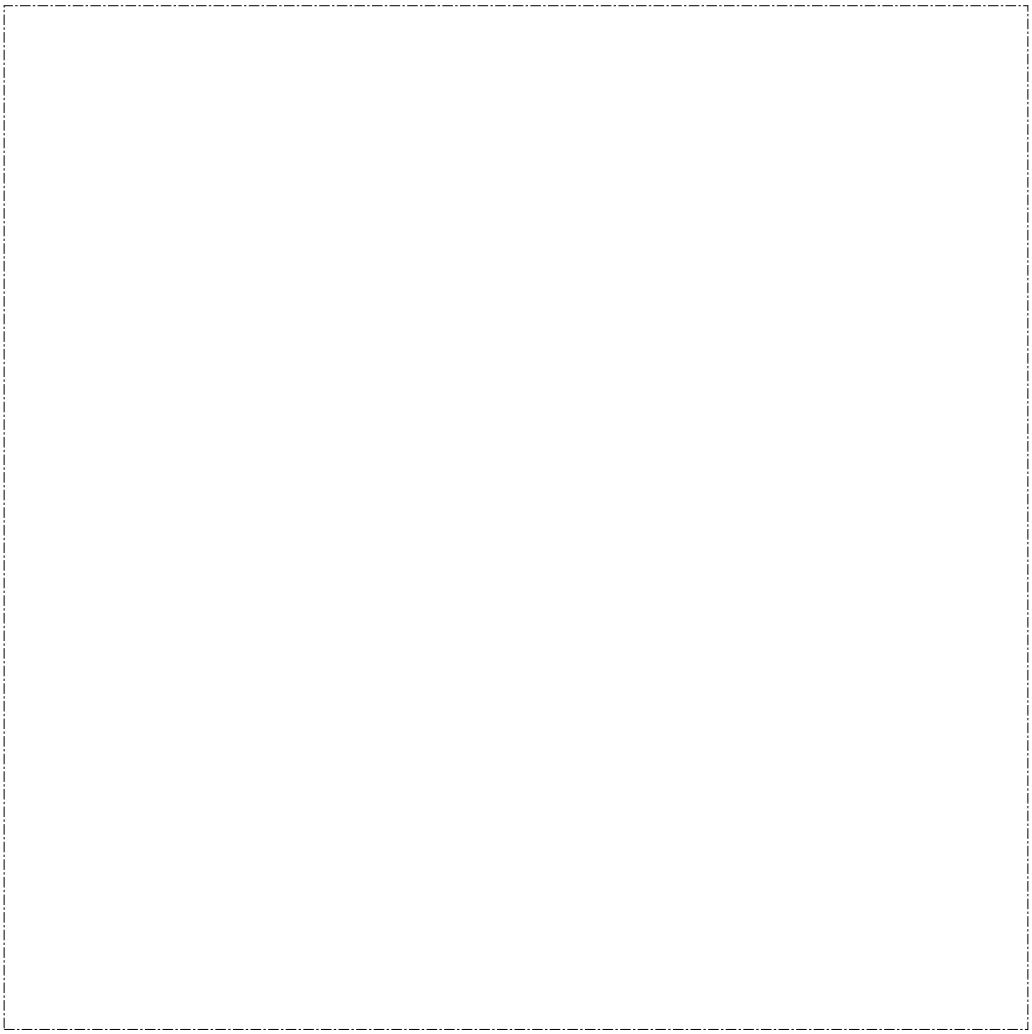
8229 Bridge Manual

GA27-4025-00



8229 Bridge Manual

GA27-4025-00

Note

Before using this information and the product it supports, be sure to read the general information under “Notices” on page xi.

First Edition (March 1994)

This edition applies to Version 1.0 Release 1.0 of the IBM 8229 Bridge.

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Properly shielded and grounded cables and connectors must be used in order to meet FCC emission limits. IBM is not responsible for any radio or television interference caused by using other than recommended cables and connectors or by unauthorized changes or modifications to this equipment. Unauthorized changes or modifications could void the user's authority to operate the equipment.

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Proper cables are available from IBM authorized dealers.

Order Information: For new orders, contact an IBM authorized sales representative. For replacement orders, contact an IBM authorized service representative.

Japanese Voluntary Control Council for Interference (VCCI) Statement

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Safety Notices

For translations of the safety notices shown below, see Appendix D, “IBM 8229 Token-Ring-to-WAN Connectivity.”

Danger

For your safety, you must connect equipment only to a properly wired and grounded outlet. An improperly wired outlet can place hazardous voltage on accessible metal parts of the equipment. You are responsible for outlet wiring.

Danger

To avoid shock hazard:

- The power cord must be connected to a properly wired and earthed receptacle.
- Any equipment to which this product will be attached must also be connected to properly wired receptacles.

Danger

Turn power off and unplug the power cord from the receptacle before connecting or disconnecting signal cables.

Danger

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About This Manual

This manual contains information about planning, installation, configuration, operation, and problem determination for the IBM 8229 Bridge (8229). This manual comes with each 8229 and can also be ordered separately. Store this manual at or near your equipment.

Who Should Use This Manual

You should be familiar with the physical organization of the LAN in which the 8229 will be installed. It is assumed that you have some experience or professional education regarding networking equipment.

Table 0-1. Intended Users of this Manual

Activity	**Individual**
Planning	Network administrator
Installation	Installer or electrician
Configuration	Network administrator
Diagnostics	Network administrator
Parts replacement	Provider of service

How This Manual Is Organized

This publication contains the following chapters and appendixes:

- Chapter 1, “Introduction”
- Chapter 2, “Planning for Module Switch Settings”
- Chapter 3, “Bridge Installation”
- Chapter 4, “Installing the 8229 Software”
- Chapter 5, “8229 Advanced Configuration Parameters”
- Chapter 6, “LDBRG Program”
- Chapter 7, “Using the DTE Port and the EIA 232 Interface”
- Chapter 8, “IBM 8229 Utility Program: Token-Ring-to-Token-Ring and Token-Ring-to-WAN Configuration”
- Chapter 9, “IBM 8229 Utility Program: Token-Ring-to-Ethernet Configuration”
- Chapter 10, “IBM 8229 Utility Program Messages for All Networks”
- Chapter 11, “Running the 8229 With SNMP”
- Chapter 12, “Problem Determination and Servicing”
- Appendix A, “Planning and Record Worksheets”
- Appendix B, “Overview of the 8229 Function”
- Appendix C, “Details of IBM 8229 Token-Ring-to-Ethernet Use”
- Appendix D, “IBM 8229 Token-Ring-to-WAN Connectivity”
- Appendix E, “Frame Format and Address Conversion”
- Appendix F, “Parts Listing”
- Appendix G, “Contents of the LBE Directory”
- Appendix H, “Safety Notices”

It also contains a list of abbreviations, a glossary, and an index.

For More Information

If you want more information about planning, installing, using, or servicing your network hardware or network software, see “Related Publications” and contact your nearest IBM representative for ordering these (and other) IBM manuals.

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Related Publications

Table 0-2 lists related IBM manuals and their topics.

Table 0-2. IBM Publications

Title	Planning	Installation	Software	Diagnostics
IBM Token-Ring Network Introduction and Planning Guide, GA27-3677	√	√		
IBM Token-Ring Network Installation Guide, GA27-3678		√		√
IBM Token-Ring Network Architecture Reference, SC30-3374			√	
IBM Token-Ring Network Problem Determination Guide, SX27-3710				√
IBM Cabling System Planning and Installation Guide, GA27-3361	√	√		√
IBM Cabling System Optical Fiber Planning and Installation Guide, GA27-3943	√	√		
Local Area Network Concepts and Products, GG24-3178	√	√	√	
IBM Local Area Network Administrator’s Guide, GA27-3748	√	√	√	√
IBM Local Area Network Technical Reference, SC30-3383	√			
IBM Local Area Network Support Program User’s Guide	√		√	
Using LAN Network Manager, SC31-7105	√	√	√	
IBM AIX SystemView NetView/6000 V2R1 User’s Guide, SC31-7024-00			√	
IBM SystemView NetView/6000 V2R1 Problem Determination Guide, SC31-7021-00				√

Chapter 1. Introduction

The IBM 8229 Bridge (hereafter referred to as the *8229*) with the appropriate attachment modules transfers data frames between LAN segments. The 8229 can connect a token-ring LAN segment to another token-ring LAN segment, a token-ring LAN segment to an Ethernet LAN segment, or a token-ring LAN segment over a WAN to a second token-ring LAN segment. In all configurations, one of the attached LAN segments is a token-ring segment. The following illustrations show each of the possible network configurations that one 8229 can support.

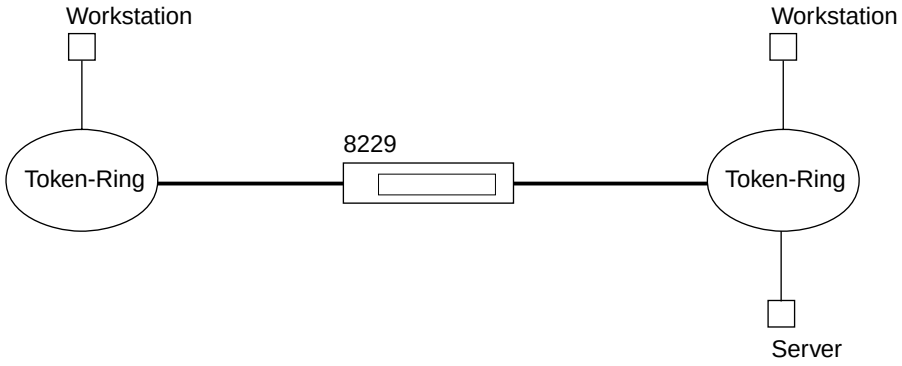


Figure 1-1. Token-Ring-to-Token-Ring Connection

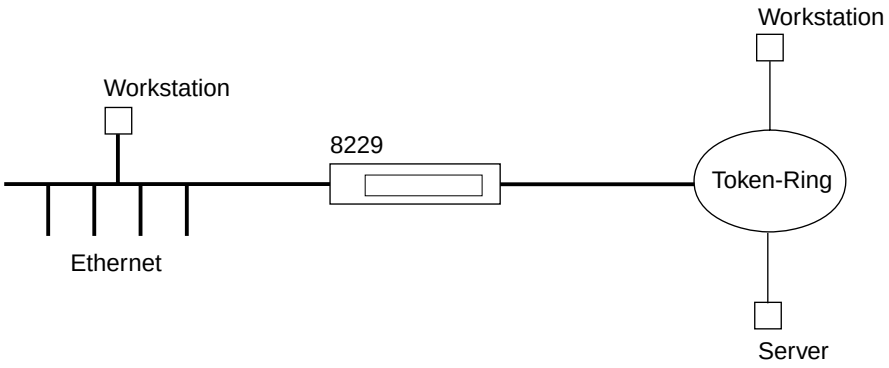


Figure 1-2. Token-Ring-to-Ethernet Connection

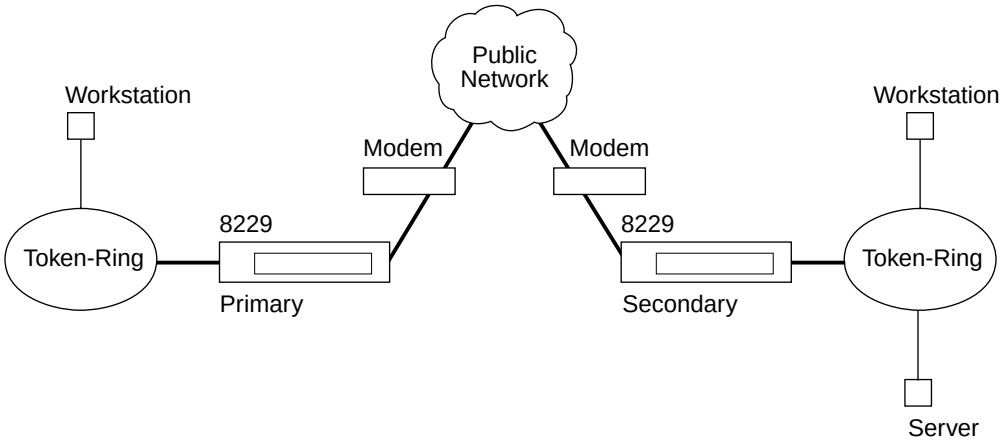


Figure 1-3. Token-Ring-to-Token-Ring WAN Connection

The token-ring-to-token-ring WAN configuration is also referred to as a *split bridge*. Each of the two 8229s is regarded as a logical half of a complete bridge. The two logical halves of the bridge are separated by the WAN segment.

Guidelines for Setting Up and Operating the 8229

In most cases, the 8229 *requires no configuration*. For many of the remaining cases, only the switches on the attachment modules require changes.[1] The 8229 comes from the factory with operational software loaded in the bridge that supports the hardware configuration installed. For an 8229 that requires no configuration, or only requires setting the switches, you must perform the following steps:

1. Unpack the product.
2. Check to be sure that the attachment module switches are in the desired positions.
3. Install the 8229 either on a flat surface or in a rack.
4. Power up the 8229.

If you need to change the operational software or configure the 8229 software parameters, you must power up the 8229 and then configure the software. Chapters 4 through 11 describe the tools provided with the 8229 to enable you to replace or change the bridge software.

Example of 8229 Use

Figure 1-4 on page 1-3 shows a typical network with two token-ring networks and an Ethernet LAN. Note the locations of the 8229s. In this example, a Single-Port Token-Ring Attachment Module and an Ethernet Attachment Module both need to be inserted into the 8229 that connects the token-ring LAN segment to the Ethernet LAN segment (Bridge number 15). An explanation about these and other 8229 attachment modules is provided under “Using the 8229 Attachment Modules” on page 1-4.

[1] An *attachment module* is a card that is inserted in the bridge chassis. The LAN is attached to this module.

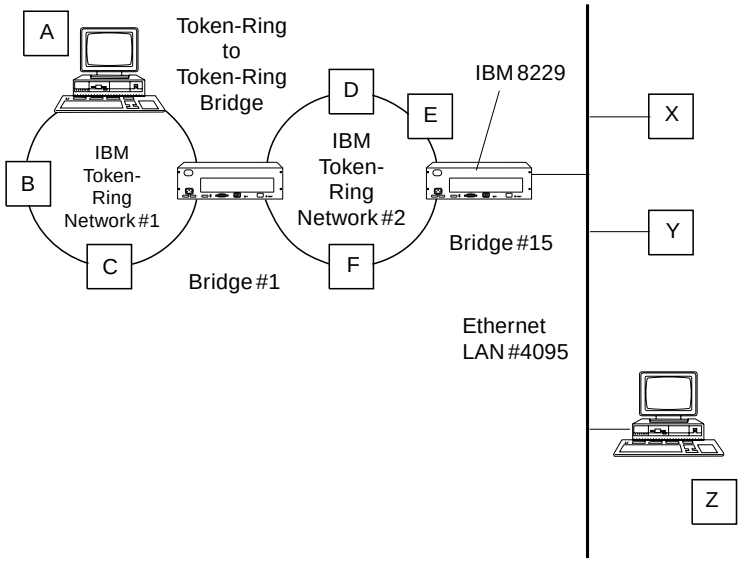


Figure 1-4. An Example of a Network Using an 8229

It is important to understand how data is sent on the network in this example. The devices with addresses A, B, and C coexist on the IBM Token-Ring Network. The devices with addresses X, Y, and Z coexist on the Ethernet LAN. In this example, the Ethernet LAN is supporting either Ethernet Version 2 or IEEE 802.3. If A wants to send a frame to Z, it first sends an explorer frame without any routing information. When no response is received within a certain time limit, A adds a routing field to the frame and retransmits the frame, as described below:

Source address A

Destination address Z

Bridge number 1 changes the routing field and copies the frame on the IBM Token-Ring Network number 2. The new routing field is as follows:

Source address A

Destination address Z
Single-route broadcast
Largest frame is 4472 bytes
Ring-in is 1
Bridge number is 1
Ring-out is 2

Bridge number 15 then adds the A address and its routing information to its database. The routing information stored is as follows:

Source address A

Destination address Z

Routing Specific route
Largest frame is 1470 bytes
Ring-in is 1
Bridge number is 1
Ring-out is 2

Bridge number is 15
Ring-out is 4095

Note: The 8229 (bridge number 15) changes the largest frame size fields. The largest frame size is changed to the maximum for Ethernet.

The 8229 (bridge number 15) removes the routing from the frame and sends the frame on the Ethernet port after the appropriate frame conversion.

When any frame is received from the Ethernet port with the destination address A, the 8229 inserts the above routing field in the frame before transmitting the frame on the token-ring port. Station A then saves the routing field and uses it in all future transmissions to Z.

For more information about bridging in general, begin by seeing Appendix B, "Overview of the 8229 Function" on page B-1. You may also want to see the *IBM Token-Ring Network Architecture Reference* (SC30-3374).

Using the 8229 Attachment Modules

To use the 8229, you must have one or two attachment modules. There are four types of attachment modules:

- Single-Port Token-Ring LAN Attachment Module
- Dual-Port Token-Ring LAN Attachment Module
- Ethernet LAN Attachment Module
- Wide Area Network (WAN) Attachment Module

The *single* and *dual* descriptions refer to the number of port groups that an attachment module has. The Single-Port Token-Ring Attachment Module has one port group consisting of two ports:

- An RJ-45 port for unshielded twisted-pair (UTP) connection
- A port for a 9-pin D-Shell male connector (for STP)

The Dual-Port Token-Ring Attachment Module has two port groups; each port group consists of two ports:

- An RJ-45 port for unshielded twisted-pair (UTP) connection
- A port for a 9-pin D-Shell male connector (for STP)

Only one port within each port group can be used at one time.

You may use one or two attachment modules. The attachment modules plug into the front of the 8229. The 8229 comes with default settings and is preconfigured to work in *one* of the following recommended environments:

- Token-ring-to-token-ring: use the Dual-Port Token-Ring Attachment Module or two Single-Port Token-Ring Attachment Modules.
- Token-ring-to-Ethernet: use the Single-Port Token-Ring Attachment Module or one port of the Dual-Port Token-Ring Attachment Module *and* the Ethernet Attachment Module.
- Token-ring-to-Token-Ring WAN: use the Single-Port Token-Ring Module or one port of the Dual-Port Token-Ring Attachment Module *and* the WAN Attachment Module

Media Access Control Addresses

A group of four contiguous addresses is on the Media Access Control (MAC) address label. The label is located on the front of the 8229 next to the reset button, as shown in the figure below.

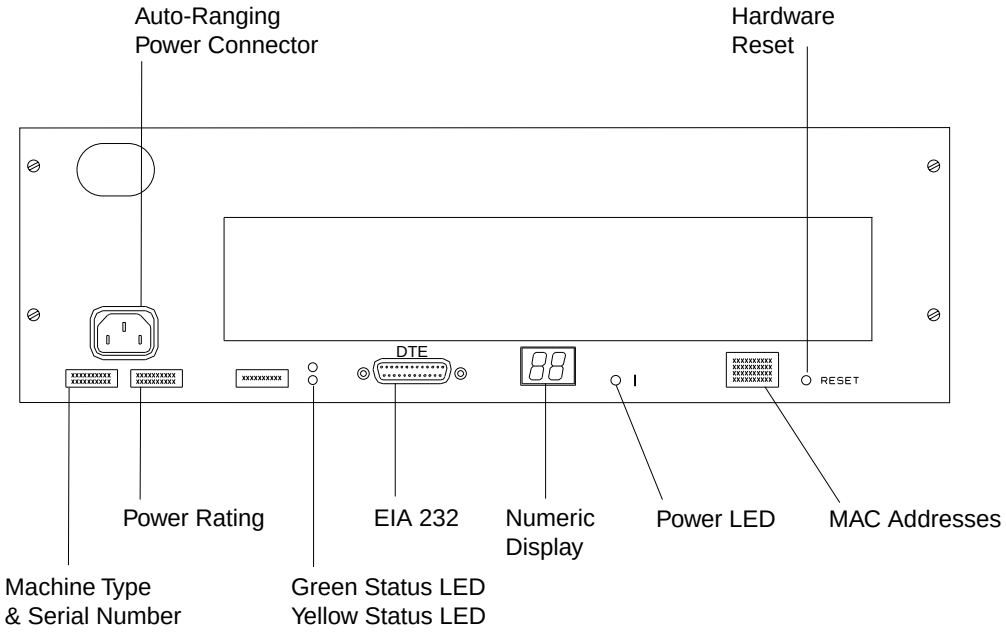


Figure 1-5. The 8229 Front Panel

For example, these four addresses might be found on the label:

```
08005A43CB2A
08005A43CB2B
08005A43CB2C
08005A43CB2D
```

The topmost two addresses of the group, for example, 08005A43CB2A and 08005A43CB2B, are maintained in a universally administered address programmable read-only memory (PROM) located on the main logic board of the 8229. They are written in the same format as that used to transmit on the token ring, with the most significant bit first. The topmost address, for example, 08005A43CB2A, is assigned by the operational software to Port 1 and the second address, for example, 08005A43CB2B, is assigned to Port 2. The other two MAC addresses provided with the 8229 are reserved.

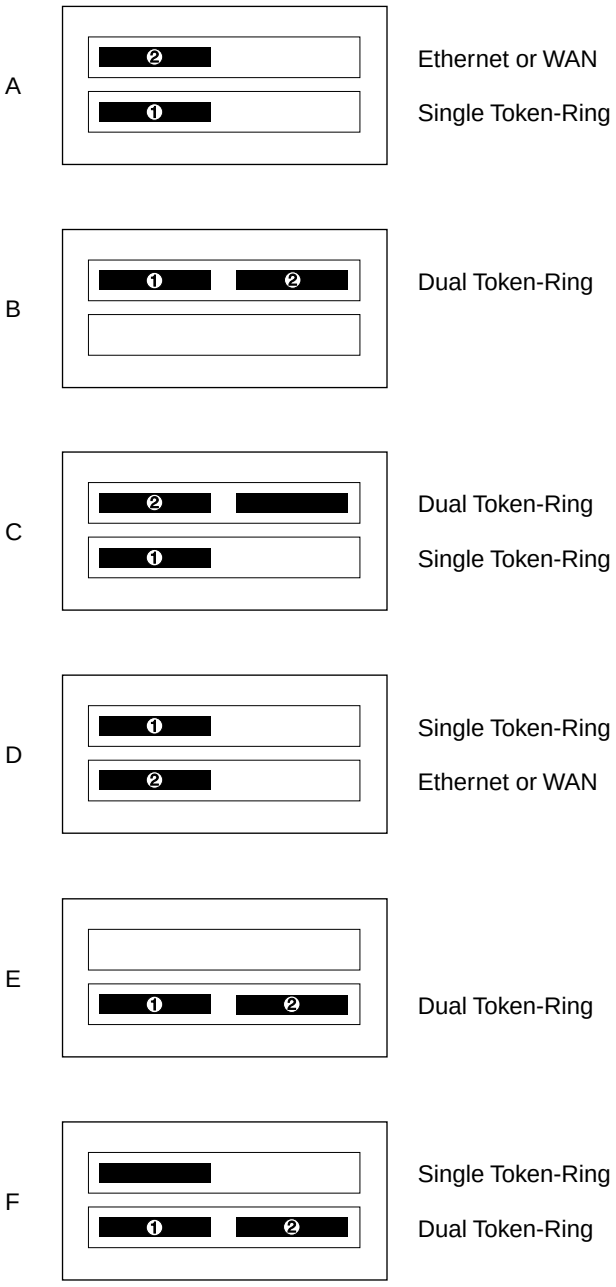


Figure 1-6. Port Defaults for Several Possible Configurations. In this diagram, the number 1 represents Port 1 and the number 2 represents Port 2.

Locating Ports 1 and 2

The locations of Port 1 and Port 2 depend on which LAN attachment modules are installed in the 8229. In general, the first token-ring port on the bridge is Port 1. When you are using two Single-Port Token-Ring Attachment Modules, the port for the lower module is Port 1 and the port for the upper module is Port 2.

When you are using one Single-Port Token-Ring Attachment Module and either an Ethernet Attachment Module or a WAN Attachment Module, the 8229 will detect the first operational token-ring port and regard that port as Port 1; Port 2 is the Ethernet or WAN Attachment Module port, as shown in **A** and **D** in Figure 1-6.

When you are using a Single-Port Token-Ring Attachment Module and a Dual-Port Token-Ring Attachment Module, Port 1 is defined as the first port found, starting at the bottom left and proceeding to the bottom right and then to the top left, and Port 2 is defined as the second port found. This configuration is shown in **C** and **F**. Using a Dual-Port Token-Ring Attachment Module with a Single- Port Token-Ring Attachment Module is not recommended because one of the three available ports is not used.

B and **E** show a Dual-Port Token-Ring Module being used by itself.

The Default Software Configuration

The default software configuration for your 8229 comes loaded on the 8229. If you need to replace the default operational software, you must reload the 8229 FLASH. You must use one of the utility programs provided with the 8229 or the EIA 232 Program to reload the operational software. The default software parameters can be changed using one of the utility programs.

Note: See Chapter 4, “Installing the 8229 Software” for a fuller description of the software and instructions for using it.

Planning for Installation and Use

The 8229 supports communications in all currently valid IBM Token-Ring configuration environments and all valid Ethernet Version 2 or IEEE 802.3 topologies.

Using the Planning and Record Worksheets

Planning and record forms are provided in Appendix A, “Planning and Record Worksheets.” The network administrator should complete them before installation. The worksheets should be used before, during, and after installation.

Other Record-Keeping

On other appropriate charts, floor plans, and other network documentation, you should record the location and identification of:

- Each 8229 in your network
- Each personal computer used to run the IBM 8229 Utility Program
- The cable connection points at the 8229 ports and at the next network device
- The source and destination addresses of cables and the cable numbers
- The MAC address

Refer to the *IBM Token-Ring Network Introduction and Planning Guide* for help with planning charts and other network documentation. Keeping accurate and current network documents will help you install and modify your network and perform problem determination procedures.

Physical, Electrical, and Environmental Information

The 8229 is suitable for a 19-inch equipment rack. It occupies 3 vertical units (1.75 inches per unit).

The 8229 is 133.4 mm (5.25 in.) high, 482.6 mm (19 in.) wide, and 355.6 mm (14 in.) deep. The main chassis is 444.5 mm (17.5 in.) wide; when attached, the mounting brackets extend the chassis width to 482.6 mm (19 in.).

Weight

The weight of the 8229 varies depending upon the configuration of attachment modules installed. When it contains one dual-port token-ring attachment module and one module slot cover, the weight of the bridge is 11.4 kg (25 lbs).

Electrical Information

The 8229 operates within the range of 90 to 245 V ac and within the power frequency range of 49 to 62 Hz. The power supply, power pre-filter, power connector panel, and surrounding protective cage are constructed as a single, removable unit. (There is no power switch or accessible fuse.)

As with all electronic equipment, it is important to keep the 8229 in a dry and clean environment.

This product complies with electronic emission standards, as described in “Electronic Emission Notices” on page xii.

Magnetic Fields: Magnetic fields from nearby radio-frequency sources can affect the operation of networking equipment. Before installing this product, consult your local authority concerning transmitting antennas, radar installations, and industrial equipment.

Lightning: You should add lightning protection on your secondary power source when the utility company installs lightning protectors on the primary power source or when the area is subject to electrical storms and power surges. You may want to establish lightning protection for your signal lines.

Selecting a Place for the 8229

The 8229 is designed to operate reliably in normal business environments, with no special cooling requirements. Normal winter heating and normal ventilation and operation within these ranges are required for reliable operation:

Temperature ranges:

Operating: 10° to 40C° (50° to 104F°)
Power off: 10° to 50C° (50° to 125F°)
Storage: 1° to 60C° (32° to 140F°)
Shipment: –40° to 60C° (–40° to 140F°)

Humidity Ranges:

Operating:	8% to 80% maximum wet bulb 27C° (80F°)
Power off:	8% to 80% maximum wet bulb 27C° (80F°)
Storage:	5% to 80% maximum wet bulb 29C° (85F°)
Shipment:	5% to 100% maximum wet bulb 29C° (85F°)

Air Space Considerations: The sides of the 8229 should have a clearance of at least 150 mm (6 in.).

Operation in General

This section defines the characteristics of the 8229 that are independent of the attachment modules installed.

Programs Supplied with the 8229

Two sets of programs are supplied on the diskette for management and configuration of the 8229:

- The *IBM 8229 Utility Program* allows you to change bridge parameters for LLC management only.
- The *LDBRG* program allows you to load code, filters, and SNMP configuration parameters over the network regardless of whether you are using LLC or SNMP.

The EIA 232 Program allows parameters and code to be specified and loaded through the EIA 232 port. This program is resident in the 8229 and is accessible through a terminal that is configured for TTY or VT100 emulation and is connected to the EIA 232 port. The EIA 232 Program is also known as the *out-of-band* utility because it is accessed by the EIA 232 port rather than through a workstation connected to the LAN.

Operational Software

Operational software for the 8229 is maintained in the FLASH within the 8229. This software can be updated or replaced by use of a personal computer and the EIA 232 port (which is labeled *DTE*) on the front panel of the 8229. File transfer for software load is performed by using the XMODEM protocol, supported by a variety of available ASCII terminal emulation software products (not included on the Operational Software Diskette provided with the 8229).

You can also load the software over the LAN using the IBM 8229 Utility Program or the LDBRG program contained on the diskette that came with the 8229.

There are two operational modes: *full operational mode* and *minimal operational mode.*

Full Operational Mode

Full operational mode is achieved after the 8229 has gone through initialization without encountering a problem. This is the normal operational mode.

In full operational mode, the 8229 can support several operations in addition to being able to use the EIA 232 port.

When the 8229 is running in operational mode and is configured for SNMP, the Utility Program can no longer be linked to the 8229. The SNMP bridge manager such as NetView/6000* takes over the management of the bridge.

Minimal Operational Mode

In the event that the operational software is corrupt, or if the operational software is valid but does not match the hardware configuration, the 8229 will progress following power-on to minimal mode. See Chapter 12, “Problem Determination and Servicing.”

In minimal operational mode, the only function supported is the ability to use the EIA 232 port to load the 8229 operational software.

Restarting and Resetting the 8229

Throughout this manual, the term *restart* describes a process, such as powering off and powering on, that does not affect the NVR and does not erase any information that has been provided to the 8229. The term *reset*, on the other hand, describes a process, such as pressing the reset button, that does erase the NVR and reloads it with the default factory 8229 parameters.

Using the Hardware Reset Button

To see where the reset button is, see Figure 1-5 on page 1-5. For information about using the hardware reset button during problem determination and resolution, see Chapter 12, “Problem Determination and Servicing.”

Important: If you press the reset button during normal operations, the system performs a system reset and erases the contents of the NVR. The NVR contains the SNMP variables and any other bridge parameters that you have loaded. After a hardware reset, the system restarts normally but all user-specific bridge variables are written over by the default values.

If there is a connection through the EIA 232 port, the first time that the reset button is pressed, a special message is displayed on the attached workstation to inform you that the NVR has been reset:

```
Non-volatile RAM will be set to default values.
```

This message is also displayed when the NVR is loaded with operational software that supports a new hardware and network configuration. See “Uploading the Operational Software” on page 1-11 for more information.

If this message is presented at any other time, there may be a hardware problem with NVR and diagnostic procedures may be appropriate.

Before using the hardware reset button, see Chapter 3, “Bridge Installation.”

When Not to Use the Hardware Reset Button

Under no circumstances should you use the reset button to perform as a *soft reboot*. If you press the reset button, the configuration and management data for the 8229 are erased and are replaced by the default values.

Powering On and Powering Off

To restart the 8229, unplug the power cord completely and then reinsert it. This is a restart; it does not affect the NVR.

Uploading the Operational Software

A *restart* of the 8229 occurs when you keep the network and hardware configuration (for example, token-ring-to-token-ring) and change the operational software that determines the management protocol of the LAN. For example, if you load the file STRT.X to replace TRT.X in order to support simple network management protocol (SNMP) on a token-ring-to-token-ring LAN, the bridge is restarted, not reset. NVR is not erased and the unique bridge parameters are saved.

On the other hand, a *reset* of the bridge occurs if you change the network and hardware configuration and load the operational software to support the new configuration. For example, if you load the file TREE.X to support token-ring-to-Ethernet on an 8229 that had been configured with TRT.X for a token-ring-to-token-ring configuration, the reloading of the operational software causes a reset. In this case, the NVR is erased and the default parameters for the new configuration are loaded.

Contents of the Diskette

The diskette contains a variety of files, such as Management Information Base (MIB) files for SNMP management, operational software files, and utility files. It also contains a README file, which you should read when you first use the diskette. These files are compressed and must be exploded to be viewed. For instructions about exploding the files and a list of the most important files by category, see Chapter 4, “Installing the 8229 Software.” Appendix G, “Contents of the LBE Directory” on page G-1 includes a complete list of the files that appear on the hard disk after the 8229 files are installed on your workstation.

Overview of the Parameters Set by the Switches

You can set some most commonly used parameters using switches on the attachment modules. In fact, the following two frequently changed parameters cannot be changed by the utility programs or the EIA 232 program, and must be changed using the switches:

1. Token-ring speed
2. Connector type

Other parameters that can be changed by using the switches include the following:

- LAN segment number
- Bridge mode (for the Ethernet Attachment Module)
- Bridge number
- Parameters for the WAN Attachment Module:
  - Primary or secondary bridge
  - Largest frame size
  - Wrap check

In many cases, the default switch settings will meet the needs of your network.

Important: The default switch setting for network speed on both the Single and the Dual Token-Ring Attachment Module is 16 Mbps.

For a full description of the switch settings, see Chapter 2, “Planning for Module Switch Settings.”

LAN Management Programs That Support the 8229

The IBM LAN Network Manager Program, Versions 1.0 and 1.1, provides LAN management support to the 8229.

The IBM LAN Network Manager Version 1.1 provides full token-ring and Ethernet network management and configuration support to the 8229, providing all of the functions that the Utility Program provides, with the exception of loading operational software and user-defined filter programs.

When the 8229 is loaded with operational software to support SNMP management, use an SNMP Manager, such as NetView/6000.

Chapter 2. Planning for Module Switch Settings

Overview

Physical configuration for the 8229 is accomplished by setting switches on the attachment modules. Depending on your network and the network management systems that you use, physical configuration may be all that you need to do. Before you install an Attachment Module in the 8229, you must plan whether you need to change the default configuration switches that are on the Attachment Module. These eight DIP-type switches are used to set parameters pertinent to the type of attachment module. Figure 2-1 shows the location of the switches on each attachment module and the factory default settings of the switches.

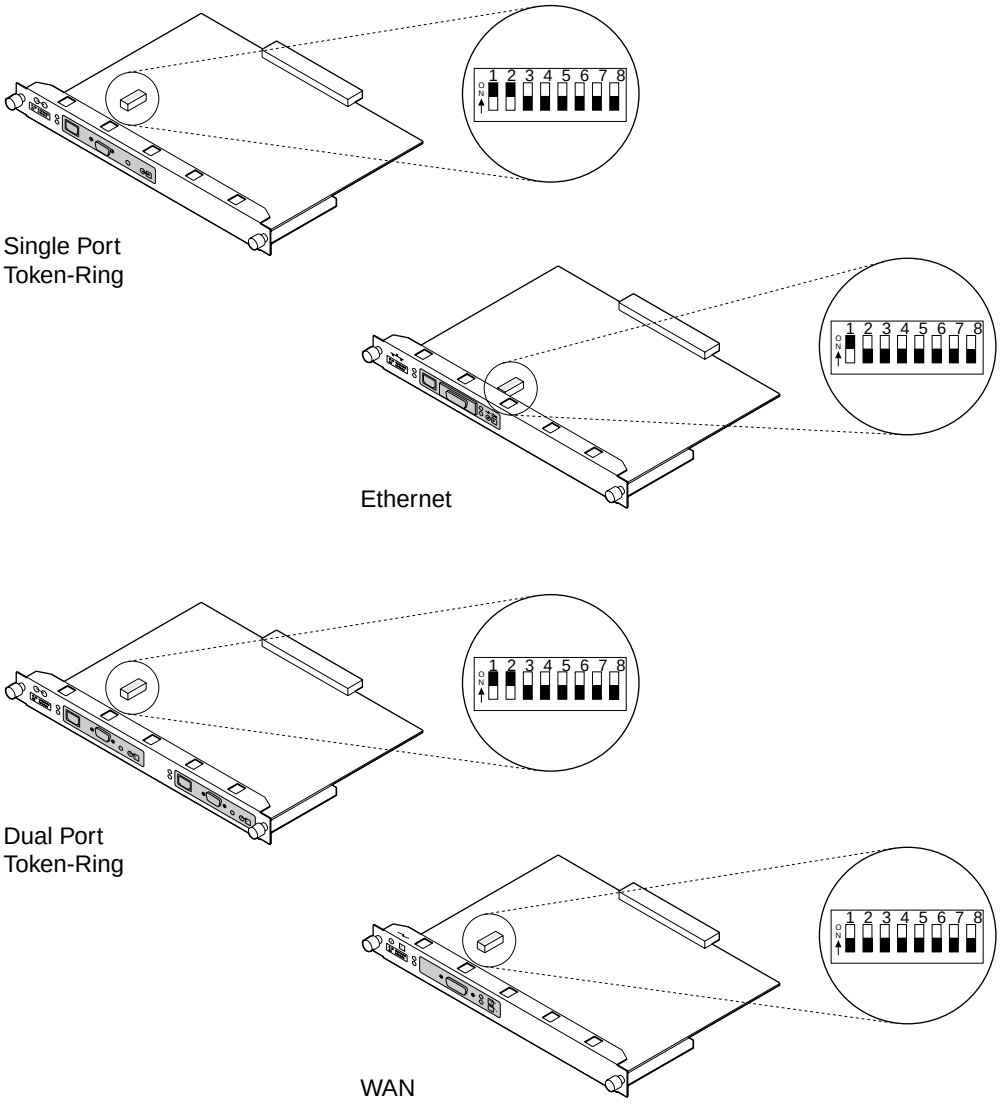


Figure 2-1. Attachment Module Default Switch Settings

How to Proceed

Your network requires planning either for switches for Token-Ring (including Token Rings over a WAN) or for Token-Ring-to-Ethernet use. Examine the sections of this chapter pertinent to your network.

Note: In the following switch setting descriptions for the Token-Ring and the Ethernet attachment modules, the term *port* refers to a port group consisting of two connectors, one for each type of cable connection that can be made. Only one port group can be used at one time; the switch setting for the port sets both connectors to the same value. For example, if you set a token-ring port for 16 Mbps, both connectors run at that speed.

1. Record the appropriate switch settings on a copy of the cabling chart found in Appendix A, “Planning and Record Worksheets.”
2. When you have finished recording your switch settings on the cabling chart, you should use the chart as you install the 8229 (or provide it the individual who will be installing the 8229).
3. Software configuration is performed over the LAN. See Chapter 4, “Installing the 8229 Software” to determine if you should plan for software configuration, after planning for switch settings.

Planning for Token-Ring Attachment Module Switch Settings

See Appendix B, “Overview of the 8229 Function” if you would like more information about bridging in general (before planning for setting the switches).

Default Settings

These are the default switch settings for the Single-Port Token-Ring Attachment Module:

Switches	Position	Value
1	Up (on)	Port 1 speed 16 Mbps with Early Token Release (ETR)
2	Up (on)	Port 2 speed 16 Mbps with ETR
3, 4	Down (off), Down (off)	Token-ring segment number 1
5, 6	Down (off), Down (off)	Bridge number 1
7	Down (off)	Port 1 is D Shell (STP)
8	Down (off)	Port 2 is D Shell†

These are the default switch settings for the Dual-Port Token-Ring Attachment Module:

Switches	Position	Value
1	Up (on)	Port 1 speed 16 Mbps with ETR
2	Up (on)	Port 2 speed 16 Mbps with ETR
3, 4	Down (off), Down (off)	Token-ring segment number 1
5, 6	Down (off), Down (off)	Bridge number 1
7	Down (off)	Port 1 is D Shell (STP)
8	Down (off)	Port 2 is D Shell (STP)†

Values of Switches 2, 7, and 8

See “Locating Ports 1 and 2” on page 1-6 for illustrations of some of the possible hardware configurations.

If you have two Single-Port Token-Ring Attachment Modules, the switches on the module that contains Port 1 (the bottom module) control the values of the switches on the module that contains Port 2 (the top module). To set the parameters for the 8229, set the switches only on the lower of the two attachment modules.

If you have this configuration:

> One Single-Port Token-Ring Attachment Module and one Dual-Port Token-Ring Attachment Module

the switch settings for the switches on Port 1 override the switch settings for the switches on Port 2.

Switch Setting Definitions

The following tables describe the possible values for the switch settings:

Switch 1	Speed of Port 1
Down (off)	4 Mbs with ETR disabled
Up (on)	16 Mbs with ETR enabled (Default)

Note: Switch 1 is used for both Single and Dual-Port Token-Ring Attachment Modules.

Switch 2	Speed of Port 2
Down (off)	4Mbs with ETR disabled
Up (on)	16Mbs with ETR enabled (Default)

Switch 3	Switch 4	LAN Segment Number of Port 1
Down (off)	Down (off)	1 (Default)
Up (on)	Down (off)	2
Down (off)	Up (on)	3
Up (on)	Up (on)	4

Switch 5	Switch 6	Bridge Number
Down (off)	Down (off)	1 (Default)
Up (on)	Down (off)	2
Down (off)	Up (on)	3
Up (on)	Up (on)	4

Switch 7	STP/UTP for Port 1
Down (off)	D Shell (STP) (Default)
Up (on)	UTP

Switch 8	STP/UTP for Port 2
Down (off)	D Shell (STP) (Default)
Up (on)	UTP

Notes:

1. Although switches 2 and 8 affect only Port 2, they must be set on the attachment module on which Port 1 is located.
2. The default token-ring segment number for the second token-ring port is the value of the token-ring segment number for the first port plus 1. For example, if the first token-ring segment is 1, the second segment is 2.
3. All parameter values except port speed and STP or UTP can be changed as a remote configuration option.
4. The LAN segment numbers are used only if the 8229 is the only Ring Parameter Server (RPS) on a LAN segment; an existing active RPS on either LAN will override the segment number for that LAN regardless of the 8229 settings.

Planning for Ethernet Attachment Module Switch Settings

Shown below are default and all possible switch settings.

Default Settings

These are the default switch settings:

Switches	Position	Value
1, 2	Up (on), Down (off)	Automatic mode
3	Down (off)	Reserved
4	Down (off)	Reserved
5, 6	Down (off), Down (off)	Ethernet segment number FF0
7	Down (off)	15-pin AUI D-Shell connector
8	Down (off)	Reserved

Switch Setting Definitions

The following tables describe the possible switch settings:

Switch 1	Switch 2	Mode and frame format
Down (off)	Down (off)	Mode 1. Convert and forward frames using Ethernet Version 2 format.
Down (off)	Up (on)	Mode 2. Convert and forward frames using IEEE 802.3 format.
Up (on)	Down (off)	Automatic mode. Convert and forward all frames using Ethernet Version 2 format if the Ethernet address format is not in the 8229 database. (Default)
Up (on)	Up (on)	Automatic mode. Convert and forward frames using IEEE 802.3 format if the Ethernet address format is not in the 8229 database.

Switch 5	Switch 6	Segment Number
Down (off)	Down (off)	FF0 (Default)
Up (on)	Down (off)	FF1
Down (off)	Up (on)	FF2
Up (on)	Up (on)	FF3

Switch 7	Active Connector
Down (off)	15-pin AUI D-Shell connector (Default)
Up (on)	RJ-45 10 BASE-T connector

Planning for WAN Attachment Module Switch Settings

For an overview of Token-Ring-to-WAN 8229 configuration, see Appendix D, "IBM 8229 Token-Ring-to-WAN Connectivity."

Shown below are default and all possible switch settings.

Default Settings

These are the default switch settings for the WAN Attachment Module:

Switches	Position	Value
1	Down (off)	Secondary
2, 3, 4	Down (off), Down (off), Down (off)	Largest frame size 8144
5, 6	Down (off), Down (off)	Reserved
7	Down (off)	Wrap check enabled
8	Down (off)	Reserved

Switch Setting Definitions

The following table shows the positions for Switch 1:

Switch 1	Value
Down (off)	Secondary (Default)
Up (on)	Primary

The default for switch 1 is *off* to indicate that the WAN module functions as the secondary half of a split bridge. Setting this switch *on* specifies that the WAN module functions as the primary half of the split bridge. In this case, the half of the bridge that contains this module controls the configuration parameters for both halves of the bridge. The 8229 can be the primary half of a split bridge composed of two 8229s.

However, the 8229 cannot be the primary half of a split bridge composed of the IBM Remote Token-Ring Bridge Program[1] regardless of the setting of this switch. When the IBM Remote Token-Ring Bridge Program makes up half of a split bridge, it must always be primary.

WAN port parameters are determined by the switch settings and the network attachment. The EIA 232, X.21, and V.35 interfaces are automatically detected from the attached cable. Line speed (bit rate) is determined by the timing supplied by the synchronous modem or Data Service Unit (DSU).

[1] The supported versions of the IBM Remote Token-Ring Bridge Program are: IBM Remote Token-Ring Bridge/DOS Version 1.0 and IBM Remote Token-Ring Bridge Program Version 2.2.

Table 2-1. WAN Switches 2, 3, and 4

Switch 2	Switch 3	Switch 4	Largest frame size (in bytes)
Down (off)	Down (off)	Down (off)	Automatic (Default)
Up (on)	Down (off)	Down (off)	4472
Down (off)	Up (on)	Down (off)	2052
Up (on)	Up (on)	Down (off)	1500
Down (off)	Down (off)	Up (on)	516
Down (off)	Down (off)	Up (on)	516
Down (off)	Up (on)	Up (on)	516
Up	Up	Up	Largest†

†8144 if 16 Mbps token-ring; else, 4472.

Notes:

1. When the frame size is 516, the 8229 will actually pass frames up to 620 bytes in length, to allow this setting to be used with Novell IPX protocol, which requires 576 bytes plus some overhead allowance.
2. The values for frame size set by the switches can be overridden by remote configuration.
3. Both token-ring LAN segments must operate at 16 Mbps to use the frame size of 8144. If either segment operates at 4 Mbps, the frame size of 4472 will be selected even if the switches are set for 8144.
4. The as-shipped setting of *Off Off Off* indicates that the 8229 should configure itself to the optimal setting, based on the actual measured baud rate of the modem or Data Service Unit (DSU). Each frame size is chosen according to the baud rate measured.

Range for Baud Rate	Frame Size
0–19 200	516
19 102–38 400	1500
38 401–512 000	2052
512 001–1 540 000	4472
1 540 001–2 048 000	8144

5. Even if the baud rate indicates that the frame size should be 8144, the frame size of 4472 is chosen if either of the token-ring segments to which the 8229 is connected is running at 4 Mbps.

The following table shows the positions for Switch 7:

Switch 7	Value
Down (off)	Perform the wrap test (Default)
Up (on)	Bypass the wrap test

Chapter 3. Bridge Installation

Overview

Network planning should be completed before you install the 8229. For information about network planning, begin by reading “Planning for Installation and Use” on page 1-7.

Before You Begin

If the 8229 will be placed on a level surface instead of in a rack, you need:

1. Completed cabling chart from the network administrator
2. A small screwdriver for the universal screws used with the attachment modules
3. The contents of the 8229 and attachment module shipping cartons

If the 8229 will be installed in a rack, you need all of the above items plus four screws appropriate to your rack, a completed rack inventory chart, and a suitable screwdriver.

It is extremely important that you not connect the power cord until you are specifically told to do so.

Power is obtained through an IEC CEE-22 power connector. There is no power switch. The power supply is auto-ranging (100/240 V ac 50/60 Hz). Connection of the power cord from a primary power source supplies power to the 8229.

Unpacking

1. Remove the power cord, diskette, and mounting accessories. (The mounting brackets, small package of screws, cable mounting handle, cable management bracket, and rubber feet are in the plastic bag.)
2. Remove the bridge from its packaging. If you plan to do surface mounting, take out the rubber feet.
3. Make sure that you have everything (see Figure 3-1).

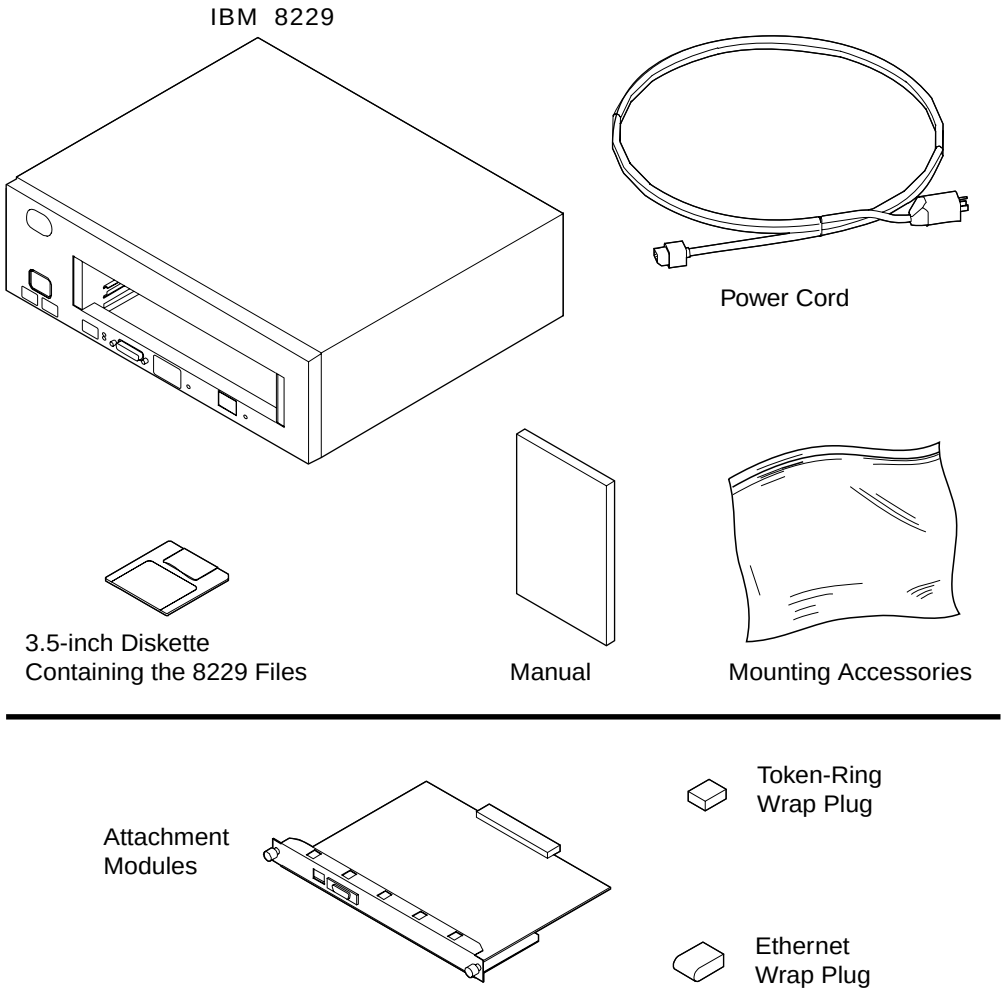


Figure 3-1. Contents of the Shipping Carton for the Single-Port Token-Ring Attachment Module

4. Refer to the completed network planning documentation that you received from the network administrator. At least one attachment module identified in the cabling chart must be a token-ring attachment module.
5. If you ordered an 8229 without any attachment modules, if you ordered the wrong attachment modules, or if you would like to order additional attachment modules, see Appendix F, “Parts Listing.”
6. Now see “Verifying the Bridge and the Attachment Modules” on page 3-4.

