



@server

iSeries

Networking Hardware Interfaces

Frame relay

Version 5 Release 3





@server

iSeries

Networking Hardware Interfaces

Frame relay

Version 5 Release 3

Note

Before using this information and the product it supports, be sure to read the information in "Notices," on page 29.

Fifth Edition (August 2005)

This edition applies to version 5, release 3, modification 0, of IBM Operating System/400 (product number 5722-SS1) and to all subsequent releases and modifications until otherwise indicated in new editions. This version does not run on all reduced instruction set computer (RISC) models nor does it run on CISC models.

© Copyright International Business Machines Corporation 2000, 2005. All rights reserved.

US Government Users Restricted Rights – Use, duplication or disclosure restricted by GSA ADP Schedule Contract with IBM Corp.

Contents

Frame relay	1	Tune frame relay performance	17
Printable PDF	2	Local management interface	18
Network connections for frame relay	2	Parameters that control exchanges of information	18
Physical environment for frame relay	4	Local management interface exchanges	18
Configurations for frame relay	5	Scenarios for frame relay configuration	19
SNA direct configurations	5	SNA direct configuration scenarios for frame	
IP direct configurations	7	relay.	19
Bridged connections for frame relay	7	Bridged configuration scenarios for frame relay	22
Connecting systems without a frame-relay		Related Information	26
network	7	Distributed data interface networks (DDI)	26
Configuration objects for frame relay	7	Wireless networks	27
Frame relay addressing	9	Appendix. Notices	29
Data link connection identifiers	9	Trademarks	31
Adapter addresses for frame relay	10	Terms and conditions for downloading and printing	
Routing characteristics for frame relay	10	information	31
Maximum frame size parameter requirements for			
frame relay	14		
Additional MAXFRAME parameter			
considerations	16		

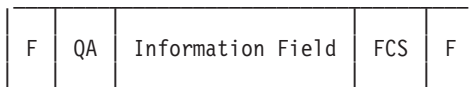
Frame relay

Frame relay is a communications networking protocol that defines how frames are routed through a fast-packet network based on the address field in the frame. Frame relay takes advantage of the reliability of data communications networks to minimize the error checking done by the network nodes. This provides a packet-switching protocol similar to but much faster than X.25.

The high speed that you can obtain through frame-relay networks makes them well suited for wide area network (WAN) connectivity. Administrators commonly use frame relay to connect two or more local area network (LAN) bridges over large distances.

For a printed copy of this information, see "Printable PDF" on page 2.

The following diagram shows the frame format that frame-relay networks use:



F = HDLC or Q.922 flag

QA = HDLC or Q.922 address field (2 bytes)

FCS = HDLC or Q.922 frame-check sequence (2 bytes)

Frame-relay network architecture is based on the integrated systems digital network (ISDN) packet-mode bearer services. The following table shows the standards, either pending or approved, that define the services and the user-to-network interface of frame-relay networks:

ANSI and Equivalent ITU-T Standards

ANSI Standard	Equivalent ITU-T Standard
T1.606, Frame Relay Bearer Services (FRBS) Architectural Framework	I.233, ISDN Frame Mode Bearer Service
T1.618, FRBS Core Aspects	Q.922, ISDN Extended Data Link (LAP-E)
T1.617, FRBS Signaling	Q.933, Frame Mode Bearer Services (FMBS) Signaling
T1.606 Addendum 1, FRBS Congestion Management	I.370, ISDN FMBS Congestion Management

The iSeries™ server implementation of frame-relay network support uses protocol headers as defined in the TCP/IP Request for Comment 1490 (RFC 1490).

Frame-relay networks achieve their greater efficiency by minimizing the error checking done by nodes within the network. For SNA, iSeries frame-relay support uses IEEE 802.2 logical link control to provide flow control and error recovery functions (see Figure 1 on page 2).

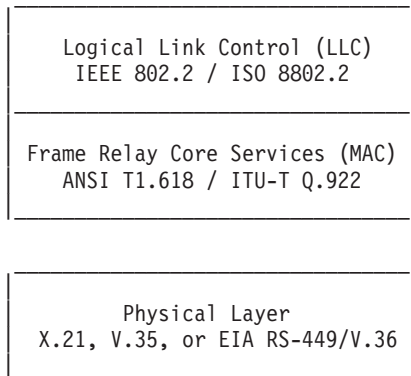


Figure 1. iSeries Implementation of Frame-Relay Networking

As indicated above, you can make the connection between the iSeries system and the frame relay network by using X.21, V.35, or RS-449 physical interfaces.

Review the following topics to ensure that you know how frame relay networks function and how you might use them:

- Network connections for frame relay
- Physical environment for frame relay
- Configurations for frame relay
- Configuration objects for frame relay
- Addressing for frame relay
- Routing characteristics for frame relay
- Maximum frame size parameter requirements for frame relay
- Performance tuning for frame relay
- Local management interface
- Configuration scenarios for frame relay

Printable PDF


To view or download the PDF version of this document, select [Frame relay](#) (about 392 KB).

Saving PDF files

To save a PDF file on your workstation for viewing or printing:

1. Right-click the PDF file in your browser (right-click the link above).
2. Click the option that saves the PDF locally.
3. Navigate to the directory in which you want to save the PDF file.
4. Click **Save**.

Downloading Adobe Reader

- 1 You need Adobe Reader installed on your system to view or print these PDFs. You can download a free copy from the Adobe Web site (www.adobe.com/products/acrobat/readstep.html) .

Network connections for frame relay

The iSeries system provides support for the following types of frame-relay network connections:

- 2 iSeries: Networking Hardware Interfaces Frame relay

Frame-relay direct network

Allows communications using SNA, or TCP/IP data over a frame-relay network at speeds of up to 2.048 Mbps. This support allows a network of systems to communicate using the frame-relay network as a backbone without the need for multiple leased T1 lines. This function is also known as boundary network node (BNN) support.

Bridged frame-relay network

Allows the iSeries system to communicate over a frame-relay network. This communication takes place through a remote bridge that is attached to a token-ring, Ethernet, or distributed data interface (DDI) network. Bridged frame-relay connections allow the iSeries system to communicate with stations on the remote local area network (LAN) as if they were attached locally to the LAN. This function is also known as boundary access node (BAN).

Figure 2 shows an example of a bridged frame-relay connection.

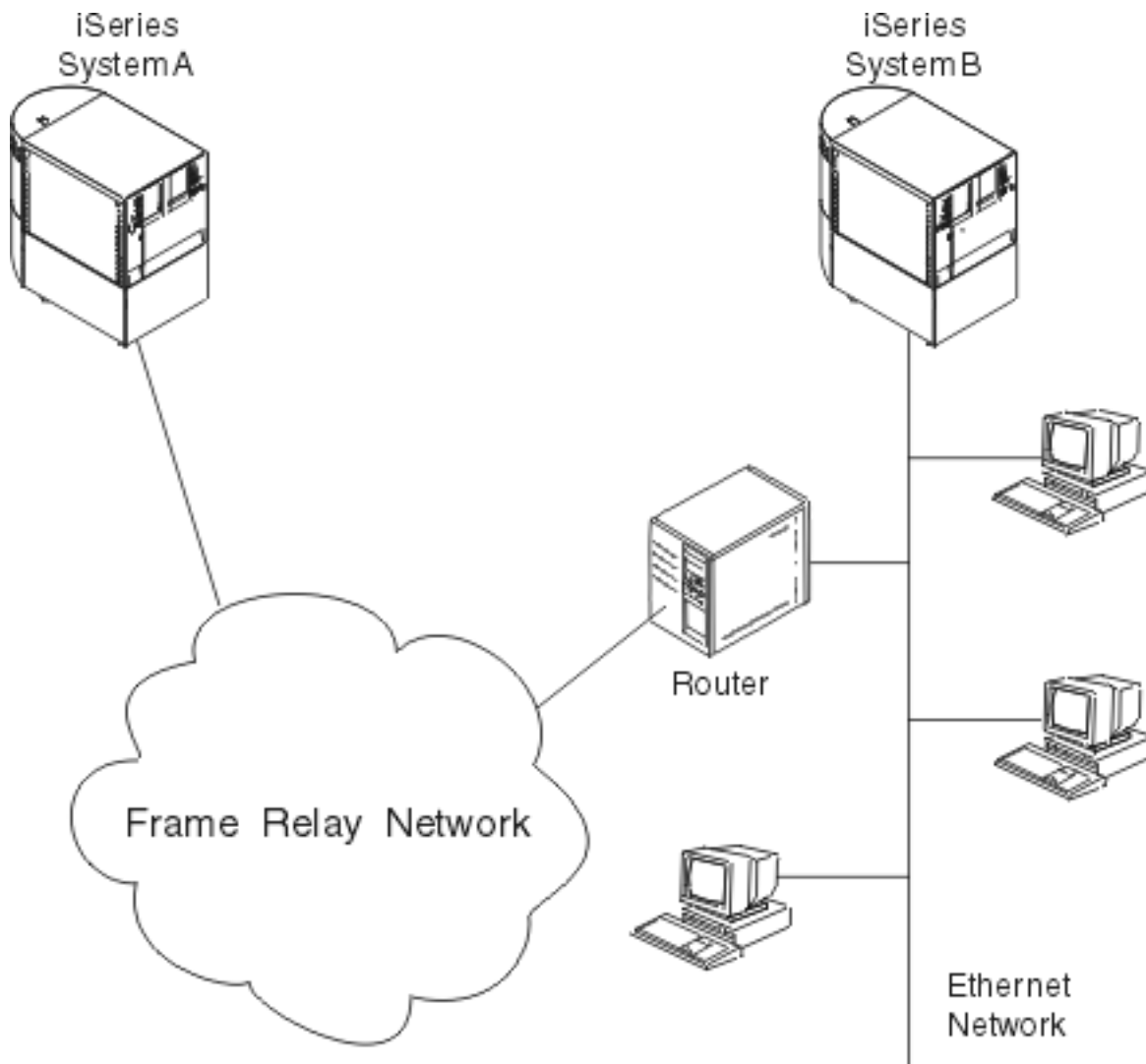


Figure 2. Example of a Bridged Frame-Relay Network Connection

In this example, iSeries System A communicates through the frame-relay network and the bridge to iSeries System B. Bridged frame-relay connections support SNA and TCP/IP data communications.

