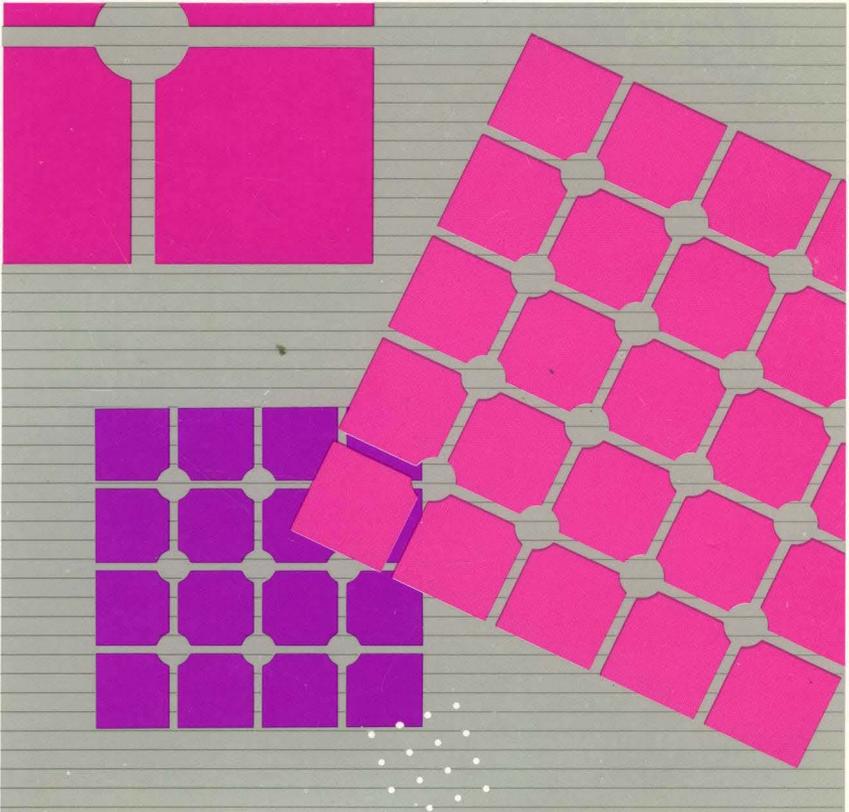




8209 LAN Bridge

GA27-3891-00

**Attachment
Module Guide
For Ethernet** and
IEEE 802.3 LANs**





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Attachment
Module Guide
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IEEE 802.3 LANs

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First Edition (September 1990)

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About This Manual

The primary purpose of this manual is to provide information about the installation and function of the IBM* 8209 LAN Bridge Attachment Module for Ethernet** Version 2 and IEEE 802.3 LANs. This manual can be used to begin problem analysis procedures.

Who Should Use This Manual

This manual was written for anyone who is connecting an Ethernet or IEEE 802.3 LAN to an IBM 8209 LAN Bridge (IBM 8209). This manual contains:

- Configuration planning information and instructions, for use by a network planner or administrator
- Attachment module installation instructions, configuration instructions, and problem analysis procedures. These instructions or tasks can be done by a network administrator or equipment installer.

What You Should Know

You should be familiar with the communications needs of your organization. You do not need a background in LANs, but you will need to be familiar with the physical organization of the LAN in which the IBM 8209 will be installed.

To install the attachment module in an IBM 8209, you will need:

- This *Attachment Module Guide*
- The *IBM 8209 LAN Bridge Customer Information* manual that is shipped with the IBM 8209
- Information from some of the publications listed in "Related Publications" on page xi.

In this manual:

- The IBM 8209 LAN Bridge is also referred to as the IBM 8209 and the bridge.

- The term *Ethernet attachment module* is a short term for IBM 8209 LAN Bridge Attachment Module for Ethernet and IEEE 802.3 LANs.
- The term *Ethernet LAN* refers to both Ethernet Version 2 and IEEE 802.3 LANs, unless specifically indicated otherwise.

How This Manual Is Organized

This manual contains the following chapters and appendixes:

- Chapter 1, Overview, summarizes the functions and capabilities of the Ethernet attachment module.
- Chapter 2, Planning for IBM 8209 Configuration, contains
 - Information to help you determine whether you need to do IBM 8209 basic and advanced configuration
 - Instructions for filling out the Bridge Planning Chart
 - Descriptions of attachment module configuration switch settings
 - Descriptions of advanced configuration parameters.
- Chapter 3, Basic Configuration and Attachment Module Installation, contains instructions for
 - Setting switches on the Ethernet attachment module to perform IBM 8209 basic configuration
 - Installing the Ethernet attachment module in the IBM 8209.
- Chapter 4, The IBM 8209 Utility Program, contains information about
 - Installing the IBM 8209 LAN Bridge Utility Program, Version 2.0 (Utility Program)
 - Using the Utility Program to change and display IBM 8209 and Ethernet attachment module configuration parameter values.
- Chapter 5, Problem Analysis, contains information to help you
 - Identify an IBM 8209 malfunction
 - Resolve simple problems with the IBM 8209 and the Ethernet attachment module
 - Provide information to your service representative to help isolate IBM 8209 component failures.

- Appendix A, Blank Worksheets, contains
 - A Bridge Planning Chart that you can copy and use as needed for IBM 8209 planning and configuration.
 - An address conversion table with an example and instructions for converting token-ring adapter addresses to Ethernet adapter addresses, and vice versa.
- Appendix B, How the IBM 8209 LAN Bridge Functions, contains information about how the IBM 8209 operates with the Ethernet attachment module.
- Appendix C, Utility Program Messages, contains a list of messages generated by the Utility Program, the meaning of each message, and any recommended action to take when a message appears.
- Appendix D, Ethernet Attachment Module Parts List, contains a list of part numbers for your service representative to use to order replacement attachment modules, attachment module wrap plugs, and Utility Program diskettes.

The last part of this manual contains a list of abbreviations, a glossary, and an index.

Related Publications

Table 0-1 lists related IBM manuals and the topics they address.

Note: The table heading abbreviations are:

- PL = Planning
- IN = Installation
- NS = Network Software
- NT = Network Theory
- PD = Problem Determination.

Title	PL	IN	NS	NT	PD
<i>IBM 8209 LAN Bridge Customer Information, SA21-9994</i>	X	X			X
<i>IBM 8209 LAN Bridge Service Information, SY31-9077</i>					X
<i>A Building Planning Guide for Communication Wiring, G320-8059</i>	X				
<i>Introduction to Local Area Networks, GC20-8203</i>	X			X	
<i>IBM Cabling System Planning and Installation Guide, GA27-3361</i>	X	X			X
<i>Using the IBM Cabling System with Communication Products, GA27-3620</i>	X				
<i>IBM Token-Ring Network Introduction and Planning Guide, GA27-3677</i>	X	X			
<i>IBM Token-Ring Network Installation Guide, GA27-3678</i>		X			X
<i>IBM Token-Ring Network Architecture Reference, SC30-3374</i>				X	
<i>IBM Token-Ring Network Problem Determination Guide, SX27-3710</i>					X
<i>IBM Token-Ring Network Guide for Small Networks, SK2T-0300</i>	X	X			X
<i>IBM Token-Ring Network Telephone Twisted-Pair Media Guide, GA27-3714</i>	X	X			X
<i>IBM Token-Ring Network Optical Fiber Cable Options, GA27-3747</i>	X				
<i>IBM Local Area Network Administrator's Guide, GA27-3748</i>	X	X	X	X	X

Table 0-1 (Page 2 of 2). Related Publications					
Title	PL	IN	NS	NT	PD
<i>IBM Cabling System Catalog, G570-2040</i>	X	X			
<i>IBM Cabling System Technical Interface Specification, GA27-3773</i>	X	X			
<i>IBM LAN Manager User's Guide, packaged with program diskettes</i>			X		X
<i>IBM Local Area Network Technical Reference, SC30-3383</i>				X	
<i>IBM Token-Ring Network Bridges and Management, GG24-3062</i>	X	X		X	
<i>Local Area Network Concepts and Products, GG24-3178</i>	X	X	X	X	
<i>IBM LAN Manager and NetView/PC Planning and Installation for Token-Ring Networks, GG24-3128</i>	X	X	X		
<i>Installation Guidelines for IBM Token-Ring Network Products, GG24-3291</i>	X	X			
<i>IBM Multisegment LAN Design Guidelines, GG24-3298</i>	X	X		X	
<i>IBM LAN Manager V2.0 and LAN Manager Entry V1.0 Installation Guidelines, GG24-3388</i>	X	X	X		

The following publications contain additional information:

- *IBM 8209 LAN Bridge Safety Information*
- *Institute of Electrical and Electronics Engineers 802.3 Local Area Network Considerations, GG22-9422*
- *IEEE Standards for Local Area Networks: Carrier Sense Multiple Access with Collision Detection (CSMA/CD) Access Method and Physical Layer Specifications, ANSI/IEEE Standard 802.3-1985 ISO Draft International Standard 8802/3, May 1986.*
- *IEEE Standards for Local Area Networks: Token-Ring Access Method and Physical Layer Specifications, ANSI/IEEE Standard 802.5-1985 ISO Draft International Standard 8802/5, September 1986.*

- *Draft IEEE Standard 802.1: Part D MAC Bridges, Unapproved Draft Published for Comment Only, Revision 7. Prepared by IEEE Project 802, P802.1D/D7, February 1989.*

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Chapter 1. Overview

The IBM* 8209 LAN Bridge Attachment Module for Ethernet** Version 2 and IEEE 802.3 LANs (Ethernet attachment module) allows devices on an Ethernet or IEEE 802.3 LAN segment to communicate with devices on an IBM Token-Ring Network segment through an IBM 8209 LAN Bridge (IBM 8209). The IBM 8209 with an Ethernet attachment module provides:

- Conversion between different access protocols (token-passing ring and Carrier Sense Multiple Access with Collision Detection or CSMA/CD)
- Frame format conversion for data transmission between the two LAN segments.

To a device on the IBM Token-Ring Network segment, the IBM 8209 appears as a source routing bridge to another IBM Token-Ring Network segment. The IBM 8209 is functionally transparent to any device on the Ethernet or IEEE 802.3 LAN segment.

When the Ethernet attachment module is installed in the IBM 8209, the IBM 8209 provides two LAN connections:

Connection	Description
Token-Ring	Network This connection is a four-wire lobe connection. The maximum distance of the lobe cable from the IBM 8209 to the access unit depends on the media type. The IBM 8209 supports either a 4- or 16-Mbps IBM Token-Ring Network segment.
Ethernet or	IEEE 802.3 This connection is a six-wire attachment unit interface (AUI) connection. The IBM 8209 with the Ethernet attachment module supports 10-Mbps Ethernet Version 2 or IEEE 802.3 LANs. The IBM 8209 can be up to 50 m (164 ft) from the transceiver (used to transmit and receive data) on the Ethernet LAN.

Figure 1-1 shows the IBM 8209 connected to an IBM Token-Ring Network access unit and an Ethernet or IEEE 802.3 LAN transceiver.

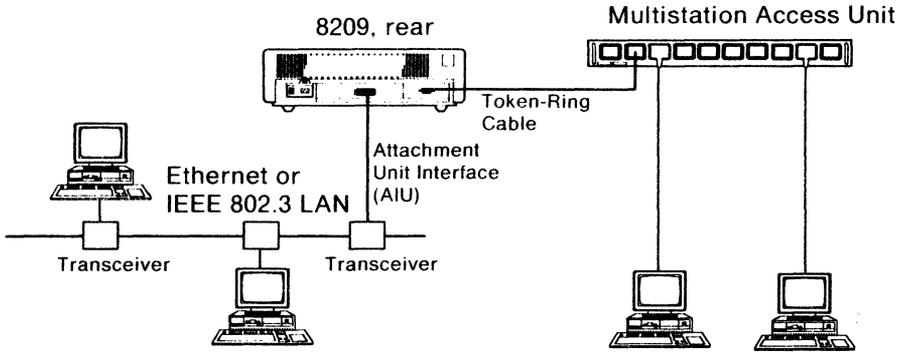


Figure 1-1. IBM 8209 Connected to a Token-Ring Network Access Unit and an Ethernet Transceiver

A simplified connection diagram using the IBM 8209 is shown in Figure 1-2.

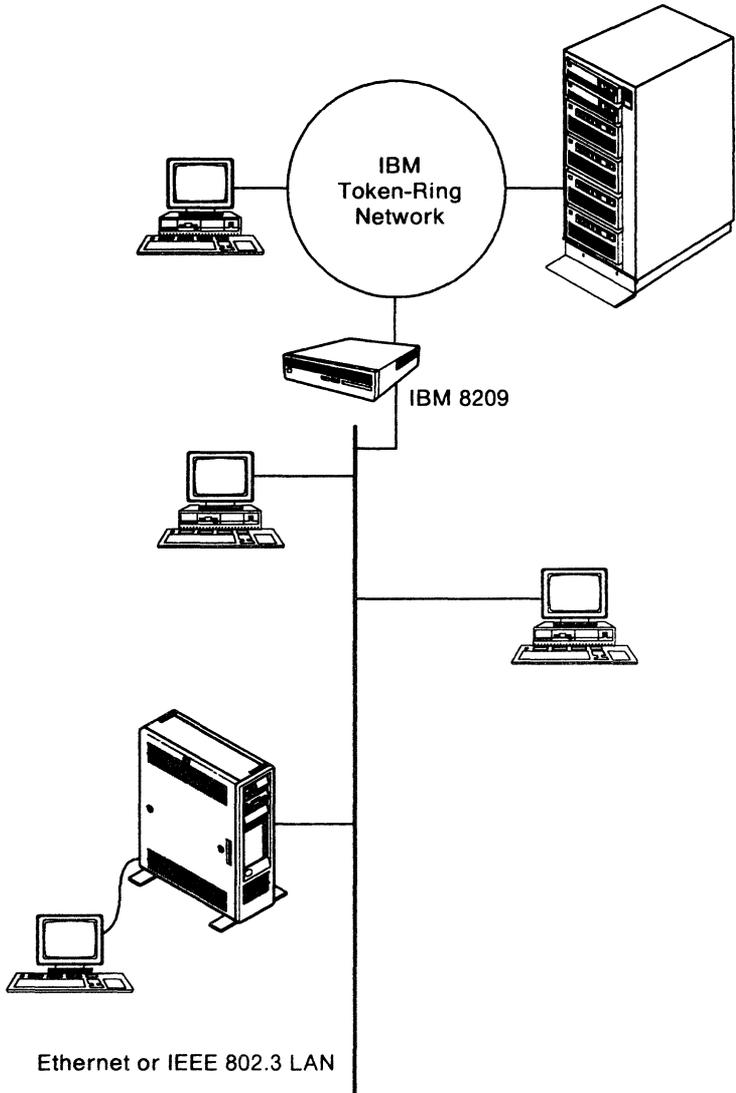


Figure 1-2. The IBM 8209 between an IBM Token-Ring Network and an Ethernet/IEEE 802.3 LAN

Functions of the Ethernet Attachment Module

The Ethernet attachment module:

- Supports a 10-Mbps Ethernet Version 2 or IEEE 802.3 LAN.
- Supports Ethernet Version 2 and IEEE 802.3 traffic at the same time.
- Uses spanning-tree protocol on the Ethernet or IEEE 802.3 LAN to allow only a single path between any two stations in the network.

For more information, see "Spanning-Tree Protocol" on page B-10.

- Enables the transfer of frames between stations on an IBM Token-Ring Network segment and stations on an Ethernet Version 2 or IEEE 802.3 LAN segment, with appropriate access protocol conversion and data frame format conversion.

For more information, see "Frame Format Conversions" on page B-12.

- Allows IBM Token-Ring Network stations to communicate with Ethernet or IEEE 802.3 LAN stations without affecting communications between IBM Token-Ring Network stations.
- Provides isolation between the LAN segments so that unnecessary LAN activity
 - Does not intrude from one LAN segment into the other LAN segment
 - Does not significantly increase contention problems on either LAN.

This process is called **filtering**. For more information, see "Filtering" on page B-7.

Supported LAN Types and Protocols

The IBM 8209 with the Ethernet attachment module installed provides:

- Access protocol support (token-passing) for attachment to an IBM Token-Ring Network segment

The *IBM 8209 LAN Bridge Customer Information* manual contains more information about IBM Token-Ring Network support.

- Access protocol support (CSMA/CD) for attachment to an Ethernet Version 2 or IEEE 802.3 LAN segment.
- Access protocol conversion and frame format conversion for each LAN connected to it.

This *Attachment Module Guide* describes the above items.

Ethernet and IEEE 802.3

The following are the CSMA/CD LAN types commonly called Ethernet:

- Ethernet Version 1
- Ethernet Version 2
- IEEE 802.3.

The IBM 8209 supports both the Ethernet Version 2 and IEEE 802.3 implementations. IEEE 802.3 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 IBM 8209. 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 and IEEE 802.3 exist at protocol levels, requiring the IBM 8209 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 1-6, the IBM 8209 provides token-ring to Ethernet frame format

conversion and token-ring to IEEE 802.3 frame format conversion.

Protocols and Interfaces

The IBM 8209 supports the use of SNA, Network Basic Input/Output Services (NETBIOS), and Transmission Control Protocol/Internet Protocol (TCP/IP) on both the IEEE 802.3 networks and Ethernet networks.

The IBM 8209 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

Two of the switches on the attachment module allow you to configure the IBM 8209 to:

- Operate exclusively in one of the two specific modes of frame format conversion
- Dynamically determine from frame format and database contents which of the two modes of conversion is needed for a frame (automatic mode selection).

When mode 1, mode 2, and automatic mode selection are correctly used with LAN protocols, the IBM 8209 is functionally transparent to application programs running in stations on either side of the bridge.

For information about the switches on the Ethernet attachment module, see “Bridge Planning Chart Section 2 — Basic Configuration Switch Settings” on page 2-5.

IBM 8209 Databases

The IBM 8209 maintains a block of non-volatile storage that acts as two separate databases:

- A token-ring database
- An Ethernet database.

In the Ethernet database, the IBM 8209 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 IBM 8209 automatic mode selection is enabled, the IBM 8209 can check the Ethernet database for the frame format of the Ethernet station to which a token-ring originated frame is sent. The IBM 8209 can then convert the token-ring frame format to the correct Ethernet format (Ethernet Version 2 or IEEE 802.3).

The IBM 8209 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 database for an Ethernet station, the IBM 8209 uses the frame format conversion mode selected by the attachment module mode selection switch.

For more information about the IBM 8209 database, see "Databases" on page B-5.

Mode 1

In mode 1, the IBM 8209 performs frame format conversion between Ethernet Version 2 and IBM Token-Ring Network frame formats.

In mode 1, the IBM 8209 provides:

- Subnetwork access protocol (SNAP) header processing to support the TCP/IP protocol.

For more information about SNAP support, see “Token-Ring to Ethernet Conversion” on page B-13.

- RT* (RISC technology protocol) header processing for SNA, NETBIOS, and other logical link control- (LLC-) based protocols

For more information about LLC support, see “Token-Ring to Ethernet Conversion” on page B-13 and “Token-Ring to Ethernet Conversion for LLC-Based Protocols” on page B-19.

Mode 2

In mode 2, the IBM 8209 performs frame format conversion between IEEE 802.3 and IBM Token-Ring Network frame formats.

In mode 2, the IBM 8209 transparently supports the transfer of LLC data for LLC-based protocols such as SNA and NETBIOS.

Note: The setting of the attachment module switches to select mode 1 or 2 and to enable or disable automatic mode selection are described in “Basic Configuration Switch Setting Descriptions” on page 2-7.

Supported Network Configurations

The IBM 8209 with an Ethernet attachment module supports communications between:

- Stations connected to an IBM Token-Ring Network segment and stations connected to an Ethernet or IEEE 802.3 LAN, with both LAN segments connected to the same IBM 8209 (as shown in Figure 1-2 on page 1-3)
- Stations that are separated from the IBM 8209 by one or more bridged LANs, for networks containing just IBM 8209s (see Figure 1-3 on page 1-10), and for networks containing IBM 8209s and other types of bridges (see Figure B-9 on page B-21).

