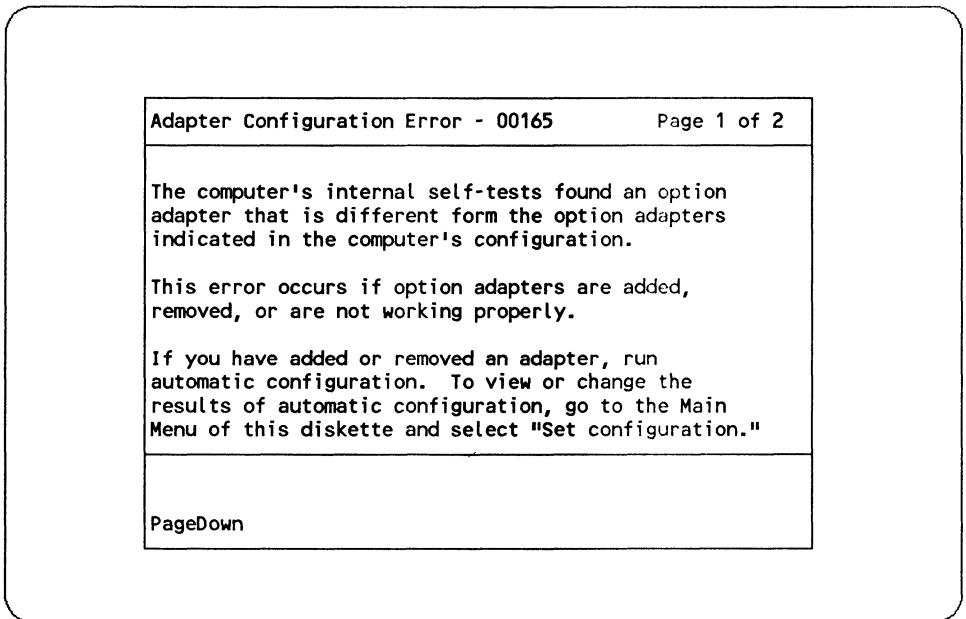
To make settings on each IBM PC Network Baseband Adapter/A you have installed, complete the following steps.

- 1) Boot the station with its working copy of the "REFERENCE" diskette.

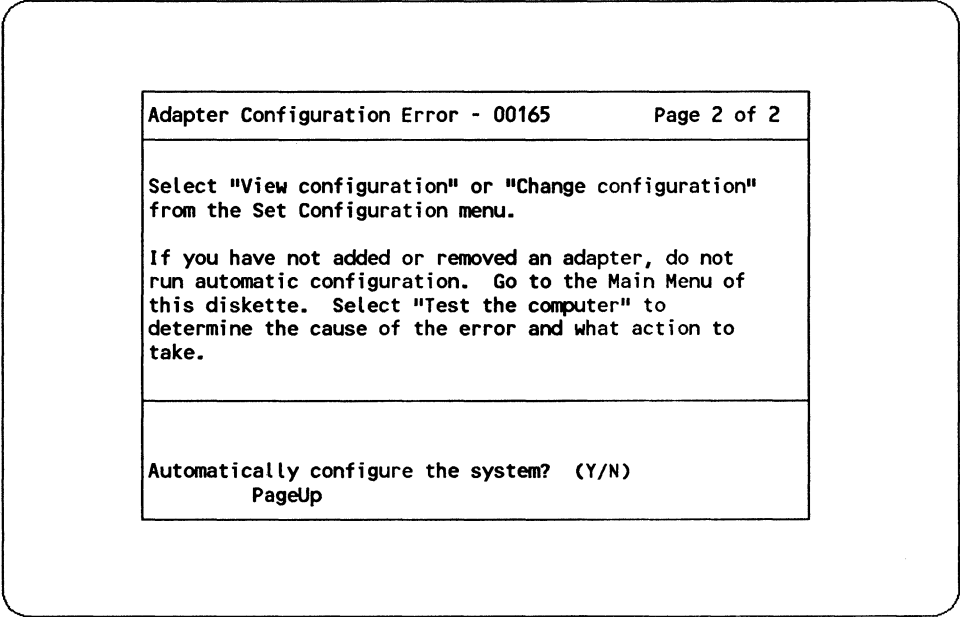
After the station has been booted, the screen will display an IBM logo. A prompt *similar* to the following will also appear in the lower left-hand corner:

Press Enter to continue:

- 2) Press the Enter key to continue to the next screen. Because you have added a new adapter to the station, you will receive the error message shown below.



- 3) Press the PageDown key (as directed at the bottom of the screen). The following screen will appear:



- 4) Type "N" and press the Enter key. The "REFERENCE" diskette's Main Menu will appear:

Main Menu	
1.	Learn about the computer
2.	Backup the Reference Diskette
3.	Set configuration
4.	Set features
5.	Copy an option diskette
6.	Move the computer
7.	Test the computer
Use ↑ or ↓ to select. Press Enter.	
Esc=Quit F1=Help	

- 5) Use the Up- and Down-arrow keys to highlight Option 3 (“Set configuration”) and press the Enter key. A screen *similar* to the one shown below will appear:

Set Configuration
1. View configuration 2. Change configuration 3. Backup configuration 4. Restore configuration 5. Run automatic configuration
Press a number to select Esc=Quit F1=Help

- 6) Choose Option 2 ("Change configuration") and press the Enter key. A screen *similar* to the following will appear. (Although the whole screen is shown on this page, you must scroll down to see all of it on your station.)

Any information in brackets can be changed.

Change Configuration	
Total System Memory	
Installed Memory.....	1024 KB (1.0 MB)
Usable Memory.....	1024 KB (1.0 MB)
Built In Features	
Installed Memory.....	1024 KB (1.0 MB)
Diskette Drive A Type.....	[1.44 MB 3.5"]
Diskette Drive B Type.....	[Not installed]
Math Coprocessor.....	Not installed
Serial Port.....	[SERIAL_1]
Parallel Port.....	[PARALLEL_1]
Slot1 - PC Network Adapter	
Type, Memory Location, Interrupt Level	
[Primary, Mem 1, In 2]	
Slot2 - Empty	
Slot3 - Empty	
Slot4 - IBM Fixed Disk Adapter	
Type of first drive.....	[30]
Type of second drive.....	[0]
Arbitration level.....	[Level_3]
Esc=Quit	F5=Previous
F1=Help	F6=Next
F10=Save	↑ Home
	PageUp
	↓ End

- 7) Using the Up- and Down-arrow keys, scroll through the settings on the screen, making sure that the settings match the settings you chose when you ran NETGEN or BRGEN.

The NETGEN and BRGEN settings are listed in the chart below. Note that the "Primary" in brackets on your screen corresponds to I/O address 620-627 below; "Alternate" in brackets on your screen corresponds to I/O address 628-62F below. "Mem 1," "Mem 2," or "Mem 3" in brackets on your screen correspond to memory addresses CE000-CFFFF, D6000-D7FFF, and DE000-DFFFF below, respectively. "Int 2" or "Int 3" in brackets on your screen correspond to IRQ 2 or 3 below.

	IRQ	I/O Address	Memory Address
Option P4:	2	620-627	CE000-CFFFF
Option P5:	2	620-627	D6000-D7FFF
Option P6:	2	620-627	DE000-DFFFF
Option P7:	3	620-627	CE000-CFFFF
Option P8:	3	620-627	D6000-D7FFF
Option P9:	3	620-627	DE000-DFFFF
Option A4:	2	628-62F	CE000-CFFFF
Option A5:	2	628-62F	D6000-D7FFF
Option A6:	2	628-62F	DE000-DFFFF
Option A7:	3	628-62F	CE000-CFFFF
Option A8:	3	628-62F	D6000-D7FFF
Option A9:	3	628-62F	DE000-DFFFF

NOTE:

Options P4 through P9 can be used for primary adapters only;
options A4 through A9 can be used for alternate adapters only.

- 8) If the settings are *correct* for this network station (file server, bridge, or workstation), exit the Configuration screen by pressing the Escape key.

If any setting is *incorrect*, highlight the incorrect setting and use the F5 and F6 keys to scroll through the available settings. An asterisk will appear to the right of any available setting when it conflicts with other settings in use. If this happens, choose an available setting that does not create a conflict.

- 9) After you have changed any incorrect settings, press F10 to save the changes and exit the Configuration screen.

CABLING YOUR NETWORK

After you have planned the network layout, and installed properly set PC network adapters in each network station, you should connect the network stations and other PC Network hardware with the appropriate baseband cabling. As you do so, follow the steps listed below.

- 1) If there are any network stations or other components that you have not yet placed in the locations you have chosen for them, put these items in place now.
- 2) Next, run the appropriate lengths and types of baseband cables between network stations and components.
- 3) Then, connect all stations and components with network cables.
- 4) Install the terminator and wrap plug at the appropriate locations. If you are building a basic baseband network, locate the two stations on the ends of the network. You will notice that the metal brackets attached to the baseband adapters installed in these two stations both have one empty socket where another cable might be attached. Insert a terminator into one of these sockets and a wrap plug into the other.

If you are building an extended network, insert one terminator and one wrap plug into the two "OUT" ports on the baseband extender. Then locate the last station on each chain of stations (the one farthest from the baseband extender). Note that the metal bracket on the baseband adapter in each of these stations has one empty socket. Insert a terminator into each of these empty sockets so that the end of each chain of stations is terminated.

- 5) Finally, connect the baseband extender to an appropriate AC power source. Then return to your main NetWare manual.

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HOW TO USE THIS MANUAL

This manual explains how to install Standard Microsystems ARCNET networking hardware on a NetWare network. It is a supplement to several main NetWare manuals.

If you haven't already done so, read and follow the instructions in your main NetWare manual up to the point where it advises you to consult this supplement.

Chapters 1 through 4 of this supplement introduce the networking hardware you will be using. They also explain how to plan your own network and how to prepare and install the networking hardware.

If you are installing boards in a file server for NetWare 386, see Appendix A for the board setting options. Appendix A contains board settings for the PC, PC02, PC100, PC110, PC120, PC130, PC210, PC220, PC250, and PC260 network boards.

Appendix B contains instructions for using an ARCNET-PS110 board on a NetWare v2.0a network. If you are installing a NetWare v2.0a network containing ARCNET-PS110 boards, you must complete the instructions in the appendix before you run the GENOS, GENSH, or GENBR installation utilities, and before you use the main chapters in this supplement.

NOTE:

This manual also covers and includes Novell RX-Net network boards that are equivalent to the Standard Microsystems network boards. Specifically this refers to the Novell RX-Net/2 and the Novell RX-Net II boards.

The RX-Net/2 board is equivalent to the Standard Microsystems PS110 board.

The RX-Net II board is equivalent to the Standard Microsystems PC120 board.

Any and all references to the Standard Microsystems PS110 and PC120 boards also apply to their RX-Net equivalent boards listed above.

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Trademarks

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1 **PLANNING YOUR NETWORK**

In this chapter, you will

- Identify network hardware.
- Learn how each hardware component is used on the network.
- Learn the rules and limitations for using the hardware.
- Design your own network layout and make sure that you have all the hardware you need to set up your network.

NETWORK HARDWARE

A Standard Microsystems ARCNET network consists of ARCNET network boards and several other pieces of hardware. The type of boards that can be used are described below and illustrated in Figure 1.1. Other hardware is described on page 1-3 and illustrated in Figure 1.2 on page 1-5.

ARCNET Network Board. This is a printed circuit board. One must be inserted into each network station so the station can communicate with other stations on the network. NetWare supports a number of Standard Microsystems ARCNET boards, including the PC, PC02, PC100, PC110, PC120, PC130, PC210, PC220, PC250, PC260, and PS110.

Information on the PC130 and PC220 boards is found in Chapter 2.

Information on the PS110 board is found in Chapter 3.

Board setting information on all other supported boards is in Appendix A.

The PC, PC02, PC100, PC110, PC120, PC130, PC250, PC260 and PS110 boards all feature low-impedance transceivers. In this supplement, these boards will be referred to as low-impedance boards, low-impedance PC boards, or low-impedance PS boards.

The PC210 and PC220 boards have high-impedance transceivers and will be referred to as high-impedance PC boards.

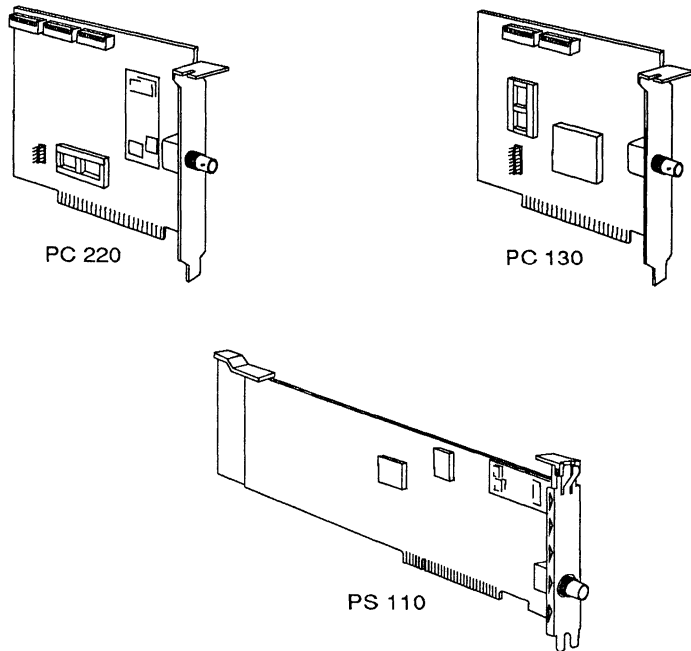


Figure 1.1
Standard Microsystems ARCNET Network Boards

Cable. Standard Microsystems ARCNET networks use RG-62/U 93-ohm coaxial cable to connect network components.