For more information, see bridged frame-relay configurations.

Physical environment for frame relay

The equipment that attaches to a frame-relay network, such as an iSeries system, is the terminal equipment (TE). A frame-relay network node is a frame handler (FH).

The connection from the TE to the FH normally exists through a data service unit (DSU) and channel service unit (CSU) pair. This DSU and CSU pair converts the TE physical interface to the FH interface that is used by the frame-relay network.

The iSeries system supports three physical interface types for attachment to the DSU and CSU pair:

- EIA RS-449, ITU-T V.36
- ITU-T X.21
- ITU-T V.35

CRTNWIFR command

Use the CRTNWIFR command to specify both the physical interface (INTERFACE parameter) and data transmission rate (LINESPEED parameter). The type of physical interface that you specify depends on the cable that you use. The following tables list the supported physical interfaces, cable lengths, network interface (NWI) clock parameters, and the maximum data transmission speed available for each interface:

Table 1. Device Types 2699, 2721, 2742, 2745, 2771, and 2793 High-Speed Communications IOAs

Physical Interface	Cable Length	NWI Clock Parameter	Maximum Data Transmission Rate
*RS-449	20 ft (6.1 m)	*MODEM, *LOOP, *INVERT	2048000 bps
	50 ft (15.2 m)	*MODEM	64000 bps
	80 ft (24.4 m)		
	150 ft (45.7 m)		
	50 ft (15.2 m)	*LOOP	2048000 bps
	80 ft (24.4 m)		
	150 ft (45.7 m)		
*V.35	20 ft (6.1 m)	*MODEM, *LOOP, *INVERT	2048000 bps
	50 ft (15.2 m)		
	80 ft (24.4 m)	*MODEM, *LOOP, *INVERT	64000 bps
*X.21	20 ft (6.1 m)	*MODEM	2048000 bps
	50 ft (15.2 m)	*MODEM, *INVERT	64000 bps

Notes:

1. *LOOP requires DCE support for looped clocking.
2. Data transmission rates greater than 512000 bps might require *LOOP or *INVERT clocking.

On the frame-relay-supported hardware, the specified value for the INTERFACE parameter must match the physical interface and cable that you attached to the input-output adapter (IOA).

CLOCK parameter

The `CLOCK` parameter on the `CRTNWIFR` command specifies the method by which the clocking function is provided for the network interface. Possible values are:

***MODEM**

The default value. The modem provides the clocking.

***LOOP**

Indicates that the data circuit-terminating equipment (DCE) received clock is looped back to the DCE on the data terminal equipment (DTE) transmit clock. This value improves high-speed data transmission, but it is valid only if supported by the modem.

***INVERT**

All three interfaces support `*INVERT`.

Configurations for frame relay

The physical environment of a frame-relay network allows you to set up the following configurations:

- SNA direct configurations
- IP direct configurations
- Bridged frame-relay configurations

You can also establish a frame-relay connection even if you do not have a frame-relay network.

SNA direct configurations

The iSeries system allows frame-relay connections to remote systems that support the SNA direct format that is defined by Frame-Relay Forum IA 3.1. In this format, the frame-relay packets encapsulate the SNA data.

Figure 3 on page 6 shows an example of SNA direct connections to a remote iSeries system, a 5494 Remote Control Unit, and a 3745 Communications Controller on data link connection identifiers (DLCIs) 22, 23, and 24.

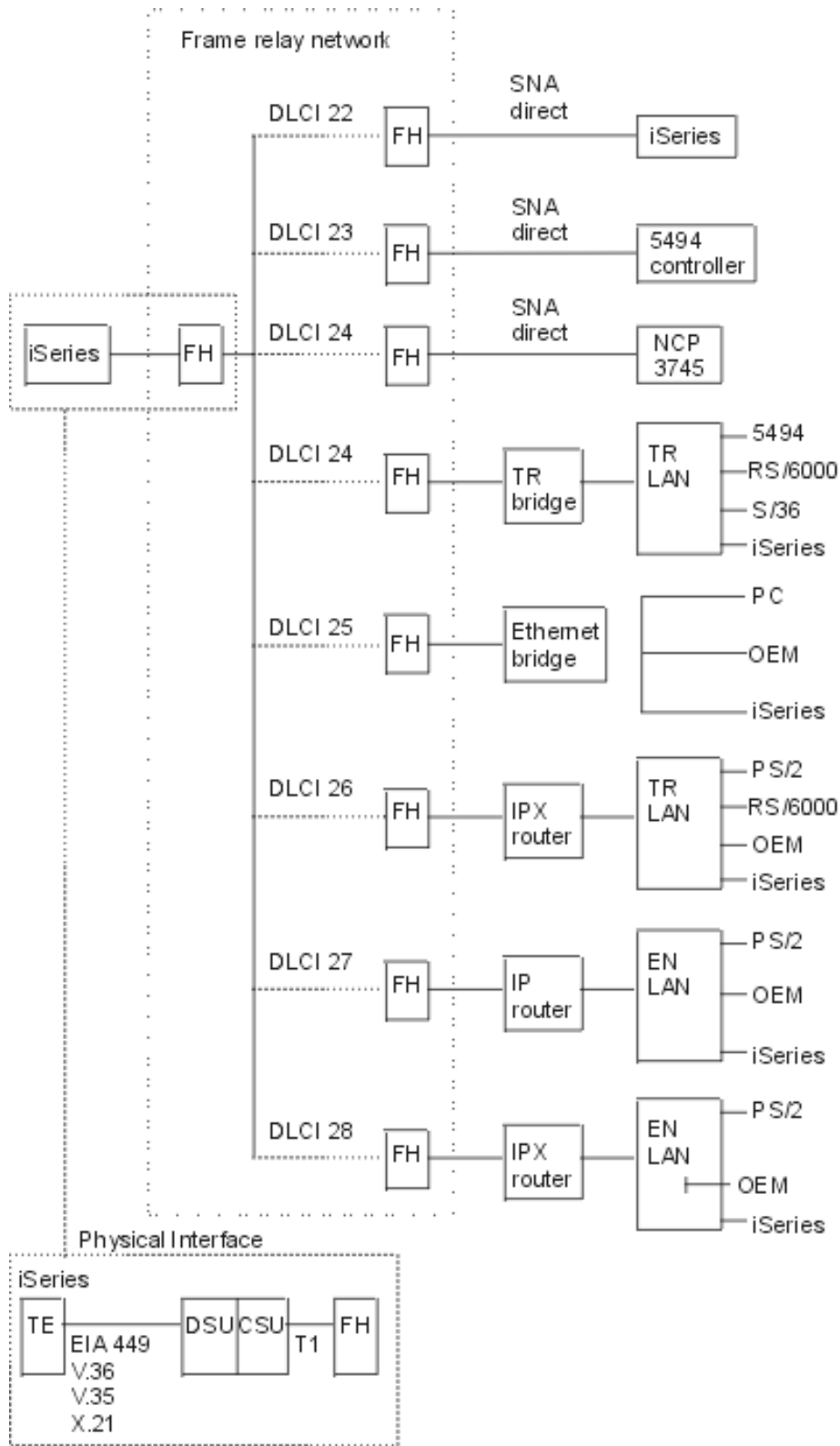


Figure 3. Example of a Frame-Relay Network

For more information on the frame format that is used for SNA direct connections, see Routing characteristics for frame relay.

IP direct configurations

The iSeries system allows frame-relay connections to remote systems that support the IP direct format that is defined by Frame-Relay Forum IA 3.1. In this format, the frame-relay packets encapsulate the TCP/IP data.

For more information on the frame format that is used for IP direct connections, see Routing characteristics for frame relay.

Bridged connections for frame relay

The iSeries system allows frame-relay connections to remote local area networks (LANs) that support the bridged frame-relay formats as defined by the Frame-Relay Forum IA 3.1. Most bridges, routers, and communication controllers support these formats.

Note: You can use the iSeries system to bridge APPN networks, and the integrated frame-relay support can eliminate the need for a bridge between the iSeries system and the frame-relay network. However, the iSeries system does not provide a complete, integrated bridging function.

Bridged frame-relay connections support both SNA and TCP/IP data traffic by encapsulating the token-ring, Ethernet, or DDI frames within the frame-relay packet.

For more information on the frame formats that are used for bridged frame-relay connections, see Routing characteristics for frame relay.

Connecting systems without a frame-relay network

You can establish frame-relay connections without a frame-relay network, similar to the X.25 DTE-to-DTE mode. This type of configuration supports both SNA direct and bridged frame-relay formats.

For example, by configuring one of a pair of iSeries systems as a frame handler (LMIMODE(*FH) on the network interface description) and the other as terminal equipment (LMIMODE(*TE)), you can connect the two systems using a modem eliminator or a high-speed communications line. In this configuration, the system configured as the FH responds to local management interface (LMI) polls received from the terminal equipment (TE). It then reports the status of permanent virtual circuits (PVCs) configured on the frame handler (FH) system.

For an example scenario that shows the configuration of two iSeries systems for SNA direct frame-relay communications without a frame-relay network, see SNA direct connection using a modem eliminator.

For more information about LMI modes, see Local management interface.