An example of a complex LAN using the IBM 8209 is shown in Figure 1-4 on page 1-11.

For an example of how the IBM 8209 works with a network, see “An Example of a Network Using an IBM 8209” on page B-21.

Supported Cable Systems

An attachment unit interface (AUI) cable connects the Ethernet attachment module to a transceiver on an Ethernet or IEEE 802.3 LAN. The cable can be up to 50 m (164 ft) long, if the cable meets the requirements for AUI cabling as described in the IEEE 802.3 standard.

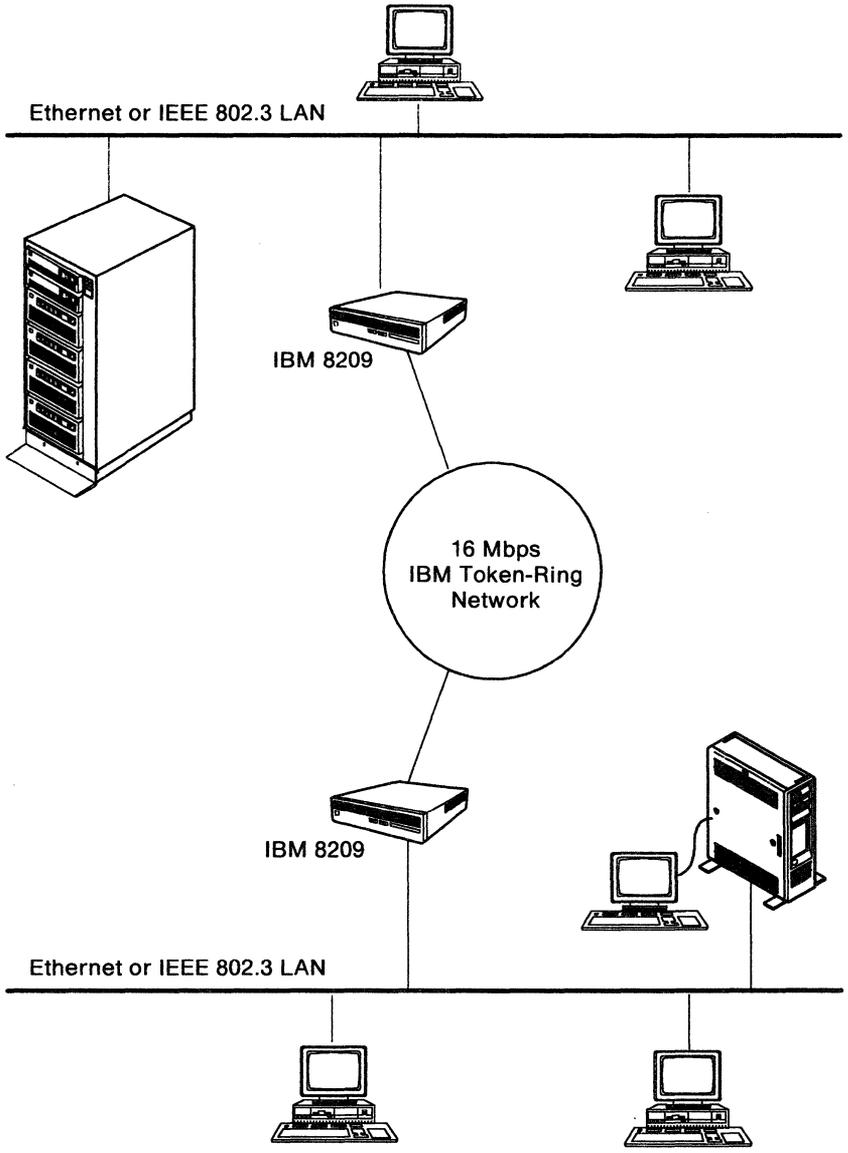


Figure 1-3. Token-Ring Backbone Configuration

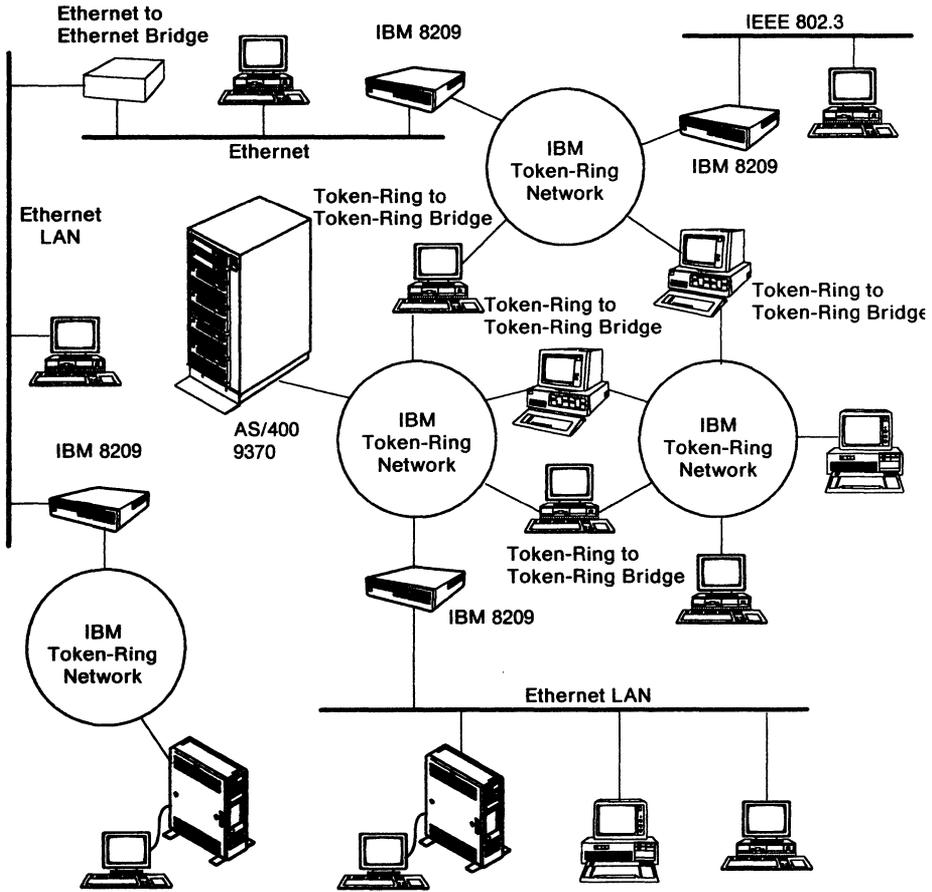


Figure 1-4. Connecting Multiple LANs with the IBM 8209 and Other Bridges

Chapter 2. Planning for IBM 8209 Configuration

The information in this chapter helps you to:

- Make the decisions necessary to configure the IBM 8209 correctly for your network

The section beginning on page 2-26 contains:

- Detailed descriptions of the configuration parameters
 - Tables that show default values and value ranges
 - IBM 8209 Bridge Utility Program (Utility Program) panel examples.
- Fill out a copy of the Bridge Planning Chart to specify the values to use for the configuration parameters for this bridge.

A blank original of the Bridge Planning Chart is in Appendix A, "Blank Worksheets."

The Bridge Planning Chart is used to help you:

- Install the bridge hardware
- Do the basic and advanced bridge configurations, if needed
- Analyze and resolve problems with the IBM 8209 in your network.

You may also need to refer to the following documents to complete the Bridge Planning Chart:

- The *IBM Token-Ring Network Introduction and Planning Guide* for information on physical placement and labeling of the bridge hardware and cable connections in the network.
- The *IBM Local Area Network Administrator's Guide* for information on determining the values for configuration parameters that affect network data flow and network management (locally administered addresses and server functions, for example).

The IBM 8209 Bridge Planning Chart

You should fill out a copy of the Bridge Planning Chart for each IBM 8209 in your network. The chart is used for hardware installation, bridge configuration, and problem determination.

Appendix A contains a blank Bridge Planning Chart. Before filling out the chart, make the required number of copies of the blank original. Save the original for making future copies.

When you have finished filling out the Bridge Planning Chart:

- Give a copy to the person who will install the bridge hardware and prepare the Utility Program working disk or diskette.
- File a copy with the other permanent records for your network.

Each time you change the configuration of a bridge in the network, you should fill in a new Bridge Planning Chart, use it to make the changes, and file a copy of the chart with your network documentation.

Filling Out the Bridge Planning Chart

You can fill out the sections of the Bridge Planning Chart as you read this chapter:

- The chart heading identifies the bridge and indicates the type of configuration needed for the bridge.
- Section 1 shows the physical location of the bridge in your network.
- Section 2 indicates the basic configuration settings for the Ethernet attachment module switches.
- Section 3 indicates the parameter values to specify to define the IBM 8209 to the Utility Program.
- Section 4 indicates the parameter values to specify when you use the Utility Program to do advanced configuration.

The Chart Heading

In the spaces provided at the top of the chart:

- Write the date.
- Write the unique bridge name or number that you select to identify this bridge in your network.

This identification can be the bridge number set by the Ethernet attachment module switches, or the name or number that you specify in the advanced configuration.

- Indicate the need for basic and advanced configuration.

Place a check mark in the appropriate space on the chart to indicate whether basic or advanced configuration or both are needed for this bridge.

For each type of configuration that is needed, continue to read this chapter and fill in the appropriate part of the Bridge Planning Chart with the values to specify during the configuration.

Bridge Planning Chart Section 1 — Physical Connections

This section of the chart shows the physical connection of the bridge to each of the two LAN segments.

At the center of the sketch write the following information about the IBM 8209:

- Physical location (room, building, city)
- Device identification number (for your record-keeping).

Write on the chart the following information for the connections to the IBM 8209 token-ring built-in adapter:

1. The number of the cable, if applicable
2. The type of cable connected to the IBM 8209 token-ring connector — either an IBM Token-Ring Network adapter cable or Type 3 Media Filter (if the Token-Ring Network uses telephone twisted-pair media as its lobe wiring)
3. The number of the faceplate to which the cable is attached, if applicable
4. The location, identification number, and connector number of the access unit or transceiver.

Return to step 1 to complete Section 1 for the Ethernet attachment module connections.

Bridge Planning Chart Section 2 — Basic Configuration Switch Settings

The five switches on the attachment module are used to indicate to the IBM 8209 the values of the basic configuration parameters.

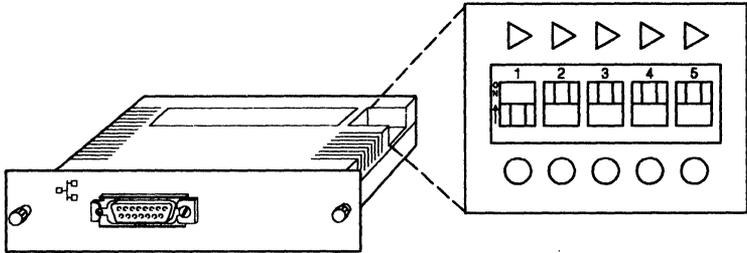


Figure 2-1. IBM 8209 Ethernet Attachment Module

The attachment module is shipped with the preset configuration shown in Table 2-1.

Table 2-1. Preset Configuration Switch Settings	
Switch Number and Function	Preset Default
1 Automatic Mode Selection	▲ Enabled
2 Mode Selection	● Ethernet Version 2
3 and 4 Bridge Number and Ethernet LAN Segment Number	● ● Bridge Number = 0 LAN Segment Num. = X'FF0'
5 Token-Ring Network Data Transfer Rate	● 4 Mbps

Changing the Preset Configuration

To fill in Section 2 of the Bridge Planning Chart, do the following:

- 1** Determine whether any switch positions need to be changed from the preset defaults.

To determine whether the switch settings need to be changed for an IBM 8209 in your network, read the information about each switch in "Basic Configuration Switch Setting Descriptions" on page 2-7.

Note: You may also want to read additional information about the functions and defaults of the configuration parameters in "Advanced Configuration Parameter Descriptions" on page 2-28. Advanced configuration parameter values override the switch settings.

- 2** For each switch that you decide to change from the preset position, indicate in Section 2 of the Bridge Planning Chart the position (▲ or ●) to set each switch during basic configuration.

For each switch, place an X under either the ▲ column or the ● column on the chart.

Basic Configuration Switch Setting Descriptions

Use the following descriptions to:

- Determine whether to change the setting of each Ethernet attachment module switch from the preset configuration position.
- Complete Section 2 of the Bridge Planning Chart if any switch settings need to be changed.

Switch 1 — Automatic Mode Selection

The setting of switch 1 determines whether automatic mode selection is enabled or disabled.

- When automatic mode selection is **enabled**, the IBM 8209 uses the Ethernet database to determine whether to convert IBM Token-Ring Network-originated frames to Ethernet Version 2 format or to IEEE 802.3 format.

For each station that originates frames on the Ethernet LAN, the IBM 8209 records the frame format used by the station in the Ethernet database, along with the station's adapter address. The IBM 8209 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 destination station (the station has not yet originated a frame on the Ethernet LAN), the IBM 8209 converts the token-ring frame to the format indicated by the mode selection switch on the attachment module.

For more information about the Ethernet database, see "Databases" on page B-5.

Set switch 1 to ▲ to enable automation mode selection if

- Some stations on the Ethernet LAN use the Ethernet Version 2 frame format and other stations 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 IBM 8209 converts token-ring frames to the format indicated by the setting of the attachment module mode selection switch (Ethernet Version 2 format or IEEE 802.3 format). The IBM

8209 does not search the Ethernet database for a destination frame format entry.

Set switch 1 to ● to disable automatic mode selection if you know that

- All stations on the Ethernet or IEEE 802.3 LAN that is connected to the IBM 8209 are using one frame format exclusively (either all Ethernet Version 2 format or all IEEE 802.3 format).
- All communicating stations use the same frame format (Ethernet or IEEE 802.3), although the frames must pass across a different type of LAN in the route to their destination. For example, see the network configurations shown in Figure 1-2 on page 1-3 and Figure 1-3 on page 1-10.

How Switches 1 and 2 Work Together

When automatic mode selection is enabled (switch 1 is set to ▲), the IBM 8209 examines switch 2 for the mode selection only if the IBM 8209 cannot find the frame format for the destination station in its Ethernet database.

The IBM 8209 will **not** find the frame format for the destination station in the database when:

- 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 IBM 8209. The IBM 8209 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.

The IBM 8209 keeps the frame format information for an Ethernet LAN station in the Ethernet database until:

- The IBM 8209 power is turned off
- The Ethernet LAN station does not transmit for so long that the IBM 8209 removes the format entry for that station from its database. (The **aging time** expires for that database entry. The length of the aging time period can be changed

by using the Utility Program. See “Spanning-Tree Parameters” on page 2-43.)

Switch 2 — Mode Selection

The setting of switch 2 determines whether the IBM 8209 expects frames on the Ethernet LAN to be in Ethernet Version 2 format or IEEE 802.3 format.

- **Mode 1**

When switch 2 is set to ●, the IBM 8209 expects all frames transmitted over the Ethernet LAN to be in Ethernet Version 2 format.

In mode 1, the IBM 8209 provides

- Frame format conversion between Ethernet Version 2 and token-ring frame formats
- SNAP header processing for TCP/IP and RT header (RISC technology protocol) processing for SNA and NETBIOS.

- **Mode 2**

When switch 2 is set to ▲, the IBM 8209 expects all frames transmitted over the Ethernet LAN to be in IEEE 802.3 format.

In mode 2, the IBM 8209 provides frame format conversion between IEEE 802.3 and token-ring frame formats.

When automatic mode selection is disabled (switch 1 is set to ●), the IBM 8209 provides processing and conversion for only those frames from the Ethernet LAN that are in the format indicated by the setting of switch 2.

Switches 3 and 4 — Bridge Number and LAN Segment Number

Switches 3 and 4 can be used to set the IBM 8209 bridge number and the Ethernet LAN segment number to one of four combinations, shown in Table 2-2 on page 2-11.

Note: You must do an advanced configuration, by using the IBM 8209 Utility Program or a network management program, to:

- Change the IBM 8209 bridge number, Ethernet LAN segment number, or both to a value other than those shown in Table 2-2 on page 2-11.
- Change the IBM Token-Ring Network LAN segment number, which cannot be set in the switches, from its default of 1.

The IBM 8209 Bridge Number

The settings of switches 3 and 4 select a bridge number of 0, 1, 2, or 3. Bridge numbers 4 through 15 (4-F hexadecimal) can be selected only during advanced configuration, by using the Utility Program or a network management program to override the values set in switches 3 and 4.

IBM 8209 LAN Segment Numbers

The IBM Token-Ring Network segment and the Ethernet LAN segment to which the IBM 8209 is connected must each have a unique LAN segment number.

The LAN segment number for the IBM Token-Ring Network segment has a default value of 1, which can be changed by using the Utility Program or a network management program.

Switches 3 and 4 allow you to select one of the four Ethernet LAN segment numbers shown in Table 2-2 on page 2-11.

The switches are preset to a bridge number of 0 and an Ethernet LAN segment number of X'FF0'. Table 2-2 shows you how to set the switches to one of four combinations of values for the bridge number and the Ethernet LAN segment number.

Table 2-2. Switches 3 and 4			
Switch 3	Switch 4	Bridge Number	Ethernet LAN Segment Number
●	●	0	X'FF0'
●	▲	1	X'FF1'
▲	●	2	X'FF2'
▲	▲	3	X'FF3'

Some programs that can be used to override the switch settings are:

- The IBM 8209 Utility Program
- The IBM LAN Manager program
- The IBM LAN Network Manager program.

In most cases, LAN segment numbers must be unique throughout the network. Bridge numbers must be unique if the bridges have links with network management programs.

Switch 5 — IBM Token-Ring Network Data Transfer Rate (4 Mbps or 16 Mbps)

Switch 5 indicates to the IBM 8209 the data transfer rate being used by the IBM Token-Ring Network segment connected to the IBM 8209. The IBM 8209 token-ring port must transfer data at the same rate as the rest of the devices on the IBM Token-Ring Network segment.

- Set switch 5 to ● if the IBM Token-Ring Network segment and the IBM 8209 token-ring port transfer data at 4 Mbps.
- Set switch 5 to ▲ if the IBM Token-Ring Network segment and the IBM 8209 token-ring port transfer data at 16 Mbps.

Logic Board Reset Procedure

Switch 5 can also be used to reset the advanced configuration parameter values in IBM 8209 non-volatile storage back to the original factory defaults. This is called a *Logic Board Reset*. You may want to do a logic board reset in preparation for:

- Moving the IBM 8209 to another LAN environment where the default configuration parameter values are acceptable
- Redefining the configuration to meet new network requirements
- Installing a different attachment module in the IBM 8209.

To reset the logic board:

- 1 Set the IBM 8209 Power switch to the O (off) position.
- 2 Remove the attachment module that is currently installed in the IBM 8209, if any.
- 3 Change the setting of switch 5 to the opposite of its position the last time the IBM 8209 Power switch was turned on.
- 4 Install the attachment module with the changed switch setting in the IBM 8209.
- 5 Set the IBM 8209 Power switch to the | (on) position.
- 6 Wait about 40 seconds, until the Power (Ⓢ) and Ready (R) lights are on and the other lights are off.
- 7 Set the IBM 8209 Power switch to the O (off) position.
- 8 If necessary, remove the module from the IBM 8209.
- 9 Set switch 5 (and the other switches) for normal operation on the module you are going to use in the IBM 8209, and insert the module in the IBM 8029.

When the IBM 8209 power is turned on, the IBM 8209 recognizes that switch 5 has been set in the opposite position from what it was the last time the power was turned on. The IBM 8209 then clears all configuration values from its non-volatile storage. This includes all values defined by using either the Utility Program or a network management program during advanced configuration.

Bridge Planning Chart Section 3 — Bridge Definition and System Definition

This section of the chart corresponds with the Utility Program panels for the bridge definition function and the system definition function.

Table 2-3 lists the bridge definition and system definition parameters required by the Utility Program, the default values, and the allowed ranges for these parameters.

The parameter descriptions follow the table.

