3174 Establishment Controller/Networking Server Installation Guide

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Abstract

The 3174 Establishment Controller is an important component in multi-protocol networks involving subarea SNA, Advanced Peer-to-Peer Networking, Peer Communication, Token-Ring and Ethernet LAN, X.25, Frame Relay, Integrated Services Digital Network, asynchronous communication, and TCP/IP.

In addition, it offers significant functions such as local format storage, dynamic definition of dependent LUs, ESCON attachment, network management, end-user productivity enhancements, and multi-host connectivity through single link multi-host and multiple upstream physical attachments. Using the Multiple Logical Terminal capability, a user can access multiple host sessions from one terminal.

This document describes the 3174 features and functions, with emphasis on their installation, customization, and operation. It is intended for systems engineers and customer personnel who are installing the 3174. A knowledge of the 3270 Information Display System is assumed.

(832 pages)

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Special Notices

This publication is intended to help the customer to install and customize the 3174 Establishment Controller and its features. It contains an introduction to the 3174 and descriptions of most of the available features. Where possible, these descriptions are supported by examples of working 3174 configurations. The information in this publication is not intended as the specification of any programming interfaces that are provided by the 3174 Establishment Controller. See the PUBLICATIONS section of the IBM Programming Announcement for the 3174 Establishment Controller for more information about what publications are considered to be product documentation.

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Preface

The 3174 Establishment Controller is a very important component in multi-protocol networks involving subarea SNA, Advanced Peer-to-Peer Networking (APPN), Peer Communication, Token-Ring and Ethernet LAN, X.25, Frame Relay communication, Integrated Services Digital Network (ISDN), asynchronous (ASCII) communication, and Transmission Control Protocol/Internet Protocol (TCP/IP). In addition, it offers significant functions such as Local Format Storage, Dynamic Definition of Dependent LUs, ESCON attachment, network management, end-user productivity enhancements, and multi-host connectivity through single link multi-host (SLMH) and multiple upstream physical attachments. Using the Multiple Logical Terminal (MLT) capability, a user can access multiple sessions across different protocol networks from one terminal.

This document describes the 3174 features and functions, with emphasis on their installation, customization, and operation. It is intended for systems engineers and customer personnel who are installing the 3174. Knowledge of the 3270 Information Display System is assumed.

The information contained in this document is based on installation experience at the International Technical Support Organization, Raleigh. Wherever possible, example scenarios and customization are included for guidance.

The document is organized as follows:

- Chapter 1, "Introduction to the 3174"

  This chapter offers a brief history of the evolution of the 3174 Establishment Controller from the 3274 Control Unit. The various models available and their features, both hardware and microcode, are briefly described.

- Chapter 2, "Installation Planning"

  This chapter discusses the planning needed for host and terminal attachments, cabling, and the physical installation of the 3174, including customer setup tasks required.

- Chapter 3, "Microcode Customization"

  This chapter describes the planning and procedures required to customize the 3174 microcode to support desired features and functions.

- Chapter 4, "LAN Support"

  This chapter covers the 3174 attached to a token-ring network or an Ethernet network, both as a gateway (local and remote) and as a downstream physical unit (DSPU). It includes topics such as performance, connectivity, customization, backup/recovery, and considerations when installing them in different environments such as VM/SP, MVS and VSE.

- Chapter 5, “X.25 Support”

  This chapter covers the 3174 attached to an X.25 network as a PU 2.0 device. It includes operation of the 3174 on permanent virtual circuit (PVC) and switched virtual circuit (SVC) connections.

- Chapter 6, “X.25 Token-Ring Gateway RPQ”

  This chapter describes the function of the 3174 as a token-ring gateway when attached to the X.25 network. It includes example scenarios in which the 3174 acts as a QLLC primary and secondary gateway for host access.

- Chapter 7, “Asynchronous Emulation Adapter (AEA)”

  This chapter describes the installation and customization of the 3174 AEA.

- Chapter 8, “ESCON Connection”

  This chapter describes the Enterprise Systems Connection (ESCON) optical fiber channel support provided by the 3174 ESCON models.

- Chapter 9, “Multi-Host Connectivity”

  This chapter describes the Multiple Logical Terminal capability, the Concurrent Communication Adapter and Single Link Multi-Host support. It includes descriptions of the multi-host connectivity supported via the LAN Gateway and X.25 or Frame Relay attachments.