Configuration objects for frame relay

The iSeries system uses the following configuration objects for frame-relay communications:

Network interface description

The network interface (NWI) description defines the characteristics of the physical connection, including:

- Physical interface used.
- LMI mode.
- LMI timer and retry values.
- DLCI numbers assigned to the virtual connections.

Use the frame-relay Create Network Interface Description (CRTNWIFR) command to create one NWI description for each input-output adapter (IOA).

Line description

The line description defines the logical connection to the network. You can attach up to 256 line descriptions to each frame-relay network interface. You must create one line description for each DLCI that is used. Use the following CL commands to create line descriptions attached to frame-relay network interface descriptions:

CRTLINFR

SNA or IP direct connections to remote systems that support the frame-relay communications protocol, such as an SNA direct connection to another iSeries system or 3745 Communications Controller.

CRTLINTRN

Bridged token-ring network connections.

CRTLINDDI

Bridged DDI network connections.

CRTLINETH

Bridged Ethernet network connections.

Controller description

Use the controller description to define the remote system or controller. You can attach up to 256 controller descriptions to each line description. However, the NWI description supports no more than 256 active controllers. Controller descriptions occur across a number of line descriptions. Use the following CL commands to create controller descriptions for frame-relay communications:

CRTCTLAPPC

APPC controllers represent systems that support APPC or APPN communications. APPC controllers typically represent iSeries systems and personal computers.

CRTCTLHOST

SNA host controllers represent controllers such as the 3745 controller running NCP.

CRTCTLNET

Network controllers are used for direct IP connections. They are automatically created when you configure and start TCP/IP communications for frame relay.

The value specified for the LINKTYPE parameter on the controller description determines the type of line description to which the controller can be attached:

- Controller descriptions that specify LINKTYPE(*FR) attach only to frame-relay line descriptions.
- Controller descriptions that specify LINKTYPE(*LAN) attach to token-ring, DDI, or Ethernet lines.

You can configure both APPC and SNA host controllers as APPN(*YES). If you configure the controllers as APPN(*NO), then you must also create APPC or SNA host device descriptions for each session that the remote system supports.

Figure 4 on page 9 shows an example of objects that are configured for frame-relay communications, including the network interface (NWI), line descriptions (LINDs), and controller descriptions (CTLDs).

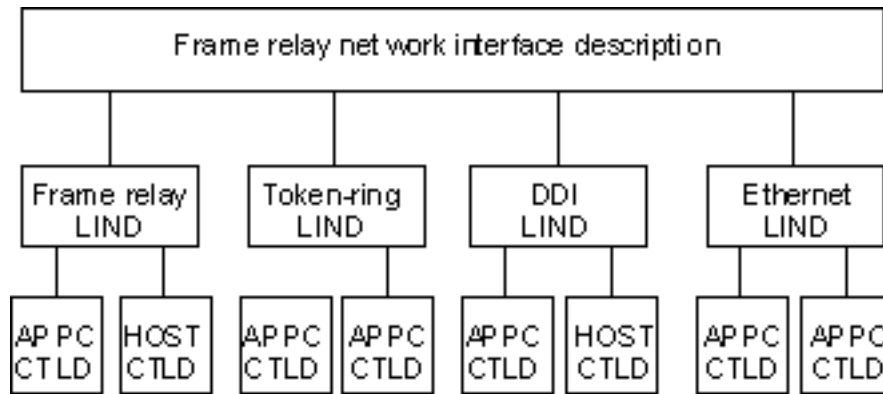


Figure 4. Example of Objects Configured for Frame-Relay Communications

Frame relay addressing

For direct connections, data link connection identifiers (DLCIs) provide frame-relay addressing. For bridged connections, local area network (LAN) adapter addresses provide frame-relay addressing.

Data link connection identifiers

The iSeries system uses DLCIs to identify the logical connections between nodes.

A single physical connection to the frame-relay network is used to support multiple logical, or virtual, connections. The frame-relay network assigns a DLCI number that identifies each virtual connection, called a permanent virtual circuit (PVC). The iSeries system supports up to 256 virtual circuits for each physical connection.

The frame-relay network provider assigns the DLCI number, typically at subscription time, that is used to identify a virtual circuit. The DLCI number applies only to the connection between nodes (TE-to-FH or FH-to-FH).

Figure 5 shows an example of DLCI assignments for a frame-relay connection.

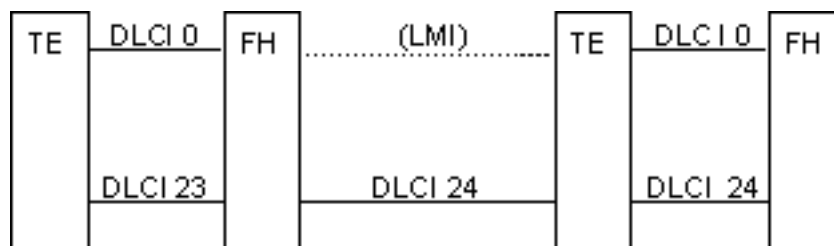


Figure 5. Example of DLCI Assignments for PVC Connections

To configure DLCI values for frame-relay and bridged LAN line descriptions, specify the NWIDLCI parameter on the line description command. You can also configure DLCI values by specifying the DLCI number and line description name on the DLCI parameter of the CRTNWIFR command.

The iSeries system uses DLCI 0 for the local management interface (LMI). This corresponds to the ANSI Annex-D standard. The LMI manages the physical and virtual connections between the terminal equipment (TE) and the frame handler (FH). Use DLCIs 1 through 1018 to identify logical connections to remote TEs.

For more information about LMI modes, see Local management interface.

Adapter addresses for frame relay

The frame-relay communications input-output processor (IOP) is not given a preset, or burned-in, adapter address. You must specify this address for the local adapter address (ADPTADR parameter) on token-ring, distributed data interface (DDI), and Ethernet line descriptions used for bridged frame-relay connections. Configure the frame-relay adapter address the same as for locally attached local area network (LAN) lines. SNA or IP direct configurations do not require the local adapter address.

You must configure the remote adapter address (ADPTADR parameter on the controller description) to match the adapter address of the remote system.

SNA direct frames do not include adapter addresses. You do not need to configure the adapter address for frame-relay line descriptions or for controllers that specify LINKTYPE(*FR).

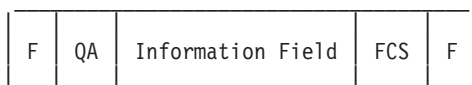
Routing characteristics for frame relay

The frame-relay network routes frames through the network by examining the data link connection identifier (DLCI) field and then routing the frame to an outgoing link. The network delivers frames to the remote terminal end (TE) in the same sequence as they were provided to the network by the local TE.

At each node within the frame-relay network, the system verifies the frame check sequence (FCS) and checks the frame format and size. If the frame is valid, the system replaces the DLCI and FCS before routing the frame to the next node. If the frame is damaged or otherwise not valid, the system discards it. The network node provides no error recovery.

Frame-relay core services (FRCS) frame format

Figure 6 shows the basic frame format that is used for frame-relay communications.



F = HDLC or Q.922 flag
QA = HDLC or Q.922 address field (2 bytes)
FCS = HDLC or Q.922 frame-check sequence (2 bytes)

Figure 6. Frame-Relay Frame Format

The frame-relay core services (FRCS) portion of the frame routes the frame through the frame-relay network. The frame structure is based on the ITU-T Q.922 protocol.

Figure 7 on page 11 shows the FRCS frame format on the fields within the 2-byte Q.922 address field (QA).

- DLCI 0 = DLCI high order bits (6 bits)
- DLCI 1 = DLCI low order bits (4 bits)
- C/R = Command/response bit (not used)
- EA0/1 = Extended address indicators
- CC = Congestion control (3 bits)

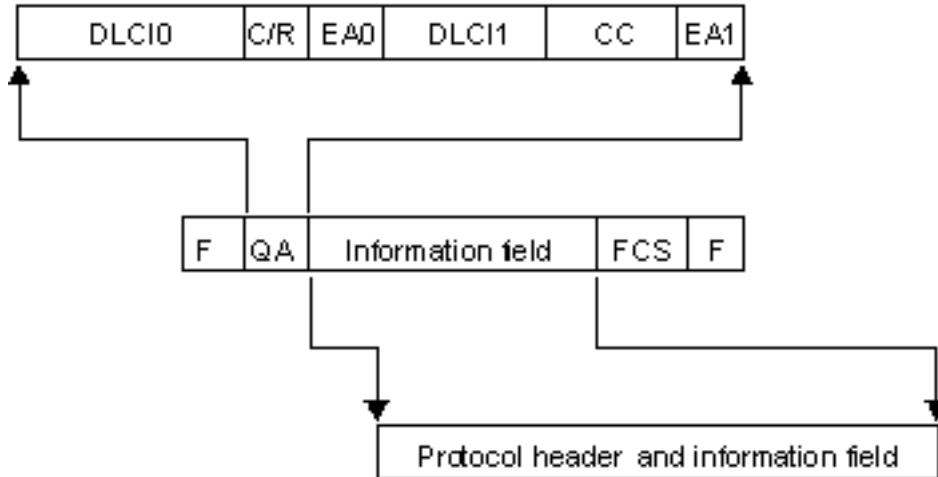


Figure 7. Frame Format for Frame-Relay Core Services (FRCS)

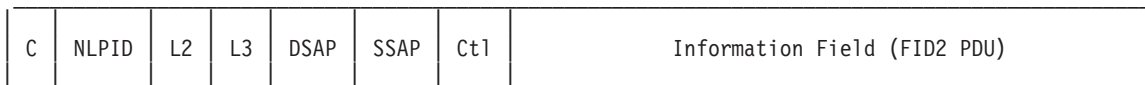
Frame-relay protocol headers

TEs use frame-relay protocol headers to provide routing for frames, to assure data integrity, and to perform recovery when frames are damaged or lost. iSeries frame-relay support uses protocol headers that are defined in Frame-Relay Forum IA 3.1.