Verifying the Bridge and the Attachment Modules

Notice the icon in the upper left-hand corner on the front. (See the matching symbol in the figures below.) Be absolutely certain that you have the correct attachment module for your network.

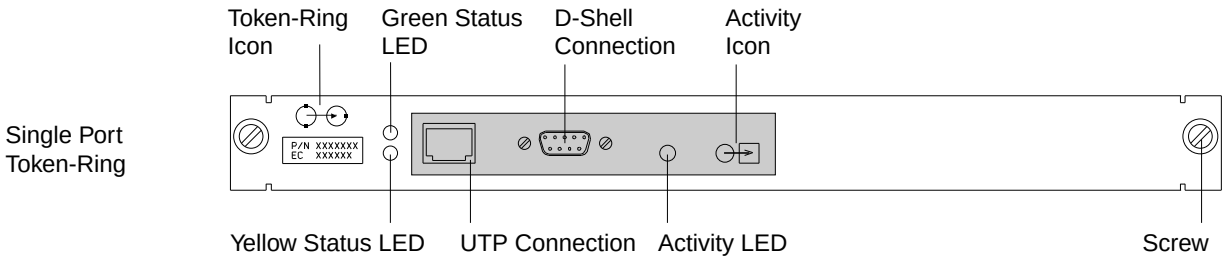


Figure 3-2. Single-Port Token-Ring Attachment Module

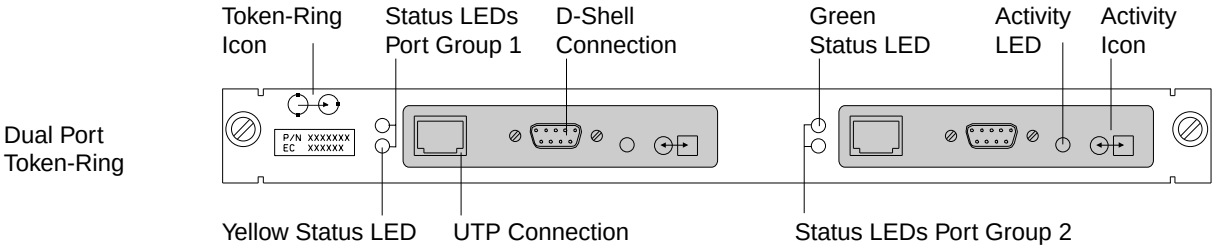


Figure 3-3. Dual-Port Token-Ring Attachment Module

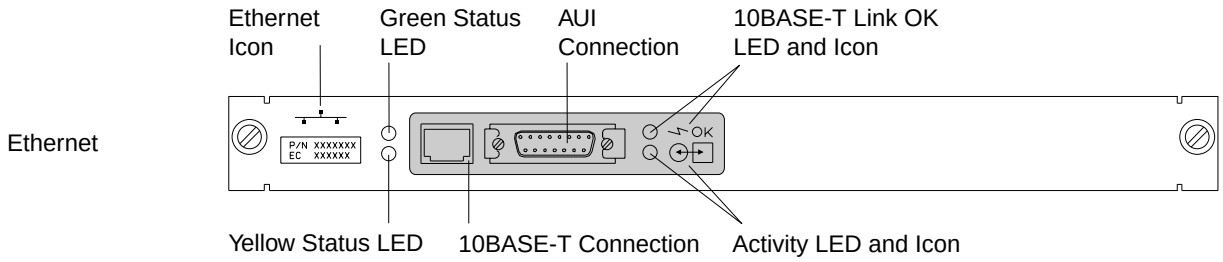


Figure 3-4. Ethernet Attachment Module

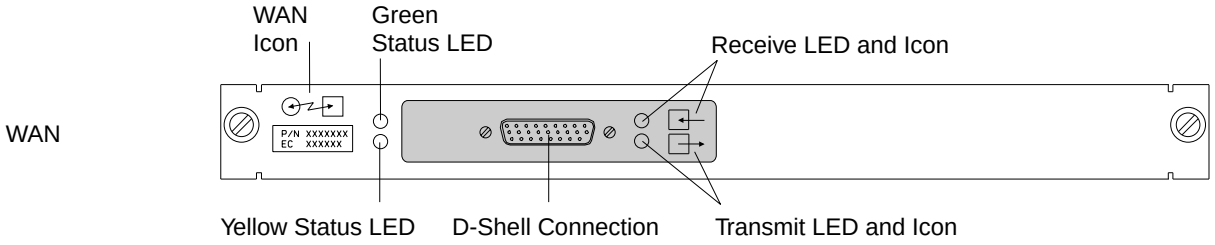


Figure 3-5. WAN Attachment Module

Installing the 8229

Refer to your network planning documentation to determine whether the 8229 should be placed on a surface area or mounted in a rack.

Placing the 8229 on a Tabletop

1. Locate the four self-adhesive rubber feet, which are in the plastic bag of mounting accessories.
2. Place the feet exactly as shown in Figure 3-6.
3. Place the 8229 on the surface where it will be used.

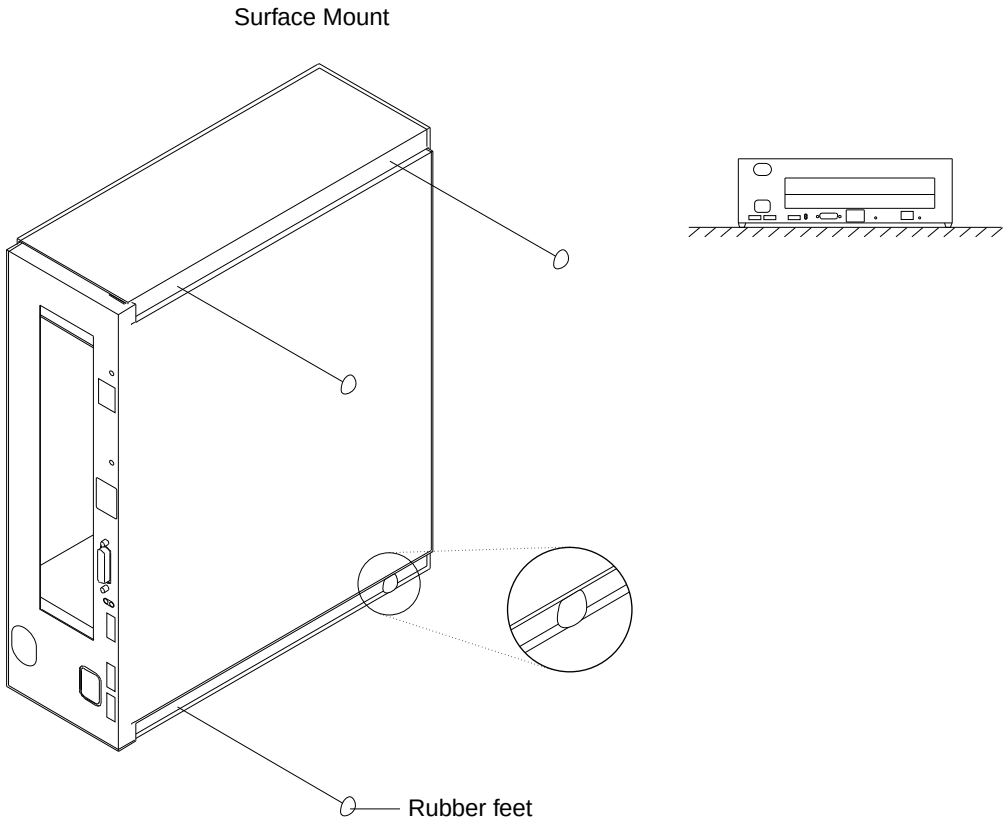


Figure 3-6. Placing the 8229 on a Surface Area

4. Locate the MAC address label on the front of the 8229 (to the left of the reset button). Refer to Figure 3-9 on page 3-11.
5. Record the top two MAC addresses on the cabling chart, and return the records to the network administrator.
6. Locate the 2-digit numeric display in the center of the lower portion on the front of the 8229. Refer to Figure 3-9 on page 3-11.
7. Remove the protective film over the display.

Do not connect the power cable yet.

Mounting the Bridge in a Rack

1. Locate the mounting brackets, small package of screws, cable mounting handle, and cable management bracket, which are all shipped in the plastic bag.
2. Attach the rack-mounting brackets using the four short screws. See Figure 3-7 on page 3-8.
3. Determine which side of the rack you want to use for cable management.
4. Using the two long screws, attach the cable mounting handle to the cable mounting bracket on that side of the 8229. See Figure 3-7 on page 3-8.
5. Attach the cable management bracket to the cable mounting handle by slipping the bracket over the handle. Push it firmly, so that it snaps into place. See Figure 3-7 on page 3-8.
6. If you prefer to reduce the weight of the box temporarily to facilitate installation, you can separate the cover from the inner power supply and planar board combination:
   a. Put the 8229 on a flat surface.
   b. Remove the four retaining screws on the front of the 8229. See Figure 3-7 on page 3-8.
   c. Slide the cover off backwards.
7. Examine the rack inventory chart provided by the network administrator to determine where in the rack the 8229 should be mounted.
8. Mount the cover (or the entire 8229) in the rack, using the screws provided with your rack.
9. If you have removed the chassis (the inner power supply and planar board combination), slide it back into the cover and replace the four retaining screws, which you removed earlier. See Figure 3-7 on page 3-8.
10. Locate the MAC addresses on the label on the front of the 8229 (to the left of the reset button). See Figure 3-9 on page 3-11 for a view of the 8229 front panel.
11. Record the addresses in the spaces provided on the cabling chart.
12. Locate the numeric display in the center of the lower portion of the front of the 8229. display.
13. Remove the protective film from the numeric display.

Do not connect the power cord yet.

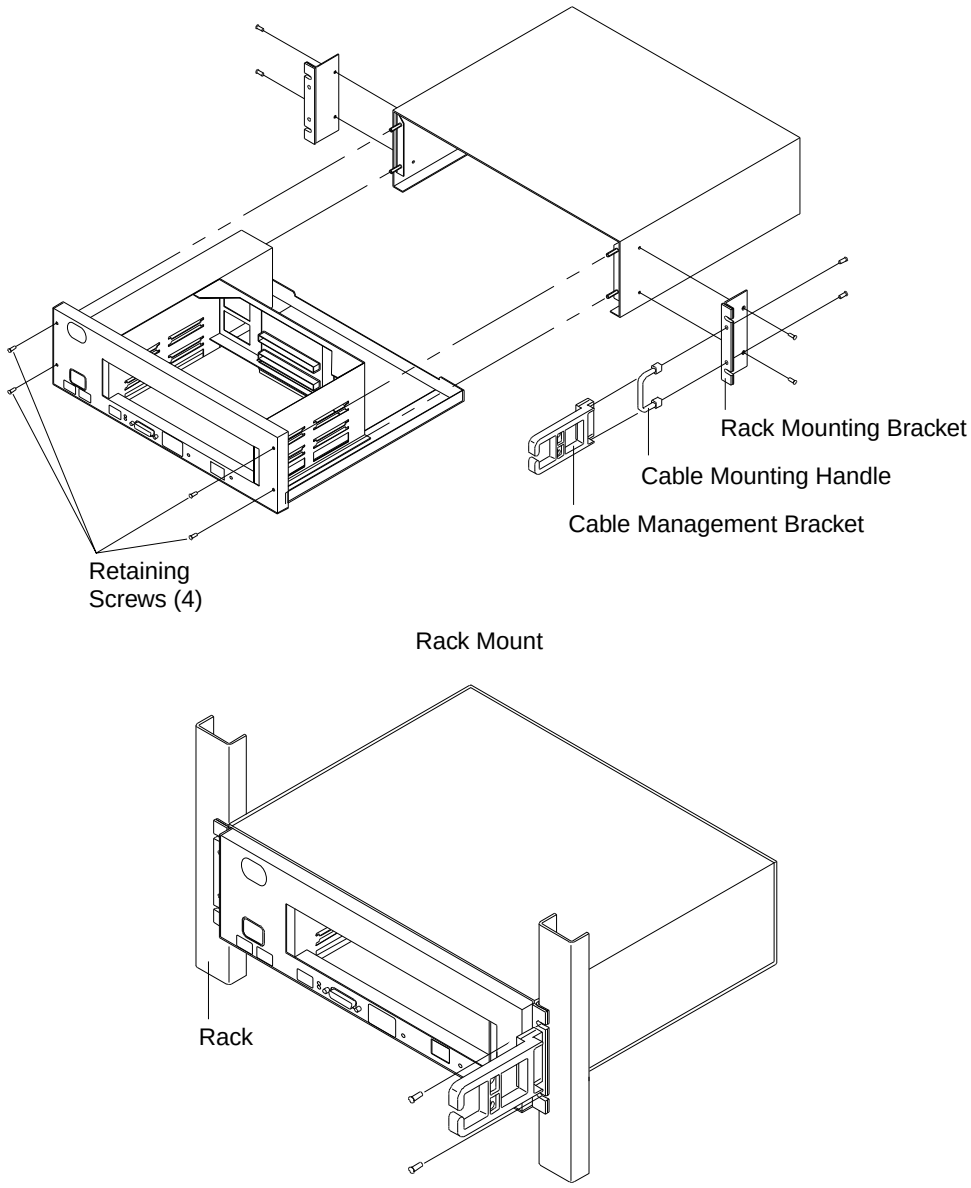


Figure 3-7. Placing the 8229 in a Rack

When you have finished placing the 8229, continue by reading the section under “Installing the Attachment Modules” on page 3-9.

Installing the Attachment Modules

If an attachment module did not come installed in the 8229, you will need to install one now. At least one of the attachment modules in the 8229 must be a token-ring attachment module.

Eight DIP-type switches are contained on each attachment module for setting configuration parameters. Before you place the attachment module in the 8229, you may need to set these configuration switches. See the cabling chart provided by the network administrator.

If the planning records state that the defaults should be used, do not change the switch settings. Otherwise, set the switches so that they agree with the cabling chart. To do this, you may need to remove the attachment modules. If so, see "Removing and Replacing the Attachment Modules" on page 12-14. For information about the meanings of switch settings, see Chapter 2, "Planning for Module Switch Settings" on page 2-1.

1. Look at the cabling chart provided by the network administrator to determine where each attachment module goes within the 8229.
   a. If you are installing only one attachment module, it should be placed in the open slot.
   b. If you are installing an attachment module in the top slot, remove the two small screws holding the slot cover in place and then insert the attachment module. Keep the screws and slot cover so that you will have them if you need to cover the open slot.

      When only one attachment module is installed, the slot cover should be secured over the empty slot to prevent EMC transmission and to keep dirt out.
2. Locate the guide rails on either side of the open slot.
3. Insert the attachment module so that the edges of the module travel between the guide rails.
4. When the attachment module stops sliding easily into the slot, finish seating it by placing your thumbs on the front of the module and pressing strongly until it snaps into place. It should be flush with the front of the bridge.
5. Push in and tighten the thumb screws on either side of the attachment module.

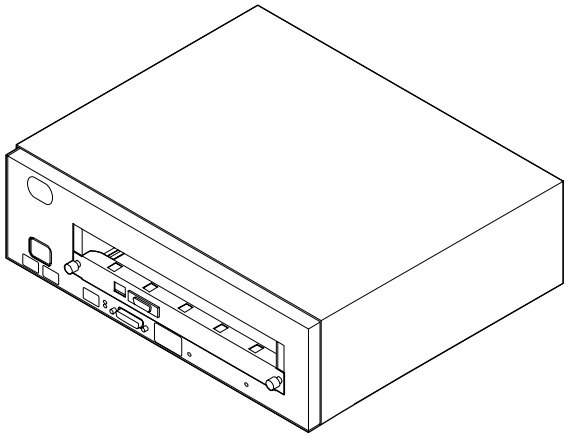


Figure 3-8. Placing the Module in a Bridge

Identifying the 8229 Front Panel

The **EIA 232** data terminal element (DTE) port is for loading operating software to the FLASH memory contained on the main logic board.

Power Light-Emitting Diode (LED): When green, indicates that power is available to the 8229.

Green Status LED: Indicates that the 8229 has successfully completed its basic tests and is ready for operation.

Yellow Status LED: Indicates that the 8229 has detected an internal fault as part of the basic tests and is inoperative. The fault code appears as a numeric display.

Numeric Display: A 2-digit numeric display indicates the current status of the diagnostics in progress, or the fault code in the case of a detected fault.

Hardware Reset: A recessed reset button is accessible on the front panel of the 8229. See “Using the Hardware Reset Button” on page 1-10.

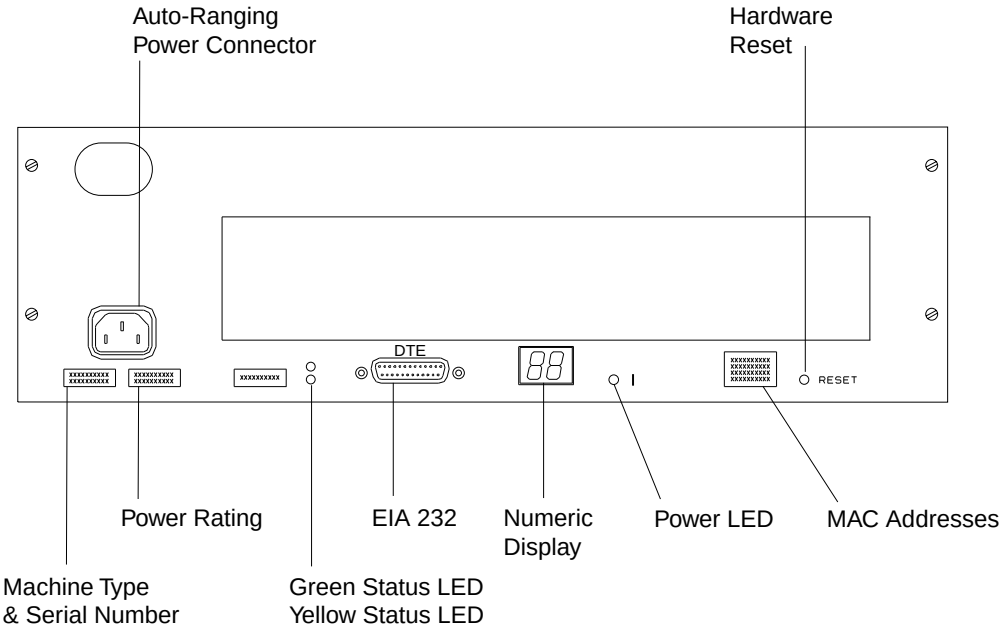


Figure 3-9. The 8229 Front Panel

Identifying the Attachment Module

Port Status Indicators: Each attachment module has a pair of status LEDs for each port. The green status LED, when lit, indicates that the internal tests for the port have been successfully completed; the yellow status LED, when lit, indicates a detected internal fault.

LAN Activity Indicators: Each attachment module indicates outbound activity for each port. The green activity LED indicates that the 8229 is successfully connected to the respective LAN and that traffic is being forwarded by the 8229 from that network. See Figures 3-10, 3-11, 3-12, and 3-13 for illustrations of the attachment modules.

Testing the 8229 (Optional)

1. Locate the wrap plugs that were shipped with the attachment modules and insert the plugs in the appropriate parts of the front of the attachment modules.

   Notes:

   a. Wrap plugs are supplied for the Token-Ring D-shell connectors and the Ethernet AUI port only. Other ports do not need wrap plugs.

      If you are testing the WAN attachment module, make sure that switch 7 is in the Down position. Because the WAN attachment module has a built-in wrap function, there is no wrap plug for this module.

   b. Ensure that the hardware switch settings for cable type are in the default (Down) position.

2. You may now attach the power cord first to the wall outlet and then to the 8229.

   Note: There is no power switch.

3. Observe the following bring-up sequence:

   When you connect power to the 8229, it will go through a basic assurance test (BAT) that lasts about 90 seconds. All of the LEDs should light momentarily and the numeric display should show ascending values. At the conclusion of the test, the numeric display should go blank, the power and green status LEDs on the 8229 should be lit, the green status on each attachment module. should be lit, and the green status LED should be lit.

4. If any number is still displayed, or if any yellow LED is lit, see Chapter 12, “Problem Determination and Servicing” on page 12-1.

5. Power *off* the 8229 by disconnecting the power cord before continuing.

Connecting the Data Cables

Make certain that the 8229 is powered off before you start this procedure.

1. Look at the cabling chart provided by the network administrator to determine how the bridge should be cabled to the network.

   Note: On the Token-Ring modules, an unshielded twisted-pair (UTP) connector and a D-shell connector (STP) are provided for each port.

   The ports are designated on the cover by the black overlay spanning the two connectors. At each port group, you may use either the UTP or the D-shell, but not both.

   On the Ethernet module, both a 10BASE-T and an AUI port are provided. You may connect a cable to only one of these.

   The WAN module has a single connection port on it.

2. When you have finished cabling, attach the power cable first to the wall outlet and then to the 8229.
3. Look for the initialization sequence described in “Testing the 8229 (Optional)” on page 3-12.
4. If the 8229 tests satisfactorily, mark this on the cabling chart and return the records to the network administrator.
5. If the 8229 does not test satisfactorily, see Chapter 3, “Bridge Installation” on page 3-1.

EIA 232 Port Connector Signals

A 25-pin male EIA 232 connector is used for the front panel diagnostic port. This port is marked *DTE*, and is configured for DTE operation at 9600 bps with an 8-data-bit, no-parity, 1-stop-bit character format.

Token-Ring Connection

The physical interface to the token-ring LAN is a 9-pin D female connector (Type 1) used for STP connection or an 8-pin RJ-45 connector used for UTP connection. The Single-Port Token-Ring Module has two ports (in one group) but only one port can be used at any one time. The Dual-Port Token-Ring Module has four ports (in two port groups) but only one port of each port group can be used at any one time.

The activity LED is lit only when the 8229 is transmitting outbound on the ring.

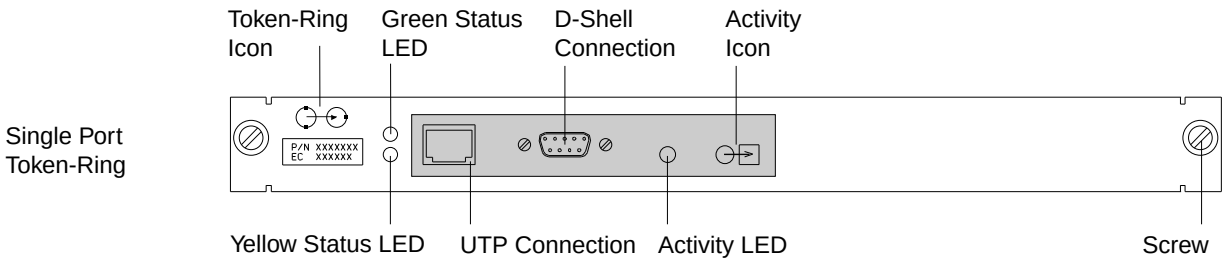


Figure 3-10. Single-Port Token-Ring Attachment Module

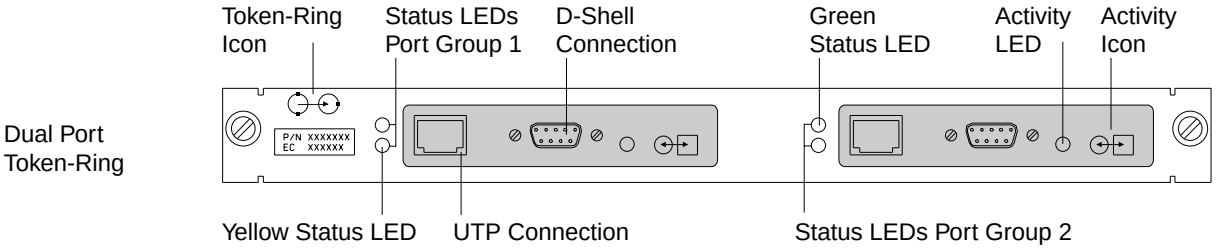


Figure 3-11. Dual-Port Token-Ring Attachment Module

Ethernet Connection

The physical interface to the Ethernet LAN is a 15-pin female D connector (AUI). The RJ-45 connector supports an Ethernet 10BASE-T connection (UTP). The Ethernet Attachment Module has one port group with two ports, but only one port can be used at one time.

The activity LED indicates transit or outbound traffic.

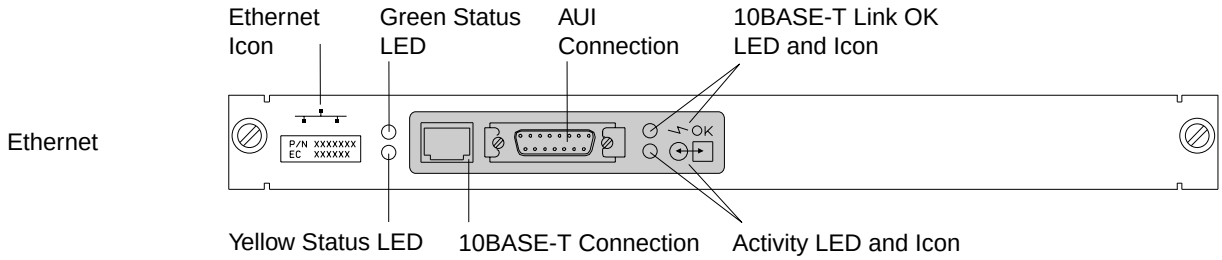


Figure 3-12. Ethernet Attachment Module

WAN Connection

The physical interface to a WAN is a 26-pin D female connector. The Single WAN Module has one port.

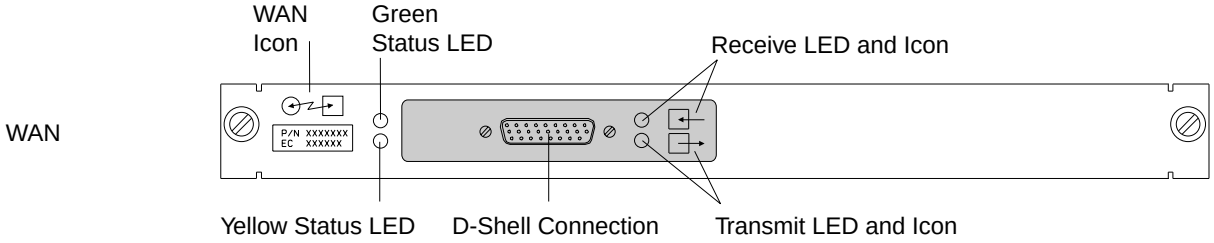


Figure 3-13. WAN Attachment Module

Chapter 4. Installing the 8229 Software

The 8229 is shipped with an Operational Software Diskette that contains backup copies of the files for the operational software. The default operational software is pre-loaded in the FLASH on the 8229. The operational software acts as microcode to enable the bridge to function. For example, the program TRT.X is a file in the operational software that supports token-ring-to-token-ring connection and LLC2 network management.

When You Can Use the 8229 Without Changing the Software

If you have followed the installation instructions provided in Chapter 3, “Bridge Installation,” you have completed the installation of the hardware and the default operational software provided with your 8229. Now you should determine whether you can run the 8229 without changing the default software or the default values for the bridge parameters. You can probably avoid changing the software if the following conditions apply to you:

1. Your bridge hardware matches your physical network. For example, you connect a token-ring network to a token-ring network with an 8229 that has two single-port token-ring attachment modules or one dual port token-ring attachment module.
2. You do not need to change the bridge configuration parameters. Suggestions for using these parameters and descriptions of them are provided in Chapter 5, “8229 Advanced Configuration Parameters.”
3. You do not plan to use simple network management protocol (SNMP).

When You Have to Change the Software

You need to access and change the 8229 software if any of these situations apply to you:

- You need to upload new operational software. You must do this whenever you change the function of the 8229.

  For example, suppose the 8229 is using two Single-Port Token-Ring Attachment Modules to connect two token-ring segments. You remove one of the Single Token-Ring Attachment Modules and replace it with an Ethernet Attachment Module, to connect the 8229 to an Ethernet segment. In this case, you must upload new operational software.

  You must also upload new operational software if you want to use SNMP in your network.

- You need to upload a filter program other than the default filters that are automatically provided in the 8229 operational software.

Overview of the 8229 Software

The 8229 software consists of these categories:

Operational software

This software is composed of microcode to operate the 8229 and management information base (MIB) files used to implement SNMP on the 8229. Sample user-defined filter files are included, as well.

Utility programs

These are the IBM 8229 Utility Program (referred to as the *Utility Program* in this manual) and the LDBRG program. The files for these utility programs are compressed on the Operational Software Diskette provided with the 8229. However, an installation utility is provided to enable you to explode and install the Utility Program and LDBRG.

These programs provide various bridge management functions and allow you to upload operational software and user-defined filters. Of the two utility programs, only LDBRG enables you to upload SNMP parameters. The Utility Program operates only in a network running with LLC Type 2 protocol.

EIA 232 Program

This program resides in the 8229; therefore, the files for this program are not found on the Operational Software Diskette. This program is accessible through the EIA 232 port when a terminal configured for teletypewriter (TTY) or VT100 emulation is attached to the port. The EIA 232 Program enables you to change the SNMP parameters, to upload the operational software and the user-defined filters, and to restart the 8229.

This program does not allow you to change the 8229 LLC Type 2 parameters. To change these parameters, use the Utility Program. You can also change the 8229 parameters using the IBM LAN Network Manager Program.

How to Install the Software Found on the Operational Software Diskette

At this point, if you plan to use only the EIA 232 Program, see Chapter 7, “Using the DTE Port and the EIA 232 Interface.” If you want to install the utility programs and the operational software on a drive in your workstation, you should continue with the following process:

1. Insert the Operational Software Diskette that was shipped with the 8229 into the diskette drive of your workstation. Make the drive in which you want to install the 8229 software the *current* drive.
2. At the DOS prompt type **A: Install** and press **Enter**.

This command explodes and installs the files that were shipped with the 8229 and copies them on your designated drive in a new subdirectory called *LBE*. In this subdirectory you will find the following files:

- IBM 8229 SNMP MIBs files
  - TR_SURR.my
  - IBM8229.my
  - SUR_TRAP.my
- FLASH microcode files
  - TRT.X, used in token-ring-to-token-ring networks with LLC Type 2 network management
  - STRT.X, used in token-ring-to-token-ring networks with SNMP
  - TREE.X, used in token-ring-to-Ethernet networks with LLC Type 2 network management
  - STREE.X, used in token-ring-to-Ethernet networks with SNMP
  - WAN.X, used in token-ring-to-WAN with LLC Type 2 network management

- Sample user-defined filter programs
  - FILTER1.X, which is the link limiting filter
  - FILTER2.X, which is the NetBIOS filter
  - FILTER3.X, which is the null filter for the Token-Ring to WAN split bridge configuration. See Appendix D, “IBM 8229 Token-Ring-to-WAN Connectivity” for a description of this configuration.
- LDBRG.exe, which is the Load IBM 8229 Utility file and can be used if the 8229 is configured for SNMP or LLC Type 2 network management
- LBE.bat, which is the IBM 8229 LLC Type 2 Network Configuration Utility Program (Utility Program)
- README, which describes the contents of the diskette provided with the 8229
- LOAD_IP.txt, which is a text file that describes the SNMP parameters and contains a sample file for sending the bridge SNMP parameters to the 8229 using LDBRG
- FILTERS.doc, which describes the three sample user-defined filter programs provided

See Appendix G, “Contents of the LBE Directory” for a complete list of the files you will find in your drive after you explode the 8229 Utility Diskette. You will need about 2.0 MB of storage for these files (after they are uncompressed).

How to Continue

At this point, you have successfully installed the two utility programs (the Utility Program and LDBRG). For instructions about using the LDBRG program, see Chapter 6, “LDBRG Program.” For information about the Utility Program, see Chapter 8, “IBM 8229 Utility Program: Token-Ring-to-Token-Ring and Token-Ring-to-WAN Configuration.” Keep in mind that the Utility Program is for LLC Type 2 network management only. If you plan to use SNMP management, you must use LDBRG or the EIA 232 Program.

Chapter 5. 8229 Advanced Configuration Parameters

Overview

The term *advanced configuration* is used to describe the process of replacing any of the default bridge operational software or changing the default software parameters. Advanced configuration of the 8229 is required if you need to:

- Specify an 8229 bridge number or a LAN segment number other than those that can be set using the attachment module configuration switches
- Define filter range values for one or both LAN segments connected to the 8229
- Load a filter program into the 8229
- Change the values for any of the other advanced configuration parameters, including
  - Single-route broadcast
  - Locally administered MAC addresses
  - Management server support (parameter server, error monitor, and configuration report server)
  - Link Passwords
  - SNMP parameters

See Chapter 8, “IBM 8229 Utility Program: Token-Ring-to-Token-Ring and Token-Ring-to-WAN Configuration” and Chapter 9, “IBM 8229 Utility Program: Token-Ring-to-Ethernet Configuration” for descriptions of the parameters.

For lists of the parameters, see the following topics, depending upon the types of network segment connected by your 8229:

- For token-ring-to-token-ring bridging, or for token-ring-to-WAN split bridging, see “Token-Ring-to-Token-Ring Advanced Configuration Parameters” on page 5-3.

  Note: The 8229 parameters are the same for token-ring-to-token-ring bridging as for split bridging, with the exception of some WAN parameters set by the switches and described in “Planning for WAN Attachment Module Switch Settings” on page 2-7.
- For token-ring-to-Ethernet bridging, see “Token-Ring-to-Ethernet Advanced Configuration Parameters” on page 5-5.
- For networks managed with SNMP, you must configure SNMP variables. See “8229 SNMP Agent Configuration Parameters” on page 5-7 for a list of the SNMP agent parameters and Chapter 11, “Running the 8229 With SNMP” for information about preparing the 8229 for use in a network managed by SNMP.

Note: The Token-Ring-to-WAN split bridge configuration does not support SNMP management.

Token-Ring-to-Token-Ring Advanced Configuration Parameters

Table 5-1 shows the 8229 bridge and port advanced configuration parameters for 8229s that support two Token-Ring LAN segments. Use this table to determine how you want to configure your 8229. Record the values of the parameters on the worksheets in Appendix A, “Planning and Record Worksheets.”

See Chapter 8 for a description of these parameters.

Table 5-1 (Page 1 of 2). Token-Ring-to-Token-Ring Advanced Configuration Parameter Value Ranges and Default

Parameter Description	Default Value	Allowed Range
Bridge Parameters		
Bridge Name	None	1 to 8 alphanumeric
Bridge Number	1	0–9, A–F
Frame Forwarding Active	1	1 = Yes 0 = No
Single-Route Broadcast Mode	1	1 = Yes (Automatic) 0 = No (Manual)
Path Trace	1	1 = Active 0 = Inactive
Spanning Tree		
Bridge Priority	32768	0–65535
Port 1 and 2 Parameters		
LAN Segment Number Port 1	1	1–FFF
LAN Segment Number Port 2	2	1–FFF
Locally Administered Address	(none)	4000 0000 0001– 4000 7FFF FFFF
Single-Route Broadcast	1	1 = Yes 0 = No
Hop Count Limit	7	1–7
Early Token Release	1	1 = Yes 0 = No
Parameter Server	1	1 = Enabled 0 = Disabled
Error Monitor	1	1 = Enabled 0 = Disabled
Configuration Report Server	1	1 = Enabled 0 = Disabled
Port Path Cost	250 (4 Mbps) 63 (16 Mbps)	0–65535
Port Priority	128	0–255
Filter Parameters		
Filter Program Status	1	1 = Enabled 0 = Disabled

Table 5-1 (Page 2 of 2). Token-Ring-to-Token-Ring Advanced Configuration Parameter Value Ranges and Default

Parameter Description	Default Value	Allowed Range
Criteria Range Filter Port 1 and 2		
Filter Offset	000	0–100 (decimal)
Range 1 Low	0000	0–FFFF
Range 1 High	FFFF	0–FFFF
Range 2 Low	0000	0–FFFF
Range 2 High	FFFF	0–FFFF
Address Range Filter Port 1 and 2		
Source Address Low	0000 0000 0000	12 hexidecimal digits
Source Address High	0000 0000 0000	12 hexidecimal digits
Destination Address Low	0000 0000 0000	12 hexidecimal digits
Destination Address High	0000 0000 0000	12 hexidecimal digits
Link Passwords		
Link Password 0	0000 0000	6 to 8 alphanumeric
Link Password 1	0000 0000	6 to 8 alphanumeric
Link Password 2	0000 0000	6 to 8 alphanumeric
Link Password 3	0000 0000	6 to 8 alphanumeric
System Definition		
Reporting Link Password	blank	6 to 8 alphanumeric

Token-Ring-to-Ethernet Advanced Configuration Parameters

Table 5-2 shows the 8229 bridge and port advanced configuration parameters for 8229s that support bridging between Token-Ring and Ethernet LAN segments. Use this table to determine how you want to configure an 8229.

See Chapter 8 and Chapter 9 for a description of these parameters.

Table 5-2 (Page 1 of 2). Token-Ring-to-Ethernet Advanced Configuration Parameters

Parameter Description	Default Value	Allowed Range
Bridge Parameters		
Bridge Name	None	1 to 8 alphanumeric
Bridge Number	1	0–9, A–F
Automatic Mode Selection	1	1 = Enabled 0 = Disabled
Mode Priority	1	1 = Ethernet V2 2 = 802.3
Forward LLC traffic (mode 1)	1	1 = Yes 0 = No
Enabled SAPs for LLC traffic	00, 04, 08, F0, F4, FC	00 to FF (additional fields available)
TCP/IP address conversion	1	1 = Enabled 0 = Disabled
Dual Mode Multicast Conversion	1	1 = Enabled 0 = Disabled
Use General Broadcast Frames	0	1 = Enabled 0 = Disabled
IPX Support	0	1 = Enabled 0 = Disabled
Broadcast Address Conversion	1	1 = Enabled 0 = Disabled
Spanning Tree Parameters		
Bridge Maximum Age	20	6–40 seconds
Bridge Hello Time	02	1–10 seconds
Bridge Forward Delay	15	4–30 seconds
Bridge Priority	32768	0–65535
Aging Time	00300	1–65535 seconds
Maximum Transit Time	1	1–4 seconds
Port 1 Token-Ring Parameters		
LAN Segment Number Port 1	001	1–FFF
Locally Administered Address	(none)	4000 0000 0000 4000 7FFF FFFF
Early Token Release	1	1 = Enabled 0 = Disabled
Hop Count Limit	7	1–7
Parameter Server	1	1 = Enabled 0 = Disabled
Error Monitor	1	1 = Enabled 0 = Disabled

Table 5-2 (Page 2 of 2). Token-Ring-to-Ethernet Advanced Configuration Parameters

Parameter Description	Default Value	Allowed Range
Configuration Report Server	1	1 = Enabled 0 = Disabled
Port Path Cost	250 (4 Mbps) 63 (16 Mbps)	0–65535
Port Priority	128	0–255
Port 2 Ethernet Parameters		
LAN Segment Number Port 2	FF0	1–FFF
Locally Administered Address	(none)	4000 0000 0000 4000 7FFF FFFF
Port Path Cost	100 (10 Mbps)	0–65535
Port Priority	128	0–255
Filter Parameters		
Filter Program Status	1	1 = Enabled 0 = Disabled
Criteria Range Filter Port 1 and 2		
Filter Offset	000	0–100 (decimal)
Range 1 Low	0000	0–FFFF
Range 1 High	FFFF	0–FFFF
Range 2 Low	0000	0–FFFF
Range 2 High	FFFF	0–FFFF
Address Range Filter Port 1 and 2		
Source Address Low	0000 0000 0000	12 hexidecimal digits
Source Address High	0000 0000 0000	12 hexidecimal digits
Destination Address Low	0000 0000 0000	12 hexidecimal digits
Destination Address High	0000 0000 0000	12 hexidecimal digits
Link Passwords		
Link Password 0	0000 0000	6 to 8 alphanumeric
Link Password 1	0000 0000	6 to 8 alphanumeric
Link Password 2	0000 0000	6 to 8 alphanumeric
Link Password 3	0000 0000	6 to 8 alphanumeric

8229 SNMP Agent Configuration Parameters

Table 5-3 shows the parameters that are used to define the 8229 SNMP agent. Use this table to determine how you want to configure an 8229.

For more information about the 8229 SNMP agent configuration, see the LOAD_IP.txt file provided on the Operational Software Diskette that is shipped with the 8229, and Chapter 11, “Running the 8229 With SNMP.” Use the LOAD_IP.txt file or the EIA 232 Program to set these parameters.

The WAN attachment module cannot be used with SNMP.

Table 5-3. 8229 SNMP Agent Configuration Parameters

Parameter Name	Description
System Group Values	
sysName	Specifies the name of the bridge
sysDescr	Describes the bridge
sysLocation	Defines the location of the bridge
sysContact	Defines a contact name and telephone number
Enable/Disable Authentication Failure Traps	
snmpEnableAuthenTraps	Enable, Disable
Community Specifications (Up to 6)	
Community Name	Community name up to 40 characters; no spaces
IP address	IP address of the owner of the community name
Read or Write	Use read to allow read privileges for a community Use Write to allow read/write privileges
Trap Community Specification (Up to 6)	
Trap community name	Trap community name up to 40 characters; no spaces
IP address	IP address of SNMP manager to receive alerts
IP Group Values	
IP address	Address of 8229 SNMP agent
Subnet mask	8229 assigned subnet mask
defroute	8229 default gateway IP address

Chapter 6. LDBRG Program

The LDBRG Program enables you to:

- Load SNMP Parameters to the 8229 from an ASCII text file such as LOAD_IP.txt
- Load filter programs to the 8229
- Load operational software to the 8229

The LDBRG Program operates through a workstation connected to a LAN segment in the network that includes the 8229. LDBRG can communicate with any 8229 in the network. Because this program is used to load files, you will be given only an acknowledgment that the files have been sent. No acknowledgment is returned from the 8229 that a file has been received or implemented.

Additional information about the 8229 LDBRG Program is provided in the README file on the diskette shipped with the 8229.

Using LDBRG

LDBRG.exe can run only in DOS 3.3 or higher. Also, LDBRG requires that the appropriate drivers from the IBM Local Area Network Support Program be active in the workstation. Refer to the *Local Area Network Support Program User's Guide*, which is shipped with the LAN Support Program, for instructions about loading the LAN Support Program. The LAN Support Program drivers that support an Ethernet adapter enable LDBRG to be run from a workstation using an Ethernet adapter.

The command syntax to implement LDBRG is:

```
LDBRG MAC_ADDRESS [Drive] [Path] FILENAME
```

MAC_ADDRESS represents the MAC address of the destination port on the 8229, for example, 08005A436821; FILENAME represents the file name of the file being transferred, for example, LOAD_IP.txt or TRT.X.

For example, the command to load TRT.X at the sample MAC address 08005A436821 is:

```
LDBRG 08005A436821 C:\LBE\TRT.X
```

Note: If the file transfer proceeds normally, the 8229 immediately restarts after the file transfer is complete. Be sure not to power off the 8229 during file loading. If the 8229 is powered off during file loading, it enters minimal mode and must be reloaded by the EIA 232 Port.

When to Use the EIA 232 Program

The EIA 232 Program enables you to install and change the SNMP parameters, to upload the operational software and user-defined filters, and to restart the 8229. This program performs many functions, but is not required except in minimal mode for the operation of the bridge. See “Minimal Operational Mode” on page 1-10.

Chapter 7. Using the DTE Port and the EIA 232 Interface

Setting Up the DTE Port

Follow this procedure to set up and use your out-of-band management interface, which is identified as the DTE port on the front of the 8229. This interface enables you to access the EIA 232 Program that lets you upload operating code and filters that come on the 8229 Operational Software Diskette. This program also lets you preconfigure the 8229 bridge with the SNMP variables necessary for operation in an SNMP environment. These variables include your Internet Protocol (IP) address, default gateway IP address, subnet mask, community parameters, and trap community parameters.

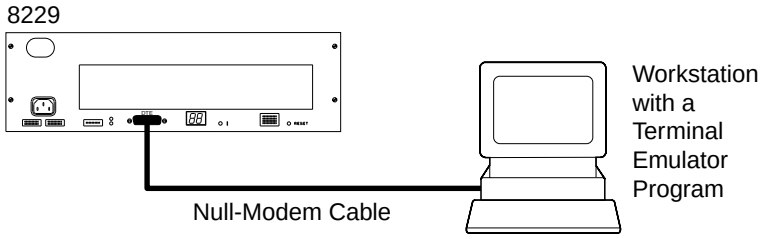


Figure 7-1. Using the DTE Port with a Null Modem Cable

Perform the following tasks:

1. Ensure that the other ports on the 8229 (the ones to which your workstation is not attached) either are cabled to the network or have wrap plugs (only token-ring D-shells and AUI connectors) in place.
2. Attach your workstation to the 8229 in either of the two ways described below:
   - Directly, by plugging the null-modem cable from a serial port on your workstation into the EIA 232 port labeled “DTE” on the front of the 8229.
   - Remotely, by going through a modem interface to a telephone line.

     Note: If you are going through modems and telephone lines, make sure that the modems are configured to be compatible with your terminal emulation software. See specifications for emulation below and your modem configuration instructions. Configure your modem for auto-answer.
3. Using the terminal emulation software of your choice, set your workstation to emulate a VT100 or TTY terminal with the following configuration:
   - 9600 BAUD
   - 8 data bits
   - 1 stop bit
   - No parity
   - XMODEM file transfer protocol
4. If your 8229 is powered off, follow the steps under step 4a below. If your 8229 is already powered on (and has gone through its self-test), follow the steps under step 4b on 7-3.
   a. These are the steps you should follow if your bridge is powered off:
      1) Power on the 8229 (by attaching the power cord first to the main receptacle and then to the 8229).
      2) Let the 8229 go through its bring-up sequence (described in the procedures for “Testing the Bridge”).

3) Observe the Hardware Status information that is presented on the monitor of your workstation automatically after carrier detect is present. This will be followed by a menu.

4) Select the desired option from the menu.

Note: The bridge is shipped preconfigured for LLC management. If you intend to use SNMP, then select the options that allow you to set the SNMP variables. You should load these variables into the bridge before uploading the operating code for SNMP management. The operating code is shipped on the Operational Software Diskette. A file named STRT.X is used for token-ring-to-token-ring bridging; a file named STREE.X is used for token-ring-to-Ethernet bridging.

b. These are the steps you should follow if your bridge is already powered on:

1) Press **Enter** to send an interrupt to the bridge
2) Observe the menu that is presented on the monitor of your workstation.
3) Select the desired option from the menu.

Note: The bridge is shipped preconfigured for LLC management. If you intend to use SNMP, then select the options that allow you to set the SNMP variables. You should load these variables into the bridge before uploading the operating code for SNMP management. The operating code is shipped on the Operational Software Diskette. A file named STRT.X is used for token-ring-to-token-ring bridging; a file named STREE.X is used for token-ring-to-Ethernet bridging.

EIA 232 Program Menus

The 8229 must complete its full power-on sequence (that is, the 8229 numeric display must be blank before the 8229 presents its primary menu).

Throughout the EIA 232 program, the system prompt (>>) indicates that some form of input either is expected during an active operation or is accepted to initiate an operation. If you request an illegal operation, a message will be displayed.

The primary menu display allows you to specify which operation is to be initiated. Depending on which menu item you choose, additional options or menus may be displayed. The primary menu is preceded by a five-line hardware status summary.

```
Select desired operation.  Then Enter.

1. Upload code to the 8229
2. Upload user filter to 8229
3. Display 8229 information
4. Display SNMP system variables (not used for LLC Management)
5. Modify SNMP system variables (not used for LLC Management)
6. Perform a system restart of the 8229
>>
```

Menu option 1, `Upload code to the 8229`, enables you to upload the 8229 operational software. Uploading the operational software would normally be done to update or upgrade the software that is already resident in the 8229, to change the physical configuration of the bridge, or to change the network management

scheme that is to be executed. It is assumed that the file to be uploaded is resident on the workstation connected to the 8229 diagnostic port.

Menu option 2, *Upload user filter to 8229*, enables you to upload a user-defined filter program that will operate on the 8229. It is assumed that the file to be uploaded is resident on the device connected to the 8229 diagnostic port.

Menu option 3, *Display 8229 information*, gives you a quick way to examine the universally administered MAC address, the currently assigned IP addresses, the current configuration, and other information about the 8229.

Menu option 4, *Display SNMP system variables*, gives you a way to display the current SNMP and IP parameters associated with the 8229.

Menu option 5, *Modify SNMP system variables*, allows you to display and to modify the various SNMP and IP parameters associated with the 8229. The new SNMP variables are stored in NVR. The modified SNMP variables do not take effect until after the system has been restarted.

Menu option 6, *Perform a system restart of the 8229*, allows you to initiate an operational restart of the 8229.

Note: This is the equivalent of a power-on sequence, different from using the hardware reset button.

Primary Menu Option 1: Upload Code to the 8229

When you select the first menu option, Upload code to the 8229, a warning message and cancel option menu are displayed:

```
Continuing this operation will halt the current 8229 operations
and will cause the 8229 to restart.

Select desired option.  Then Enter.

1. Continue with file transfer
2. Cancel file transfer
>>
```

If an entry other than 1 or 2 is made, the system displays an error message (invalid entry) and redisplays the entire menu. When you select option 2, the system redisplays the primary menu panel. When you select option 1, the 8229 prepares itself for the upload and asks you to initiate the file transfer operation.

```
Please start XMODEM file transfer.
Several Control-Xs (^X) will terminate upload.
```

Note: The terminal emulator program must be configured as indicated in step 3 on page 7-2 with the correct defaults. The uploading is performed by the emulator program. Therefore, it is necessary to return to the emulator program to start the binary file transfer. If the upload operation does not begin within 60 seconds, an error condition is detected, the process is discontinued, and an error message is displayed. No additional information is displayed during the program upload process.