- Chapter 10, “Connectivity Customization Examples”

  Several example scenarios, involving the use of the Multiple Logical Terminal capability, the Concurrent Communication Adapter and Single Link Multi-Host support, are presented here for guidance during customization and system definition.

- Chapter 11, “Dynamic Definition of Dependent LUs (DDDLU)”

  This chapter describes the functions provided with 3174 microcode, in conjunction with VTAM, to dynamically define terminals to VTAM. It includes example VTAM definitions and displays.

- Chapter 12, “Local Format Storage”

  This chapter explains LFS and its use to improve line utilization and response times. It also describes the software product offered by BMC Software Inc., UltraOpt/VTAM, which works in conjunction with LFS to provide even better datastream optimization, line utilization and response times.

- Chapter 13, “Network Management”

  Features such as Network Asset Management, including Vital Product Data, and Central Site Control Facility (CSCF) are discussed in this chapter.

- Chapter 14, “Configuration Support-C Release 2”

  Several end-user productivity enhancements are integrated in Configuration Support-C Release 2 base microcode. These enhancements are described in this chapter.

- Chapter 15, “Configuration Support-C Release 3”

  This chapter describes the enhancements introduced in Configuration Support-C Release 3.

- Chapter 16, “Configuration Support-C Release 4”

  The 3174 Configuration Support-C Release 4 enhancements introduced together with the Ethernet support are described in this chapter.

- Chapter 17, “Configuration Support-C Release 5”

  The new Frame Relay Communication support, the APPN enhancements such as APPN over X.25 and Frame Relay and other enhancements introduced in Configuration Support-C Release 5 are described in this chapter.

- Chapter 18, “APPN”

  This chapter describes the 3174 as a network node in an Advanced Peer-to-Peer Networking (APPN) environment.

- Chapter 19, “Peer Communication”

  This chapter describes the function provided by the 3174 that allow coax attached DOS and OS/2 workstations to communicate as peer devices, as if they were on a token-ring LAN.

- Chapter 20, “Frame Relay Support”

  This chapter briefly describes the 3174 Frame Relay Communication support introduced in Configuration Support-C Release 5.

- Chapter 21, “TCP/IP”

  This chapter describes the function of the 3174 as a Transmission Control Protocol/Internet Protocol (TCP/IP) TELNET client, providing services to Control Unit Terminal (CUT) mode displays to access 3270, ASCII and TCP/IP applications from a single terminal.

- Chapter 22, “ISDN”

  This chapter describes the function of the 3174 as an Integrated Services Digital Network (ISDN) gateway. It includes brief discussions of ISDN concepts and terminology.

The book includes the following appendixes:

- Appendix A, “3174 Adapters”
- Appendix B, “3174 Features”
- Appendix C, “3174 Physical Specifications”
- Appendix D, “3174 Feature Slot Usage”
- Appendix E, “3174 Storage Requirements”
- Appendix F, “APARs”
- Appendix G, “VTAM/NCP Definition Examples”
- Appendix H, “3174 Workstation Networking Module”
- Appendix I, “Keyboard Layouts”

Related Publications

The following publications are considered particularly suitable for a more detailed discussion of the topics covered in this document.

To Become Familiar with the 3174:

Master Index, GC30-3515
3174 Introduction, GA27-3850

To Prepare Your Site for the 3174:

Site Planning, GA23-0213
Physical Planning Template, GX27-2999

To Set Up and Operate the 3174:

Models 1L, 1R, 2R, 3R, 11L, 11R, 12L, 12R, 13R and 14R User's Guide, GA23-0337
Models 21H, 21L, 21R, 22L, 22R, 23R and 24R User's Guide, GA27-3874
Models 51R, 52R, 53R, 61R, 62R, 63R and 64R User's Guide, GA23-0333
Models 81R, 82R, 90R, 91R, and 92R User's Guide, GA23-0313

To Plan for and Customize the 3174:

Configuration Support-A and S

Planning Guide, GA27-3844
Utilities Guide, GA27-3853
Central Site Customizing User's Guide, GA23-0342
Asynchronous Emulation Adapter Description and Reference, GA27-3872

Configuration Support-B

Planning Guide, GA27-3862
Model 90R Tokenway Planning, GD21-0036
Utilities Guide, GA27-3863
Central Site Customizing User's Guide, GA27-3868
Asynchronous Emulation Adapter Description and Reference, GA27-3872