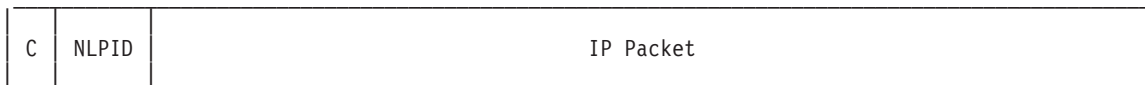
The iSeries system uses protocol header formats for SNA direct, bridged local area network (LAN), and local management interface (LMI) connections. The information field of the FRCS frame contains these headers and information fields (protocol data units or IP packets).

The following diagrams show the protocol header formats:

SNA Direct Frame Format



IP Direct Frame Format



High-Performance Routing (HPR) Frame Format



Bridged Token-ring and DDI LAN Frame Format (Frame-Relay Forum IA 3.1)

C	PAD	NLPID	OUI	PID	AC	FC	DA	SA	RI	DSAP	SSAP	Ctl	Information Field
---	-----	-------	-----	-----	----	----	----	----	----	------	------	-----	-------------------

Bridged IEEE 802.3 Ethernet LAN Frame Format (Frame-Relay Forum IA 3.1)

C	PAD	NLPID	OUI	PID	AC	FC	DA	SA	Lth	DSAP	SSAP	Ctl	Information Field
---	-----	-------	-----	-----	----	----	----	----	-----	------	------	-----	-------------------

Bridged Ethernet Version 2 LAN Frame Format (Frame-Relay Forum IA 3.1)

C	PAD	NLPID	OUI	PID	DA	SA	Type	Information Field
---	-----	-------	-----	-----	----	----	------	-------------------

LMI Messages Frame Format

C	PD	Null	Type	LMI Information Elements
---	----	------	------	--------------------------

Address Resolution Protocol (ARP) Format

C	NLPID	OUI	PID	ARP Packet
---	-------	-----	-----	------------

The following table describes the protocol header fields:

Table 2. Format Fields for the Frame-Relay Protocol Header

Field	Description	Values and Notes
C	Q.922 (HDLC) control field	
PAD	Pad characters	Pad characters (hex 00) are permitted between the control field and the NLPID field. Pad characters are used for boundary alignment.
NLPID	Network-level protocol identifier	08 ITU-T Q.931 (SNA direct and HPR) 80 IEEE Subnetwork Access Protocol (SNAP) for bridged LAN connections CC Internet protocol (IP) direct
PD	Protocol discriminator	LMI frames use hex 08
OUI	Organization-unique identifier	0080C2 IEEE 802.1 000000 ARP

Table 2. Format Fields for the Frame-Relay Protocol Header (continued)

Field	Description	Values and Notes
PID	Protocol identifier	<p>The iSeries system supports the following formats not using frame check sequence (FCS):</p> <p>0007 Ethernet</p> <p>0009 Token-ring network</p> <p>000A DDI network</p> <p>0806 ARP</p> <p>The iSeries system provides receive-only support for the following formats using FCS:</p> <p>0001 Ethernet</p> <p>0003 Token-ring network</p> <p>0004 DDI network</p>
L2	Layer 2 protocol	<p>For iSeries systems using SNA direct connections, 4C80 is placed in the L2 field</p> <p>Byte 1</p> <p>4C IEEE 802.2 (ISO 8802/2)</p> <p>4E Q.922 (IDLC)</p> <p>46 LAP-B (X.25)</p> <p>4A HDLC NRM (SDLC)</p> <p>51 ISO 7776</p> <p>70 Without IEEE 802.2 (ISO 8802/2) header</p> <p>Byte 2</p> <p>80 Undefined</p> <p>81 MAC address included (IEEE 802.2, ISO 8802/2) or HDLC address included (ISO 7776)</p>

Table 2. Format Fields for the Frame-Relay Protocol Header (continued)

Field	Description	Values and Notes
L3	Layer 3 protocol	For iSeries systems using SNA direct connections, 7082 is placed in the L3 field Byte 1 66 ITU-T X.25 67 ISO 8208 (X.25 PLC) 70 User-specified Byte 2 81 SNA subarea (FID4) 82 SNA peripheral (FID2) 83 APPN (FID2) 85 HPR Network Layer Protocol (FID5)
	Information field	iSeries support for SNA direct, frame-relay connections requires the information field to contain a FID2 protocol data unit (PDU). Information fields sent over bridged connections may contain FID2 PDUs or IP packets.
<p>Other Protocol Header Field Abbreviations:</p> <p>AC Access control</p> <p>FC Frame control</p> <p>DA Destination address</p> <p>SA Source address</p> <p>RI Routing information</p> <p>Lth Length</p> <p>Type Ethernet type</p> <p>DSAP Destination service access point</p> <p>SSAP Source service access point</p> <p>Ctl IEEE 802.2 control field</p>		

Maximum frame size parameter requirements for frame relay

The frame-relay network provider defines and typically establishes a tariff for the frame information field size provided. This size is referred to as N203. Use the N203 value to determine the value specified for the iSeries maximum frame size (MAXFRAME parameter).

The MAXFRAME parameter specifies the maximum protocol data unit (PDU) that the system transmits or receives. The iSeries system supports MAXFRAME values from 262 to 8192 bytes. The common N203 frame size that all networks and attached equipment support is 1600 bytes.

The MAXFRAME value configured must take into account the amount of overhead required for the various line types and their associated protocol headers. The length of these headers varies, depending on the type of frame-relay connection. For example, bridged connections typically require a longer header than that used for SNA direct because these headers must include source and destination adapter addresses. Distributed data interface (DDI) and token-ring connections also include up to 18 bytes of routing information.

The following table shows the number of bytes required for the various frame-relay header types:

Table 3. Lengths for 802.2, Remote LAN, and Frame-Relay Headers

Connection Type and Protocol	802.2 LLC Header	Remote LAN Headers				Frame Relay Headers			Total Bytes
		RI	AC/AF	Type/Length	DA/SA	C/NLPID	OUI/PID	L2/L3	
SNA direct	4					2		4	10
IP direct						2			2
HPR						2		4	6
Bridged token-ring	4	18	2		12	3	5		44
Bridged DDI	4	18	2		12	3	5		44
Bridged IEEE 802.3	4			2	12	3	5		26
Bridged Ethernet V2				2	12	3	5		22

Abbreviations used:

RI Routing information

AC/FC Access control (AC) and frame control (FC)

DA/SA Destination address (DA) and source address (SA)

C/NLPID
Q.922 control field (C), Network Level Protocol Identifier (NLPID), and optional PAD

OUI/PID
Organization Unique ID (OUI) and Protocol Identifier (PID)

L2/L3 Layer 2 (L2) and Layer 3 (L3) Protocol

The MAXFRAME value configured for the line description must equal the N203 value subscribed to from the network minus the total length of the header for the connection type and protocol. For example:

- If the N203 subscription is 1600 and you are configuring for SNA direct communications, the MAXFRAME value specified on the CRTLINFR command should be set to 1590 (1600 – 10 bytes).
- If the N203 subscription is 8192 and you are configuring a bridged frame-relay connection to a token-ring network, the MAXFRAME value specified on the CRTLINTRN command should be set to 8148 (8192 – 44 bytes).

Further, there are some additional MAXFRAME parameter considerations that you need to consider.

Additional MAXFRAME parameter considerations

You need to base the maximum frame size on your iSeries system on the following:

- N203 value.
- Maximum frame size supported by the protocol or connection type.
- Maximum frame size supported by the remote station.

Use the minimum of these values, minus the adjustment for the protocol header, to configure the MAXFRAME parameter for frame-relay connections. The following table shows the maximum frame size limits for supported connection types:

Table 4. Maximum Frame Size Limits for Connection Types

Connection Type	Maximum Frame Size (MAXFRAME Parameter) Limits
SNA direct	8182
IP direct	8190
HPR	8186
Bridged token-ring	8148
Bridged DDI	4444
Bridged Ethernet	1496 for ETHSTD(*IEEE8023) 1500 for non-SNA data using ETHSTD(*ETHV2) 1493 for SNA data using ETHSTD(*ETHV2)

Note: At this time, the largest value allowed for the MAXFRAME parameter on the CRTLINFR command is 8182.

You can configure the maximum frame size used for a connection at several levels of the iSeries configuration:

Line description MAXFRAME parameter

Specify the maximum frame size used for an individual permanent virtual circuit (PVC) (DLCI) on the MAXFRAME parameter of the frame-relay, token-ring, or distributed data interface (DDI) line description.

You cannot configure the MAXFRAME parameter on Ethernet line descriptions. Ethernet local area networks (LANs) normally use a frame size of 1500 bytes. We recommend a N203 value of 1600 for Ethernet connections to accommodate the standard 1500-byte frame size. For a N203 value less than 1600, you need to configure the maximum frame size on either the line description source service access point (SSAP) parameter or the controller description.

Line description SSAP parameter

You can specify the maximum frame size for an individual SSAP for the maximum frame size element of the line description SSAP parameter.

Controller description MAXFRAME parameter

You can specify the maximum frame size for connections to individual remote stations on the controller description MAXFRAME parameter.

The iSeries system uses the smallest of the above values when selecting the maximum frame size used for connection to the remote station. For SNA connections, the system might also negotiate the frame size downward, based on the exchange identifier (XID) exchange with the remote station.