Parameter Description	Default Value	Allowed Range
Bridge Definition		
Bridge name	(none)	1-8 characters
Link during bring-up	N	Y, N
Base adapter address	(none)	See note 1.
Ethernet bridge adapter address (in IEEE 802.5 format)	(none)	See note 2.
System Definition		
Reporting link password	00000000	

Notes:

1. When the IBM 8209 is initially installed and configured, you must specify the token-ring adapter universally administered address.

You can then define a locally administered address in the bridge configuration. If you do so, after you finish the configuration you must unlink from the bridge, change this address to the locally administered address, and reestablish the link with the bridge.

2. When the IBM 8209 is initially installed and configured, you must specify here the adapter address obtained by adding 1 to the token-ring universally administered adapter address.

You can then define a locally administered address in the bridge configuration. If you do so, after you finish the configuration you must unlink from the bridge, change this address to the locally administered address, and reestablish the link with the bridge.

Bridge Definition Parameters

```
DFIPBD25                      IBM 8209 UTILITY PROGRAM
                               Add Bridge Definition
-----
Type the information below and press Enter.

Bridge name . . . . . [      ]           1-8 characters
Link during bring-up? . . . . . [N]       Y=Yes, N=No

Bridge adapters:
Base adapter address . . . . . [      ]   12 hexadecimal digits
Module adapter address . . . . . [      ]  12 hexadecimal digits

Comments . . . . . [      ]

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

Figure 2-2. Utility Program Bridge Definition

Bridge Name

Explanation: This parameter assigns a 1-8 character name to this IBM 8209. The bridge name is used to identify to a network management program the bridge for which a network management function is requested.

Link During Bring-up

Explanation: This parameter indicates whether a communication link is to be established automatically with the bridge during network management program initialization, or is to be established by the network management program operator sometime after initialization is complete.

Base Adapter Address

Explanation: This parameter defines to the network management program the 12-digit hexadecimal adapter address used by the IBM 8209 token-ring built-in adapter.

This address can be the universally administered address or a locally administered address.

When the IBM 8209 is initially installed and configured, you must specify the token-ring adapter universally administered address.

You can then define a locally administered address in the bridge configuration. If you do so, after you finish the configuration you must unlink from the bridge, change this address to the locally administered address, and reestablish the link with the bridge.

Note: You may at some time establish a link from an IBM LAN Manager or IBM LAN Network Manager to an IBM 8209 that is connected to an Ethernet backbone LAN segment. If you have a problem establishing the link, try swapping the order of the IBM 8209 adapter addresses in the LAN Manager bridge definition (define the Ethernet adapter first).

Module Adapter Address

Explanation: This parameter defines to the network management program the 12-digit hexadecimal adapter address used by the IBM 8209 Ethernet attachment module adapter.

When the IBM 8209 is initially installed and configured, you must specify here the adapter address obtained by adding 1 to the token-ring universally administered adapter address.

You can then define a locally administered address in the bridge configuration. If so, after you finish the configuration you must unlink from the bridge, change this address to the locally administered address, and reestablish the link with the bridge.

Note: You may at some time establish a link from an IBM LAN Manager or IBM LAN Network Manager to an IBM 8209 that is connected to an Ethernet backbone LAN segment. If you have a problem establishing the link, try swapping the order of the IBM 8209 adapter addresses in the LAN

Manager bridge definition (define the Ethernet adapter first).

Comments

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

System Definition

```
DFIPSD50                      IBM 8209 UTILITY PROGRAM
                               System Definition
-----
Type in a new password, then press Enter.

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

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

Figure 2-3: System Definition Reporting Link Password

Reporting Link Password

Explanation: Specify here the link password for link 0, if a nonzero password is defined to the bridge for link 0.

- Write the nonzero link password in the Reporting Link Password space in Section 3 of the Bridge Planning Chart.
- Write the **same** password in the Link 0 Password space in Section 4 of the Bridge Planning Chart (see “Link Passwords” on page 2-46).

Notes:

1. The Utility Program must use link 0 to establish a link with the IBM 8209, and is therefore the controlling network management program for the IBM 8209. As long as the Utility Program is running and linked to an IBM 8209, other network management programs can link to that IBM 8209 only in observing status (using link 1, 2, or 3).

2. If the default password of all zeros is used for link 0 in the bridge configuration, the reporting link password is also all zeros.
3. If the Utility Program is to establish a link with more than one IBM 8209, the same link password must be defined for link 0 in the bridge configuration for all of the IBM 8209s linked to the same Utility Program.
4. When the IBM 8209 is initially installed and configured, you can specify any valid reporting link password here (as long as the link 0 password is still all zeros). You can then change the link password for link 0 in the configuration. If you change the link 0 password in the configuration, you must unlink from the bridge, change this reporting link password to the new password for link 0, and reestablish the link with the bridge.

Bridge Planning Chart Section 4 – Utility Program Advanced Configuration Parameters

This section of the chart corresponds with the panels for the Utility Program Configure Bridge Parameters function.

Table 2-4 on page 2-26 lists the advanced configuration parameters that can be changed by the Utility Program, the default values, and the allowed ranges for these parameters.

“Advanced Configuration Parameter Descriptions” on page 2-28 contains descriptions of the configuration parameters and examples of Utility Program panels used to do advanced configuration.

Use the table and the descriptions to help you:

- Decide whether to change any parameter values from the defaults
- Determine what value to assign to each changed parameter.

To fill out this section of the Bridge Planning Chart:

- 1 In “Advanced Configuration Parameter Descriptions” on page 2-28, read the description of each parameter.
- 2 In the appropriate spaces on the chart:
 - Write the value to use for each changed parameter.
 - Write a dash in the space if the default value is to be used.

Determining Your Need For Advanced Configuration

In many cases, all the necessary IBM 8209 configuration for a particular LAN can be done by setting the configuration switches on the Ethernet attachment module during basic configuration. (See “IBM 8209 Basic Configuration” on page 3-2 and “Bridge Planning Chart Section 2 — Basic Configuration Switch Settings” on page 2-5.)

To meet additional needs of your network, however, one or more programs can be used to do advance configuration to:

- Change configuration parameter values that cannot be set in the attachment module configuration switches
- Override the values set in the attachment module switches without changing the physical switch positions.

Each program used for advanced configuration of the IBM 8209 runs in a personal computer that is attached to a LAN segment in the network with the IBM 8209. “Programs to Use for Advanced Configuration” on page 2-24 contains more information about how to determine which programs you need and how to use the programs you choose.

Advanced configuration of the IBM 8209 is required if you need to:

- Specify an IBM Token-Ring Network LAN segment number for the IBM 8209 other than the default value of 1.
- Specify an IBM 8209 bridge number, an Ethernet LAN segment number, or an IEEE 802.3 LAN segment number other than what can be set using the configuration switches.

For more information about setting the configuration switches, see “IBM 8209 Basic Configuration” on page 3-2.

- Enter static Ethernet or IEEE 802.3 database entries into the Ethernet database.

For more information about the database, see “Databases” on page B-5.

- Define filter values for one or both LAN segments connected to the IBM 8209.

For more information about filters, see “Filtering” on page B-7.

- Change the values for any of the other advanced configuration parameters, including
 - Spanning-tree
 - Address conversion and mapping
 - Broadcast address support
 - LLC support and service access point (SAP) definition
 - Locally administered addresses
 - Management server support (parameter server, error monitor, and configuration report server).

For more information about these parameters, see “Advanced Configuration Parameter Descriptions” on page 2-28.

Programs to Use for Advanced Configuration

Advanced configuration is done with one or more network management programs that run in a personal computer that is connected to a LAN segment in the network with the IBM 8209.

Network management programs that may be used are the:

- IBM 8209 Utility Program
- IBM LAN Manager program, Version 1 or 2
- IBM LAN Network Manager program, Version 1.0 or 1.1.

The Utility Program, the IBM LAN Manager programs, and the IBM LAN Network Manager programs have different capabilities. You need to decide which parameters and network management information you need to access before you choose to use one or more of these programs. You may already have a network management program in your network that can also be used with the IBM 8209.

Refer to the instructions shipped (either in hardcopy or in online help text) with each program for more information about installing, loading, and operating the program.

The IBM 8209 Utility Program

The Utility Program diskettes are packaged with the Ethernet attachment module. The Utility Program enables you to:

- Display and change Ethernet and IEEE 802.3 LAN configuration parameters (including spanning-tree parameters, static database entries, and filter parameters)
- Change the LAN segment number for either LAN segment connected to the IBM 8209
- Change the bridge number for the IBM 8209, to either override the attachment module switch setting or to select a value between 4 and 16.
- Display Ethernet and IEEE 802.3 LAN error counters.

The Utility Program runs in a personal computer connected to a LAN segment in the network with the IBM 8209 you are configuring.

The IBM LAN Manager Program, Versions 1 and 2

The IBM LAN Manager must be purchased separately, and runs in a personal computer attached to an IBM Token-Ring Network segment in the same network as the IBM 8209.

The IBM LAN Manager allows you to:

- Set any of the IBM 8209 configuration parameters related to the IBM Token-Ring Network segment to which the IBM 8209 is connected
- Retrieve IBM Token-Ring Network status and performance information.

Note: You may choose to use an IBM LAN Manager or an IBM LAN Network Manager program to establish a link to an IBM 8209 that is connected to an Ethernet backbone LAN segment. If you have a problem establishing the link, try swapping the order of the IBM 8209 adapter addresses in the bridge definition (define the Ethernet adapter address first).

The IBM LAN Network Manager Program, Versions 1.0 and 1.1

The IBM LAN Network Manager Version 1.0 provides the same network management and configuration support to the IBM 8209 as the IBM LAN Manager Version 2.0.

The IBM LAN Network Manager Version 1.1 provides full token-ring and Ethernet network management and configuration support to the IBM 8209, providing all of the functions that the Utility Program provides.

Advanced Configuration Parameter Defaults and Allowed Ranges

Table 2-4 (Page 1 of 2). Advanced Configuration Parameter Value Ranges and Defaults — Utility Program		
Parameter Description	Default Value	Allowed Range
Bridge Number	0 or switch	0-9, A-F
Token-Ring LAN Segment Number	1	0-FFF
Locally Administered Address	(none)	400000000001-40007FFFFFFF
Early Token Release	1 (Enabled)	0, 1
Ethernet LAN Segment Number	X'FF0' or switch	0-FFF
Locally Administered Address	(none)	400000000001-40007FFFFFFF
Token-Ring Hop Count Limit	7	1-7
Parameter Server	1 (Enabled)	0, 1
Error Monitor	1 (Enabled)	0, 1
Configuration Report Server	1 (Enabled)	0, 1
Automatic Mode Selection	(switch)	0, 1
Mode Priority	(switch)	1, 2
Forward LLC Traffic (Mode 1)	Y	Y, N
Enabled SAPs for LLC Traffic	00, 04, 08, F0, F4, FC	
TCP/IP Address Conversion	1 (Enabled)	0, 1
Dual Mode Multicast Conversion	1 (Enabled)	0, 1
Use General Broadcast Frames	0 (Disabled)	0, 1
Broadcast Address Conversion	1 (Enabled)	0, 1
Criteria Range Filter		
Filter Offset	0	0-100 (0-64 hex)
Range 1 Low	0	0-FFFF
Range 1 High	0	0-FFFF
Range 2 Low	0	0-FFFF
Range 2 High	0	0-FFFF
Address Range Filter		
Source Address Low	000000000000	12 hex digits

Table 2-4 (Page 2 of 2). Advanced Configuration Parameter Value Ranges and Defaults – Utility Program

Parameter Description	Default Value	Allowed Range
Source Address High	000000000000	12 hex digits
Destination Address Low	000000000000	12 hex digits
Destination Address High	000000000000	12 hex digits
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) 63 (16 Mbps) 100 (Ethernet)	0-65535
Port Priority	128	0-255
Aging Time	300	1-65535 seconds
Maximum Transit Time	1	1-4 seconds
Link Password 0	00000000	
Link Password 1	00000000	
Link Password 2	00000000	
Link Password 3	00000000	

Advanced Configuration Parameter Descriptions

This section describes the IBM 8209 advanced configuration parameters that you can change by using the Utility Program.

Bridge Port Information Parameters

DFIPC803	IBM 8209 UTILITY PROGRAM Configure Bridge Parameters	Page 1 of 7

Type any changes and press Enter.		
Bridge name	:	
Bridge number	:	[] (0-F)
Bridge Port Information		
LAN segment number	:	[001&rbk. (1-FFF)
Adapter	:	
Locally administered address	:	[] (hex)
Segment type	:	T-R Mbps
Early Token Release	:	[1] (0=Disabled, 1=Enabled)
LAN segment number	:	[FF0] (1-FFF)
Adapter	:	
Locally administered address	:	[] (hex)
Segment type	:	Ethernet Mbps
Enter Esc=Cancel F1=Help F3=Exit F5=Refresh		
		PgDn

Figure 2-4. Bridge Port Information

Bridge Number

Explanation: This parameter uniquely identifies a bridge in frame routing information when frames are forwarded through a bridge.

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

Token-Ring LAN Segment Number

Explanation: This parameter specifies the number used to identify the LAN segment connected to the IBM 8209 built-in token-ring connector. The value for the LAN segment connected to the token-ring connector must be different from the value for the LAN segment connected to the Ethernet attachment module connector.

Note: All bridges connected to a specific LAN segment must refer to that LAN segment by the same number.

Locally Administered Address

Explanation: Use this parameter to assign a particular adapter address to the built-in token-ring bridge adapter.

If this parameter value is left blank, the IBM 8209 uses the token-ring universally administered address.

You can assign a locally administered address to the token-ring adapter during configuration. If you do so, after configuration is finished you must unlink from the bridge, change the base adapter address to this locally administered address in the bridge definition, and reestablish the link with the bridge.

Each adapter address must be unique in the bridge and in the entire network.

Early Token Release

Explanation: You can use this option for a 16-Mbps IBM Token-Ring Network 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 IBM 8209 ignores the parameter value of *Enabled* (the default) for Early Token Release if the IBM Token-Ring Network 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.

Ethernet LAN Segment Number

Explanation: This parameter specifies the number used to identify the LAN segment that is connected to the Ethernet attachment module.

The value of the Ethernet LAN segment number must be different from the value of the token-ring LAN segment number.

Note: All bridges connected to a specific LAN segment must refer to that LAN segment by the same number.

Locally Administered Address

Explanation: Use this parameter to assign a particular adapter address to the Ethernet attachment module bridge adapter.

If this parameter value is left blank and when the IBM 8209 is initially installed and configured, the bridge definition expects the module address to be one greater than the token-ring adapter address.

You can assign a locally administered address to the Ethernet attachment module adapter during configuration. If you do so, after configuration is finished you must unlink from the bridge, change the module adapter address to this locally administered address in the bridge definition, and reestablish the link with the bridge.

Each adapter address must be unique in the bridge and in the entire network.

Note: The Ethernet locally administered address must be specified on this panel in token-ring (IEEE 802.5) format. See "Address Conversion" on page A-7 for an explanation of how to convert manually between Ethernet and token-ring addresses.

Token-Ring Hop Count Limit and Server Parameters

```
DFIPC804                      IBM 8209 UTILITY PROGRAM          Page 2 of 7
                               Configure Bridge Parameters

-----
Type any changes and press Enter.

Bridge name . . . . . :

Bridge Port Information
LAN segment number . . . . . :

Hop count limit . . . . . : [7]      (1-7)

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

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

Figure 2-5. Token-Ring Hop Count Limit and Server Parameters

Hop Count Limit

Explanation: This parameter specifies the number of consecutive bridges through which a broadcast frame can travel, including the current bridge. Hop count does not apply to non-broadcast frames or to single-route broadcast frames.

If the number of bridges the frame has passed through is equal to or greater than this hop count limit value, the frame will not be transmitted further.

Parameter Server

Explanation: This parameter specifies for the IBM Token-Ring Network segment whether or not the parameter server functional address is enabled; that is, whether the bridge will copy and process frames destined for this function.

The 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 attached to the LAN segment.

Error Monitor

Explanation: This parameter specifies for the IBM Token-Ring Network segment whether the error monitor functional address is enabled; that is, whether the bridge will copy and process frames destined for this function.

The error monitor does the following:

- 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
- Updates the **LAN Segment Status** area of the LAN Manager or LAN Network Manager panels to “Soft Error” when appropriate.

If the error monitor parameter value is **N (No)**, the error information will be zeros, and the LAN segment status “Soft Error” will not be displayed on the network management program panels when soft errors occur.

Note: If the bridge reports to the LAN Manager Version 2.0, you must enable the error monitor by setting the parameter value to **Y (Yes)** during bridge configuration. Otherwise, the communication link between the IBM LAN Manager and the bridge cannot be established.

Configuration Report Server

Explanation: This parameter specifies for the IBM Token-Ring Network segment whether or not the configuration report server functional address is enabled; 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 IBM Token-Ring Network segment to the network management programs that request reports. It reports changes in nearest active upstream neighbor (NAUN) addresses and active monitor on the LAN segment.

Bridge Forwarding Parameters

```
DFIPCB05                IBM 8209 UTILITY PROGRAM                Page 3 of 7
                        Configure Bridge Parameters
-----
Type any changes and press Enter.

Bridge name . . . . . :

Bridge Forwarding Parameters
Automatic mode selection . . . . : [ ]      (0=Disabled, 1=Enabled)
Mode priority . . . . . : [ ]      (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] [ ] [ ] [ ] [ ]

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)

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

Figure 2-6. Bridge Forwarding Parameters

Automatic Mode Selection

Explanation: This parameter enables or disables automatic mode selection, and overrides the setting of attachment module switch 1 (see “Switch 1 — Automatic Mode Selection” on page 2-7).

When automatic mode selection is **enabled**, the IBM 8209 determines whether to convert IBM Token-Ring Network originated frames to Ethernet Version 2 format or to IEEE 802.3 format. The IBM 8209 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 destination station, the IBM 8209 converts the token-ring frame to the format indicated by the mode selection switch on the Ethernet attachment module, or by the value for the mode priority configuration parameter (which overrides the switch setting).

For more information about the Ethernet database, see “Databases” on page B-5.

Specify 1 (Enabled) for automatic mode selection if:

- Some stations on the Ethernet LAN use the Ethernet Version 2 frame format and other stations 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 IBM 8209 converts all token-ring originated frames 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 IBM 8209 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 or IEEE 802.3 LAN that is connected to the IBM 8209 are operating exclusively with one frame format (either all Ethernet Version 2 format or all IEEE 802.3 format).
- All communicating stations use the same frame format (Ethernet or IEEE 802.3), although the frames must pass across a different type of LAN in the route to their destination. For example, see the network configurations shown in Figure 1-2 on page 1-3 and Figure 1-3 on page 1-10.

How Automatic Mode Selection and Mode Selection Work Together.

When automatic mode selection is enabled, the IBM 8209 examines the mode selection only if the IBM 8209 cannot find the frame format for the destination station in its Ethernet database.

The IBM 8209 will **not** find the frame format for the destination station in the database when:

- 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 IBM 8209. The IBM 8209 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 IBM 8209 keeps the frame format information for an Ethernet LAN station in the Ethernet database until:

- The IBM 8209 power is turned off
- The Ethernet LAN station does not transmit for so long that the IBM 8209 removes the format entry for that station from its database. (The **aging time** expires for that database entry. The length of the aging time period can be changed by using the Utility Program. See "Spanning-Tree Parameters" on page 2-43.)
- The station's static entry is deleted from the database.

Mode Priority

Explanation: The value of the mode priority parameter determines whether the IBM 8209 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 (see "Switch 2 — Mode Selection" on page 2-9).

Note: The recommended mode selection for all IBM 8209s connected to a token-ring segment used as a backbone ring is mode 1 and 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 IBM 8209 expects all frames transmitted over the Ethernet LAN to be in Ethernet Version 2 format.

In mode 1, the IBM 8209 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 IBM 8209 expects all frames transmitted over the Ethernet LAN to be in IEEE 802.3 format.

In mode 2, the IBM 8209 provides frame format conversion between IEEE 802.3 and token-ring frame formats.