Passive hubs. Passive hubs relay network signals. They have four ports (standard BNC connectors) to which network cables can be attached. Any unused port on a passive hub must be terminated with a 93-ohm terminator.

Active hubs. Active hubs not only relay network messages but also condition and amplify signal strength. They have eight ports. Terminating unused ports on active hubs is recommended but not necessary.

BNC terminating plugs. 93-ohm terminators ensure that reflections on the line do not interfere with network transmissions.

BNC connector plugs. BNC twist-lock connector plugs attach to both ends of each length of cable.

BNC connector jacks. BNC connector jacks attach to BNC connector plugs. BNC connector jacks are located on several pieces of hardware, including active and passive hubs, active links, and network interface boards.

Active links. Active links can connect two cables when both include a string of stations containing high-impedance PC boards.

BNC T-connectors. BNC T-connectors connect network stations containing high-impedance PC boards to network cabling.

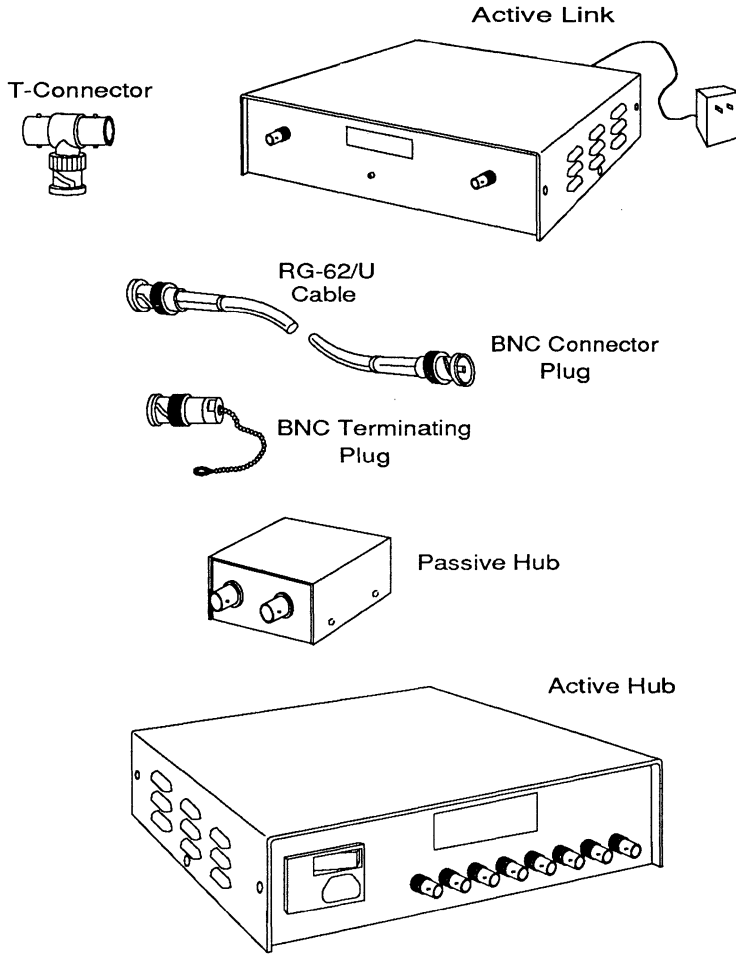


Figure 1.2
Standard Microsystems ARCNET Hardware

NETWORK LAYOUT USING LOW-IMPEDANCE BOARDS

Below is a summary of limitations and rules for a network layout using low-impedance boards in star topologies. As you review this summary, refer to Figure 1.3 on page 1-8.

LIMITATIONS

- Maximum cable distance from one end of the network to the other: 20,000 feet
- Maximum distance between active hubs: 2,000 feet
- Maximum distance between an active hub and a network station: 2,000 feet
- Maximum distance between an active hub and a passive hub: 100 feet
- Maximum distance between a passive hub and a station: 100 feet

RULES

- Connect active hubs to other active hubs, passive hubs, and stations.
- Use passive hubs only as intermediate connections between active hubs and stations. Do not connect passive hubs in series.
- Connect workstations, file servers, and bridges anywhere in the network.
- Do not create loops. A loop is created when a cable coming from an active or passive hub passes through other hubs and then connects back into the original hub.
- Terminate unused ports on an active hub where possible; unused ports on a passive hub must be terminated. Use a 93-ohm terminator.
- If, sometime after installation, you remove a network station from a passive hub, remove the cable also and install a terminator.
- Be careful not to crimp the cable, damage its insulation, or run the cable near heat sources or in heavy traffic areas where hand trucks or rolling chairs might damage it.
- If you have unconnected boards (not connected to a network) in file servers or bridges, they must be terminated or the drivers for them disabled.

CLARIFICATIONS

- Passive hubs split and relay network signals but do not boost the signal's strength. If passive hubs are connected in series, the signal strength becomes too weak for communication.
- On a simple, two-station network, stations may be up to 2,000 feet apart.

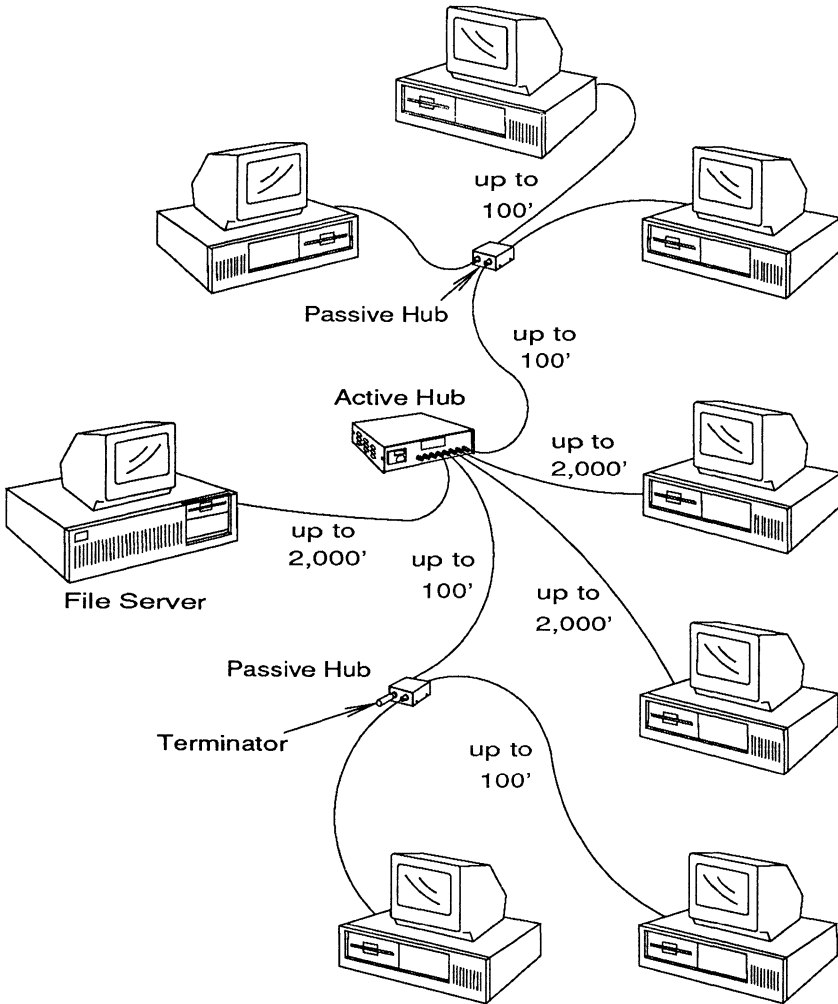


Figure 1.3
Network Layout Using Low-Impedance Boards

NETWORK LAYOUT USING HIGH-IMPEDANCE PC BOARDS

Below is a summary of limitations and rules for a network layout using only high-impedance PC boards in bus topologies. As you review this summary, refer to Figure 1.4.

LIMITATIONS

- Maximum cable distance from one end of the network to the other: 20,000 feet
- Maximum number of high-impedance PC boards connected in series: 8
- Minimum distance between T-connectors: 3 feet
- Maximum length of cable with high-impedance PC boards connected in series: 1,000 feet
- Maximum distance between two active hubs when no high-impedance PC boards are connected in series between the hubs: 2,000 feet

RULES

- Do not use passive hubs with high-impedance PC, bus topology networks. You can connect additional workstations to a bus topology network by linking bus cables via active links.
- Connect stations to cables with T-connectors.
- Do not use a drop cable between a T-connector and a station.
- Terminate both ends of each length of cable with either an active hub or a terminator.
- Do not create loops. A loop is created when a cable coming from an active hub passes through other hubs and then connects back into the original hub.

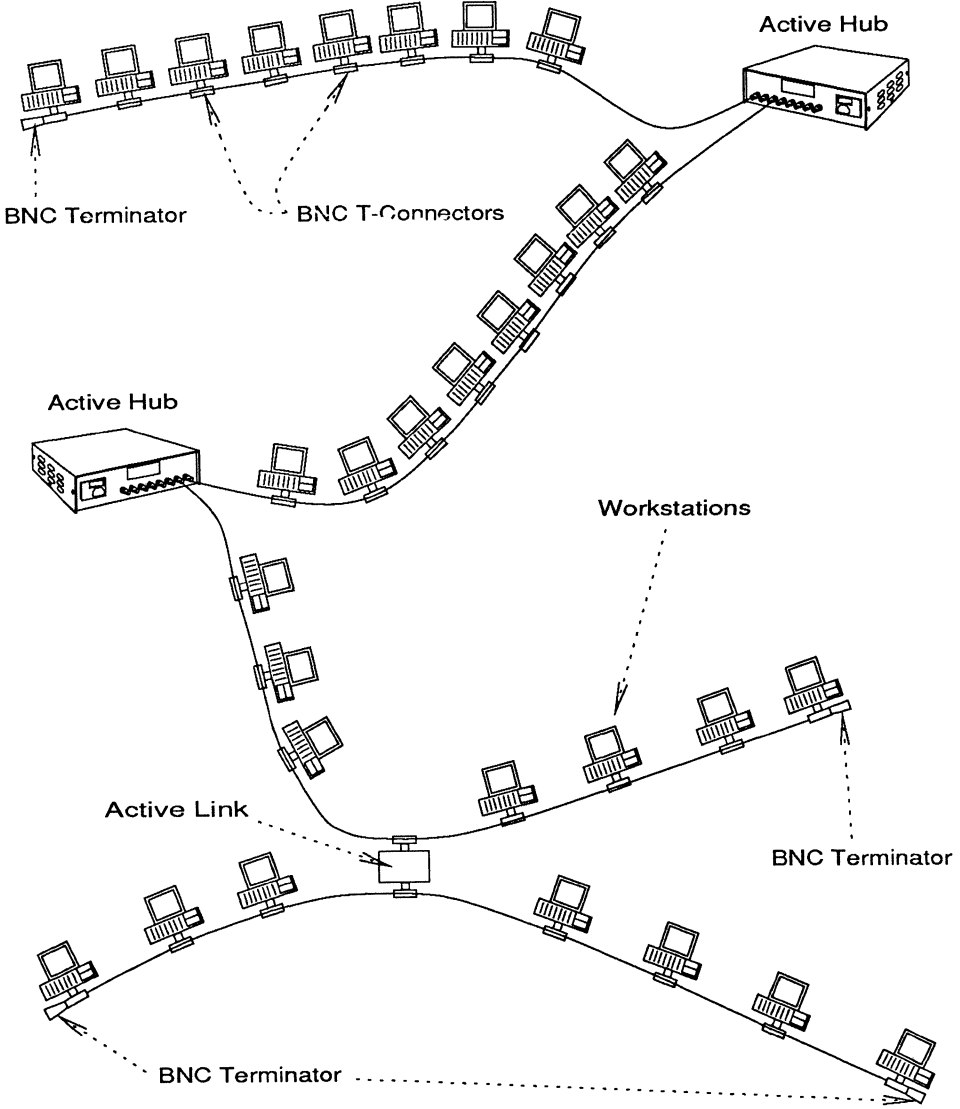


Figure 1.4
Network Layout Using High-Impedance PC Boards

NETWORK LAYOUT USING HIGH-IMPEDANCE AND LOW-IMPEDANCE BOARDS ON THE SAME NETWORK

Bus networks using high-impedance PC boards and star networks using low-impedance boards can be combined on the same network if they are connected by an active hub. See Figure 1.5.

If necessary, a high-impedance PC board can be connected to a hub in place of a low-impedance board in a star network. Attach the high-impedance PC board to the coaxial cable with a T-connector and terminate the open end of the connector with a 93-ohm terminator.

However, a low-impedance board cannot be used in place of a high-impedance PC board in a bus network.

If, sometime after installation, a number of stations are relocated on the network and a low-impedance board is inadvertently placed in the middle of a series of high-impedance PC boards, network communication is hampered.