Tune frame relay performance

APPC and SNA host controller descriptions allow specification of a group of LANxxxxxx parameters to provide performance-tuning capabilities for both local area network (LAN) and frame-relay connections. Because frame-relay networks operate at slower speeds than LANs, it might be necessary to adjust some of these parameters when you use the controller description for frame-relay connections.

If you specify the default value, *CALC, for the LANxxxxxx parameters, then the iSeries system automatically uses the values recommended for frame-relay connections. The system adjusts these values to allow for network delays. For example, the system might reduce them when using a high-speed network running at J1, T1, or E1 speeds. Reducing these values allows quicker error detection, but it also reduces the time allowed for error recovery.

You can display the values that the system chooses by using the DSPCTLD command when the controller is active. The following table shows the values used for frame-relay connections when you specify *CALC for the LANxxxxxx parameters:

*Table 5. *CALC Values for Controller Description Performance Parameters*

Parameter	Function	*CALC Value
LANCenntmr	Sets wait time for polling remote station.	20 seconds
LANCnnrty	Sets number of poll retries sent to remote station.	10
LANrsptmr	Sets wait time for frame retransmission.	20 seconds
LANfrmrty	Sets number of frame retransmission attempts.	10
LANacktmr	Sets wait time for acknowledgment to remote station.	1 second
LANackfrq	Sets number of frames received before sending acknowledgment.	1
LANinactmr	Sets wait time for requesting response from remote station.	25 seconds
LANmaxout	Sets number of outstanding frames allowed before requesting acknowledgment from remote station.	2
LANwdwstp	Provides an alternative value equivalent to the LANMAXOUT parameter for use during periods of network congestion. The system provides an algorithm for returning the effective maximum outstanding frames value to that specified by the LANMAXOUT parameter as congestion subsides.	*NONE

It should be noted that you might receive better performance with a larger frame size. In a mixed LAN and WAN environment, it might help to put CP Session support on the faster LAN controllers rather than the WAN controllers. The more DLCIs you have per network interface (NWI), the poorer the performance you have per DLCI.

Local management interface

The iSeries system uses the local management interface (LMI) to exchange status information between the frame-relay network (or the frame handler system) and systems attached to the network (terminal equipment). The LMI uses data link connection identifier 0 (DLCI 0) to provide verification of the physical connection and status for logical connections.

LMIMODE parameter

Use the LMIMODE parameter on the network interface description to specify the type of LMI exchange done by the iSeries system. You can configure the iSeries system as terminal equipment (*TE), or you can configure the iSeries system as terminal equipment (*ANNEXA). When you specify *TE, you really use ANNEX D, and when you specify *ANNEXA, you really use ANNEX A.

You can also configure the iSeries system to exchange no LMI information (*NONE).

Your LMI type must match the values of the network provider. If ANNEX D or ANNEX A are unavailable, ask the network provider to turn LMI off and set the iSeries to *NONE.

When you make a connection without a network (using a modem eliminator or non-switched line), you can configure the iSeries system as a frame handler (LMIMODE(*FH)). In this configuration, the iSeries system responds to LMI messages as an FH.

For more information on LMI, see the following:

- Parameters that control exchanges of information
- Local management interface exchanges

Parameters that control exchanges of information

The polling interval (POLLITV) and full inquiry interval (FULLINQITV) parameters control the exchange of information over the local management interface (LMI).

- The POLLITV parameter represents the frame-relay T391 timer. It sets the interval at which the terminal end (TE) sends a status inquiry message to the frame handler (FH). You can set the POLLITV parameter to any value between 5 and 30 seconds. The default value is 10 seconds.
- The FULLINQITV parameter represents the frame-relay N391 count. The FULLINQITV parameter sets the interval at which the TE requests full status from the FH. You can set the FULLINQITV parameter to any value between 1 and 255 cycles. The default value is 6 cycles.

Local management interface exchanges

Use polling interval (POLLITV) and full inquiry interval (FULLINQITV) parameters to control the keep-alive and PVC status exchanges over the local management interface (LMI).

Keep-alive exchange

Use the keep-alive exchange to maintain contact between the terminal end (TE) and the frame handler (FH). It consists of an exchange of sequence messages.

At intervals specified by the POLLITV parameter, the TE sends Status Inquiry messages to the FH. The FH responds with a Status message that includes the correct sequence number (both Status Inquiry and Status messages include sequence numbers).

PVC status change

After the number of Status Inquiry messages specified by the FULLINQITV parameter have completed, the TE requests a full status from the FH. The FH responds with a Status message that includes a list of the permanent virtual circuits (PVCs) assigned to the physical connection and the status of each PVC.

You can use the Display Network Interface Description (DSPNWID) command to show the PVC status reported by the network.

Scenarios for frame relay configuration

This topic provides example scenarios of the following configurations:

- SNA direct configuration scenarios for frame relay
- Bridged configuration scenarios for frame relay

SNA direct configuration scenarios for frame relay

This topic provides example scenarios of the following SNA direct configurations:

- SNA direct connection of two iSeries systems
- SNA direct connection using a modem eliminator
- SNA direct connection to host system

SNA direct connection of two iSeries systems

In Figure 8, a connection exists between an iSeries system in Minneapolis and an iSeries system in Madison over a frame-relay network.

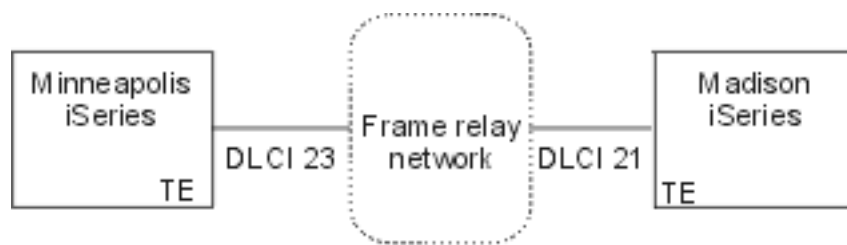


Figure 8. SNA Direct Connection between Minneapolis and Madison Systems

The two systems have an APPN connection that is configured on the frame-relay data link connection identifier (DLCI). Note that the frame-relay link in Minneapolis has much more traffic and operates at 1536000 bps. The link in Madison operates at 64000 bps. The frame-relay network allows for this difference in subscriptions at the two sites.

The Minneapolis connection to the network uses DLCI 23. In Madison, the DLCI number is 21. If the connection uses a frame-relay network, the DLCI numbers have only local (terminal end to frame handler) significance and might be different on the two interfaces. The network is responsible for setting up the connection between the DLCIs at administration time.

If you require more than one APPC connection between the two sites, you must define additional SSAP and DSAP values on the lines, and the additional controllers need different SSAP and DSAP combinations.

Review the following topics for additional information on configuring the iSeries systems in Minneapolis and Madison:

- Configuration for the iSeries system in Minneapolis
- Configuration for the iSeries system in Madison

Configuration for the iSeries system in Minneapolis: Use the prompt display for the Create Network Interface Description (Frame Relay) (CRTNWIFR) command to create the network interface (NWI) description on the Minneapolis system. The INTERFACE and LINESPEED parameter values must match the network subscription, and you must specify a LMIMODE value when communicating over a

frame-relay network. The LMIMODE value must match the network subscription and can be *TE, *ANNEXA, or *NONE. The local management interface (LMI) uses DLCI 0 for both *ANNEXA and *TE, but it does not use a DLCI for *NONE.

Use the prompt display for the Create Line Description (Frame Relay) (CRTLINFR) command to create the frame-relay line description on the Minneapolis system. The DLCI that you specify for the line must match the network subscription. Because frame-relay SNA direct addressing requires 10 bytes of overhead, a frame size of 1590 is configured for the MAXFRAME parameter. In other words, you need to use a frame size that is at least 10 bytes less than the network subscription. You also need to know the frame size at the other side of the network. For example, if one side is 1600 and the other is 2100, then both sides need to be set to 1600.

Use the prompt display for the Create Controller Description (APPC) (CRTCTLAPPC) command to create the APPC controller description on the Minneapolis system. You must specify LINKTYPE(*FR) for SNA direct connections.

Note: The default values for SSAP and DSAP are both 04. These values must match the values specified for the remote system. If you create more controllers using the same line description (DLCI), you must specify a unique SSAP and DSAP pair. This might require you to configure more SAPs on the frame-relay line description.

Configuration for the iSeries system in Madison: Use the following commands to create the frame-relay configuration for the iSeries system in Madison:

```
CRTNWIFR  NWID(FRMADISON) RSRNAME(LIN121) NRZI(*NO) INTERFACE(*RS449V36) +
          CLOCK(*MODEM) LINESPEED(64000) LMIMODE(*TE) +
          TEXT('Frame-relay NWI in Madison')

CRTLINFR  LIND(FRMINNEAP) NWI(FRMADISON) NWIDLCI(21) MAXFRAME(1590) +
          EXCHID(05633966) TEXT('Frame-relay DLCI to Minneapolis +
          Branch')

CRTCTLAPPC CTLD(FRMINNEAP) LINKTYPE(*FR) SWTLINLST(FRMINNEAP) +
          RMTCPNAME(MINNEAP) EXCHID(05601300) DSAP(04) SSAP(04) +
          TEXT('APPN Connection to Minneapolis Central Office')

CRTDEVAPPC DEVD(FRMINNEAP) RMTLOCNAME(MINNEAP) CTL(FRMINNEAP) +
          LOCADR(00) TEXT('APPC connection to iSeries in Minneapolis')
```

SNA direct connection using a modem eliminator

Figure 9 shows the configuration of two iSeries systems for SNA direct frame-relay communications without a frame-relay network.