Once the program has been successfully loaded, the system performs a series of information messages that inform you about progress of the 8229 software update.

The following messages are displayed, one line at a time, upon the completion of the activity described. The numerical display on the bridge is also changing.

Warning: Do not power off or reset the 8229 during this file transfer. If the file transfer is not completed, the 8229 will return to minimal mode.

```
Caution: Removing power from the 8229 during the update may damage memory

Uploading complete.
Updating 8229: Phase 1
Updating 8229: Phase 2
Updating 8229: Phase 3
Update successful

Restart in process.
```

Once the uploading process has been completed, the system performs an automatic restart and begins full operational mode, displaying the primary menu (See “EIA 232 Program Menus” on page 7-3).

During the upload, some form of error condition or failure can occur.

The following table provides a list of the error messages and their cause that could be displayed during the upload.

MESSAGE	CAUSE
Error In transfer	Upload operation was not successful.
Invalid file format	Uploaded file was not the file type expected.
FLASH Memory Error: could not update	Hardware failure of FLASH Memory.
FLASH Memory Error: signature error	Hardware failure with FLASH Memory.
Flash Memory Error: invalid checksum	Checksum of FLASH Memory is not correct.

Primary Menu Option 2: Upload User Filter to 8229

When you select the first menu option, the 8229 prepares itself for the upload and asks you to initiate the file transfer operation.

```
Please start XMODEM file transfer.
Several Control-Xs (^X) will terminate upload.
```

Note: The terminal emulator program must be set up (in the profile) with the correct defaults. The uploading is performed by the emulator program. Therefore, it is necessary to return to the emulator program to start the file transfer.

Depending on the terminal emulator package being used, the periodic display of the letter C or the section symbol X'' may be supported. Once the uploading process begins, the additive display stops. If the upload operation does not begin within 60 seconds, an error condition is detected and the process is discontinued with an error message being displayed. No additional information is displayed by the 8229 during the filter upload process. Once the upload has been completed, the system redisplays the primary menu.

You can terminate the upload process by entering several Control-X keystrokes from the keyboard connected to the device communicating with the 8229.

If there are any errors during the filter upload, the same error messages that were described for the program file upload are used.

Primary Menu Option 3: Display 8229 Information

When you select the third menu option, Display 8229 information, useful information about the current configuration of the 8229 is displayed:

```
Hardware Revision: n
Boot Version: N.nn
Product ID: _______ - Version: ____     Created mm/dd/tt yyyy
Token-Ring/_________ Local Bridge
_______ LAN Management
PORT 1 - MAC address: 08005A43nnnn  TYPE: _____  _____ Slot: ___
PORT 2 - MAC address: nnnnnnnnnnnn  TYPE: _____  _____ Slot: ___
SNMP Agent IP address: nnn.nnn.nnn.nnn
Press any key to continue
>>
```

Pressing any key redisplays the primary menu.

Label	Description
Hardware Revision	This entry displays the current hardware revision level of the 8229.
Boot Version	This entry displays the current software level of the installed BIOS (the boot EPROM).
Product ID/Version	This entry displays the product number and the current version level of the 8229 software that is currently installed in the 8229 (FLASH).
Bridge Type	This entry displays the type of bridge configuration that is supported by the software that has been loaded.
LAN Management	This entry displays the type of LAN management software that has been loaded. Current options are IBM LLC Type 2 and SNMP.
Port 1/Port 2	These entries display information about the current 8229 logical port configuration including: • The universally (or locally) administered MAC address of the port • The type of port (token-ring or Ethernet) • The slot (upper or lower) and port (1 or 2) where it is physically located.
SNMP Agent	This entry displays the SNMP agent's IP address. The IP address is either the default IP address or the modified IP address.

Primary Menu Option 4: Display SNMP System Variables

When you select this menu option, the currently defined SNMP variables are displayed. The following display shows the standard defaults that are provided by all versions of the 8229 software.

```
sysDescr:    IBM 8229 LAN Bridge (C) Copyright IBM Corp. 1993
sysContact:  UNDEFINED
sysName:     Token-Ring/__________ Local Bridge
sysLocation: UNDEFINED
IP address:      128.127.nnn.nnn
Subnet mask:     255.255.0.0
Default gateway: 0.0.0.0
Community
  1: public                                    0.0.0.0 read
  2: netman                                    0.0.0.0 write
  3: not defined
  4: not defined
  5: not defined
  6: not defined
Trap Community
  1: not defined
  2: not defined
  3: not defined
  4: not defined
  5: not defined
  6: not defined
Press any key to continue
>>
```

Pressing any key redisplays the primary menu.

Label	Description
sysDescr	MIB2 system group variable of 60 characters. Default is "IBM 8229 Lan Bridge (C) Copyright IBM Corp. 1993."
sysContact	MIB2 system group variable of 60 characters. Default is "UNDEFINED."
sysName	MIB2 system group variable of 60 characters. Default is currently loaded software configuration.
sysLocation	MIB2 system group variable of 60 characters. Default is "UNDEFINED."
IP Address	IP address of the SNMP agent. n=decimal equivalent of the second-to-last MAC address byte for port 1
Subnet Mask	IP subnet mask. Default is 255.255.0.0.
Default Gateway	IP address of default gateway. Default is 0.0.0.0.
Community	Community parameters including community name and other community parameters described in Chapter 11.
Trap Community	Trap community parameters including trap community name and IP address of the SNMP manager to receive the alerts.

Primary Menu Option 5: Change SNMP System Variables

When you select this menu option, change SNMP system variables, the change SNMP variables menu is displayed:

```
Select SNMP variable to change. Then Enter.

 1. sysDescr
 2. sysContact
 3. sysName
 4. sysLocation
 5. IP address
 6. Subnet mask
 7. Default gateway
 8. Disable snmpEnableAuthenTraps
 9. Community
10. Trap Community
11. Entries are correct, continue
>>
```

You must select the desired menu item and then press Enter. If an entry other than 1 through 11 is made, the system displays an error message (invalid entry) and redisplays the entire menu. When you select option 11, the system redisplays the primary menu.

When you select options 1 through 7, the system displays a working panel that provides the current SNMP system variables and allows you to change the current definition of the SNMP variables.

Note: None of the SNMP changes take effect until the 8229 has been restarted or powered up again. Option 8 is a toggle option that alternates the desired effect (enabling or disabling the snmpEnableAuthenTraps variable) each time you select it.

When you select option 9 or 10, the system displays either the Choose Community or Trap Community menu. Subsequent displays allows you to select one of the communities to modify.

Option 1. Change sysDescr Definition Panel

This panel is used to review and change the current definition of the sysDescr SNMP variable.

```
SNMP Variable name: sysDescr
Format:        Character string - 60 characters maximum.

Current entry: IBM 8229 LAN Bridge (C) Copyright IBM Corp. 1993

Type in desired value. Then Enter.
>>
```

Option 2. Change sysContact Definition Panel

This panel is used to review and change the current definition of the sysContact SNMP variable.

```
SNMP Variable name: sysContact
Format:        Character string - 60 characters maximum.

Current entry: UNDEFINED

Type in desired value. Then Enter.
>>
```

Pressing Enter with no entry clears (erases) the current entry and returns you to the primary menu.

Option 3. Change sysName Definition Panel

This panel is used to review and change the current definition of the sysName SNMP variable.

```
SNMP Variable name: sysName
Format:        Character string - 60 characters maximum.

Current entry: Token-Ring/Token-Ring Local Bridge

Type in desired value. Then Enter.
>>
```

Pressing Enter with no entry clears (erases) the current entry and returns you to the Choose SNMP variable to change menu. To retain the current entry, the entire string must be re-keyed before pressing Enter (or press escape).

Option 4. Change sysLocation Definition Panel

This panel is used to review and change the current definition of the sysLocation SNMP variable.

```
SNMP Variable name: sysLocation
Format:        Character string - 60 characters maximum.

Current entry: UNDEFINED

Type in desired value. Then Enter.
>>
```

Pressing Enter with no entry clears (erases) the current entry and returns you to the menu. To retain the current entry, the entire string must be re-keyed before pressing Enter (or press escape).

Option 5. Change IP Address Definition Panel

This panel is used to review and change the current definition of the IP address for the SNMP agent. A valid IP address must be entered. Note: no validation of the address other than format (n.n.n.n) is performed. It is your responsibility to ensure that the address is appropriate for your environment.

```
SNMP Variable name: IP address
Format:        ddd.ddd.ddd.ddd

Current entry: 128.127.0.116

Type in desired value. Then Enter.
>>
```

Entering a correctly formatted IP address returns you to the Change SNMP Variables menu.

Option 6. Change Subnet Mask Definition Panel

This panel is used to review and change the current definition of the subnet mask. A valid IP address must be entered. Note: no validation of the address other than format (n.n.n.n) is performed. It is your responsibility to ensure that the subnet mask address is appropriate for your environment.

```
SNMP Variable name: Subnet mask
Format:        ddd.ddd.ddd.ddd

Current entry: 255.255.0.0

Type in desired value. Then Enter.
>>
```

Pressing Enter with no entry or an invalid entry causes an error message to be displayed, and the panel is redisplayed. To retain the current entry, the entire IP address must be re-keyed before pressing Enter (or press escape). Entering a correctly formatted IP address and then pressing Enter returns you to the Change SNMP Variables menu.

Option 7. Change Default Gateway Definition Panel

This panel is used to review and change the current definition of the default gateway. A valid IP address must be entered. Note: no validation of the address other than format (n.n.n.n) is performed. It is your responsibility to ensure that the address is appropriate for your environment.

```
SNMP Variable name: Default gateway
Format:        ddd.ddd.ddd.ddd

Current entry: 0.0.0.0

Type in desired value. Then Enter.
>>
```

Note: If there is not a direct route between the 8229 and the network manager, a route can be defined to allow the connection.

Pressing Enter with no entry or an invalid entry causes an error message to be displayed, and the panel is redisplayed. To retain the current entry, the entire IP address must be re-keyed before pressing Enter (or press escape). Entering a correctly formatted IP address and then pressing Enter returns you to the Change SNMP Variables menu.

Option 8. Disable snmpEnableAuthenTraps

Each time that you select option 8, the Authentication trap is toggled between enabled and disabled. When enabled, this option will read “Disable snmpEnableAuthenTraps.” When disabled, this option will read “Enable snmpEnableAuthenTraps.”

Note: Enabling the authentication allows an alert (trap) to be sent to the network manager if unauthorized access is attempted.

Option 9. Select Community Menu

This menu panel is used to select one of six SNMP communities for examination and parameter changes. Subsequent displays allow you to modify the existing SNMP Community variables. This panel displays the current definitions of the six communities and then provides a menu from which you can select one for modification or review.

Note: Managers using the names defined as communities are allowed to access the 8229. This access can be read or read/write. If the IP address is set to 0.0.0.0, then multiple network managers, using the same community name, can have access to the 8229.

```
Community 1: public                          0.0.0.0   read
Community 2: netman                          0.0.0.0   write
Community 3: not defined
Community 4: not defined
Community 5: not defined
Community 6: not defined

Select community to change. Then Enter.

 1. Community 1
 2. Community 2
 3. Community 3
 4. Community 4
 5. Community 5
 6. Community 6
 7. Entries are correct, continue
>>
```

If an entry other than 1 through 7 is made, the system displays an error message (“Invalid Entry”) and redisplays the entire panel. You can accept the current definitions by selecting menu option 7 or change one of the communities by selecting the appropriate menu option. If you select options 1 through 6, the system displays the change community definition panel.

Change Community Definition Panel: This panel is used to review and change the current definition of the selected community. Community definition includes a name, a valid IP address, and read or write access.

Note: No validation of the address other than format (n.n.n.n) is performed. It is your responsibility to ensure that the address and community access mode are appropriate for your network.

Definition for the communities must be contiguous. To define more than one community you must define 1, then 2, then 3, and so on. If you attempt to define a community, for example 4, and community 3 is not already defined, the system automatically changes the community being defined to 3. You can see the community number being modified. For example, for community 1 you would see the following, providing that you did not modify the original factory defaults:

```
SNMP Variable name: Community 1
Format:  Name(no spaces, 40 characters max) IP_Address Access(read/write)

Community 1: public                          0.0.0.0 read
read
Type in desired value. Then Enter.
>>
```

You must enter all three parameters (name, IP_Address, and Access) on one line. Use space characters as delimiters. Pressing Enter with no entry clears (erases) the current entry and returns you to the Choose community to change menu.

Option 10. Select Trap Community Menu

This menu is used to select one of six SNMP Trap Communities for examination and changes. Subsequent displays allow you to modify the existing SNMP Trap Community variables. This panel displays the current definitions of the six trap communities and then provides a menu to select one for modification or review.

Note: The trap communities define where alerts (traps) are sent. If a network manager wants to receive any trap, such as a cold start trap that is generated each time the bridge comes up, then this trap community name must first be established.

```
Trap Community 1
Trap Community 2
Trap Community 3
Trap Community 4
Trap Community 5
Trap Community 6

Select trap community to change. Then Enter.

 1. Trap Community 1
 2. Trap Community 2
 3. Trap Community 3
 4. Trap Community 4
 5. Trap Community 5
 6. Trap Community 6
 7. Entries are correct, continue
>>
```

If an entry other than 1 through 7 is made, the system displays an error message (Invalid Entry) and redisplays the entire menu. You can accept the current definitions by selecting menu option 7 or change the definition of one of the SNMP Trap Communities by selecting the appropriate menu option. If you select options 1 through 6, the system displays the Change trap community value panel.

Change Trap Community Definition Panel: This panel is used to review and change the current definition of the selected trap community. Entries include a name and a valid IP address. Note: no validation of the address other than format (n.n.n.n) is performed. It is your responsibility to ensure that the address is appropriate for your environment. Definition for the trap communities must be contiguous. To define more than one trap community you must define 1, then 2, then 3, and so on. If you attempt to define a trap community, for example 4, and trap community 3 is not already defined, the system automatically changes the community being defined to 3. You can see the trap community being modified, but no other notification is made.

```
SNMP Variable name: Trap Community n
Format:        Name(no spaces, 40 characters max) IP_Address

Trap Community n: not defined
Type in desired value. Then Enter.
>>
```

You must enter both parameters (name and IP_Address) on one line. Space characters are used as delimiters.

Primary Menu Option 6: Perform a system Restart of the 8229

When you select menu option 6, the system displays an information message that explains the consequences of the restart function and the Continue operation menu is displayed.

```
Continuing this operation will halt the current 8229 operations
and will cause the 8229 to re-start.

Select desired option. Then Enter.

1. Continue with restart
2. Cancel restart
>>
```

If an entry other than 1 or 2 is made, the system displays the error message (Invalid Entry) and redisplays the entire menu. When you select option 2, the system redisplays the primary menu. When you select option 1, the system restarts. The whole process takes a few minutes to be successfully accomplished.

```
Restart in process.
```

Once the user-initiated restart process has been completed, the system comes up in full operational mode, and the menu is redisplayed.

Chapter 8. IBM 8229 Utility Program: Token-Ring-to-Token-Ring and Token-Ring-to-WAN Configuration

IBM 8229 Utility Program

The IBM 8229 Utility Program (hereafter referred to as the *Utility Program*) uses the LLC Type 2 LAN management methodology and runs on a workstation attached to the same network as the 8229. The workstation can access the 8229 by being on the same LAN segment as the 8229 or by accessing the 8229 over other bridges from a different LAN segment.

The Utility Program enables you to:

- Display and change advanced configuration parameter values (such as values for single-route broadcast, spanning tree, and filter parameters)
- Display or change the LAN segment number (for either LAN segment connected to the 8229) to a value other than the value set by the attachment module switches
- Display or change the bridge number and the bridge name. The configuration parameter for the bridge number overrides the bridge number set by the attachment module configuration switches.
- Display and change the status of the LAN management servers
- Load a filter program into the 8229
- Load operational software into the 8229

SNMP and the Utility Program

SNMP configuration requires operational software that is specific to SNMP, such as STRT.X or STREE.X. **When the operational software for SNMP is loaded, the 8229 does not link with the Utility Program.** If you attempt to use the Utility Program when you have loaded STRT.X or STREE.X, you will receive one of these two error messages:

```
DFIPD289I      Operation failed, bridge not linked
DFIPD753W      Operation failed, no communication response received
```

In order to use the Utility Program in this situation, you must use LDBRG or the EIA 232 Program to upload the appropriate operational software for LLC Type 2 network management protocol, for example, TRT.X or TREE.X. Then, you are able to link the Utility Program to the 8229. The Utility Program does not work when the 8229 is configured for SNMP.

Using the Utility Program With Token-Ring-to-WAN Configuration

A token-ring-to-WAN bridge can consist of two 8229s or one 8229 and a workstation in which the IBM Remote Token-Ring Bridge Program[1] is installed. When the token-ring-to-WAN configuration consists of two 8229s, you can use the Utility Program. When it consists of the IBM Remote Token-Ring Bridge Program and one 8229, you cannot use the Utility Program.

[1] The supported versions of the IBM Remote Token-Ring Bridge Program are: IBM Remote Token-Ring Bridge/DOS Version 1.0 and IBM Remote Token-Ring Bridge Program Version 2.2.

Token-Ring-to-WAN Configuration Using Two 8229s

In the case of the Token-Ring-to-WAN configuration using two 8229s, the two 8229s each use one Token-Ring Attachment Module and one WAN Attachment Module. On the token-ring side, each 8229 is attached to a token-ring; on the WAN side, each 8229 is attached to the WAN. Figure 8-1 shows this configuration:

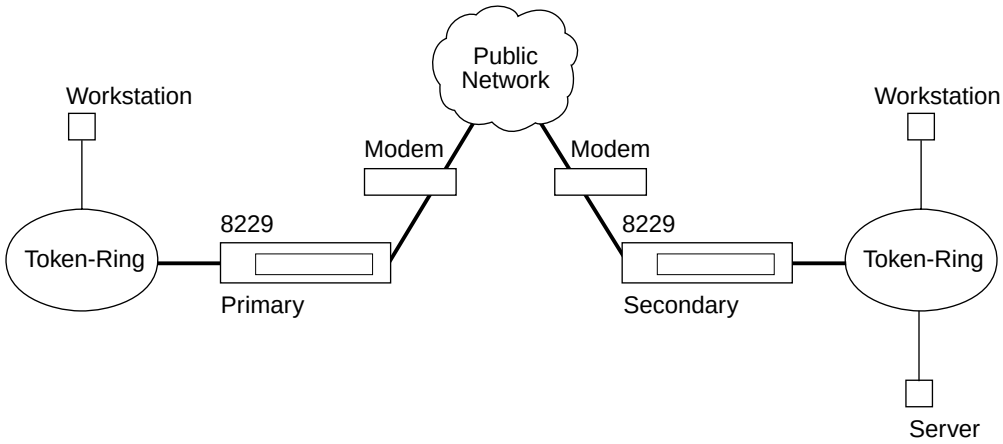


Figure 8-1. Token-Ring-to-WAN Connection

In this configuration, the 8229 supports only token-ring-to-token-ring connection and LLC Type 2 LAN network management protocol. The operational software file used by each half of the bridge is WAN.X.

Logically, each 8229 is regarded as only one half of the bridge. This configuration is known as a *split bridge*. The *primary* half of the bridge determines the parameters that control the *secondary* half of the bridge, which is located on the other side of the WAN segment. The split bridge has only one bridge name and one bridge number. Switch setting 1 on the WAN Attachment Module is set to tell the system that this 8229 is designated as the primary half of the bridge.

Important: The Utility Program must be linked to the primary half of this split bridge.

Once the Utility Program is linked to the primary half of the bridge, using the Utility Program is the same for the split bridge composed of two 8229s as it is for a token-ring-to-token-ring bridge.

Token-Ring-to-WAN-Configuration Using the IBM Remote Token-Ring Bridge Program

You can have a split bridge composed of a workstation with IBM Remote Token-Ring Bridge Program at one side of the WAN and an 8229 at the other side. In this configuration, the 8229 is always the secondary half of the split bridge. You cannot use the Utility Program with this configuration; you must designate the workstation with the IBM Remote Bridge Program Version 2.0 as the primary half of the bridge and set the parameters on that bridge, using the LAN Network Manager Program. The 8229 accepts the parameters set for the primary half of the bridge, that is, the parameters for the IBM Remote Token-Ring Bridge Program.

To load and set a user-defined filter program when the 8229 is the secondary half of the split bridge, use LDBRG. To clear a user-defined filter when the 8229 is the secondary half of the split bridge, perform one of the following steps:

- Press the hardware reset button
- Use LDBRG to load FILTER3.X, the null filter. This file erases the user-defined filter program from the secondary bridge.

Running the Utility Program

To run the Utility Program, you must have installed DOS 3.3 or higher in the workstation and you must have activated the LAN Support Program. You can run the Utility Program from an Ethernet segment provided you have activated the LAN Support Program for the Ethernet adapter in your workstation. Refer to the *Local Area Network Support Program User's Guide*, shipped with the LAN Support Program, for more information. See "How to Install the Software Found on the Operational Software Diskette" on page 4-3 for instructions about installing the Utility Program on a fixed disk in your workstation.

After you have installed the Utility Program and the other operational software to your workstation, these files are located in subdirectory LBE. The Utility Program displays the token-ring-to-token-ring configuration panels when the operational software is TRT.X (for token-ring-to-token-ring physical configuration) and the token-ring-to-Ethernet panels when the operational software is TREE.X (for token-ring-to-Ethernet physical configuration).

Make LBE your current directory and type:

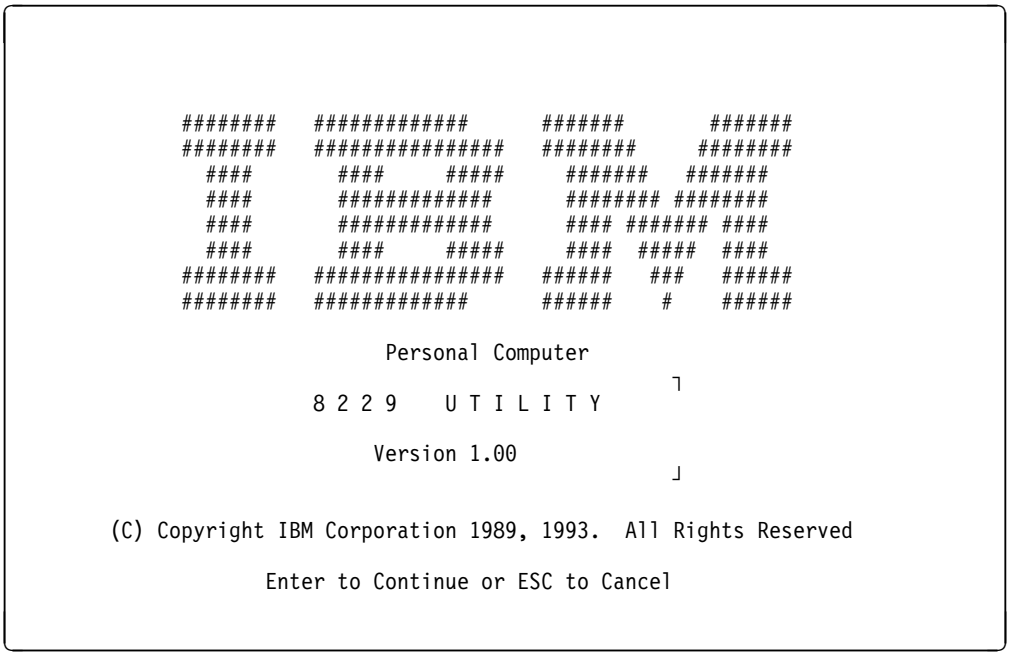
```
LBE
```

The first panel of the Utility Program is displayed.

Functions of the Utility Program

The first panel and the Main Menu of the Utility Program are shown in the next two illustrations:

Title Panel



Main Menu

```
DFIPBD10                  IBM 8229 UTILITY PROGRAM
                              Bridge Functions

Select one of the following and press Enter.

   1. Bridge profile          Display bridge status and parameters

   2. Link bridge             Establish reporting link with bridge

   3. Unlink bridge           Terminate reporting link with bridge

   4. Configure bridge        Configure bridge parameters

   5. Bridge definition       Add/Delete/View/Change bridge definitions

   6. System definition       Define bridge password

   S  Shutdown                Shut down the 8229 Utility



Enter  Esc=Cancel  F1=Help  F3=Exit
```

The following list includes all the functions of the Utility Program:

- Bridge definition. These are the bridge definition choices:
  - Add a bridge definition
  - View and make changes in an existing definition
  - List up to 8 bridge definitions and change the parameters of those bridges
- Linking the Utility Program to the bridge
- Configuring the bridge. These are the configuration choices:
  - Modifying bridge parameters
  - Loading user-defined filter programs
  - Loading operational software
- Querying the bridge profile
- Defining a bridge password using System Definition
- Unlinking the Utility Program from the bridge
- Shutting down the Utility Program

Each of these functions will be described in this chapter. Choose the functions with which you need assistance.

Finding Your Way Through the Utility Program

Press the F1 key for online help using the panels. Press **Enter** to save the information you have entered on a panel and press **Esc** to return to the previous panel. If you press **Esc** without pressing **Enter** first, changes you have made on that one panel are canceled and you are returned to the previous panel. Changes that you have previously entered on panels other than the one from which you just escaped are not affected.

Option 5. Bridge Definition

You must define a bridge. To define the bridge, begin by choosing Option 5 from the Main Menu. A panel comes up asking whether you want to add, view, or list the bridge definition. Select *Option 1. Add* to add a bridge definition. If you select View or List, panels are displayed to allow you to do either of those functions. However, you cannot view or list the bridges until you have defined them.

Add Bridge Definition Panel

The following panel is displayed:

```
 DFIPBD25              IBM 8229 UTILITY PROGRAM
                         Add Bridge Definition

Type the information below and press Enter

Bridge name . . . . . . . . . 1-8 characters

Link during bring-up. . . . . Y=Yes  N=No


Bridge adapters:
 Port 1 adapter address . . . 12 hexadecimal digits
 Port 2 adapter address . . . 12 hexadecimal digits




Comments:

Enter  Esc=Cancel  F1=Help  F3=Exit  F5=Refresh
```

Figure 8-2. Utility Program: Add Bridge Definition

Type in the bridge name. There are three other fields you must fill in: `Link during bring-up?`, the Port 1 address, and the Port 2 address. The comments field is optional. Be sure to type in *ALL* the required information before pressing Enter. If you press Enter before all the information has been entered, the information you have entered up to that point on that panel is erased and has to be re-entered. Also, note that *Esc*, not *Enter*, is used to exit the panel after the information has been entered.

Bridge Name

This parameter assigns a 1- to 8-character name to this 8229. The bridge name is the name of this bridge in the network, and is the name by which the network management program knows the bridge.

Important: We recommend that you keep a record of the name of the bridge. Although the Utility Program can display the names of all the bridges, it saves time to know the bridge name. Many functions of the Utility Program require you to enter it.

Link During Bring-Up

If you choose **Y (Yes)** for this option, the 8229 will automatically be linked to the Utility Program or another network management program when you bring up the program. If you choose **N (No)** for this option, you will have to manually relink the 8229 each time you bring up the Utility Program or another network management program.

Note: 8229 links to the Utility Program are automatically severed when the Utility Program shuts down.

Port 1 Adapter Address

This address must be the 12-digit hexadecimal address for the first port adapter. It must be the universally administered MAC address when you first

define the 8229 because the operational software is designed to identify the adapter by its universally administered address. Later, by changing an 8229 parameter, you can redefine the universally administered address for this port to a locally administered MAC address if desired. To change the port address to a locally administered MAC address, you must follow this procedure:

1. Use the Bridge Configuration function to set the locally administered address for Port 1
2. Unlink the 8229 from the Utility Program
3. Use the Bridge Definition function to redefine the port address to match the port locally administered address parameter
4. Relink to the bridge

If you need help identifying the universally administered MAC address for Port 1, see “Media Access Control Addresses” on page 1-5.

Note: Be sure to keep a record of the locally administered MAC address because you will need it to identify that port in the network if the 8229 should be reset. Resetting replaces all parameters with their default values, and the default values for the port addresses are the universally administered addresses, not the locally administered MAC addresses.

Port 2 Adapter Address

This address must be the universally administered MAC address for Port 2 when the port is first defined. The universally administered MAC address equals the value of the Port 1 MAC address plus 1. To replace the universally administered MAC address with a locally administered MAC address, you must follow the same procedure you followed for Port 1.

Comments

Comments are optional. The Utility Program provides space in this parameter for up to 40 characters of comments about this bridge and its use in the network.

Completing the Bridge Definition

When you have typed in all the required information on the panel, press Enter, then press Esc. If you press Enter twice without changing any of the information on the panel, you get a message saying you have a duplicate bridge name and number. If you get this message, simply press Esc. The Utility Program will then correctly define the one bridge for which you have entered information and will bring up the previous menu panel that has the choices Add, View, or List. Press Esc from this panel to return to the Main Menu.

Defining Multiple Bridges

The Utility Program allows you to define up to 8 bridges using the version of the Utility Program that has been exploded to the LBE subdirectory. If you must define more bridges, copy the operational software to a new subdirectory and execute the Utility Program by typing **LBE** from the new subdirectory.

Note: Be sure to create the new subdirectory using DOS commands. Do not use the installation aid supplied with the 8229 for this task.

Option 2. Linking to the 8229

Linking establishes a communication path from the workstation to the 8229. You need to link to the bridge after you have defined it if you want to use the Utility Program to change its configuration or operational software. To link to the 8229, choose Option 2 from the Main Menu and follow the instructions provided by the panels.

Linking to a particular bridge happens automatically when you activate the Utility Program if you have defined that bridge for `Link during bring-up?` equals **Y (Yes)**.

Option 4. Configuring the Bridge

Configuration of the bridge allows you to perform one of the three following tasks:

1. Change parameters
2. Load user-defined filter programs
3. Load operational software (identified as system microcode by the Utility Program)

You choose Option 4 from the Main Menu to enter bridge configuration. The next panel asks for the name of the bridge. After you enter the bridge name, a menu panel enables you to choose one of the configuration tasks.

Configure Bridge Panel 1: Name, Number, Frame Forwarding, Ports

If you choose to change parameters, the following panel appears:

```
DFIPCB03               IBM 8229 UTILITY PROGRAM          Page 1 of 7
                      Configure Bridge Parameters

Type any changes and press Enter

Bridge name. . . . . . . . . . . :
Bridge number. . . . . . . . . . :  (0-F)
Frame forwarding active. . . . . :  (1=Yes  0=No)

Bridge port information

LAN segment number . . . . . . . :  (1-FFF)
 Adapter . . . . . . . . . . . . :
 Locally administered address. . :  (hex)
 Segment type  . . . . . . . . . :  Token-Ring          Mbps

LAN segment number. . . . . . . . :  (1-FFF)
 Adapter . . . . . . . . . . . . :
 Locally administered address  . :  (hex)
 Segment type  . . . . . . . . . :  Token-Ring          Mbps



Enter  Esc=Cancel  F1=Help  F3=Exit  F5=Refresh
                                                          PgDn
```

Figure 8-3. Bridge Port Information Parameters

Bridge Number

This parameter uniquely identifies a bridge in the token-ring frame routing field.

The bridge number defined here overrides the bridge number set in the attachment module configuration switches.

Frame Forwarding Active

This parameter specifies whether or not the bridge will begin transmitting frames from one LAN segment to the other when the 8229 power is turned on and initialization is complete.

Set this parameter value to **N (No)** for the following reasons:

- You want to use the IBM 8229 Utility Program or the IBM LAN Network Manager Version 1.1 to activate frame forwarding for a bridge through its link with the program.
- You want to isolate a LAN segment or segments from the rest of the network for a particular reason or time period, and activate frame forwarding only at certain times or for certain tasks. A network administrator may want to use this function to control each bridge individually from a central location.

LAN Segment Number

This parameter specifies the number used to identify the LAN segment connected to the 8229 Port 1 and Port 2 token-ring connectors. The value for the LAN segment connected to the Port 1 token-ring connector must be different from the value for the LAN segment connected to the Port 2 token-ring connector.

Notes:

1. All bridges connected to a specific LAN segment must refer to that LAN segment by the same number.
2. This segment number can be overridden if another Ring Parameter Server has already defined the segment differently than it is defined here.

Locally Administered Address

Use this parameter to assign a locally administered MAC address to Port 1 and Port 2. These two addresses cannot be the same.

If this parameter value is left blank, the IBM 8229 uses the universally administered MAC address. You can find the universally administered MAC address on a label on the front of the 8229. The top most number is the Port 1 MAC address and the number just below it is the Port 2 MAC address.

You can assign a locally administered MAC address to Port 1 and Port 2 during configuration. If you do so, after configuration is finished, you must unlink from the bridge, change the Port adapter address to this locally administered MAC address in the bridge definition, and reestablish the link with the bridge. See “Option 5. Bridge Definition” on page 8-6.

Note: If you have assigned a locally administered address and want to change back to using the universally administered address for each port, you must follow these steps:

1. Change these locally administered MAC addresses to all 0’s in the bridge configuration
2. Terminate the link between the bridge and the Utility Program

3. Change the addresses for these ports to the universally administered MAC addresses in the Bridge Definition, as described in “Option 5. Bridge Definition” on page 8-6.
4. Reestablish the link between the bridge and the Utility Program

A port address identifies an adapter that is connected at that port. Each adapter address must be unique in the bridge and in the entire network.

Configure Bridge Panel 2: Single-Route Broadcast, Hop Count Limit, Early Token Release

If you press **PgDn** to proceed, the second configuration panel appears:

```
DFIPCB04               IBM 8229 UTILITY PROGRAM          Page 2 of 7
                      Configure Bridge Parameters

Type any changes and press Enter

Bridge name. . . . . . . . . . . :

Single-route broadcast mode. . . :  (1=Automatic, 0=Manual)

Path trace . . . . . . . . . . . :  (1=Active, 0=Inactive)

Bridge port information
 LAN segment number. . . . . . . :  aaa        bbb

 Single-route broadcast. . . . . :  aaa        bbb     (1=Yes  0=No)

 Hop count limit . . . . . . . . :  aaa        bbb     (1-7)

 Early Token Release . . . . . . :  aaa        bbb     (1=Yes, 0=No)


 Enter  Esc=Cancel  F1=Help  F3=Exit  F5=Refresh
                                                          PgUp
                                                          PgDn
```

Figure 8-4. Single-Route Broadcast, Hop Count Limit, and Early Token Release Parameters. The two fields in this panel next to LAN Segment Number, which show aaa and bbb, represent the LAN segment number that is displayed. Numbers in parentheses represent valid parameter values.

Single-Route Broadcast Mode

This parameter allows you to choose whether to specify the single-route broadcast parameter manually or automatically.

Manual Mode

If you choose the manual mode (0), you must set the single-route broadcast parameter values for each bridge in your network during bridge configuration.

For more information about setting the single-route broadcast parameter values:

- See the single-route broadcast parameter description on page 8-13.
- Refer to the *Local Area Network Administrator's Guide*.

Automatic Mode

If you choose the automatic mode (1), the 8229 will communicate with other bridges to determine how to set the single-route broadcast parameter values to **1 (Yes)** or **0 (No)** to compensate for changes in the network configuration.

For more information about when to use the automatic or manual single-route broadcast mode, refer to the *IBM Local Area Network Administrator's Guide*.

Mixing 8229s and IBM Bridge Programs in Automatic Mode

If you choose the automatic mode, *all* bridges in the network should use automatic mode. If you have the IBM Token-Ring Bridge Program Version 2.1 or 2.2, refer to the *IBM Token-Ring Bridge Program User's Guide* (Versions 2.1 and 2.2) and the *IBM Local Area Network Administrator's Guide* for more information about using the automatic single-route broadcast mode.

If your network includes several levels of IBM bridges and bridge programs, you need to apply program temporary fixes (PTFs) to some earlier versions of the bridge programs in order to run the network in the automatic single-route broadcast mode. Without the PTFs, the following events may occur:

- Some LAN segments may become isolated from the network.
- Some LAN segments may receive duplicate single-route broadcast frames.

You must use the following PTF with the indicated bridge program:

Table 8-1. PTF Numbers

Name of Bridge Program	PTF Number
IBM Token-Ring Network Bridge Program, Version 2.2	PTF UR25531 or later
IBM PC Network Bridge Program, Version 1.0	PTF UR25532 or later

If you do not use the PTF with these bridges, you will *not* be able to use the automatic single-route broadcast mode of these bridges in a LAN that includes later versions of the IBM Token-Ring Network Bridge Program and the IBM 8229.

Path Trace

When path trace is enabled and a frame passes across the bridge with the system path trace request bit set on, a notification is sent to any network management programs that have a communication link established with the bridge.

Single-Route Broadcast

Use this parameter to specify whether single-route broadcast frames are to be passed from one LAN segment to the other through the bridge when single-route broadcast manual mode is selected.

If you set a value for this parameter to **1 (Yes)**, the 8229 LAN segment adapter receives all single-route broadcast frames and passes them to the other LAN segment.

If you set a value for this parameter to **0 (No)**, all single-route broadcast frames received from the LAN segment are discarded. A bridge that does not forward single-route broadcast frames is not at present one of the designated bridges of the spanning tree protocol. See “Spanning Tree Protocol” on page B-8.

You must set the single-route broadcast mode to manual in order to be able to set the single-route broadcast parameter values manually for each LAN connected to this bridge during bridge configuration. The 8229 ignores these parameter values if automatic single-route broadcast mode is selected.

Hop Count Limit

This parameter specifies the number of consecutive bridges through which an all-routes broadcast frame can travel, including the current bridge. Hop count does not apply to non-broadcast frames.

If the number of bridges the all-routes broadcast frame has passed through (the frame’s hop count) is equal to or greater than this hop count limit value, the frame will not be transmitted further.

Early Token Release

You can use this option for a 16-Mbps LAN segment to reduce the average time required for a token-ring adapter to gain access to a free token. Early Token Release allows an adapter to release a new token as soon as it finishes transmitting a frame instead of having to wait for the copied frame to return from the receiver.

The 8229 ignores the parameter value of Enabled (the default) for Early Token Release if the LAN segment transfers data at 4 Mbps.

Refer to the *IBM Local Area Network Administrator’s Guide* for additional information about Early Token Release and how it affects the performance of the network.

Configure Bridge Panel 3: Server Parameters

Press **PgDn**, to see the next configuration panel:

```
DFIPCB05               IBM 8229 UTILITY PROGRAM          Page 3 of 7
                      Configure Bridge Parameters

Type any changes and press Enter

Bridge name. . . . . . . . . . . :

Bridge port information
 LAN segment number  . . . . . . :  aaa          bbb

 Enabled functional addresses
 Parameter server  . . . . . . . :  [1]          [1]
  (1=Enabled, 0=Disabled)
 Error monitor . . . . . . . . . :  [1]          [1]
  (1=Enabled, 0=Disabled)
 Configuration report server . . :  [1]          [1]
  (1=Enabled, 0=Disabled)



 Enter  Esc=Cancel  F1=Help  F3=Exit  F5=Refresh
                                                          PgUp
                                                          PgDn
```

Figure 8-5. Servers (Enabled Functional Addresses). The two fields in this panel next to LAN Segment Number, which show aaa and bbb, represent the LAN segment number that is displayed.

Parameter Server

This parameter specifies to an IBM Token-Ring Network segment whether or not the Ring Parameter Server functional address is enabled in the bridge; that is, whether the bridge will copy and process frames destined for this function.

The Ring Parameter Server provides the LAN segment number to an adapter when the adapter is attaching to the LAN segment, and sends a notification to one or more network manager programs when a new adapter has been attached to the LAN segment.

Error Monitor

This parameter specifies to a LAN segment whether the Ring Error Monitor functional address is enabled in the bridge; that is, whether the bridge will copy and process frames destined for this function.

The Ring Error Monitor does the following tasks:

- Compiles error statistics reported by adapters on the token-ring segment
- Analyzes the statistics to determine a probable cause of errors degrading network operation
- Sends reports to indicate critical problems to the network management programs that have requested reports

If the error monitor parameter value is 0 (Disabled), the error information will be 0's, and the LAN segment status *Soft Error* will not be displayed on the network management program panels when soft errors occur. Refer to the

IBM Local Area Network Administrator's Guide for more information about the error monitor.

Configuration Report Server

This parameter specifies for the LAN segment whether or not the Configuration Report Server functional address is enabled in the bridge; that is, whether the bridge will copy and process frames destined for this function.

The Configuration Report Server sends notifications about the current active configuration of the LAN segment to the network management programs that request reports. For example, it reports changes in the addresses of the nearest active upstream neighbors (NAUNs) and changes of the active monitor.

Configure Bridge Panel 4: Criteria Filter Ranges

Press **PgDn** to bring up the next panel:

```
 DFIPCB06              IBM 8229 UTILITY PROGRAM          Page 4 of 7
                     Configure Bridge Parameters

Type any changes and press Enter

Bridge name. . . . . . . . . :

Bridge forwarding parameters
 Filter program status . . . :  [1]
   (1=Enabled, 0=Disabled)
 LAN segment number  . . . . :  aaa                bbb
 Acceptable Values

 Filter definition
   Filter offset (decimal) . :  [000]     [000]     (0-100)
    filter offset (decimal) . :  [000]     [000]     (0-100
     Range 1 low   (hex) . . :  [0000]    [0000]    (0-FFFF)
     Range 1 high  (hex) . . :  [FFFF]    [FFFF]    (0-FFFF)
     Range 2 low   (hex) . . :  [0000]    [0000]    (0-FFFF)
     Range 2 high  (hex) . . :  [FFFF]    [FFFF]    (0-FFFF)


 Enter  Esc=Cancel  F1=Help  F3=Exit  F5=Refresh
                                                          PgUp
                                                          PgDn
```

Figure 8-6. Criteria Filter Range Definition Parameters. The two fields in this panel next to LAN Segment Number, which show aaa and bbb, represent the LAN segment number that is displayed. Numbers in parentheses represent valid parameter values.

Filter Program Status

This parameter indicates whether a filter program that is loaded in the 8229 is enabled or disabled when the 8229 is running.

When the status is Enabled, a user-defined filter program runs when the IBM 8229 is operating.

If you want to stop running a filter program, set this parameter to 0 (Disabled). The IBM 8229 stops using the current filter program. (You do not need to terminate and reestablish the link with the bridge.)

The Filter Program Loaded field in the Bridge Profile shows you whether a filter program is currently loaded.

Criteria Filter Definition Parameters

These parameters determine the offset within a frame where the information to be compared to the criteria filter range is found and allow you to set the ranges for the criteria filter. The criteria filters are included as part of the operational software; they are not supplied by the user.

The default criteria range values of X'0000' to X'FFFF' effectively disable these filters because the values of the criteria information to be compared always fall within these ranges.

Filter Offset

This parameter indicates the location within a frame of the 2 bytes of information that are compared with the filter range values. The location of the field containing these 2 bytes varies depending on the frame format.

This offset value is the number of bytes (from 0 to 100 in decimal) from the beginning of the field to count to find the 2 bytes of compare information. The offset of 0 for token-ring frames is the destination service access point (DSAP) in the frame header.

You can specify a separate filter offset and filter ranges for each 8229 LAN segment connection (that is, for Port 1 and for Port 2).

Ethernet Filter Offsets

The Ethernet frame offsets are located in the following fields:

- The Ethernet Version 2.0 frame offset of 0 is located at the beginning of the TYPE field.
- The Ethernet IEEE 802.2 frame offset of 2 is located at the beginning of the DSAP, skipping over the LENGTH field before the DSAP in this frame header field.

See the frame formats in “Frame Format Conversions” on page E-3.

Range 1 Low

This parameter specifies the 2-byte low value for range 1. If the 2 bytes of information located at the offset into the information field are less than this value, the frame is discarded (not forwarded).

Range 1 High

This parameter specifies the 2-byte high value for range 1. If the 2 bytes of information located at the offset into the information field are greater

than this value, the frame is discarded (not forwarded).

Range 2 Low
This parameter specifies the 2-byte low value for range 2. If the 2 bytes of information located at the offset into the information field are less than this value, the frame is discarded (not forwarded).

Range 2 High
This parameter specifies the 2-byte high value for range 2. If the 2 bytes of information located at the offset into the information field are greater than this value, the frame is discarded (not forwarded).

For more information regarding the Criteria Filter, see “Criteria Range Filter” on page B-6.

Configure Bridge Panel 5: Address Range Filter

Press **PgDn** to bring up the next panel:

```
 DFIPCB07              IBM 8229 UTILITY PROGRAM          Page 5 of 7
                     Configure Bridge Parameters

Type any changes and press Enter

Bridge name . . . . . . . . . . :

Bridge forwarding parameters
 LAN segment number . . . . . . . : aaa              bbb

 Filter definition
  Source address low. . . . . . . : [000000000000]  [000000000000]
  (12 hexadecimal digits)
    Source address high . . . . . : [000000000000]  [000000000000]
  (12 hexadecimal digits)
    Destination address low . . . : [000000000000]  [000000000000]
  (12 hexadecimal digits)
    Destination address high. . . : [000000000000]  [000000000000]
  (12 hexadecimal digits)


 Enter  Esc=Cancel  F1=Help  F3=Exit  F5=Refresh
                                                                PgUp
                                                                PgDn
```

Figure 8-7. Address Range Filter Parameters. The two fields in this panel next to LAN Segment Number, which show aaa and bbb, represent the LAN segment number that is displayed.

Source and Destination Address Filter Definitions
These parameters specify the hexadecimal 12-digit low and high source address and the low and high destination address for the address range filter. There is a separate address range filter for each of the two 8229 LAN segments.

Frames with source or destination addresses within and including the specified values are filtered (discarded) by the 8229.

Address ranges are directional. In the case of the source address range for segment 1, nodes on segment 1 whose addresses fall *within* the source address range can receive information from segment 2 but cannot send information to segment 2. The destination address range for segment 1 enables nodes on segment 1 whose addresses fall *within* the destination address range to send information to segment 2, but not to receive information from segment 2. If the same addresses are specified in the source and destination address ranges, the specified nodes on segment 1 can neither send information to segment 2 nor receive information from it.

The same rules apply to segment 2; the source address range specifies nodes in segment 2 that can receive information from segment 1 but cannot send information to it; the destination address range specifies nodes in segment 2 that cannot receive information from segment 1 but can send information to it.

For more information regarding Address Range Filters, see “Address Range Filter” on page B-7.

Configure Bridge Panel 6: Spanning Tree Parameters

Press **PgDn** to view the next configuration panel:

```
 DFIPCB08              IBM 8229 UTILITY PROGRAM          Page 6 of 7
                      Configure Bridge Parameters

Type any changes and press Enter

Bridge name . . . . . :

Spanning tree parameters

 Bridge priority. . . . . : [32768]  (0-65535)

 LAN segment number . . . : aaa     bbb     Acceptable Values
  Port path cost. . . . . : [250]   [250]   (0-65535)
  Port priority . . . . . : [128]   [128]   (0-255)




 Enter  Esc=Cancel  F1=Help  F3=Exit  F5=Refresh
                                                          PgUp
                                                          PgDn
```

Figure 8-8. Spanning-Tree Parameters. The two fields in this panel next to LAN Segment Number, which show aaa and bbb, represent the LAN segment number that is displayed. Numbers in parentheses represent valid parameter values.

Spanning Tree Parameters

The spanning tree parameters are used by the automatic single-route broadcast function to maintain one and only one path for single-route broadcast frames between any two LAN segments in the network. See Appendix B, “Overview of the 8229 Function” and refer to the *IBM Local Area*

Network Administrator's Guide. for more information about the spanning tree protocol and automatic single-route broadcast configuration. The parameter values are used for the following purposes:

- To determine which one of two or more parallel bridges between two LAN segments is able to forward single-route broadcast frames at any one time
- To detect when a bridge has left or entered the network and readjust single-route broadcast parameter values for active bridges accordingly
- To determine the relative *length* of a path in the network between two LAN segments. The greater the path cost parameter, the greater the relative length of a path through this bridge. For example, a bridge connected to two 16 Mbps segments offers a shorter relative path length than a bridge connected to one 4 Mbps segment and one 16 Mbps segment.

The default values should be used for these parameters unless a specific circumstance in your network requires one or more of them to be changed. Such circumstances include:

- Performance

  For example, port path cost values can be used always to select the *shortest* and most efficient path when there is a choice of active paths.
- Matching parameters with other bridges in the network

The spanning tree parameters that can be changed by using the Utility Program are shown in Table 8-2.

Table 8-2. Spanning Tree Parameters

Parameter Description	**Default Value (Decimal)**	**Allowed Range (Decimal)**
Bridge Priority	32768	1–65535
Port Path Cost	100 (10 Mbps—for Ethernet only) 63 (16 Mbps—for token-ring only) 250 (4 Mbps—for token-ring only)	0–65535
Port Priority	128	0–255

Configure Bridge Panel 7: Link Passwords

Press **PgDn** to view the next configuration panel:

```
DFIPCB09              IBM 8229 UTILITY PROGRAM          Page 7 of 7
                     Configure Bridge Parameters

Type any changes and press Enter
Passwords must be 6 - 8 alphanumeric characters.

Bridge name  . . . . . :


 Link password 0   . . . :  [        ]

 Link password 1   . . . :  [        ]

 Link password 2   . . . :  [        ]

 Link password 3   . . . :  [        ]




 Enter  Esc=Cancel  F1=Help  F3=Exit  F5=Refresh
                                                          PgUp
```

Figure 8-9. Link Passwords

Link Passwords

The bridge uses these passwords to determine whether a network management program, such as the IBM LAN Network Manager Program or the Utility Program, is authorized to establish a communication link with the bridge.

Note: If you have defined a unique reporting link password using the System Definition panel, this password *must be entered* again as Link password 0 on this panel. Link password 0 is the reporting link password and it must match the reporting link password defined by the System Definition panel.

A network management program is authorized to establish a link with the bridge when:

- The bridge link password and the network management program reporting link password are the same.

  The exception for the 8229 is when the 8229 is initially installed and configured. The reporting link password specified in the System Definition panel can be any valid 6- to 8-character value. As long as the bridge configuration Link 0 password is all 0's, you can specify any valid reporting link password in the System Definition panel for any network management program.

  Note: All 0's are the default values for these passwords. However, these 0's are not displayed. The password fields are always blank except when you are actually typing a new value. Therefore, you must keep a record of your link passwords if you change them.

If you specify a Reporting link password of 0's in the System Definition Panel and then change the link 0 password to a nonzero value here, you must unlink from the bridge after you have finished configuration. Then, use the System Definition function to change the Reporting link password to the nonzero Link 0 password specified here, and reestablish the link to the bridge.

- If you set up a Link password 0 with a unique value, only one network management program at a time can have a controlling link to the bridge. Any other network management programs can link to the bridge only as observers, using one of the other Link passwords (1, 2, or 3) to link to the bridge.