Configuration Support-C

Planning Guide, GA27-3918
Utilities Guide, GA27-3920
Central Site Customizing User's Guide, GA27-3919
ASCII Functions Reference, GA27-3872

To Perform Problem Determination:

Customer Problem Determination, GA23-0217
Status Codes, GA27-3832

To Install Features or Convert Models on the 3174:

Fixed Disk Installation and Removal Instructions, GA27-3864
Diskette Drive Installation and Removal Instructions, GA23-0263
Device Control Adapters Installation and Removal Instructions, GA23-0265
Model Conversion Instructions, GA23-0295
Token-Ring Network Feature and Ethernet Network Feature Installation and Removal Instructions, GA23-0329
Storage Expansion Feature Installation and Removal Instructions, GA23-0330
Communication Adapter Installation and Removal Instructions, GA27-3830
Asynchronous Emulation Adapter Installation and Removal Instructions, GA23-0341
Concurrent Communication Adapter and Integrated Services Digital Network Adapter Installation and Removal Instructions, GA27-3851
Models 21H, 21L, 21R, 22L, 22R, 23R and 24R Feature Installation and Removal Instructions, GA27-3875

To Use the Asynchronous Emulation Adapter Feature:

Asynchronous Emulation Adapter Description and Reference, GA27-3872
Terminal User's Reference for Expanded Functions, GA23-0332

To Use the Multiple Logical Terminals Function:

Terminal User's Reference for Expanded Functions, GA23-0332

To Obtain Datastream Programming and Reference Information:

Functional Description, GA23-0218
Data Stream Programmer's Reference, GA23-0059
ASCII Functions Reference, GA27-3872
3174 Reference Summary, GX27-3872
3174 Character Set Reference, GA27-3831
3270 X.25 Operation, GA23-0204

To Perform Maintenance (Service Personnel):

Models 1L, 1R, 2R, 3R, 11L, 11R, 12L, 12R, 13R and 14R Maintenance Information, SY27-2572
Models 21H, 21L, 21R, 22L, 23R and 24R Maintenance Information, SY27-0323
Models 51R, 52R, 53R, 61R, 62R, 63R and 64R Maintenance Information, SY27-2573
Models 81R, 82R, 90R, 91R, and 92R Maintenance Information, SY27-2584
CE Reference Summary, SX27-3873
Status Codes, GA27-3832

To Install, Customize, and Service the 8250 Workstation Networking Module (WNM)

8250 Workstation Networking Module Installation and Customization Guide, GA27-4022
3174 Planning Guide - Configuration Support-C, GA27-3918
3174 Utilities Guide - Configuration Support-C, GA27-3920
8250 Workstation Networking Module Problem Determination and Service Guide, SY27-0342

Related International Technical Support Organization Publications

The following Redbooks are recommended for a more detailed information of the following topics covered in this document.

To Use the 3174 TCP/IP Feature:

Using 3174 in TCP/IP Networks, GG24-4172

To Use the 3174 CSCM Feature:

NetView Distribution Manager Release 2 and 3174 Central Site Change Management Implementation Guide, GG24-3424

NetView DM/2 V2.1 Remote Administrator and New Functions, GG24-4419

To Use the 3174 APPN Feature:

3174 APPN Implementation Guide, GG24-3702
3174 APPN Implementation Guide Update, GG24-4171 (Available 1Q95)

To Use the 3174 Frame Relay Feature:

3174 in Higher Speed WAN and Multiprotocol Networks, GG24-4376 (Available 1Q95)

Other ITSO redbooks:

X.25 Guide, GG24-3458

Automated Configuration Management Using the Information/System-NetView Bridge Adapter, GG24-3871

Personal Communications/3270 Version 2 Implementation Guide, GG24-3703

Personal Communications/3270 Version 3.1 Implementation Guide, GG24-4173

TCP/IP Tutorial and Technical Overview, GG24-3376

AS/400 ISDN Connectivity, GG24-3517

APPN Architecture and Product Implementations Tutorial, GG24-3669

Local Area Network Reference, GG24-4111

Network Products Reference, GX28-8002

A complete list of International Technical Support Organization publications, with a brief description of each, may be found in:

Bibliography of International Technical Support Organization Technical Bulletins, GG24-3070