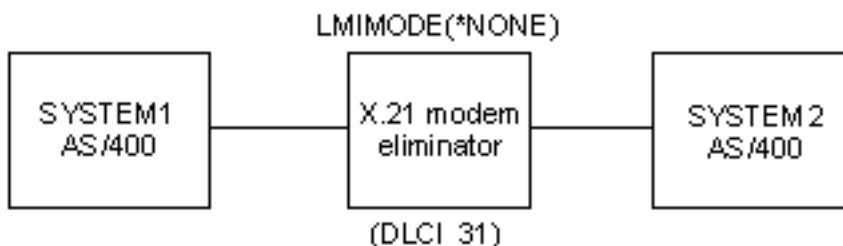


Figure 9. SNA Direct Connection using a Modem Eliminator

In this scenario, iSeries system SYSTEM1 connects to iSeries system SYSTEM2 through a X.21 modem eliminator. The modem eliminator operates at a speed of 1.536 Mbps. One data link connection identifier

(DLCI) is defined between the two systems. Both SYSTEM1 and SYSTEM2 are defined as APPN end nodes. You must create the APPC controller descriptions, but the device descriptions are created automatically.

Review the following topics for additional information on configuring the SYSTEM1 and SYSTEM2 iSeries systems:

- Configuration for the SYSTEM1 system
- Configuration for the SYSTEM2 system

Configuration for the SYSTEM1 system: Use the following commands to configure the SYSTEM1 iSeries system:

```
CRTNWIFR  NWID(SYSTEM1) RSRNAME(LIN301) INTERFACE(*X21)1 +
          LINESPEED(1536000)1 LMIMODE(*NONE)2 +
          TEXT('Frame-relay connection through modem eliminator')

CRTLINFR  LIND(SYSTEM2FR) NWI(SYSTEM1) NWIDLCI(31)3 MAXCTL(40) +
          MAXFRAME(8182)4 EXCHID(05610441) LINKSPEED(1536000)5 +
          TEXT('Frame-relay direct line to SYSTEM1')

CRTCTLAPPC CTLD(SYSTEM2FR) LINKTYPE(*FR)6 APPN(*YES) +
          SWTLINLST(SYSTEM1FR) RMTNETID(*NETATR)+
          RMTCPNAME(SYSTEM1) EXCHID(5600033) DSAP(04)7 SSAP(04) +
          TEXT('FR direct controller for SYSTEM1')
```

Notes:

1. The INTERFACE and LINESPEED parameters must match the modem eliminator.
2. LMIMODE is *NONE, meaning the systems do not exchange LMI data. You do not need the LMI for attachments without a network.
3. The DLCI for the line must match the DLCI configured on the remote system for this connection. If you configure multiple lines, all DLCIs must match the remote system.
4. There is no maximum frame size in a system-to-system configuration, but both values must match. In this example, a value of 8182 gives the best performance.
5. Set the APPN link speed (LINKSPEED parameter) according to the speed specified on the NWI.
6. Specify LINKTYPE(*FR) for SNA direct connections.
7. The default values for SSAP and DSAP are both 04. These values must match the values specified for the remote system. If you create more controllers using the same line description (DLCI), you must specify a unique SSAP and DSAP pair. This might require you to configure more SAPs on the frame-relay line description.

Configuration for the SYSTEM2 system: Use the following commands to configure the SYSTEM2 iSeries system:

```
CRTNWIFR  NWID(SYSTEM2) RSRNAME(LIN291) INTERFACE(*X21) +
          LINESPEED(1536000) LMIMODE(*NONE) +
          TEXT('Frame-relay Interconnect through modem eliminator')

CRTLINFR  LIND(SYSTEM1FR) NWI(SYSTEM2) NWIDLCI(31) MAXCTL(40) +
          MAXFRAME(8182) EXCHID(05600033) LINKSPEED(1536000) +
          TEXT('Frame-relay direct line to SYSTEM1')

CRTCTLAPPC CTLD(SYSTEM1FR) LINKTYPE(*FR) APPN(*YES) +
          SWTLINLST(SYSTEM1FR) RMTNETID(*NETATR)+
          RMTCPNAME(SYSTEM2) EXCHID(05610441) DSAP(04) SSAP(04) +
          TEXT('FR direct controller for SYSTEM2')
```

SNA direct connection to host system

Figure 10 on page 22 shows the configuration of an iSeries system for frame-relay communications with a 3745 Host Controller.

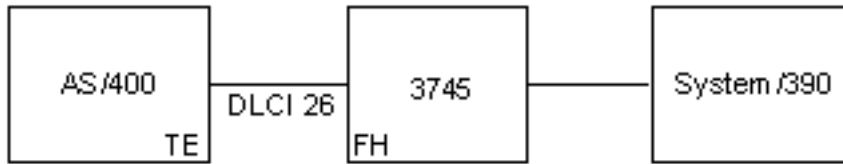


Figure 10. SNA Direct Connection to 3745 Host Controller

The 3745 provides frame-relay network function, and the iSeries is configured as a terminal end (TE).

A 64000 bps V.35 line exists between the iSeries and the 3745. The iSeries system might also have data link connection identifier (DLCI) connections to multiple 3745s, 6611s, and RouteXpanders through the 3745. However, these configurations are not shown as part of this scenario.

There is a single PVC connection between the iSeries and the host system. This connection supports a 3270 emulation device used to access applications on the host. It also includes a distributed host command facility (DHCF) session.

Configuration for the iSeries system

Use the following commands to configure the iSeries system using an SNA direct connection with the 3745 and the host system:

```
CRTNWIFR  NWID(FR3745) RSRNAME(LIN121) +
          INTERFACE(*V35)1 LINESPEED(64000)1 +
          LMIMODE(*TE)2 TEXT('Frame relay connection to 3745')
```

```
CRTLINFR  LIND(FR3745) NWI(FR3745) NWIDLCI(26) +
          EXCHID(05636759) TEXT('DLCI connection to the host')
```

```
CRCTCLHOST CTLD(FRHOST) LINKTYPE(*FR) APPN(*NO) +
           SWTLINLST(FR3745) MAXFRAME(8182) +
           SSCPID(050000000001) SWTDSC(*YES) +
           TEXT('Remote host system')
```

```
CRTDEVDSP  DEVD(FRDHCF) DEVCLS(*RMT) TYPE(3277) +
           MODEL(*DHCF) LOCADR(02) CTL(FRHOST) +
           TEXT('Remote host system dhcf device')
```

```
CRTDEVHOST DEVD(FREML) LOCADR(01) RMTLOCNAME(HOSTSYS) +
           CTL(FRHOST) APPTYPE(*EML) +
           TEXT('Emulation device to remote host')
```

Notes:

1. The INTERFACE and LINESPEEED parameters must match the characteristics of the line to the 3745.
2. The LMI mode is the default value of *TE, which means the iSeries acts as the terminal equipment. You must configure the 3745 as the frame handler (FH) by using ANSI Annex D (DLCI 0).
3. By creating a frame-relay line description (CRTLINFR), you indicate that the DLCI is connected to another device. The device supports the frame-relay SNA direct frame format of RFC 1490, such as the 3745.
4. The DLCI for the line must match the DLCI that you assigned in the configuration of the 3745.

Bridged configuration scenarios for frame relay

This topic provides example scenarios of the following bridged connections:

- Bridged connections to remote token-ring networks. This scenario involves connecting an iSeries system on a frame-relay network to systems on two remote token-ring networks. The 6611 Network Processor and PS/2-based RouteXpander/2 are used as bridges between the frame-relay network and the remote local area networks (LANs).
- Bridged connection to an Ethernet network. This scenario involves connecting an iSeries system to an Ethernet LAN using a 6611 Network Processor. The 6611 is used as both the frame-relay frame handler and a bridge.

The configurations of the 6611 and the RouteXpander/2 are not included, but some general considerations for configuring them are provided.

Bridged connections to remote token-ring networks

Figure 11 shows the configuration of an iSeries system for frame-relay communications with devices on two different token-ring networks.

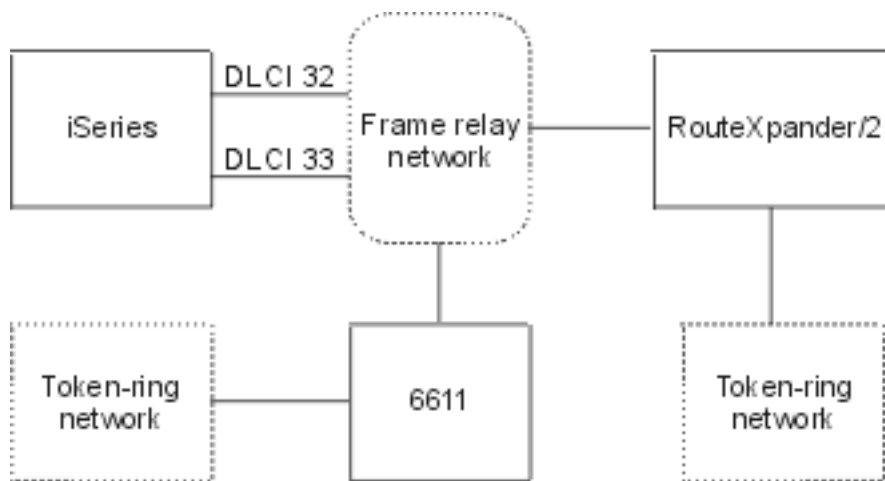


Figure 11. Bridged Connections to Remote Token-Ring Networks

One token-ring network is connected using a 6611 Network Processor as a bridge. The other is connected using a RouteXpander/2.

The T1 connection into the frame-relay network is configured by using two data link connection identifiers (DLCIs), with each providing a link to one of the bridges. DLCI 32 defines a PVC to the RouteXpander, and DLCI 33 defines a PVC to the 6611.