Therefore, if you plan to use both high-impedance and low-impedance boards on the same network, make an accurate record of where you install each kind of board so that relocating stations won't hamper network communication.

For rules on using low-impedance boards on the network, see page 1-6. For rules on using high-impedance boards, see page 1-9.

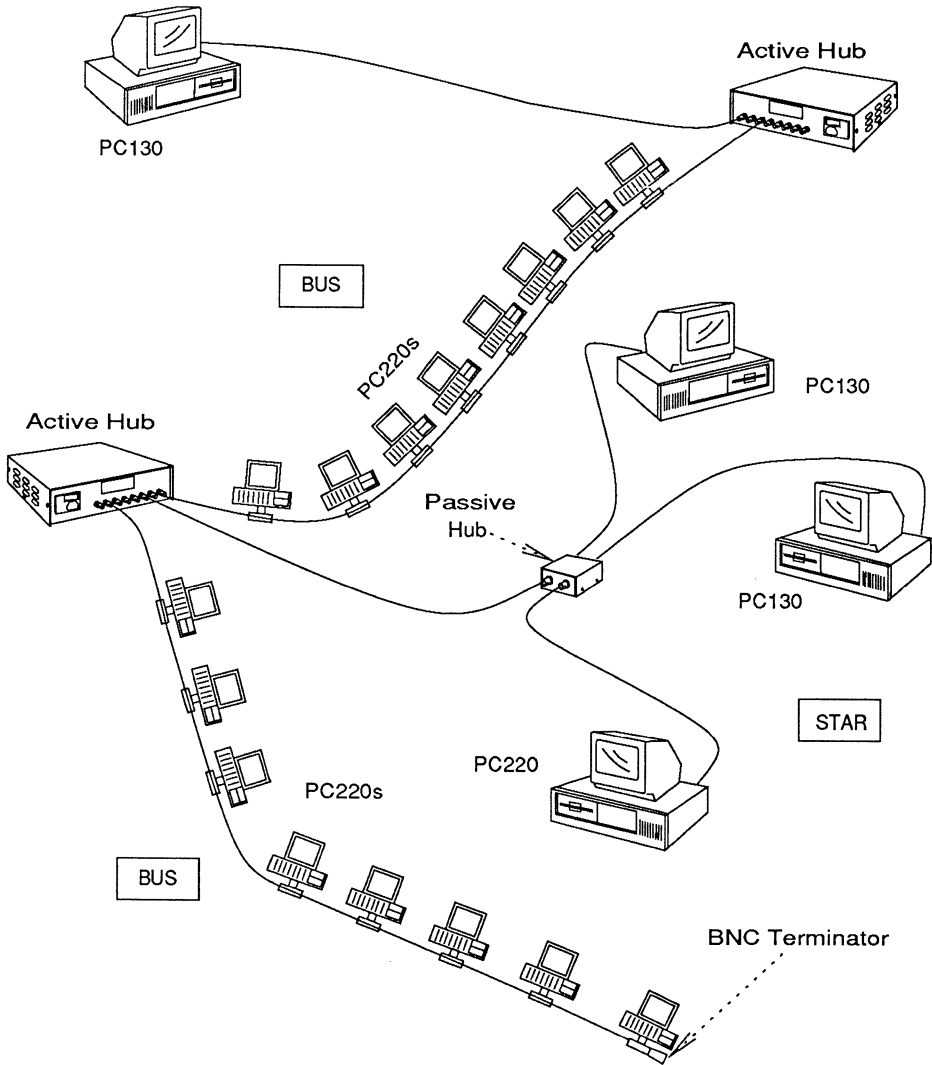


Figure 1.5
Network Layout Using
High-Impedance and Low-Impedance Boards
on the Same Network

PLANNING YOUR NETWORK LAYOUT

Now that you are familiar with Standard Microsystems ARCNET hardware and understand how it can be used to create a network, you are ready to plan your own network. As you plan, consider the following questions:

- How large an area must the cabling system cover?
- How many stations (servers, bridges, and workstations) will be connected to the cabling system?
- How far apart will the stations be?
- What potential growth in size and number of connections must the system accommodate?
- Which station addresses should be assigned? (See page 2-15 for instructions for setting station addresses for PC boards and page 3-9 for PS boards.)

After careful consideration of the above information, complete the following steps.

- 1) Draw your network plan, labeling each piece of hardware that will be included (stations, cables, active and passive hubs, terminators). Keep in mind the rules given in the preceding sections.
- 2) Measure the distances between all components and make sure they fall within the appropriate minimum and maximum specifications.
- 3) Record these distances on your sketch.
- 4) Ensure that the locations you choose for file servers have adequate room for any peripherals (printers, external disk drives, and so forth) that will be attached.
- 5) Refer to this network plan in Chapter 4 to cable your network.

SUMMARY

This chapter has described the following:

- How to identify Standard Microsystems ARCNET hardware components
- How to fit hardware components into a network layout
- How to plan your network

If you are installing low- or high-impedance PC boards in your network stations, go to Chapter 2. If you are installing low-impedance PS boards in your network stations, go to Chapter 3.

2 SETTING AND INSTALLING ARCNET PC NETWORK BOARDS

This chapter explains how to make the following settings on either low- or high-impedance PC boards:

- Configuration option (interrupt line, base I/O address, and memory buffer address)
- Station address
- Remote Reset (if necessary)

This chapter also explains how to install ARCNET PC network boards in network stations.

LABELING ARCNET PC NETWORK BOARDS

Refer to the network sketch you made in Chapter 1 and the worksheets you filled out when you generated the NetWare operating system or shell for each station. (The worksheets are in the main NetWare installation manual.) Then, using an adhesive label or some other form of identification, label each ARCNET network board with the following information:

- The specific network station into which the network board will be inserted (for example, "Rich's station by the main door").
- The configuration option.
- If the network board will be installed in a server or bridge, the configuration option is the one you chose when you generated the NetWare operating system. Network boards installed in the same server or bridge cannot have the same configuration option number. However, network boards installed in different servers or bridges can.
- If the network board will be installed in a workstation, the configuration option is the one you chose when you generated the NetWare shell for that particular workstation.
- The station address.

LOCATING COMPONENTS USED TO MAKE SETTINGS ON ARCNET PC NETWORK BOARDS

Refer to the following figures to locate the switches you will use to make settings on your ARCNET PC network boards. You will need to refer back to these figures in subsequent instructions.

- If you have PC130 boards, refer to Figure 2.1.
- If you have PC220 boards, refer to Figure 2.2 on page 2-4.

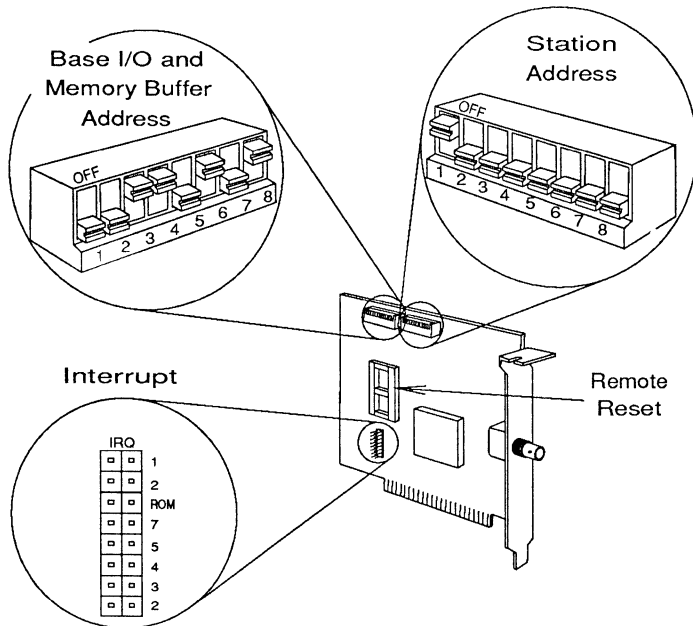


Figure 2.1
ARCNET PC130 Board Components

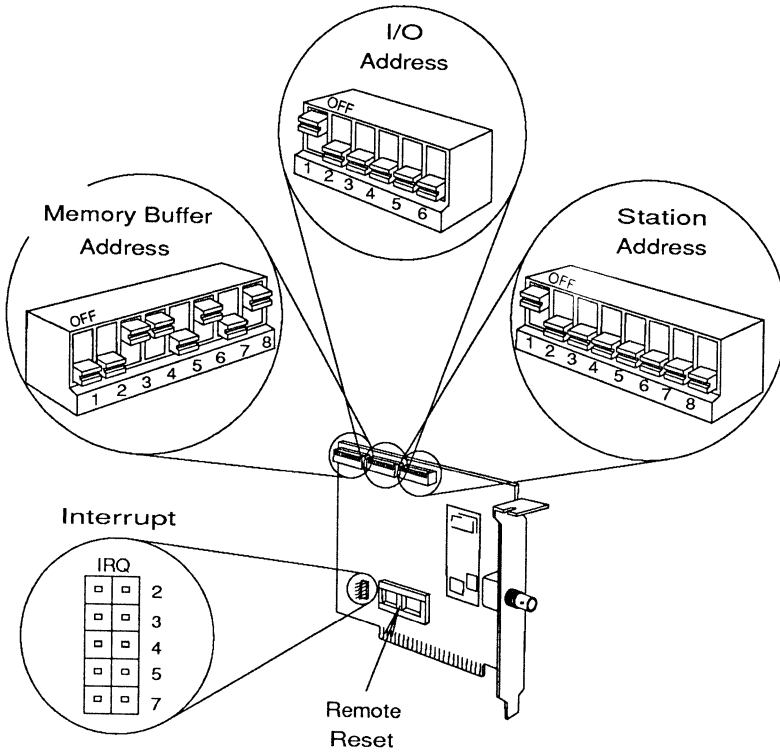


Figure 2.2
ARCNET PC220 Board Components

SETTING THE CONFIGURATION OPTION

The configuration option for the ARCNET PC boards includes three settings:

- Interrupt line (set with jumpers)
- Base I/O address (set with switch block)
- Memory buffer address (set with switch block)

The configuration option should be recorded on the tags that you attached to each network board when you labeled them. Refer to these tags and to Figures 2.1, 2.2, 2.3, and 2.4 (pages 2-3, 2-4, 2-6, and 2-11, respectively) to set each network board according to the option you chose.

If your board has slide switches, slide each switch to the side where the dark tab is shown. If your board has rocker switches, depress each rocker switch on the side where the dark tab is shown.

Config. Option	Base I/O Address	Memory Buffer Address	Interrupt Setting
0	<p>2E0h</p>	<p>D0000h</p>	<p>IRQ 2</p>
1	<p>2F0h</p>	<p>D0000h</p>	<p>IRQ 2</p>
2	<p>2E0h</p>	<p>D0000h</p>	<p>IRQ 3</p>
3	<p>2F0h</p>	<p>D0000h</p>	<p>IRQ 3</p>

Figure 2.3
PC130 Configuration Option Table

Config. Option	Base I/O Address	Memory Buffer Address	Interrupt Setting
4	<p>2E0h</p>	<p>D0000h</p>	<p>IRQ 4</p>
5	<p>2F0h</p>	<p>D0000h</p>	<p>IRQ 4</p>
6	<p>2E0h</p>	<p>D0000h</p>	<p>IRQ 5</p>
7	<p>2F0h</p>	<p>D0000h</p>	<p>IRQ 5</p>

Figure 2.3 (Continued)
PC130 Configuration Option Table

Config. Option	Base I/O Address	Memory Buffer Address	Interrupt Setting
8	<p>2E0h</p>	<p>D0000h</p>	<p>IRQ 7</p>
9	<p>2F0h</p>	<p>D0000h</p>	<p>IRQ 7</p>
10	<p>300h</p>	<p>C0000h</p>	<p>IRQ 2</p>
11	<p>2F0h</p>	<p>C0000h</p>	<p>IRQ 3</p>

Figure 2.3 (Continued)
PC130 Configuration Option Table

Config. Option	Base I/O Address	Memory Buffer Address	Interrupt Setting
12	<p>2E0h</p>	<p>C0000h</p>	<p>IRQ 4</p>
13	<p>2E0h</p>	<p>C0000h</p>	<p>IRQ 5</p>
14	<p>300h</p>	<p>D0000h</p>	<p>IRQ 7</p>
15	<p>300h</p>	<p>E0000h</p>	<p>IRQ 2</p>

Figure 2.3 (Continued)
PC130 Configuration Option Table

Config. Option	Base I/O Address	Memory Buffer Address	Interrupt Setting
16	<p>2F0h</p>	<p>E0000h</p>	<p>IRQ 3</p>
17	<p>2E0h</p>	<p>E0000h</p>	<p>IRQ 4</p>

Figure 2.3 (Continued)
PC130 Configuration Option Table

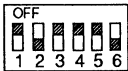

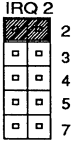
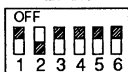

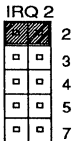
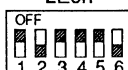


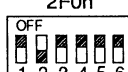
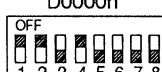



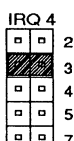
Config. Option	Base I/O Address	Memory Buffer Address	Interrupt Setting
0	2E0h 	D0000h 	IRQ 2 
1	2F0h 	D0000h 	IRQ 2 
2	2E0h 	D0000h 	IRQ 3 
3	2F0h 	D0000h 	IRQ 3 
4	2E0h 	D0000h 	IRQ 4 