You can specify link passwords in one of the following ways:

- Leave all of the link passwords at the defaults of all 0's.

  To fill out the parameters worksheet for the Utility Program:

  – Indicate in the parameters worksheet in Appendix A, "Planning and Record Worksheets" that you plan to keep the default Link password 0.

  – Indicate that you want the default System Definition Reporting link password.

- Change one or more link passwords to nonzero values during advanced configuration.

  To fill out the parameters worksheet for Utility Program advanced configuration:

  – Write the desired Link password values in the Utility Program parameters worksheet, unless you need to keep these records in a more secure place.

  – Write the link password for link 0 (to be used between the Utility Program or other controlling network management program and this 8229) in the System Definition Reporting link password space in the parameters worksheet, unless you need to keep it in a more secure place.

Notes:

1. Each password must consist of 6 to 8 characters, which can include letters, numbers, and the symbols @, #, $, and %.
2. The four passwords do not have to be unique.
3. Press **F5 (Refresh)** to clear all of the link password fields if you make an error while typing the entries.
4. The network management program must give a valid reporting link password (one of the four link passwords or defaults specified here) when establishing a link with a bridge, or the link request will be rejected.

What to Do If You Lose Track of a Password

If the link password 0 is not known (is forgotten or lost), you must use the hardware reset button to reset the all the link passwords to 0's.

Important: Pressing the reset button erases all your unique advanced configuration parameters and overwrites them with the original factory-set default values. We recommend that you check all the

records of your configuration parameter values for completeness before you do a reset, so that you can restore them parameters to their previous values.

Refer to the user's guide packaged with each network management program and to the *IBM Local Area Network Administrator's Guide* for more information about using the network management programs in a network that includes bridges.

Load Filter Program Parameters Panel

Loading filter program parameters is one of the choices under *Option 4 Configure bridge* from the main menu. If you press Esc from any of the Configure Bridge Parameters panels, you return to the menu asking whether you want to change bridge parameters, load filter programs, or load system microcode. Choose Option 2. Load Filter Program if you want to load a user-defined filter program.

```
 DFIPCB10              IBM 8229 UTILITY PROGRAM
                         Load Filter Program

Type the drive ID and full pathname of the filter program to load, then
press Enter.


Drive ID  . . . . . : [C]        (0=Default, A-Z)


Pathname of program . . : [\LBE\]









 Enter  Esc=Cancel  F1=Help  F3=Exit  F5=Refresh
```

Figure 8-10. Load Filter Program Parameters

Drive ID

This parameter specifies the drive letter of the disk drive where the filter program is stored. A value of 0 indicates the default drive.

Path name

This parameter specifies the full path and name of the filter program. If no drive is specified in the path name, the filter program is assumed to be on the disk or diskette in the drive specified by *drive ID*. If the drive is specified in the path name, it will override the drive specified in Drive ID.

Loading System Microcode

This is the third configuration option available under Option 4. Configure Bridge from the main menu. The panel requests the Drive ID and the path name for the operational software file you wish to upload to the bridge, and is similar in format to Figure 8-10 on page 8-22. See Chapter 4, “Installing the 8229 Software” for a description of the operational software.

Option 1. Querying the Bridge Profile

From the main menu, choose Option 1, Bridge profile. After you name the bridge, the same panel shown in “Configure Bridge Panel 1: Name, Number, Frame Forwarding, Ports” on page 8-9 is displayed. The Utility Program displays the bridge configuration parameters. Page down and Page up to see all the panels. When you are finished, press **Esc** twice to return to the Main Menu.

Option 6. Defining a Bridge Password: System Definition

To change the System Definition Reporting link password, you must first unlink the 8229 if it is linked to the Utility Program. Then, if you choose Option 6. System Definition from the main menu, the following panel appears:

```
 DFIPSD50               IBM 8229 UTILITY PROGRAM
                            System Definition

Type in a new password, and press Enter


Reporting link password . . : [     ]  6-8 alphanumeric characters
```

```
 Enter  Esc=Cancel  F1=Help  F3=Exit  F5=Refresh
```

Figure 8-11. System Definition-Reporting Link Password

This panel allows you to set up the Reporting link password.

Reporting link password

Specify here the bridge’s link password for Link 0 if a nonzero password is to be defined in the Bridge Configuration for Link 0.

Write the nonzero link password in the configuration parameter worksheet in Appendix A, “Planning and Record Worksheets,” unless you need to keep it in a more secure place.

Notes:

1. The Utility Program always uses Link password 0 to establish a link with the 8229 and is therefore always the controlling network management program for the 8229. As long as the Utility Program is running and linked to a 8229, other network management programs can link to that 8229 only in observing status (using Link password 1, 2, or 3). The Utility Program cannot function as an observing network management program.
2. If the Utility Program is to establish a link with more than one 8229, the same link password must be defined for link 0 in the Bridge Configuration for all of the 8229s linked to the same Utility Program.
3. When the 8229 is initially installed and configured, you can specify any valid reporting link password here (as long as the Link 0 password in the bridge configuration is still all 0’s). You can then change the link password for link 0 in the Bridge Configuration.

   If you change the link 0 password in the Bridge Configuration either from all 0’s to a nonzero value or from one nonzero value to another, you must take the following action to activate the new password:

   a. Terminate the link between the bridge and the Utility Program.
   b. If the System Definition Reporting link password is not already the same as the new link 0 password, change it to the new link 0 password.
   c. Reestablish the link between the bridge and the Utility Program.

Option 3. Unlinking from the 8229

Use Option 3 from the Main Menu to unlink the 8229 from the Utility Program without shutting down the Utility Program.

When Unlinking Can Interrupt Traffic Flow Over the 8229

Unlink activates any configuration changes. You must unlink the bridge to activate configuration parameter changes.

Note: Activation of configuration parameters changes requires the 8229 to leave the LAN and then re-open. This process interrupts bridge traffic for up to 30 seconds.

The only configuration change that does NOT interrupt traffic is loading a user-defined filter. See Chapter 5, “8229 Advanced Configuration Parameters” for lists of the parameters.

Shutting Down the Utility Program

This option shuts down the Utility Program. You must type **LBE** from the directory LBE to start the program up again. Shutdown automatically unlinks the Utility Program from the 8229 if you have not previously terminated the link between them.

Chapter 9. IBM 8229 Utility Program: Token-Ring-to-Ethernet Configuration

Differences in the Utility Program for Token-Ring and Ethernet

Before reading this chapter, you need to read Chapter 8, “IBM 8229 Utility Program: Token-Ring-to-Token-Ring and Token-Ring-to-WAN Configuration.” Most of the functions of the Utility Program are the same for token-ring-to-token-ring configuration and for token-ring-to-Ethernet configuration. These are the functions of the Utility Program for token-ring-to-Ethernet configuration:

- Bridge definition
- Linking the Utility Program to the bridge
- Configuring the bridge. This choice brings up a menu that offers the following options:
  - Loading bridge parameters
  - Loading static addresses into the Ethernet static address database
  - Loading mapped addresses
  - Retrieving and reading the Ethernet database
  - Loading user-defined filter programs
  - Loading operational microcode
- Querying the bridge profile
- Defining a bridge password using System Definition
- Unlinking the Utility Program from the bridge
- Shutting down the Utility Program

These functions are the same as for the token-ring-to-token-ring configuration, except for some of the choices for configuring the bridge and some of the Configure Bridge panels. You reach the configuration choices when you choose Option 4. *Configure bridge* from the Main Menu and then choose Option 1. *Bridge parameters* from the Configure Bridge Menu.

These are the parameter choices that are specific to Ethernet:

2. *Static entries*
3. *Address Mapping*
4. *Read data base*

These choices bring up panels that enable you to enter values for the following parameters:

- Static addresses for the Ethernet static address database
- Mapped addresses

For a description of these parameters, see “Address Databases” on page B-3 and “Broadcast Address Conversion” on page B-14.

Among the Configure Bridge panels, which you reach by choosing Option 1. *Bridge parameters* from the Configure Bridge Menu, panels 5 and 7 are identical for token-ring-to-token-ring and token-ring-to-Ethernet configurations. Configure Bridge panels 1, 2, and 4 are different in format, but the requested parameters are the same as some of the token-ring-to-token-ring parameters. See Chapter 8 for descriptions of these parameters. Configure Bridge panels 3 and 6 request new parameter values, and are shown in this chapter.

Configure Bridge Panel 3: Bridge Forwarding Parameters

```
DFIPCB05                  IBM 8229 UTILITY PROGRAM              Page 3 of 7
                        Configure Bridge Parameters

Type any changes and press Enter.

Bridge name . . . . . . . . . . . . :  _____

Bridge Forwarding Parameters
  Automatic mode selection  . . . . :    [1]      (0=Disabled, 1=Enabled)
  Mode priority . . . . . . . . . . :    [1]      (1=Ethernet V2, 2=802.3)
    Forward LLC traffic (mode 1)  . :    [1]      (1=Yes, 0=No)
    Enabled SAPs for LLC traffic  . :    [00]  [04]  [08]  [ F0rbrk.  [F4]
                                         [  ]  [  ]  [  ]  [  ]  [  ]

  TCP/IP address conversion . . . . :    [1]      (0=Disabled, 1=Enabled)
  Dual mode multicast conversion  . :    [1]      (0=Disabled, 1=Enabled)
  Use general broadcast frames  . . :    [0]      (0=Disabled, 1=Enabled)
  Broadcast address conversion  . . :    [1]      (0=Disabled, 1=Enabled)
  Novell IPX support . . . . . . . . . . . :    [0]      (0=Disabled, 1=Enabled)



Enter  Esc=Cancel  F1=Help  F3=Exit  F5=Refresh                          PgUp
                                                                         PgDn
```

Figure 9-1. Bridge Forwarding Parameters

Automatic Mode Selection

This parameter enables or disables automatic mode selection, and overrides the setting of Switch 1 of the Ethernet Attachment Module.

When automatic mode selection is *enabled*, the 8229 determines whether to convert frames which originated on the IBM Token-Ring Network to Ethernet Version 2 format or to IEEE 802.3 format. The 8229 searches the Ethernet database for the frame format used by the token-ring frame's destination station.

If there is no Ethernet database entry for the token-ring frame's destination station, the 8229 converts the token-ring frame to the format indicated by the mode selection switch on the Ethernet attachment module, or the value for the mode priority configuration parameter, which overrides the switch setting.

For more information about the Ethernet databases, see "Address Databases" on page B-3.

Specify **1** (Enabled) for automatic mode selection if either of these situations is applicable:

- Some stations on the Ethernet LAN use the Ethernet Version 2 frame and others use the IEEE 802.3 frame format.
- You are not sure which frame format is being used by each station on the Ethernet LAN.

When automatic mode selection is *Disabled*, the 8229 converts all frames that originated on the token-ring to the format indicated by the setting of the attachment module mode selection switch, or by the value for the mode priority configuration parameter (Ethernet Version 2 format or IEEE 802.3

format). The 8229 does not search the Ethernet database for a destination frame format entry.

Specify **0** (Disabled) for automatic mode selection if you know that:

- All stations on the Ethernet Version 2 or IEEE 802.3 LAN that is connected to the 8229 are operating exclusively with one frame format (either all Ethernet Version 2 frame format or all IEEE 802.3 frame format).
- All communicating stations use the same frame format (Ethernet Version 2 or IEEE 802.3), although the frames must pass across a different type of LAN in the route to their destination. For example, frames may originate on an Ethernet IEEE 802.3 LAN segment, pass over a token-ring backbone by crossing one 8229, and re-enter a second Ethernet LAN segment by crossing over a second 8229.

How Automatic Mode Selection and Mode Priority Work Together

When automatic mode selection is enabled, the 8229 examines the mode priority only if the 8229 cannot find the frame format for the destination station in its Ethernet database.

The 8229 will *not* find the frame format for the destination station in the database in the following circumstances:

- An IBM Token-Ring Network station sends a frame to an Ethernet station, and that Ethernet station has never previously transmitted a frame examined by the 8229. The 8229 does not have a frame format database entry for that Ethernet station.
- An IBM Token-Ring Network station sends a frame to a group address.

  If dual-mode multicast conversion and automatic mode selection are enabled, the token-ring frame is forwarded in both Ethernet Version 2 and IEEE 802.3 format. Otherwise, the token-ring frame is forwarded in the format indicated by the attachment module mode selection switch or the value of the mode priority parameter.

The 8229 keeps the frame format information for an Ethernet LAN station in the Ethernet address database until one of the following events takes place:

- The 8229 power is turned off.
- The Ethernet LAN station does not transmit for so long that that the 8229 removes the format entry for that station from its database. That is, the *aging time* expires for that database entry. The length of the aging time period can be changed by using the Utility Program.
- The station's static entry is deleted from the database.
- The hardware reset button is pressed.

Mode Priority

The value of the mode priority parameter determines whether the 8229 expects frames on the Ethernet LAN to be in Ethernet Version 2 or IEEE 802.3 frame format.

This parameter value overrides the setting of the attachment module mode selection switch.

Note: The recommended mode priority for all 8229s connected to a token-ring segment used as a backbone ring is mode 1 and automatic mode selection disabled.

- Mode 1

  When mode 1 is specified, the 8229 expects all frames transmitted over the Ethernet LAN to be in Ethernet Version 2 format.

  In mode 1, the 8229 provides frame format conversion between Ethernet Version 2 and token-ring frame formats.

  Mode 1 provides SNAP and RT header processing for higher level protocols sucn as SNA and NetBIOS and allows enabling of support for forwarding and converting of LLC-based protocol frames.

- Mode 2

  When mode 2 is specified, the 8229 expects all frames transmitted over the Ethernet LAN to be in IEEE 802.3 format.

  In mode 2, the 8229 provides frame format conversion between IEEE 802.3 and token-ring frame formats.

When automatic mode selection is disabled, the 8229 provides processing and conversion only for Ethernet frames in the format indicated by the mode priority configuration parameter configuration (or the attachment module mode selection switch). Table 9-1 shows the 8229 mode to select for correct conversion of the various frame types used by Novell NetWare stations, when the 8229 Novell IPX protocol support is enabled. Novell IPX support is an advanced configuration parameter.

The frame type used by each NetWare station must be indicated to NetWare during installation. The network administrator must match the frame types used by communicating NetWare stations with the appropriate mode priority selection for the 8229.

Table 9-1. Novell IPX Protocol Frame Formats

To Convert from: Ethernet Frame Type to:	**Token-Ring Frame Type**	**Select 8229 Mode**
ETHERNET_802.3†	TOKEN_RING	2
ETHERNET_802.2†	TOKEN_RING	2
ETHERNET_II	TOKEN_RING	1
ETHERNET_SNAP	TOKEN_RING_SNAP	2

† Only one of these frame types can be used on the IEEE 802.3 Ethernet segment at one time. The first frame type detected by the 8229 after the bridge power is turned on is the type supported.

Forward LLC Traffic (Mode 1)

This parameter determines whether the 8229 is to enable or disable the forwarding of frames for IEEE 802.2 LLC-based protocols from the IBM Token-Ring Network segment to the Ethernet LAN when the 8229 is forwarding mode 1 traffic.

When this function is enabled, the LLC-based protocol frames that are forwarded must have a destination service access point (DSAP) that is included in the list specified in the enabled SAPs parameter.

If you choose to enable this parameter, you can make any required changes in the Enabled SAPs for LLC Traffic parameters to support protocols other than SNA and NETBIOS. However, do not change the predefined values (hex 00, 04, 08, F0, F4, and FC) if you need SNA, network management, or NetBIOS support.

See Appendix E, “Frame Format and Address Conversion” for details about the frame format conversion for LLC-based protocol frames.

Enabled SAPs for LLC Traffic

This parameter allows you to specify up to 10 DSAPs for LLC-based protocol frames that will be forwarded when forwarding of LLC traffic is enabled in mode 1.

If you do not specify values for this parameter, the default enabled SAPs are hex 00, 04, 08, F0, F4, and FC.

TCP/IP Address Conversion

This parameter indicates whether the 8229 is to perform bit-order address inversion on the addresses within the I-Field of TCP/IP address resolution protocol/reverse address resolution protocol (ARP/RARP) and ARP/RARP response frames.

This conversion allows communication between versions of these protocols that are not otherwise compatible.

For more information about TCP/IP ARP/RARP frame conversion, see “ARP Conversion” on page E-6.

Dual-Mode Multicast Conversion

This parameter indicates whether the 8229 is to transmit two multicast frames (one in Ethernet Version 2 format and one in IEEE 802.3 format) for each frame with a group or broadcast address that is forwarded from the IBM Token-Ring Network when automatic mode is enabled.

When dual-mode multicast conversion is disabled and automatic mode selection is enabled, frames with group and broadcast addresses are forwarded in the format determined by the mode priority parameter or the attachment module mode selection switch.

Use General Broadcast Frames

This parameter indicates whether the 8229 is to forward a frame to the IBM Token-Ring Network segment as an all-routes broadcast frame or a single-route broadcast frame when the destination address is not found in the token-ring database.

When this function is enabled, the frames are forwarded as all-routes broadcast. Enable this function when rings are connected by multiple bridges between active 8229 bridges, to allow the most efficient path to be discovered and used between two stations in the network.

Note: Enabling this function may result in unwanted broadcast frames being copied to all token-ring segments.

When this function is disabled, the frames are forwarded as single-route broadcast.

Broadcast Address Conversion

When this function is enabled, the 8229 converts the IBM Token-Ring Network all-stations broadcast address of X'C000 FFFF FFFF' in a frame to the Ethernet all-stations broadcast address of X'FFFF FFFF FFFF'.

When this function is disabled, the 8229 in its normal address conversion converts the IBM Token-Ring Network all-stations broadcast address of X'C000 FFFF FFFF' in a frame to the Ethernet address of X'0300 FFFF FFFF' (which is not known as an all-stations broadcast address).

Disable this function when multiple 8229s are connected to the same Ethernet LAN segment in a backbone configuration.

The conversion is from token-ring-to-Ethernet only. If you want the 8229 to convert the Ethernet addresses X'FFFF FFFF FFFF' or X'0300 FFFF FFFF' to the token-ring all-stations address, you must specify the Ethernet address and the token-ring address as a mapped address pair in the 8229.

Note: Some mapped addresses can be kept within the Ethernet static address data base. The 8229 converts an Ethernet frame's destination address to the corresponding token-ring address if the Ethernet frame's destination address is found among these entries.

Novell IPX Support

This parameter indicates whether the 8229 is to enable or disable support for Novell Novell IPX protocols, so that Novell NetWare stations on the connected LAN segments can communicate with each other across the 8229.

The default is 0 (Disabled). You must do advanced configuration to enable Novell IPX Support.

Enable Novell IPX support when:

- The NetWare workstations are using Novell device drivers

  OR

- The NetWare workstations on the Ethernet/IEEE 802.3 LAN segment are using PC DOS and IBM LAN Support Program device drivers. The LAN Support Program device drivers give to and receive from NetWare the medium access control (MAC) addresses in IEEE 802.3 (CSMA/CD) format.

Disable Novell IPX support when the NetWare workstations on the Ethernet/IEEE 802.3 LAN segment are using PC DOS and IBM LAN Support Program device drivers, and the device drivers are configured to give to and receive from NetWare the MAC addresses in IEEE 802.5 (token-passing ring) format.

Notes:

1. The NetWare workstations on the Ethernet/IEEE 802.3 LAN segment that use DOS and IBM LAN Support Program device drivers configured for IEEE 802.5 MAC addresses can communicate only with:

   - Other NetWare workstations on the Ethernet/IEEE 802.3 LAN segment that also use PC DOS and IBM LAN Support Program device drivers configured for IEEE 802.5 MAC addresses

     NetWare workstations on an Ethernet/IEEE 802.3 LAN segment that use IBM LAN Support Program device drivers configured for IEEE 802.5 MAC addresses cannot communicate with NetWare workstations on the LAN segment that use IBM LAN Support Program device drivers configured for IEEE 802.3 MAC addresses.

   - Any NetWare server or workstation on the IBM Token-Ring Network segment, through the 8229.

NetWare servers on an Ethernet/IEEE 802.3 LAN segment cannot use IBM LAN Support Program device drivers.

2. The following Novell device drivers must be used by Novell server/requestor stations connected to the token-ring LAN segment to provide source-routing bridge support:
   - ROUTE.COM
   - ROUTE.NLM.

Supported Novell IPX Frame Types

Each Novell IPX frame type contains a value that can be used to identify the frame as an Novell IPX protocol frame. The beginning location and the contents of the field containing that value in Novell IPX frames vary with the frame type.

Table 9-2 shows the frame type that is specified to NetWare, the location of the beginning of the field, and the values of the bytes in that field that identify the Novell IPX frame type.

Table 9-2. Novell IPX Protocol Frame Filter Information

Frame Type	Beginning (Offset 0) of the Field
ETHERNET_802.3	At the LENGTH field. At offset 2 is a checksum of X'FFFF' in the Novell IPX header.
ETHERNET_802.2	At the LENGTH field. The LLC header at offset 2 can contain an SSAP and DSAP value of X'E0 E0' or X' E0 E1'.
ETHERNET_II	At the TYPE field.†
ETHERNET_SNAP	At the LENGTH field. The LLC header, containing X'AA AA 03', follows the LENGTH field. The Protocol ID (X'00 00 00') follows the LLC header. The TYPE field† follows the Protocol ID, at an offset of 8.
TOKEN_RING	At the LLC header. The LLC header begins with an SSAP and DSAP value of either X'E0 E0' or X'E0 E1'.
TOKEN_RING_SNAP	At the LLC header, X'AA AA 03'. The Protocol ID (X'00 00 00') follows the LLC header. The TYPE field† follows the Protocol ID, at an offset of 6.

†The types that can appear in the TYPE field are:

X'8137' – Novell IPX
X'7809' – NetWare/AppleTalk
X'80F3' – NetWare/AppleTalk
X'809B' – NetWare/AppleTalk.

Configure Bridge Panel 6: Spanning Tree Parameters

```
DFIPCB08                  IBM 8229 UTILITY PROGRAM                Page 6 of 7
                        Configure Bridge Parameters

Type any changes and press Enter.

Bridge name . . . . . . . . . . . . : _____

Spanning Tree Parameters
  Bridge maximum age  . . . . . . . . :    [20]     (6-40 seconds)
  Bridge hello time . . . . . . . . . :    [02]     (1-10 seconds)
  Bridge forward delay  . . . . . . . :    [15]     (4-30 seconds)
  Bridge priority . . . . . . . . . . :    [32768]  (0-65535)

  LAN segment number
  Acceptable Values . . . . . . . . . :    aaa                       bbb
  Port path cost  . . . . . . . . . . :    [nnnnn]        [mmmmm]   (0-65535)
  Port priority . . . . . . . . . . . :    [128]          [128]     (0-255)

Aging time  . . . . . . . . . . . . . :    [300]    (1-65535 seconds)
Maximum transit time  . . . . . . . . :    [1]      (1-4 seconds)



Enter  Esc=Cancel  F1=Help  F3=Exit  F5=Refresh                          PgUp
                                                                         PgDn
```

Figure 9-2. Spanning Tree Parameters

Spanning Tree Parameters

The spanning tree parameters are used in an Ethernet or IEEE 802.3 network to maintain one and only one path between any two LAN segments in the network. The parameter values are used to:

- Determine which one of two or more parallel bridges between two LAN segments is active at any one time
- Detect when a bridge has left or entered the network, and readjust active bridges accordingly
- Determine the relative length of the path in the network between two LAN segments. Relative length has to do with path cost in terms of the time a frame requires to pass across the network.

The default values should be used for these parameters, unless a specific circumstance exists in your network that requires one or more of them to be changed. Such circumstances include:

- Performance

  For example, port path cost values and timing values can be used to select the shortest and most efficient path when there is a choice of active paths.

- Matching parameters with other bridges in the network.

The spanning tree parameters that can be changed by using the Utility Program are shown in Table 9-3 on page 9-10.

Table 9-3. Spanning-Tree Parameters

Parameter Description	Default Value	Allowed Range
Bridge Maximum Age	20	6–40 seconds
Bridge Hello Time	2	1–10 seconds
Bridge Forward Delay	15	4–30 seconds
Bridge Priority	32768	1–65535
Port Path Cost	250 (4 Mbps T/R) 63 (16 Mbps T/R) 100 (Ethernet)	0–65535
Port Priority	128	0–255

For more information about spanning tree protocol and parameters, see "Spanning Tree Protocol" on page B-8 and the IEEE 802.1 Standard for MAC bridges.

Aging Time

This parameter defines in seconds the amount of time that a dynamic entry in the 8229 address database is retained after last use.

Maximum Transit Time

This parameter defines in seconds the maximum time that can elapse between the reception and transmission of a forwarded frame. The 8229 attempts to discard a frame that has been held at the 8229 for this period of time. However, once the frame has been queued for transmission, it will not be discarded even if the maximum transmit time has elapsed.

Chapter 10. IBM 8229 Utility Program Messages for All Networks

Overview

This chapter lists the explanations for the the messages that appear in the IBM 8229 Utility Program.

Messages

The following messages are displayed by the IBM 8229 Utility Program.

DFIPD002I **Operation in progress, please wait**

Meaning: The program is performing an operation that you requested.

DFIPD006I **Operation completed successfully**

Meaning: The operation you requested has been completed.

DFIPD007W **Operation failed**

Meaning: The operation you requested has failed.

DFIPD083E **File full, operation failed**

Meaning: All available space on the target file has been used. No data can be added.

DFIPD155E **Cursor must be on a line with data**

Meaning: The cursor needs to be positioned on a line with data for the operation to be performed.

DFIPD162E **Press Enter to process action**

Meaning: You typed an action on the display and then pressed a key other than Enter (such as a Function key or a Scroll key).

DFIPD163E **Request only one action**

Meaning: You typed an action next to more than one item on the display and then pressed Enter. Only one action is allowed on only one item at a time.

DFIPD164E **Invalid action requested. Please try again**

Meaning: You typed an action that is not available on this display and then pressed Enter.

DFIPD174I **Bridge is linked. Deletion not permitted**

Meaning: You tried to delete a bridge definition, but that bridge currently has a communications link established with the Utility Program. A bridge must be defined to the Utility Program in order for the Utility Program to communicate with it. You may delete the definition after the communications link has ended.

DFIPD176E **Adapter address not unique**

Meaning: The same adapter address was entered for both adapters in the Bridge Definition function, or the adapter address indicated by the cursor is the same as an adapter address in another bridge definition. Bridge adapter addresses defined to the Utility Program must always be unique. The adapter address was probably mistyped.

DFIPD177E LAN segment number not unique

Meaning: The same LAN segment number was entered for both ports in the Bridge Definition function. The ports in a bridge are always on different LAN segments.

DFIPD178I Bridge definition added

Meaning: A new bridge definition was successfully added.

DFIPD179I Bridge definition changed

Meaning: The bridge definition was successfully changed.

DFIPD219E Adapter not found. Limited function available

Meaning: The Utility Program cannot find its own adapter or its adapter code. This is an initialization error.

Action:

1. The Utility Program uses adapter 0 (or primary) of your work station.

   If the switch on the adapter is not set to 0, change the adapter switch and restart the Utility Program.

   Note: Some adapters do not have switches. For such an adapter, you make the primary-alternate selection through a configuration program that is shipped on the diskette with the adapter.

   If you are using DOS and the adapter number is correct, ensure that the CONFIG.SYS file in the root directory contains the following statements:

   ```
   FILES=60
   BUFFERS=20
   DEVICE=C:\LSP\DXMA0MOD.SYS
   DEVICE=C:\LSP\DXMC0MOD.SYS
   ```

   If the above statement group is not contained in the CONFIG.SYS file, reinstall the IBM LAN Support Program as appropriate.

   If the following statement is in your CONFIG.SYS file (x = don't care),

   ```
   DEVICE=x:\xxxx\DXMT0MOD.SYS
   ```

   a NetBIOS driver has been defined. Ensure that "ES=1" (extra SAPs) and "EST=8" (extra stations) are included in the statement as follows:

   ```
   DEVICE=x:\xxxx\DXMT0MOD.SYS ES=1 EST=8
   ```

2. If the problem persists, reinstall the LAN Support Program and the Utility Program.

DFIPD226W Adapter inoperative; press Esc or F3 to exit

Meaning: You see this message when the Utility Program's adapter closes and you are using any of the Utility Program's functions that require communication on the LAN segment.

DFIPD227W Adapter inoperative; function not available

Meaning: This message is displayed when the Utility Program function that requires communications on the LAN is requested and the Utility Program's adapter has closed.

DFIPD237E **Insufficient resource to open Service Access Point**

Meaning: The Utility Program cannot open the service access point (SAP) because of insufficient resources assigned. The user should increase the number of SAPs and link stations defined.

DFIPD240E **Invalid adapter address**

Meaning: The adapter address entered is either a functional address, a group address, or is not a full 12-digit hexadecimal address. If you entered more than one adapter address on the display, the cursor is positioned under the address in error.

DFIPD254E **Bridge name not found**

Meaning: The bridge name entered has not been defined to the LAN Network Manager. The name may have been typed incorrectly.

DFIPD255E **Duplicate bridge name**

Meaning: A bridge has already been defined using this bridge name.

DFIPD257W **No bridges have been defined**

Meaning: You selected a bridge function, but no bridges have been defined to the LAN Network Manager.

DFIPD262E **Invalid data. Please try again**

Meaning: The data entered is not valid for the input field on the current display.

DFIPD263E **Required data is missing. Please try again**

Meaning: The data that is required to perform an operation is missing.

DFIPD273E **Password format is incorrect. Please try again**

Meaning: The new passwords must be 6 to 8 characters long with no imbedded blanks. The valid characters are: letters A to Z and a to z, numbers 0 to 9, and special characters @, $, %, and #.

DFIPD280W **Operation failed, no communication response received**

Meaning: The LAN Network Manager sent a frame to a station that did not respond within a fixed time. Verify that the command was sent over the network. If the status is Normal, try the operation again.

DFIPD285I **Bridge already linked**

Meaning: You tried to link to a bridge that already has the communications link established. The communications link is not disrupted.

DFIPD286I **Bridge already unlinked**

Meaning: You tried to end a link to a bridge that does not have a communications link established.

DFIPD289I **Operation failed, bridge not linked**

Meaning: You requested a bridge function (bridge profile, for instance), but the LAN Network Manager does not have a communications link established with that bridge. Possibly the bridge name is undefined or was typed incorrectly.

DFIPD307I Link limit exceeded

Meaning: This message is displayed when the operator tries to add a ninth bridge definition that specifies automatic linking to the IBM 8229 Utility Program ("Link during bring-up" = Y). The maximum number of bridges that can be in session with the IBM 8229 Utility Program at one time is eight.

DFIPD314I Reporting link data changed

Meaning: The reporting link, reporting link password, or both have changed. The change will take effect when you reinitialize or reset the LAN Manager.

DFIP501E Error accessing specified file. Press ESC

Meaning: The Utility Program could not access or read the specified disk file.

Action:

1. Verify the drive\path\filename specified.
2. Verify the existence and location of the file.

DFIP502E Invalid locally administered address

Meaning: The locally administered address entered is either a functional address, a group address, a universally administered address, or is not a full 12-digit hexadecimal address.

DFIPD601W Frame transmission failure

Meaning: The adapter support software was not able to process the Utility Program's transmit request.

DFIPD602W Transmit timer failure

Meaning: The adapter support software reported an error while processing the Utility Program's transmit timer start request.

DFIPD603W Receive timer failure

Meaning: The adapter support software reported an error while processing the Utility Program's receive timer start request.

DFIPD700W Operation failed, no communication response to TEST frame

Meaning: When linking to a bridge, the application initially sends a TEST frame to determine the route to the bridge. This message indicates that the TEST frame was copied, but that there was no response to it.

Action:

1. Check the adapter address for the bridge to be linked by the bridge definition.
2. If it is correct, verify that there is a route to the bridge.

DFIPD701W TEST frame transmission failure

Meaning: Same as DFIPD601, except that this applies specifically to the TEST frame sent initially to find a route to the bridge.

DFIPD702W Transmit timer failure, TEST frame

Meaning: Same as DFIPD602, except that this applies specifically to the TEST frame sent initially to find a route to the bridge.

DFIPD703W **Receive timer failure, TEST frame**

Meaning: Same as DFIPD603, except that this applies specifically to the TEST frame sent initially to find a route to the bridge.

DFIPD750E **Operation failed, invalid key**

Meaning: During the link attempt, the Utility Program received a LAN Network Manager rejected message from the bridge due to an invalid reporting link password.

Action: Correct reporting link key under System definition.

DFIPD751E **Operation failed, reporting link already in use**

Meaning: There is already a controlling reporting link established between the bridge and another Utility Program or LAN network manager.

DFIPD752E **Operation failed - invalid reporting link identifier**

Meaning: There is a system problem if this message is displayed.

Action: Exit and restart the Utility Program and re-link with the bridge.

DFIPD753E **Operation failed, unable to establish connection**

Meaning: During the link attempt, the Utility Program received a LAN network manager rejected message from the bridge indicating no response to the bridge's SABME LLC frame.

Action: Try the operation again.

DFIPD754E **Operation failed, route traverses this node**

Meaning: The routing information field in the Set Reporting Point frame contained the destination bridge in one of its route designator fields, resulting in a LAN network manager rejected message from the bridge.

Action: Verify your network configuration and the bridge definition. If both are correct, the bridge is incompatible with this Utility Program.

DFIPD770E **Operation failed - server available but not active**

Meaning: There is a system problem if this message is displayed.

Action: Exit and restart the Utility Program and re-link with the bridge.

DFIPD771E **Operation failed, invalid server state**

Meaning: The bridge's state does not allow for reception of this frame: for example, receiving a set reporting point frame over an established link.

DFIPD772E **Operation failed - invalid bridge definition**

Meaning: This message is displayed when one of the adapter addresses in the bridge definition is incorrect or the bridge definition file TRE.def has been corrupted.

Action:

1. Verify the addresses in the bridge definition. If you do not know the addresses, you are forced to restore the 8229 by accessing it using the universally administered MAC addresses.

   The universally administered MAC addresses of the bridge are posted on a label on the front of the bridge; the universal address of Port 1 is the top address on the label and the universal address of Port 2 is the next address on the label from the top (equal to the value of the address of Port 1 plus 1).

To re-instate the universally administered MAC addresses, you have to reset the bridge. To reset the bridge, perform the following actions:

a. Record your parameter settings, because reset replaces all user-defined parameter values with default values.

b. Press the hardware reset button.

2. Change the bridge definition to use the universal addresses or create a new bridge definition and link with the bridge using the new definition.

If the above procedure still does not work, exit the Utility Program and delete the file TRE.def. Restart the Utility Program and reenter the bridge definitions.

DFIPD900E Error accessing bridge definition file. Press ESC

Meaning: The Utility Program could not open the bridge definition file for use.

DFIPD901E Error accessing file. Press ESC

Meaning: The Utility Program could not read or write to the file specified.

Action: Exit the Utility Program. Verify the existence and integrity of the file if this error message occurred when attempting to retrieve data from the file. If this error message occurred when attempting to save data to the file, determine whether there is sufficient available disk space.

DFIPD910E Program exceeds maximum size

Meaning: This message is displayed when the operator attempts to load a user-defined filter program into the 8229 bridge that is larger than the maximum size.

Action: Reduce the size of the user-defined filter program. See the README file for the maximum size allowed.

DFIPD950E Low range exceeds high range

Meaning: The token-ring-to-token-ring bridge filter definition low-range values exceed the high-range values.

DFIPD951E Hello Time must be less than the Forward Delay

Meaning: This message is displayed when the operator attempts to enter spanning tree parameters where the Hello Time value exceeds the value of the Forward Delay.

DFIPD952E The Forward Delay must be less than the Maximum Age

Meaning: This message is displayed when the operator attempts to enter spanning tree parameters where the Forward Delay value exceeds the value of the Maximum Age.

DFIPD953E The Hello Time must be less than the Maximum Age

Meaning: This message is displayed when the operator attempts to enter spanning tree parameters where the Hello Time value exceeds the value of the Maximum Age.

DFIPD955E Bridge version does not support this function

Meaning: This message is displayed when the operator attempts to enter parameters for a function that is not supported by the bridge.

DFIPD990E **Operation failed, return code is rc**

Meaning: The adapter support software failed during an operation, returning an error code of rc.

Action: Refer to Appendix B in the *IBM LAN Technical Reference* for detailed information about the returned error code.

DFIPD991E **Operation failed, TEST frame return code is rc**

Meaning: Same as DFIPD990, except that this applies specifically to the TEST frame sent initially to find a route to the bridge.

DFIPD992E **Operation failed, rejection code is rc**

Meaning: During the link attempt, the Utility Program received a LAN network manager rejected message from the bridge with the rejection code of rc.

DFIPD993E **Operation failed, reason code is rc**

Meaning: During the link attempt, the Utility Program received a Set Reporting Point Error message from the bridge with the reason code of rc.

DFIPD997E **Operation failed - duplicate data base entry**

Meaning: This message is displayed when the operator attempts to enter an address or address pair that already exists within that respective database.

DFIPD998E **Operation failed - entries exceed data base capacity**

Meaning: This message is displayed when the operator attempts to enter, from either a panel or a file, a number of database entries that exceed the maximum capacity of the database.

Chapter 11. Running the 8229 With SNMP

This chapter is divided into the following topics:

1. Overview of Simple Network Management Protocol (SNMP)
2. Steps required to enable the 8229 for SNMP
3. Description of the SNMP Parameters for the 8229
4. Enabling SNMP Using the EIA 232 Program
5. Enabling SNMP Using LDBRG
6. The 8229's Use of Trivial File Transfer Protocol (TFTP)

Overview of SNMP

SNMP is used in a TCP/IP environment to allow network devices, such as the 8229, to be managed from a remote site over a network. SNMP is organized to use management information bases (MIBs). Some of the variables in these files can be set to act as flags; others serve to store data. Within the SNMP design, the two key software entities are the manager and the agent. These two communicate with one another using the SNMP protocol. In general, managers make requests to the agents and collect information from them. The agents respond to the requests made by the managers. Both agents and managers consult the MIBs when they need information that is stored there.

From the SNMP point of view, the 8229 is an agent and a network management program such as NetView/6000* is the manager. Both the 8229 and the network manager access the same MIBs. The network manager must load with the three private MIBs that are unique to the 8229 before it can communicate with the 8229.

Steps Required to Enable the 8229 for SNMP

SNMP for the 8229 can be implemented over a token-ring or an Ethernet LAN.

Note: SNMP cannot be used from an 8229 that connects a token-ring to a WAN; in other words, the split bridge configuration of the 8229 does not support SNMP.

To enable the 8229 to support SNMP, perform the following steps:

1. Using either the EIA 232 Program or LDBRG, configure the 8229 with the SNMP parameters required by your network.

   Note: The Utility Program cannot be used to configure the 8229 with the SNMP parameters, nor can it link to an 8229 that is running SNMP operational software, that is, STRT.X or STREE.X. If you are in SNMP and wish to use the Utility Program, you must first reload the 8229 with operational software that provides LLC2 network management, for example, TRT.X, TREE.X, or WAN.X.

   These are the SNMP parameters that must be provided to the 8229:

   - System group values (defaults are provided for the only required variable)
   - IP address
   - Subnet mask
   - Default gateway IP address, if any
   - Enable or disable authentication or failure traps

- The following community parameters for each community desired:
  - Community name
  - IP address of the SNMP community's manager
  - Access mode, either Read only or Read/Write
- The following trap parameters for each trap community desired:
  - Trap community name
  - IP address of the SNMP manager to receive the alerts

2. Upload the STRT.X or STREE.X operational software file to the 8229, using either the EIA 232 program or LDBRG. Use STRT.X for an 8229 that connects a token-ring network to another token-ring network and STREE.X for an 8229 that connects a token-ring network to an Ethernet network.

   Important: Keep in mind that restarting the 8229 does not erase the FLASH. However, if you upload software that changes the physical configuration of the bridge, the bridge is reset, the FLASH is erased, and all parameter values, including the SNMP parameter values, are overwritten by their defaults.

   For example, suppose you are using TRT.X as your operational software to connect two token-rings in LLC2. You do not change your token-ring-to-token-ring physical configuration. Therefore, if you change over to SNMP and upload STRT.X after loading your SNMP parameters, the 8229 is restarted as opposed to reset.

   However, whether you change from STRT.X to TREE.X or to STREE.X, since you have changed the hardware configuration, the 8229 is reset.

3. Using the procedure appropriate for NetView/6000 or another SNMP network management program you are using, compile and load the three private MIBs to the workstation in which the network management program is installed. The three private MIBs are found on the fixed disk of the workstation to which you uploaded the 8229 operational software. These are their file names:

   - IBM8229.my
   - TR_SURR.my
   - SUR_TRAP.my

   Although these files have to be compiled and loaded to the SNMP network management program, they do not have to be separately uploaded to the 8229 because they are permanently resident in the 8229's memory.

Once the private MIBs are loaded into the SNMP network manager, the manager will have full ability to manage the 8229. You can now use SNMP SETs, GETs, and TRAPs to configure, query, and monitor the 8229. Figure 11-1 shows the relationship of the 8229 private MIBs to the Internet MIBs.

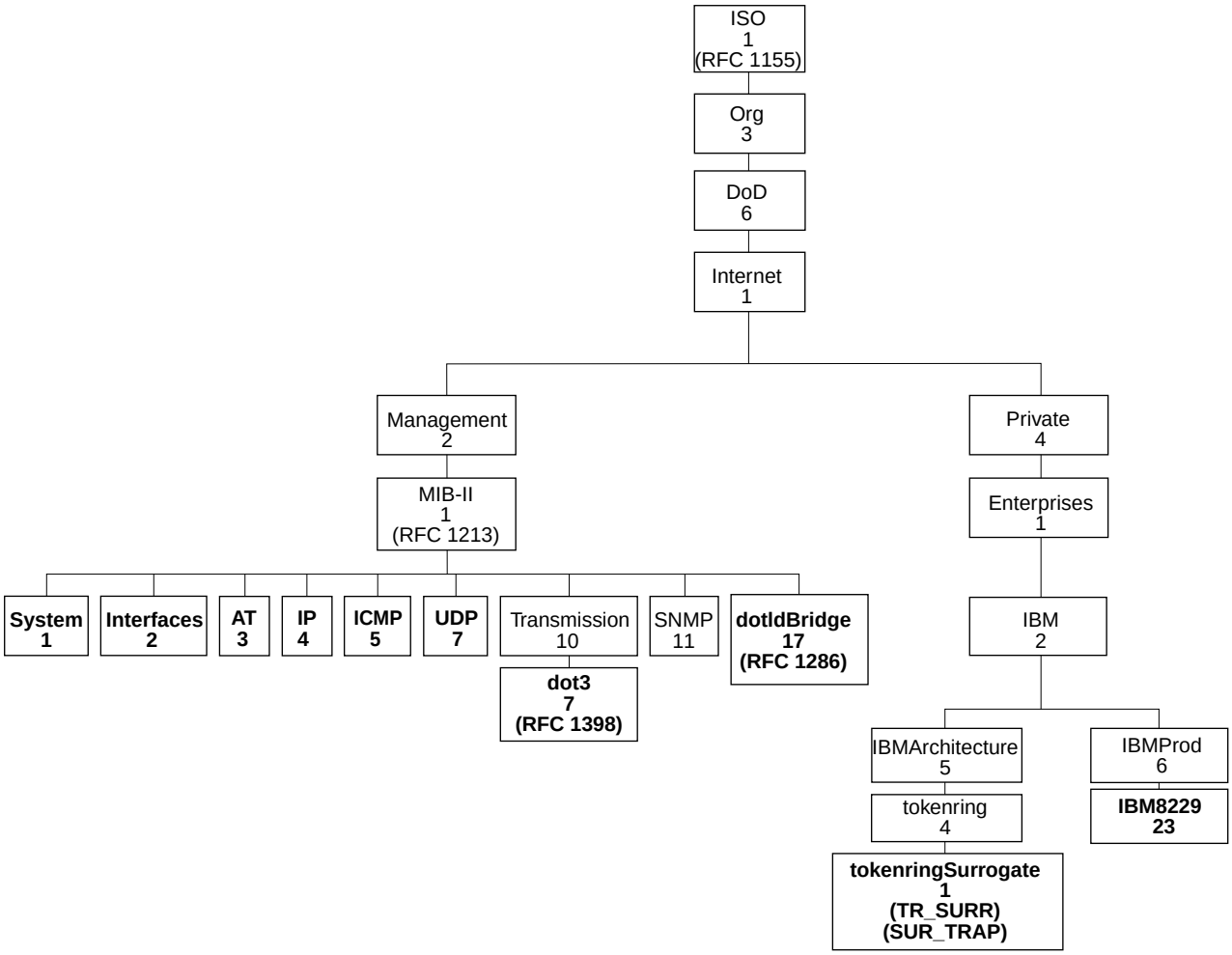


Figure 11-1. The MIB Chart

Restoring the 8229 to LLC Type 2 Network Management Protocol

If the 8229 is running in SNMP and you need to configure it for LLC Type 2 network management, use the EIA 232 Program or LDBRG to upload the appropriate LLC2 operational software. For example, replace STRT.X with TRT.X. The 8229 restarts; its LLC Type 2 parameters have never been erased and so they become operational again. Relink your LLC Type 2 network manager, such as IBM LAN Network Manager, to the 8229.

Description of Some of the Required SNMP Parameters

First, see the descriptions of Menu Option 4 and Menu Option 5 for the EIA interface in Chapter 7, “Using the DTE Port and the EIA 232 Interface” on page 7-1. Most of the 8229 SNMP variables are described there. You are required to provide unique definitions of all the SNMP variables except for the System group variables. Among the System group variables, the name of the 8229 is required, but a default for it is provided. The other System group variables are optional.

To augment the information found in Chapter 7, “Using the DTE Port and the EIA 232 Interface” on page 7-1, see the following brief description of some of the required SNMP parameters:

IP Address
A 32-bit quantity divided into two parts, a network address and a host address. This is a unique value that precisely identifies the address of the 8229 SNMP agent.

Subnet Mask
The assigned subnet mask for the 8229. A subnet mask is used to break out the network identifier within the IP address so that this subnetwork can be distinguished from others.

Default gateway IP address
The default gateway (IP address) for IP routing, if any.

Enable or disable SNMP authentication or failure traps
When this parameter is enabled, if an SNMP request is received from a community other than one of the communities defined in the community specification, the 8229 will send an alert message to each defined trap community. Otherwise, a message will not be sent to each defined trap community when this type of SNMP request is received.

Community Parameters
These parameters specify an administrative relationship between agents and managers. There are three parts to the community parameters:

- Name of the community
- IP address of the manager within the community
- Access mode of the manager: *Read* allows the manager to read information from the 8229, but not to make changes to that information (Get). *Read/Write* allows the manager both to read information from the 8229 and to make changes to it (Set).

Trap Parameters
These are event notifications sent by agents to their managers. They consist of two parts:

- Name of the trap community
- IP address of the SNMP management entity that is to receive the traps (alerts). IP address 0.0.0.0 is not a valid address for a trap community.

Using the EIA 232 Program to Enable SNMP

Chapter 7, “Using the DTE Port and the EIA 232 Interface” on page 7-1 describes how to use the EIA 232 Program. Using Menu Option 5, select one of the parameters from the SNMP variable menu, and enter the SNMP parameters required. When you have entered all the necessary parameter values, select Option 11 (Continue) from the *Select SNMP variable to change* menu; then, press Enter. The Primary Menu reappears. If you have not yet uploaded the operational software for SNMP, use Option 1 to upload the software. If you upload new software to implement SNMP but do *not* change the physical configuration of the 8229, the 8229 is restarted, not reset; that is, the NVR is not erased. Since the restart occurs automatically when the software is uploaded, you do not need to

specifically use Option 6 to restart the 8229 unless you *do not* upload new operational software.

Note that it is normal for the numerical display on the 8229 to cycle swiftly and repeatedly through its numbers as the uploading of new operational software takes place. This cycling, which ends as soon as the new operational software is completely uploaded, is not a sign that the 8229 is malfunctioning.

After the 8229 is restarted, do not forget to compile and load the three private MIBs on the SNMP network management workstation.

Using LDBRG to Enable SNMP

See Chapter 6, “LDBRG Program” for a description of LDBRG. To use LDBRG to enter the SNMP parameters in the 8229, first make a backup copy of the file LOAD_IP.txt. This is the sample SNMP configuration file provided when the files of the Operational Software Diskette are exploded and loaded to a workstation. Directions for modifying the variables in this file are included on the file. Edit Load_IP.txt to reflect the parameter values you need and use LDBRG to upload this file to the 8229.

LDBRG performs parsing and interpretation of the LOAD_IP.txt file before it transmits the SNMP configuration data to the bridge. If any errors are encountered in the parsing process, the message

```
Unable to assign [variableName] to [value]
```

is returned. If you get this message, check the syntax and value for that variable in LOAD_IP.txt and try again to upload the file.

Use LDBRG’s ability to upload operational software to upload new operational software to the 8229, for example, STRT.X or STREE. X. To do this, follow these steps.

1. Make a backup copy of the Operational Software Diskette.
2. Type the following command to upload the operational software file to the 8229.

   ```
   LDBRG MAC_ADDRESS [Drive] [Path] FILENAME
   ```

   FILENAME represents the name of the operational software file, either STRT.X or STREE.X.

   Note: If the new operational software corresponds to the physical configuration of the 8229, a restart (as opposed to a reset) will automatically occur at the end of the uploading process. The new SNMP parameters that you have loaded will become active *only after* this restart occurs.

Remember to complete the process by compiling the private MIBs to the network management program before you attempt to set up communication between the network manager and the 8229.

The 8229's Use of TFTP

The 8229 configured for SNMP allows the SNMP manager to upload operational software and user-defined filter programs to the 8229 from a remote workstation on the LAN.

To upload a file to the 8229, the SNMP manager issues the following SET commands:

```
SNMP SET [FILENAME]
SNMP SET [loader IP address]
SNMP SET [load initiate flag]
```

These commands instruct the 8229 to locate the file by its filename in a loader workstation connected to the LAN. The 8229 uses TFTP to issue a TFTP GET request to the loader workstation, which uploads the requested file to the 8229.

If the file received by the 8229 is an operational software file, the 8229 automatically restarts. If the file requested is a user-defined filter program, the 8229 uploads the file. In this case, a restart is not required.

Chapter 12. Problem Determination and Servicing

Overview

This chapter provides information to help you resolve problems with the 8229. You should also become familiar with Appendix A, “Planning and Record Worksheets” on page A-1. When specified, some instructions should be followed by the provider of service only. Before working on this device, see “Safety Notices” and review “Electronic Emission Notices” on page xii. Also see “Setting Up the DTE Port” on page 7-2.