The source route bridging protocol is carried out on both bridges in this configuration. Both SNA APPC/APPN and TCP/IP traffic are possible in these configurations. The TCP/IP configuration for lines ROUTE6611 and ROUTEEX is done similarly to the way all token-ring network lines are configured for TCP/IP on the iSeries system.

Review the following topics for additional information on creating the frame-relay network interface (NWI) description:

- Creating the frame-relay network interface description
- Bridged token-ring configuration through the 6611 processor
- Bridged token-ring configuration through RouteXpander/2

Creating the frame-relay network interface description: Use the following command to configure the iSeries system connection to the frame-relay network:

```
CRTNWIFRN NWID(FRMRLY) RSRNAME(LIN031) INTERFACE(*RS449V36)1 +
  LINESPEED(1536000)1 LMIMODE(*TE)2 +
  TEXT('T1 link to frame-relay network')
```

Notes:

1. Values that you specify for the INTERFACE and LINESPEED parameters must match the frame-relay services that the network provider supplies.
2. Local management interface (LMI) mode is *TE, which means the iSeries system exchanges information with the network on data link connection identifier 0 (DLCI 0). If the network does not support the LMI on DLCI 0, then you must configure the LMIMODE parameter to *NONE. The network provider must then configure the frame-relay switch not to perform LMI functions on the line.

Bridged token-ring configuration through the 6611 network processor: Use the following commands to configure the iSeries connection to a remote token-ring network through a 6611 Network Processor.

```
CRTLINTRN1 LIND(ROUTE6611) RSRNAME(*NWID) NWI(FRMRLY) +
  NWIDLDCI(33)2 LINESPEED(*NWI) MAXFRAME(8148)3 +
  ADPTADR(400000036760)4 EXCHID(05636760) +
  AUTOCRTCTL(*YES)5 TEXT('DLCI to the 6611')
```

```
ADDTCPIFC6 INTNETADR('59.1.2.222') LIND(ROUTE6611)
```

```
CRTCTLAPPC CTLD(PC3) LINKTYPE(*LAN) SWTLINLST(ROUTE6611) +
  RMTNETID(APPN) RMTCPNAME(PC3) ADPTADR(400000051718) +
  TEXT('PC3 on 6611 Token-ring Network')
```

```
CRTDEVAPPC DEVD(PC3) RMTLOCNAME(PC3) LCLLOCNAME(SYS320) CTL(PC3) +
  TEXT('PC3 on 6611 Token-ring Network')
```

```
CRTCTLAPPC CTLD(PC4) LINKTYPE(*LAN) SWTLINLST(ROUTE6611) +
  RMTNETID(APPN) RMTCPNAME(PC4) ADPTADR(4000000564318) +
  TEXT('PC4 on 6611 Token-ring Network')
```

```
CRTDEVAPPC DEVD(PC4) RMTLOCNAME(PC4) LCLLOCNAME(SYS320) CTL(PC4) +
  TEXT('PC4 on 6611 Token-ring Network')
```

Notes:

1. By creating a token-ring line (CRTLINTRN), you indicate that the data link connection identifier (DLCI) for which you are configuring connects to a token-ring bridge. The bridge provides RFC 1490 bridging and performs source-route bridging.
2. The DLCI configured for the line must match that which is supplied by the network provider. At administration time, the network provider must establish a PVC connection to the location of the bridge. If you connect more than one bridge, you need to configure multiple DLCIs and token-ring line descriptions.
3. The MAXFRAME values for each line might be different. The selected values must take into account the maximum sizes that the network and bridge support. For information about determining a frame size to configure in your line descriptions, see maximum frame size parameter requirements for frame relay.
4. You must generate an adapter address (ADPTADR) for each line description that you configure for bridging over frame relay. The frame-relay adapter does not have a preset address.
5. Configure AUTOCRTCTL so that any devices that dial in to the iSeries have controller and device descriptions automatically created.
6. Use the ADDTCPIFC command to define a new interface to the TCP/IP configuration.

This configuration lets you communicate by using either SNA or TCP/IP data.

Note: If the 6611 Network Processor passes TCP/IP data from a frame-relay network to a token-ring or Ethernet network, you must ensure that the 6611 does not filter data for SAP AA. You must turn off filtering for SAP AA on both the frame-relay port and the token-ring or Ethernet port.

Bridged token-ring connection through RouteXpander/2: Use the following commands to configure the iSeries connection to a remote token-ring network through a RouteXpander/2:

```
CRTLINTRTN LIND(ROUTEEX) RSRNAME(*NWID) NWI(FRMRLY) NWIDLCI(32) +
  LINESPEED(*NWI) MAXFRAME(4052) ADPTADR(400000036759) +
  EXCHID(05636759) AUTOCRTCTL(*YES) +
  TEXT('DLCI to RouteXpander/2')

ADDTCPIFC INTNETADR('59.1.2.211') LIND(ROUTEEX)

CRTCTLAPPC CTLD(PC1) LINKTYPE(*LAN) SWTLINLST(ROUTEEX) RMTNETID(RPC) +
  RMTCPNAME(PC1) ADPTADR(400000049605) TEXT('PC1 on +
  RouteXpander/2 Token-ring Network')

CRTDEVAPPC DEVD(PC1) RMTLOCNAME(PC1) LCLLOCNAME(SYS320) CTL(PC1) +
  TEXT('PC1 on RouteXpander/2 Token-ring Network')

CRTCTLAPPC CTLD(PC2) LINKTYPE(*LAN) SWTLINLST(ROUTEEX) RMTNETID(RPC) +
  RMTCPNAME(PC2) ADPTADR(400000047605) TEXT('PC2 on +
  RouteXpander/2 Token-ring Network')

CRTDEVAPPC DEVD(PC2) RMTLOCNAME(PC2) LCLLOCNAME(SYS320) CTL(PC2) +
  TEXT('PC2 on RouteXpander/2 Token-ring Network')
```

Use this configuration to communicate by using either SNA or TCP/IP.

Bridged connection to an Ethernet network

Figure 12 shows the configuration of an iSeries system for frame-relay communications with devices on an Ethernet network.

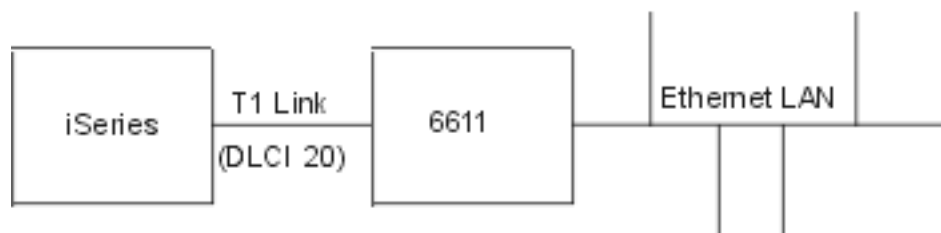


Figure 12. Bridged Configuration to the Ethernet Network

The Ethernet local area network (LAN) is connected by using a 6611 bridge and transparent bridging. The bridge is connected to the iSeries by using a T1 link.

As seen in the above scenario, no frame-relay network exists in the connection between the iSeries and the 6611. In this scenario, the iSeries provides the frame handler (FH), or DCE function, and the 6611 bridge is the terminal equipment (TE). Both SNA APPC/APPN and TCP/IP traffic are possible in this configuration. The TCP/IP configuration for line ETHER6611 is done similarly to the way all Ethernet lines are configured for TCP/IP on the iSeries.

Use the following commands to configure the iSeries connection to the Ethernet network through a 6611 Network Processor.

```
CRTNWIFR NWID(FT1) RSRNAME(LIN231) NRZI(*YES)1
  INTERFACE(*RS449V36)2 LINESPEED(1536000)2 +
  LMIMODE(*FH)3 +
  TEXT('Network Interface for T1 link to Ethernet Bridge')
```

```

CRTLINETH4 LIND(ETHER6611) RSRNAME(*NWID) NWI(FRT1)
NWIDLCI(20)5 ADPTADR(020000036759)6 +
EXCHID(05636759) LINKSPEED(1536000) AUTOCTRL(*YES)7 +
TEXT('DLCI to the 6611 Ethernet LAN')

ADDTCPIFC8 INTNETADR('59.1.2.222') LIND(ETHER6611)

CRTCTLAPPC CTLD(PC5) LINKTYPE(*LAN) SWTLINLST(ETHER6611) +
RMTNETID(RPC) RMTCPNAME(PC5) ADPTADR(020000043405) +
TEXT('PC5 on 6611 Ethernet Network')

CRTDEVAPPC DEVD(PC5) RMTLOCNAME(PC5) LCLLOCNAME(SYS320) CTL(PC5) +
TEXT('PC5 on 6611 Ethernet Network')

CRTCTLAPPC CTLD(PC6) LINKTYPE(*LAN) SWTLINLST(ETHERNET6611) +
RMTNETID(RPC) RMTCPNAME(PC6) ADPTADR(400000455405) +
TEXT('PC6 on 6611 Ethernet Network')

CRTDEVAPPC DEVD(PC6) RMTLOCNAME(PC6) LCLLOCNAME(SYS320) CTL(PC6) +
TEXT('PC6 on 6611 Ethernet Network')

```

Notes:

1. You must configure NRZI(*YES) when communicating directly with a 6611 without a frame-relay network, such as on a T1 link. You must also configure the 6611 to use NRZI.
2. The INTERFACE and LINESPEED parameters must match the characteristics of the T1 line that you use.
3. The local management interface (LMI) mode is *FH, which means the iSeries acts as the frame handler and the 6611 acts as the terminal equipment (TE). LMI is exchanged on data link connection identifier 0 (DLCI 0).
4. By creating an Ethernet line (CRTLINETH), you indicate that the DLCI for which you are configuring connects to an Ethernet bridge. The Ethernet bridge carries out RFC 1490 bridging and performs transparent bridging.
5. The iSeries system communicates with the 6611 bridge on DLCI 20.