When automatic mode selection is disabled, the IBM 8209 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).

Forward LLC Traffic (Mode 1)

Explanation: This parameter determines whether the IBM 8209 is to enable or disable the forwarding of frames for IEEE 802.3 LLC-based protocols from the IBM Token-Ring Network segment to the Ethernet LAN when the IBM 8209 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 “Token-Ring to Ethernet Conversion for LLC-Based Protocols” on page B-19 for details of the frame format conversion for LLC-based protocol frames.

Enabled SAPs for LLC Traffic

Explanation: 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

Explanation: This parameter indicates whether the IBM 8209 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 to RARP Conversion” on page B-17.

Dual Mode Multicast Conversion

Explanation: This parameter indicates whether the IBM 8209 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

Explanation: This parameter indicates whether the IBM 8209 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 IBM 8209 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

Explanation: When this function is enabled, the IBM 8209 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 IBM 8209 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 IBM 8209s 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 IBM 8209 to convert the Ethernet addresses X'FFFF FFFF FFFF' or X'0300 FFFF FFFF' to the token-ring all-stations address, you must specify Ethernet address and the token-ring address as a mapped address pair in the IBM 8209 configuration (see "Address Database Static Entries and Mapped Addresses" on page 2-49).

Criteria Filter Range Definition Parameters

DFIPCB06	IBM 8209 UTILITY PROGRAM Configure Bridge Parameters	Page 4 of 7

Type any changes and press Enter.		
Bridge name :		
Bridge Forwarding Parameters		
LAN segment number :		
Filter Definition		
Filter offset (Decimal) :	[0]	[0] (0-100)
Range 1 low (Hex) :	[0]	[0] (0-FFFF)
Range 1 high (Hex) :	[FFFF]	[FFFF] (0-FFFF)
Range 2 low (Hex) :	[0]	[0] (0-FFFF)
Range 2 high (Hex) :	[FFFF]	[FFFF] (0-FFFF)
Enter Esc=Cancel F1=Help F3=Exit F5=Refresh		
		PgUp PgDn

Figure 2-7. Criteria Filter Range Definition Parameters

Filter Offset

Explanation: This parameter (2 bytes in length) specifies the byte offset into the medium access control (MAC) data (information) field of the 2 bytes of information that are compared with the filter range values. The beginning of the information field varies with the frame format:

- The Ethernet frame information field offset of zero is at the beginning of the TYPE field (see the Ethernet frame format in “Frame Format Conversions” on page B-12).
- The information field offset of zero for token-ring and IEEE 802.3 frames is at the beginning of the DSAP field (see the frame formats in “Frame Format Conversions” on page B-12).

For more details about filtering, see “Filtering” on page B-7.

You can specify a separate filter offset and filter ranges for each IBM 8209 LAN connection.

Range 1 Low

Explanation: This parameter specifies the 2-byte binary 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

Explanation: This parameter specifies the 2-byte binary 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

Explanation: This parameter specifies the 2-byte binary 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

Explanation: This parameter specifies the 2-byte binary 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).

Address Range Filter Definition Parameters

```
DFIPCB07                IBM 8209 UTILITY PROGRAM                Page 5 of 7
                        Configure Bridge Parameters
-----
Type any changes and press Enter.

Bridge name . . . . . :

Bridge Forwarding Parameters
LAN segment number . . . . . :

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 2-8. Address Range Filter Definition Parameters

Source and Destination Address Low and High Values

Explanation: 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 IBM 8209 LAN connection.

Frames with source or destination addresses within the specified values are filtered (discarded) by the IBM 8209.

Spanning-Tree Parameters

DFIPCB08	IBM 8209 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 :	[2]	(1-10 seconds)
Bridge forward delay :	[15]	(4-30 seconds)
Bridge priority :	[32768]	(0-65535)
LAN segment number :		
Port path cost :	[250]	[100] (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 2-9. Spanning-Tree Parameters

Spanning-Tree Parameters

Explanation: 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 (path cost).

The default values should be used for these parameters unless a specific circumstance exists in your network 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 always 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:

Table 2-5. 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) 63 (16 Mbps) 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-10 and the IEEE 802.1 Standard for MAC bridges listed in “Related Publications” on page xi.

Aging Time

Explanation: This parameter defines in seconds the amount of time that a dynamic entry in the IBM 8209 address database is retained after last use.

Maximum Transit Time

Explanation: This parameter defines in seconds the maximum time that can elapse between the reception and transmission of a forwarded frame. The IBM 8209 attempts to discard a frame that has been held at the IBM 8209 for this period of time. However, once the frame has been queued for transmission, elapsing of the maximum transit time will not cause the frame to be discarded.

Link Passwords

DFIPCB09	IBM 8209 UTILITY PROGRAM Configure Bridge Parameters	Page 7 of 7

Type any changes and press Enter. Passwords must be 6-8 alphanumeric characters.		
Bridge name :		
Link password 0 . . .	[00000000]	
Link password 1 . . .	[00000000]	
Link password 2 . . .	[00000000]	
Link password 3 . . .	[00000000]	
Enter Esc=Cancel F1=Help F3=Exit F5=Refresh		PgUp

Figure 2-10. Link Passwords

Link Passwords

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

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 IBM 8209 is when the IBM 8209 is initially installed and configured. The reporting link password specified during system definition can be any valid 6-8 character value. As long as the link 0 password is all zeros, you can specify any valid reporting link password in system definition for any network management program.

If you specify a reporting link password of zeros at system definition and then change the link 0 password to a nonzero

value here, you must unlink from the bridge after you finish configuration. 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.

- Establishing the link does not cause two controlling network management programs to be linked to the same bridge at the same time.

If one or more network management programs will establish links with an IBM 8209 in your network (you need at least one such program to do advanced configuration), you can specify link passwords in one of the following ways:

1. Leave all of the link passwords at the defaults of all zeros.

To fill in the Bridge Planning Chart for the Utility Program:

- Write dashes in the spaces in Section 4 on the chart for the Link Passwords
- Write a dash in Section 3 on the chart for the System Definition Reporting Link Password.

For any other network management program to establish a link with this IBM 8209, that network management program must use a reporting link password of all zeros and must not link while the Utility Program is linked (as the controlling program).

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

To fill in the Bridge Planning Chart for Utility Program advanced configuration:

- Write each changed password in the appropriate Link Password space in Section 4 on the chart.
- Write the link password for link 0 (to be used between the Utility Program and this IBM 8209) in the System Definition Reporting Link Password space in Section 3 on the chart.

Before a network management program can establish a link to this IBM 8209, the program operator must specify a reporting link password in the network management program system definition. The reporting link password

must be the link password defined in this bridge advanced configuration for the correct link number.

Notes:

1. Each password must consist of 6-8 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 the link password fields if an error is made in 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.

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.

Address Database Static Entries and Mapped Addresses

Ethernet Static Address Entries

Explanation: Each of these parameter values is the station (adapter) address of an Ethernet station that sends frames over the IBM 8209. The IBM 8209 determines the frame format used by each station and records it in the database with the station address.

You can add these entries manually or from a file to the Ethernet address database. They cannot be deleted when the database entry aging time expires. You must delete them manually or do a logic board reset to remove them from the database.

You can also save them in a file before deleting and redefining the IBM 8209 configuration, so that you do not have to enter them manually again for the new configuration.

Mapped Addresses

Explanation: These entries specify a pair of addresses, one Ethernet and one token-ring. The IBM 8209 converts an Ethernet frame's destination address to the corresponding token-ring address if the destination address is found in these entries.

The addresses are entered in their originating format (token-ring addresses in IEEE 802.5 format, and Ethernet addresses in Ethernet/IEEE 802.3 format).

Other Record-Keeping

In addition to completing the Bridge Planning Chart, you should add certain information to your other network records. On the appropriate charts, floor plans, and other network documentation, you should record the location and identification of:

- Each IBM 8209 in your network
- Each personal computer used to run the Utility Program
- The cable connection points at the device and at the network access.

Refer to the *IBM Token-Ring Network Introduction and Planning Guide* and to available Ethernet network planning information to help you in locating, completing, and updating planning charts and other network documentation.

Keeping accurate and current network documents will assist you in installing your network, modifying your network, and performing problem determination procedures.

Chapter 3. Basic Configuration and Attachment Module Installation

As you follow the IBM 8209 installation procedure in the *IBM 8209 LAN Bridge Customer Information* manual, you will be instructed to install an attachment module in the back of the IBM 8209.

The information and instructions in this chapter help you to:

- Change the IBM 8209 preset basic configuration, if necessary, by setting some or all of the configuration switches on the Ethernet attachment module
- Install the Ethernet attachment module in the IBM 8209.

Note: After you have installed the IBM 8209 and attachment module, you can do advanced configuration (see “Bridge Planning Chart Section 4 — Utility Program Advanced Configuration Parameters” on page 2-21.) to:

- Change configuration parameter values that are not set in the switches
- Override the values set in the switches without physically changing the switch positions.

IBM 8209 Basic Configuration

Before you install the Ethernet attachment module in the IBM 8209, you can set five switches on the attachment module to change the preset basic configuration.

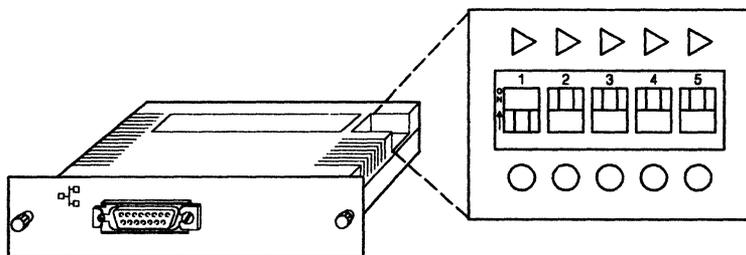


Figure 3-1. IBM 8209 Ethernet Attachment Module

The attachment module is shipped with the preset configuration shown in Table 3-1.

Table 3-1. Preset Configuration Switch Settings	
Switch Number and Function	Preset Default
1 Automatic Mode Selection	▲ Enabled
2 Mode Selection	● Ethernet Version 2 (mode 1)
3 and 4 Bridge Number and Ethernet LAN Segment Number	● ● Bridge Number = 0 LAN Seg. Num. = X'FF0'
5 Token-Ring Network Data Transfer Rate	● 4 Mbps

To Do Basic Configuration:

- 1 Get a filled-in copy of the Bridge Planning Chart from your network administrator or planner.
- 2 If you have not already done so, remove the attachment module from the packaging material.
- 3 Locate the configuration switches on the attachment module.
- 4 Change the settings of the switches as indicated in Section 2 of the Bridge Planning Chart.

If the preset configuration is to be used (no switches need to be changed), check the attachment module switches to ensure that they are set to the positions for the preset configuration.

If Section 2 of the chart indicates that one or more switches need to be reset, change the switch positions as shown on the chart.

- 5 Go to "Installing the Ethernet Attachment Module" on page 3-4 to install the attachment module in the IBM 8209.

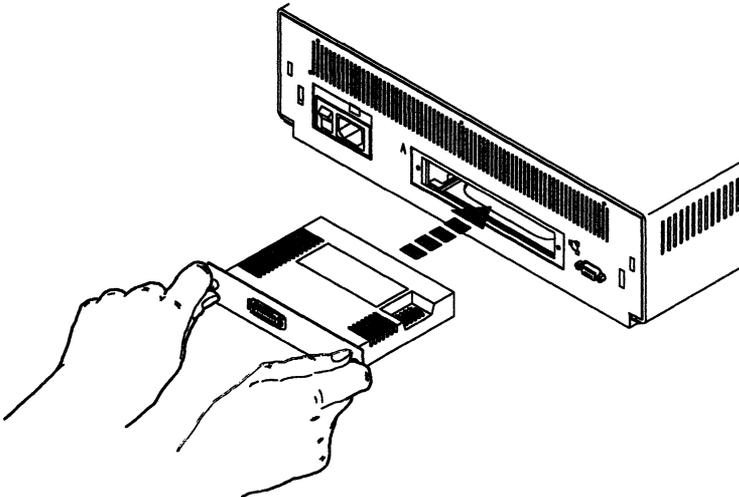
Installing the Ethernet Attachment Module

The IBM 8209 installation process in the *IBM 8209 LAN Bridge Customer Information* manual instructs you to install an attachment module in the back of the IBM 8209.

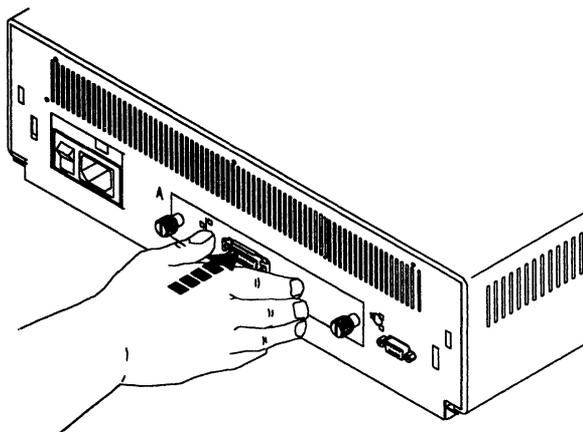
If basic configuration is required for this IBM 8209, follow the instructions in "IBM 8209 Basic Configuration" on page 3-2 before doing the steps in this section to install the module.

To install the attachment module in the IBM 8209:

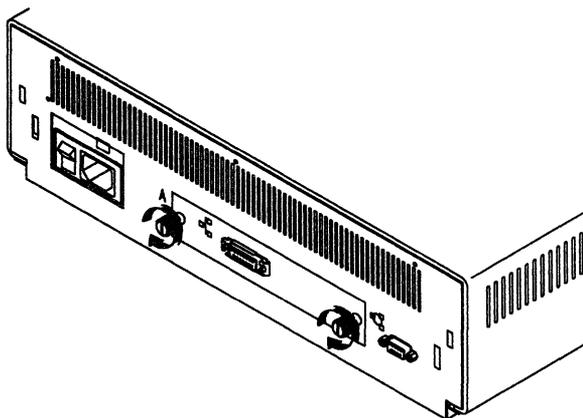
- 1 Insert the attachment module into the back of the IBM 8209.



2 Push the attachment module in until it is secure.



3 Tighten the two thumbscrews to fasten the attachment module to the back of the IBM 8209.



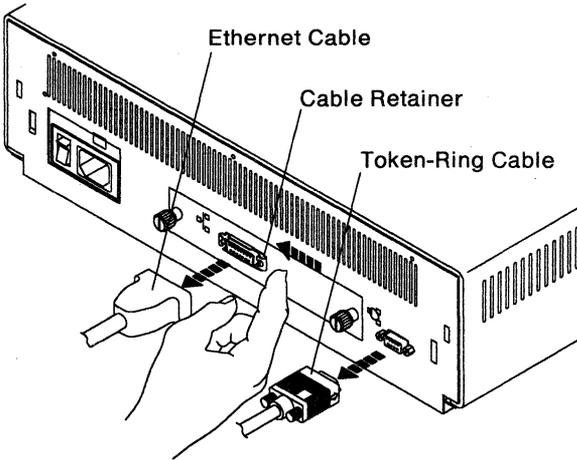
DANGER

To prevent a possible electrical shock during an electrical storm, do not connect cables or station protectors for communications lines, display stations, printers, or telephones.

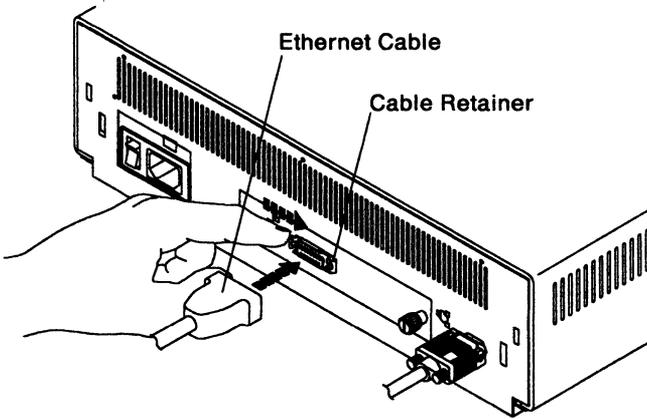
DANGER

To prevent a possible electrical shock from touching two surfaces with different electrical grounds, use one hand, when possible, to connect or disconnect signal cables.

- 4 Before connecting an Ethernet AUI cable to the connector on the attachment module, slide the cable retainer to the left.



- 5 Connect an Ethernet AUI cable to the connector on the attachment module.
- 6 Slide the cable retainer to the right after connecting the Ethernet AUI cable.



- 7 Return to the *IBM 8209 LAN Bridge Customer Information* manual to finish the IBM 8209 installation.

Once the IBM 8209 is installed and operating, you can install and use the Utility Program to do advanced configuration, if needed.

Chapter 4. The IBM 8209 Utility Program

The Utility Program provides two major functions for an IBM 8209 with an Ethernet attachment module:

- Advanced configuration

The Utility Program can be used to change the values for IBM 8209 configuration parameters that cannot be set in the attachment module configuration switches, and to override the values that have been set in the switches.

- Network management functions, including display of configuration parameter current values and Ethernet error information

The Utility Program can be used to display IBM 8209 current configuration parameter values and Ethernet error counters.

Note: The IBM 8209 can function in reasonably complex network environments without the use of the Utility Program. However, the needs of your network may require an IBM 8209 advanced configuration and the network management functions provided by the Utility Program. See the configuration information in Chapter 2 to help you decide whether you need to use the Utility Program with an IBM 8209 in your network.

The Utility Program comes in two versions:

- One for use with IBM Personal Computer Disk Operating System (PC DOS)
- One for use with IBM Operating System/2* Extended Edition (OS/2* EE).

Both versions are contained on the 3.5-inch diskette that is packaged with the Ethernet attachment module. Only the DOS version is contained on the 5.25-inch diskette, which is also packaged with the attachment module.

This chapter assumes that you have already:

- **Installed an IBM 8209 with an Ethernet attachment module in your network**
- **Installed a network adapter in a personal computer**
- **Connected the adapter to a LAN segment in the network with the IBM 8209**
- **Run diagnostic tests to verify the correct operation of the IBM 8209, the personal computer, and the network adapter.**

Utility Program Installation

Before you can install and use the Utility Program in a personal computer on your network, you must:

- Install an operating system (either DOS 3.3 or higher, or OS/2 EE 1.1 or higher) in the computer.

You must purchase the operating system separately, and install it by following the instructions in the publications packaged with the operating system.

- Install the required operating system device drivers with the operating system, to support the operation of the network adapter in the computer and on the network.

See one of the following sections for more information about the required device drivers for adapter support:

- If you are using DOS, read “DOS Device Drivers” below.
- If you are using OS/2 EE, read “OS/2 EE Adapter Support” on page 4-6.

Once the required operating system and adapter support software are installed in the computer, continue to “Utility Program Installation Procedures” on page 4-7 to install the Utility Program.

DOS Device Drivers

The DOS device drivers required for network adapter support can be provided in two ways:

- Install the LAN Support Program in the Utility Program computer after DOS is installed and before the Utility Program is installed.

Note: If the network adapter in the Utility Program computer is an Ethernet adapter, you must also install the version of NDIS (Network Driver Interconnect Specification) drivers required by the adapter.

Refer to the publications and online files packaged with the IBM LAN Support Program for information and instructions for installing the required adapter support.

For an IBM Token-Ring Network Adapter

If you are using a token-ring adapter, as a minimum the following entries should be included in the CONFIG.SYS file after the LAN Support Program is installed:

```
device=dxma0mod.sys  
device=dxmc0mod.sys  
    or  
device=dxma0mod.sys  
device=dxmc1mod.sys
```

Note: The Utility Program does not require the LAN Support Program support for NETBIOS or for an IBM 3270 workstation. You may, however, want to include these features to support other programs that use the computer when the Utility Program is not running.

If you include these functions, be sure to specify the number of extra SAPs and link stations needed to have sufficient resources available. The extra SAPS and link stations are specified in the DEVICE command in the CONFIG.SYS file that is used to install NETBIOS support.

As a minimum, the following entries should be included in your CONFIG.SYS file after installation of the IBM LAN Support Program for Token-Ring is completed:

```
device=dxma0mod.sys  
device=dxmc0mod.sys  
    or  
device=dxma0mod.sys  
device=dxmc1mod.sys
```

For an Ethernet or IEEE 802.3 LAN Adapter

If you are using an Ethernet adapter with IBM LAN Support Program Version 1.2, your CONFIG.SYS file should contain entries such as:

```
device=C:\LANMAN\protman.exe  
device=C:\pathname\macwd.dos  
device=C:\pathname\dxma0mod.sys  
device=C:\pathname\dxme0mod.sys
```

In the above example:

1. ELNKII.DOS or ELNKMC.DOS may be substituted for MACWD.DOS depending upon the Ethernet adapter used.
2. The driver entries are listed in the order shown above.
3. \LANMAN\ should also contain the files PROTOCOL.INI, PRO.MSG, and PROTMAN.EXE. The bindings parameter in PROTOCOL.INI may need to be edited for the Ethernet adapter used in your system.
4. The AUTOEXEC.BAT file should also contain the statement: \pathname\netbind

If you include NETBIOS support, you will see a statement at the end of the driver list in your CONFIG.SYS file such as:

```
device=dxmt0mod.sys  
or  
device=C:\pathname\dxmt0mod.sys
```

If you install NETBIOS, change the statement in the CONFIG.SYS file to allow an extra Service Access Point (SAP) and 8 extra link station connections, to be used by the IBM 8209 Utility Program. If you install NETBIOS with the Ethernet support, you must also add the Open On Load parameter to the *dxmt0mod.sys* driver. The statement should be:

```
device=dxmt0mod.sys es=1 est=8 o=n  
or  
device=C:\pathname\dxmt0mod.sys es=1 est=8 o=n
```

Refer to the DXMINFO.DOC file in the IBM LAN Support Program distribution diskette and the IBM LAN Support

Program manual for additional information on driver configuration.

- On an IBM Token-Ring Network segment, use the device drivers that are included as part of the IBM LAN Manager Version 1.0.

In the DOS environment, the Utility Program and the IBM LAN Manager Version 1.0 can be installed in the same personal computer, but only one of the two programs can be running at a time. (The IBM LAN Manger Version 2.0 and the IBM LAN Network Manager programs must run with OS/2 EE.)

You must install the IBM LAN Manager Version 1.0 in the personal computer before you install the Utility Program. The IBM LAN Manager includes the following entries in the DOS CONFIG.SYS file, which loads the required device drivers each time DOS is loaded. You do not need to install any other device drivers for the IBM Token-Ring Network adapter support needed for the Utility Program and the IBM LAN Manager Version 1.0.