If the planar board is replaced, the replacement planar board will have a new MAC address. New address labels will be shipped with the board. Update the network planning records to reflect the new address and place the new address label on the front of the 8229.

The 8229 performs internal diagnostic tests on its hardware and software during initialization. Normally the numeric code will change as each check is completed. However, if a test fails, the diagnostic code of the test that failed will remain displayed. You can then view the table of codes and procedures in this chapter to resolve the problem. The operational software diskette contains the files TOKENHEX, ETHERHEX, and WANHEX that provide the error codes and their definition.

Bridge Basic Assurance Tests

Following the application of power, the 8229 will perform a series of basic assurance tests (BATs) that will test the 8229 hardware and the network connections. Then following the BATs, the 8229 will poll the networks and components on both connected networks to build address tables, confirm network topology and accessibility, and check for net loops.

The following table of diagnostic codes explains each test as it is indicated by the code on the display, and also provides procedures for problem resolution.

Minimal Operational Mode

In the event that the operational software is corrupt, or if the operational software is valid but does not match the hardware configuration, the 8229 will progress following power-on to minimal mode.

In minimal operational mode, the only function supported is the ability to use the EIA 232 port to load the 8229 operational software.

Locating Ports 1 and 2

This section defines ports 1 and 2 and will help you identify and locate the ports when you use the diagnostic codes section that follows.

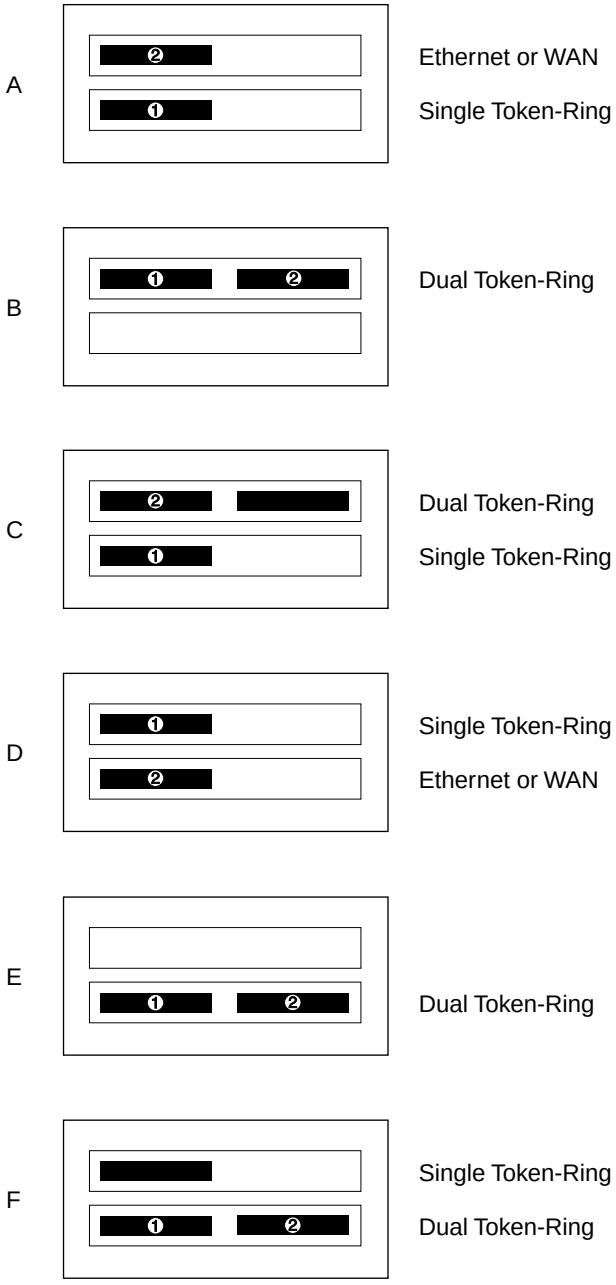


Figure 12-1. Port Defaults for Several Possible Configurations. In this diagram, the number 1 represents Port 1 and the number 2 represents Port 2.

The locations of Port 1 and Port 2 depend on which LAN attachment modules are installed in the 8229. In general, the first token-ring port on the bridge is Port 1. When you are using two Single-Port Token-Ring Attachment Modules, the port for the lower module is Port 1 and the port for the upper module is Port 2.

When you are using one Single-Port Token-Ring Attachment Module and either an Ethernet Attachment Module or a WAN Attachment Module, the 8229 will detect the first operational token-ring port and regard that port as Port 1; Port 2 is the Ethernet or WAN Attachment Module port, as shown in **A** and **D** in Figure 1-6 on page 1-6.

When you are using a Single-Port Token-Ring Attachment Module and a Dual-Port Token-Ring Attachment Module, Port 1 is defined as the first port found, starting at the bottom left and proceeding to the bottom right and then to the top left, and Port 2 is defined as the second port found. This configuration is shown in **C** and **F**. Using a Dual-Port Token-Ring Attachment Module with a Single- Port Token-Ring Attachment Module is not recommended because one of the three available ports is not used.

B and **E** show a Dual-Port Token-Ring Module being used by itself.

Diagnostic Codes

Diagnostic codes are displayed on the 2-digit numeric display and indicate the test that is in progress or, if the system halts, the test that has failed.

The green status LED will be lit steadily once the local diagnostics have been completed. The LED will remain lit steadily as long as the bridge is running.

Table 12-1 (Page 1 of 8). Numeric codes and actions

Code	Test in progress or failed	Status/Action
00 - 08	• Internal hardware verification testing processor, RAM, boot prom, and flash memory • Bringup of minimum run-time code.	1. Unplug the power cord. 2. Remove all attachment modules. (See “Removing and Replacing the Attachment Modules” on page 12-14.) 3. Plug in the power cord to restart the 8229. 4. If the numeric code remains in the range from 00 to 08, replace the planar board. (See “Removing and Replacing the Planar Board” on page 12-24.) 5. If the numeric code proceeds past code 19, unplug the power cord and re-install the attachment modules. (See “Removing and Replacing the Attachment Modules” on page 12-14.)
09	Pause: awaiting load of correct operational code	The 8229 is in minimal mode. 1. Select the operational code to load that matches the modules installed and the management type. 2. Use the Utility Program, LDBRG, or the EIA 232 port to load the correct operational code level to the 8229.
10 - 19	Running Planar board diagnostics • Forwarding processor operation • RAM function	1. Unplug the power cord. 2. Remove all attachment modules. (See “Removing and Replacing the Attachment Modules” on page 12-14.) 3. Plug in the power cord. 4. If the numeric code remains in the range from 10 to 19, replace the planar board. (See “Removing and Replacing the Planar Board” on page 12-24.) 5. If the code proceeds past 19, unplug the power cord and re-install the attachment modules. (See “Removing and Replacing the Attachment Modules” on page 12-14.)

Table 12-1 (Page 2 of 8). Numeric codes and actions

Code	Test in progress or failed	Status/Action
20	Validating attachment module configuration	Token-ring module not found in either slot or mismatch of attachment modules and operational code. 1. Procedure 1: a. Unplug the power cord. b. Verify that a token-ring module is installed and firmly seated in the 8229. c. Plug in the power cord to restart the 8229. 2. Procedure 2: a. If using the EIA 232 port, verify that the correct operational code is loaded to support the attachment module types installed. b. If there is a mismatch, either load the correct operational code or install the correct attachment modules and restart the 8229. (Use the Utility Program, LDBRG, or the EIA 232 port to load the correct operational code level to the 8229. 3. Procedure 3: Check the rear connector board for bent pins and replace if necessary. (See "Removing and Replacing the Rear Connector Board" on page 12-21.) 4. Procedure 4: If the same failure occurs after completing procedures 1, 2, and 3, replace the planar board. (See "Removing and Replacing the Planar Board" on page 12-24.)
21 - 29	System initialization	1. Unplug the power cord. 2. Remove and then re-install all attachment modules. (See "Removing and Replacing the Attachment Modules" on page 12-14.) 3. Plug in the power cord. 4. If the code is still in the range from 21 to 29, replace the planar board. (See "Removing and Replacing the Planar Board" on page 12-24.)
30 - 39	Reserved	No action required.

Table 12-1 (Page 3 of 8). Numeric codes and actions

Code	Test in progress or failed	Status/Action
40 - 44	Port 1 initialization	Token-ring module found but no communication established between module and initialization hardware and software. 1. Unplug the power cord. 2. Verify that a token-ring module is installed and firmly seated in Port 1. 3. Restart the 8229 by plugging in the power cord. 4. If the code again stops in the range of 40 to 44, move the token-ring module to another slot. It may be necessary to swap positions with another installed module. 5. If moving the module corrects the problem, replace the rear connector board. (See "Removing and Replacing the Rear Connector Board" on page 12-21.) 6. If the same failure occurs, replace the token-ring module. (See "Removing and Replacing the Attachment Modules" on page 12-14.)
45 - 49	Port 2 initialization	Port 2 module found but no communication established between module and initialization hardware and software. 1. Unplug the power cord. 2. Verify that the modules are installed and firmly seated. 3. Restart the 8229 by plugging in the power cord. 4. If the code again stops in the range of 45 to 49, move the module to the other slot. It may be necessary to swap positions with the other installed module. 5. If moving the module corrects the problem, replace the rear connector board. (See "Removing and Replacing the Rear Connector Board" on page 12-21.) 6. If the same failure occurs, replace the module. (See "Removing and Replacing the Attachment Modules" on page 12-14.)
50 - 59	Reserved	No action required.

Table 12-1 (Page 4 of 8). Numeric codes and actions

Code	Test in progress or failed	Status/Action
60, 61, 63	Attempting to open Port 1 and insert into the token ring (See "Locating Ports 1 and 2" on page 12-3 to identify port locations)	1. Verify that the token-ring cable is correctly connected. 2. Unplug the power cord and verify that switch 7 on the token-ring module is set to match the port connector type. (On = RJ45, Off = D shell) 3. Verify that switch 1 is set for the correct token-ring data rate. 4. If the code is unchanged after restarting the 8229, use the wrap test to isolate the bridge from the network. a. Unplug the power cord and remove the cable from port 1. b. Verify that switch 7 on the attachment module is set to OFF. c. Insert the wrap plug (shipped with the 8229) into the D shell connector. d. Plug in the power cord. e. If the test proceeds past codes in the range of 60 to 64 the problem is not within the bridge. 1) Recheck the cable and cable connections. 2) Connect the 8229 to a different multi-station access unit. 3) Use a network management tool to check the network for beacons or other network conditions. f. If the code is unchanged, record the current 8229 parameters (both bridge and SNMP management parameters) and then press the hardware reset button on the front of the 8229 to reset the bridge parameters to the factory defaults. g. If the problem is not resolved, replace the module. (See "Removing and Replacing the Attachment Modules" on page 12-14.)
62	Performing duplicate address check	Bridge address is not unique to the network. 1. Change the locally administered address (if used on the network) of the bridge or of the device on the network that has the same address. 2. Move either the bridge or the conflicting device to a different network. 3. If the code is unchanged, record the current 8229 parameters (both bridge and SNMP management parameters) and then press the hardware reset button on the front of the 8229 to reset the bridge parameters to the factory defaults.
64	Reserved	No action required.

Table 12-1 (Page 5 of 8). Numeric codes and actions

Code	Test in progress or failed	Status/Action
65 - 89	***** TOKEN-RING SECTION *****	Ethernet and WAN each have a separate section that follows this section for codes from 65 through 89
65, 66, 68	Attempting to open Port 2 and insert into the LAN (Token-ring only) (See "Locating Ports 1 and 2" on page 12-3 to identify port locations)	1. Verify that the token-ring cable is correctly connected. 2. Unplug the power cord and verify that switch 8 on the token-ring module is set to match the port connector type. (On = RJ45, Off = D shell) 3. Verify that switch 2 is set for the correct token-ring data rate. **Note:** For a token-ring bridge configuration using 2 single token-ring attachment modules, the switches on the module used as port 1 control both modules. 4. If the code is unchanged after restarting the 8229, use the wrap test to isolate the bridge from the network. a. Unplug the power cord and remove the cable from port 2. b. Verify that switch 8 on the attachment module is set to OFF. c. Insert the wrap plug (shipped with the 8229) into the D shell connector. d. Plug in the power cord. e. If the test proceeds past codes in the range of 65 to 68 the problem is not within the bridge. 1) Recheck the cable and cable connections. 2) Connect the 8229 to a different multi-station access unit. 3) Use a network management tool to check the network for beacons or other network conditions. f. If the code is unchanged, record the current 8229 parameters (both bridge and SNMP management parameters) and then press the hardware reset button on the front of the 8229 to reset the bridge parameters to the factory defaults. g. If the problem is not resolved, replace the module. (See "Removing and Replacing the Attachment Modules" on page 12-14.)
67	Performing duplicate address check	Bridge address is not unique to the network. 1. Change the locally administered address (if used on the network) of the bridge or the device on the network that has the same address. 2. Move either the bridge or the conflicting device to a different network. 3. If the code is unchanged, record the current 8229 parameters (both bridge and SNMP management parameters) and then press the hardware reset button on the front of the 8229 to reset the bridge parameters to the factory defaults.
69 - 79	Reserved	No action required.

Table 12-1 (Page 6 of 8). Numeric codes and actions

Code	Test in progress or failed	Status/Action
80 - 89	• Verifying unique token-ring numbers and bridge operation • Verifying bridge operation by sending and receiving frames	1. Use the network planning and cabling charts to ensure that the correct ring numbers are assigned to the rings connected by the 8229. 2. If there is a conflict, assign a different number to one of the rings. **Note:** If a ring is already defined by another device or entity on the ring, (for example, another bridge) the 8229 will use that ring number and the newly assigned number will be ignored. 3. Verify that both LAN cable connectors are not connected to the same LAN. 4. Verify that all parallel bridges are assigned and using bridge numbers that are unique. 5. Analyze the network to determine why the bridge is unable to forward frames over the network to itself. (See "Bridge Self-Test" on page 12-12.)
65 - 89	***** ETHERNET SECTION *****	Token-ring and WAN each have a separate section for codes 65 through 89.
65	Attempting to open Port 2 and insert into the Ethernet LAN (See "Locating Ports 1 and 2" on page 12-3 for information to identify port locations)	1. Verify that the LAN cable is correctly connected and restart the 8229. 2. Unplug the power cord and verify that switch 7 on the attachment module is set to match the port connector type. (On = 10BaseT, Off = AUI) 3. If the code is unchanged after restarting the 8229, use the wrap test to isolate the bridge from the network. a. Unplug the power cord and remove the cable from port 2. b. Verify that switch 7 on the attachment module is set to OFF. c. Insert the wrap plug (shipped with the 8229) into the AUI connector. d. Plug in the power cord. e. If the test proceeds past codes in the range of 65 to 68 the problem is not within the bridge. 1) Recheck the cable and cable connections. 2) Connect the 8229 to a different multi-station access unit. 3) Use a network management tool to check the network for other network conditions. f. If the code is unchanged, record the current 8229 parameters (both bridge and SNMP management parameters) and then press the hardware reset button on the front of the 8229 to reset the bridge parameters to the factory defaults. g. If the problem is not resolved, replace the module. (See "Removing and Replacing the Attachment Modules" on page 12-14.)

Table 12-1 (Page 7 of 8). Numeric codes and actions

Code	Test in progress or failed	Status/Action
69 - 79	Reserved	No action required.
80	8229 entering listening mode (Ethernet only)	No action required. The 8229 is operational and observing traffic on the Ethernet LAN.
81	8229 entering learning mode	No action required. The 8229 is building a dynamic database using the addresses of the ethernet workstations on the network that are sending frames.
80 - 89	• Verifying unique LAN segment numbers and bridge operation • Verifying bridge operation by sending and receiving frames	1. Use the network planning and cabling charts to ensure that the correct LAN segment numbers are assigned to the segments connected by the 8229. 2. If there is a conflict, assign a different number to one of the segments. **Note:** If a segment is already defined by another device or entity on the LAN, (for example, another bridge) the 8229 will use that segment number and the newly assigned number will be ignored. 3. Verify that both LAN cable connectors are not connected to the same LAN. 4. Verify that all parallel bridges are assigned and using bridge numbers that are unique. 5. Analyze the network to determine why the bridge is unable to forward frames over the network to itself. (See "Bridge Self-Test" on page 12-12.)
65 - 89	***** WAN SECTION *****	Token-ring and Ethernet each have a separate section describing codes from 65 through 89.
65	Checking WAN cable	1. Verify that the WAN cable type and part number are correct. 2. If the correct WAN cable is installed, replace the cable because it has a fault.
66	Performing external loopback test	Verify that the WAN attachment module switch 7 is set to disable the cable wrap test.
67	Checking modem or DSU transmit clock	1. Verify that the modem or DSU is set to provide external transmit and receive clock to the 8229. 2. Verify the correct WAN cable type and part number and replace if necessary.
68	Checking code revision level of both bridge halves	1. Verify that the correct code revision level is loaded for both bridge halves. 2. Use the Utility Program, LDBRG or the EIA 232 port to load the correct operational code level to the 8229.
69 - 79	Reserved	No action required.
81 - 84	Waiting for frames from the other half of the remote connection (WAN only)	1. Verify that both bridge halves are operational. 2. Restart the bridge by unplugging and then plugging in the power cord.
88	Verifying bridge operation by sending and receiving broadcast frames.	Verify that each LAN is assigned and using a number that is unique.

Table 12-1 (Page 8 of 8). Numeric codes and actions

Code	Test in progress or failed	Status/Action
89	Verifying communications link	The communications link is down. 1. Verify that both halves of the bridge are operational. 2. Verify all bridge and network cable connections. 3. Restart the bridge by unplugging and then plugging in the power cord.
89 - 93	Reserved	No action required.
94	Cable fault on Port 1	1. Verify that the Port 1 cable is correctly connected to the network at the multistation access unit. 2. Restart the 8229 by unplugging and then plugging in the power cord. 3. If the problem reoccurs, replace the cable.
95	Cable fault on Port 2	1. Verify that the Port 2 cable is correctly connected to the network at the multistation access unit. 2. Restart the 8229 by unplugging and then plugging in the power cord. 3. If the problem reoccurs, replace the cable.
96	Single Port Mode	Only port 1 attachment module found. 1. Verify that the correct modules are installed in the 8229 to provide port 1 and port 2 connection. 2. Verify that the correct operational code is loaded to support Port 2 connections. **Note:** You can display the information on hardware and code matches by using the EIA 232 port. 3. If the code is incorrect, use the Utility Program linked to Port 1, LDBRG, or the EIA 232 port to load the correct code.
Blank	The display is blank and all other 8229 LEDs are lit	The 8229 is fully operational.
Blank	The display is blank and none of the LEDs are lit	1. Verify that the power cord is plugged into the 8229 and power is available at the power outlet. (Try connecting another device to the power outlet.) 2. Replace the power cord. 3. Replace the power supply. (See “Removing and Replacing the Power Supply” on page 12-15.)

Status LED Indication

There are status LEDs (green and yellow) on each attachment module and on the main planar board of the 8229. If the yellow LED remains lit, replace that module.

Power LED (Green)

If the green LED remains off (unlit) after power is applied, have your provider of service replace the power supply.

Module Connector

The attachment modules are installed into the front of the 8229 and plug into the rear (internal) connector board that is connected to the planar board on the 8229. If the attachment modules do not insert correctly into the 8229, have the provider of service check the rear connector board. This part may be defective.

Bridge Self-Test

This test is performed as part of the token-ring initialization processing and only if frame forwarding is active. If the test fails, frame forwarding will be deactivated. The steps of the self-test are as follows:

1. A test frame is formatted for transmission from one LAN port to another LAN port. This frame has no routing information. The frame is sent and a timer is started.

   If the test response is received within 1 second, it indicates that both LAN ports are plugged into the same LAN segment. Frame forwarding is deactivated and no further self-test is performed.

2. If no response is received after two retries, the 8229 will perform a figure-eight self-test by sending a non-broadcast frame to itself as follows:

   a. A test, non-broadcast routed frame is formatted for transmission from one LAN port to the other LAN port. A timer is started and the frame is sent three times.

   b. If more than three responses are received, indicating multiple parallel paths, frame forwarding is deactivated and no further self-test is performed.

   c. If no response is received, indicating a network problem or an internal 8229 fault, frame forwarding is deactivated and no further self-test is performed.

   d. If one, two, or three responses are received, the test is repeated in the other direction.

   Any bridge self-test failures cause the setting of a status flag to be returned to the LAN network manager on request and a code is posted on the numeric display on the 8229.

3. Once the non-broadcast path has been validated, a test frame is broadcast from one LAN port to the other to determine whether there are incorrect paths (loop topology) within the network. (This could occur if bridges were configured with incorrect ring numbers.) There may be multiple responses to this frame. The 8229 waits 3 seconds for the response frames to traverse the network. If the first ring number of any response (or last ring number, depending upon the direction bit) contains a ring number other than the first LAN port's ring number, no further test processing is performed, and bridge frame forwarding is deactivated.

4. If either no response is received or the correct response is received, the test is repeated in the other direction.
5. If frame forwarding is deactivated as a result of one of the error conditions indicated, a LAN network management program can reset the 8229 to activate frame forwarding, but the self-test sequence will be repeated as part of the restart sequence. If the error condition still exists, it will be detected in the repeated self-test sequence and the 8229 will again disable frame forwarding.

Removal and Replacement Procedures

This section provides the procedures needed to remove and replace customer replaceable units (CRUs) and field replaceable units (FRUs).

For information about the part numbers associated with this product, see Appendix F, “Parts Listing.”

Before working on this device, see “Safety Notices” and review “Electronic Emission Notices” on page xii.

In order to facilitate reconnection, label all cables and attachment modules or have the cabling charts available before using these procedures.

CRUs and FRUs

The only CRUs for the 8229 that can be replaced by the customer are the attachment modules.

The FRUs for the 8229 should be replaced only by a customer engineer (CE); they are:

- Power Supply
- Rear Connector Board
- Planar Board

Service personnel should use an ESD handling kit to prevent electrostatic discharge when using these procedures.

Removing and Replacing the Attachment Modules

Removing the Attachment Modules

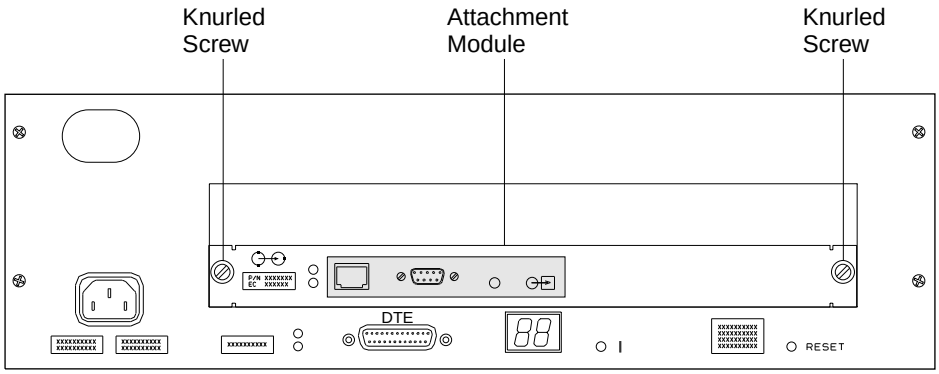


Figure 12-2. 8229 Front Panel

1. Unplug the power cord.
2. Loosen the knurled screws on both sides of the module.
3. Grip the knurled screws and pull the module out of its slot.

Replacing the Attachment Modules

1. Insert the module in its slot and ensure that the edges of the module are inside the guide rails.
2. Press with force on the face of the module until it snaps into place and is flush with the faceplate of the 8229.
3. Push in and tighten the knurled screws on both sides of the module.
4. Plug in the power cord.
5. You are now finished with this procedure. View the numeric display to verify the power-on sequence. (See the first sections of this chapter for the correct power-on sequence and error codes.)

Removing and Replacing the Power Supply

Removing the Power Supply

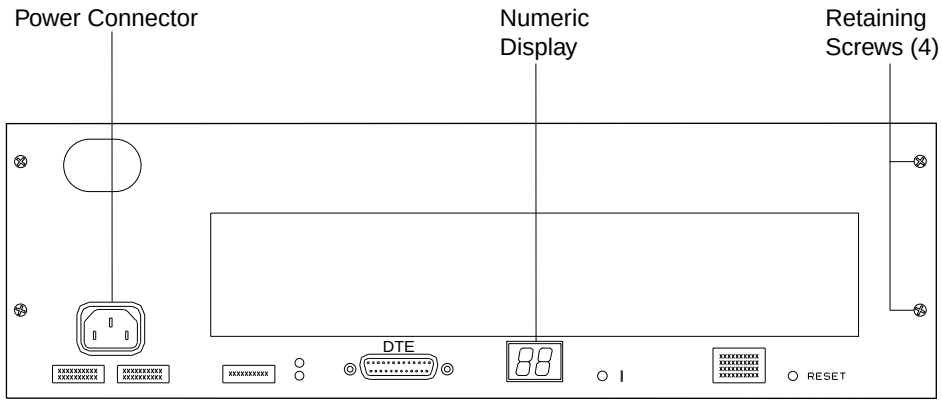


Figure 12-3. 8229 Front Panel Retaining Screws

1. Unplug the power cord.
2. Remove the four retaining screws.
3. Pull the internal frame out of the cover.
4. Place the internal frame on a flat surface.

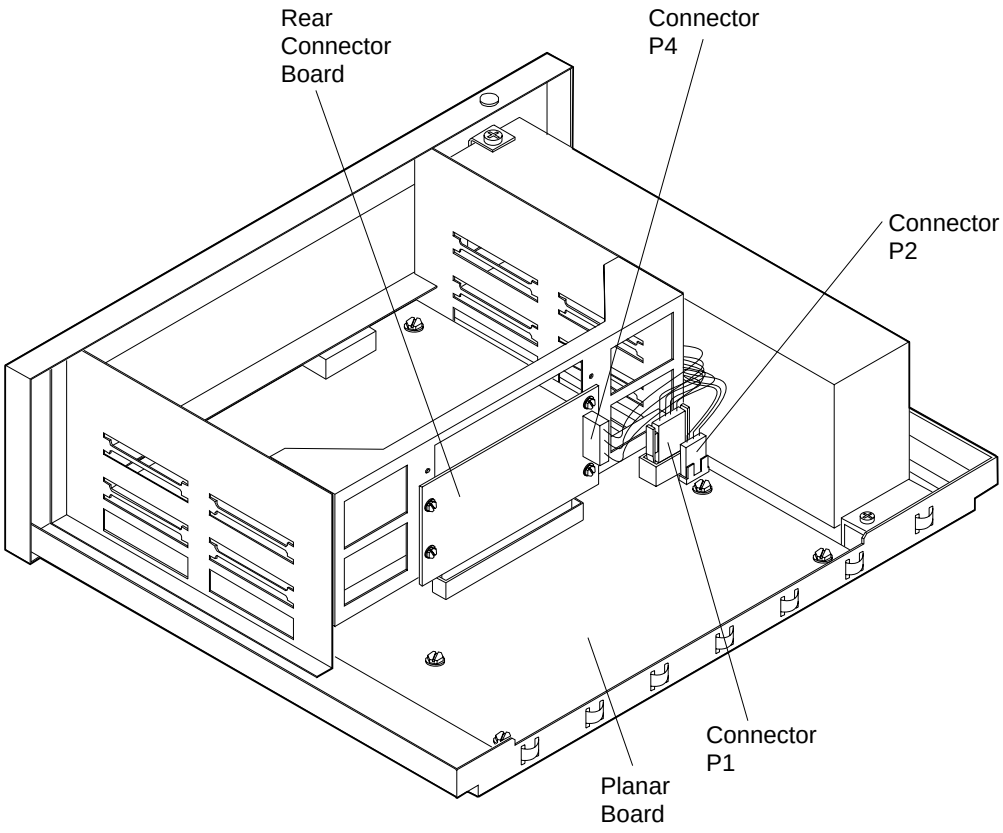


Figure 12-4. Connector and Planar Board Connectors

5. Pull the white connector plug (labeled P4) straight out to disconnect it from the rear connector board.
6. Squeeze the side tabs and pull the black connector (labeled P1) upward to disconnect it from the planar board.
7. Pull the small white connector (labeled P2) straight up to disconnect it from the planar board.

   Note: The extra white connector in the wiring harness, labeled P3, is not used and does not need to be disconnected or reconnected.

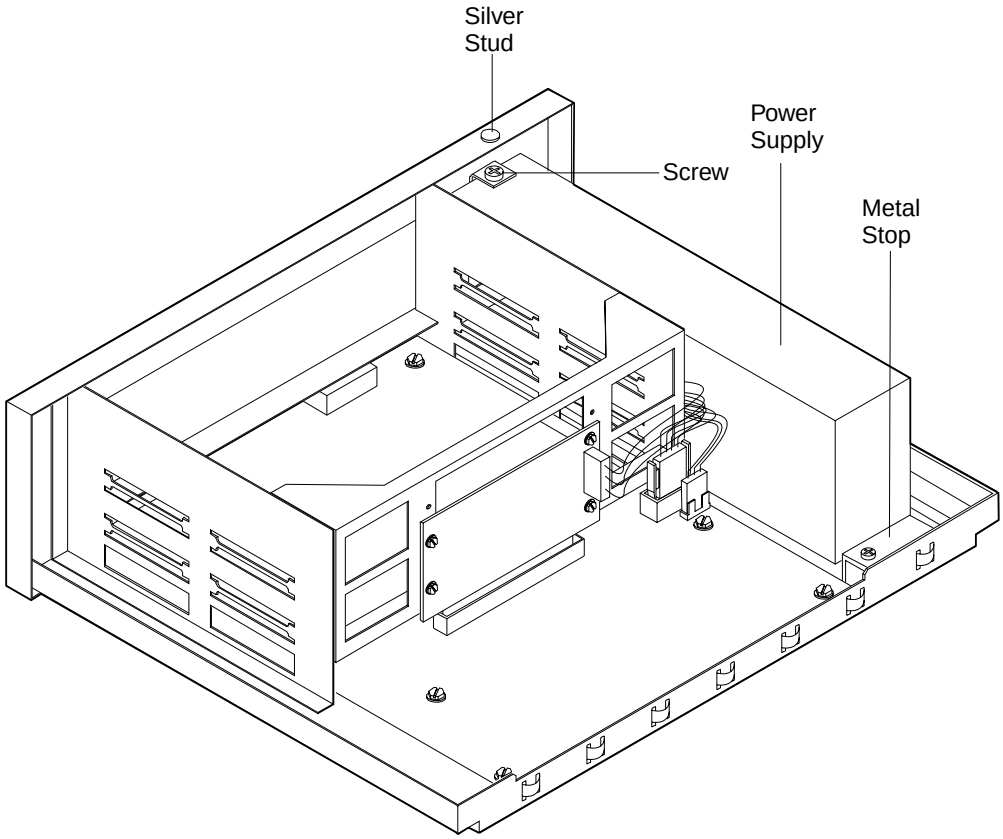


Figure 12-5. Removing the Power Supply

8. Remove the metal stop at the rear of the power supply.
9. Pop the silver stud out of the top of the faceplate by pressing upward from the bottom.
10. Use the opening for the silver stud to insert a Phillips screwdriver and remove the screw holding the front of the power supply in place.
11. Slide the power supply to the back of the internal frame and then lift it out.

Replacing the Power Supply

1. Position the power supply against the back of the internal frame so that the power socket aligns with the opening in the faceplate.
2. Maintaining pressure on the top of the power supply, slide it forward until the power socket mates with the opening in the faceplate, and the interlocking tabs on the internal frame and the bottom of the power supply hold it securely in place.

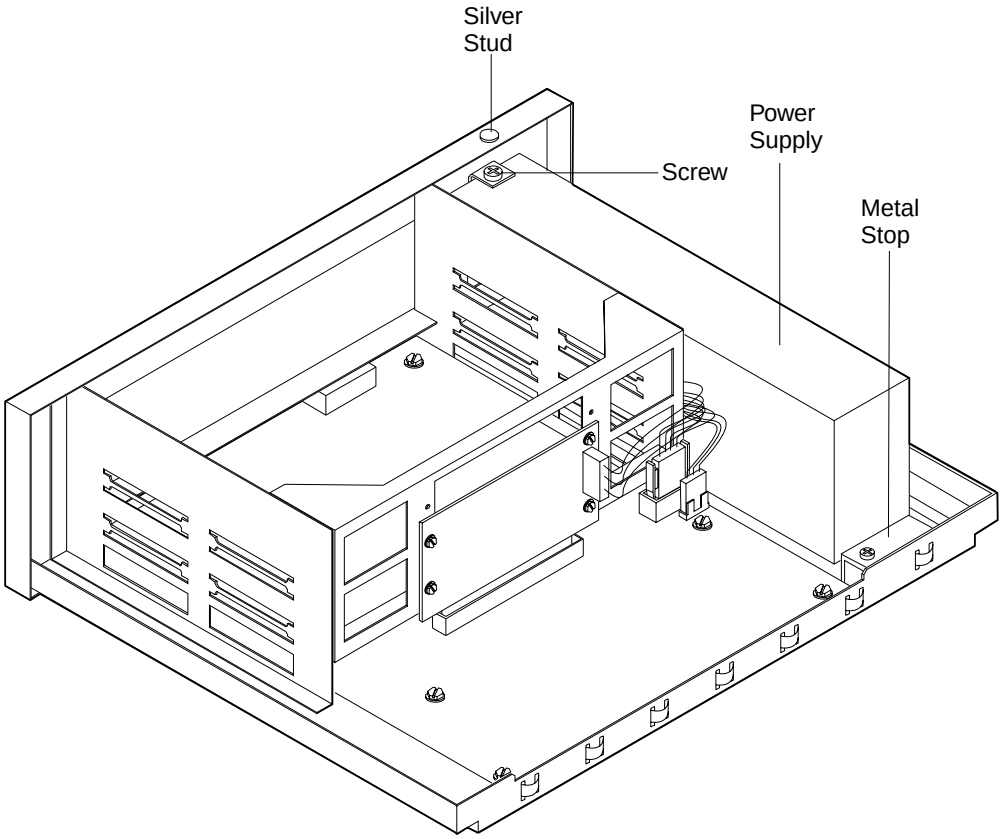


Figure 12-6. Replacing the Power Supply

3. Use the opening for the silver stud to insert a Phillips screwdriver and install the screw that holds the front of the power supply in place.
4. Replace the silver stud by pressing it into the opening.
5. Replace the metal stop at the rear of the power supply.

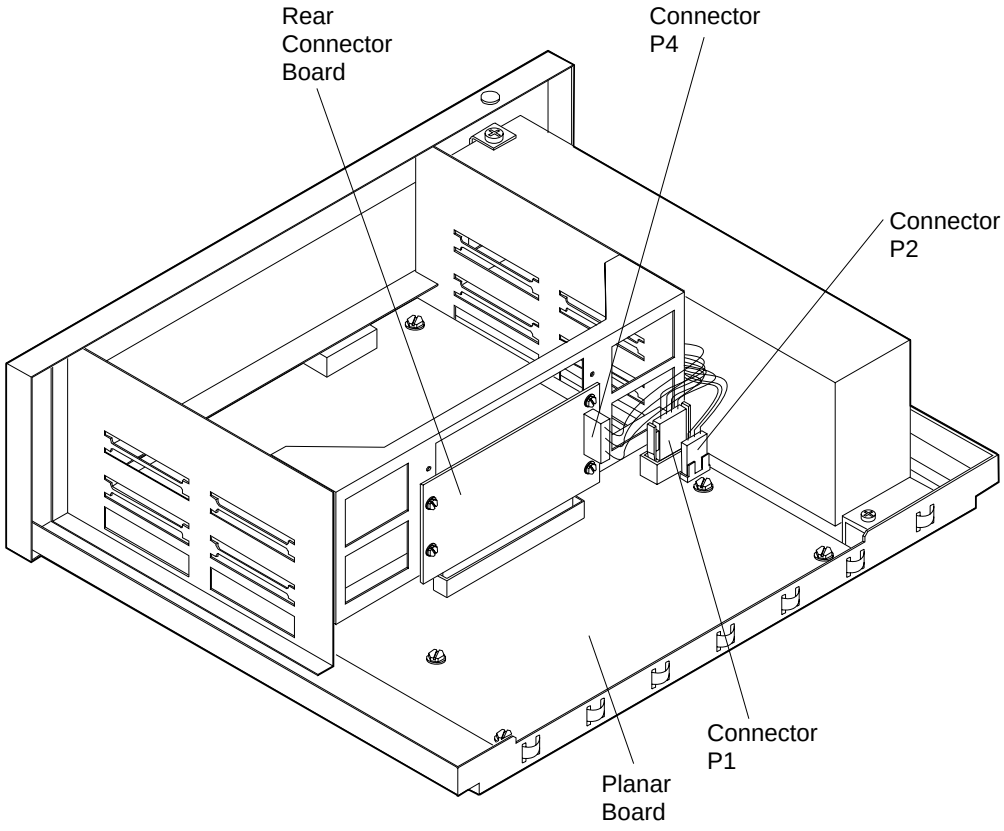


Figure 12-7. Connector and Planar Board Connectors

6. Connect the black connector (labeled P1) to the planar board as indicated in Figure Figure 12-7.
7. Connect the small white connector (labeled P2) to the planar board as indicated in Figure 12-7.
8. Connect the large white connector (labeled P4) to the rear connector board as indicated in Figure 12-7.

   Note: The extra white connector in the wiring harness, labeled P3, is not used and does not need to be disconnected or reconnected.
9. Slide the internal frame into the 8229 cover.

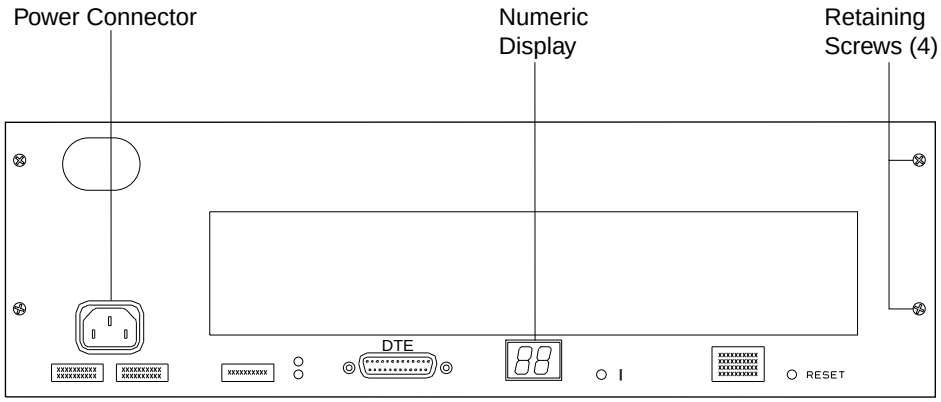


Figure 12-8. Front Cover

10. Install the four retaining screws.
11. Plug in the power cord.
12. You are now finished with this procedure. View the numeric display to verify the power-on sequence. (See the first sections of this chapter for the correct power-on sequence and error codes.)

Removing and Replacing the Rear Connector Board

Removing the Rear Connector Board

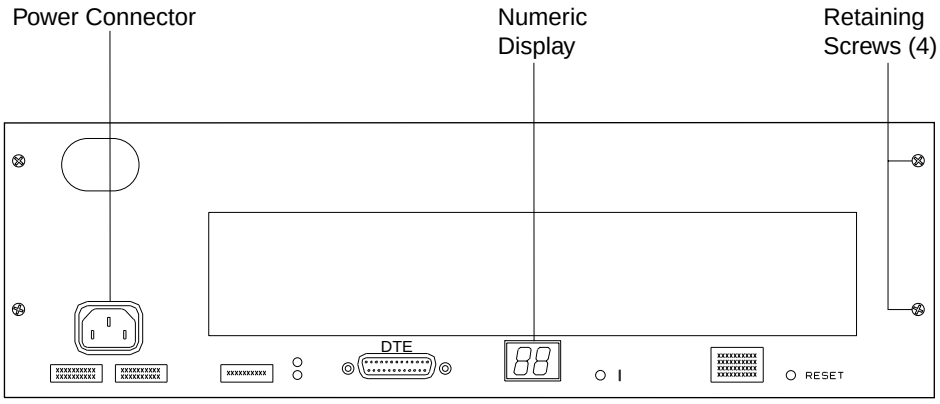


Figure 12-9. 8229 Front Panel

1. Unplug the power cord.
2. Remove all attachment modules.
   a. Loosen the knurled screws on both sides of the module.
   b. Grip the knurled screws and pull the module out of its slot.
3. Remove the four retaining screws from the faceplate.
4. Slide the interior frame out from the cover.
5. Place the interior frame on a flat surface.

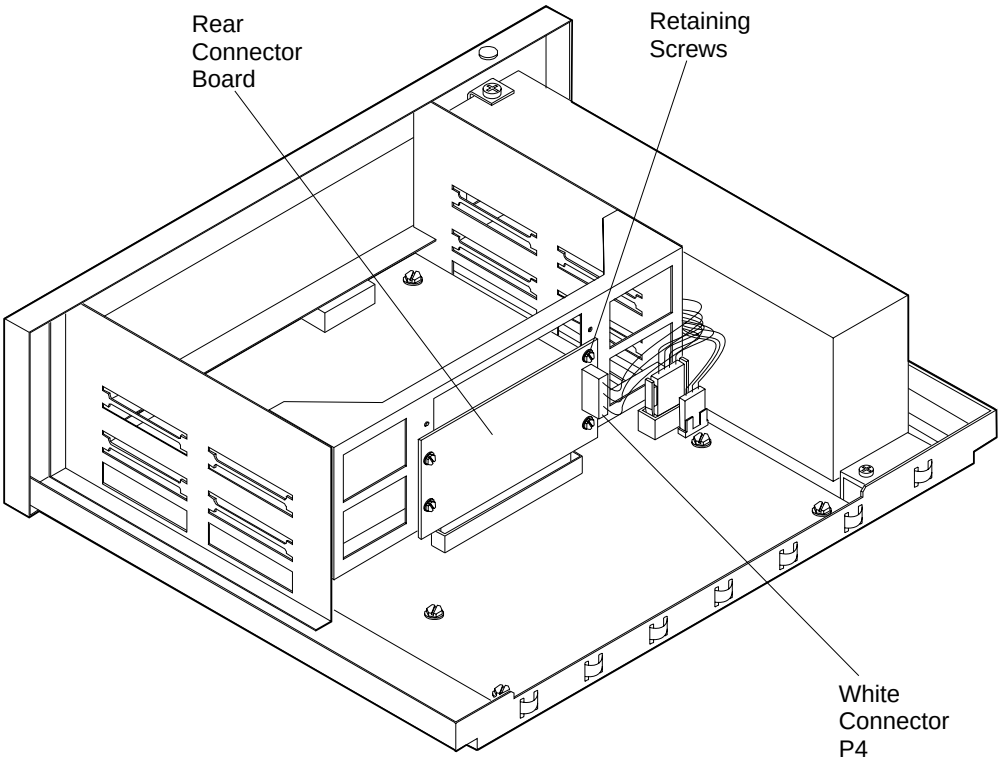


Figure 12-10. Rear Connector Board

6. Pull the white connector plug (labeled P4) straight out to disconnect it from the rear connector board.
7. Remove the four screws holding the rear connector board to the attachment module frame.
8. Remove the board by lifting it up until it disengages from the connector on the planar board.

Replacing the Rear Connector Board

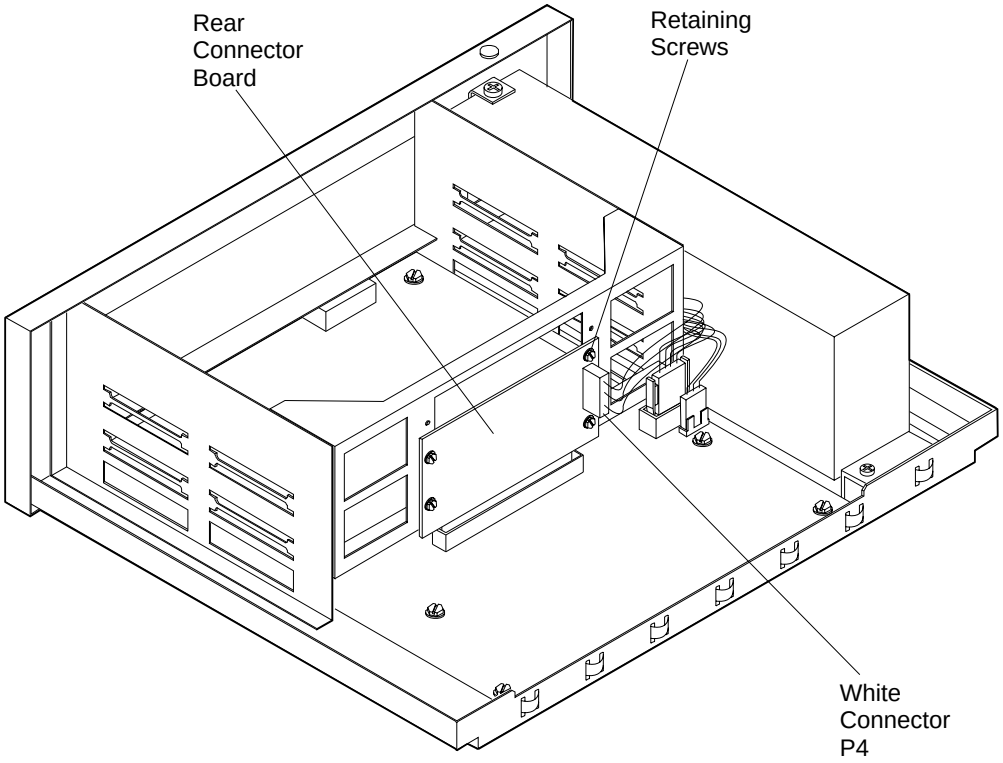


Figure 12-11. Rear Connector Board

1. Position the board over the connector on the planar board with its face against the rear of the module attachment rack, and press down firmly until the board is securely seated.
2. Replace the four retaining screws.
3. Connect the white connector plug (labeled P4) to the board as indicated in Figure 12-11.
4. Slide the internal frame into the cover.

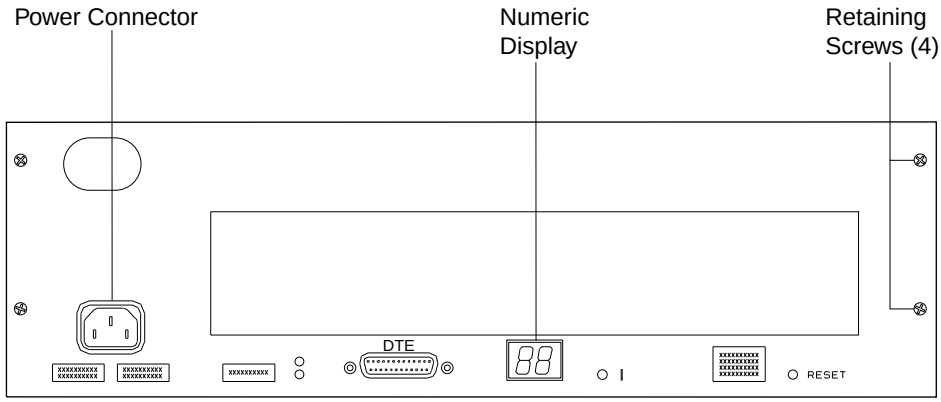


Figure 12-12. 8229 Front View

5. Install the four retaining screws in the faceplate.
6. Install the attachment modules.
   a. Insert the module in its slot and ensure that the edges of the module are inside the guide rails.
   b. Press the face of the module with force until it snaps into place and is flush with the faceplate of the 8229.
   c. Push in and tighten the two knurled screws.
7. Plug in the power cord.
8. You are now finished with this procedure. View the numeric display to verify the correct power-on sequence. (See the first sections of this chapter for the correct power-on sequence and error codes.)

Removing and Replacing the Planar Board

Each replacement planar board will have new MAC addresses associated with it and a new address label. The network must be updated to reflect the new MAC addresses and the new address label must replace the old one on the front of the 8229.

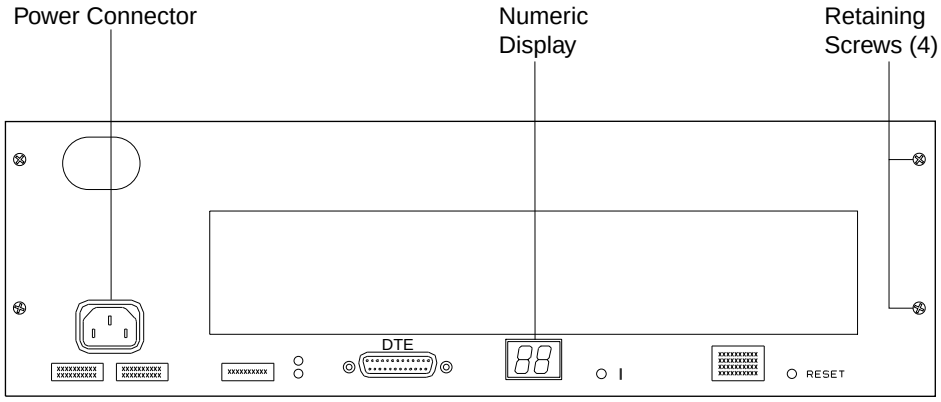


Figure 12-13. Front View

Removing the Planar Board

1. Unplug the power cord.
2. Remove all attachment modules.
   a. Loosen the knurled screws on both sides of the module.
   b. Grip the knurled screws and pull the module out of its slot.
3. Remove the four retaining screws from the faceplate.
4. Pull the internal frame out of the cover.
5. Place the internal frame on a flat surface.