Figure 2.4
PC220 Configuration Option Table

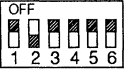
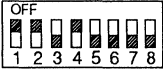
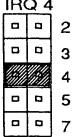
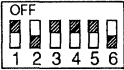
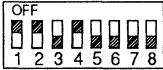
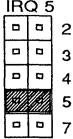
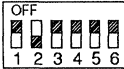

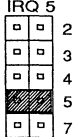
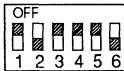

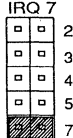
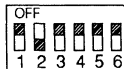

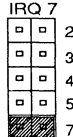
Config. Option	Base I/O Address	Memory Buffer Address	Interrupt Setting
5	2F0h 	D0000h 	IRQ 4 
6	2E0h 	D0000h 	IRQ 5 
7	2F0h 	D0000h 	IRQ 5 
8	2E0h 	D0000h 	IRQ 7 
9	2F0h 	D0000h 	IRQ 7 

Figure 2.4 (Continued)
PC220 Configuration Option Table

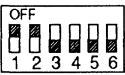
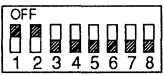
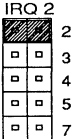


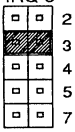
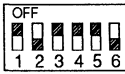
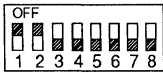

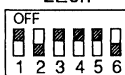

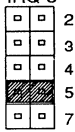
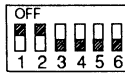
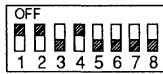
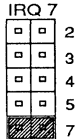
Config. Option	Base I/O Address	Memory Buffer Address	Interrupt Setting
10	300h 	C0000h 	IRQ 2 
11	2F0h 	D0000h 	IRQ 3 
12	2E0h 	C0000h 	IRQ 4 
13	2E0h 	C0000h 	IRQ 5 
14	300h 	D0000h 	IRQ 7 

Figure 2.4 (Continued)
PC220 Configuration Option Table

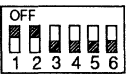

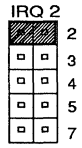
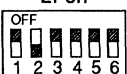

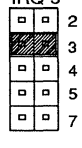
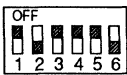
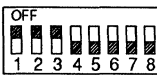
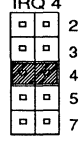
Config. Option	Base I/O Address	Memory Buffer Address	Interrupt Setting
15	300h 	E0000h 	IRQ 2 
16	2F0h 	E0000h 	IRQ 3 
17	2E0h 	E0000h 	IRQ 4 

Figure 2.4 (Continued)
PC220 Configuration Option Table

SETTING STATION ADDRESSES

Each ARCNET network board must have a unique station address. There are 255 addresses available.

To organize your network, assign lower-digit addresses to servers and bridges and reserve a block of unassigned addresses to allow for expansion.

For example, to set up a network with one file server and one bridge, allowing for six more of each in the future, assign station address 1 to your present file server and reserve station addresses 2 through 7 for future servers. Similarly, assign station address 8 to the bridge, and reserve station addresses 9 through 14 for future bridges. Start workstation addresses at 15.

Determine the station address by setting the eight switches on the station address switch block. (See Figures 2.1 and 2.2 on pages 2-3 and 2-4.) To set a unique station address for each board, refer to the tables in Figure 2.5 beginning on the next page and set the switches on the station address switch block to the address you have chosen.

If your board has slide switches, slide each switch to the side where the dark tab is shown. If your board has rocker switches, depress each rocker switch on the side where the dark tab is shown.

IMPORTANT:

You must not use address 0 (zero) for any network station. This is a broadcast address.

Add.	Switch Block settings	Add.	Switch Block settings	Add.	Switch Block settings
1 01h		11 0Bh		21 15h	
2 02h		12 0Ch		22 16h	
3 03h		13 0Dh		23 17h	
4 04h		14 0Eh		24 18h	
5 05h		15 0Fh		25 19h	
6 06h		16 10h		26 1Ah	
7 07h		17 11h		27 1Bh	
8 08h		18 12h		28 1Ch	
9 09h		19 13h		29 1Dh	
10 0Ah		20 14h		30 1Eh	

Figure 2.5
Station Address Settings

Add.	Switch Block settings	Add.	Switch Block settings	Add.	Switch Block settings
31 1Fh		41 29h		51 33h	
32 20h		42 2Ah		52 34h	
33 21h		43 2Bh		53 35h	
34 22h		44 2Ch		54 36h	
35 23h		45 2Dh		55 37h	
36 24h		46 2Eh		56 38h	
37 25h		47 2Fh		57 39h	
38 26h		48 30h		58 3Ah	
39 27h		49 31h		59 3Bh	
40 28h		50 32h		60 3Ch	

Figure 2.5 (Continued)
Station Address Settings

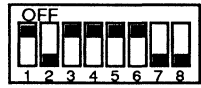
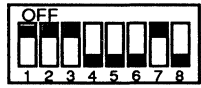
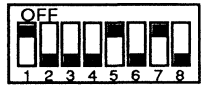
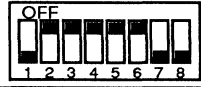
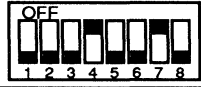
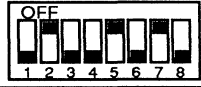
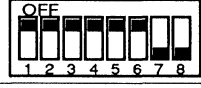
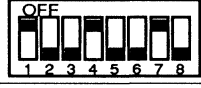

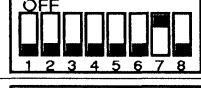

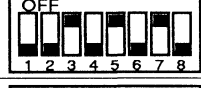


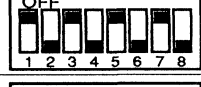



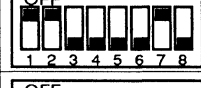
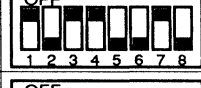
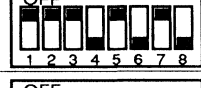
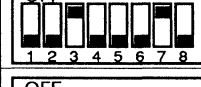
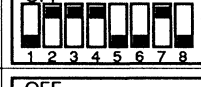
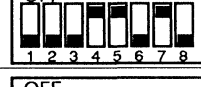
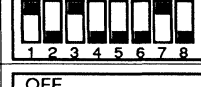

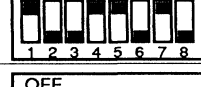



Add.	Switch Block settings	Add.	Switch Block settings	Add.	Switch Block settings
61 3Dh		71 47h		81 51h	
62 3Eh		72 48h		82 52h	
63 3Fh		73 49h		83 53h	
64 40h		74 4Ah		84 54h	
65 41h		75 4Bh		85 55h	
66 42h		76 4Ch		86 56h	
67 43h		77 4Dh		87 57h	
68 44h		78 4Eh		88 58h	
69 45h		79 4Fh		89 59h	
70 46h		80 50h		90 5Ah	

Figure 2.5 (Continued)
Station Address Settings


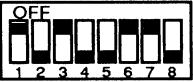
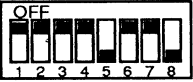
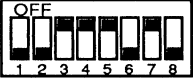
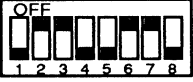
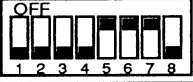
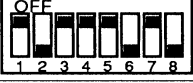
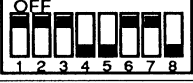
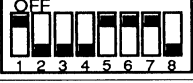
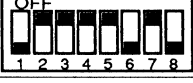
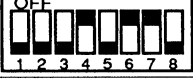
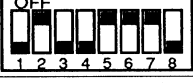
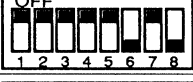
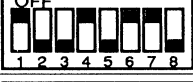

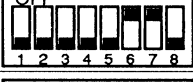
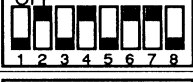
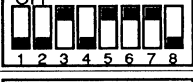
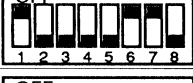
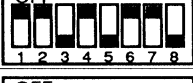
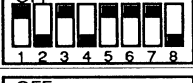



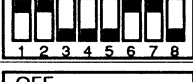
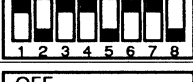
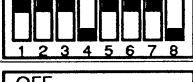
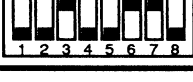
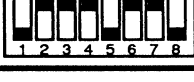
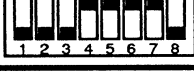
Add.	Switch Block settings	Add.	Switch Block settings	Add.	Switch Block settings
91 5Bh		101 65h		111 6Fh	
92 5Ch		102 66h		112 70h	
93 5Dh		103 67h		113 71h	
94 5Eh		104 68h		114 72h	
95 5Fh		105 69h		115 73h	
96 60h		106 6Ah		116 74h	
97 61h		107 6Bh		117 75h	
98 62h		108 6Ch		118 76h	
99 63h		109 6Dh		119 77h	
100 64h		110 6Eh		120 78h	

Figure 2.5 (Continued)
Station Address Settings



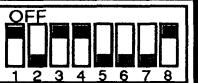

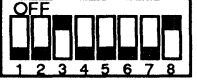

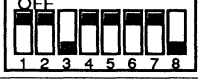
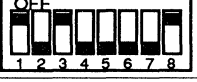

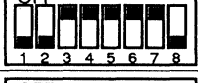
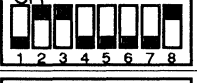
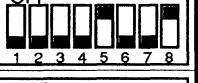
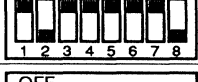

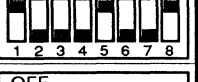

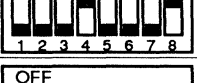
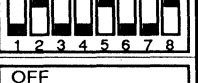
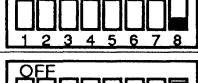
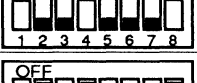
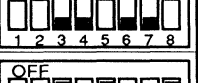
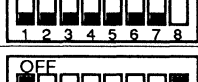

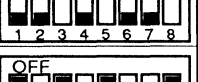
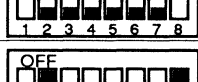
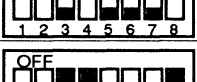
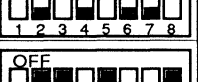
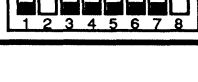
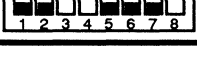
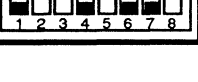
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122 7Ah		132 84h		142 8Eh	
123 7Bh		133 85h		143 8Fh	
124 7Ch		134 86h		144 90h	
125 7Dh		135 87h		145 91h	
126 7Eh		136 88h		146 92h	
127 7Fh		137 89h		147 93h	
128 80h		138 8Ah		148 94h	
129 81h		139 8Bh		149 95h	
130 82h		140 8Ch		150 96h	

Figure 2.5 (Continued)
Station Address Settings

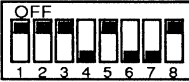
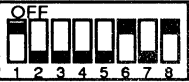
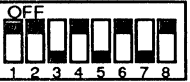
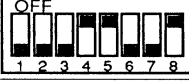
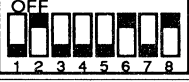

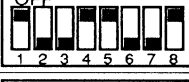
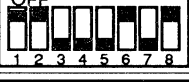
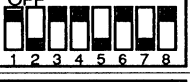
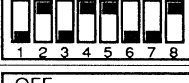


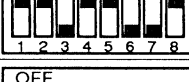
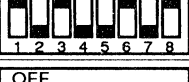
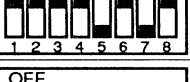
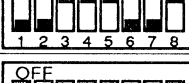
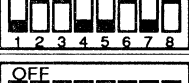
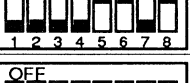
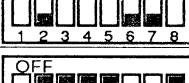
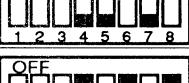
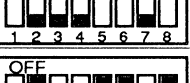
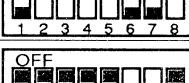
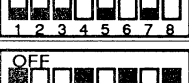
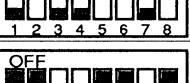
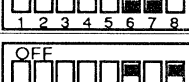
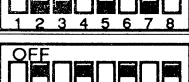
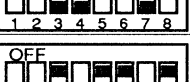
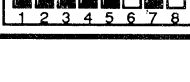
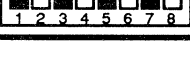
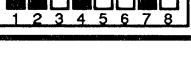
Addr.	Switch Block settings	Addr.	Switch Block settings	Addr.	Switch Block settings
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152 98h		162 A2h		172 ACh	
153 99h		163 A3h		173 ADh	
154 9Ah		164 A4h		174 AEh	
155 9Bh		165 A5h		175 AFh	
156 9Ch		166 A6h		176 B0h	
157 9Dh		167 A7h		177 B1h	
158 9Eh		168 A8h		178 B2h	
159 9Fh		169 A9h		179 B3h	
160 A0h		170 AAh		180 B4h	

Figure 2.5 (Continued)
Station Address Settings

Addr.	Switch Block settings	Addr.	Switch Block settings	Addr.	Switch Block settings
181 B5h		191 BFh		201 C9h	
182 B6h		192 C0h		202 CAh	
183 B7h		193 C1h		203 CBh	
184 B8h		194 C2h		204 CCh	
185 B9h		195 C3h		205 CDh	
186 BAh		196 C4h		206 CEh	
187 BBh		197 C5h		207 CFh	
188 BCh		198 C6h		208 D0h	
189 BDh		199 C7h		209 D1h	
190 BEh		200 C8h		210 D2h	