Note: If the 6611 Network Processor passes TCP/IP data from a frame-relay network to a token-ring or Ethernet network, you must ensure that the 6611 does not filter data for SAP AA. You must turn off filtering for SAP AA on both the frame-relay port and the token-ring or Ethernet port.

6. You must generate an adapter address (ADPTADR) for each line description that you configure for bridging over frame relay. The frame-relay adapter does not have a preset address.
7. Configure AUTOCTRL so that any devices that dial in to the iSeries have controller and device descriptions automatically created.
8. Use the ADDTCPIFC command to define a new interface to the TCP/IP configuration.

Use this configuration to communicate by using either SNA or TCP/IP data.

Related Information

The following topics provide related information:


- distributed data interface networks (DDI)
- wireless networks

Distributed data interface networks (DDI)

The latest information about Distributed data interface networks (DDI) is located in the LAN,

Frame-Relay and ATM support  document.

Wireless networks

The latest information about wireless networks is located in the LAN, Frame-Relay and ATM support document  .

Appendix. Notices

This information was developed for products and services offered in the U.S.A.

IBM may not offer the products, services, or features discussed in this document in other countries. Consult your local IBM representative for information on the products and services currently available in your area. Any reference to an IBM product, program, or service is not intended to state or imply that only that IBM product, program, or service may be used. Any functionally equivalent product, program, or service that does not infringe any IBM intellectual property right may be used instead. However, it is the user's responsibility to evaluate and verify the operation of any non-IBM product, program, or service.

IBM may have patents or pending patent applications covering subject matter described in this document. The furnishing of this document does not grant you any license to these patents. You can send license inquiries, in writing, to:

- | IBM Director of Licensing
- | IBM Corporation
- | North Castle Drive
- | Armonk, NY 10504-1785
- | U.S.A.

For license inquiries regarding double-byte (DBCS) information, contact the IBM Intellectual Property Department in your country or send inquiries, in writing, to:

- | IBM World Trade Asia Corporation
- | Licensing
- | 2-31 Roppongi 3-chome, Minato-ku
- | Tokyo 106-0032, Japan

The following paragraph does not apply to the United Kingdom or any other country where such provisions are inconsistent with local law: INTERNATIONAL BUSINESS MACHINES CORPORATION PROVIDES THIS PUBLICATION "AS IS" WITHOUT WARRANTY OF ANY KIND, EITHER EXPRESS OR IMPLIED, INCLUDING, BUT NOT LIMITED TO, THE IMPLIED WARRANTIES OF NON-INFRINGEMENT, MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE. Some states do not allow disclaimer of express or implied warranties in certain transactions, therefore, this statement may not apply to you.

This information could include technical inaccuracies or typographical errors. Changes are periodically made to the information herein; these changes will be incorporated in new editions of the publication. IBM may make improvements and/or changes in the product(s) and/or the program(s) described in this publication at any time without notice.

Any references in this information to non-IBM Web sites are provided for convenience only and do not in any manner serve as an endorsement of those Web sites. The materials at those Web sites are not part of the materials for this IBM product and use of those Web sites is at your own risk.

IBM may use or distribute any of the information you supply in any way it believes appropriate without incurring any obligation to you.

Licensees of this program who wish to have information about it for the purpose of enabling: (i) the exchange of information between independently created programs and other programs (including this one) and (ii) the mutual use of the information which has been exchanged, should contact:

IBM Corporation

Software Interoperability Coordinator, Department 49XA
3605 Highway 52 N
Rochester, MN 55901
U.S.A.

Such information may be available, subject to appropriate terms and conditions, including in some cases, payment of a fee.

- | The licensed program described in this information and all licensed material available for it are provided
- | by IBM under terms of the IBM Customer Agreement, IBM International Program License Agreement,
- | IBM License Agreement for Machine Code, or any equivalent agreement between us.

Any performance data contained herein was determined in a controlled environment. Therefore, the results obtained in other operating environments may vary significantly. Some measurements may have been made on development-level systems and there is no guarantee that these measurements will be the same on generally available systems. Furthermore, some measurements may have been estimated through extrapolation. Actual results may vary. Users of this document should verify the applicable data for their specific environment.

Information concerning non-IBM products was obtained from the suppliers of those products, their published announcements or other publicly available sources. IBM has not tested those products and cannot confirm the accuracy of performance, compatibility or any other claims related to non-IBM products. Questions on the capabilities of non-IBM products should be addressed to the suppliers of those products.

All statements regarding IBM's future direction or intent are subject to change or withdrawal without notice, and represent goals and objectives only.

All IBM prices shown are IBM's suggested retail prices, are current and are subject to change without notice. Dealer prices may vary.

This information is for planning purposes only. The information herein is subject to change before the products described become available.

This information contains examples of data and reports used in daily business operations. To illustrate them as completely as possible, the examples include the names of individuals, companies, brands, and products. All of these names are fictitious and any similarity to the names and addresses used by an actual business enterprise is entirely coincidental.

COPYRIGHT LICENSE:

This information contains sample application programs in source language, which illustrate programming techniques on various operating platforms. You may copy, modify, and distribute these sample programs in any form without payment to IBM, for the purposes of developing, using, marketing or distributing application programs conforming to the application programming interface for the operating platform for which the sample programs are written. These examples have not been thoroughly tested under all conditions. IBM, therefore, cannot guarantee or imply reliability, serviceability, or function of these programs.

- | SUBJECT TO ANY STATUTORY WARRANTIES WHICH CANNOT BE EXCLUDED, IBM, ITS
- | PROGRAM DEVELOPERS AND SUPPLIERS MAKE NO WARRANTIES OR CONDITIONS EITHER
- | EXPRESS OR IMPLIED, INCLUDING BUT NOT LIMITED TO, THE IMPLIED WARRANTIES OR
- | CONDITIONS OF MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE, AND
- | NON-INFRINGEMENT, REGARDING THE PROGRAM OR TECHNICAL SUPPORT, IF ANY.

| UNDER NO CIRCUMSTANCES IS IBM, ITS PROGRAM DEVELOPERS OR SUPPLIERS LIABLE FOR
| ANY OF THE FOLLOWING, EVEN IF INFORMED OF THEIR POSSIBILITY:
| 1. LOSS OF, OR DAMAGE TO, DATA;
| 2. SPECIAL, INCIDENTAL, OR INDIRECT DAMAGES, OR FOR ANY ECONOMIC CONSEQUENTIAL
| DAMAGES; OR
| 3. LOST PROFITS, BUSINESS, REVENUE, GOODWILL, OR ANTICIPATED SAVINGS.

| SOME JURISDICTIONS DO NOT ALLOW THE EXCLUSION OR LIMITATION OF INCIDENTAL OR
| CONSEQUENTIAL DAMAGES, SO SOME OR ALL OF THE ABOVE LIMITATIONS OR EXCLUSIONS
| MAY NOT APPLY TO YOU.

Each copy or any portion of these sample programs or any derivative work, must include a copyright notice as follows:

© (your company name) (year). Portions of this code are derived from IBM Corp. Sample Programs. © Copyright IBM Corp. _enter the year or years_. All rights reserved.

If you are viewing this information softcopy, the photographs and color illustrations may not appear.

Trademarks

The following terms are trademarks of International Business Machines Corporation in the United States, other countries, or both:

| AIX
| AIX 5L
| e(logo)server
| eServer
| i5/OS
| IBM
| iSeries
| pSeries
| xSeries
| zSeries

| Intel, Intel Inside (logos), MMX, and Pentium are trademarks of Intel Corporation in the United States, other countries, or both.

Microsoft, Windows, Windows NT, and the Windows logo are trademarks of Microsoft Corporation in the United States, other countries, or both.

Java and all Java-based trademarks are trademarks of Sun Microsystems, Inc. in the United States, other countries, or both.

| Linux is a trademark of Linus Torvalds in the United States, other countries, or both.

UNIX is a registered trademark of The Open Group in the United States and other countries.

Other company, product, or service names may be trademarks or service marks of others.

Terms and conditions for downloading and printing information

| Permissions for the use of the information you have selected for download are granted subject to the following terms and conditions and your indication of acceptance thereof.

- | **Personal Use:** You may reproduce this information for your personal, noncommercial use provided that all proprietary notices are preserved. You may not distribute, display or make derivative works of this information, or any portion thereof, without the express consent of IBM.
- | **Commercial Use:** You may reproduce, distribute and display this information solely within your enterprise provided that all proprietary notices are preserved. You may not make derivative works of this information, or reproduce, distribute or display this information or any portion thereof outside your enterprise, without the express consent of IBM.
- | Except as expressly granted in this permission, no other permissions, licenses or rights are granted, either express or implied, to the information or any data, software or other intellectual property contained therein.
- | IBM reserves the right to withdraw the permissions granted herein whenever, in its discretion, the use of the information is detrimental to its interest or, as determined by IBM, the above instructions are not being properly followed.
- | You may not download, export or re-export this information except in full compliance with all applicable laws and regulations, including all United States export laws and regulations. IBM MAKES NO GUARANTEE ABOUT THE CONTENT OF THIS INFORMATION. THE INFORMATION IS PROVIDED "AS-IS" AND WITHOUT WARRANTY OF ANY KIND, EITHER EXPRESSED OR IMPLIED, INCLUDING BUT NOT LIMITED TO IMPLIED WARRANTIES OF MERCHANTABILITY, NON-INFRINGEMENT, AND FITNESS FOR A PARTICULAR PURPOSE.

All material copyrighted by IBM Corporation.

- | By downloading or printing information from this site, you have indicated your agreement with these terms and conditions.



Printed in USA