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Other Publications

- *TCP/IP for the IBM 3174 Establishment Controller*, G221-3343
- *X.25 1984/1988 DTE/DCE and DTE/DTE Interface Architecture Reference*, SC30-3409
- *IBM ISDN Interface Co-Processor/2 Model 2 Technical Reference*, SA33-3230
- *Integrated Service Digital Networks Data Link Control Architecture Reference*, SC31-6826
- *Integrated Service Digital Networks Circuit-Switched Signalling Control*, SC31-6827
- *Planning for Enterprise Systems Connection Links*, GA23-0367
- *IBM 3299 Terminal Multiplexer Product Information and Setup*, G520-4216
- *IBM 3299 Terminal Multiplexer Model 32 Planning for Optical Fiber Cable*, GA27-3902
- *3174 Telephone Twisted-Pair Terminal Multiplexer Adapter (RPQ 8Q0806) User's Guide*, GA27-3929
- *3174 Peer Communication User's Guide RPQ 8Q0718*, GA27-3887
- *3174 Establishment Controller With Local Format Storage*, G221-3318
- *3270 Entry Assist User's Guide*, GA23-0119
- *VTAM V3.4.1 Resource Definition Reference*, SC31-6438
- *VTAM V3.4.1 Messages and Codes*, SC31-6433

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Chapter 1. Introduction to the 3174

The 3174 Establishment Controller is the most fundamental component of the 3270 family of products, which includes display stations, printers and control units. It connects and controls a cluster of user terminals (display stations, printers, PCs or PS/2s) to a host computer. Hence, it is frequently referred to as a *cluster controller* or a *control unit*.

Since its introduction, the types of network environment that the 3174 can participate in grow with each new release of the 3174. Today, it is a key component in SNA, SDLC, BSC, X.25, ISDN, TCP/IP, APPN*, Frame Relay, token-ring, Ethernet (frame formats IEEE 802.3 and Ethernet DIX Version 2), and ASCII networks.

It is the intention of this document to describe the 3174′s features and functions and to assist the user in installing and implementing the product effectively.

This chapter provides an introduction to the 3174 and the 3270 family of products. It includes descriptions of:

- The different models of the 3174
- Host and terminal attachment capabilities
- Hardware and microcode features
- Microcode releases
- Network management
- National Language Support, including CECP

1.1 Brief History

The 3270 family of products has been with us now for more than 20 years. During this period, there were only two major changes to the basic design of the control unit: the change from the original 3271/2 Controllers to the New Display System 3274 Control Unit, and then the change from the 3274 Control Unit to the 3174 Establishment Controller. Since the introduction of the 3174, there have been many changes to the communication environment. In response to these changes, the 3174 has been enhanced with many more features and functions than both its predecessors put together.

1.1.1 3271/2 Controller

The 3271/2 Controllers were introduced in 1971. The 3271 was a remote controller supporting BSC at speeds up to 9600 bps. (A later model had SNA support as a PU T1.) The 3272 was for S/370 channel attachment. Each supported a maximum of 32 devices, typically a mixture of 3277 display stations and 3284/3286 printers.

These controllers were hard wired; that is, all the logic was coded in hardware on cards inside the machine. This made them very fast to start up; you could simply turn them on and they were ready. However, adding new features and functions was a major problem. Invariably, it required hardware changes, such as card replacement and rewiring, which were both time consuming and inconvenient.

1.1.2 3274 Control Unit

To overcome this problem, IBM* introduced the customizable 3274 in 1977. It was a radical change from the 3271/2 in that it was designed around an internal processor programmed with microcode. The microcode could then be tailored by the user to support the growing number of new features that technology made available.

Terminals introduced with the 3274 included the first color display station, the IBM 3279 Color Display Station. The 3279 was originally a four-color display. With the introduction of the 3270 extended data stream, it became possible to deliver seven colors with highlighting and graphics.

Terminals designed specifically to attach to the 3274 included the 3278 Display Station (monochrome), the 3279 Color Display Station and a range of printers, including the 3287 Printer. These terminals are referred to as Type A (or Category A) terminals to differentiate them from the Type B (or Category B) terminals designed for the earlier 3271/2 controllers and which used a different coax protocol.

The 3274 developed over time to support many features including:

- V.24 interfaces up to 14.4 Kbps
- V.35 interfaces up to 56 Kbps
- X.25 network attachment
- DFT functions
- 3299 multiplexer
- RPQs including:
  - Entry Assist
  - Dual Logic (the ability to have two sessions from a CUT mode display).