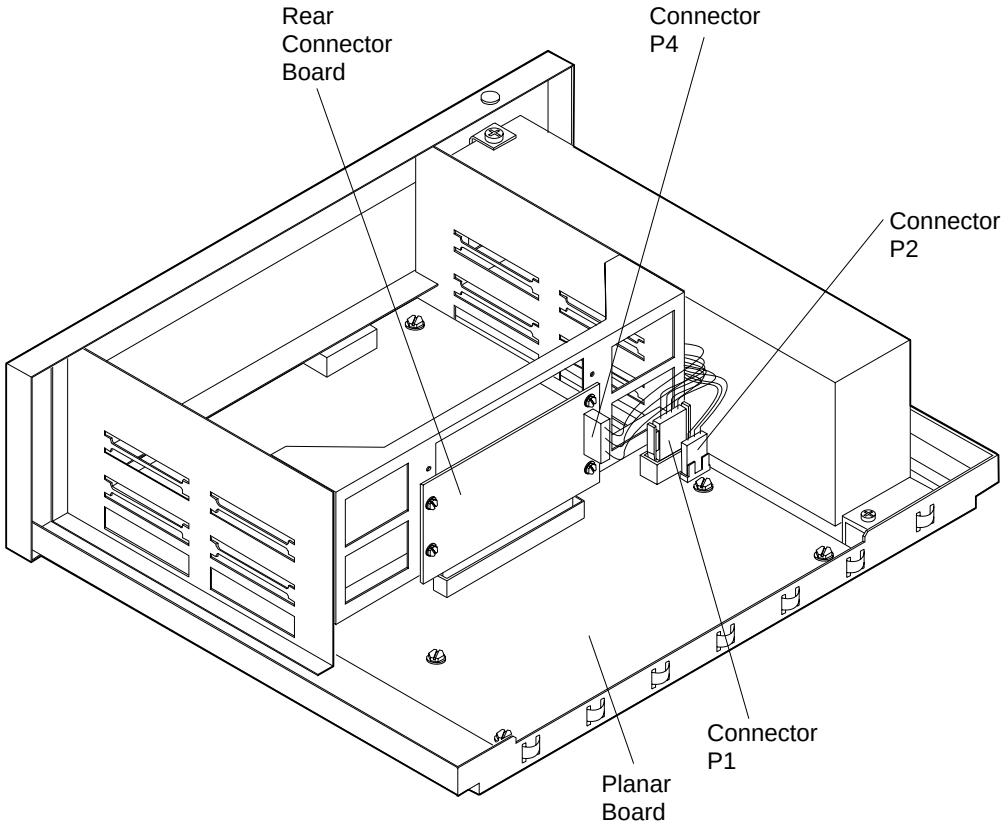


Figure 12-14. Connector and Planar Board Connectors

6. Pull the white connector (labeled P4) straight out to disconnect it from the rear connector board.
7. Squeeze the side tabs and pull the black connector (labeled P1) up to disconnect it from the planar board.
8. Pull the small white connector (labeled P2) straight up to disconnect it from the planar board.

   Note: The extra white connector in the wiring harness, labeled P3, is not used and does not need to be disconnected or reconnected.

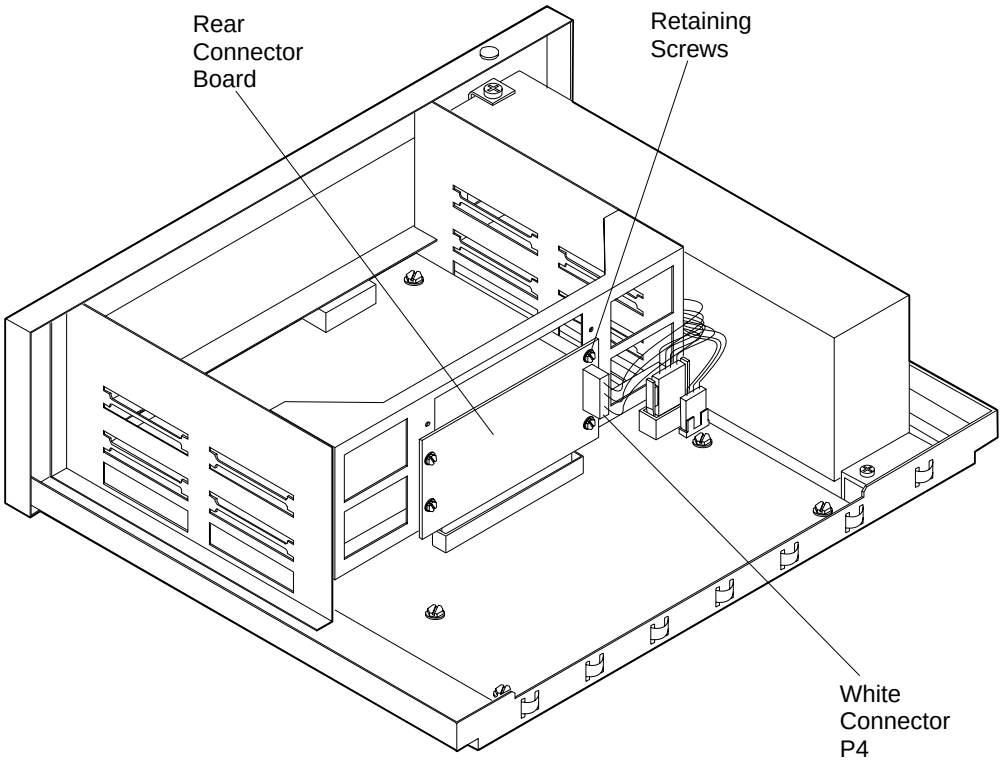


Figure 12-15. Rear Connector Board

9. Remove the four screws holding the rear connector board to the attachment module frame.
10. Remove the board by lifting it up until it disengages from the connector on the planar board.

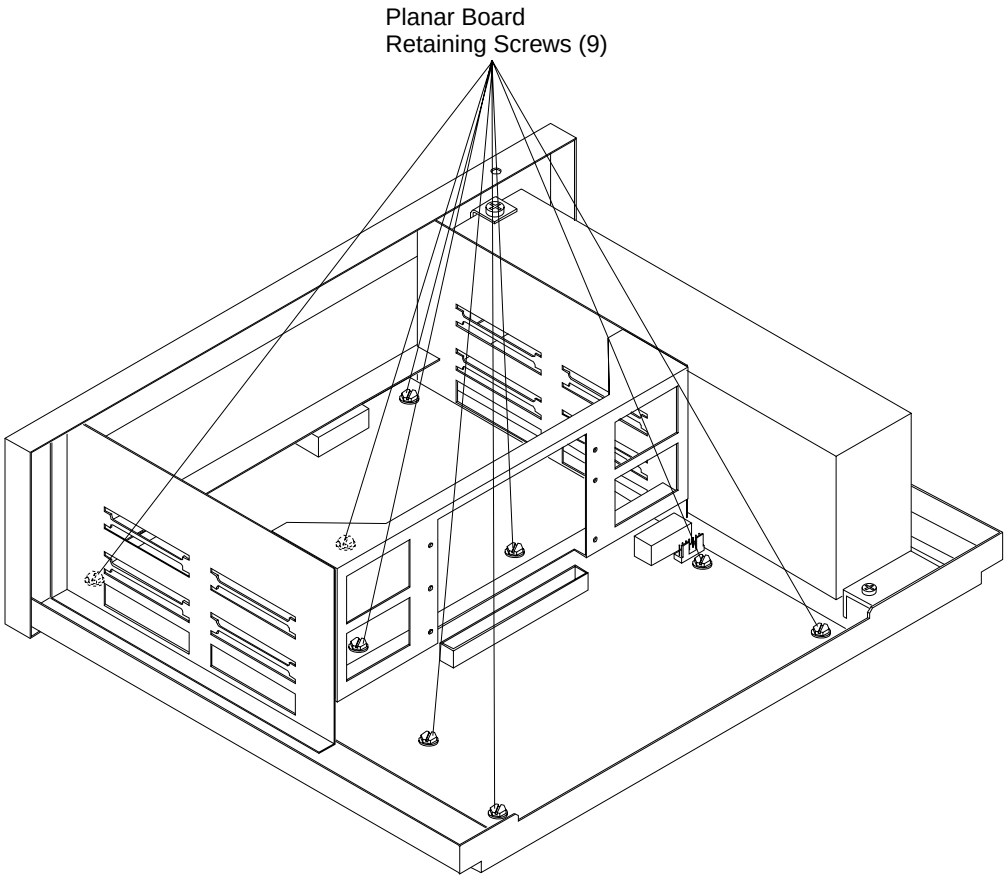


Figure 12-16. Planar Board

11. Remove the nine screws that attach the planar board to the frame.
12. Remove the two small hex-head machine screws from either side of the EIA 232 port on the front of the 8229.
13. Raise the back of the planar board and carefully guide it out from underneath the attachment module rack. Use care when removing the planar because the screw posts can cause damage to the planar's underside.

Replacing the Planar Board

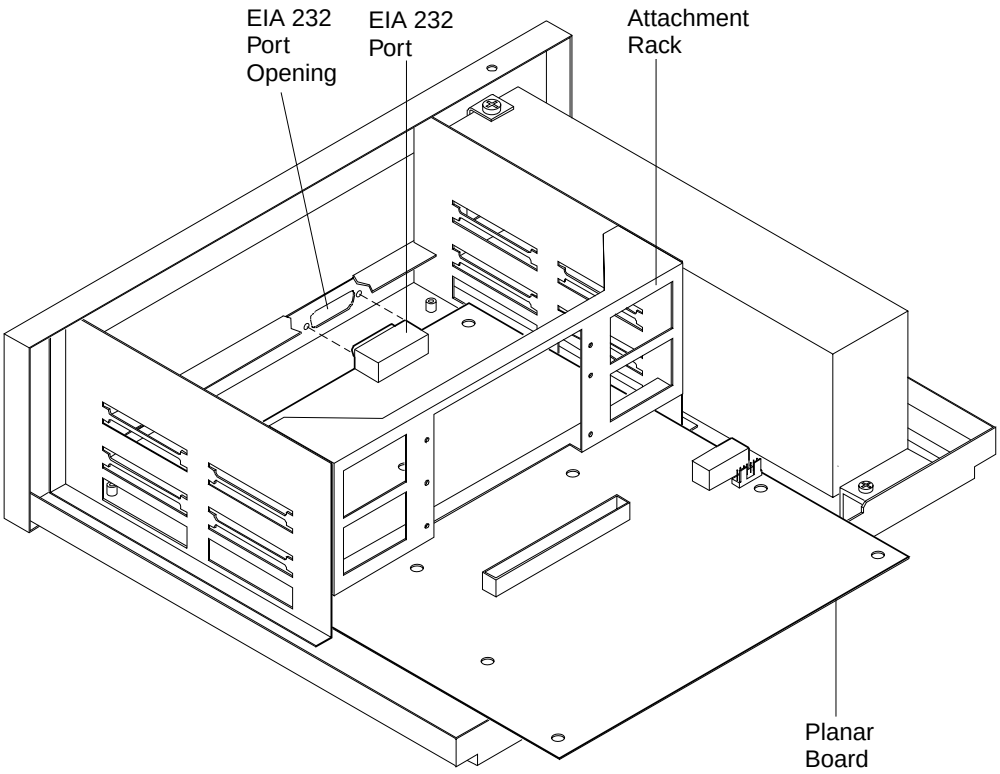


Figure 12-17. Positioning the Planar

1. Align the planar board so that the EIA 232 port will mate with the opening in the front of the 8229.
2. Carefully guide the planar board under the attachment module rack and align the holes in the board over the threaded posts on the internal frame. Use care when installing the planar because the screw posts can damage the planar's underside.
3. Replace, but do not tighten, the nine hex-head screws that attach the planar to the internal frame.
4. Replace and tighten the two hex-head machine screws on either side of the EIA 232 port on the front of the 8229.
5. Tighten the nine screws in the planar board.
6. Position the rear connector board over the connector on the planar board with its face against the rear of the attachment module rack, and press down firmly until the board is securely seated.
7. Replace the four retaining screws in the rear connector board.

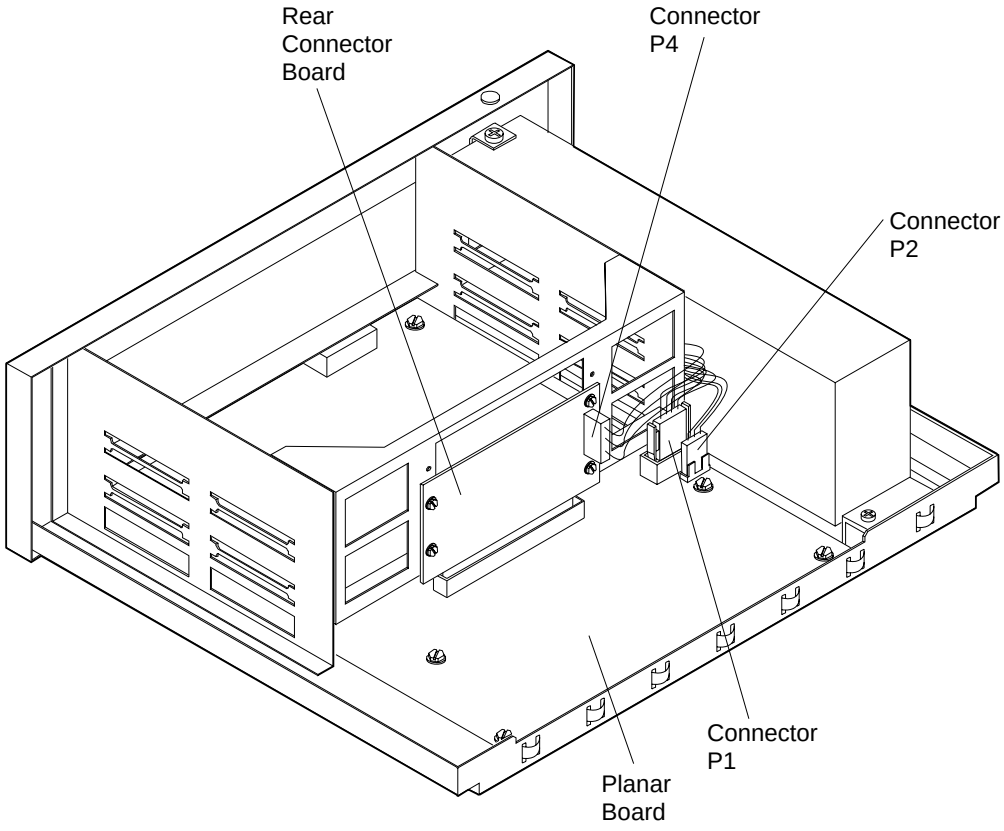


Figure 12-18. Connector and Planar Board Connectors

8. Connect the black connector (labeled P1) to the planar board as indicated in Figure 12-18.
9. Connect the small white connector (labeled P2) to the planar board as indicated in Figure 12-18.
10. Connect the larger white connector (labeled P4) to the rear connector board as indicated in Figure 12-18.

    Note: The extra white connector in the wiring harness, labeled P3, is not used and does not need to be disconnected or reconnected.
11. Install the attachment modules.
    a. Insert the module in its slot and ensure that the edges of the module are inside the guide rails.
    b. Press the face of the module with force until it snaps into place and is flush with the faceplate of the 8229.
    c. Push in and tighten the two knurled screws.
12. Slide the internal frame into the 8229 cover.
13. Install the four retaining screws in the faceplate.
14. Plug in the power cord.
15. You are now finished with this procedure. View the numeric display to verify the power-on sequence. (See the first sections of this chapter for the correct power-on sequence and error codes.)

Appendix A. Planning and Record Worksheets

Overview

The following charts and worksheets should be completed by the network planner (or network administrator). Once completed, they should be referred to when network operations are taking place, such as installing, configuring, reconfiguring, or performing problem determination.

Keep completed forms with your network records, and make sure that they are available to those who work with your network software and network hardware, including the 8229.

It is extremely important that you keep accurate, complete, and up-to-date records for your network.

You are hereby authorized to copy the charts and worksheets provided in this appendix for your use.

Rack Inventory Chart

Date	

Wiring Closet Number		Rack Number		Planner's Initials	

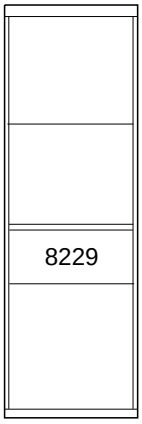
Rack Diagram

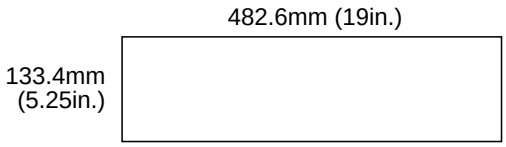
Instructions

Fill out a Rack Inventory Chart for each equipment rack.

1. Enter the wiring closet location number, the equipment rack identification number, and the planner's initials.
2. If you have the template for the Rack Inventory Chart from the *Token-Ring Network Introduction and Planning Guide*, GA27-3677, draw an outline of the IBM 8230 for each 8229. The 8229 has the same dimensions as the 8230.
3. If you do not have the template, use the dimensions below to represent the size of the 8229. The 8229 occupies 3 vertical units (1.75 inches per unit).
4. Write the unit identification number and component type on each component on the chart.

Example





8229 Dimensions Scaled to the size of the Rack Diagram

IBM 8229 Cabling Chart

8229 Unit# _____

Building _____

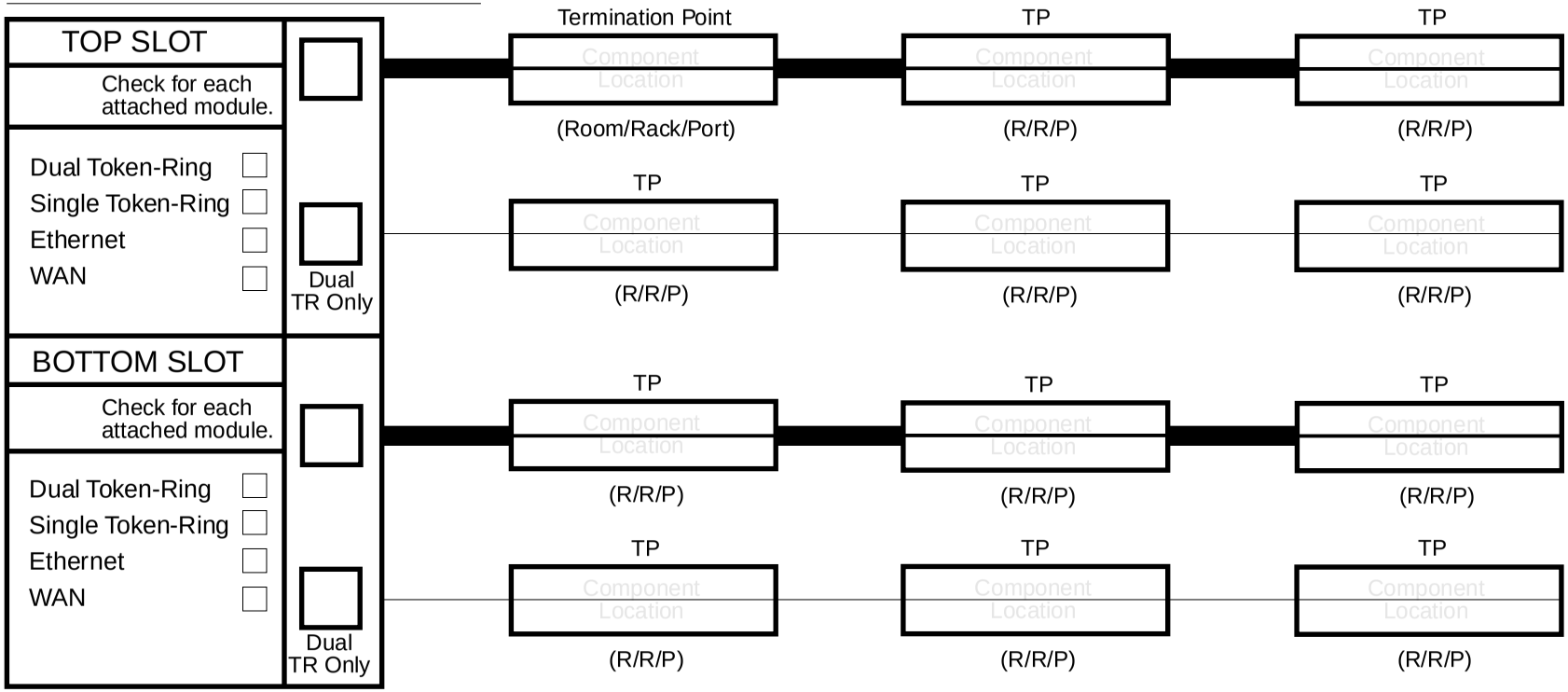
Location (Room, Rack) _____

MAC Addresses _____

_____

Mark the appropriate boxes below to represent the switch settings for the top slot.

	1	2	3	4	5	6	7	8
Up (On)								
Down (Off)								



Mark the appropriate boxes below to represent the switch settings for the bottom slot.

	1	2	3	4	5	6	7	8
Up (On)								
Down (Off)								

Token-Ring-to-Token-Ring Configuration Parameters Worksheet

Worksheet No.:_____

Bridge Information:_____

Table A-1 (Page 1 of 2). Advanced Configuration Parameter Value Ranges and Defaults

Parameter Description	Default Value	Allowed Range	Your Data
Bridge Parameters			
Bridge Name	None	1 to 8 alphanumeric	
Bridge Number	1 or switch	0–9, A–F	
Frame Forwarding Active	1	1 = Yes 0 = No	
Single-Route Broadcast Mode	1	1 = Automatic 0 = Manual	
Path Trace	1	1 = Active 0 = Inactive	
Spanning Tree			
Bridge Priority	32768	0–65535	
Port 1 and 2 Parameters			
LAN Segment Number Port 1	1	1–FFF	
LAN Segment Number Port 2	1	1–FFF	
Locally Administered Address	(none)	4000 0000 0001– 4000 7FFF FFFF	
Single-Route Broadcast	1	1 = Yes (Automatic) 0 = No (Manual)	
Hop Count Limit	7	1–7	
Early Token Release	1	1 = Yes 0 = No	
Parameter Server	1	1 = Enabled 0 = Disabled	
Error Monitor	1	1 = Enabled 0 = Disabled	
Configuration Report Server	1	1 = Enabled 0 = Disabled	
Port Path Cost	250 (4 Mbps) 63 (16 Mbps)	0–65535	
Port Priority	128	0–255	
Filter Parameters			
Filter Program Status	1	1 = Enabled 0 = Disabled	
Criteria Range Filter Port 1 and 2			
Filter Offset	000	0–100 (decimal)	
Range 1 Low	0000	0–FFFF	
Range 1 High	FFFF	0–FFFF	
Range 2 Low	0000	0–FFFF	
Range 2 High	FFFF	0–FFFF	

Table A-1 (Page 2 of 2). Advanced Configuration Parameter Value Ranges and Defaults

Parameter Description	Default Value	Allowed Range	Your Data
Address Range Filter Port 1 and 2			
Source Address Low	0000 0000 0000	12 hex digits	
Source Address High	0000 0000 0000	12 hex digits	
Destination Address Low	0000 0000 0000	12 hex digits	
Destination Address High	0000 0000 0000	12 hex digits	
Link Passwords			
Link Password 0	0000 0000	6 to 8 alphanumeric	
Link Password 1	0000 0000	6 to 8 alphanumeric	
Link Password 2	0000 0000	6 to 8 alphanumeric	
Link Password 3	0000 0000	6 to 8 alphanumeric	
System Definition			
Reporting Link Password	blank	6 to 8 alphanumeric	

Token-Ring-to-Ethernet Configuration Parameters Worksheet

Worksheet No.:_____

Bridge Information:_____

Table A-2 (Page 1 of 2). Token-Ring-to-Ethernet Advanced Configuration Parameters

Parameter Description	Default Value	Allowed Range	Your Data
Bridge Parameters			
Bridge Name	None	1 to 8 alphanumeric	
Bridge Number	1	0–9, A–F	
Automatic Mode Selection	1	1 = Enabled 0 = Disabled	
Mode Priority	1	1 = Ethernet V2 2 = 802.3	
Forward LLC traffic (mode 1)	1	1 = Yes 0 = No	
Enabled SAPs for LLC traffic	00, 04, 08, F0, F4, FC	00 to FF (additional fields avail.)	
TCP/IP address conversion	1	1 = Enabled 0 = Disabled	
Dual Mode Multicast Conversion	1	1 = Enabled 0 = Disabled	
Use General Broadcast Frames	0	1 = Enabled 0 = Disabled	
IPX Support	0	1 = Enabled 0 = Disabled	
Broadcast Address Conversion	1	1 = Enabled 0 = Disabled	
Spanning Tree Parameters			
Bridge Maximum Age	20	6–40 seconds	
Bridge Hello Time	02	1–10 seconds	
Bridge Forward Delay	15	4–30 seconds	
Bridge Priority	32768	0–65535	
Aging Time	00300	1–65535	
Maximum Transit Time	1	1–4 seconds	
Port 1 Token-Ring Parameters			
LAN Segment Number Port 1	001	1–FFF	
Locally Administered Address	(none)	4000 0000 0001– 4000 7FFF FFFF	
Early Token Release	1	1 = Enabled 0 = Disabled	
Hop Count Limit	7	1–7	
Parameter Server	1	1 = Enabled 0 = Disabled	
Error Monitor	1	1 = Enabled 0 = Disabled	

Table A-2 (Page 2 of 2). Token-Ring-to-Ethernet Advanced Configuration Parameters

Parameter Description	Default Value	Allowed Range	Your Data
Configuration Report Server	1	1 = Enabled 0 = Disabled	
Port Path Cost	250 (4 Mbps) 63 (16 Mbps)	0–65535	
Port Priority	128	0–255	
Port 2 Ethernet Parameters			
LAN Segment Number Port 2	FF0	1–FFF	
Locally Administered Address	(none)	4000 0000 0001– 4000 7FFF FFFF	
Port Path Cost	100	0–65535	
Port Priority	128	0–255	
Filter Parameters			
Filter Program Status	1	1 = Enabled 0 = Disabled	
Criteria Range Filter Port 1 and 2			
Filter Offset	000	0–100 (decimal)	
Range 1 Low	0000	0–FFFF	
Range 1 High	FFFF	0–FFFF	
Range 2 Low	0000	0–FFFF	
Range 2 High	FFFF	0–FFFF	
Address Range Filter Port 1 and 2			
Source Address Low	0000 0000 0000	12 hex digits	
Source Address High	0000 0000 0000	12 hex digits	
Destination Address Low	0000 0000 0000	12 hex digits	
Destination Address High	0000 0000 0000	12 hex digits	
Link Passwords			
Link Password 0	0000 0000	6 to 8 alphanumeric	
Link Password 1	0000 0000	6 to 8 alphanumeric	
Link Password 2	0000 0000	6 to 8 alphanumeric	
Link Password 3	0000 0000	6 to 8 alphanumeric	
System Definition			
Reporting Link Password	blank	6 to 8 alphanumeric	

8229 SNMP Agent Configuration Parameters Worksheet

Worksheet No.:_____

Bridge Information:_____

Table A-3. 8229 SNMP Agent Configuration Parameters

Parameter Name	Description	Your Data
System Group Values		
sysName	Specifies the name of the bridge	
sysDescr	Describes the bridge	
sysLocation	Defines the location of the bridge	
sysContact	Defines a contact name and telephone number	
Enable/Disable Authentication Failure Traps		
snmpEnableAuthenTraps	Enable, Disable	
Community Specifications (Up to 6)		
Community Name	Community name up to 40 characters	
IP address	IP address of the owner of the community name	
Read or Write	Use read to allow privileges for a community. Use Write to allow read/write privileges.	
Trap Community Specification (Up to 6)		
Trap community name	Trap community name up to 40 characters	
IP address	IP address of SNMP manager to receive alerts	
IP Group Values		
IP address	Address of 8229 SNMP agent	
Subnetmask	8229 assigned subnet mask	
defroute	8229 default gateway IP address	

Appendix B. Overview of the 8229 Function

This appendix is provided to assist you with network planning and use. It describes the functioning of the 8229. The information in this appendix applies to connection to the token-ring network. Connection to Ethernet is described when understanding the Ethernet connection increases the understanding of the token-ring connection. Keep in mind that in all configurations, one side of the 8229 is attached to a token-ring network.

Before reading this appendix, read Chapter 1, “Introduction.” It may also be helpful to first be familiar with the contents of Chapter 5, “8229 Advanced Configuration Parameters.”

This appendix contains the following sections:

How the Bridge Functions

The 8229 is a two-port MAC bridge. With the Ethernet attachment module, it connects either an Ethernet Version 2 or IEEE 802.3 Carrier Sense Multiple Access with Collision Detection (CSMA/CD) Ethernet LAN to an IEEE 802.5 token-ring LAN. The 8229 provides the necessary conversion of information frames (groups of data blocks) exchanged between two dissimilar LANs.

The 8229 can also be used to connect a token ring to a WAN. Appendix D, “IBM 8229 Token-Ring-to-WAN Connectivity” on page D-1 describes this configuration.

The 8229 (with Novell IPX support enabled or disabled) appears to stations on the token-ring LAN as a source-routing bridge to another token-ring LAN. The 8229 is functionally transparent to stations on the Ethernet LAN, appearing as a single native device on the Ethernet LAN. Supported functions are:

- Routing through bridges
- Maintaining databases
- Changing information field length
- Finding and maintaining network addresses
- Filtering
- Support of the spanning tree protocol
- Support of access protocols such as logical link control (LLC)
- Novell IPX protocol support
- Frame format conversion.

These functions can be enabled, disabled, or assigned values by using the 8229 Utility Program or the IBM LAN Network Manager if your network is running under LLC Type 2 management protocol. An SNMP management application that has compiled the appropriate MIBs can also perform these functions when your network is running under SNMP. (Only the IBM LAN Network Manager Version 1.1 or later can display and change the Novell IPX support parameter value; other LAN network manager programs cannot.)

Routing Frames through Bridges

Bridges must have access to routing information in order to determine whether to forward a frame to the next LAN segment.

Source Routing

The 8229 supports the IBM Token-Ring Network implementation of source routing for bridging multi-ring networks.

Source routing requires that the source station on a multi-ring network specify in each frame the rings and bridges that must be traversed in the route to reach the destination station. Source routing specifies an algorithm that can be used by a station to obtain dynamically the necessary routing information to reach any other station on a multi-ring network.

To determine the routing information, the source station issues a discovery frame on its ring. If a response is received from the desired destination station, it shows that both the source and destination stations are on the same ring and that no routing information is needed.

If no response is received, the source station issues a multi-ring search frame that fans out to every ring in the network. As the frame is copied from one ring to another, each associated bridge updates the routing information in the search frame. When the search frame finally reaches the destination, it contains the routing between the source and destination stations. The destination station then sends a response frame back to the source station with the routing information. Both stations then use the routing information in each subsequent information frame sent between them.

Two options are available for sending a multi-ring search frame:

- The search frame can be sent so that only one copy of the frame is received by the destination station even if multiple paths exist between the source and destination stations. Bridge configuration parameters can be set to ensure that only one bridge between any two rings is authorized to copy and forward the search frame. This option is called *single-route broadcast* by IBM, and *spanning tree explorer* by IEEE.
- The search frame can be sent so that multiple copies of the frame are received by the destination station if multiple paths exist between the source and destination stations. The destination station receives one copy of the frame for each unique path. This option is called *all-routes broadcast* by IBM, and *all-routes explorer* by IEEE.

The destination station may:

- Send one response frame for each of multiple search frames it received.
- Send, for a single search frame received, an all-routes broadcast response frame. Either response allows the source station the option to choose the most direct route to the destination station.

The 8229 in an Ethernet environment always acts as a single-route broadcast bridge in the token-ring domain. It must do so because the transparent bridging used with Ethernet requires that only one path is enabled between the source and the destination stations.

Transparent Bridging

Transparent bridging is used on most MAC bridges for interconnecting IEEE 802.3 or Ethernet Version 2 LANs. The 8229 incorporates transparent bridging for use with the attachment module that supports Ethernet LANs.

Transparent bridging provides a transparent interconnection of LANs so that any station can communicate with any other station in the network as if both stations were on the same LAN. All routing functions are handled entirely within the transparent bridges.

Transparent bridging requires that the bridges dynamically maintain a source address database for each of their LAN connections. Each bridge connection operates in a *promiscuous* mode so that every frame on

the LAN is received. The source address from each frame is saved in the database. The database is then searched to determine whether the destination address of the frame is in the database. If so, the frame is discarded since both the source and the destination stations are on the same LAN. If, however, the frame destination address is not found in the database, the bridge forwards the frame on its other port. This decision process is a type of *filtering*.

Transparent bridging requires that there be only one path between any two stations in the network configuration. Otherwise, the frames can loop and stay in the network permanently, causing network bandwidth to be wasted and often causing the network to fail.

A spanning tree protocol for transparent bridging results in a loop-free network configuration. By enabling and disabling the ability of a bridge to forward frames to the other network, this protocol ensures dynamically that there is only one active bridge between any two LANs in the entire transparent bridging network.

Token-Ring-to-Ethernet Bridging

For the 8229, the source-routing network and transparent bridging network are considered as two separate domains. Each domain consists of one or more LAN segments connected by bridges using a common bridging method. Each domain uses its specific spanning tree protocol independent of any other domain.

The 8229 between the source-routing Token-Ring domain and the transparent bridging Ethernet domain functions like a source-routing bridge at the Token-Ring side and a transparent routing bridge at the Ethernet side. If the frame comes to the bridge using source routing, but must enter Ethernet, the 8229 uses data bases to find the required Ethernet MAC address, changes the frame format, and forwards the frame using transparent routing. If the frame comes to the bridge using transparent routing and must enter the token ring, the bridge either finds the route in the token-ring data base or sends a single-route broadcast to find the route. As soon as the bridge knows the route, it modifies the frame for source routing and sends it out as a source-routed frame.

Although a transparent bridging domain allows only one active bridge between any two LAN segments in the domain or between domains, parallel 8229s can be installed between the Ethernet and token-ring domains for backup purposes.

Note: Higher level protocols (for example, TCP/IP and SNA) must be compatible for two stations to communicate successfully across a bridge.

Address Databases

The 8229 maintains a block of memory storage that acts as two address databases:

- The Ethernet database contains the source addresses detected on the Ethernet Version 2 or IEEE 802.3 Ethernet LAN and the frame format each station uses for data transmission.
- The token-ring database contains the source addresses and routing information for stations on the IBM Token-Ring Network.

The token-ring database contains dynamic entries only. The Ethernet database may contain either static or dynamic entries. Static entries are specified during advanced configuration and are loaded by the 8229 during Utility Program initialization. Static entries are kept in the permanent storage on the 8229. Dynamic entries are created as part of the learning process of the 8229.

In the 8229 learning process, the Ethernet database is loaded with dynamic entries. The 8229 enters the learning state in which it observes all frames on the Ethernet port and saves each unique source address in its database. While in this state, the 8229 does not send any frames. It leaves the learning state after about 30 seconds to begin normal operation. (This time spent in the learning state can be varied by

changing the Bridge Forward Delay configuration parameter value.) During normal operation, the 8229 updates dynamic entries in the database whenever a new source address is detected in an Ethernet frame.

The token-ring database does not have any entries until the 8229 begins normal operation. The 8229 adds entries to the token-ring database only for those destination stations specified in frames that originate on the Ethernet LAN.

The Ethernet database represents known stations on the Ethernet LAN, whereas the token-ring database represents only those token-ring stations for which the 8229 has forwarded a frame from the Ethernet LAN. Associated source routing information is also kept for each token-ring source address.

Aging Time

Dynamic entries have an aging time attribute, which determines how long an inactive entry stays in the database. The default value of 300 seconds can be changed by the Utility Program. The aging time permits the 8229 to dynamically adapt the database to changes in the network configuration.

The aging time of the entries in the Ethernet database is updated whenever messages from the Ethernet stations are received. The aging time of the entries in the token-ring database is updated whenever messages received from the Ethernet port are sent to the token-ring stations.

The 8229 supports up to a combined total of 2048 entries in the Ethernet and token-ring address databases. The maximum number of entries in the token-ring database is limited to 1024. After the address database is full, the 8229 does not forward traffic from any station that does not have a database entry. The 8229 begins to add entries to a database and forward traffic for those new stations after the aging time expires for some dynamic entries, and they are removed from the database.

Information Field Length

The 8229 with an Ethernet attachment module supports frames with a maximum information field of 1500 bytes, which is the maximum supported by Ethernet. For the token-ring network, the 8229 sets the largest frame (LF) field of the routing field to binary 001, indicating a maximum information field of 1470 bytes. However, the 8229 accepts and sends token-ring frames of slightly varying maximum information field lengths in the two different modes. The accepted lengths are:

- Up to 1508 bytes for mode 1 TCP/IP traffic
- Up to 1457 bytes for RT PC* LLC traffic
- Up to 1500 bytes for all other mode 2 traffic.

These variations exist because the 8229 adds and deletes different fields when using different frame conversion modes. For more information about the frame conversion modes, see “Modes of Data and Frame Format Conversion” on page B-9.

The minimum information field lengths are:

- 3 bytes in mode 2 for frames originating on the IBM Token-Ring Network
- 48 bytes in mode 1

Network Address

The network address (also called the *adapter address* or the *station address*) identifies a station or adapter in a station to others on the network.

The 8229 supports the IEEE 48-bit (12 hexadecimal digits) address format only. Each network address must be unique in the network. If the 8229 detects a duplicate address on either LAN connected to it, the 8229 does not send any frames to that address.

Each 8229 connection to a LAN has a network or adapter address. From the point of view of each LAN, the *bridge address* is the adapter address assigned to that LAN connection.

IPX Support

Because the Novell IPX support does not byte-invert source and destination MAC addresses, a small potential arises for duplicate MAC addresses to exist on the network.

Individual MAC addresses must not be used on the source LAN segment that translate to a group address indication on the destination LAN segment. Use locally administered addresses to avoid the problem of translation to a destination group address. The locally administered addresses must not have a “1” in:

- The rightmost bit of the first (leftmost) byte of an IBM Token-Ring Network individual destination MAC address (a 6-byte, 12-digit hexadecimal address).
- The leftmost bit of the first (leftmost) byte of an Ethernet individual destination MAC address (a 6-byte, 12-digit hexadecimal address).

If a NetWare** workstation or server is also sending non-IPX frames (such as NetBIOS or SNA frames) and Novell IPX support is enabled, this station may appear to network management programs or other stations on the other side of the 8229 as if it were two different stations with different network addresses.

Filtering

The 8229 supports filters to reduce any unnecessary traffic between LANs.

Filters may be set up so that the only frames forwarded across a bridge are those that meet the filtering criteria. Information within each frame is compared to the specified filtering criteria values. If the information meets the compare criteria (is either within the range or outside the range, depending on the filter), the frame is forwarded across the bridge. Otherwise, the frame is discarded.

Such filtering results in improved performance of the connected LAN by ensuring that unnecessary traffic does not cross the bridge.

The 8229 supports two types of built-in filters to reduce unnecessary traffic between LANs:

- A criteria range filter
- An address range filter

Criteria Range Filter

The 8229 supports a filter with two criteria ranges for traffic flowing from each connected LAN to the other connected LAN. Frames for which the value of the filtering information bytes falls within *either* of the two criteria ranges are allowed to pass. For example, if the criteria ranges are 0800–0806 and 8035, only frames with filtering information field values in the range of 0800–0806 or frames with the information field value of 8035 are allowed to pass over the bridge.

The criteria ranges of each filter are specified in configuration parameters consisting of an offset and two ranges of allowed values:

1. An offset into the field in the frame that contains the 2 bytes of filtering comparison information

   The field containing the 2 bytes to be compared varies depending on the frame type.

   - The Ethernet Version 2 frame offset of 0 is located at the beginning of the TYPE field.
   - The IEEE 802.3 frame offset of 2 is located at the beginning of the DSAP, skipping over the LENGTH field before the DSAP in this frame header field.
   - The token-ring frame offset of 0 is located at the beginning of the DSAP field.
   - Table B-2 shows the beginning of the field containing the compare information in Novell IPX protocol frame types.
2. Range 1 low and range 1 high
3. Range 2 low and range 2 high

A received frame is filtered (discarded) if the filtering information (2 bytes) is greater than the high value of the range and less than the low value of the range. If the value of the compare bytes does not fall within either of the two criteria ranges, the frame is discarded. For example, a frame with filtering information of X'0807' is discarded when the bridge filter is set to accept only TCP/IP traffic. On the other hand, a frame with filtering information of X'8035' is accepted.

A value of FFFF for each high range and a value of all 0's for each low range disables the filter.

TCP/IP Filter Example: If you need to forward only TCP/IP traffic between token-ring and IEEE 802.3 Ethernet LANs, the filter offset and filter ranges should be set as follows:

	Token-Ring	**IEEE 802.3 Ethernet**
Filter offset	6	8
Range 1 low	0800	0800
Range 1 high	0806	0806
Range 2 low	8035	8035
Range 2 high	8035	8035

Note: The offsets 6 and 8 are used to reach the TYPE field within SNAP headers. The filter allows forwarding of frames with type values of 0800 through 0806 or 8035. Frames with any other value in the TYPE field are discarded by the 8229.

If you need to forward only TCP/IP traffic between token-ring and Ethernet Version 2 LANs, the filter offset and filter ranges should be set as follows:

	Token-Ring	Ethernet V2
Filter offset	6	0
Range 1 low	0800	0800
Range 1 high	0806	0806
Range 2 low	8035	8035
Range 2 high	8035	8035

NETBIOS Filter Example: If you need to forward only NETBIOS traffic between two token-ring segments, the filter offset and filter ranges should be set as follows:

	Base Token-Ring	Module Token-Ring
Filter offset	0	0
Range 1 low	F0F0	F0F0
Range 1 high	F0F1	F0F1
Range 2 low	F0F0	F0F0
Range 2 high	F0F1	F0F1

Note: An offset of 0 allows comparison for NETBIOS SAP values in the DSAP and SSAP fields. The SAP value used by NETBIOS is `X'F0'`. However, because the SSAP's least significant bit may be used to indicate command response, `X'F1'` must also be checked.

Address Range Filter

The 8229 supports a filter with configuration parameters for a high and low source address range and a high and low destination address range for traffic flowing from each connected LAN to the other connected LAN.

A received frame containing a source or destination address *within* the specified range is filtered (discarded).

An 8229 filter can be disabled by specifying a value of all 0's for the high and the low range for a filter.

Maximum Transit Time

Transit time is the time that a frame, waiting to be sent, is held within the 8229.

The 8229 ensures that no traffic is held in the bridge for longer than the maximum transit time. If there is network congestion, the 8229 is not able to send traffic. Traffic that is held for the maximum transit time and that has not been queued for transmission is discarded. The default value for this parameter is 1 second. This value can be altered using the Utility Program.

Spanning Tree Protocol

Spanning tree protocol is used between bridges in a LAN to ensure that a single path exists between any two stations in the network.

The IBM Token-Ring Network uses the spanning tree protocol called *single-route broadcast* to maintain a single path between any two LAN segments in the network for single-route broadcast messages used in route discovery.

Ethernet LANs use the spanning tree protocol to allow only one of two (or more) parallel bridges to forward frames. If more than one parallel bridge in an Ethernet domain is allowed to forward frames, the frames can loop endlessly in the network. The spanning tree protocol is used if there are parallel bridges between a token-ring and an Ethernet network, to allow only one bridge to forward frames at any one time.

If there are parallel bridges between a token-ring segment and an Ethernet domain, the spanning tree protocol ensures that only one of the bridges, called the *designated bridge*, enters the data forwarding state, whereas other parallel bridges remain in the blocking state. An 8229 in the blocking state, although not forwarding any frames, continues to participate in the spanning tree protocol. If the designated bridge fails for any reason, the spanning tree protocol causes a blocked parallel bridge to enter the forwarding state.

Bridges use messages, timers, and configuration parameter values to provide the spanning tree protocol support required for the LANs connected to each bridge. The bridges maintain several parameters and timers independently of the individual ports and several parameters and timers for each port. One bridge in the network (the root bridge) sends a message at a specified interval (the Hello time) to help maintain the domain awareness of designated and blocked bridges. The timers and messages allow the network to *elect* a new root or designated bridge as needed when bridges become active or inactive on the network.

Spanning Tree Bridge Parameters

The 8229 maintains the following spanning tree bridge parameters and uses IEEE assigned default values for all parameters and timers. These values can be altered using the Utility Program.

- Bridge maximum age
- Bridge hello time
- Bridge forward delay
- Bridge priority
- Port priority
- Path cost

Protocols and Interfaces

The 8229 supports the use of SNA, NetBIOS, and TCP/IP on both the Ethernet Version 2 and IEEE 802.3 Ethernet.

The 8229 with the Ethernet attachment module supports the Novell IPX protocol used by:

- Novell NetWare 286 v2.15 Revision C (AppleTalk value-added processes [VAPs], are needed for AppleTalk support)
- Novell NetWare v2.2 Revision A
- Novell NetWare v3.11, which supports AppleTalk

Note: Stations functioning as Novell NetWare servers and requestors on the token-ring must use source-routing device drivers to be able to send and receive frames across an 8229.

The 8229 does not limit the use of any protocols that are compatible for communication and that adhere to the industrial protocol standards for token-ring and Ethernet LANs.

Modes of Data and Frame Format Conversion

Communication between the token-ring and Ethernet LANs requires frame format conversion because frame format is different between these two protocols. Two of the switches on the attachment module allow you to select one of the following modes of frame conversion:

- Mode 1 or mode 2
- Automatic mode enabled or disabled

Mode 1 performs frame format conversion between Ethernet Version 2 and IBM Token-Ring Network frame formats; mode 2 performs frame format conversion between IEEE 802.3 Ethernet and IBM Token-Ring Network frame formats; and automatic mode enables the 8229 dynamically to determine from frame format and database contents which of the two modes of conversion is needed for a frame. If automatic mode is not selected, the bridge operates exclusively in mode 1 or mode 2.

When mode 1, mode 2, and automatic mode selection are correctly used with LAN protocols (with and without Novell IPX support enabled), the 8229 is functionally transparent to application programs running in stations on either side of the bridge.

Using Bridge Databases for Automatic Mode

The 8229 maintains a block of memory storage that acts as two separate databases:

- A token-ring database
- An Ethernet database.

The Ethernet database is further broken down into a static database and a dynamic database.

In the Ethernet dynamic database, the 8229 records the adapter address of each station and the formats (either Ethernet Version 2 or IEEE 802.3) in which frames are originated from each station on the Ethernet LAN.

When 8229 automatic mode selection is enabled, the 8229 can check the Ethernet database for the frame format of the Ethernet station to which a token-ring originated frame is sent. The 8229 can then convert the token-ring frame format to the correct Ethernet format (Ethernet Version 2 or IEEE 802.3).

The 8229 determines the mode of frame format conversion for the token-ring frames by checking the database for the frame format of the Ethernet station. If there is no entry in the dynamic database for an Ethernet station, the 8229 must obtain the Ethernet information from the Ethernet static database. In this case, the 8229 uses the frame format conversion mode selected by the Ethernet Attachment Module mode selection switch (either mode 1 or mode 2).

For more information about the 8229 database, see “Address Databases” on page B-3.

Mode 1

In mode 1, the 8229 performs frame format conversion between Ethernet Version 2 and IBM Token-Ring Network frame formats.

In this mode, the 8229 provides:

- SNAP header processing to support the TCP/IP protocol.

  For more information about SNAP support, see “Token-Ring to Ethernet Version 2.0 Conversion” on page E-4.

- RT* (reduced instruction-set computer [RISC] technology protocol) header processing for SNA, NetBIOS, and other LLC-based protocols.

  For more information about LLC support, see “Token-Ring to Ethernet Version 2.0 Conversion” on page E-4 and “Token-Ring-to-Ethernet Version 2 Conversion for LLC-Based Protocols” on page E-6.

- Frame format conversion between Novell IPX protocol ETHERNET_II and TOKEN_RING frame types.

Applications in Mode 1

The following section shows some applications that can be used in mode 1. This example is a sample of the applications; it is not meant to represent all the applications the bridge can support in mode 1.

When the 8229 is configured to operate in mode 1, performing SNAP header processing, TCP/IP will be supported as illustrated in Figure B-1. LLC-based protocols such as SNA and NetBIOS can also be supported in this mode through the use of the RT header.

Figure B-1. TCP/IP Application Using A Bridge.

SMTP *Simple Mail Transfer Protocol*
NSP *Name Service Protocol*
TELNET *Telecommunications Network*
UDP *User Datagram Protocol*
ARP *Address Resolution Protocol*
MAC *Media Access Control*
DNS *Domain Name Service*
FTP *File Transfer Protocol*
TCP *Transmission Control Protocol*
IP *Internet Protocol*
LLC *Logical Link Control*

Mode 2

In mode 2, the 8229 performs frame format conversion between IEEE 802.3 Ethernet and IBM Token-Ring Network frame formats, including these Novell IPX protocol frame types:

- ETHERNET_802.3 and TOKEN_RING
- ETHERNET_802.2 and TOKEN_RING
- ETHERNET_SNAP and TOKEN_RING_SNAP

In mode 2, the 8229 transparently supports the transfer of LLC data for LLC-based protocols such as SNA and NetBIOS.

Applications in Mode 2

The examples mentioned are intended only as samples of the applications the 8229 can support in mode 2.

When the 8229 is configured to operate in mode 2, a transparent MAC level bridge, it will transparently support the transfer of the LLC layer. Higher level protocols that are LLC based, such as SNA, may use the 8229 in this mode. Examples of the higher level protocols using the LLC layer that may use the 8229 in this mode include SNA, NetBIOS, and OSI protocol stacks such as Technical and Office Protocol (TOP).

When either mode 1 or mode 2 is correctly selected as a configuration option for the LAN protocols, the 8229 is functionally transparent to applications running in stations on either side of the bridge.

Mode Priority

The value of the mode priority parameter in the Utility Program determines whether the 8229 expects frames on the Ethernet LAN to be in Ethernet Version 2 format or IEEE 802.3 format.

This parameter value overrides the setting of the attachment module mode selection switch.

Note: The recommended mode priority for all 8229s connected to a token-ring segment used as a backbone ring is mode 1 with automatic mode selection disabled.

A backbone LAN segment can be used to carry traffic from one LAN segment to another, and in such a case would have few or no other stations connected to it except bridges.

Mode 1: When mode 1 is specified, the 8229 expects all frames transmitted over the Ethernet LAN to be in Ethernet Version 2 format.

In mode 1, the 8229 provides frame format conversion between Ethernet Version 2 and token-ring frame formats.

Mode 1 provides SNAP and RT header processing for higher level protocols such as SNA and NetBIOS and allows enabling of support for forwarding and converting of LLC-based protocol frames.

Mode 2: When mode 2 is specified, the 8229 expects all frames transmitted over the Ethernet LAN to be in IEEE 802.3 format.

In mode 2, the 8229 provides frame format conversion between IEEE 802.3 and token-ring frame formats.

Selecting 8229 Modes: When automatic mode selection is disabled, the 8229 provides processing and conversion only for Ethernet frames in the format indicated by the mode priority configuration parameter (or the attachment module mode selection switch).

Table B-1 on page B-12 shows the 8229 mode to select for correct conversion of the various frame types used by Novell NetWare stations, when 8229 Novell IPX protocol support is enabled (IPX support is an advanced configuration parameter). The frame type used by each NetWare station must be indicated to NetWare during installation. The network administrator must match the frame type used by communicating NetWare stations with the 8229 mode selection.