Figure 2.5 (Continued)
Station Address Settings

Add.	Switch Block settings	Add.	Switch Block settings	Add.	Switch Block settings
211 D3h		221 DDh		231 E7h	
212 D4h		222 DEh		232 E8h	
213 D5h		223 DFh		233 E9h	
214 D6h		224 E0h		234 EAh	
215 D7h		225 E1h		235 EBh	
216 D8h		226 E2h		236 ECh	
217 D9h		227 E3h		237 EDh	
218 DAh		228 E4h		238 EEh	
219 DBh		229 E5h		239 EFh	
220 DCh		230 E6h		240 F0h	

Figure 2.5 (Continued)
Station Address Settings

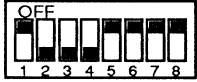
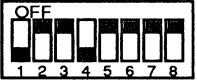
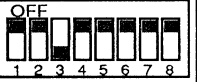
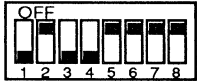
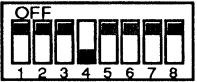
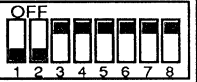
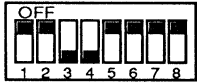
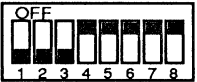
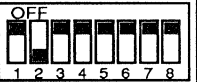
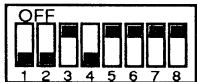
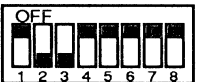
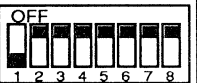

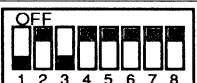
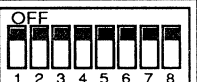
Addr.	Switch Block settings	Addr.	Switch Block settings	Addr.	Switch Block settings
241 F1h		246 F6h		251 FBh	
242 F2h		247 F7h		252 FCh	
243 F3h		248 F8h		253 FDh	
244 F4h		249 F9h		254 FEh	
245 F5h		250 FAh		255 FFh	

Figure 2.5 (Continued)
Station Address Settings

SETTING REMOTE RESET

The Remote Reset feature allows workstations to boot from a network disk. (This feature does not apply to file servers or bridges.)

If you plan to use this feature, enable Remote Reset on each workstation's ARCNET network board by inserting a Remote Reset PROM into the Remote Reset PROM socket. Locate the Remote Reset PROM socket by referring to Figures 2.1 and 2.2 on pages 2-4 and 2-5; then refer to Figure 2.6 and complete the following steps.

- 1) Position the Remote Reset PROM over the Remote Reset PROM socket, aligning the notch on the PROM with the notch on the socket.
- 2) Align the pins on the PROM with the pin receptacles on the socket.
- 3) Gently push the PROM all the way down into the socket, being careful not to bend the pins.

NOTE:

If your board has a ROM jumper (such as on the PC130 board, Figure 2.1 on page 2-3), you must place a short plug on the jumper to activate Remote Reset.

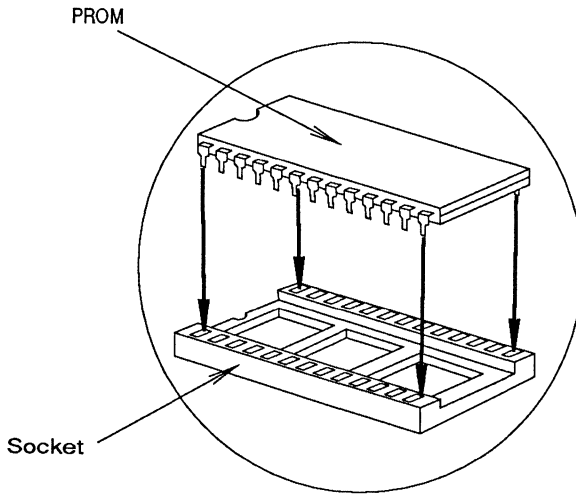


Figure 2.6
Enabling Remote Reset

INSERTING ARCNET PC NETWORK BOARDS INTO NETWORK STATIONS

After you have made the proper settings on your network boards, insert them into the appropriate network stations by completing the following steps:

- 1) Turn off and unplug each station and peripheral.
- 2) Remove the cover of each station according to the manufacturer's instructions.
- 3) For each network station, remove the metal dummy bracket from any empty slot and insert the ARCNET network board as shown in Figures 2.7 and 2.8.

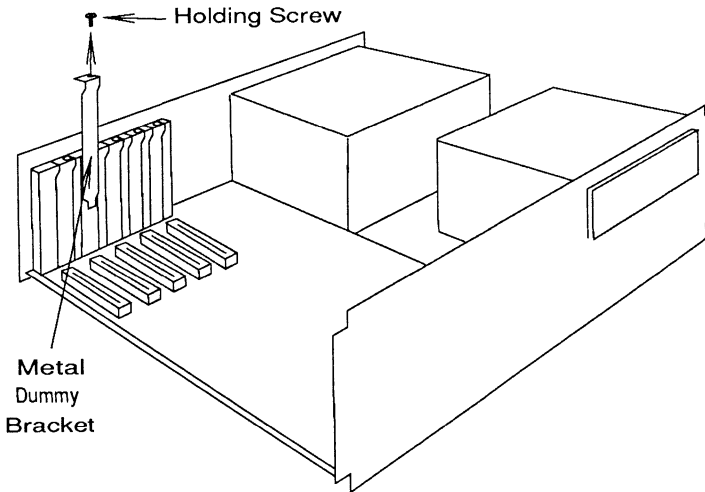


Figure 2.7
Removing a Metal Dummy Bracket from a Network Station

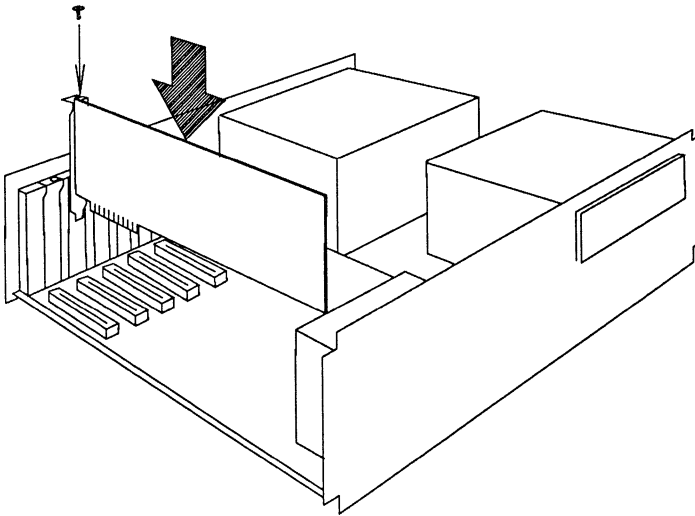


Figure 2.8
Inserting an ARCNET PC Network Board
into a Network Station

After you have installed the network boards, plug in and turn on each station and peripheral. Replace the covers of your stations at this time, unless you first want to test the network to verify that everything is working properly.

SUMMARY

This chapter has explained how to set ARCNET PC network boards and install them in network stations.

For instructions on how to install and set ARCNET PS network boards, go to Chapter 3.

For instructions on how to cable your network, go to Chapter 4.

3 INSTALLING AND SETTING ARCNET-PS110 NETWORK BOARDS

This chapter explains how to insert PS110 network boards into network stations.

It also explains how to make the following settings on PS110 boards:

- Configuration option (interrupt line, I/O base address, and RAM buffer address)
- Station address

LABELING STATIONS FOR ARCNET-PS110 NETWORK BOARDS

Refer to the network sketch you made in Chapter 1 and the worksheets you filled out when you generated the NetWare operating system or shell for each station. (The worksheets are in the main NetWare installation manual.) Then, using an adhesive label or some other form of identification, label each station that will contain an ARCNET-PS110 network board with the following information:

- A description of the network station and its location (for example, "Katalina's station by the window").
- The configuration combination (file server and bridge boards only).

For PS110 boards to be installed in servers or bridges, the configuration combination is the one you chose when you generated the NetWare operating system. PS110 boards installed in the same server or bridge cannot have the same configuration combination. However, PS110 boards installed in different servers or bridges can.

When you generated NetWare shells for workstations containing PS110 boards, you were not prompted to select a configuration combination, because NetWare shells for PS110 boards are "auto-configuring." A given shell can be used by a workstation regardless of the workstation's hardware configuration settings.

- The station address.

INSERTING ARCNET-PS110 NETWORK BOARDS INTO NETWORK STATIONS

To insert an ARCNET-PS110 network board into a Micro Channel bus computer, complete the following steps.

- 1) Turn off the computer.
- 2) Remove the cover according to the manufacturer's instructions.
- 3) Loosen the screw on the cover of any empty expansion slot. Then pull out the expansion slot cover as shown in Figure 3.1. (Refer to the station shown in Figure 3.1 that most closely resembles the station you are using.)
- 4) Insert the PS110 network board into the expansion slot and press firmly. See Figure 3.2 on page 3-5.
- 5) Tighten the expansion slot screw so that the board will remain in place.
- 6) Replace the computer cover and tighten the cover screws.

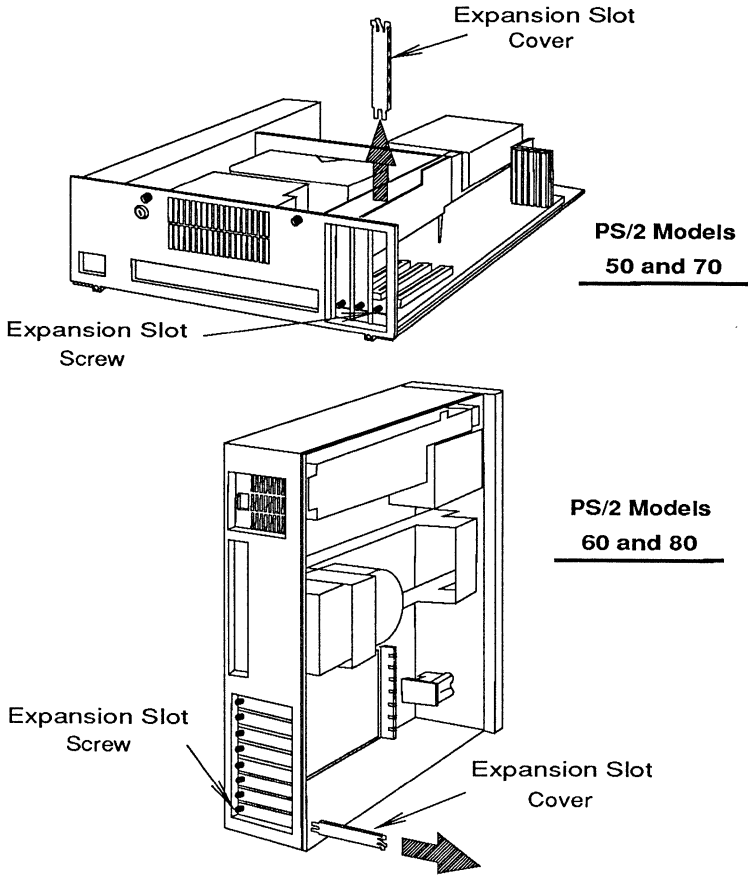


Figure 3.1
Removing an Expansion Slot Cover

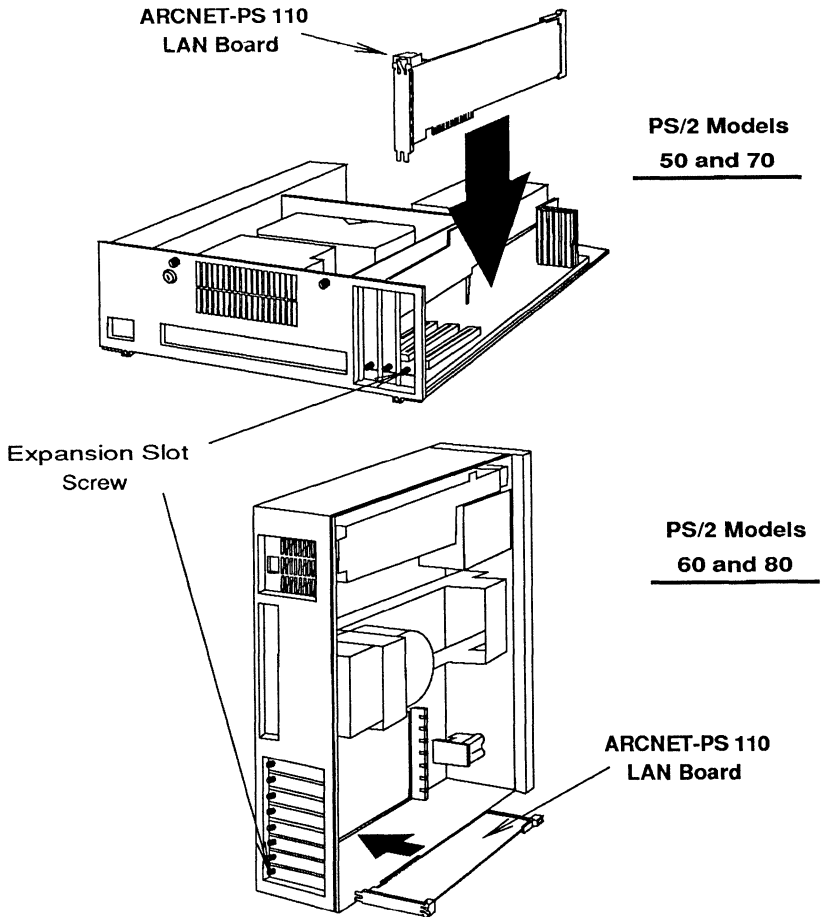


Figure 3.2
Inserting an ARCNET-PS110 (or RX-Net/2) Network Board
into a Network Station

SETTING THE ARCNET-PS110 NETWORK BOARD

The configuration and station address on ARCNET-PS110 boards are made by running the IBM *REFERENCE* diskette (or similar program) that was included with your computer, and not with the jumper and switch settings used for other types of network boards.