3274 models included 8-port remote, 12-port remote, 16-port remote, and 32-port local and remote, units.

1.1.3 3174 Subsystem Control Unit

The development of new technology such as faster internal processors and smaller packaging led to the introduction of the 3174 Subsystem Control Unit in 1986. The 3174 was designed to enhance the 3270 product line with many new connectivity options and features. Like the 3274, it was customizable; the difference was that it used smaller (5.25-inch) diskettes than the 3274 (8-inch diskettes) and the customization process was simplified and made considerably faster.

The packaging of the 3174 enabled the installation of many new features such as the LAN and Asynchronous Emulation Adapters.

New terminals were smaller, lighter and incorporated better ergonomic design. Image support was now available using the 3193 Display Station “portrait” monitor.

1.1.4 3174 Establishment Controller

In 1989, IBM introduced a new range of 3174 models and changed the name from 3174 Subsystem Control Unit to 3174 Establishment Controller. This change in name reflects the expanded role of the 3174 in a business establishment, providing many connectivity options to both local and wide area networks.

The new models provided increased internal processor speed, 2MB of base memory (twice that of the previous model) and a 2.4MB diskette drive. The new diskette drive was needed because the microcode to support the new connectivity options was growing larger than the existing 1.2MB drives could sustain.

The current 3174 models include the Tokenway (a small remote token-ring gateway), rack-mountable 3174s for situations where larger numbers of terminals need to be attached and Workstation Networking Module (WNM) to integrate 3174 facilities into the IBM 8250 Multiprotocol Intelligent Hub.

New features include:

- ISDN Basic Rate Interface Adapter, to allow downstream intelligent workstations to connect via ISDN
- Telephone Twisted Pair (TTP) multiplexer
- Concurrent Communication Adapters (CCA), which allow additional SNA or BSC hosts to physically attach to a single 3174
- 64 coax port capability
- 32-port 3299 Terminal Multiplexer
- S/390 host attachment over Enterprise Systems Connection (ESCON) channels using fiber optic cable

These features, and others, will be described in more detail in the remainder of this document.

1.2 3174 Models

Before the 1989 announcement, the 3174 Subsystem Control Unit consisted of the following models:

- 01L, 01R, 02R, 03R, 51R, 52R, 53R, 81R and 82R.

In 1989, IBM announced the 3174 Establishment Controller consisting of the following models:

- 11L, 11R, 12R, 13R, 61R, 62R, 63R, 91R and 92R.

These models supersede each of the original 3174 models and offer a higher throughput, more base storage and support for a total of 6 MB of storage for the larger models. They are designed and built with state-of-the-art CMOS technology and with Very Large Scale Integration (VLSI) circuitry. This new technology design produces advantages of smaller size, faster circuitry, less power, additional control storage capacity, and room for growth.

In 1990, six more models were added:

- 90R (Tokenway), 21R, 21L, 12L, 22L and 23R.

In 1991, Model 22R was added for Europe, Middle East, and Africa.

In 1993, three new models were added with the announcement of Ethernet adapter (FC 3045).

- 14R, 24R and 64R.

Also in 1993, IBM 3174 Workstation Networking Module (WNM), which is also known as 8250 Workstation Networking Module, was added to the existing 3174 product line to integrate 3174 functionality into the IBM 8250 Multiprotocol Intelligent Hub.

- 41R and 43R.

  See H.2, "Workstation Networking Module Feature (#3174)" on page 800 for more information about Models 41R and 43R.

We will now look at the characteristics and capabilities of these models. Note that each model number has a suffix, either "R" for remote or "L" for local, which indicates the base machine host attachment type. The "R" suffix indicates a 3174 as being network attached via SDLC, BSC, X.25, Frame Relay or LAN ; the "L" suffix indicates a 3174 as being attached to the host via parallel or ESCON channels.

All 3174s, except the WNM, are housed in one of four cabinet types. These are:

- Large floor-standing models

  These models have a dash 0xx or a dash 1xx designation, for example, the 3174-01L or the 3174-11R. They have the capability of supporting:

  – Up to 24 Asynchronous Emulation Adapter (AEA) ports
  – Up to two additional host communication adapters (CCAs)
  – Up to four 3174 ISDN BRI Adapter
  – A Token-Ring Gateway
  – An Ethernet Gateway
  – Up to 64 coax ports with the 3270 Port Expansion Feature

- Rack-mounted models

  These models have a dash 2xx designation, for example, the 3174-21L or the 3174-22R. They are equivalent to the large 1xx models but the packaging has been compressed to make them fit in a rack. They are only 10 inches (254 mm) high. These models have only five expansion slots available for adding extra features. (The 22L and 23R have only four expansion slots.) They support the same attachments as the large models, but due to the limited slots cannot accommodate all features at the same time. However, not many customers configure all features in the same 3174 and thus the rack-mounted models may be adequate for most situations.