Table B-1. Novell IPX Protocol Frame Formats

To Convert from: Ethernet Frame Type to	Token-Ring Frame Type;	Select 8229 Mode
ETHERNET_802.3†	TOKEN_RING	2
ETHERNET_802.2†	TOKEN_RING	2
ETHERNET_II	TOKEN_RING	1
ETHERNET_SNAP	TOKEN_RING_SNAP	2

† Only one of these frame types can be used on the IEEE 802.3 Ethernet segment at one time. The first frame type detected by the 8229 after the bridge power is turned on is the type supported.

Each Novell IPX frame type contains a value that can be used to identify the frame as an Novell IPX protocol frame. The beginning location and the contents of the field containing that value in Novell IPX frames vary with the frame type.

Table 9-2 on page 9-8 shows the frame type that is specified to NetWare, the location of the beginning of the field, and the values of the bytes in that field that identify the Novell IPX frame type.

Table B-2. Novell IPX Protocol Frame Information

Frame Type	Beginning (Offset 0) of the Field
ETHERNET_802.3	At the LENGTH field. At offset 2 is a checksum of X'FFFF' in the Novell IPX header.
ETHERNET_802.2	At the LENGTH field. The LLC header at offset 2 can contain an SSAP and DSAP value of X'E0 E0' or X' E0 E1'.
ETHERNET_II	At the TYPE field.†
ETHERNET_SNAP	At the LENGTH field. The LLC header, containing X'AA AA 03', follows the LENGTH field. The Protocol ID (X'00 00 00') follows the LLC header. The TYPE field† follows the Protocol ID, at an offset of 8.
TOKEN_RING	At the LLC header. The LLC header begins with an SSAP and DSAP value of either X'E0 E0' or X'E0 E1'.
TOKEN_RING_SNAP	At the LLC header, X'AA AA 03'. The Protocol ID (X'00 00 00') follows the LLC header. The TYPE field† follows the Protocol ID, at an offset of 6.

†The types that can appear in the TYPE field are:

X'8137' – Novell IPX
X'7809' – NetWare/AppleTalk
X'80F3' – NetWare/AppleTalk
X'809B' – NetWare/AppleTalk.

Other 8229 Parameters

Descriptions of some of the other Utility Program parameters follows.

Forward LLC Traffic (Mode 1)

This parameter determines whether the 8229 is to enable or disable the forwarding of frames for IEEE 802.2 LLC-based protocols from the IBM Token-Ring Network segment to the Ethernet LAN when the 8229 is forwarding mode 1 traffic.

When this function is enabled, the LLC-based protocol frames that are forwarded must have a DSAP that is included in the list specified in the enabled SAPs parameter.

If you choose to enable this parameter, you can make any required changes in the Enabled SAPs for LLC Traffic parameters to support protocols other than SNA and NetBIOS. However, do not change the predefined values (hex 00, 04, 08, F0, and F4) if you need SNA network management or NetBIOS support.

See “Token-Ring-to-Ethernet Version 2 Conversion for LLC-Based Protocols” on page E-6 for details of the frame format conversion for LLC-based protocol frames.

Enabled SAPs for LLC Traffic

This parameter allows you to specify up to 10 DSAPs for LLC-based protocol frames that will be forwarded when forwarding of LLC traffic is enabled in mode 1.

If you do not specify values for this parameter, the default enabled SAPs are hex 00, 04, 08, F0, and F4.

TCP/IP Address Conversion

This parameter indicates whether the 8229 is to perform bit-order address inversion on the addresses within the I-Field of TCP/IP address resolution protocol/reverse address resolution protocol (ARP/RARP) and ARP/RARP response frames.

This conversion allows communication between versions of these protocols that are not otherwise compatible.

For more information about TCP/IP ARP/RARP frame conversion, see “ARP Conversion” on page E-6.

Dual-Mode Multicast Conversion

This parameter indicates whether the 8229 is to transmit two multicast frames (one in Ethernet Version 2 format and one in IEEE 802.3 Ethernet format) for each frame with a group or broadcast address that is forwarded from the IBM Token-Ring Network when automatic mode is enabled.

When dual-mode multicast conversion is disabled and automatic mode selection is enabled, frames with group and broadcast addresses are forwarded in the format determined by the mode priority parameter or the attachment module mode selection switch.

Use General Broadcast Frames

This parameter indicates whether the 8229 is to forward a frame to the IBM Token-Ring Network segment as an all-routes broadcast frame or a single-route broadcast frame when the destination address is not found in the token-ring database.

When this function is enabled, the frames are forwarded as all-routes broadcast. Enable this function when rings are connected by multiple bridges between active 8229s, to allow the most efficient path to be discovered and used between two stations in the network.

Note: Enabling this function may result in unwanted broadcast frames being copied to all token-ring segments.

When this function is disabled, the frames are forwarded as single-route broadcast.

Broadcast Address Conversion

When this function is enabled, the 8229 converts the IBM Token-Ring Network all-stations broadcast address of X'C000 FFFF FFFF' in a frame to the Ethernet all-stations broadcast address of X'FFFF FFFF FFFF'.

When this function is disabled, the 8229 in its normal address conversion converts the IBM Token-Ring Network all-stations broadcast address of X'C000 FFFF FFFF' in a frame to the Ethernet address of X'0300 FFFF FFFF' (which is not known as an all-stations broadcast address).

Disable this function when multiple 8229s are connected to the same Ethernet LAN segment in a backbone configuration so that the Ethernet networks will not become congested. When this parameter is enabled, the broadcast message is sent to each attached Ethernet workstation on each attached Ethernet LAN.

The conversion is from token-ring to Ethernet only. If you want the 8229 to convert the Ethernet addresses X'FFFF FFFF FFFF' or X'0300 FFFF FFFF' to the token-ring all-stations address, you must specify the Ethernet address and the token-ring address as a mapped address pair in the 8229 configuration.

IPX Support

This parameter indicates whether the 8229 is to enable or disable support for Novell IPX protocols, so that Novell NetWare stations on the connected LAN segments can communicate with each other across the bridge.

The default is 0 (disabled). You must do advanced configuration to enable Novell IPX support.

Enable Novell IPX support when:

- The NetWare workstations are using Novell device drivers

  OR

- The NetWare workstations on the Ethernet segment are using PC DOS and IBM LAN Support Program device drivers that transmit and receive the MAC addresses from NetWare in IEEE 802.3 Ethernet (CSMA/CD) format. (See the *Local Area Network Support Program Version 1.2 [or higher] User's Guide*.)

Disable Novell IPX support when the NetWare workstations on the Ethernet segment are using PC DOS and IBM LAN Support Program device drivers that transmit and receive the MAC addresses from NetWare in IEEE 802.5 (token-passing ring) format.

Notes:

1. The NetWare workstations on the Ethernet segment that use DOS and IBM LAN Support Program device drivers configured for IEEE 802.5 MAC addresses can communicate only with:

   - Other NetWare workstations on the Ethernet segment that also use PC DOS and IBM LAN Support Program device drivers configured for IEEE 802.5 MAC addresses

     NetWare workstations on an Ethernet segment that use IBM LAN Support Program device drivers configured for IEEE 802.5 MAC addresses cannot communicate with NetWare workstations on the LAN segment that use IBM LAN Support Program device drivers configured for IEEE 802.3 MAC addresses.

   - Any NetWare server or workstation on the IBM Token-Ring Network segment, through the 8229

     NetWare servers on an Ethernet segment cannot use IBM LAN Support Program device drivers.

2. The following Novell device drivers must be used by Novell server/requestor stations connected to the token-ring LAN segment to provide source-routing bridge support:

   - ROUTE.com
   - ROUTE.nlm

Token-Ring Use

This section defines the characteristics of the source routing bridge function between two Token-Ring ports configured in an 8229.

The 8229 with a dual-port Token-Ring Attachment Module or two single-port Token-Ring Attachment Modules provides a means to transfer frames between two Token-Ring LAN segments, performing filtering, management server functions, and support of LAN network management functions. The 8229 supports either a 4- or 16-Mbps Token-Ring LAN on either of the two communications ports.

A simplified connection diagram using the 8229 is illustrated in Figure B-2.

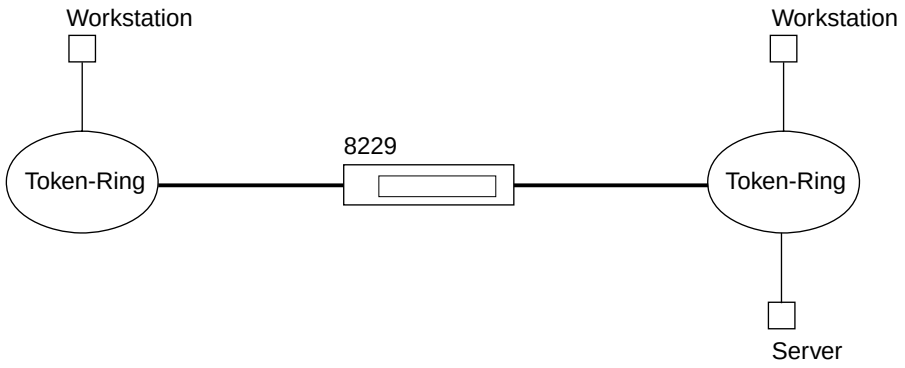


Figure B-2. Typical Token-Ring Connection

The primary function of this bridge is to allow devices on a Token-Ring LAN to communicate with devices on another Token-Ring LAN.

Token-Ring Network Operation

As stated above, when the 8229 is configured with either one dual-port Token-Ring Attachment Module or two single-port Token-Ring Attachment Modules, it can connect two IBM Token Rings operating at 4 or 16 Mbps. Its main functions are to transfer frames between the rings to which the 8229 is connected and to provide an interface between the Bridge Manager function and the Token-Ring Attachment Module.

Performance Counters

The bridge maintains the following performance counters for each port:

1. Frames discarded (due to the target ring being inoperative), long and short.
2. Frames not received (due to Token-Ring congestion), long and short.
3. Frames not forwarded (other), long and short.
4. Non-broadcast frames forwarded.
5. Non-broadcast bytes forwarded.
6. Broadcast frames forwarded.
7. Broadcast bytes forwarded.

These counters are for the LAN network manager with the accumulated values reported on request, or on a periodic basis. These values begin to be accumulated when the bridge program is started. They continue to accumulate and will wrap if the field size is exceeded.

Counter Update Details

The frame forward counter is updated for each frame successfully forwarded (broadcast and non-broadcast, respectively). The number of bytes forwarded log is updated for each frame successfully forwarded (broadcast and non-broadcast, respectively). The number of bytes for each frame is the entire frame length including the CRC.

Percentage of Frames Lost

Every minute, the bridge calculates the percentage of frames lost.

If the value exceeds 0.1%, indicating more than 1 frame per 1000 are being lost, a Bridge Performance Threshold Exceeded frame is sent to all LAN network management programs that have requested bridge reports.

Note: If the denominator of the above formula is less than 100, the calculation is not made.

In addition to the above notification, the bridge periodically sends a Bridge Counter Report if the controlling LAN network management program has requested such reports by setting a nonzero Calculation Interval. These counters are maintained by source segment and will be sent to all LAN network management programs that have requested bridge reports. These are sent each time the interval expires. The interval must be set to a value that is a multiple of 60 seconds.

Frame Forwarding

The bridge process moves frames being routed through the bridge from one bridge adapter to the other. All frames received by the bridge adapter that contain RI information, and do not have a specific, functional, or group address match for the receiving bridge adapter, are examined by the bridge process. If they are being routed through the bridge, the bridge process handles them. Frames with an address match are processed by spanning tree and LAN network management functions.

See Figure B-3 for a diagram of a token-ring network frame.

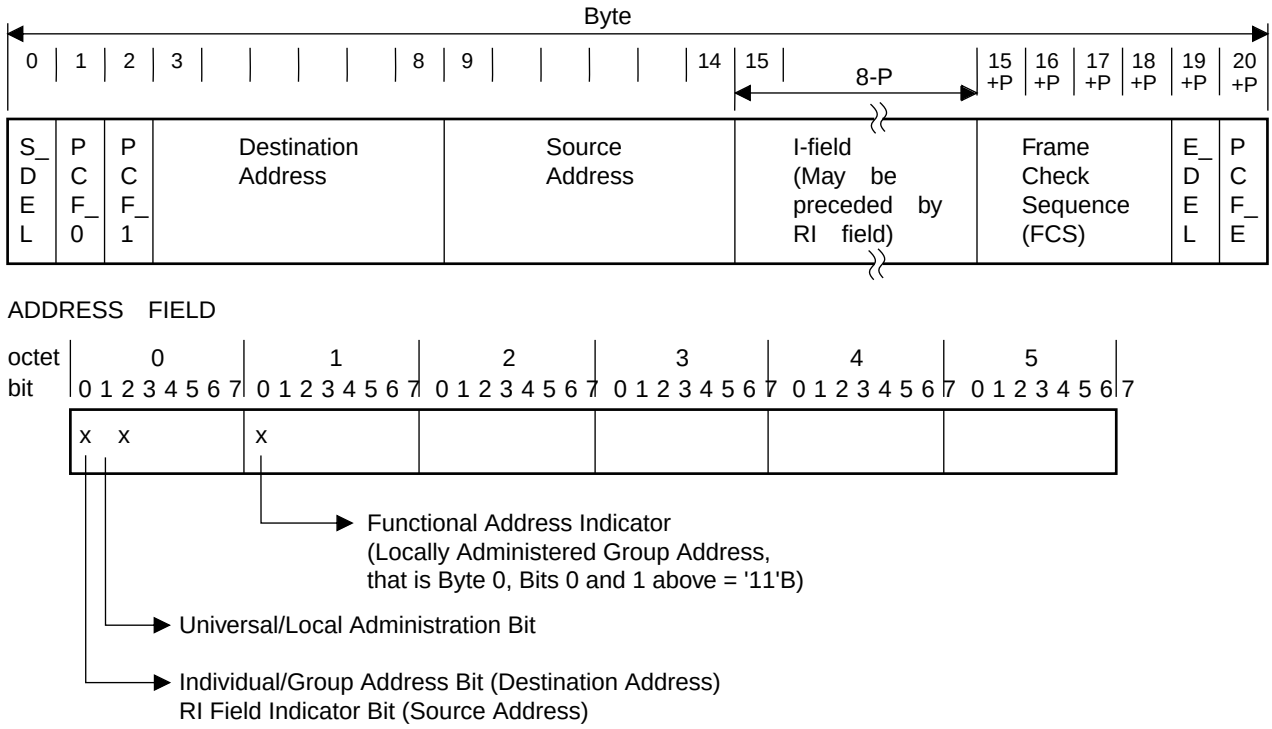


Figure B-3. Frame Format

Bridge Process Description

Once the bridge process has verified that the frame needs to be forwarded by this bridge, the broadcast bit in the routing control field is examined (see Figure B-4 on page B-20). If this bit is on (B'1'), the frame is a broadcast frame and is processed by the broadcast routed frame portion of the bridge process. If the broadcast bit is off (B'0'), the frame is handled by the non-broadcast routed frame portion of the bridge process.

Non-Broadcast Routed Frame Processing

Once a frame has been identified as a non-broadcast routed frame to be forwarded by this bridge, the process moves it to the bridge transmit buffers on the output adapter and transmits it.

Frame Length Checking: First, if the received frame is longer than the largest frame the bridge can forward or shorter than the minimum size Token-Ring frame, the frame will be discarded and the Frames Not Forwarded counter will be incremented.

The largest frame size is determined by the speed of the destination ring; a 4-Mpbs Token Ring can accept a maximum of 4472 bytes in the information field; however; a 16-Mbps Token-Ring can accommodate up to 17800 bytes.

Loop Checking: Second, the bridge process must verify that the RI field does not contain duplicate target ring numbers, which would cause the frame to circulate indefinitely. Each route number in the RI field must be checked for an occurrence of the bridge's target ring number. If the RI field contains more than one occurrence of the bridge's target ring number, the frame is rejected and the Frames Not Forwarded counter is incremented.

Target Ring Status: Third, the status of the target ring must be tested. If the target ring is beaconing, or the target ring adapter has been removed due to Wire Fault, Auto Remove 1, or Removed Received, the frame is discarded and the Frames Discarded counter is incremented.

Frame Filtered by Appendage: If any frame-forward filter user appendages have been set, they are called to determine whether the frame can pass through this bridge. If any appendage returns, indicating not to forward the frame, the frame is discarded. Otherwise, the frame is forwarded through the bridge.

Filters include system filters (destination and source address ranges as well as information field contents) and filter appendages (user-defined filters) loaded into the 8229 through the Utility Program.

Frame Forwarding

Once these checks have been made, the 8229 forwards the data. Since non-broadcast frames are not changed by the forwarding process, the CRC will be preserved through the bridge.

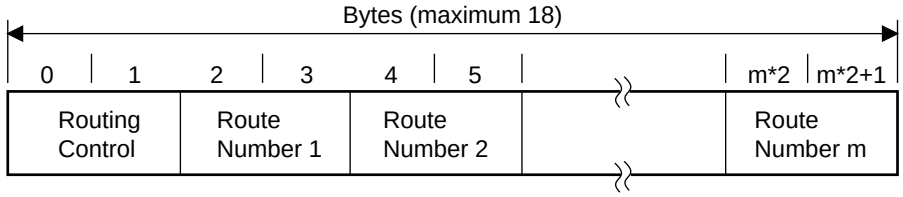
Frame Forward Completion

When the adapter has completed the transmission of the frame, it will post an interrupt indicating the completion of the transmission and stripping of the frame. The bridge process will then scan the transmit buffers to determine the length of the forwarded frame, the strip status of the forwarded frame, and whether or not a path trace report must be generated for the frame. The bridge activity logs for non-broadcast frames and non-broadcast bytes forwarded are updated at this time.

Path Trace for a Non-Broadcast Routed Frame

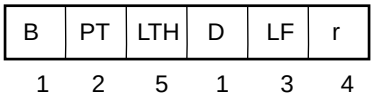
A non-broadcast routed frame may request a path trace report be returned when the bridge has completed processing the frame. This will be indicated in the path trace bit of the routing control field shown in Figure B-4 on page B-20 (the routing control field is offset 14 bytes from the beginning of the data area in the first receive buffer). If the path trace bit indicates a system path trace (that is, the most significant path trace bit, byte 0 bit 1 of the routing control field) request, a path trace report is constructed and sent to the LAN manager.

ROUTING INFORMATION (RI) FIELD

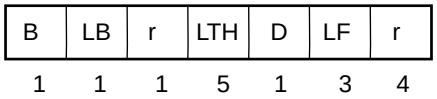


ROUTING CONTROL FIELD

Non-broadcast

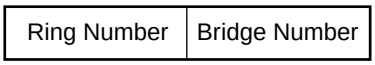


Broadcast



B = Broadcast Bit
LB = Limited Broadcast Bit
LTH = RI Field Length
D = Direction
LF = Largest Frame Size
PT = Path Trace
r = Reserved
* = To the power of

ROUTE NUMBER SUBFIELD



PB = Partition Bits (4 for IBM Token-Ring)

Numbers below frames indicate field length in bits

Figure B-4. Frame Format — Routing Information Field

Broadcast Routed Frame Processing

Once a frame has been identified as a broadcast routed frame to be forwarded by this bridge, the bridge process must add information to the frame's RI field describing the route to be taken by that frame. The bridge process must then move that frame to the transmit queue for the output adapter as it does for a non-broadcast routed frame. Again, several checks are made before routing the frame.

Frame Length Checking: If the received frame is longer than the largest frame the bridge can forward or shorter than the minimum size Token-Ring frame, the frame will be discarded and the Frames Not Forwarded counter is incremented.

Target Ring Status: As with non-broadcast routed frames, the status of the target ring must be tested. If the target ring is Beaconing, or the target ring adapter has been removed due to Wire Fault, Auto Remove 1, or Removed Received, the frame is discarded and the Frames Discarded counter is incremented.

Hop Count and RI Field Validation: The RI field of the frame will be checked to ensure that it does not contain an odd length value, or that the length value is less than 2. If either of these conditions is true, the frame will be discarded. The frame will also be discarded if the source ring is not present in the RI field, or if the source ring is not the last entry in the RI field.

The Hop Count limit of the frame will be tested by dividing the RI length field by 2 and subtracting 1 to remove the control field length. If the result of this calculation is greater than the Hop Count specified for the bridge, the frame will be discarded. This calculation works because the RI length field is constructed so that it contains 1 for the length of the control field, plus twice the number of hops.

If the frame is discarded due to an invalid RI field, the Frames Not Forwarded counter is updated. This counter is not updated if the hop count is exceeded.

Adding Routing Information for Broadcast Frames: The bridge must add information to a broadcast routed frame's RI field indicating the path that the frame has traveled. If this bridge is the first bridge that the frame has encountered, the source and target ring number and the bridge number must be added to the frame's RI field. For subsequent bridges in a frame's path, the target ring number and the bridge number are added to the frame's RI field. The bridge number and the number of the last ring from which the frame came make up the *route designator*. When the frame reaches its destination, the route designators that have been added to the RI field describe the path of rings and bridges traversed from the source ring to the destination ring.

The RI field length must be updated to reflect the additional entries. The first bridge in a frame's path adds 4 to the RI length field and subsequent bridges add 2 the RI length field.

Frame Forwarding: Once these checks have been made, the bridge process forwards the data. The broadcast routed frame must be tagged to indicate that the CRC needs to be recalculated.

The data buffer pointers will be moved from the receive CCBs of the input ring's adapter to a transmit buffer CCB for the output ring's adapter.

Frame Forward Completion: When the output ring's adapter has completed the transmission of the frame, it posts an interrupt indicating the completion of the transmission and stripping of the frame. The bridge process then scans the transmit buffers to determine the length of the forwarded frame, and the strip status of the forwarded frame. The bridge activity logs for the number of Broadcast Frames and Broadcast Bytes forwarded are updated at this time.

Automatic Single-Route Broadcast Mode

The 8229 can be configured with the Utility Program or by the LAN Network Manager Program to communicate with other active bridges to configure the single-route broadcast parameter automatically. This allows the bridges to establish and dynamically maintain a single-route broadcast path through the network. The automatic configuration will be accomplished by using a subset of the spanning tree algorithm. If dynamic maintenance of the single-route broadcast is desired, all bridges should be configured to participate in the protocols. If some bridges are manually configured, holes or loops could occur in the single-route broadcast path. Since some previous releases of the PC-based Token-Ring bridge do not support automatic configuration, then either the old bridges should be updated with the new release, or the new bridges should be configured manually.

A bridge configured to participate in the dynamic maintenance of the network's single-route broadcast path can be in one of three modes:

- Blocking
  - Not forwarding single-route broadcast frames
  - Not participating in the bridge protocols
- Listening
  - Not forwarding single-route broadcast frames
  - Participating in the bridge protocols
- Forwarding
  - Forwarding single-route broadcast frames
  - Participating in the bridge protocols

Bridges participating in the protocols communicate with each other to determine the single-route broadcast path. All inter-bridge communication on the token-ring is done with LLC Type-1 frames. The frames are sent to the bridge functional address and the spanning tree SAP X'42'. The algorithm causes the bridges to select a root bridge. The root bridge will periodically send out a Hello frame on both LAN segments to which it is connected. Other bridges that provide a best or only path to other LAN segments in the network are selected as designated bridges. When a designated bridge receives a Hello frame on its root side port, it will send out a Hello frame on its non-root or designated side port. Each LAN segment will have a Hello frame circulated on it by either the root or a designated bridge. The root and all designated bridges will have single-route broadcast active for both ports. All other bridges will have single-route broadcast deactivated for both ports. Any bridge that is not selected as the root or a designated bridge provides a parallel path through the network. If the root or a designated bridge is shut down, one of the blocking bridges will automatically be selected to replace it and will turn on single-route broadcast for both ports.

Note: Automatic single-route broadcast mode affects only the single-route broadcast parameter settings for that bridge. It does not affect the way the bridge processes all-route broadcast or non-broadcast frames.

Station Address

The 8229 supports the IEEE 48-bit address format only. Each station address must be unique in both LANs: that is, a station address on one Token-Ring LAN must not be duplicated on the alternate LAN.

Information Field Length

The 8229 supports token-ring frames with a maximum length of 17 800 bytes, which is the maximum supported by the communication link. A maximum of 4472 bytes is supported by a token-ring operating at 4 Mbps.

With either or both rings operating at 4 Mbps and 8144 set as the largest frame size, the 8229 will set the LF field of the routing field to B'011', indicating a maximum information field of 4472 bytes.

If the LF has been set by another bridge to be less than the above values, the field will not be changed by the 8229.

Station Address

The 8229 supports the IEEE 48-bit address format only. Each station address must be unique in both LANs: that is, a station address on one Token-Ring LAN must not be duplicated on the alternate LAN.

Appendix C. Details of IBM 8229 Token-Ring-to-Ethernet Use

The 8229, when configured with a Token-Ring Attachment Module and Ethernet Attachment Module, provides a means to transfer frames between stations on a Token-Ring LAN and stations on Ethernet Version 2 and IEEE 802.3 LANs, performing the appropriate protocol conversion and format manipulation. The 8229 supports either a 4 or 16 Mbps Token-Ring LAN and a 10 Mbps Ethernet LAN.

The 8229 supports two LAN connections, one Token-Ring and one Ethernet.

A simplified connection diagram using the 8229 is illustrated in Figure C-1.

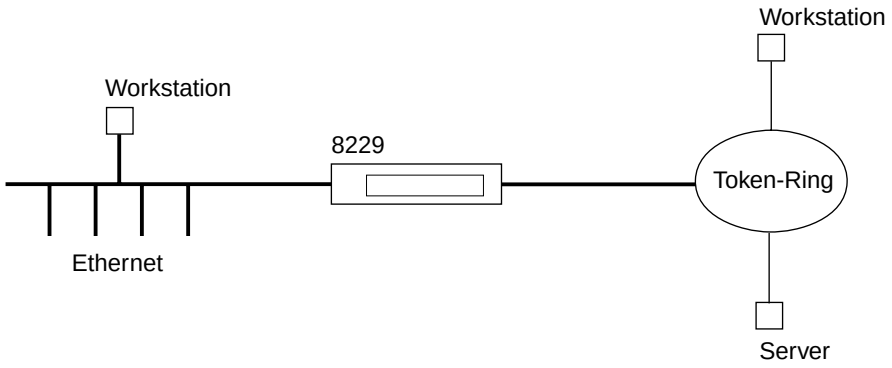


Figure C-1. Typical Connection Using the 8229 with an Ethernet Module

Supported LAN Types and Protocols

The 8229 with the Ethernet attachment module installed provides:

- Access protocol support (token-passing) for attachment to an IBM Token-Ring Network segment
- Access protocol support (CSMA/CD) for attachment to an Ethernet Version 2 or IEEE 802.3 Ethernet segment
- Novell IPX protocol support to enable communication across the 8229 between stations that use Novell NetWare on the LAN segments
- Access protocol conversion and frame format conversion for each LAN connected to it

Versions of Ethernet Supported

The following are the CSMA/CD LAN types commonly called Ethernet:

- Ethernet Version 1
- Ethernet Version 2
- IEEE 802.3

The 8229 supports both Ethernet Version 2 and IEEE 802.3 Ethernet. IEEE 802.3 Ethernet is based on, and coexists with, Ethernet Version 2.

Ethernet Version 1 does not coexist with either Ethernet Version 2 or with IEEE 802.3, and is not supported by the 8229. The two Ethernet versions have different end-of-transmission states (half-step versus full-step) and electrical common mode characteristics. Both Ethernet Version 2 and IEEE 802.3 use the half-step end-of-transmission state; Ethernet Version 1 uses the full-step state.

Differences between Ethernet Version 2 and IEEE 802.3 Ethernet exist at protocol levels, requiring the 8229 to support two different modes of frame format conversion between the IBM Token-Ring Network segment and the Ethernet LAN segment. As described in “Modes of Data and Frame Format Conversion” on page B-9, the 8229 provides token-ring-to-Ethernet Version 2 frame format conversion and token-ring-to-IEEE 802.3 Ethernet frame format conversion.

Protocols Supported

Other differences between Ethernet Version 2 and IEEE 802.3 Ethernet exist at protocol levels above the physical layer and are accommodated in the configurable modes of operation of the 8229 as described in the following paragraphs.

The 8229 supports the use of SNA, NetBIOS, and TCP/IP on both Ethernet Version 2 and IEEE 802.3 Ethernet. The design of the 8229 does not preclude the use of any protocols that adhere to the industrial protocol standards for Token-Ring and Ethernet LANs. However, only SNA, TCP/IP, NetBIOS and Novell NetWare IPX protocols have been tested.

8229 Modes

In mode 1, the 8229 performs frame format conversion between Ethernet Version 2 and IBM Token-Ring Network frames. In mode 2, the 8229 performs frame format conversion between IEEE 802.3 Ethernet and IBM Token-Ring Network frames. See “Modes of Data and Frame Format Conversion” on page B-9 for more information.

Appendix D. IBM 8229 Token-Ring-to-WAN Connectivity

The 8229 (with a token-ring attachment module and a WAN attachment module) connects a token ring operating at 4 or 16 Mbps to a WAN. This configuration is called a *split bridge* because two bridges are physically present but the two bridges make one connection. The telecommunications link stretching between the two halves of the bridge is considered as if it were part of the bridge. One half of the bridge is designated as *primary* and the other half as *secondary*. Figure D-1 shows this configuration.

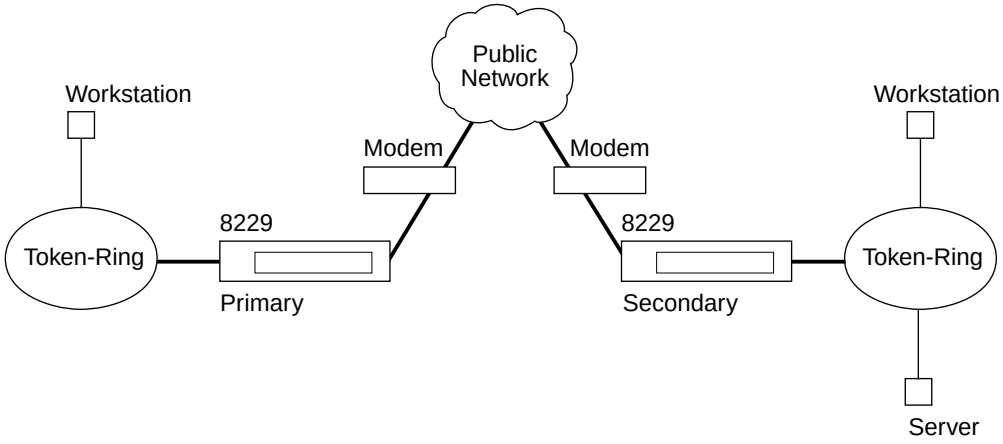


Figure D-1. Typical Use of IBM 8229s with WAN Modules

The 8229 WAN Attachment Module communicates with one of the following bridges at the other end of the WAN:

- IBM Remote Token-Ring Bridge/DOS Version 1.0 or IBM Remote Token-Ring Bridge Program Version 2.2 running on a workstation
- Another 8229 with a WAN attachment module

Note: In this configuration, the 8229 supports only the two versions of the IBM Remote Token-Ring Bridge stated in the previous list: IBM Remote Token-Ring Bridge/DOS Version 1.0 or IBM Remote Token-Ring Bridge Program Version 2.2. These versions of the Remote Token-Ring Bridge Program are referred to in this manual as the *Remote Token-Ring Bridge Program*.

The Remote Token-Ring Bridge Program is always the *primary* half of the split bridge. In this case, LAN Network Manager must be used to configure the Remote Token-Ring Bridge Program. The parameters set for the primary half of the bridge are used by the secondary half of the bridge, which is the 8229.

If you want to clear a user-defined filter in the 8229, perform one of the following steps:

- Press the hardware reset button (the parameters in NVR are not controlling the bridge, so erasing them does no harm).
- Use LDBRG to load the null filter file, FILTER3.X. FILTER3.X erases the user-defined filter.

Supported Protocols

The 8229 functions as a local source-routing MAC level bridge, performing frame forwarding without modification to the contents of the information field within the frame. As such, all upper level protocols supported on the token-ring LAN will be supported by the 8229.

The 8229 supports an LLC2 LAN management scheme only, in this configuration. On the telecommunications link, the frame formatting and bridge-half communication is compatible with the split bridge.

Supported Network Topologies

The 8229 supports communications in all valid token-ring configurations supported by existing personal-computer-based IBM Token-Ring bridge programs.

The WAN port supports serial data rates up to 2.048 Mbps with timing supplied by the network interface equipment. Operation is supported for dedicated path connections; specific network topologies are a function of the carrier service and are functionally transparent to the 8229, as long as acceptable line quality is provided.

Bridge Configuration Terms

It is important to understand the following terms:

Bridge Number

A bridge number is a unique identification of a bridge to the network when frames are forwarded through the bridge. The two bridge halves use the same bridge number. The network recognizes the bridge halves as having one bridge number.

Notes:

1. Multiple bridges spanning the same two LAN segments (parallel bridges) must have different bridge numbers.
2. Use the default bridge number if there are no parallel bridges connected to the LAN segment.

   For the 8229, this value can be manually set using the Token-Ring Attachment Module switches.

The configuration of the (primary) bridge is done through its configuration program.

LAN Segment Number (Primary)

The primary LAN segment number identifies the LAN segment to which the token-ring adapter or token-ring attachment module in the primary bridge half is attached. This is also referred to as the *local LAN segment*.

The value of the local LAN segment must be different from the value of the secondary LAN segment.

Notes:

1. If the WAN module is connected to an IBM Remote Token-Ring Bridge Program, the 8229 must be secondary.
2. All bridges connected to a specific LAN segment must refer to the segment by the same value.

LAN Segment Number (Secondary)

The secondary LAN segment number specifies or identifies the LAN segment to which the token-ring adapter or token-ring attachment module is attached in the secondary bridge half. This is also referred to as the *remote LAN segment*.

Notes:

1. If the WAN module is connected to an IBM Remote Token-Ring Bridge Program, the 8229 must be secondary.
2. All bridges connected to a specific LAN segment must refer to the segment by the same value.

It is important to note that this value can be manually set on the 8229 through the token-ring attachment module switches.

Frame Forwarding Active

This function specifies whether the 8229 will begin transmitting frames from one LAN segment to another.

Note: If the two bridge halves cannot bring up the link between the local and remote segment, then the frame forwarding is disabled. If there is a problem with the link, the numeric display will show a numeric code. See Chapter 12, "Problem Determination and Servicing."

Maximum Frame Size

This parameter specifies the largest size of a frame in bytes that the bridge can process. The line data rate of the telecommunications link connecting the two bridge workstations affects the maximum frame size that the 8229 can support. For application programs sending frames across a bridge, adjust the application to send a maximum frame size less than or equal to the maximum frame size that the bridge can process. See "Switch Setting Definitions" on page 2-7.

The default value indicates that the 8229 should configure itself to the optimal setting, based on the actual measured baud rate of the modem or Data Service Unit (DSU). Each frame size is chosen according to the baud rate measured.

Range for Baud Rate	Frame Size
0–19 200	516
19 102–38 400	1500
38 401–512 000	2052
512 001–1 540 000	4472
1 540 001–2 048 000	8144

Even if the baud rate indicates that the frame size should be 8144, the frame size of 4472 is chosen if either of the token-ring segments to which the 8229 is connected is running at 4 Mbps. The 8229 discards frames larger than the specified maximum frame size.

Important: If you are operating the bridge at lower line speeds, use special care when you configure the maximum frame size above 4472. At lower speeds, the smallest bit error rate could cause an excessive amount of data to be lost if the data is contained in large frames.

If you set the maximum frame size larger than 4472, you must have a token ring that runs at 16 Mbps.

Bridge Performance Threshold

This parameter cannot be set using the Utility Program, but can be set using LAN Network Manager in LLC2. It is an LLC2 parameter. It specifies the maximum allowable number of frames that are not forwarded through the bridge, per 10 000 frames arriving at the bridge, due to bridge adapter and communications adapter congestion, a beaconing target ring, or invalid frames. Each time the threshold is exceeded, the 8229 counts a *threshold exceeded* occurrence in the Performance Statistics and sends a notification to any linked LAN Network Manager Program.

Note: The total number of frames arriving at the bridge and the total number of frames in error (excluding telecommunications link errors) are used to determine whether or not the threshold has been exceeded. The count of frames filtered is included in the total number of frames arriving at the

bridge, but is not included in the total number of frames in error (excluding telecommunications link errors). The count of frames filtered is not included in a notification to linked LAN Network Manager Programs.

Automatic Single-Route Broadcast Mode

If you choose the A (Automatic) option, the 8229 will communicate with other 8229s to determine how to set the single-route broadcast parameter values to (Y) Yes or (N) No to compensate for changes in the network configuration.

The single-route automatic broadcast mode must not be used in the following situations:

- When the bridge is in the only path connecting one LAN segment to another LAN segment

  Use manual mode and set the single-route broadcast parameters to **Y (Yes)** to prevent this LAN segment from being isolated from the network.

- When the telecommunications link connecting the bridges has a low line data rate, such as 9.6 Kbps

  The messages generated by the automatic mode of single-route broadcast can cause the volume of traffic across the telecommunications link to be excessive.

- When the bridge is connecting separately administered large LANs at different sites.

  When using slower line data rates such as 9.6 Kbps to connect the bridge halves, the number of bridges from the root bridge to the last bridge (including the root bridge) in a path should be no more than four. If there are more than four, messages from the root bridge may not reach the last bridge quickly enough. The last bridge may assume that a bridge in the path has left the network, and may try to start the process to reset the single-route broadcast parameters and bridge roles.

You can use the automatic mode of the single-route broadcast mode for bridges on other LAN segments or networks on either side of this bridge depending on the needs of your network.

For more information about when to use the automatic mode of the single-route broadcast mode, refer to the *IBM Local Area Network Administrator's Guide*.

The automatic single-route broadcast mode uses the bridge ID to decide which one of two or more parallel bridges will forward single-route broadcast frames.

For more information about setting bridge labels and bridge IDs, refer to the *IBM Local Area Network Administrator's Guide*.

Path cost indicates the relative length of the path between this bridge and a centrally located (root) bridge in the network. A bridge's path cost equals the sum of the path cost increments of the bridges between it and the root bridge, plus its own increment.

The automatic single-route broadcast mode uses path cost to decide which parallel path between two LAN segments to use as the single-route broadcast path.

Important: The 8229, when using the automatic mode of the single-route broadcast parameter, will not recognize the existence of the IBM Token-Ring Network Bridge Program., Version 1.0, Version 1.1, Version 2.0 without PTF UR25531, or the IBM PC Network Bridge without PTF UR25532.

Be sure not to confuse the IBM Token-Ring Network Bridge Program with the IBM Local Token-Ring Bridge/DOS Version 1.0, which replaces the IBM Token-Ring Network Bridge Program. This warning does not apply to the IBM Local Token-Ring Bridge/DOS Version 1.0.

If you try to use the IBM Token-Ring Network Bridge Program Version 1.0, Version 1.1, or Version 2.0 without the required PTF, you may experience the following problems:

- Some LAN segments can become isolated from the network
- Some LAN segments can receive duplicate single-route broadcast frames

If you have the following bridges in your network and you want to use the automatic mode of the single-route broadcast parameter with these bridges, you must use the following PTF or later with that 8229:

Table D-1. PTF Numbers

Name of 8229	PTF Number
IBM Token-Ring Network Bridge Program Version 2.0	PTF UR25531 or later
IBM PC Network Bridge Version 1.0	PTF UR25532 or later

If you do not use the PTF with these bridges, you will *not* be able to use the automatic mode of the single-route broadcast parameter of these bridges in the same network.

For more information about when to use the automatic or manual mode of the single-route broadcast parameter, refer to the *IBM Local Area Network Administrator's Guide*.

Line Data Rate

The line data rate is the speed at which the telecommunications link is to be clocked. The telecommunications link operates at data rates from 9.6 Kbps to 2.048 Mbps.

Both modems should be set for the same line speed and data rate. Set your modems to the appropriate timing for the WAN. Since the 8229 does not support internal clocking, the modem performs external clocking for the bridge.

Electrical Interface

This parameter indicates what type of electrical interface is being used at the communications adapter (V.24, V.35, or X.21). The 8229 automatically determines the electrical interface according to the attached cable.

Bridge Mode

The bridge mode determines what method the bridge half will use to connect to its other half. This parameter must be set to the same value for both bridge halves.

Notes:

1. The 8229 WAN Attachment Module supports only leased-line connections.
2. If the IBM Remote Token-Ring Bridge Program is the primary bridge half, it must be configured for leased lines.

Filters

Each bridge uses its own filter selections. The 8229 uses the following selections:

- Address filter
- Range filter
- User-defined filter

The IBM Remote Token-Ring Bridge Program uses a user-defined filter.

The bridge-half filter decision is made after data is taken off the token-ring LAN and before the data is sent to the WAN connection.

Bridge Initialization

Each bridge half can be powered up independently of the other. The first bridge half that comes up waits for the other bridge half to complete initialization before communication on the link can begin. The initialization process can take up to 3 minutes (or perhaps longer) to complete.

Bridge Restart

If the 8229 detects a beaconing condition on either LAN segment due to a problem on the network, the 8229 will attempt to open the adapters until both adapters have been opened successfully. A beaconing condition indicates that the LAN segment is inoperative.

For example, a beaconing condition can be caused by a broken cable somewhere in the network. The 8229 will retry initialization until the cable is fixed and the bridge is able to open its adapter successfully.

Important: In case an adapter in the bridge has been set to the wrong data rate, the 8229 will not be able to initialize until you change the data rate on the adapter to match the rate of the LAN segment to which it is connected. This problem will cause a beaconing condition on the LAN Segment connected to the bridge adapter that is set to the wrong data transfer rate.

While attempting to initialize, the 8229 performs the following actions:

1. The 8229 continues trying to open the adapter once per minute until the Token-Ring Network adapter and communications adapter in both bridge halves open successfully.
2. The 8229 sends an alert to the IBM LAN Network Manager as notification of the beaconing condition on the LAN segment. The LAN Network Manager Program will forward the alert to NetView* if a link with NetView has been established.
3. If the 8229 does not receive an acknowledgment from the LAN Network Manager Program within 1 minute, the 8229 continues sending an alert every minute until it has sent 4 alerts.

   If the 8229 does receive an acknowledgment from the LAN Network Management Program, the 8229 will not send out any more alerts.
4. After the fourth alert is sent without receiving an acknowledgment, the 8229 waits 10 minutes and repeats the procedure again (Step 3–Step 5) if the beaconing condition has not been corrected.

   The five token-ring status conditions are:

   - Normal
   - Soft error
   - Beaconing
   - Adapter closed
   - Wire fault

The LAN Network Manager Program logs each alert in its alert log and passes the alert to NetView if a link with NetView has been established. Each alert contains the fault domain for problem determination.

Coexistence With the IBM Remote Token-Ring Bridge Program

If the primary half is an IBM Remote Token-Ring Bridge Program, the 8229 secondary half will support the following split bridge functions:

- Bridge testing
- Configuring data
- Network status
- Path trace
- Performance counters

- Communication status
- Shutdown verification

8229 WAN Equipment and Supplies

To install and operate the 8229 module at data rates from 9.6 Kbps to 2.048 Mbps, the following equipment is needed for each bridge half:

- One 8229 (with one token-ring attachment module and one WAN attachment module).
- A DCE device that provides attachment to the telecommunication link.
  - A modem and its attaching cables, which are compatible with your network (see Table D-2).
  - A data service unit (DSU)

Table D-2. Electrical Interface, Required Cable, and Line Data Rates

Electrical Interface	Supporting Cable	Line Data Rate	Part Number
V.24	EIA 232-C Attachment Interface Cable	9.6 Kbps to 19.2 Kbps. See note 1.	02F9477
V.35	V.35 Interface Cable	9.6 Kbps through 2.048 Mbps	02F9494
X.21	X.21 Interface Cable	9.6 Kbps through 2.048 Mbps. See note 2.	02F9493

Note 1: Shorter cables are required to run above 19.2 Kbps.

Note 2: Part number 02F9493 currently only runs at a maximum throughput of 256 Kbps.

To obtain these cables, contact the IBM National Parts Center at 1-800-388-7080.

Appendix E. Frame Format and Address Conversion

This appendix describes the various types of frame format conversion that the 8229 can do. Frame conversion is required when the bridge connects a token-ring network to Ethernet. This appendix also describes manual address conversion, which you may have to do for some protocols.

Example of Converting an Address

Figure E-1 shows how token-ring address 1000 5A4D BC96 is converted into a bit-inverted Ethernet address.

The same process is used to convert an Ethernet address to a token-ring address.

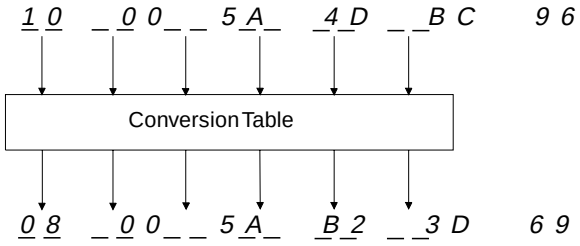


Figure E-1. An Example of How a Token-Ring Address Is Converted

Manual Address Conversion

The bit order of the 48-bit (12-digit) IEEE adapter (MAC) address is reversed between the token-ring and Ethernet LANs. Some protocols that use this address may not adjust for the inverted bits when communicating between LANs. Therefore, you must manually convert the address bit order.

Use the following procedure to convert an address. This section also shows you the Address Conversion Chart.

1. Write the 12-digit address on the Address Conversion Chart.

   Separate the 12 digits into pairs. Use the first digit of each pair as the row coordinate and the second digit as the column coordinate.

2. Locate a bit-order inverted pair in Table E-1 on page E-2 for each pair you wrote on the worksheet.

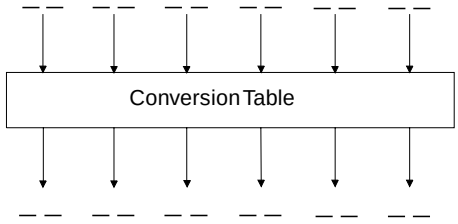
3. Combine the 6 pairs from the table into the converted 12-digit address.

Table E-1. Address Conversion Table

2nd Char (Col.) → 1st Char ↓ (Row)	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
0	00	80	40	C0	20	A0	60	E0	10	90	50	D0	30	B0	70	F0
1	08	88	48	C8	28	A8	68	E8	18	98	58	D8	38	B8	78	F8
2	04	84	44	C4	24	A4	64	E4	14	94	58	D4	34	B4	74	F4
3	0C	8C	4C	CC	2C	AC	6C	EC	1C	9C	5C	DC	3C	BC	7C	FC
4	02	82	42	C2	22	A2	62	E2	12	92	52	D2	32	B2	72	F2
5	0A	8A	4A	CA	2A	AA	6A	EA	1A	9A	5A	DA	3A	BA	7A	FA
6	06	86	46	C6	26	A6	66	E6	16	96	56	D6	36	B6	76	F6
7	0E	8E	4E	CE	2E	AE	6E	EE	1E	9E	5E	DE	3E	BE	7E	FE
8	01	81	41	C1	21	A1	61	E1	11	91	51	D1	31	B1	71	F1
9	09	89	49	C9	29	A9	69	E9	19	99	59	D9	39	B9	79	F9
A	05	85	45	C5	25	A5	65	E5	15	95	55	D5	35	B5	75	F5
B	0D	8D	4D	CD	2D	AD	6D	ED	1D	9D	5D	DD	3D	BD	7D	FD
C	03	83	43	C3	23	A3	63	E3	13	93	53	D3	33	B3	73	F3
D	0B	8B	4B	CB	2B	AB	6B	E8	1B	9B	5B	DB	3B	BB	7B	FB
E	07	87	47	C7	27	A7	67	E7	17	97	57	D7	37	B7	77	F7
F	0F	8F	4F	CF	2F	AF	6F	EF	1F	9F	5F	DF	3F	BF	7F	FF

Address Conversion Chart

The following form can be used for converting addresses.



Frame Format Conversions

The 8229 has two main types of frame format conversions:

- Bit inversion

  The bit order of the bytes for the destination and source address fields is inverted by the 8229 as part of the copy process, when the bit order of these fields is reversed between the two LAN types.

- Frame header manipulation

  Address, control, routing, and length information is copied to or deleted from a frame before the frame is forwarded, to provide the fields required by the destination LAN type.

The 8229 provides the following frame format conversions:

- Token-ring to Ethernet Version 2.0
- Ethernet Version 2.0-to-token-ring
- Token-ring to IEEE 802.3 Ethernet
- IEEE 802.3 Ethernet-to-token-ring
- ARP MAC address bit-inversion
- RARP MAC address bit-inversion
- Token-ring to Ethernet Version 2.0 for LLC-based protocols
- Ethernet Version 2.0-to-token-ring for LLC-based protocols

Note: If you need to convert token-ring and Ethernet addresses (bit-inversion) manually, see “Manual Address Conversion” on page E-1. You may need to do manual conversion if you are:

- Defining a locally administered address for an Ethernet port. The address must be specified in the IEEE 802.5 format in the bridge configuration. (The 8229 does not do bit inversion on addresses of recognized IPX frames when IPX support is enabled.)
- Isolating a problem with a protocol.
- Tracing frames between the networks.

Token-Ring to Ethernet Version 2.0 Conversion

This conversion runs on the 8229 in mode 1.

The conversion from a token-ring frame to an Ethernet Version 2 frame for TCP/IP operation is represented in Figure E-2. In this conversion, the routing information (RI) and the destination service access point (DSAP), source service access point (SSAP), control (CONT), and protocol ID contained in the subnetwork access protocol (SNAP) header are extracted from the token-ring frame and discarded. The destination address (DA), source address (SA), and information field (TYPE and INFO) are copied into an Ethernet frame and sent to the Ethernet LAN.

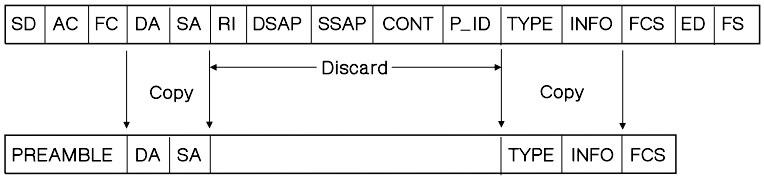


Figure E-2. Token-Ring Version 2.0-to-Ethernet Frame Conversion

In this conversion process, the bit order of the bytes for the destination and source address fields is inverted by the 8229 as part of the copy process because the bit order of these fields is reversed between the two LAN types.

Ethernet Version 2.0-to-Token-Ring Conversion

This conversion runs on the 8229 in mode 1.

This conversion is the reverse of the token-ring to Ethernet conversion. In the conversion from an Ethernet frame-to-a-token-ring frame, the destination address (DA), source address (SA), and information fields (TYPE and INFO) are copied into the respective fields of a token-ring frame. Before sending the frame to the token-ring LAN segment, the 8229:

- Retrieves the source routing information associated with the token-ring destination address and inserts the information into the frame
- Inserts the fixed hexadecimal values AA AA 03 (representing the DSAP, SSAP, and control fields) into the frame
- Inserts a protocol ID of hexadecimal 00 00 00 into the frame.