To set configurations and station addresses, you will need a working copy of the *REFERENCE* diskette (or similar set-up diskette) that was included with your computer. If you have not made a working copy of the *REFERENCE* diskette, do so before continuing with these instructions. You will also need the *LAN_DRV_100* diskette that you received with your PS110 board.

Boot your computer with the working copy of the *REFERENCE* diskette (or similar set-up diskette). After the computer is booted, follow the instructions for changing the settings as explained in the program. Do not automatically configure the system. (Configuring the system automatically does not allow you to select and verify the correct board settings.)

Because your *REFERENCE* diskette (or similar set-up diskette) does not initially contain the ARCNET-PS110 configuration files, you must copy them from an option diskette (the *LAN_DRV_100* diskette). To do so, highlight "copy an option diskette" and press <Enter>. Then set the new configuration option. The following subheadings explain how to set the configuration combination and station address on the ARCNET-PS110 board.

SETTING THE CONFIGURATION OPTION

The configuration option for the ARCNET PS110 board includes three settings:

- The IRQ (“Interrupt Level” on the screen)
- The I/O base address (the starting number of the “I/O Port Address Range” on the screen)
- The RAM buffer address (“RAM Buffer Base Address” on the screen)

You must change the settings on the screen as follows:

- For file servers and bridges, change the settings on the screen so that they match the station’s configuration option. (You labeled each file server or bridge with its configuration earlier in this chapter.)
- For workstations, choose any combination of configuration option settings (except as noted below) from the chart. The settings you make will be recognized by the workstation’s “auto-configuring” shell.

IMPORTANT:

Do not choose an interrupt level that conflicts with other boards in the station. (IBM’s *REFERENCE* diskette program allows duplicate interrupt levels in a given station, but NetWare does not.)

To change a configuration option setting on the “Change Configuration” screen, first use the Up- and Down-arrow keys to highlight the option. Then press the F5 and F6 keys to scroll through the settings until the correct one is on the screen. (You will save your changes later.)

The possible ARCNET-PS110 board configuration option settings are listed in the chart below.

	<u>IRQ</u>	<u>I/O Base Address</u>	<u>RAM Buffer Address</u>
Option 0:	2	02E0h	D000h
Option 1:	2	0350h	C000h
Option 2:	2	0300h	CC00h
Option 3:	2	01988h	DC00h
Option 4:	3	02E0h	D000h
Option 5:	3	0350h	C000h
Option 6:	3	0300h	CC00h
Option 7:	3	01988h	DC00h
Option 8:	4	02E0h	D000h
Option 9:	4	0350h	C000h
Option 10:	4	0300h	CC00h
Option 11:	4	01988h	DC00h
Option 12:	7	02E0h	D000h
Option 13:	7	0350h	C000h
Option 14:	7	0300h	CC00h
Option 15:	7	01988h	DC00h

NOTE:

For configuration options 0 through 3, the "Interrupt Level" setting will read "IRQ 2 (9)" on the screen.

Configuration options 12 through 15 are not available for NetWare v2.1.

SETTING THE STATION ADDRESS

Each ARCNET network board must have a unique station address. There are 255 addresses available.

To organize your network, assign lower-digit addresses to servers and bridges and reserve a block of unassigned addresses to allow for expansion.

For example, to set up a network with one file server and one bridge, allowing for six more of each in the future, assign station address 1 to your present file server and reserve station addresses 2 through 7 for future servers. Similarly, assign station address 8 to the bridge, and reserve station addresses 9 through 14 for future bridges. Start workstation addresses at 15.

IMPORTANT:

If your network consists of both PS110 boards and PC boards (described in Chapter 2), do not assign station addresses to the PS110 board that you assigned to PC boards. Remember, station addresses must be unique.

The ARCNET-PS110 station address setting consists of the “Node Address High Digit” and “Node Address Low Digit” settings on the “Change Configuration” screen. Change the settings on the screen, as instructed under this subheading, so that they correspond to the station’s address. (You labeled each station with its station address earlier in this chapter.)

- 1) To set the station address, convert it from a decimal number (1 to 255) to a hexadecimal number (01h to FFh). Use the conversion chart on the next two pages to determine the hexadecimal station address.

The “Node Address High Digit” on the screen represents the left-hand digit of the hexadecimal station address. The “Node Address Low Digit” represents the right-hand digit of the hexadecimal station address.

For example, if the decimal station address is 12, the hexadecimal station address is 0C. The “Node Address High Digit” is 0 (zero), and the “Node Address Low Digit” is C. If the decimal station address is 50, the hexadecimal station address is 32. The “Node Address High Digit” is 3 and the “Node Address Low Digit” is 2.

- 2) Use the Up- and Down-arrow keys to highlight the "Node Address High Digit" setting on the screen, and then use the F5 and F6 keys to scroll through the digits until the correct one is on the screen.
- 3) Repeat this process for the "Node Address Low Digit" setting on the screen. (You will save your changes later.)

HEXADECIMAL CONVERSION CHART

<u>Decimal</u>	<u>Hexa- decimal</u>	<u>Decimal</u>	<u>Hexa- decimal</u>	<u>Decimal</u>	<u>Hexa- decimal</u>	<u>Decimal</u>	<u>Hexa- decimal</u>
		27	1B	54	36	81	51
1	01	28	1C	55	37	82	52
2	02	29	1D	56	38	83	53
3	03	30	1E	57	39	84	54
4	04	31	1F	58	3A	85	55
5	05	32	20	59	3B	86	56
6	06	33	21	60	3C	87	57
7	07	34	22	61	3D	88	58
8	08	35	23	62	3E	89	59
9	09	36	24	63	3F	90	5A
10	0A	37	25	64	40	91	5B
11	0B	38	26	65	41	92	5C
12	0C	39	27	66	42	93	5D
13	0D	40	28	67	43	94	5E
14	0E	41	29	68	44	95	5F
15	0F	42	2A	69	45	96	60
16	10	43	2B	70	46	97	61
17	11	44	2C	71	47	98	62
18	12	45	2D	72	48	99	63
19	13	46	2E	73	49	100	64
20	14	47	2F	74	4A	101	65
21	15	48	30	75	4B	102	66
22	16	49	31	76	4C	103	67
23	17	50	32	77	4D	104	68
24	18	51	33	78	4E	105	69
25	19	52	34	79	4F	106	6A
26	1A	53	35	80	50	107	6B

HEXADECIMAL CONVERSION CHART (Continued)

<u>Decimal</u>	<u>Hexa- decimal</u>	<u>Decimal</u>	<u>Hexa- decimal</u>	<u>Decimal</u>	<u>Hexa- decimal</u>	<u>Decimal</u>	<u>Hexa- decimal</u>
108	6C	141	8D	174	AE	206	CE
109	6D	142	8E	175	AF	207	CF
110	6E	143	8F	176	B0	208	D0
111	6F	144	90	177	B1	209	D1
112	70	145	91	178	B2	210	D2
113	71	146	92	179	B3	211	D3
114	72	147	93	180	B4	212	D4
115	73	148	94	181	B5	212	D4
116	74	149	95	182	B6	213	D5
117	75	150	96	183	B7	214	D6
118	76	151	97	184	B8	215	D7
119	77	152	98	185	B9	217	D9
120	78	153	99	186	BA	218	DA
121	79	154	9A	187	BB	219	DB
122	7A	155	9B	188	BC	220	DC
123	7B	156	9C	189	BD	221	DD
124	7C	157	9D	190	BE	222	DE
125	7D	158	9E	191	BF	223	DF
126	7E	159	9F	192	C0	224	E0
127	7F	160	A0	193	C1	225	E1
128	80	161	A1	194	C2	226	E2
129	81	162	A2	195	C3	227	E3
130	82	163	A3	196	C4	228	E4
131	83	164	A4	197	C5	229	E5
132	84	165	A5	198	C6	230	E6
133	85	166	A6	198	C6	231	E7
134	86	167	A7	199	C7	232	E8
135	87	168	A8	200	C8	233	E9
136	88	169	A9	201	C9	234	EA
137	89	170	AA	202	CA	235	EB
138	8A	171	AB	203	CB	236	EC
139	8B	172	AC	204	CC	237	ED
140	8C	173	AD	205	CD	238	EE

HEXADECIMAL CONVERSION CHART (Continued)

<u>Decimal</u>	<u>Hexa- decimal</u>	<u>Decimal</u>	<u>Hexa- decimal</u>	<u>Decimal</u>	<u>Hexa- decimal</u>	<u>Decimal</u>	<u>Hexa- decimal</u>
239	EF	243	F3	247	F7	251	FB
240	F0	244	F4	248	F8	252	FC
241	F1	245	F5	249	F9	253	FD
242	F2	246	F6	250	FA	254	FE
						255	FF

SETTING THE NETWORK TIMEOUT PARAMETER

The “Network Timeout Parameter” setting for the PS110 board must be “Normal” for all network stations. If necessary, use the Up- and Down-arrow keys to highlight the “Network Timeout Parameter” line, and use the F5 and F6 keys to change the setting to “Normal.”

SAVING THE ARCNET-PS110 BOARD SETTINGS

After you have set the configuration combination, station address, and network timeout parameter, press the F10 key to save the changes and exit the “Change Configuration” screen.

For each additional PS110 board in your network, return to “Setting the ARCNET-PS110 Network Board” on page 3-6 and repeat the instructions.

SUMMARY

This chapter has explained how to insert ARCNET-PS110 network boards into network stations and make settings on them.

The next chapter contains instructions for cabling your network.

4 CABLING YOUR NETWORK

Once you have set and installed the ARCNET network boards, you are ready to cable your system according to the plan you made in Chapter 1. Complete the following steps:

- 1) Place your network stations (servers, bridges, and workstations) and any peripherals (printers and disk subsystems) according to your network plan.
- 2) Place the hubs where they offer the most efficient use of cable.
- 3) Connect the stations and hubs together. You can use precut cable with BNC plugs already attached, or you can measure and cut your own cable and manually attach BNC plugs.
- 4) Terminate all unused ports on active and passive hubs with 93-ohm terminators.

After you have installed the cables and connected each station to the network cabling, return to your main NetWare manual.

APPENDIX A: ARCNET FILE SERVER BOARD SETTINGS FOR NETWARE 386

Use this appendix to set file server boards on NetWare 386 networks. Options are given for the ARCNET PC, PC02, PC100, PC110, PC120 (and RX-Net II), PC130, PC210, PC220, PC250, and PC260 network boards:

- Interrupt line
- Base I/O address
- Memory buffer address
- Station address

One page is devoted to each board with an illustration of the board, where the setting locations are for the various settings, and the setting options.

IMPORTANT:

Disable the Boot ROM on all ARCNET file server boards by removing the jumper plug (if there is one) from the ROM or ROM Enable jumper. Remove any Remote Reset PROMs.

To set the PS110 and RX-Net/2 boards, run your *REFERENCE* or *SETUP* diskette and follow the instructions to copy the option diskette that came with your board. Then run the *REFERENCE* or *SETUP* diskette to set the board.