- Medium-sized desk top models

  These models have a dash 5xx or a dash 6xx designation, for example, the 3174-51R or the 3174-63R. They can support 9 to 16 coax devices and, depending on the specific model type, one or a combination of the following:

  – Asynchronous emulation adapter
  – Token-ring adapter

– Ethernet adapter

– 3174 ISDN BRI adapter

– Concurrent communication adapter (up to two on some models)

- Small table-top models

  These models have a dash 8xx or a dash 9xx designation, for example, the 3174-81R or the 3174-90R. These models attach between four and eight coax devices. The 90R, also known as the Tokenway, is a token-ring gateway. They do not support the asynchronous emulation adapter or concurrent communication adapters.

The 3174 Workstation Networking Module (WNM) is housed within the IBM 8250 Multiprotocol Intelligent Hub and it can be customized as two different models, 41R and 43R depending, on the host attachment type. The Model 41R is attached via remote TP link while the Model 43R is attached via an internal token-ring adapter which interfaces directly with the 8250 Hub.

See H.2, "Workstation Networking Module Feature (#3174)" on page 800 for more information on the 3174 Workstation Networking Module.

1.3 Attachment Description

This section describes the attachment capability of the 3174 to hosts and terminals, and the various multiplexer configurations that can be used for terminal attachments.

1.3.1 Host Attachment

There are three basic methods of physically attaching the 3174 to the host:

- Via local channel
  - Models x1L for the S/370 channel
  - Models x2L for the S/390* ESCON* channel
- Via remote TP link
  - Models x1R or 90R (Tokenway) for V.24 or V.35 interfaces
  - Models x2R for X.21 interfaces
- Via a LAN
  - Models x3R (token-ring network)
  - Models x4R (Ethernet network)

Local Channel Attach

The 3174 Models 01L, 11L and 21L have Data-Chaining Interlocked, High Speed Transfer, and Data Streaming channel operational modes. This provides channel data rates up to 1.0, 1.25, and 2.5 megabytes per second, respectively.

The 3174 Models 12L and 22L attach to the host via the ESCON fiber optic channel. This channel is capable of attaching the 3174 to eight different physical hosts via the ESCON Director at distances of up to 5.4 miles (9 km) in three stages. Performance of the 3174 over ESCON is comparable to that over a S/370 channel.

Remote Link Attach

The 3174 remote attach models provide improved communication capabilities. The base communication hardware will provide the following interfaces as applicable to the 3174 model selected. Communication protocol (SDLC, BSC, X.25 or Frame Relay) is selectable during the customization.

- Models 01R, 11R, 21R, 41R, 51R, 61R, 81R, 90R and 91R

  RS-232C/CCITT V.24 and CCITT V.35 interfaces for SNA/SDLC, BSC, X.25, and Frame Relay (only for 11R, 21R, 41R and 61R) remote link attachment. Maximum speeds are 19.2 Kbps for BSC, 64 Kbps for X.25 and 256 Kbps for SNA/SDLC and Frame Relay.

- Models 02R, 12R, 22R, 52R, 62R, 82R and 92R

  X.21 interface (CCITT V.11) for SNA/SDLC, X.25 and Frame Relay (only for 12R and 62R) remote link attachment. Maximum speeds are 256 Kbps for SNA/SDLC and 64 Kbps for X.25.

LAN Attach (Token-Ring or Ethernet Attach)

The 3174 provides for attachment of a 3270 Information Display System to the LAN. Models x3R provide attachment to a token-ring network, and models x4R provide attachment to an Ethernet network. The token ring may operate at 4 Mbps or 16 Mbps, while the Ethernet operates at 10 Mbps, to provide a good solution for those users who need fast response times in both local and remote locations. The 3174s with LAN Attachment can communicate with up to eight host processors. The host gateway may be one of the following:

- For a 3174 with a token-ring attachment, 3745, 3720 or 3725 Communication Controller fit with a Token-Ring Interface Coupler (TIC) and running the ACF/NCP facility called NCP Token-Ring Interconnection (NTRI).