```
device=dfia0mod.sys
device=dfic0mod.sys
or
device=C:\directoryname\dfia0mod.sys
device=C:\directoryname\dfic0mod.sys
```

OS/2 EE Adapter Support

The device drivers required for network adapter support are included with the OS/2 EE operating system, and need not be installed as part of a separate program.

If an IBM LAN Manager or IBM LAN Network Manager program is installed in the same computer with the Utility Program, installing the IBM LAN Manager or IBM LAN Network Manager first will include the required device driver support.

If the Utility Program will use the same computer as an IBM LAN Manager or IBM LAN Network Manager program, follow the instructions in the OS/2 EE publications for including in the CONFIG.SYS file the device drivers needed for IBM Token-Ring Network adapter support.

Note: If you are using an Ethernet adapter, you will need to include in the installation the required Ethernet adapter support.

Utility Program Installation Procedures

When the device drivers have been installed as described in the previous sections, the Utility Program can be installed on and run from either a working diskette (DOS only) or a fixed disk directory (DOS and OS/2 EE).

In either case, you should first make a working copy of the original distribution diskette to use during the installation process. Then, store the original distribution diskette in a safe place.

To help you install the Utility Program on a fixed disk, the distribution diskettes provide an installation aid for each operating system environment (DOS and OS/2 EE).

Installing the Utility Program With OS/2 EE

The OS/2 EE version of the Utility Program must be installed in a fixed disk directory.

Fixed Disk, Using the Installation Aid

- 1 Select the OS/2 full screen command prompt.
- 2 Insert the working copy of the distribution diskette into drive A.
- 3 At the prompt, type:
`CD \OS2\INSTALL`
Press **Enter**.
- 4 Then type:
`INSTAID`
Press **Enter**.
- 5 Follow the instructions and the messages on the panels until the Utility Program is successfully installed.

Installing the Utility Program With DOS

There are three ways to install the Utility Program with DOS:

- Use the DOS installation aid to install the Utility Program in a fixed disk directory.
- Install the Utility Program in a fixed disk directory without using the installation aid.
- Install the Utility Program on a working diskette.

Fixed Disk, Using the Installation Aid

To use the installation aid to install the Utility Program in a fixed disk directory:

- 1 Ensure that there are at least 300 000 bytes available on the fixed disk.
- 2 Insert the working copy of the distribution diskette into drive A.
- 3 Change to the root directory of the fixed disk. The DOS prompt should be "C:>" or "D:>".
- 4 At the DOS prompt, type:
A:INSTALL
Press **Enter**.
- 5 Follow the instructions and messages on the panels until the Utility Program is successfully installed.

Fixed Disk, Without Using the Installation Aid

To install the Utility Program on a fixed disk without using the installation aid:

- 1 Change to the root directory of the fixed disk. The DOS prompt should be "C:>" or "D:>".
- 2 Insert the working copy of the distribution diskette into drive A.
- 3 At the DOS prompt, type:
MKDIR LBE

Press Enter.

4 Then type:

```
XCOPY A:\DOS\*.* LBE /V
```

Press Enter.

5 When the copy has finished, the Utility Program is installed.

Working Diskette (DOS Only)

Copy the Utility Program files to a formatted diskette.

Loading the Utility Program

When the Utility Program has been successfully installed, use the following instructions for the DOS environment or the OS/2 EE environment to load and run the Utility Program.

As the Utility Program loads and initializes, messages are displayed to indicate the progress of loading and initialization. When initialization finishes successfully, the Bridge Functions panel is displayed and the Utility Program is ready to be used.

Loading the Utility Program in an OS/2 Environment

To load from the OS/2 menu:

- 1 Select the *Start Programs* option from the Task Manager menu, and press **Enter**.
- 2 Select the *IBM 8209 Utility* option from the Start Programs menu, and press **Enter**.
- 3 Press **Enter** to continue.

To load from the full screen command prompt:

- 1 Select the OS/2 full screen command prompt.
- 2 At the prompt, type:
CD \LBE
Press **Enter**.
- 3 Then, type:
LBE
Press **Enter**.
- 4 Press **Enter** to continue.

Loading the Utility Program in a DOS Environment

To load the Utility Program from a fixed disk directory:

- 1 At the command prompt, type:
CD \LBE
Press **Enter**.
- 2 Then, type:
LBE
Press **Enter**.
- 3 Press **Enter** to continue.

To load the Utility Program from a working diskette:

- 1 Insert the working diskette in drive A or drive B.
- 2 At the DOS prompt, type:
A: (or B: if drive B is used)
Press **Enter**.
- 3 Then, type:
CD DOS
Press **Enter**.
- 4 Then, type:
LBE
Press **Enter**.
- 5 Press **Enter** to continue.

Using the IBM 8209 Utility Program

The Utility Program provides several functions to allow you to configure the IBM 8209 to meet the needs of your network and to display configuration and error information about the IBM 8209.

Bridge Definition

Before you can use the Utility Program to communicate with an IBM 8209, you must define the IBM 8209 to the Utility Program.

Use the Add Bridge Definition option of the Bridge Definition function to define the IBM 8209. The parameters on the Add Bridge Definition panel are the values you write in Section 3 of the Bridge Planning Chart for the IBM 8209 (see “Bridge Planning Chart Section 3 — Bridge Definition and System Definition” on page 2-14).

Once you have defined one or more bridges to the Utility Program, you can use the View, Change, and Delete options to display and modify the definitions.

System Definition

When you have defined a bridge, you must then do a system definition to specify the password for the link that this Utility Program will use to communicate with the bridge.

To do system definition, select the System Definition function from the Bridge Functions panel. Type the reporting link password that is specified on the Bridge Planning Chart for the IBM 8209, and press the Enter key.

Note: As long as you have not done a configuration for the IBM 8209, any valid reporting link password can be used to establish a link with the IBM 8209.

To protect access to the IBM 8209 configuration, you should reconfigure the password for link 0 to a nonzero value and specify that value in the system definition.

Establishing and Terminating Links with a Bridge

For an IBM 8209 that is defined to the Utility Program, you can use the Link Bridge function to establish a link with the bridge and the Unlink Bridge function to terminate the link.

The link with a bridge should be terminated with the Unlink Bridge function whenever you need to end operation of the Utility Program.

Advanced Configuration

The Configure Bridge function is used to do advanced configuration for the IBM 8209.

Before you can do advanced configuration for an IBM 8209, you must have already:

- Installed the IBM 8209 and verified that it is operating correctly
- Installed the Utility Program and defined the IBM 8209 to it
- Defined the reporting link password in system definition
- Established a link with the IBM 8209 from the Utility Program
- Obtained a filled-in copy of the Bridge Planning Chart for the IBM 8209 that specifies the values for the advanced configuration parameters.

To do advanced configuration, type the parameter values in the respective fields on the Configure Bridge panels.

The Configure Bridge function is also used to change advanced configuration parameter values after the configuration is initially defined.

Note: The IBM 8209 does not begin using changed values for advanced configuration parameters until the IBM 8209 is reset by doing one of the following:

- Unlinking the Utility Program from the bridge and then reestablishing the link
- Turning the IBM 8209 power off and then back on.

Bridge Profile

The Bridge Profile function allows you to display the following information for an IBM 8209:

- The current values of the advanced configuration parameters, static address entries, and mapped address entries
- The Ethernet counters for collisions and invalid frame errors
- The current and maximum number of Ethernet address database static entries
- The current and maximum number of mapped address database entries.

Chapter 5. Problem Analysis

Problems that can occur when you use the IBM 8209 in your network include:

- Problems with IBM 8209 installation

Use the problem analysis procedures in the *IBM 8209 Customer Service* manual help you to identify the problem and to either resolve it or know that you need to call for hardware service.

The problems you can resolve are those such as cables not seated or connected correctly, the attachment module not seated or inserted correctly, and no power at the AC wall outlet.

The IBM 8209 contains no customer-serviceable parts. If an IBM 8209 component fails, you must call for hardware service to isolate the component and replace the failing part.

- Problems with network management programs and their links to the IBM 8209

Messages displayed by the programs help you identify the problem. Follow the recommended actions given for messages in the *User's Guide* for each program.

Consider the following before resorting to reinstalling programs or calling for service assistance:

- Verify that the adapter addresses are defined correctly in the bridge definition.
- If locally administered addresses have been assigned or the link passwords have been changed during configuration, ensure that you have unlinked from the bridge to allow the new values to take effect. Also ensure that you have updated the bridge definition and system definition with the new values before reestablishing the link with the bridge.
- If you have lost or are unsure of the link passwords for the IBM 8209, you must perform the Logic Board Reset procedure (see “Logic Board Reset Procedure” on

page 2-12) to reset the current configuration values to the original defaults. Then you can redefine the configuration and assign new passwords.

- **Problems with the network connection hardware**

Use the problem analysis procedures in the *IBM 8209 Customer Information* manual to help you determine whether the IBM 8209 is operating correctly.

Use problem determination procedures for each LAN connected to the IBM 8209 to isolate a problem with an access unit, transceiver, cable. Refer to the publications listed in "Related Publications" on page xi and to your local problem determination procedures.

- **Problems with operating systems or adapter support programs.**

Messages displayed by the programs help you identify the problem. Follow the recommended actions described for the messages in the publications packaged with the operating system and adapter support software.

Appendix A. Blank Worksheets

This appendix contains:

- A blank Bridge Planning Chart
- An address conversion table, worksheet, and example.

When filled out, these worksheets contain the information you need to do IBM 8209 planning, basic configuration, and advanced configuration tasks quickly and accurately.

You may copy these worksheets, and save the originals for copying again later.

IBM 8209 Bridge Planning Chart Using the Ethernet Attachment Module

Date _____ Bridge Name or Number _____

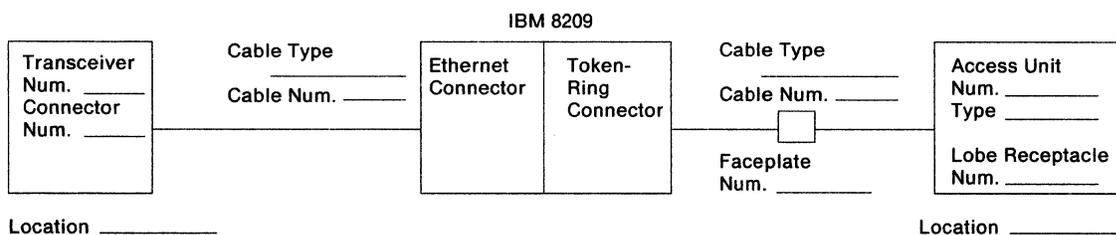
Need Basic Configuration Yes ___ No ___ (If yes, fill out Section 3.)

Need Advanced Configuration Yes ___ No ___ (If yes, fill out Section 4.)

Section 1 – Physical Connections

Location _____

Device ID _____



Section 2 – Basic Configuration Switch Settings

Switch Number and Name	Preset Default	▲	●
1 Automatic Mode Selection	▲ Enabled		
2 Mode Selection	● Ethernet V2		
3 Bridge Number and 4 Ethernet LAN Segment Number	● ● Bridge Num. = 0 LAN Seg. Num. = X'FF0'		
5 Token-Ring Network Data Transfer Rate (4 or 16 Mbps)	● 4 Mbps		

Section 3 — Bridge Definition and System Definition Parameters

Utility Program Bridge Definition

Bridge Definition Parameters	Default Value	Value
Bridge Name	(none)	
Link During Bring-up	No	
Base Adapter Address	(none)	
Module Adapter Address	(none)	
Comments (Up to 40 characters)		

Utility Program System Definition

Reporting Link Password	
-------------------------	--

Section 4 — Advanced Configuration Parameters

Utility Program Configure Bridge Parameters

Bridge Port Information	Default Value	Value
Bridge Name	(none)	
Bridge Number	0 or switch	
Token-Ring: LAN Segment Number	1	
Locally Administered Address	(none)	
Early Token Release	1 (Enabled)	
Ethernet: LAN Segment Number	(switch)	
Locally Administered Address	(none)	

Token-Ring Hop Count and Servers	Default Value	Value
Hop Count Limit	7	
Parameter Server	1 (Enabled)	
Error Monitor	1 (Enabled)	
Configuration Report Server	1 (Enabled)	

Bridge Forwarding Parameters	Default Value	Value
Automatic Mode Selection	(switch)	
Mode Selection	(switch)	
Forward LLC Traffic (Mode 1)	Yes	
Enabled SAPs for LLC Traffic	00, 04, 08, F0, F4, FC	
TCP/IP Address Conversion	1 (Enabled)	
Dual Mode Multicast Conversion	1 (Enabled)	
Use General Broadcast Frames	0 (Disabled)	
Broadcast Address Conversion	1 (Enabled)	

Criteria Filter Range Definition	Default Value	Token-Ring Value	Ethernet Value
Filter offset	0		
Range 1 low	0		
Range 1 high	FFFF		
Range 2 low	0		
Range 2 high	FFFF		

Address Filter Range Definition	Default Value	Token-Ring Value	Ethernet Value
Source address low	000000000000		
Source address high	000000000000		
Destination address low	000000000000		
Destination address high	000000000000		

Spanning-Tree Parameters	Default Value	Token-Ring Value	Ethernet Value
Bridge Maximum Age	20	N/A	
Bridge Hello Time	2	N/A	
Bridge Forward Delay	15	N/A	
Bridge Priority	32768		
Port Path Cost	250 (4 Mbps) 63 (16 Mbps) 100 (Ethernet)		
Port Priority	128		
Aging Time	300	N/A	
Maximum Transit Time	1	N/A	

Link Passwords	Default Value	Value
Link Password 0	00000000	
Link Password 1	00000000	
Link Password 2	00000000	
Link Password 3	00000000	



Ethernet Static Address Entries

Static Entries	Static Entries	Static Entries

Mapped Addresses

Token-Ring	Ethernet	Token-Ring	Ethernet

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, the Address Conversion Form and Table A-1 on page A-8 to convert an address. For an example of how to convert an address, see “Example of Converting an Address” on page A-9.

- 1 Write the 12-digit address on the Address Conversion Form.

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.

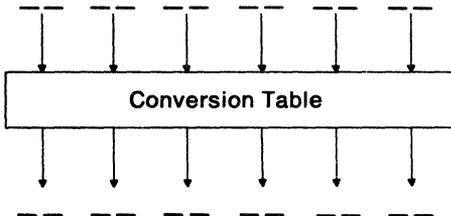
- 2 Locate a bit-order inverted pair in Table A-1 on page A-8 for each pair you wrote on the form.
- 3 Combine the 6 pairs from the table into the converted 12-digit address.

Table A-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	54	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 Worksheet

The following form can be used for converting addresses.



Example of Converting an Address

Figure A-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.

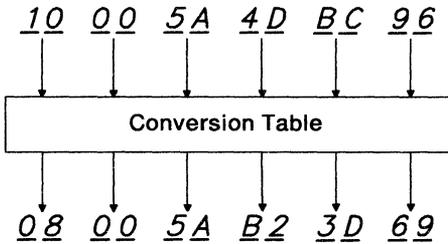


Figure A-1. An Example of How a Token-Ring Address Is Converted

Appendix B. How the IBM 8209 LAN Bridge Functions

The IBM 8209 LAN Bridge is a two-port medium access control (MAC) bridge. With the Ethernet attachment module, the IBM 8209 connects either an Ethernet or IEEE 802.3 Carrier Sense Multiple Access with Collision Detection (CSMA/CD) LAN to an IEEE 802.5 token-ring LAN. The IBM 8209 provides the necessary conversion of information frames (groups of data blocks) exchanged between two dissimilar LANs.

The IBM 8209 appears to stations on the token-ring LAN as a source-routing bridge to another token-ring LAN. The IBM 8209 is functionally transparent to stations on the Ethernet LAN, appearing as one or more native devices on the Ethernet LAN.

The IBM 8209 Functions

This appendix describes the IBM 8209 implementation of the following bridge functions:

- Routing through bridges
- Databases
- Information field length
- Network address
- Filtering
- Spanning-tree protocol
- Access protocols
- Frame format conversion.

These functions can be enabled, disabled, or assigned values by using the IBM 8209 LAN Bridge Utility Program, IBM LAN Manager, and/or the IBM LAN Network Manager to set advanced configuration parameters.

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 IBM 8209 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 IBM 8209 in an Ethernet environment always acts as a single-route broadcast bridge in the token-ring domain.

Transparent Bridging

Transparent bridging is used on most MAC bridges for interconnecting IEEE 802.3 or Ethernet LANs. The IBM 8209 incorporates transparent bridging for use with the attachment module that supports Ethernet and IEEE 802.3 LANs.

Transparent bridging provides a transparent interconnection of LANs 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 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 if 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.

IBM 8209 Routing

For the IBM 8209, 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.

A station on a token-ring network uses source routing to communicate with any station on a network that uses transparent bridging. A station on a network that uses transparent bridging communicates with any station on a token-ring network as though that station were on the same LAN.

Though a transparent bridging domain allows only one active bridge between any two LAN segments in the domain or between domains, parallel IBM 8209s 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.

Databases

The IBM 8209 maintains a block of non-volatile storage that acts as two address databases:

- The Ethernet database contains the source addresses detected on the Ethernet or IEEE 802.3 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 or IEEE 802.3 database may contain either static or dynamic entries. Static entries are specified during advanced configuration, and are loaded by the IBM 8209 during Utility Program initialization. Static entries are kept in the permanent storage on the IBM 8209. Dynamic entries are created as part of the IBM 8209's learning process.

In the IBM 8209 learning process, the Ethernet database is loaded with dynamic entries. The IBM 8209 enters the learning state in which it observes all frames on the Ethernet or IEEE 802.3 port and saves each unique source address in its database. While in this state, the IBM 8209 does not send any frames. The IBM 8209 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 IBM 8209 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 IBM 8209 begins normal operation. The IBM 8209 adds entries to the token-ring database only for those destination stations specified in frames that originate on the Ethernet LAN.

The Ethernet or IEEE 802.3 database represents known stations on the Ethernet or IEEE 802.3 LAN, whereas the token-ring database represents only those token-ring stations for which the IBM 8209 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 IBM 8209 to dynamically adapt the database to changes in the network configuration.

The aging time of the entries in the Ethernet or IEEE 802.3 database is updated whenever messages from the Ethernet or IEEE 802.3 stations are received. The aging time of the entries in the token-ring database is updated whenever messages received from the Ethernet or IEEE 802.3 port are sent to the token-ring stations.

The IBM 8209 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 IBM 8209 does not forward traffic from any station that does not have a database entry. The IBM 8209 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 IBM 8209 with an Ethernet attachment module supports frames with a maximum information field of 1500 bytes, which is the maximum supported by Ethernet or IEEE 802.3. For the token-ring network, the IBM 8209 sets the largest frame (LF) field of the routing field to binary 001, indicating a maximum information field of 1470 bytes. However, the IBM 8209 accepts and sends token-ring frames with an information field length of up to:

- 1508 bytes for mode 1 TCP/IP traffic
- 1457 bytes for RT-PC LLC traffic
- 1500 bytes for all other mode 2 traffic.

The lengths differ slightly because of selected fields being added or deleted during frame conversions.

The minimum information field lengths are:

- 3 bytes in mode 2 for frames originating on the IBM Token-Ring Network
- 48 bytes for 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 IBM 8209 supports the IEEE 48-bit (12 hexadecimal digits) address format only. Each network address must be unique in the network. If the IBM 8209 detects a duplicate address on either LAN connected to it, the IBM 8209 does not send any frames to that address.

Each IBM 8209 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.

Filtering

The IBM 8209 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 range 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 IBM 8209. It also ensures that unnecessary traffic does not decrease the performance of attached networks.

The IBM 8209 with the Ethernet attachment module supports two types of filters to reduce unnecessary traffic between LANs:

- A criteria range filter
- An address range filter.

Criteria Range Filter

The IBM 8209 supports a filter with two criteria ranges for traffic flowing from each connected LAN to the other connected LAN. The criteria ranges of each filter consist of an offset and two ranges of allowed values:

- An offset into the field in the frame that contains the filtering comparison information (this differs for different frame formats)
 - The information field begins with the DSAP field for frames forwarded between IEEE 802.3 LANs and token-ring network segments.
 - The information field begins at the TYPE field for frames forwarded between Ethernet Version 2 LANs and token-ring networks.
- Range 1 low and range 1 high, to which the information at the filter offset location is compared
- Range 2 low and range 2 high, to which the information at the filter offset location is compared.

A received frame is filtered (discarded) if the filtering information (2 bytes) is greater than the high value of each range and less than the low value of each range.

A value of all zeros for the high and the low range for a filter disables the filter.

TCP/IP Filter Example

If you need to filter only TCP/IP traffic between token-ring and IEEE 802.3 LANs, the filter offset and filter ranges should be set as follows:

	Token-Ring	Ethernet
Filter offset	6	6
Range 1 low	0800	0800
Range 1 high	0806	0806
Range 2 low	0835	0835
Range 2 high	0835	0835

Note: The offset is 6 to reach the LLC and SNAP headers at the front of the MAC data information field.

If you need to filter 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
Filter offset	6	0
Range 1 low	0800	0800
Range 1 high	0806	0806
Range 2 low	0835	0835
Range 2 high	0835	0835

Address Range Filter

The IBM 8209 supports a filter with 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 IBM 8209 filter can be disabled by specifying a value of all zeros 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 IBM 8209.

The IBM 8209 ensures that no traffic is held in the IBM 8209 for longer than the maximum transit time. If there is network congestion, the IBM 8209 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 and IEEE 820.3 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 IBM 8209s between a token-ring segment and an Ethernet domain, the spanning-tree protocol ensures that only one of the IBM 8209s, called the designated bridge, enters the data forwarding state, whereas other parallel IBM 8209s remain in the blocking state. An IBM 8209 in the blocking state, while 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 IBM 8209 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.

The *Draft IEEE Standard 802.1: Part D MAC Bridges*, listed in “Related Publications” on page xi explains the spanning-tree protocol in detail.

Spanning-Tree Bridge Parameters

The IBM 8209 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. (See “Spanning-Tree Parameters” on page 2-43.)

- Bridge maximum age
- Bridge hello time
- Bridge forward delay
- Bridge priority
- Port priority
- Path cost.

Frame Format Conversions

The IBM 8209 provides frame format conversion of two main types:

- Bit inversion

The bit order of the bytes for the destination and source address fields is inverted by the IBM 8209 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 IBM 8209 provides the following frame format conversions:

- Token-ring to Ethernet
- Ethernet to token-ring
- Token-ring to IEEE 802.3
- IEEE 802.3 to token-ring
- ARP to RARP
- RARP to ARP
- Token-ring to Ethernet for LLC-based protocols
- Ethernet to token-ring for LLC-based protocols.

Note: If you need to convert token-ring and Ethernet addresses (bit-inversion) manually, see “Address Conversion” on page A-7. 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.
- Isolating a problem with a protocol.
- Tracing frames between the networks.

Token-Ring to Ethernet Conversion

This conversion runs on the IBM 8209 in mode 1.

The conversion from a token-ring frame to an Ethernet frame for TCP/IP operation is represented in Figure B-1. 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.

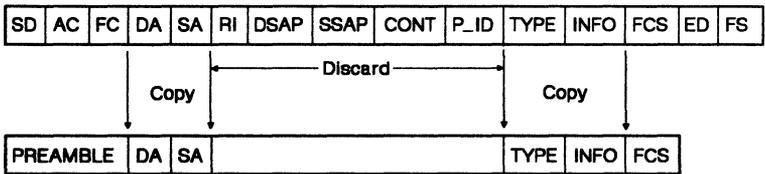


Figure B-1. Token-Ring to Ethernet Frame Conversion

In this conversion process, the bit order of the bytes for the destination and source address fields is inverted by the IBM 8209 as part of the copy process since the bit order of these fields is reversed between the two LAN types.

Ethernet to Token-Ring Conversion

This conversion runs on the IBM 8209 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 IBM 8209:

- 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.)

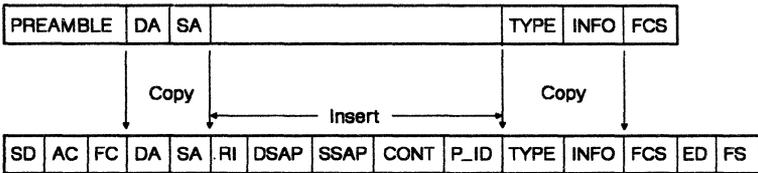


Figure B-2. Ethernet to Token-Ring Frame Conversion

In this conversion process, the bit order of the bytes for the destination and source address fields is inverted by the IBM 8209 as part of the copy process since the bit order of these fields is reversed between the two LAN types.

Token-Ring to IEEE 802.3 Conversion

This conversion runs on the IBM 8209 in mode 2.

The conversion from a token-ring frame to an IEEE 802.3 frame is represented in Figure B-3. 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 IBM 8209 is inserted in the frame and the frame is sent to the IEEE 802.3 LAN.

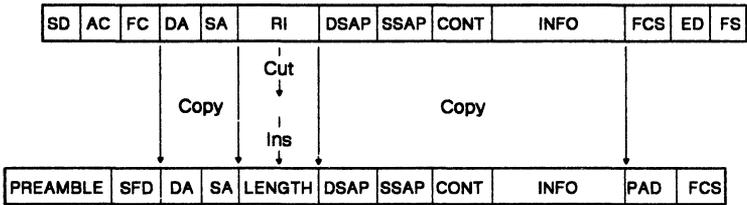


Figure B-3. Token-Ring to IEEE 802.3 Frame Conversion

In this conversion process, the bit order of the bytes for the destination and source address fields is inverted by the IBM 8209 as part of the copy process since the bit order of these fields is reversed between the two LAN types.

IEEE 802.3 to Token-Ring Conversion

This conversion runs on the IBM 8209 in mode 2.

This conversion is the reverse of the token-ring to IEEE 802.3 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 IBM 8209 then retrieves the source routing information associated with the token-ring destination address and inserts these fields following the source address before sending the frame to the token-ring LAN.

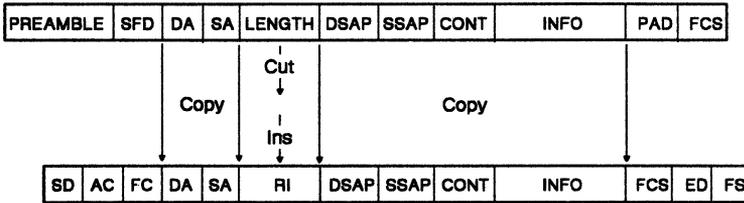


Figure B-4. IEEE 802.3 to Token-Ring Frame Conversion

In this conversion process, the bit order of the bytes for the destination and source address fields is inverted by the IBM 8209 as part of the copy process since the bit order of these fields is reversed between the two LAN types.

ARP to RARP 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 addresses within the information field of the ARP and reverse address resolution procedure (RARP) between the token-ring and Ethernet or IEEE 802.3 LANs.

The ARP conversion process is shown in Figure B-5.

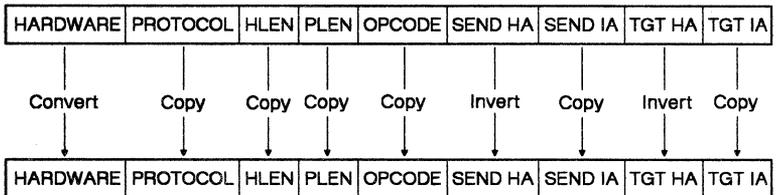


Figure B-5. ARP to RARP Conversion

RARP to ARP 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'0835' 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 are reversed between the token-ring and Ethernet or IEEE 802.3 LANs.

The RARP conversion process is shown in Figure B-6.

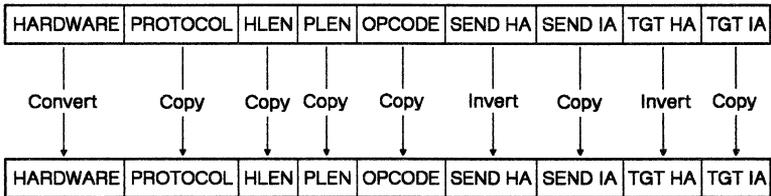


Figure B-6. RARP to ARP Conversion

Token-Ring to Ethernet 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 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 IBM 8209 when the following conditions exist:

- The IBM 8209 recognizes the destination station as communicating in Ethernet format (mode 1).
- The Forward LLC Traffic function is enabled in the IBM 8209 configuration. (The default is enabled.)
- The DSAP in the token-ring frame is contained in the IBM 8209 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 B-7; otherwise, the conversion is not done.

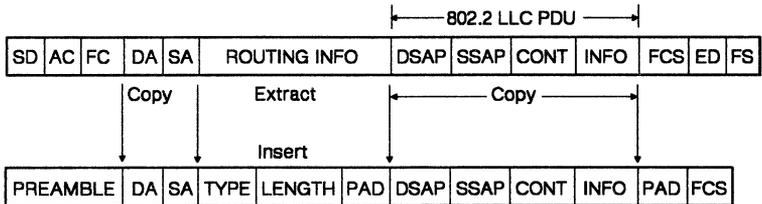


Figure B-7. Token-Ring to LLC-on-Ethernet Frame Conversion

In this conversion, the routing information (RI) is extracted from the token-ring frame and is discarded. The destination and source address (DA and 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 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 B-8.

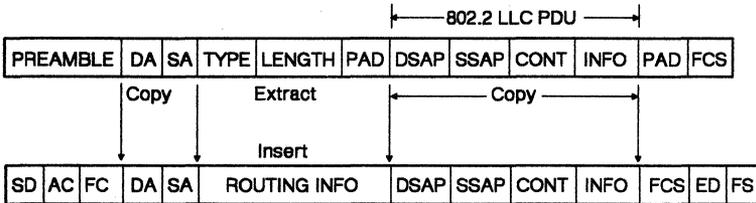


Figure B-8. LLC-on-Ethernet to Token-Ring Frame Conversion

In this conversion, the type, length, and pad fields are extracted and discarded. The LLC PDU and destination and source addresses (DA and SA) fields are copied into the token-ring frame. The IBM 8209 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.

An Example of a Network Using an IBM 8209

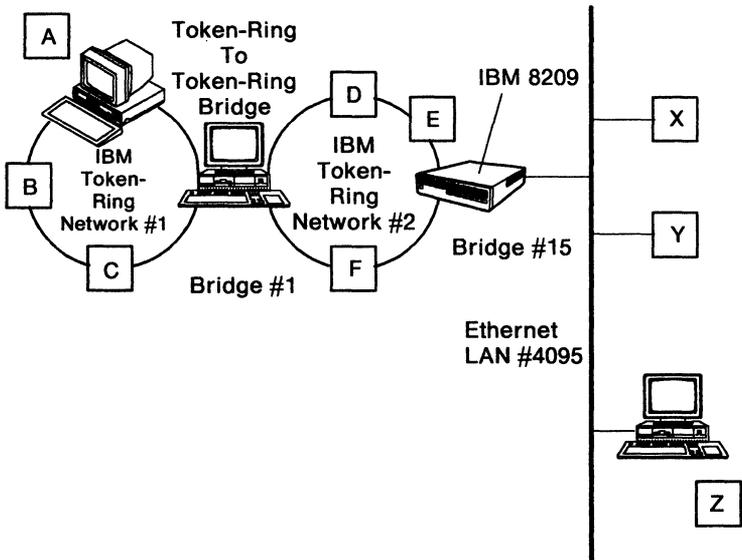


Figure B-9. An Example of a Network Using an IBM 8209

In Figure B-9, devices with addresses A, B, and C coexist on the token-ring LAN 1. The devices with addresses X, Y, and Z coexist on the Ethernet LAN. If A were to send a frame to Z, it would first send 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 shown below:

Source address	A
Destination address	Z
Routing	Single-route broadcast Direction is 0 Largest frame is 4472 bytes (for 4 Mbps)

Bridge number 1 would change the routing field and copy the frame on the LAN 2. The new routing field is as follows:

Source address	A
Destination address	Z
	Single-route broadcast.
	Direction is 0
	Largest frame is 4472 bytes
	Ring-in is 1
	Bridge number is 1
	Ring-out is 2

Bridge number 15 would then add the A address and its routing information to its database. The routing information stored would be as follows:

Source address	A
Routing	Specific route
	Direction is 1
	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 IBM 8209 (bridge number 15) changes the direction and largest frame size fields. The direction field is changed to show the reverse direction; the largest frame size is changed to the maximum for Ethernet.

The IBM 8209 (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 IBM 8209 would insert the above routing field in the frame before transmitting the frame on the token-ring port. Station A can then save the routing field and use it in all future transmissions to Z.

Appendix C. Utility Program Messages

The following messages are displayed by the IBM 8209 LAN Bridge Utility Program (Utility Program):

- DFIPD002 I Operation in progress, please wait**
- Meaning:** The program is performing an operation that you requested.
- Action:** Wait for the operation to be completed.
-
- DFIPD006 I Operation completed successfully**
- Meaning:** The operation you requested has been completed successfully.
- Action:** None.
-
- DFIPD007 W Operation failed**
- Meaning:** The operation you requested has failed.
- Action:** Use the information in other messages and error indications to correct the problem. Then, try the operation again.
-
- DFIPD083 E File full, operation failed**
- Meaning:** All available space in the target file has been used. No data can be added to the file.
- Action:** Do the following:
1. Save or erase the file.
- If you need to save the contents of the file, copy the file to another file or to a diskette, or change the name of the file.
- If you do not need the contents of the file or you have copied the file to save the contents, erase the file that is full.

2. Create a new file, or run the function of the Utility Program that creates a new file. Then, try again to do the operation that uses the file.

DFIPD155 E Cursor must be on a line with data

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

Action: Position the cursor on the correct line, and try the operation again.

DFIPD162 E Press Enter to process action

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

Action: Press the Enter key to process the action.

DFIPD163 E Request only one action.

Meaning: You typed an action next to more than one item on the panel and then pressed the Enter key. You may type an action next to only one item at a time.

Action: Type the action you want next to one item. Press the Enter key.

DFIPD164 E Invalid action requested. Please try again.

Meaning: You typed an action that is not available on this panel and pressed the Enter key.

Action: Type a valid action on the panel. Press the Enter key.

DFIPD174 I 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.

Action: Terminate the communications link with the IBM 8209. Then, try again to delete the bridge definition.

DFIPD176 E 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 addresses.

Action: Verify the correct adapter addresses for this IBM 8209, and enter the correct addresses in the bridge definition.

DFIPD177 E LAN segment number not unique

Meaning: The same LAN segment number was entered for both ports in the Bridge Definition function. The LAN segment numbers for the two segments connected to an IBM 8209 must always be different.

Action: Verify the correct LAN segment numbers for the IBM 8209, and enter the correct numbers in the bridge definition.

DFIPD178 I Bridge definition added

Meaning: A new bridge definition was successfully added.

Action: None.

DFIPD179 I Bridge definition changed

Meaning: The bridge definition was successfully changed.

Action: None.

DFIPD219 E Adapter not found. Limited function available

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

Action: Do the following:

1. Verify that the IBM Token-Ring Network adapter in the Utility Program computer is the primary adapter (adapter 0).

If the adapter has a switch for setting the primary/alternate adapter parameter, ensure that the switch is set to 0. Then start the Utility Program again.

If the adapter does not have switches, use the configuration function of the computer's Reference Diskette to verify that the IBM Token-Ring Network adapter is the primary adapter. Change the parameter, if necessary, and start the Utility Program again.

2. If the adapter is set correctly as the primary adapter, do one of the following (a. or b.):
 - a. If the Utility Program is running under DOS, ensure that the CONFIG.SYS file in the root directory contains one of the following statement groups:

If the IBM LAN Support Program is installed in the computer:

```
FILES = 60
BUFFERS = 20
DEVICE = C:\LANSP\DFIA0MOD.SYS
DEVICE = C:\LANSP\DFIC0MOD.SYS
```

If the IBM LAN Manager Version 1.0 is installed in the computer:

FILES = 60

BUFFERS = 20

DEVICE = C:\LANMGR\DFIA0MOD.SYS

DEVICE = C:\LANMGR\DFIC0MOD.SYS

If neither statement group is contained in the CONFIG.SYS file, reinstall the IBM LAN Support Program or the IBM LAN Manager. Then, start the Utility Program again.

- b. If the Utility Program is running under OS/2 EE, ensure that the correct version of OS/2 EE is loaded and that the Communications Manager is configured for LAN communications. Then, start the Utility Program again.
3. If the problem persists, reinstall the Utility Program.
4. If there is still a problem, call your service supplier.

DFIPD226 W Adapter inoperative, press Esc or F3 to exit

Meaning: The Utility Program's adapter has closed, and you are trying to use a Utility Program function that requires communication on the LAN segment.

Action: Do the following:

1. Press Esc or F3 to exit the function.
2. Shut down the Utility Program.
3. Start the Utility Program again. Watch the displayed panels to ensure that the Utility Program initializes successfully.

If initialization fails, run diagnostic tests to verify the operation of the IBM Token-Ring Network adapter. Correct any adapter problems. Start the Utility Program again.

DFIPD227 W Adapter inoperative, function not available

Meaning: The Utility Program's adapter has closed, and you are trying to use a Utility Program function that requires communication on the LAN segment.

Action: Do the following:

1. Shut down the Utility Program.
2. Start the Utility Program again. Watch the displayed panels to ensure that the Utility Program initializes successfully.

If initialization fails, run diagnostic tests to verify the operation of the IBM Token-Ring Network adapter. Correct any adapter problems. Start the Utility Program again.

DFIPD237 E Insufficient resources to open Service Access Point

Meaning: The Utility Program cannot open the service access point (SAP) because of insufficient resources assigned.

Action: Do the following:

For OS/2 EE, reconfigure OS/2 EE to increase the number of SAPs and links defined.

For DOS, start the personal computer and the Utility Program again. If other programs running in the computer also use the IBM Token-Ring Network adapter, reload these other programs AFTER the Utility Program has been reloaded.

DFIPD240 E Invalid adapter address

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

Action: Correct the indicated address.
Continue with your action or operation.

DFIPD254 E Bridge name not found

Meaning: Either the bridge name entered has not been defined to the Utility Program, or the name was typed incorrectly.

Action: Correct the name if it was typed incorrectly. If you typed the name correctly, define the bridge to the Utility Program. Then, try the operation for that bridge again.

DFIPD255 E Duplicate bridge name

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

Action: Verify that the bridge name is correct for this bridge definition.

Correct the bridge definitions and names in question and try the operation again.

DFIPD257 W No bridges have been defined

Meaning: You selected a bridge function, but no bridges have been defined to the Utility Program.

Action: Define a bridge to the Utility Program. Try the bridge function again for the defined bridge.

DFIPD262 E Invalid data. Please try again.

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

Action: Type the correct data and try the action or operation again.

DFIPD263 E Required data is missing. Please try again.

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

Action: Type the data that is required for the operation. Try the operation again.

DFIPD273 E Password format is incorrect. Please try again.

Meaning: You typed one or both new passwords incorrectly. The new passwords must be 6–8 characters long with no imbedded blanks. The valid characters are: letters A–Z and a–z, numbers 0–9, and special characters @, \$, %, and #.

Action: Type the new passwords correctly. Press the Enter key.

DFIPD280 W Operation failed - no communication response received.

Meaning: The Utility Program sent a frame to a station that did not respond within a fixed time.

Action: Check the status of the LAN segment to which the station is connected.

If the LAN segment status is **Normal**, try the operation again.

If the LAN segment status is other than **Normal**, correct the problem on the LAN segment. Then, repeat the bridge or station function that caused the Utility Program to send the frame to the station.

DFIPD285 I Bridge already linked

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

Action: Continue with the next operation for the linked bridge.

DFIPD286 I Bridge already unlinked

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

Action: Continue with the next operation.

DFIPD289 I Operation failed - bridge not linked

Meaning: You requested a bridge function (bridge profile, for instance), but the Utility Program does not have a communications link established with that bridge.

Action: Check to see whether you typed the bridge name correctly.

If the bridge name is incorrect, type the bridge name correctly. Try the bridge function again.

If the name was typed correctly, establish a link with the bridge. Then, try the operation again.

If the link cannot be established, verify the bridge definition or add a definition for the bridge. Establish a link with the bridge and try the bridge function again.

DFIPD307 I Link limit exceeded

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

Action: You can change another IBM 8209 bridge definition to not link during bring-up and then define this bridge to link during bring-up, or you can specify No for link during bring-up for this bridge and establish the link manually when needed.

DFIPD314 I Reporting link data changed.

Meaning: The reporting link, reporting link password, or both have changed. The change will take effect the next time you start the Utility Program again.

Action: If you want the change to take effect immediately, you must shut down and start the Utility Program again.

If you want to wait for the next restart of the Utility Program, no action is required.

DFIPD601 W Frame transmission failure.

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

Action: Verify that the correct adapter support software is installed and loaded with the Utility Program. If the problem persists, reinstall the adapter support software and the Utility Program. If there is still a problem, call for service assistance.

DFIPD602 W Transmit timer failure.

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

Action: Verify that the correct adapter support software is installed and loaded with the Utility Program. If the problem persists, reinstall the adapter support software and the Utility Program. If there is still a problem, call for service assistance.

DFIPD603 W Receive timer failure.

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

Action: Verify that the correct adapter support software is installed and loaded with the Utility Program. If the problem persists, reinstall the adapter support software and the Utility Program. If there is still a problem, call for service assistance.

DFIPD700 W 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: Do the following steps:

1. Check the adapter address for the bridge to be linked.
 - a. If the adapter address is incorrect, correct the address.
 - b. If the adapter address is correct, verify that there is a route to the bridge and that the route is functioning normally.
2. Try again to establish the link.

DFIPD701 W TEST frame transmission failure.

Meaning: The adapter support software was not able to process the Utility Program's transmit request for the TEST frame sent initially to find a route to the bridge.

Action: Do the following steps:

1. Check the adapter address for the bridge to be linked.

- a. If the adapter address is incorrect, correct the address.
 - b. If the adapter address is correct, verify that there is a route to the bridge and that the route is functioning normally.
2. Try again to establish the link.

DFIPD702 W Transmit timer failure - TEST frame.

Meaning: The adapter support software reported an error while processing the Utility Program's transmit timer start request for the TEST frame sent initially to find a route to the bridge.

Action: Do the following steps:

1. Check the adapter address for the bridge to be linked.
 - a. If the adapter address is incorrect, correct the address.
 - b. If the adapter address is correct, verify that there is a route to the bridge and that the route is functioning normally.
2. Try again to establish the link.

DFIPD703 W Receive timer failure - TEST frame.

Meaning: The adapter support software reported an error while processing the Utility Program's receive timer start request for the TEST frame sent initially to find a route to the bridge.

Action: Do the following steps:

1. Check the adapter address for the bridge to be linked.
 - a. If the adapter address is incorrect, correct the address.

- b. If the adapter address is correct, verify that there is a route to the bridge and that the route is functioning normally.

2. Try again to establish the link.

DFIPD750 E Operation failed - invalid reporting link key.

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

Action: Verify and correct if necessary the reporting link password in the System Definition.

Try the link operation again with the correct password.

DFIPD751 E Operation failed - reporting link already in use.

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

Action: Do one of the following:

- Try the operation using the Utility Program or IBM LAN Manager that has the controlling link with the bridge.
- Change the links so that this Utility Program has the controlling link with the bridge. Then, try the operation again.

DFIPD752 E Operation failed - invalid reporting link identifier.

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

Action: Exit and start the Utility Program again and reestablish the link with the bridge.

- DFIPD753 E Operation failed - unable to establish connection.**
- Meaning:** During the link attempt, the Utility Program received a "Utility Program rejected" message from the bridge.
- Action:** Try the operation again.
-
- DFIPD754 E 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 "Utility Program rejected" message from the bridge.
- The Utility Program tried to link to the bridge through the LAN connection on the other side of the bridge from the Utility Program.
- Action:** Ensure that the bridge adapter addresses are specified correctly in the bridge definition, and that the link password is correct in the system definition and the configuration. Try the link again.
-
- DFIPD770 E Operation failed - server available but not active.**
- Meaning:** There is a system problem if this message is displayed.
- Action:** Exit and start the Utility Program again and reestablish the link with the bridge.
-
- DFIPD771 E 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.
- Action:** Check to ensure that you are not trying to do an operation that has already been done, such as link to a bridge with a link already established.

DFIPD772 E Operation failed - invalid bridge definition.

Meaning: This message is displayed when the bridge definition file TRE.DEF has been corrupted.

Action: Exit the Utility Program, and delete the file TRE.DEF. Restart the Utility Program and enter the bridge definitions again.

DFIPD900 E Error accessing bridge definition file. Press Esc.

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

Action: Do the following:

1. Erase the TRE.DEF file from the fixed disk or working diskette from which the Utility Program is loaded.
2. Use the Bridge Definition and System Definition functions to redefine to the Utility Program all of the bridges that can have a link established with the Utility Program.
3. If the problem persists, reinstall the Utility Program and define the bridges again.

DFIPD901 E 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 if there is sufficient available disk space.

- DFIPD950 E** **Low range exceeds high range.**
- Meaning:** In an IBM 8209 filter definition, a low range value exceeds the corresponding high range value.
- Action:** Redefine the filter range so that the low range is less than the high range. Start the bridge again.
-
- DFIPD951 E** **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.
- Action:** Verify the correct values for the bridge hello time and bridge forward delay parameters, and enter the values again.
-
- DFIPD952 E** **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.
- Action:** Verify the correct values for the bridge maximum age and bridge forward delay parameters, and enter the values again.
-
- DFIPD953 E** **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.
- Action:** Verify the correct values for the bridge maximum age and bridge hello time parameters, and enter the values again.

DFIPD955 E 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. This condition could only occur when Version 2.0 of the Utility Program is used with an IBM 8209 containing the original release of the Ethernet attachment module.

Action: Verify that you are using the correct Utility Program version with your Ethernet attachment module. If necessary, change levels of the program or the module so that the two are compatible.

DFIPD990 E Operation failed - return code = *rc*

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

Action: Record the message number and return code; have them available when you contact your service supplier for assistance.

DFIPD991 E Operation failed - TEST frame return code = *rc*

Meaning: The adapter support software failed during an operation that involves the TEST frame sent initially to find a route to the bridge, returning an error code of *rc*.

Action: Record the message number and return code; have them available when you contact your service supplier for assistance.

DFIPD992 E Operation failed - rejection code = *rc*

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

Action: Record the message and rejection code; have them available when you contact your service supplier for assistance.

DFIPD993 E Operation failed - reason code = 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*.

Action: Write down the message number, the message text, and the reason code, and have them available when you call your service supplier for assistance.

DFIPD997 E 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.

Action: Verify the address or address pair that you are attempting to enter. If it has already been entered, continue with the next entry, if any. If your entry was incorrect, type the correct entry.

DFIPD998 E Operation failed - entries exceed data base capacity.

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

Action: Eliminate some of the entries from the panel or file.

Appendix D. Ethernet Attachment Module Parts List

Table D-1. Ethernet Attachment Module Parts List		
Part Number	Description	
74F8627	Attachment Module, Ethernet	
55F4897	Wrap Plug, Ethernet LAN	
74F8640	Diskettes, IBM 8209 Utility Program Version 2.0	
74F9353		US English
74F9478		France
74F9357		Germany
74F9359		Italy
	Korea	

List of Abbreviations

AC	alternating current	IEEE	Institute of Electrical and Electronics Engineers, Inc.
ANSI	American National Standards Institute	ISO	International Standards Organization
ARP	address resolution protocol	K	Kilo (1000 or 1024)
ASCII	American National Standard Code for Information Interchange	KB	Kilobyte = 1024 bytes for processor storage (memory) size, otherwise = 1000 bytes
AUI	attachment unit interface	kg	kilogram
BPDU	bridge protocol data unit	kVa	kilovolt-amperes
bps	Bits per second.	LAN	local area network
CRC	Cyclic redundancy check.	LED	light emitting diode
CRS	configuration report server	LLC	logical link control
CSMA/CD	carrier sense multiple access with collision detection	MAC	medium access control
° C	degrees Centigrade	Mbps	million bits per second
° F	degrees Fahrenheit	m	meters
DOS	Disk Operating System	mm	millimeters
DSAP	destination service access point	NAUN	nearest active upstream neighbor
ETR	Early Token Release.	NDIS	Network Driver Interconnect Specification
FCC	Federal Communication Commission (USA)	NETBIOS	Network Basic Input/Output System
FCS	Frame check sequence.	OS	Operating System
Hz	hertz	OS/2 EE	Operating System/2 Extended Edition

OSI	Open Systems Interconnection.	SAP	service access point
PC	personal computer	SNA	Systems Network Architecture
RARP	reverse address resolution protocol	SNAP	subnetwork access protocol
REM	ring error monitor	TCP/IP	Transmission Control Protocol/Internet Protocol
RISC	reduced instruction set computer	V	volts
RT	RISC technology		

Glossary

This Glossary defines local area network terms and abbreviations. It includes terms and definitions from the *IBM Dictionary of Computing (Information Processing, Personal Computing, Telecommunications, Office Systems, IBM-Specific Terms)*, SC20-1699.

- The symbol (A) identifies definitions from the *American National Dictionary for Information Processing Systems*, copyright 1982 by the Computer and Business Equipment Manufacturers Association (CBEMA).
- The symbol (I) identifies definitions from the *ISO Vocabulary-Information Processing* and *ISO Vocabulary-Office Machines*, developed by the International Organization for Standardization, Technical Committee 97, Subcommittee 1.
- The symbol (T) identifies definitions from draft international standards, draft proposals, and working papers in development by the International Organization for Standardization, Technical Committee 97, Subcommittee 1.

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.

active monitor. A function in a single adapter on a token-ring network that initiates the transmission of tokens and provides token error recovery facilities. Any active adapter on the ring has the ability to provide the active monitor function if the current active monitor fails.

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 LAN adapter.

address. (1) In data communication, the IEEE-assigned unique code or the unique locally

administered 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)

all-routes broadcast frame. A frame that has bits in the routing information field set to indicate that the frame is to be sent to all LAN segments in the network (across all bridges, even if multiple paths allow multiple copies of the frame to arrive at some LAN segments). The destination address is not examined and plays no role in bridge routing.

alternate adapter. In a personal computer that is used on a LAN and that supports installation of two network adapters, the adapter that uses alternate (not standard or default) mapping between adapter-shared RAM, adapter ROM, and designated computer memory segments. The alternate adapter is usually designated as adapter 1 in configuration parameters. Contrast with *primary adapter*.

American National Standard Code for Information Interchange (ASCII). The standard code, using a coded character set consisting of 7-bit coded characters (8 bits including parity check), used for

information interchange among data processing systems, data communication systems, and associated equipment. The ASCII set consists of control characters and graphics characters. (A)

analog. Pertaining to data consisting of continuously variable physical quantities. (A) Contrast with *digital*.

application program. (1) A program written for or by a user that applies to the user's work. Some application programs receive support and services from a special kind of application program called a network application program. (2) A program used to connect and communicate with stations in a network, enabling users to perform application-oriented activities.

architecture. A logical structure that encompasses operating principles including services, functions, and protocols. See *computer architecture*, *network architecture*, *Systems Application Architecture (SAA)*, *Systems Network Architecture (SNA)*.

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.

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

backbone LAN segment. In a LAN multiple segment configuration, a centrally located LAN segment to which other LAN segments are connected by means of bridges. In a hierarchical network, the LAN segment that is at the highest level of the hierarchy.

baseband. (1) A frequency band that uses the complete bandwidth of a transmission medium. Contrast with *broadband*, *carrierband*. (2) A method of data transmission that encodes, modulates, and impresses information on the transmission medium without shifting or altering the frequency of the information signal.

baud. The rate at which signal conditions are transmitted per second. Contrast with *bits per second (bps)*.

beaconing. An error-indicating function of token-ring adapters that assists in locating a problem causing a hard error on a token-ring network.

binary. (1) Pertaining to a system of numbers to the base two; the binary digits are 0 and 1. (A) (2) Pertaining to a selection, choice,

or condition that has two possible different values or states. (I) (A)

bit. Either of the binary digits: a 0 or 1.

bits per second (bps). The rate at which bits are transmitted per second. Contrast with *baud*.

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.

broadband. (1) A frequency band between any two non-zone frequencies. (2) A frequency band divisible into several narrower bands so that different kinds of transmissions such as voice, video, and data transmission can occur at the same time. Synonymous with *wideband*. Contrast with *baseband*, *carrierband*.

broadband local area network (LAN). A local area network (LAN) in which information is encoded, multiplexed, and transmitted through modulation of a carrier. (T)

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.

byte. (1) A string that consists of a number of bits, treated as a unit, and representing a character. (T) (2) A binary character operated upon as a unit and usually shorter than a computer word. (A) (3) A string that consists of a particular number of bits, usually 8, that is treated as a unit, and that represents a character. (4) A group of 8 adjacent binary digits that represent one extended binary-coded decimal interchange code (EBCDIC) character. (5) See *n-bit byte*.

C

cable loss (optical). The loss in an optical cable equals the attenuation coefficient for the cabled fiber times the cable length.

cable segment. A section of cable between components or devices on a network. A segment may consist of a single patch cable, multiple patch cables connected together, or a combination of building cable and patch cables connected together. See *LAN segment, ring segment*.

carrier. A wave or pulse train that may be varied by a signal bearing information to be transmitted over a communication system.

carrierband. A frequency band in which the modulated signal is superimposed on a carrier signal (as differentiated from baseband), but only one channel is present on the medium (as differentiated from broadband). Contrast with *baseband, broadband*.

carrier sense. In a local area network, an ongoing activity of a data station to detect whether another station is transmitting. (T)

channel. (1) A functional unit, controlled by a host computer, that handles the transfer of data between processor storage and local peripheral equipment. (2) A path along which signals can be sent. (3) The portion of a storage medium that is accessible to a given reading or writing station. (4) In broadband transmission, a designation of a frequency band 6 MHz wide.

circuit. (1) A logic device. (2) One or more conductors through which an electric current can flow.

coaxial (coax) cable. A cable consisting of one conductor, usually a small copper tube or wire, within and insulated from another conductor of a larger diameter, usually copper tubing or copper braid.

collision. (1) An unwanted condition that results from

concurrent transmissions on a channel. (T) (2) When a frame from a transmitting adapter encounters any other signal in its path (frame, noise, or another type of signal), the adapter stops transmitting and a collision is registered.

collision detection. In carrier sense multiple access with collision detection (CSMA/CD), a signal indicating that two or more stations are transmitting simultaneously.

command. (1) A request for performance of an operation or execution of a program. (2) A character string from a source external to a system that represents a request for system action.

communication network management (CNM). The process of designing, installing, operating, and managing distribution of information and control among users of communication systems.

component. (1) Any part of a network other than an attaching device, such as an IBM 8228 Multistation Access Unit. (2) Hardware or software that is part of a functional unit.

computer architecture. The organizational structure of a computer system, including hardware and software. (A)

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 file. The collective set of definitions that describes a 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*.

contention. In a LAN, a situation in which two or more data stations are allowed by the protocol to start transmitting concurrently and thus risk collision. (T)

controlling link. The reporting link (or authorization level) between a bridge program and a network management program that authorizes the network management program to change bridge configuration parameters and to disable and enable certain bridge program functions. Contrast with *observing link*.

cyclic redundancy check (CRC). Synonym for *frame check sequence (FCS)*.

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)

database. A set of data, part or the whole of another set of data, that consists of at least one file, and that is sufficient for a given purpose or for a given data processing system. (I) (A)

data link. (1) Any physical link, such as a wire or a telephone circuit, that connects one or more remote terminals to a communication control unit, or connects one communication control unit with another. (2) The assembly of parts of two data terminal equipment (DTE) devices that are controlled by a link protocol, and the interconnecting data circuit, that enable data to be transferred from a data source to a data sink. (I) (3) In SNA, see also *link*.

Note: A telecommunication line is only the physical medium of transmission. A data link includes the physical medium of transmission, the protocol, and associated devices and programs; it is both physical and logical.

data rate. See *data transfer rate*, *line data rate*.

data station. See *station*.

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.

data transmission. The conveying of data from one place for reception elsewhere by means of telecommunications. (I)

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.

designated bridge. In a LAN using a spanning-tree protocol, a bridge that forwards frames. See also *root bridge*, *standby bridge*.

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*.

destination service access point (DSAP). The service access point for which a logical link control protocol data unit (LPDU) is intended.

device. (1) A mechanical, electrical, or electronic contrivance with a specific purpose. (2) An input/output unit such as a terminal, display, or printer. See also *attaching device*.

device driver. The code needed to attach and use a device on a computer or a network.

digital. (1) Pertaining to data in the form of digits. (A) Contrast with *analog*. (2) Pertaining to data consisting of numerical values or discrete units.

disabled. (1) Pertaining to a state of a processing unit that prevents the occurrence of certain types of interruptions. (2) Pertaining to the state in which a transmission control unit or audio response unit cannot accept incoming calls on a line.

Disk Operating System. An operating system for computer systems that use disks and diskettes for auxiliary storage of programs and data.