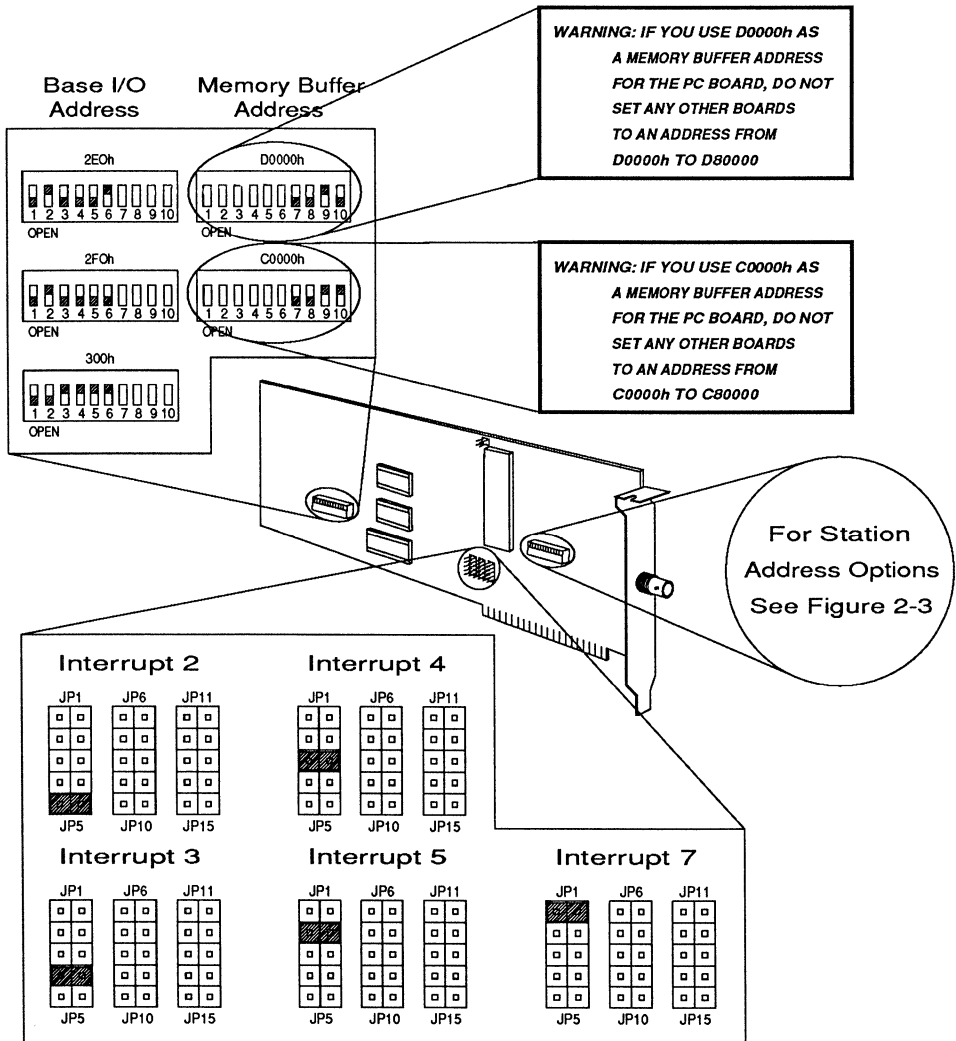


Figure A.1
ARCNET PC and PC02 Board Components and Setting Options

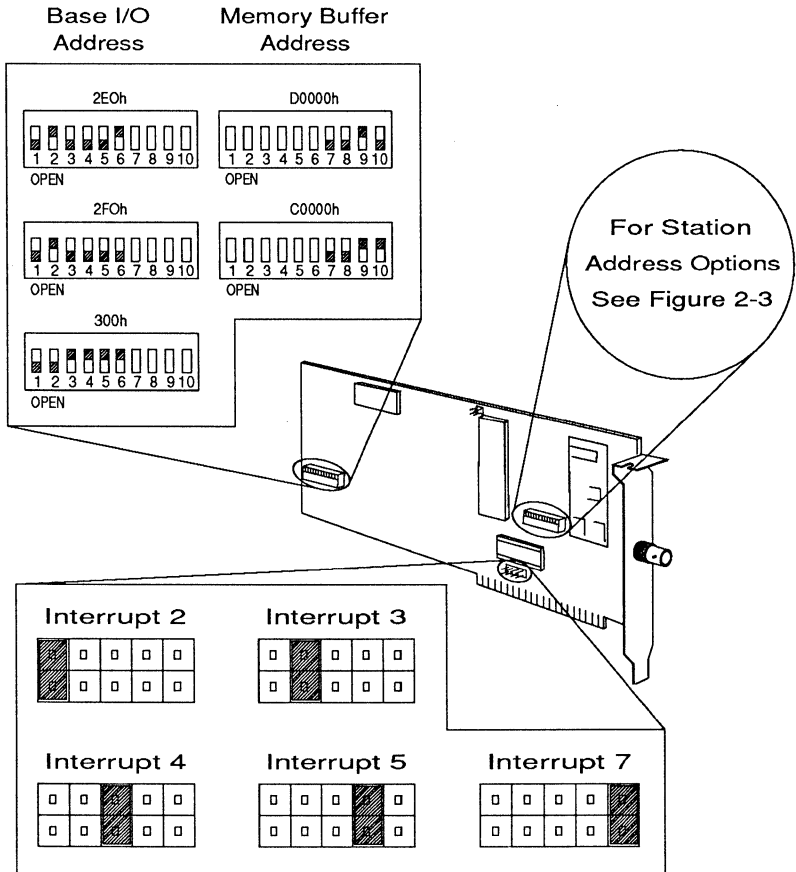


Figure A.2
ARCNET PC100 Board Components and Setting Options

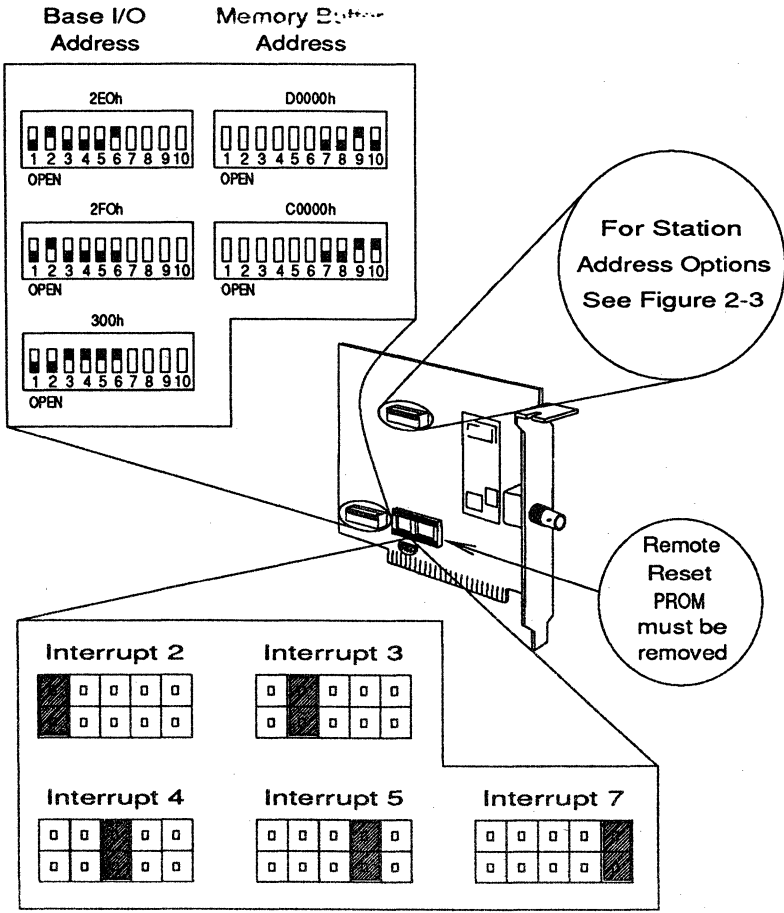


Figure A.3
ARCNET PC110 and PC210 Board Components and Setting Options

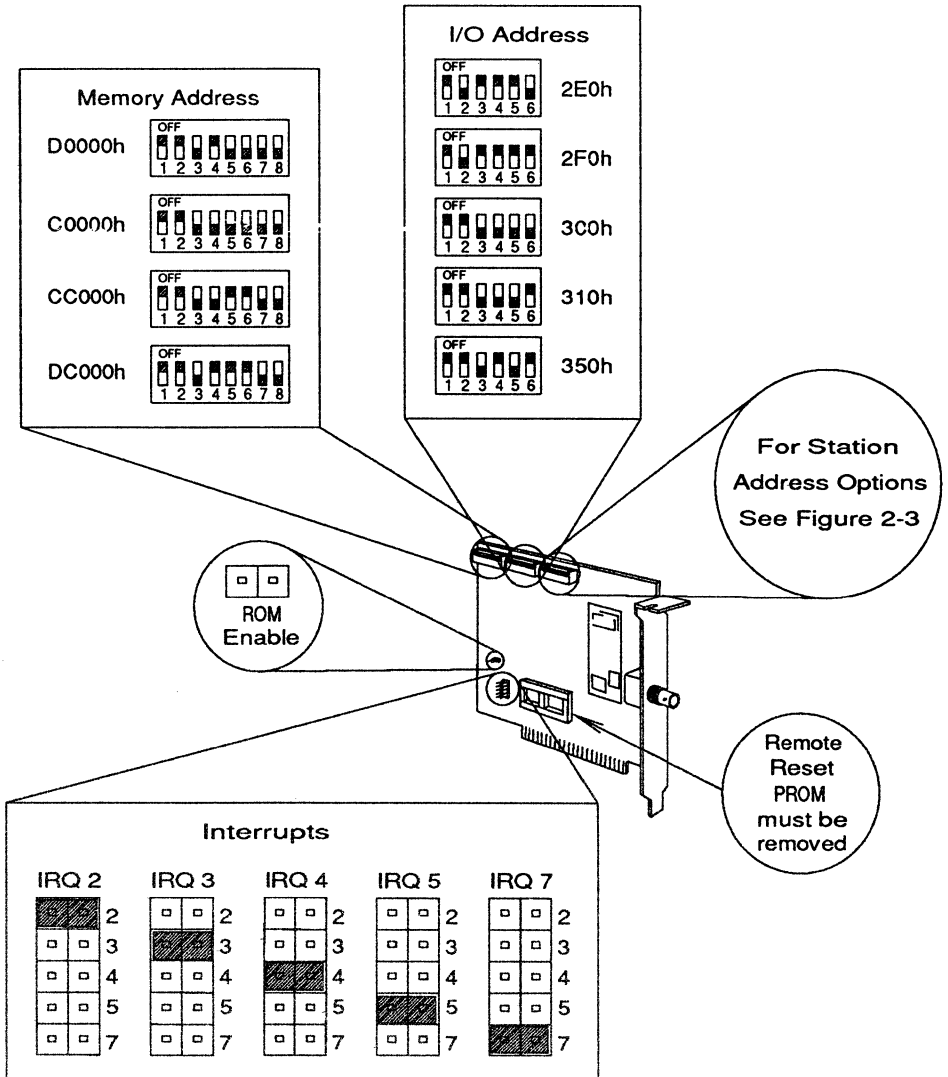


Figure A.4
ARCNET PC120 (and RX-Net II) Board Components and Setting Options

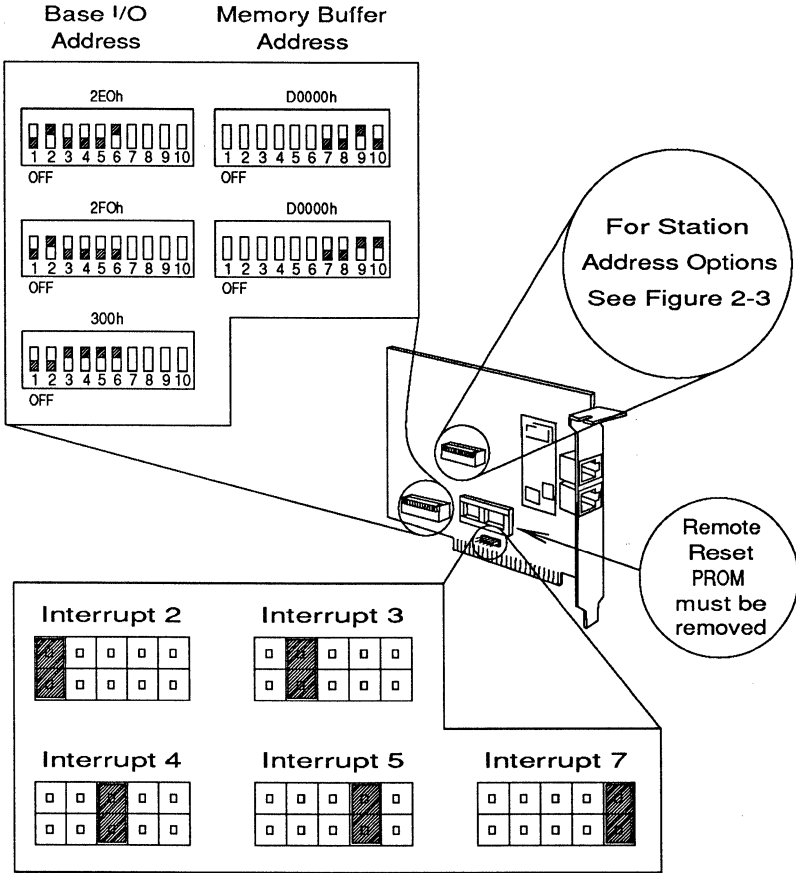


Figure A.5
ARCNET PC250 Board Components and Setting Options

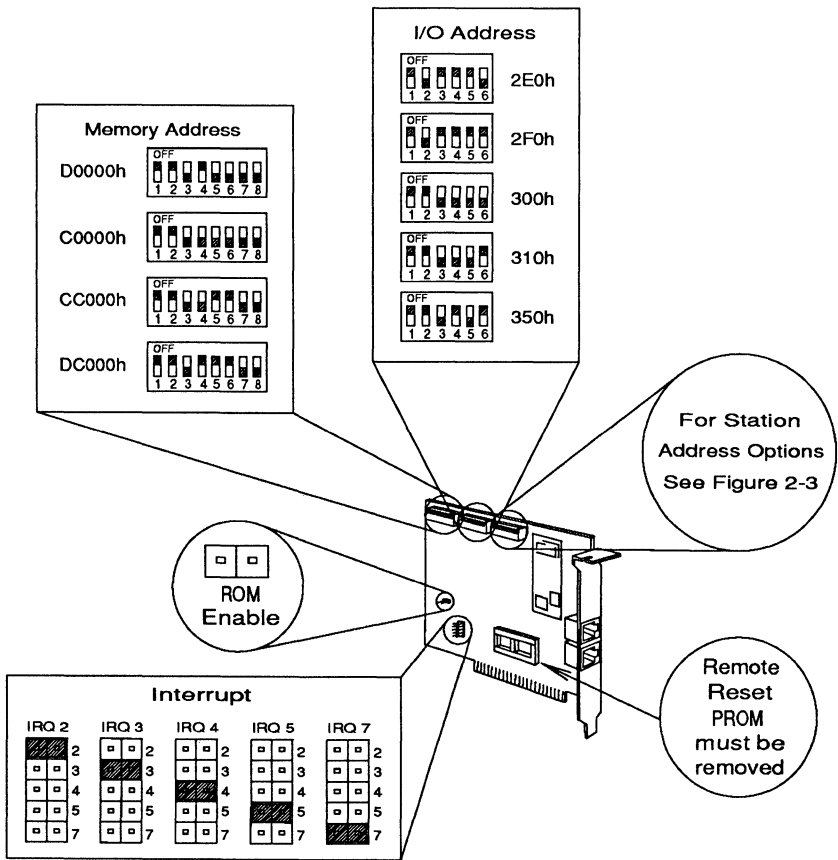


Figure A.6
ARCNET PC260 Board Components and Setting Options

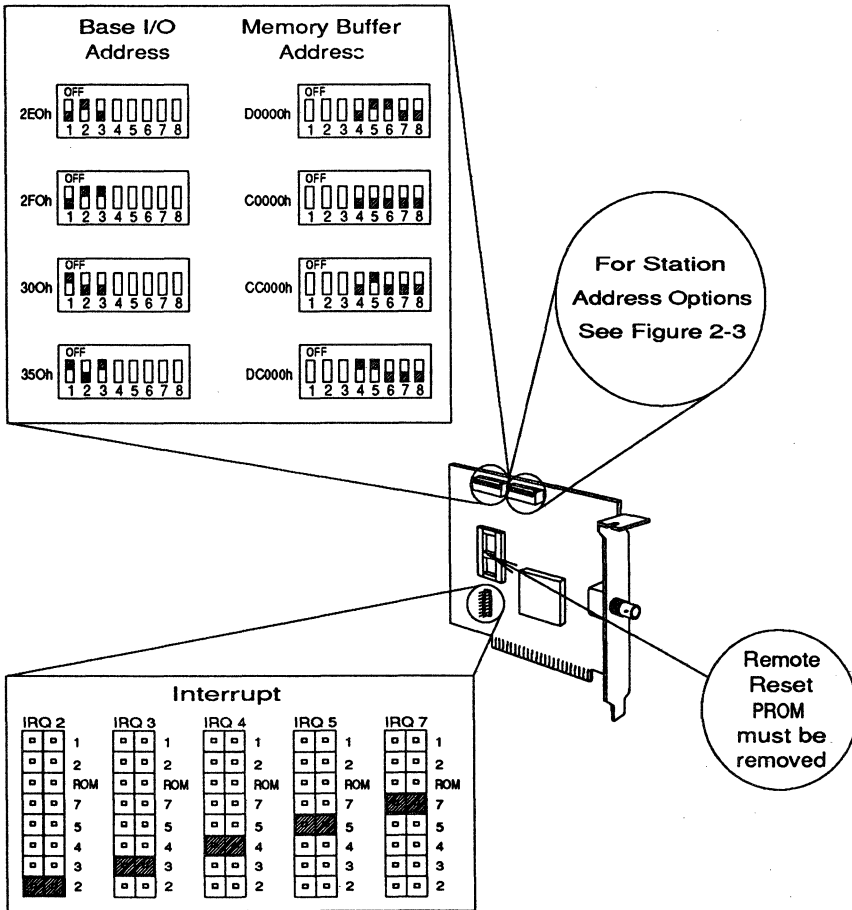


Figure A.7
PC130 Board Components and Setting Options

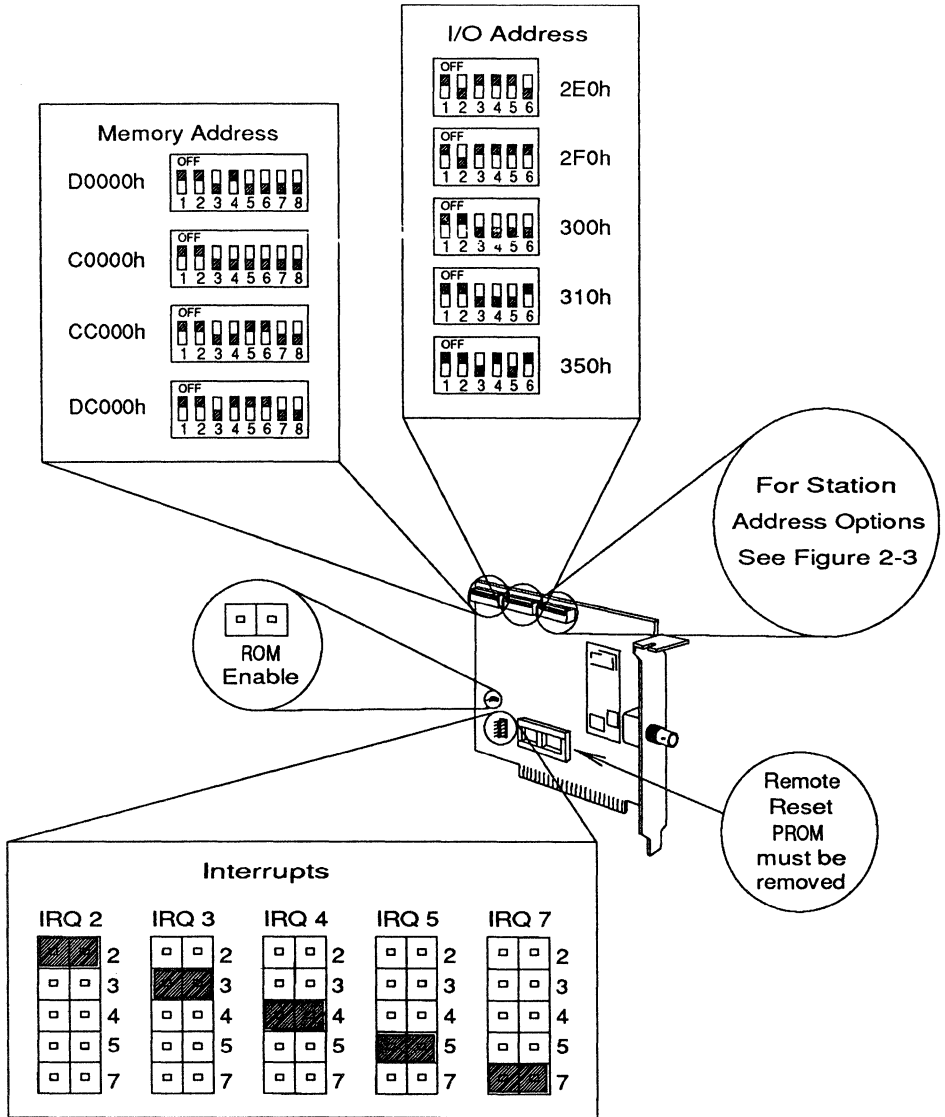


Figure A.8
PC220 Board Components and Setting Options

APPENDIX B: COPYING ARCNET-PS110 DRIVER FILES FOR NETWARE VERSION 2.0A

If you are installing a NetWare v2.0a network containing ARCNET-PS110 boards, copy ARCNET-PS110 driver files from the *LAN_DRV_100* diskette to certain diskettes you received with your main NetWare shipment. Copy the ARCNET-PS110 driver files before you run any of the following NetWare v2.0a installation utilities:

- The GENOS utility, used to generate your network operating system. The GENOS utility is outlined in Chapter 2 of the *NetWare 286 Installation: Part I* manual, and in Chapter 2 of the *NetWare 86 Installation* manual.
- The GENSH utility, used to generate your workstation shells. The GENSH utility is outlined in the same chapters as the GENOS utility.
- The GENBR utility, used to generate a NetWare bridge (if applicable). The GENBR utility is outlined in Chapter 2 of the *NetWare Bridges Installation Supplement*, and in Chapter 2 of the *NetWare Remote Workstations* manual.

The instructions under the following subheadings explain how to copy ARCNET-PS110 driver files from the *LAN_DRV_100* diskette to the *GENOS*, *GENBR*, and *GENSH* diskettes. To complete these instructions, you will need a computer with at least one 3.5-inch disk drive. (If you do not have access to 3.5-inch disk drives, you will need to convert the *LAN_DRV_100* diskette to 5.25-inch format).

COPYING OPERATING SYSTEM DRIVER FILES TO THE *GENOS* OR *GENBR* DISKETTE

To copy operating system driver files from the *LAN_DRV_100* diskette to the *GENOS* diskette, complete the following steps. (In some cases you may have more than one diskette for the *GENOS* utility. If so, whenever these instructions refer to the *GENOS* diskette, use the *GENOS-1* diskette.)

NOTE:

If you will be running the *GENBR* utility to configure a NetWare v2.0a bridge, copy the operating system driver files to the *GENBR* diskette. The instructions (and the driver files) are the same as for the *GENOS* diskette, except that you must substitute the *GENBR* diskette when asked for the *GENOS* diskette. (If you have more than one *GENBR* diskette, use the *GENBR-1* diskette for these instructions.)

- 1) Boot the computer with DOS.
- 2) Insert the *GENOS* diskette into drive A. If you have a second diskette drive, insert the *LAN_DRV_100* diskette into drive B.
- 3) Create a new subdirectory named "SMCPS110" on the *GENOS* diskette using the DOS MD command. The SMCPS110 subdirectory on the *GENOS* diskette will eventually contain the SMC ARCNET-PS110 operating system driver files. At the DOS prompt for drive A, type the following command:

```
MD SMCPS110 <Enter>
```
- 4) Use the DOS CD command to switch to the subdirectory you just created. At the DOS prompt, type

```