  Note that the 3720 and 3725 TIC is limited to 4 Mbps and that the ACF/NCP must at least be V4.2 for the 3720 and 3725, or V5 for the 3745 for SNA support. For TCP/IP over token ring, ACF/NCP must at least be V7.1.

  For a 3174 with an Ethernet Attachment, 3745, 3720 or 3725 Communication Controller fitted with an Ethernet LAN Adapter (ELA) and running ACF/NCP V6.1 and later.

  Note that only the TCP/IP is supported over the Ethernet LAN connected via a 37xx Communication Controller.

- A 3174 gateway, that is, a local or remote 3174 fit with either features #3025 or #3026 and running Configuration Support-S, or feature #3044 and running Configuration Support-B or later for token-ring LAN and feature #3045 and running Configuration Support-C4 or later for Ethernet LAN.

- An IBM 3172 Interconnect Controller with a Token-Ring Adapter or an Ethernet Adapter and running Interconnect Controller Program (ICP).

- Any directly attached host to the LAN, for example, an IBM AS/400* with a token-ring gateway feature or Ethernet gateway feature or an IBM Series/1 with a token-ring gateway feature.

1.3.2 Terminal Attachment

The 3174 offers excellent flexibility for terminal attachment. A 3270 terminal, or a workstation (such as a PC or PS/2*) emulating a 3270 terminal, may be connected directly to a base Terminal Adapter port, a Terminal Multiplexer Adapter port, a 3299 Terminal Multiplexer port, or via the new Telephone Twisted Pair Terminal Multiplexer Adapter (TTP TMA). ASCII devices (displays, printers and hosts) can be attached to a 3174 via the AEA ports. PC or PS/2 workstations can be attached via a LAN or an ISDN network to access a 3174 gateway.

3174 Models 1xL, 2xL, 1xR and 2xR can also have a second terminal adapter, known as the 3270 Port Expansion Feature, to support an additional 32 terminal attachments.

First we will discuss the attachment of ASCII devices, then intelligent workstations, and then 3270 terminals.

ASCII Device Attachment

The Asynchronous Emulation Adapter (AEA) has several functions which will be covered later in this document. One of them is the attachment of ASCII displays and printers to the 3174 to allow them to access both 3270 and ASCII hosts. Each AEA has eight ports which can used to attach to ASCII displays, printers, and hosts. Depending on the model, a 3174 may support up to three AEAs. The small models, 8xR and 9xR, cannot support an AEA.

LAN Attachment

Intelligent workstations can participate in a token-ring LAN or an Ethernet LAN and communicate with a host using the 3174 as a gateway or one of the other gateways discussed in "LAN Attach (Token-Ring or Ethernet Attach)" on page 6. The LAN can be, among others, an IBM Token-Ring or a Novell LAN running on token-ring or Ethernet. With appropriate levels of software and hardware in the gateways and host, the intelligent workstations can communicate via LU6.2 to other intelligent workstations and hosts which have the same communication capabilities elsewhere in the network.

ISDN Attachment

The 3174 ISDN BRI Adapter is a method of attaching remote downstream intelligent workstations to a 3174. The ISDN BRI Adapter is a card which plugs into one of the 3174 feature slots. It fits into the large, medium (excluding 5xR), and rack-mounted 3174s. Each ISDN BRI Adapter has four ports; each port provides two independent 64 Kbps information channel and one 16 Kbps information/control channel (see Chapter 22, "ISDN" on page 661 for further information). Thus, each ISDN BRI Adapter supports up to eight intelligent workstation connections.

An ISDN BRI Adapter is ordered as feature #3055. It comes with four cables. Depending on the 3174 model, up to four ISDN BRI Adapters can be used to support up to 32 DSPU connections.

The ISDN BRI Adapter has been designed to use the IBM Cabling System Type 2 voice grade media (VGM). It will also work with most unshielded telephone wiring. Caution should be taken when using unshielded wiring in high electromagnetic noise environments.

Note: ISDN is not currently available in all countries. Please check with your network provider and your IBM representative for the availability of ISDN and IBM ISDN products in your location.

3270 Device Attachment via Terminal Multiplexer Adapter

There are two kinds of Terminal Multiplexer Adapter: the normal TMA, which has eight BNC connectors, and the TTP TMA, which has two 50-pin D-shell connectors. Both are cards which plug into one of the 3174 feature slots.