(The SNAP header consists of the protocol ID and the TYPE fields.)

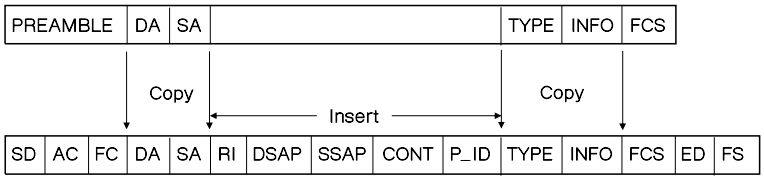


Figure E-3. Ethernet V2-to-Token-Ring Frame Conversion

In this conversion process, the bit order of the bytes for the destination and source address fields is inverted by the 8229 as part of the copy process because the bit order of these fields is reversed between the two LAN types.

Token-Ring-to-IEEE 802.3-Ethernet Conversion

This conversion runs on the 8229 in mode 2.

The conversion from a token-ring frame to an IEEE 802.3 Ethernet frame is represented in Figure E-4. In this conversion, only the routing information (RI) is extracted from the token-ring frame and discarded. The destination address (DA), source address (SA), and 802.3 INFO information is copied into an IEEE 802.3 frame, a LENGTH field calculated by the 8229 is inserted into the frame, and the frame is sent to the IEEE 802.3 Ethernet LAN.

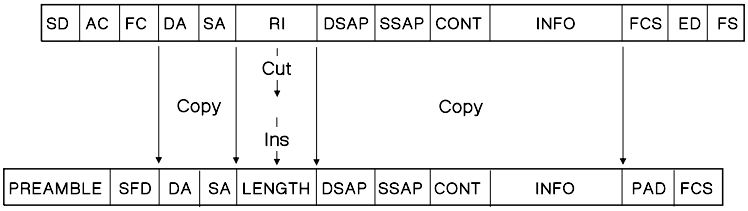


Figure E-4. Token-Ring to IEEE-802.3-Ethernet Frame Conversion

In this conversion process, the bit order of the bytes for the destination and source address fields is inverted by the 8229 as part of the copy process because the bit order of these fields is reversed between the two LAN types.

IEEE 802.3-Ethernet-to-Token-Ring Conversion

This conversion runs on the 8229 in mode 2.

This conversion is the reverse of the token-ring-to-IEEE 802.3- Ethernet conversion. In the conversion from an IEEE 802.3 frame to a token-ring frame, the destination address (DA), source address (SA), and IEEE 802.3 Info information is copied into the respective fields of a token-ring frame. The Length field is discarded. The 8229 then retrieves the source routing information fields associated with the token-ring destination address and inserts these fields following the source address before sending the frame to the token-ring LAN.

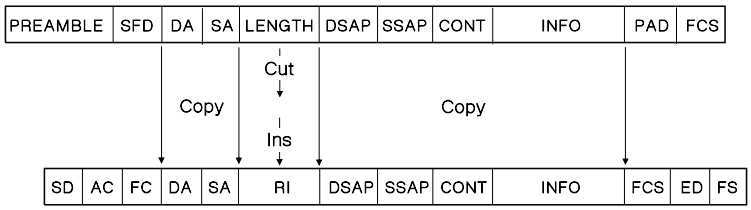


Figure E-5. IEEE 802.3-Ethernet-to-Token-Ring Frame Conversion

In this conversion process, the bit order of the bytes for the destination and source address fields is inverted by the 8229 as part of the copy process because the bit order of these fields is reversed between the two LAN types.

ARP Conversion

The address resolution protocol (ARP) is used to determine a target station's hardware network address when only the station's internet or protocol address is known in a TCP/IP environment. The mechanism used is a broadcast frame containing the protocol address of the desired LAN station. The station having the protocol address responds to the broadcast packet with a message containing its hardware address within the information field of the frame.

The ARP frames are uniquely identified by X'0806' in the TYPE field in the frame header.

Like the source and destination addresses of the frame, the bit order of the address within the information field of the ARP is inverted between the token-ring and Ethernet Version 2 or IEEE 802.3 Ethernet LANs.

The ARP conversion process is shown in Figure E-6.

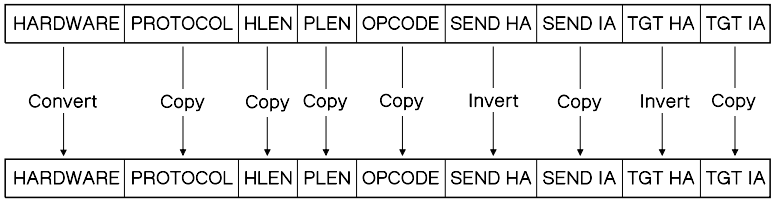


Figure E-6. ARP Conversion

RARP Conversion

RARP uses the same format as ARP and operates in a similar manner except that it is used by a station that requests its protocol address from a network server. The RARP frames are uniquely identified by X'8035' in the TYPE field in the frame header.

Like the source and destination addresses of the frame, the bit order of the addresses within the information field of RARP is inverted between the token-ring and Ethernet Version 2 or IEEE 802.3 Ethernet LANs.

The RARP conversion process is shown in Figure E-7.

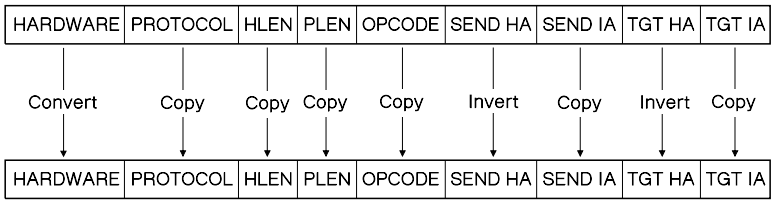


Figure E-7. RARP-to-ARP Conversion

Token-Ring-to-Ethernet Version 2 Conversion for LLC-Based Protocols

A method for transporting logical link control- (LLC-) based protocols on Ethernet Version 2 is supported by the PC-RT and OS/2 Extended Edition (OS/2 EE). The Ethernet type value of X'80D5' is used to indicate an LLC-based protocol.

The conversion from token-ring-to-Ethernet for LLC-based protocols is done by the 8229 when the following conditions exist:

- The 8229 recognizes the destination station as communicating in Ethernet Version 2 format (mode 1).

- The Forward LLC Traffic function is enabled in the 8229 configuration. (The default is enabled.)
- The DSAP in the token-ring frame is contained in the 8229 SAP table. The default values in this table are hexadecimal 00, 04, 08, F0, F4, and FC.

When the conditions for the LLC-based protocols exist, the conversion is done and the frames are forwarded as shown in Figure E-8; otherwise, the conversion is not done.

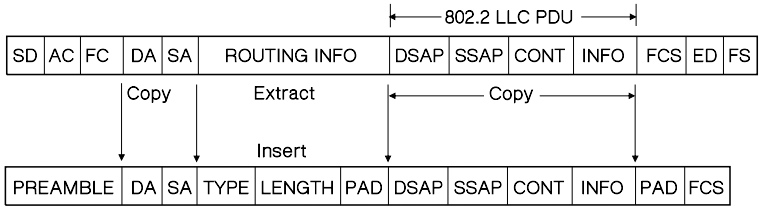


Figure E-8. Token-Ring-to-LLC-on-Ethernet Frame Conversion for LLC-Based Protocols

In this conversion, the routing information (RI) is extracted from the token-ring frame and is discarded. The destination address (DA) and source address (SA) and LLC protocol data unit (PDU) are copied into the Ethernet frame.

The LLC type field (X'80D5'), the length of the PDU, and the pad characters are inserted into the Ethernet frame and sent to the Ethernet LAN.

Ethernet Version 2.0-to-Token-Ring Conversion for LLC-Based Protocols

This conversion is the reverse of the token-ring-to-Ethernet conversion for LLC-based protocols. In this conversion, if a frame is received from an Ethernet station with a type value of hexadecimal 80D5, the conversion process is done as shown in Figure E-9.

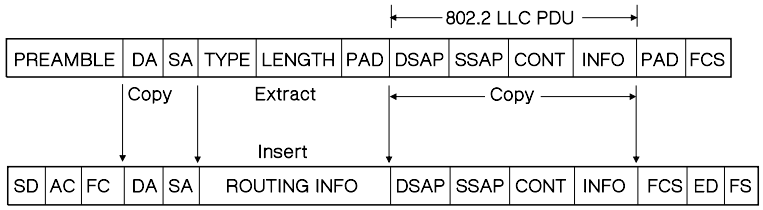


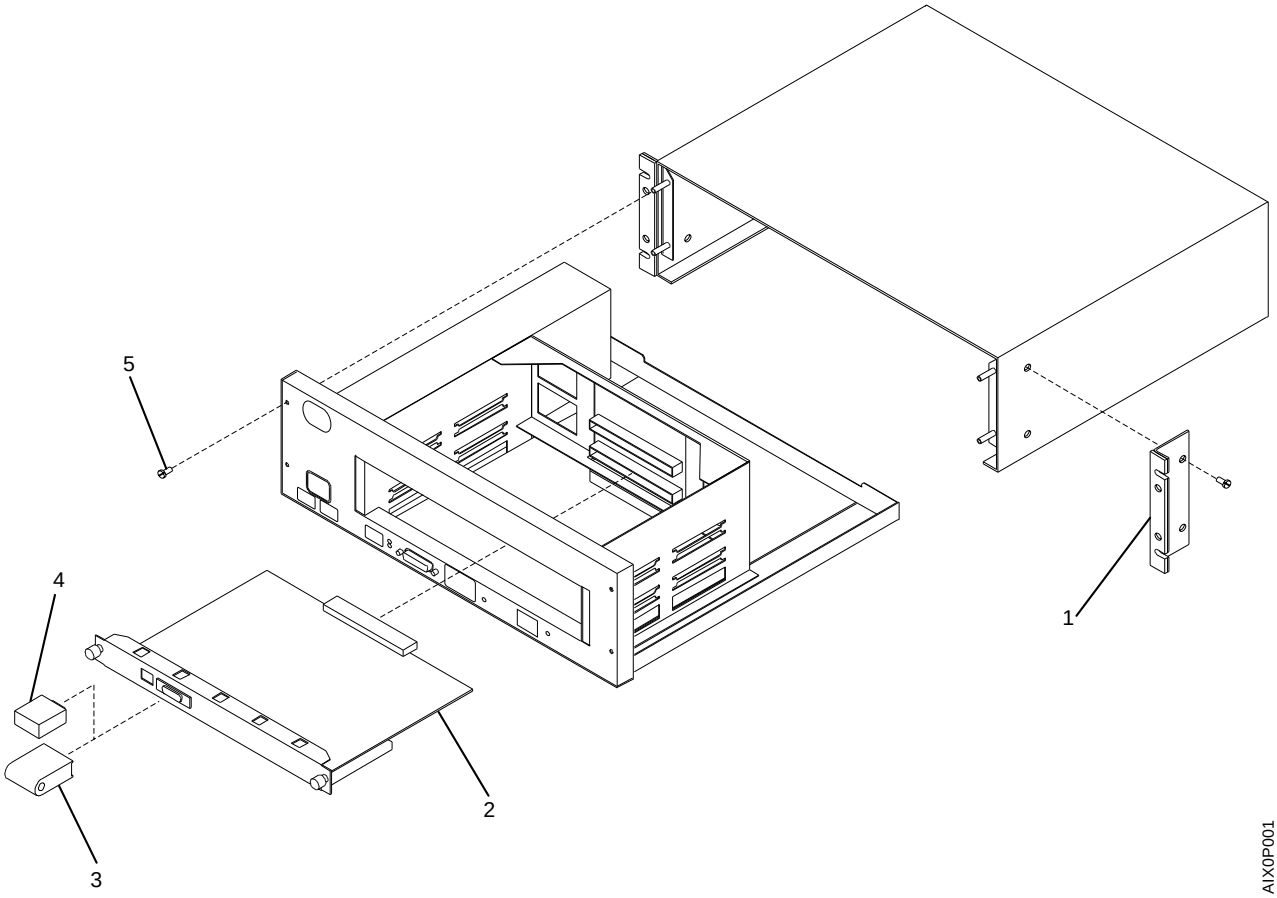
Figure E-9. LLC-on-Ethernet-to-Token-Ring Frame Conversion for LLC-Based Protocols

In this conversion, the type, length, and pad fields are extracted and discarded. The LLC PDU and destination address (DA) and source address (SA) fields are copied into the token-ring frame. The 8229 then retrieves the routing information (RI) associated with the token-ring destination address, inserts it into the token-ring frame, and sends the frame to the token-ring LAN.

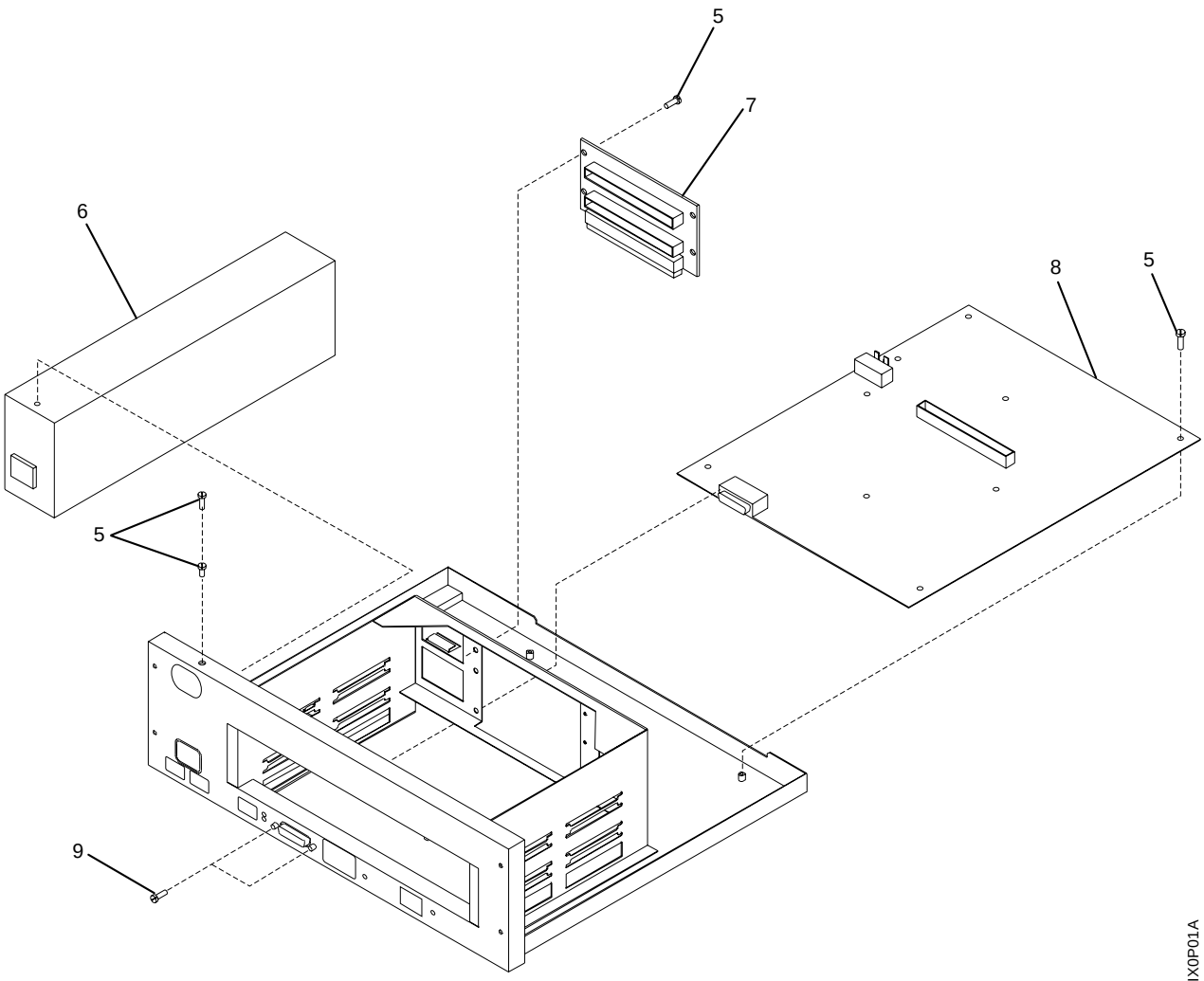
Appendix F. Parts Listing

This parts listing contains reference drawings and a corresponding index for all field replaceable parts. The index provides the part number, the quantity required (units), and a description of the part. In the following assembly index, **NP** refers to any non-procurable part.

Assembly 1: Final Assembly



Asm–Index	Part Number	Units	Description
1–		NP	Final Asm
–1	73G4768	1	• Rack Mount Kit (Includes Screws and Rubber Feet)
–2	73G4753	1	• Attachment Module, Single-Port Token Ring
–2	73G4754	1	• Attachment Module, Dual-Port Token Ring
–2	73G4755	1	• Attachment Module, Single Port Ethernet
–2	73G4757	1	• Attachment Module, WAN
–3	55F4897	1	• Wrap Connector, Ethernet
–4	55F4896	1	• Wrap Connector, Token Ring
–5	73G8870	1	• Attaching Hardware Kit



Asm–Index	Part Number	Units	Description
1–			
–5	73G8870	1	• Attaching Hardware Kit
–6	79F3367	1	• Power Supply
–7	73G8869	1	• Connector,Rear
–8	73G4752	1	• Planar
–9		NP	• Shown For Illustration Purposes only
–10	73G4779	1	• Diskette, 8229 Utility & Flash Load Programs, English (Not illustrated)
–10	73G7538	1	• Diskette, 8229 Utility & Flash Load Programs, Spanish (Not illustrated)
–10	73G7540	1	• Diskette, 8229 Utility & Flash Load Programs, German (Not illustrated)
–10	73G7542	1	• Diskette, 8229 Utility & Flash Load Programs, Japanese (Not illustrated)

Appendix G. Contents of the LBE Directory

The following list shows the files that should be found in the LBE directory after you have exploded and copied the compacted files from the Operational Software Diskette to a fixed disk on your workstation.

FILTER3.hex	DFITRE.lib
TREE.X	FILTER2.hex
WAN.X	FILTER.h
STRT.X	LBE.bat
FILTER2.X	TRT.X
LOAD IP.txt	UPDATE.exe
FILTERS.doc	FILTER1.bat
FILTER1.X	FILTER1.c
FILTER3.X	FILTER1.hex
STREE.X	FILTER3.c
DMPC.exe	NLS MSGS.txt
MYDFI.cnf	IBMMIB.my
FILTER2.c	SUR_TRAP.my
FILTER.bat	MAIN.exe
DFI.pro	README
IBM8229.my	ETHERHEX.txt
LDBRG.exe	TOKENHEX.txt
DFI.msg	WANHEX.txt
STARTUP.asm	DEBUG.tre
TR_SURR.my	TRE.def

Appendix H. Safety Notices

DANGER
For your safety, you must connect equipment only to a properly wired and grounded outlet. An improperly wired outlet can place hazardous voltage on accessible metal parts of the equipment. You are responsible for outlet wiring.

GEVARR !
Uit veiligheldsoverwegingen moet de machine steeds worden aangesloten op een degelijk bedraad en geaard stopcontact. Bij een slecht bedraad stopcontact kunnen aanraakbare metalen delen van de machine onder een gevaarlijke spanning komen te staan. De klant is verantwoordelijk voor de bedrading van het stopcontact.

Varning — LIUSFARA:
Utrustningen måste anslutas till ett korrekt kopplat jordat eluttag. Ett felkopplat uttag kan medföra att utrustningens metallytor blir spänningsförande. IBM ansvarar inte för koppling av uttag.

VORSICHT:
Gerät nur an Schutzkontaktsteckdose mit einwandfrei geerdetem Schutzkontakt anschließen. Bei nicht ordnungsgemäß angeschlossener Netzsteckdose können an berührbaren Metallteilen des Gerätes gefährliche Berührungsspannungen auftreten. Für den einwandfreien Zustand der Steckdose ist der Betreiber verantwortlich.

FARE:
For din egen sikkerhets skyld må du bare kople utstyret til en korrekt jordet stikkontakt. Hvis stikkontakten ikke er montert på godkjent måte, kan det forårsake farlige spenninger på berørbare metallflater. Kunden har ansvaret for at stikkontakten er forsvarlig koplet.

PERIGO:
Para sua segurança, somente conecte equipamentos à tomadas aterradas e com fiação adequada. Uma tomada com fiação inadequada pode causar voltagem perigosa em partes metálicas do equipamento às quais você tem acesso. O cliente é responsável pela fiação da tomada.

VAARA:
Verkkojohdon saa kytkeä vain toimintakunnossa olevaan maadoitettuun pistorasiaan. Väärin kyketyn tai maadoittamattoman pistorasian käyttö saattaa aiheuttaa vaarallisen jännitteen koneen metalliosiin. Asiakas on vastuussa pistorasian asianmukaisuudesta.

PELIGRO:
Para su seguridad, usted debe conectar el equipo solamente a un tomacorriente cableado y conectado a tierra correctamente. Un tomacorriente cableado en forma inadecuada puede ser la causa de la aparición de voltajes peligrosos en partes metálicas accesibles del equipo. El cliente es responsable del cableado del tomacorriente.

DANGER:
Pour la sécurité de l'utilisateur, la machine doit toujours être branchée sur une prise de courant correctement câblée et mise à la terre. Une prise mal câblée peut provoquer une tension dangereuse sur des parties métalliques accessibles de la machine. Le client est responsable du câblage de la prise.

PERICOLO:
Per la sicurezza dell'utente, collegare le apparecchiature solo ad una presa correttamente cablata e munita di collegamento a terra. Una presa che non sia correttamente cablata può portare tensioni pericolose sulle parti metalliche accessibili delle apparecchiature. E' responsabilità del cliente assicurarsi che la presa sia correttamente cablata.

DANGER !
Une prise d'alimentation mal installée ou un mauvais câblage de la prise de raccordement peuvent provoquer une mise sous tension dangereuse des parties métalliques du contrôleur. Le client est responsable de l'installation de la prise d'alimentation qui doit être correctement câblée et mise à la terre, afin d'éviter tout choc électrique.

PERIGO:
Para sua segurança, o equipamento só deverá ser ligado a uma tomada com os fios montados correctamente e com boa ligação de terra. Uma tomada com os fios montados incorrectamente poderá provocar o aparecimento de voltagens perigosas em partes metálicas, facilmente acessíveis, do equipamento. O cliente é responsável pela montagem dos fios da tomada e da ficha.

FARE !
Af sikkerhedshensyn skal kontrolenheden tilsluttes en korrekt forbundet stikkontakt. En stikkontakt, der ikke er korrekt forbundet, kan give farlig elektrisk spænding på systemets metaldele eller på udstyr, der er tilsluttet systemet. Det er kundens ansvar at sikre, at stikkontakten har korrekt forbindelse til jord.

危険

安全のために、機器は正しく配線された接地（アース）
極付き　電源コンセントに接続してください。
電源コンセントの誤配線により、機器の金属部分に危険な
電圧が生ずることがあります。
コンセントの配線はお客さまの責任で行ってください。

위 험

당신의 안전을 위해 기기를 적정 규격의 전선으로 접지
콘센트에 연결해야 합니다. 적정 규격이 아닌 전선으로
연결하였을 경우에는 접촉되기 쉬운 기기의 금속부분에
위험한 전류가 흐를 수 있습니다. 접지 콘센트에 연결
하는 것은 당신의 책임 입니다.

DANGER

To avoid shock hazard:

- The power cord must be connected to a properly wired and earthed receptacle.
- Any equipment to which this product will be attached must also be connected to properly wired receptacles.

PERIGO

Para evitar perigo de choque:

- O cabo de força deve estar conectado a tomadas com fios e aterramento adequados.
- Qualquer equipamento ao qual este produto seja ligado também deverá estar conectado a tomadas com fiação adequada.

FARE!

Undgå elektrisk stød:

- Netledningen skal tilsluttes en korrekt installeret stikkontakt med forbindelse til jord.
- Sørg for korrekt installation af stikkontakterne, både til produktet og til det udstyr, det tilsluttes.

GEVAAR !

Om elektrische schokken te vermijden:

- moet het netsnoer aangesloten zijn op een correct bedraad en geaard stopcontact.
- moeten alle machines waarmee dit product zal worden verbonden ook op correct bedrade stopcontacten zijn aangesloten.

PERIGO

Para evitar choques eléctricos:

- O cabo de alimentação tem de estar ligado a uma tomada de corrente correctamente instalada e com ligação à terra.
- Todo o equipamento ligado a esta máquina também deve estar ligado a tomadas correctamente instaladas.

PELIGRO

Para evitar peligro de descargas:

- El cable de alimentación debe estar conectado a una toma de corriente adecuadamente cableada y con toma de tierra.
- Cualquier equipo al que se conecte este producto debe estar también conectado a tomas de corriente adecuadamente cableadas.

PERICOLO

Per evitare scosse elettriche:

- Il cavo di alimentazione deve essere collegato a una presa munita di terra di sicurezza e propriamente cablata.
- Tutte le unità esterne di questo prodotto, devono essere collegate a prese munite di terra di sicurezza e propriamente cablate.

VAARA

Voit saada sähköiskun, jos et noudata seuraavia ohjeita:

- Tämän laitteen verkkojohdon saa kytkeä vain toimintakunnossa olevaan maadoitettuun pistorasiaan.
- Tähän laitteeseen liitettävät laitteet on kytkettävä toimintakunnossa olevaan maadoitettuun pistorasiaan.

VARNING — LIVSFARA

För att undvika elolycksfall:

- Nätkabeln måste anslutas till ett rätt kopplat jordat eluttag.
- Även annan utrustning som ska anslutas till den här produkten måste anslutas till jordat uttag.

FARE !

For å unngå elektrisk støt:

- Nettkabelen må være plugget i en korrekt koblet og jordet stikkontakt.
- Alt utstyr som er koblet til dette produktet må være plugget i en korrekt koblet stikkontakt.

DANGER !

Pour éviter tout risque de choc électrique:

- Le cordon d'alimentation doit être branché sur une prise d'alimentation correctement câblée et mise à la terre.
- D'autre part, tout le matériel connecté à ce produit doit également être branché sur des prises d'alimentation correctement câblées et mises à la terre.

VORSICHT

Aus Sicherheitsgründen

- Gerät nur an eine Schutzkontaktsteckdose mit ordnungsgemäß geerdetem Schutzkontakt anschließen.
- Alle angeschlossenen Geräte ebenfalls an Schutzkontaktsteckdosen mit ordnungsgemäß geerdetem Schutzkontakt anschließen.

危険

感電防止のため

- 電源コードは、正しく配線された接地（アース）極付きコンセントに接続してください
- この製品が接続される機器も正しい配線されたコンセントに接続してください。

위 험

감전 쇼크의 위험을 피하기 위하여:

- 전원은 반드시 적정 규격의 전선을 사용하시고 접지선이 연결된 접속기와 연결 하십시오.
- 본 제품과 연결되는 모든 기기는 반드시 적정 규격의 전선으로 접지선이 연결된 접속기와 연결되어 있어야 합니다.

DANGER
Turn power off and unplug the power cord from the receptacle before connecting or disconnecting signal cables.

FARE !
Før signalkablerne tilsluttes eller afmonteres:
Sluk for strømmen, og træk netledningen ud af stikkontakten.

PERIGO:
Desligue a força e desconecte o cabo de força da caixa antes de conectar ou desconectar os cabos de sinal.

VAARA:
Katkaise virta ja irrota verkkojohto pistorasiasta, ennen kuin kyket tai irrotat liitäntäkaapeleita.

DANGER !
Mettez le contrôleur hors tension et retirez le cordon d'alimentation de sa prise, avant de connecter ou de déconnecter les câbles d'interface.

PERIGO:
Desligue a corrente e retire o cabo de corrente eléctrica da tomada, antes de ligar ou de desligar os cabos de sinal.

FARE:
Slå av nettspenningen og trekk nettkabelen ut av kontakten før du tar ut eller kopler til signalkabler.

PERICOLO:
Spegnere l'unità e scollegare il cavo di alimentazione dalla presa, prima di collegare o scollegare i cavi segnali.

DANGER !
Mettez l'interrupteur de tension hors tension et débranchez le cordon d'alimentation de la prise avant de connecter ou de déconnecter des câbles de transmission.

GEVAAR !
Zet de netschakelaar op O (Uit) en trek de stekker uit het stopcontact vooraleer u signaalkabels los- of vastkoppelt.

VARNING — LIVSFARA:
Slå från strömmen och lossa nätkabeln från eluttaget innan du ansluter eller kopplar ur signalkablar.

PELIGRO:
Apague la alimentación eléctrica del equipo y desenchufe el cable del receptáculo antes de conectar o desconectar cables de señal.

VORSICHT:
Aus Sicherheitsgründen ist der Netzstecker zu ziehen, bevor Signalkabel angeschlossen oder aufgetrennt werden.

危険

信号ケーブルを接続したり、切り離したりするまえに、
電源を切って電源コードのプラグをコンセントから
抜いてください。

위 험

시그날 케이블을 연결하시거나 제거하시기
전에 전원을 끄고 콘센트로 부터 플러그를
뽑아 주십시오.

DANGER
To avoid a shock hazard, do not connect or disconnect any cables or perform installation, maintenance, or reconfiguration of this product during an electrical storm.

DANGER !
Pour éviter tout risque de choc électrique, ne manipulez aucun câble et n'effectuez aucune opération d'installation, d'entretien ou de reconfiguration de ce produit au cours d'un orage.

VAARA
Älä kytke tai irrota kaapeleita äläkä asenna tai huolla tätä laitetta tai muuta sen kokoonpanoa ukonilman aikana. Muutoin voit saada sähköiskun.

VORSICHT
Aus Sicherheitsgründen bei Gewitter an diesem Gerät keine Kabel angeschließen oder lösen. Ferner keine Installations-, Wartungs oder Rekonfigurationsarbeiten durchführen.

PERIGO
Para evitar perigo de choque, não conecte ou desconecte quaisquer cabos ou faça instalação, manutenção ou reconfiguração deste produto durante uma tempestade magnética.

GEVAAR !
Om het gevaar voor elektrische schokken te vermijden, mag u geen kabels aansluiten of loskoppelen en dit product niet installeren, onderhouden of opnieuw instellen tijdens een onweer.

PERICOLO
Per evitare scosse elettriche, non collegare o scollegare cavi o effettuare installazioni, riconfigurazioni o manutenzione di questo prodotto durante un temporale.

FARE
For å unngå elektrisk støt må ikke kabler kobles til eller fra. Du må heller ikke foreta installering, vedlikehold eller rekonfigurering av dette produktet under tordenvær.

PERIGO
Para evitar possíveis choques eléctricos, não ligue nem desligue cabos, nem instale, repare ou reconfigure a máquina, durante uma trovoada.

PELIGRO
Para evitar la posibilidad de descargas, no conecte o desconecte ningún cable, ni realice ninguna instalación, mantenimiento o reconfiguración de este producto durante una tormenta eléctrica.

VARNING — LIVSFARA

Vid åskväder ska du aldrig ansluta eller koppla ur kablar eller arbeta med installation, underhåll eller omkonfigurering av utrustningen.

FARE !

Undgå elektrisk stød:

Produktet må hverken installeres, vedligeholdes eller omkonfigureres i tordenvejr. Det samme gælder for tilslutning eller afmontering af kabler.

危険

雷が発生している間は、けっして機器を操作したり、あるいは
信号ケーブルの接続、切り離しはしないでください。

위 험

감전 쇼크의 위험을 피하기 위하여 천둥번개가 치는 동안에는 전원을 연결하거나 또는 끊지 마시고 또한 본 제품의 설치, 수리 및 부품교환을 하지 마시오.

List of Abbreviations

ARP	address resolution protocol
ASCII	American National Standard Code for Information Interchange
AUI	attachment unit interface
B	bel or byte
BAT	Basic Assurance Test
BIOS	Basic Input/Output System
BPDU	bridge protocol data unit
bps	bits per second
CCB	command control block
CEE-22	connector type for 3-wire power cords
CCITT	Comite Consultatif International Telegraphique et Telephonique. (The International Telegraph and Telephone Consultative Committee)
CONT	control
COS	customized operational services
CRC	cyclic redundancy check character
CRU	customer replaceable unit
CSMA/CD	carrier sense multiple access with collision detection
D	Deci. Ten or tenth part.
DA	digital-to-analog
DCE	data circuit-terminating equipment
DIP	dual in-line package
DNS	Domain Name Service
DOS	Disk Operating System
DSAP	destination service access point
DSU	data service unit
DTE	data terminal equipment
EAX	electronic automatic exchange
EIA	Electronics Industries Association
EPROM	erasable programmable read-only memory
FCC	Federal Communication Commission (U.S.)
FRU	field replaceable unit
FTP	File Transfer Protocol
Hz	hertz
ICMP	Internet Control Message Protocol
ID	Identification
IEC	International Electrotechnical Commission
IEEE	Institute of Electrical and Electronics Engineers, Inc.
in.	inch
ISO	Internation Organization for Standardization
KB	kilobyte = 1024 bytes for processor storage (memory) size, otherwise = 1000 bytes
kbps	Kilobits per second
kBps	Kilobytes per second
kg	kilogram
kVa	kilovolt-amperes
LAN	local area network
lb	pound, pounds
LBE	Directory where the contents of the operational diskette are stored after downloading
LED	light-emitting diode
LF	The line feed character
LLC	logical link control
LNM	Local Area Network Manager
m	meter, meters
MAC	media access control
MB	megabit or megabyte
Mbps	million bits per second
MIB	Management Information Base
mm	millimeter, millimeters
NAUN	nearest active upstream neighbor
NetBIOS	Network Basic Input/Output System
NSP	numeric space character
NVR	nonvolatile random access memory
OSI	open systems interconnection
PC	personal computer
PDU	protocol data unit
PROM	programmable read-only memory
PTF	program temporary fix
RARP	reverse address resolution protocol
RISC	Reduced instruction-set computer
RPS	ring parameter server

RT	Reperforator/transmitter
SAP	service access point
SMTP	Simple Mail Transfer Protocol
SNAP	subnetwork access protocol
SNMP	simple network management protocol
SNA	Systems Network Architecture
SSAP	source service access point
STP	Stop character
TCP/IP	Transmission Control Protocol/Internet Protocol
TELNET	In TCP/IP, an application protocol that allows a user at one site to access a remote system as if the user's display station were locally attached.
TFTP	trivial file transfer protocol
TOP	Technical and Office Protocol
TTY	teletypewriter
UDP	User Datagram Protocol
UTP	unshielded twisted pair
V	volts
V ac	volts alternating current
WAN	wide area network

Glossary

This glossary defines local area network terms and abbreviations used in this manual. It includes terms and definitions from the *IBM Dictionary of Computing* (New York; McGraw-Hill, Inc., 1994).

- The symbol (A) identifies definitions from the *American National Standard Dictionary for Information Systems*, ANSI X3.172-1990, copyright 1990 by the American National Standards Institute (ANSI). Copies can be purchased from the American National Standards Institute, 1430 Broadway, New York, New York 10018.
- The symbol (I) identifies definitions from the *Information Technology Vocabulary*, developed by Subcommittee 1, Joint Technical Committee 1, of the International Organization for Standardization and the International Electrotechnical Commission (ISO/IEC JTC1/SC1).
- The symbol (T) identifies definitions from draft international standards, committee drafts, and working papers being developed by ISO/IEC JTC1/SC1.

A

access unit. A unit that allows multiple attaching devices access to a token-ring network at a central point such as a wiring closet or in an open work area.

active. (1) Able to communicate on the network. A token-ring network adapter is active if it is able to transmit and receive on the network. (2) Operational. (3) Pertaining to a node or device that is connected or is available for connection to another node or device. (4) Currently transmitting or receiving.

adapter. In a LAN, within a communicating device, a circuit card that, with its associated software and/or microcode, enables the device to communicate over the network.

adapter address. Twelve hexadecimal digits that identify a local area network adapter.

address. (1) In data communication, the unique code assigned to each adapter, device, or workstation connected to a network. (2) A character, group of characters, or a value that identifies a register, a particular part of storage, a data source, or a data sink. The value is represented by one or more characters. (T) (3) To refer to a device or an item of data by its address. (A) (4) The location in the storage of a computer where data is stored. (5) In word processing, the location, identified by the address code, of a specific section of the recording medium or storage. (T)

attach. To make a device a part of a network logically. Contrast with *connect*.

attaching device. Any device that is physically connected to a network and can communicate over the network.

attachment unit interface (AUI). In a local area network, the interface between the medium attachment unit and the data terminal equipment within a data station. (I)

automatic single-route broadcast. A function used by some IBM bridge programs to determine the correct settings for, and set the bridge single-route broadcast configuration parameters dynamically, without operator intervention. As bridges enter and leave the network, the parameter settings may need to change to maintain a single path between any two LAN segments for single-route broadcast messages. See also *single-route broadcast*.

B

bit. Either of the binary digits: 0 or 1.

bridge. (1) An attaching device that connects two LAN segments to allow the transfer of information from one LAN segment to the other. A bridge may connect the LAN segments directly by network adapters and software in a single device, or may connect network adapters in two separate devices through software and use of a telecommunications link between the two adapters. (2) A functional unit that connects two LANs that use the same logical link control (LLC) procedures but may use the same or different medium access control (MAC) procedures. (T) Contrast with *gateway* and *router*.

bridge number. The bridge identifier that the user specifies in the bridge configuration. The bridge number distinguishes among parallel bridges. Parallel bridges connect the same two LAN segments.

broadcast. Simultaneous transmission of data to more than one destination.

broadcast frame. A frame that is simultaneously transmitted to more than one destination. A broadcast frame is forwarded by all bridges, unless otherwise restricted.

C

configuration. (1) The arrangement of a computer system or network as defined by the nature, number, and chief characteristics of its functional units. More specifically, the term may refer to a hardware configuration or a software configuration. (I) (A) (2) The devices and programs that make up a system, subsystem, or network. (3) See also *system configuration*.

configuration parameters. Variables in a configuration definition, the values of which characterize the relationship of a product, such as a bridge, to other products in the same network.

connect. In a LAN, to physically join a cable from a station to an access unit or network connection point. Contrast with *attach*.

D

data. (1) A representation of facts, concepts, or instructions in a formalized manner suitable for communication, interpretation, or processing by human or automatic means. (I) (A) (2) Any representations such as characters or analog quantities to which meaning is or might be assigned. (A)

data rate. See *data transfer rate, line data rate*.

data transfer. (1) The result of the transmission of data signals from any data source to a data receiver. (2) The movement, or copying, of data from one location and the storage of the data at another location.

data transfer rate. The average number of bits, characters, or blocks per unit of time passing between equipment in a data-transmission session. (I) The rate is expressed in bits, characters, or blocks per second, minute, or hour.

default. Pertaining to an attribute, value, or option that is assumed when none is explicitly specified.

default value. A value assumed when no value has been specified.

destination. Any point or location, such as a node, station, or particular terminal, to which information is to be sent.

destination address. A field in the medium access control (MAC) frame that identifies the physical location to which information is to be sent. Contrast with *source address*.

DIP switch. In an IBM personal computer, a two-position switch on a circuit board that is preset to control certain functions; the user can change the position of a DIP switch to satisfy special requirements.

disabled. (1) Pertaining to a function or feature of a device or program that is prevented from operating or from being used by some action or specification, such as a switch or a parameter value. (2) Contrast with *enabled.*

E

EIA-232. In data communications, a specification of the Electronic Industries Association (EIA) that defines the interface between data terminal equipment (DTE) and data circuit-terminating equipment (DCE), using serial binary data interchange.

enabled. (1) On a LAN, pertaining to an adapter or device that is active, operational, and able to receive frames from the network. (2) Pertaining to a function or feature that is allowed to operate or be used by some action or specification, such as a switch or parameter value. (3) Contrast with *disabled.*

Ethernet network. A baseband LAN with a bus topology in which messages are broadcast on a coaxial cable using a carrier sense multiple access/collision detection (CSMA/CD) transmission method.

F

file. A named set of records stored or processed as a unit. (T)

file name. (1) A name assigned or declared for a file. (2) The name used by a program to identify a file.

filter. A device or program that separates data, signals, or material in accordance with specified criteria. (A)

frame. (1) The unit of transmission in some LANs, including the IBM Token-Ring Network and the IBM PC Network*. It includes delimiters, control characters, information, and checking characters. On a token-ring network, a frame is created from a token when the token has data appended to it. On a token bus network (IBM PC Network), all frames including the token frame contain a preamble, start delimiter, control address, optional data and checking characters, end delimiter, and are followed by a minimum silence period. (2) In synchronous data link control (SDLC), the vehicle for every command, every response, and all information that is transmitted using SDLC procedures. Each frame begins and ends with a flag.

function. (1) A specific purpose of an entity, or its characteristic action. (A) (2) In data communications, a machine action such as carriage return or line feed.

H

header. The portion of a message that contains control information for the message such as one or more destination fields, name of the originating station, input sequence number, character string indicating the type of message, and priority level for the message.

hertz (Hz). A unit of frequency equal to one cycle per second.

Note: : In the United States, line frequency is 60Hz or a change in voltage polarity 120 times per second; in Europe, line frequency is 50Hz or a change in voltage polarity 100 times per second.

Hz. See *hertz*.

I

IEEE. Institute of Electrical and Electronics Engineers, Inc.

inactive. (1) Not operational. (2) Pertaining to a node or device not connected or not available for connection to another node or device. (3) Pertaining to a station that is only repeating frames or tokens, or both.

L

LAN. Local area network.

LAN segment. (1) Any portion of a LAN (for example, a single bus or ring) that can operate independently but is connected to other parts of the establishment network through bridges. (2) An entire ring or bus network without bridges.

LAN segment number. The identifier that uniquely distinguishes a LAN segment in a multi-segment LAN.

limited broadcast. Synonym for *single-route broadcast*.

link. (1) The logical connection between nodes including the end-to-end link control procedures. (2) The combination of physical media, protocols, and programming that connects devices on a network. (3) In computer programming, the part of a program, in some cases a single instruction or an address, that passes control and parameters between separate portions of the computer program. (I) (A) (4) To interconnect items of data or portions of one or more computer programs. (5) In SNA, the combination of the link connection and link stations joining network nodes.

LLC protocol. Logical link control protocol.

lobe. In the IBM Token-Ring Network, the section of cable (which may consist of several cable segments) that connects an attaching device to an access unit.

lobe receptacle. In the IBM Token-Ring Network, an outlet on an access unit for connecting a lobe.

local area network (LAN). A computer network located on a user's premises within a limited geographical area.
Note: Communication within a local area network is not subject to external regulations; however, communication across the LAN boundary may be subject to some form of regulation. (T)

locally administered address. An adapter address that the user can assign to override the universally administered address. Contrast with *universally administered address*.

M

MAC. Medium access control.

medium access control (MAC) protocol. In a local area network, the part of the protocol that governs communication on the transmission medium without concern for the physical characteristics of the medium, but taking into account the topological aspects of the network, in order to enable the exchange of data between data stations. (T)

medium attachment unit. In a data station on a local area network, a device used to couple the data terminal equipment to the transmission medium. (T)

message. (1) A logical partition of the user device's data stream to and from the adapter. (2) A group of characters and control bits transferred as an entity.

N

name. An alphanumeric term that identifies a data set, statement, program, cataloged procedure, or other hardware or software entity.

NetView. A host-based IBM licensed program that provides communication network management (CNM) or communications and systems management (C&SM) services.

network. (1) A configuration of data processing devices and software connected for information interchange. (2) An arrangement of nodes and connecting branches. Connections are made between data stations. (T)

network administrator. A person who manages the use and maintenance of a network.

network management. The conceptual control element of a station that interfaces with all of the architectural layers of that station and is responsible for the resetting and setting of control parameters, obtaining reports of error conditions, and determining if the station should be connected to or disconnected from the network.

network status. The condition of the network.

O

operating system. Software that controls the execution of programs. An operating system may provide services such as resource allocation, scheduling, input/output control, and data management. (A) Examples are IBM PC DOS and IBM OS/2*.

P

parallel bridge. One of the two or more bridges that connect the same two LAN segments in a network.

parameter. (1) A variable that is given a constant value for a specified application and that may denote the application. (I) (A) (2) An item in a menu or for which the user specifies a value or for which the system provides a value when the menu is interpreted. (3) Data passed between programs or procedures.

path. (1) In a network, any route between any two nodes. (T) (2) The route traversed by the information exchanged between two attaching devices in a network. (3) A command in IBM Personal Computer Disk Operating System (PC DOS) and IBM Operating System/2* (OS/2) that specifies directories to be searched for commands or batch files that are not found by a search of the current directory.

phase. The relative timing (position) of periodic electrical signals.

physical connection. The ability of two connectors to mate and make electrical contact. In a network, devices that are physically connected can communicate only if they share the same protocol. See also *logical connection*.

plug. (1) A connector designed to insert into a receptacle or socket. (2) To insert a connector into a receptacle or socket.

port. (1) An access point for data entry or exit. (2) A connector on a device to which cables for other devices such as display stations and printers are attached. Synonymous with *socket*.

procedure. A set of instructions that gives a service representative a step-by-step procedure for tracing a symptom to the cause of failure.

protocol. (1) A set of semantic and syntactic rules that determines the behavior of functional units in achieving communication. (I) (2) In SNA, the meanings of and the sequencing rules for requests and responses used for managing the network, transferring data, and synchronizing the states of network components. (3) A specification for the format and relative timing of information exchanged between communicating parties.

R

receive. To obtain and store information transmitted from a device.

receptacle. Electrically, a fitting equipped to receive a plug and used to complete a data connection or electrical path. See also *lobe receptacle.*

remove. (1) To take an attaching device off a network. (2) To stop an adapter from participating in data passing on a network.

ring network. A network configuration in which a series of attaching devices is connected by unidirectional transmission links to form a closed path. A ring of an IBM Token-Ring Network is referred to as a LAN segment or as a Token-Ring Network segment.

router. An attaching device that connects two LAN segments, which use similar or different architectures, at the reference model network layer. Contrast with *bridge* and *gateway*.

routing. (1) The assignment of the path by which a message will reach its destination. (2) The forwarding of a message unit along a particular path through a network, as determined by the parameters carried in the message unit, such as the destination network address in a transmission header.

S

server. (1) A device, program, or code module on a network dedicated to providing a specific service to a network. (2) On a LAN, a data station that provides facilities to other data stations. Examples are a file server, print server, and mail server.

single-route broadcast. The forwarding of specially designated broadcast frames only by bridges which have single-route broadcast enabled. If the network is configured correctly, a single-route broadcast frame will have exactly one copy delivered to every LAN segment in the network. Synonymous with *limited broadcast*. See also *automatic single-route broadcast*.

SNA. Systems Network Architecture.

source address. A field in the medium access control (MAC) frame that identifies the location from which information is sent. Contrast with *destination address*.

spanning tree protocol. A protocol in which only one bridge between any two LANs is authorized to copy and forward frames.

station. (1) A communication device attached to a network. The term used most often in LANs is an *attaching device* or *workstation*. (2) An input or output point of a system that uses telecommunication facilities; for example, one or more systems, computers, terminals, devices, and associated programs at a particular location that can send or receive data over a telecommunication line. See also *attaching device, workstation*.

switch. On an adapter, a mechanism used to select a value for, enable, or disable a configurable option or feature.

system. In data processing, a collection of people, machines, and methods organized to accomplish a set of specific functions. (I) (A)

system configuration. A process that specifies the devices and programs that form a particular data processing system.

Systems Network Architecture (SNA). The description of the logical structure, formats, protocols, and operational sequences for transmitting information units through, and controlling the configuration and operation of, networks.
Note: The layered structure of SNA allows the ultimate origins and destinations of information, that is, the end users, to be independent of and unaffected by the specific SNA network services and facilities used for information exchange.

T

telephone twisted pair. One or more twisted pairs of copper wire in the unshielded voice-grade cable commonly used to connect a telephone to its wall jack. Also referred to as “unshielded twisted pair” (UTP).

token. A sequence of bits passed from one device to another on the token-ring network that signifies permission to transmit over the network. It consists of a starting delimiter, an access control field, and an end delimiter. The access control field contains a bit that indicates to a receiving device that the token is ready to accept information. If a device has data to send along the network, it appends the data to the token. When data is appended, the token then becomes a frame. See *frame*.

token ring. A network with a ring topology that passes tokens from one attaching device (node) to another. A node that is ready to send can capture a token and insert data for transmission.

token-ring network. (1) A ring network that allows unidirectional data transmission between data stations by a token-passing procedure over one transmission medium so that the transmitted data returns to and is removed by the transmitting station. (T) The IBM Token-Ring Network is a baseband LAN with a star-wired ring topology that passes tokens from network adapter to network adapter. (2) A network that uses a ring topology, in which tokens are passed in a sequence from node to node. A node that is ready to send can capture the token and insert data for transmission. (3) A group of interconnected token rings.

transceiver. Any device that can transmit and receive traffic.

transfer rate. See *data transfer rate*.

Transmission Control Protocol/Internet Protocol (TCP/IP). A set of protocols that allow cooperating computers to share resources across a heterogeneous network.

transmit. To send information from one place for reception elsewhere.

transparent bridging. Interconnection of LANs with bridges so that any station can communicate with any other station in the network as though both stations were on the same LAN. All routing functions are handled entirely by the bridges.

tty. In the AIX operating system, any device that uses the standard terminal device interface. Tty devices typically perform input and output on a character-by-character basis.

twisted pair. A transmission medium that consists of two insulated conductors twisted together to reduce noise. (T)

U

universally administered address. The address permanently encoded in an adapter at the time of manufacture. All universally administered addresses are unique. Contrast with *locally administered address*.

V

version. A separate IBM-licensed program, based on an existing IBM-licensed program, that usually has significant new code or new function.

W

workstation. (1) An I/O device that allows either transmission of data or the reception of data (or both) from a host system, as needed to perform a job: for example, a display station or printer. (2) A configuration of I/O equipment at which an operator works. (T) (3) A terminal or microcomputer, usually one connected to a mainframe or network, at which a user can perform tasks.

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8229 Bridge Manual

Publication No. GA27-4025-00

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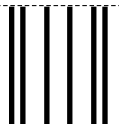
Tell Us What You Think!
GA27-4025-00

Cut or Fold
Along Line

Fold and Tape **Please do not staple** Fold and Tape



NO POSTAGE
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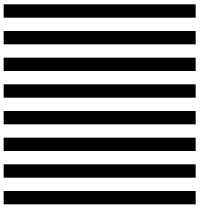

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Cut or Fold
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