downstream. (1) On an IBM Token-Ring Network, the direction of data flow. (2) In the direction of data flow or toward the destination of transmission. Contrast with *upstream*.

E

Early Token Release (ETR). In token-ring and Fiber Distributed Data Interface (FDDI) networks, a function that allows a transmitting adapter to release a new token as soon as it has completed frame transmission, whether or not the frame header has returned to that adapter.

EBCDIC. Extended binary-coded decimal interchange code. A coded character set consisting of 8-bit coded characters. (A)

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 state of a processing unit that allows the occurrence of certain types of interruptions. (3) Pertaining to the state in which a transmission control unit or an audio response unit can accept incoming calls on a line.

enterprise. A business or organization that consists of two or more sites separated by a public right-of-way or a geographical distance. Contrast with *establishment*.

establishment. A user's premises that do not extend across public rights of way (for example, a single office building, warehouse, or campus). Contrast with *enterprise*.

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.

Note: "Ethernet" is a trademark of XEROX Corporation and must be indicated on the Special Notices page facing the preface of a publication.

execution. The process of carrying out an instruction or instructions of a computer program by a computer. (I) (A)

exit. To execute an instruction or statement within a portion of a program in order to terminate the execution of that portion. (T)

Note: Such portions of programs include loops, routines, subroutines, and modules.

extended binary-coded decimal interchange code (EBCDIC). A coded character set consisting of 8-bit coded characters.

F

faceplate. A wall-mounted or surface-mounted plate for connecting data and voice connectors to a cabling system.

feature. A part of an IBM product that may be ordered separately by the customer.

Federal Communications

Commission (FCC). A board of commissioners appointed by the President under the Communications Act of 1934, having the power to regulate all interstate and foreign communications by wire and radio originating in the United States.

field. On a data medium or a storage medium, a specified area used for a particular category of data; for example, a group of character positions used to enter or display wage rates on a panel. (T)

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.

file server. A high-capacity disk storage device or a computer that each computer on a network can access to retrieve files that can be shared among the attached computers.

filter. A device or program that separates data, signals, or material in accordance with specified criteria. (A)

flag. A character or indicator that signals the occurrence of some condition, such as the setting of a switch, or the end of a word. (A)

formatted diskette. A diskette on which track and sector control information has been written and that can be used by the computer to store data.

Note: A diskette must be formatted before it can receive data.

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) A housing for machine elements. (3) 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.

frame check sequence (FCS). (1) A system of error checking performed at both the sending and receiving station after a block check character has been accumulated. (2) A numeric value derived from the bits in a message that is used to check for any bit errors in transmission. (3) A redundancy check in which the check key is generated by a cyclic algorithm. (T) Synonymous with *cyclic redundancy check (CRC)*.

frequency. The rate of signal oscillation, expressed in hertz (cycles per second).

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.

function key. A key that can signal or initiate the performance of various actions or functions that are selected by the user or determined by an application program.

functional address. In IBM network adapters, a special kind of group address in which the address is bit-significant, each "on" bit representing a function performed by the station (such as "Active Monitor," "Ring Error Monitor," "LAN Error Monitor," or "Configuration Report Server").

functional unit. An entity of hardware, software, or both, capable of accomplishing a specified purpose. (I) (A)

G

gateway. A device and its associated software that interconnect networks or systems of different architectures. The connection is usually made above the reference model network layer. For example, a gateway allows LANs access to System/370 host computers. Contrast with *bridge* and *router*.

group. (1) A set of related records that have the same value for a particular field in all records. (2) A collection of users who can share access authorities for protected resources. (3) A list of names that are known together by a single name.

group address. In a LAN, a locally administered address assigned to two or more adapters to allow the adapters to copy the same frame. Contrast *locally administered address* with *universally administered address*.

H

hard error. An error condition on a network that requires that the source of the error be removed or that the network be reconfigured before the network can resume reliable operation. See also *beaconing*. Contrast with *soft error*.

hardware. Physical equipment as opposed to programs, procedures, rules, and associated documentation. (I) (A)

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.

hop count. The number of bridges through which a frame has passed on the way to its destination.
Note: Hop count applies to all broadcast frames except single-route broadcast frames.

hop count limit. The maximum number of bridges through which a frame may pass on the way to its destination.

I

IBM Personal Computer Disk Operating System (DOS). A disk operating system based on MS-DOS.

Note: "MS-DOS" is a trademark of Microsoft Corporation and must be indicated on the Special Notices page facing the preface of a publication.

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.

input/output (I/O). (1) Pertaining to a device whose parts can perform an input process and an output process at the same time. (I) (2) Pertaining to a functional unit or channel involved in an input process, output process, or both, concurrently or not, and to the data involved in such a process.

insert. To make an attaching device an active part of a LAN.

interface. (1) A shared boundary between two functional units, defined by functional characteristics, common physical interconnection characteristics, signal characteristics, and other characteristics as appropriate. (I) (2) A shared boundary. An interface may be a hardware component to link two devices or a portion of storage or registers accessed by two or more computer programs. (A) (3) Hardware,

software, or both, that links systems, programs, or devices.

interference. (1) The prevention of clear reception of broadcast signals. (2) The distorted portion of a received signal.

International Organization for Standardization (ISO). An organization of national standards bodies from various countries established to promote development of standards to facilitate international exchange of goods and services, and develop cooperation in intellectual, scientific, technological, and economic activity.

J

jack. A connecting device to which a wire or wires of a circuit may be attached and which is arranged for insertion of a plug.

K

kilobit (Kb). One thousand binary digits.

kilobyte (KB). 1024 bytes for processor and data storage (memory) size; otherwise, 1000 bytes.

L

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 via bridges. (2) An entire ring or bus

network without bridges. See *cable segment*, *ring segment*.

LAN Segment Number. The identifier that uniquely distinguishes a LAN segment in a multi-segment LAN.

LAN segment status. The condition of the LAN segment (ring or bus).

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. (l) (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.

link connection. (1) All physical components and protocol machines that lie between the communicating link stations of a link. The link connection may include a switched or leased physical data circuit, a LAN, or an X.25 virtual circuit. In SNA, the physical equipment providing two-way communication and error correction and detection between one link station and one or more other link stations.

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*.

logical connection. In a network, devices that can communicate or work with one another because they share the same protocol. See also *physical connection*.

logical link control protocol (LLC protocol). In a local area network, the protocol that governs the exchange of frames between data stations independently of how the transmission medium is shared. (T)

logical link control protocol data unit (LPDU). The unit of information exchanged between network layer entities in different nodes. The LPDU consists of the destination service access point (DSAP) and

source service access point (SSAP) address fields, the control field, and the information field (if present).

loop. A closed unidirectional signal path connecting input/output devices to a network.

M

MAC frame. Frames used to carry information to maintain the ring protocol and for exchange of management information.

MAC protocol. (1) In a local area network, 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) See also *logical link control protocol (LLC protocol)*. (2) The LAN protocol sublayer of data link control (DLC) protocol that includes functions for adapter address recognition, copying of message units from the physical network, and message unit format recognition, error detection, and routing within the processor.

medium. A physical carrier of electrical or optical energy.

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)

megabit (Mb). A unit of measure for throughput. 1 megabit = 1 048 576 bits.

megahertz (MHz). A unit of measure of frequency. 1 megahertz = 1 000 000 hertz.

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.

microcode. (1) One or more microinstructions. (2) A code, representing the instructions of an instruction set, that is implemented in a part of storage that is not program-addressable. (3) To design, write, and also test one or more microinstructions.

monitor. (1) A functional unit that observes and records selected activities for analysis within a data processing system. Possible uses are to show significant departures from the norm, or to determine levels of utilization of particular functional units. (I) (A) (2) Software or hardware that observes, supervises, controls, or verifies operations of a system. (A)

N

name. An alphanumeric term that identifies a data set, statement, program, or cataloged procedure.

nanosecond (ns). One thousand millionth of a second.

n-bit byte. A string that consists of n bits. (T)

nearest active upstream neighbor (NAUN). For any given attaching device on an IBM Token-Ring Network, the attaching device that is sending frames or tokens directly to it.

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 architecture. The logical structure and operating principles of a computer network. (T) See also *systems network architecture (SNA)* and *Open Systems Interconnection (OSI) architecture*.

Note: The operating principles of a network include those of services, functions, and protocols.

Network Basic Input/Output System (NETBIOS). A message interface used on LANs to provide message, print server, and file server functions. The IBM NETBIOS application program interface (API) provides a programming interface to the LAN so that an application

program can have LAN communication without knowledge and responsibility of the data link control (DLC) interface.

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 management program. A program or group of programs that is used to monitor, manage, and diagnose the problems of a network.

network status. The condition of the network.

node. (1) Any device, attached to a network, that transmits and/or receives data. (2) An endpoint of a link, or a junction common to two or more links in a network. (3) In a network, a point where one or more functional units interconnect transmission lines.

O

observing link. The reporting link (or authorization level) between a bridge and a network management program that authorizes the network management program to perform all network management functions except those restricted to the controlling link. (The restricted functions include removing adapters from a ring, changing certain bridge configuration parameters, and enabling or disabling certain bridge

functions.) Contrast with *controlling link*.

office. See *work area*.

open. (1) To make an adapter ready for use. (2) A break in an electrical circuit. (3) To make a file ready for use.

open systems architecture (OSA).

A model that represents a network as a hierarchical structure of layers of functions; each layer provides a set of functions that can be accessed and that can be used by the layer above it.

Note: Layers are independent in the sense that implementation of a layer can be changed without affecting other layers.

Open Systems Interconnection

(OSI). (1) The interconnection of open systems in accordance with specific ISO standards. (T) (2) The use of standardized procedures to enable the interconnection of data processing systems.

Note: OSI architecture establishes a framework for coordinating the development of current and future standards for the interconnection of computer systems. Network functions are divided into seven layers. Each layer represents a group of related data processing and communication functions that can be carried out in a standard way to support different applications.

Open Systems Interconnection (OSI) architecture. Network architecture that adheres to a particular set of ISO standards that relates to Open Systems Interconnection. (T)

Open Systems Interconnection (OSI) reference model. A model that represents the hierarchical arrangement of the seven layers described by the Open Systems Interconnection architecture.

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.

Operating System/2 (OS/2). A set of programs that control the operation of high-speed large-memory IBM personal computers (such as the IBM Personal System/2 computer, Models 50 and above), providing multitasking and the ability to address up to 16 MB of memory. Contrast with *Disk Operating System (DOS)*.

operation. (1) A defined action, namely, the act of obtaining a result from one or more operands in accordance with a rule that completely specifies the result for any permissible combination of operands. (A) (2) A program step undertaken or executed by a computer. (3) An action performed on one or more data items, such as adding, multiplying, comparing, or moving.

optical fiber. A small-diameter strand made from glass and/or polymer that consists of a core surrounded by a lower-index-of-refraction cladding. It guides light from one end to

another by a combination of a graded index in the core and internal reflectance.

optical fiber cable. One or more optical fibers aligned with each other, with strengthening material and a protective cover.

option. (1) A specification in a statement, a selection from a menu, or a setting of a switch, that may be used to influence the execution of a program. (2) A hardware or software function that may be selected or enabled as part of a configuration process. (3) A piece of hardware (such as a network adapter) that can be installed in a device to modify or enhance device function.

P

packet. (1) In data communication, a sequence of binary digits, including data and control signals, that is transmitted and switched as a composite whole. (1) (2) Synonymous with *data frame*. Contrast with *frame*.

page. (1) The portion of a panel that is shown on a display surface at one time. (2) To move back and forth among the pages of a multiple-page panel. See also *scroll*. (3) In a virtual storage system, a fixed-length block that has a virtual address and is transferred as a unit between real storage and virtual storage.

panel. The complete set of formatted information that appears in a single display on a visual display unit.

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.

password. In computer security, a string of characters known to the computer system and a user, who must specify it to gain full or limited access to a system and to the data stored within it.

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.

path cost. A value, maintained by each IBM bridge program that uses a spanning-tree protocol, that indicates to the bridge protocol support the relative length of the path between the root bridge and a designated or standby bridge.

personal computer (PC). A desk-top, free-standing, or portable microcomputer that usually consists

of a system unit, a display, a monitor, a keyboard, one or more diskette drives, internal fixed-disk storage, and an optional printer. PCs are designed primarily to give independent computing power to a single user and are inexpensively priced for purchase by individuals or small businesses. Examples include the various models of the IBM Personal Computers, and the IBM Personal System/2 computer.

Personal Computer Disk Operating System (PC DOS). A program that controls the operation and execution of application programs one task at a time in IBM personal computers. Contrast with *Operating System/2 (OS/2)*.

Personal Computer input/output (PC I/O) channel. The architecture used by IBM personal computers and the IBM Personal System/2 computers, Models 25 and 30.

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*.

primary adapter. In a personal computer that is used on a LAN and that supports installation of two network adapters, the adapter that uses standard (or default) mapping between adapter-shared RAM, adapter ROM, and designated computer memory segments. The primary adapter is usually designated as adapter 0 in configuration parameters. Contrast with *alternate adapter*.

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. (1) (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

radio frequency (RF). Any frequency in the range within which radio waves may be transmitted, from about 10 KHz to about 300 000 MHz. .

random access memory (RAM). A computer's or adapter's volatile

storage area into which data may be entered and retrieved in a nonsequential manner.

read-only memory (ROM). A computer's or adapter's storage area whose contents cannot be modified by the user except under special circumstances.

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.

return code. (1) A value (usually hexadecimal) provided by an adapter or a program to indicate the result of an action, command, or operation. (2) A code used to influence the execution of succeeding instructions. (A)

ring error monitor (REM). A function that compiles error statistics reported by adapters on a network, analyzes the statistics to determine probable error cause, sends reports to network manager programs, and updates network status conditions. It assists in fault isolation and correction.

ring in (RI). In an IBM Token-Ring Network, the receive or input receptacle on an access unit or repeater.

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.

ring out (RO). In an IBM Token-Ring Network, the transmit or output receptacle on an access unit or repeater.

ring segment. A ring segment is any section of a ring that can be isolated (by unplugging connectors) from the rest of the ring. A segment can consist of a single lobe, the cable between access units, or a combination of cables, lobes, and/or access units. See *cable segment*, *LAN segment*.

ring station. A station that supports the functions necessary for connecting to the LAN and for operating with the token-ring protocols. These include token handling, transferring copied frames from the ring to the using node's storage, maintaining error counters, observing medium access control (MAC) sublayer protocols (for address acquisition, error reporting, or other duties), and (in the full-function native mode) directing frames to the correct data link control (DLC) link station.

root bridge. In a LAN containing IBM bridges that use a spanning-tree protocol, the bridge that sends the "hello" message on the network every few seconds. The spanning-tree protocol uses the message to detect when bridges

enter and leave the network, and to change the designated bridges accordingly. See also *designated bridge*, *standby bridge*.

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

scroll. To move all or part of the display image vertically or horizontally to display data that cannot be observed within a single display image. See also *page (2)*.

segment. See *cable segment*, *LAN segment*, *ring segment*.

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.

service access point (SAP). (1) A logical point made available by an adapter where information can be received and transmitted. A single SAP can have many links

terminating in it. (2) In Open Systems Interconnection (OSI) architecture, the logical point at which an $n + 1$ -layer entity acquires the services of the n -layer. For LANs, the n -layer is assumed to be data link control (DLC). A single SAP can have many links terminating in it. These link "end-points" are represented in DLC by link stations.

session. (1) A connection between two application programs that allows them to communicate. (2) In SNA, a logical connection between two network addressable units that can be activated, tailored to provide various protocols, and deactivated as requested. (3) The data transport connection resulting from a call or link between two devices. (4) The period of time during which a user of a node can communicate with an interactive system, usually the elapsed time between log on and log off. (5) In network architecture, an association of facilities necessary for establishing, maintaining, and releasing connections for communication between stations. (T)

signal. (1) A time-dependent value attached to a physical phenomenon for conveying data. (2) A variation of a physical quantity, used to convey data.

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*.

socket. Synonym for *port* (2).

soft error. An intermittent error on a network that causes data to have to be transmitted more than once to be received. A soft error affects the network's performance but does not, by itself, affect the network's overall reliability. If the number of soft errors becomes excessive, reliability is affected. Contrast with *hard error*.

source address. A field in the medium access control (MAC) frame that identifies the location from which information is sent. Contrast with *destination address*.

source service access point (SSAP). The service access point (SAP) from which a logical link control protocol data unit (LPDU) is originated.

standby bridge. In a LAN using automatic single-route broadcast, a bridge that does not forward single-route broadcast frames. A standby bridge is a parallel bridge or is in a parallel path between two LAN segments. See also *designated bridge*, *root bridge*.

start delimiter. The first byte of a token or frame, consisting of a special, recognizable bit pattern.

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*.

subsystem. A secondary or subordinate system, or programming support, usually capable of operating independently or asynchronously with a controlling system.

switch. On an adapter, a mechanism used to select a value for, enable, or disable a configurable option or feature.

synchronous. (1) Pertaining to two or more processes that depend on the occurrences of a specific event such as common timing signal. (I) (A) (2) Occurring with a regular or predictable timing relationship.

synchronous data link control (SDLC). A discipline conforming to subsets of the Advanced Data Communication Control Procedures (ADCCP) of the American National Standards Institute (ANSI) and High-level Data Link Control (HDLC) of the International Organization for Standardization, for managing synchronous, code-transparent, serial-by-bit information transfer over a link connection. Transmission exchanges may be duplex or half-duplex over switched or nonswitched links. The configuration of the link connection may be point-to-point, multipoint, or loop. (I)

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).

terminal. In data communication, a device, usually equipped with a keyboard and display device, capable of sending and receiving information.

threshold. (1) A level, point, or value above which something is true or will take place and below which it is not true or will not take

place. (2) In IBM bridge programs, a value set for the maximum number of frames that are not forwarded across a bridge due to errors, before a "threshold exceeded" occurrence is counted and indicated to network management programs. (3) An initial value from which a counter is decremented to zero, or a value to which a counter is incremented or decremented from an initial value. When the counter reaches zero or the threshold value, a decision is made and/or an event occurs.

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-passing. In a token-ring network, the process by which a node captures a token; inserts a message, addresses, and control information; changes the bit pattern of the token to the bit pattern of a frame; transmits the frame; removes the frame from the ring when it has made a complete circuit; generates another token; and transmits the token on the ring where it can be captured by the next node that is ready to transmit.

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.

topology. The physical or logical arrangement of nodes in a computer network. Examples include ring topology and bus topology.

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.

transmission medium. (1) A physical carrier of electrical energy

or electromagnetic radiation.

(2) The physical medium that conveys data between data stations; for example, twisted-pair wire, optical fiber, coaxial cable. (T)

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.

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*.

unshielded twisted pair (UTP). See *telephone twisted pair*.

upstream. On an IBM Token-Ring Network, the direction opposite that of data flow. Contrast with *downstream*.

V

variable. (1) In computer programming, a character or group of characters that refers to a value and, in the execution of a computer program, corresponds to an address. (2) A quantity that can assume any of a given set of values. (A)

version. A separate IBM-licensed program, based on an existing IBM-licensed program, that usually has significant new code or new function.

virtual storage (VS). (1) The storage space that may be regarded as addressable main storage by the user of a computer system in which virtual addresses are mapped into real addresses. The size of virtual storage is limited by the addressing scheme of the computer system and by the amount of auxiliary storage available, not by the actual number of main storage locations. (I) (A) (2) Addressable space that is apparent to the user as the processor storage space, from which the instructions and the data are mapped into the processor storage locations.

visual display unit (VDU). A device with a TV-like display screen, usually equipped with a keyboard.

W

wideband. Synonym for *broadband*.

wiring closet. A room that contains one or more distribution panels and equipment racks that are used to interconnect cables. Sometimes called a *network wiring closet* to distinguish it from a telephone wiring closet.

work area. An area in which terminal devices (such as displays, keyboards, and printers) are located. Access units may also be located in work areas.

working disk. A computer fixed disk to which files are copied from

an original diskette for use in everyday operation.

working diskette. A diskette to which files are copied from an original diskette for use in everyday operation to protect the original diskette from damage.

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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