CD SMCPS110 <Enter>
```

- 5) Copy the operating system driver files from the V2.0A subdirectory of the *LAN_DRV_100* diskette (in drive B) to the *GENOS* diskette (in drive A). To copy the proper files, type the following command at the DOS prompt for drive A:

```
COPY B:V2.0A\?COMDRV.OBJ <Enter>
```

If your computer has one disk drive, follow the prompts and switch diskettes as directed.

- 6) To verify that the files were copied correctly, type the following command:

```
DIR <Enter>
```

The directory listing on the screen should include the following four driver files (they may appear in any order):

```
ACOMDRV.OBJ  
BCOMDRV.OBJ  
CCOMDRV.OBJ  
DCOMDRV.OBJ
```

NOTE:

In some instances an error message indicates that the four driver files will not fit on the *GENOS* diskette. If this occurs, make room for them by removing another subdirectory and its driver files. Instructions for doing so are in Appendix B of the *NetWare 286 Installation: Part 1* manual and in Appendix A of the *NetWare Remote Workstations* manual. These instructions are also in Chapter 2 of the *NetWare 86 Installation* manual under the subheading "GENOS Utility Diskette Preparation."

After you remove a subdirectory and its driver files, you should have enough room to copy the operating system driver files to the appropriate diskettes. Repeat these instructions from Step 1.

COPYING SHELL DRIVER FILES TO THE GENSH DISKETTE

To copy shell driver files from the *LAN_DRV_100* diskette to the *GENSH* diskette, complete the following steps. (In some cases you may have more than one diskette for the *GENSH* utility. If so, whenever these instructions refer to the *GENSH* diskette, use the *GENSH-1* diskette.)

- 1) Boot the computer with DOS.
- 2) Insert the *GENSH* diskette into drive A. If you have a second diskette drive, insert the *LAN_DRV_100* diskette into drive B.
- 3) Create a new subdirectory named "SMCPS110" on the *GENSH* diskette using the DOS MD command. The SMCPS110 subdirectory on the *GENSH* diskette will eventually contain the ARCNET-PS110 shell driver files. At the DOS prompt for drive A, type the following command:

```
MD SMCPS110 <Enter>
```

- 4) Use the DOS CD command to switch to the subdirectory you just created. At the DOS prompt, type

```
CD SMCPS110 <Enter>
```

- 5) Copy the shell driver file from the V2.0A subdirectory of the *LAN_DRV_100* diskette (in drive B) to the *GENSH* diskette (in drive A). To copy the proper file, type the following command at the DOS prompt for drive A:

```
COPY B:V2.0A\SHELLDRV.OBJ <Enter>
```

If your computer has one disk drive, follow the prompts and switch diskettes as directed.

- 6) To verify that the file has been copied correctly, type the following command:

```
DIR <Enter>
```

The directory listing on the screen should include the driver file that you copied.

WHERE TO GO FROM HERE

You are now ready to return to your main installation manual and generate an operating system and shells for your SMC ARCNET-PS110 network. Use the GENOS utility to generate the operating system and the GENSH utility to generate the shells. (If you are installing a NetWare bridge, run the GENBR utility outlined in the *NetWare Bridges Installation Supplement* or in the *NetWare Remote Workstations* manual.)

As you run these utilities, select the following driver option for the SMC ARCNET-PS110 network:

```
SMC ARCNET-PS110
```

Your main installation manual will instruct you later to return to this installation supplement to complete the instructions in Chapters 1 through 4.

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