Telephone Twisted Pair TMA: The Telephone Twisted Pair TMA is ordered as feature #3105. The TTP TMA is a high density TMA in that it provides for attachment of 32 terminals via two 25-pair TTP bulk cables fitted with standard 25-pair telephone company or "telco" connectors.

Two TTP TMAs can be used with the 3270 Port Expansion Feature. This would allow attachment of 64 terminals using only three slots. The distance between the terminal and the TTP TMA must not exceed 900 feet (275 meters).

TMA: The standard TMA is ordered as feature #3103. The TMA can use coaxial cable or IBM Cabling System Types 1, 2 or 3 cables. A short length of coax connects the TMA input port to one of the Terminal Adapter ports. The TMA then provides eight ports for terminal attachment. Each Terminal Adapter can be connected to a maximum of four TMAs. Depending on the type of cable used, terminals can be up to 4920 feet (1500 meters).

3270 Device Attachment via 3299 Terminal Multiplexer

The 3299 Terminal Multiplexer is similar to the TMA but it is located external to the 3174. It is attached to the Terminal Adapter at distances of up to 4920 feet (1500 meters). The terminals can be up to another 4920 feet (1500 meters) away, depending on the type of cable. See *IBM 3174 Site Planning* for more detail on cable distance limitations.

There are four 3299 models available: Models 2, 3, 32 and 32T (Model 1 has been withdrawn).

- Models 2 and 3 each attaches up to eight devices. Model 2 can have terminals attached via coaxial cable or the IBM Cabling System media. Model 3 can have terminals attached via Telephone Twisted Pair (TTP) wiring.
- Model 32 attaches up to 32 devices and may be attached to the 3174 via an fiber optic cable, a coaxial cable, or the IBM Cabling System media.
- Model 32T attaches up to 32 devices via TTP wiring without the requirement of impedance matching devices or baluns between the multiplexer and the attached devices.

Notes:

1. To use fiber optic cable, a new terminal adapter (the Fiber Optic Terminal Adapter, feature #3110) is required in the 3174.
2. Fiber connection does not increase the maximum cable distance. What it does provide, however, is a very clean signal, which is important where 3270 devices are being used in environments with high levels of electromagnetic noise.

1.3.3 Multiplexer Configurations

Models 01L, 01R, 02R, 03R, 11L, 11R, 12L, 12R, 13R and 14R

Without the 3270 Port Expansion Feature, 3299s and TMAs may be installed in 3174s as follows:

- One to four IBM 3299 Model 2 or 3299 Model 3 Terminal Multiplexers
- One to four Terminal Multiplexer Adapter
- Any combination, up to four, of the 3299 Model 2, 3299 Model 3 or TMAs
- One 3299 Model 32 attaching up to 32 ports
- One Telephone Twisted Pair Terminal Multiplexer Adapter attaching up to 32 ports
- One to three 3299 Model 32 attaching eight devices per multiplexer
- A combination of any 8-port multiplexers and the 3299 Model 32 or the 3299 Model 32T for a total of 32 ports.

The 3299 Model 32 or 3299 Model 32T must be installed in port 0 of the integrated terminal adapter in order to have the maximum 32-port capability. If it is installed in any other terminal adapter port it will only be capable of attaching eight terminals.

The 3270 Port Expansion Feature can only be installed on Models 11L, 11R, 12L, 12R, 13R, 14R, 21R, 22R, 22L, 23R and 24R.

With the 3270 Port Expansion Feature, multiplexers may be installed as follows:

- Any combination, up to eight, of the 3299 Model 2, 3299 Model 3 and Terminal Multiplexer Adapters
- One 3299 Model 32 or 3299 Model 32T and any combination, up to four, of the 3299 Model 2 or 3299 Model 3
- Two 3299 Model 32s
- Two 3299 Model 32Ts
- One 3299 Model 32 and one 3299 Model 32T
- One Telephone Twisted Pair Terminal Multiplexer Adapter and any combination (up to four) of the 3299 Model 2, 3299 Model 3, or Terminal Multiplexer Adapters
- Two Telephone Twisted Pair Terminal Multiplexer Adapters attaching up to 32 ports.

Models 21L, 22L, 21R, 23R and 24R

Without the 3270 Port Expansion Feature, these models can have:

- Any combination, up to four, of 3299 Model 2, 3299 Model 3 and Terminal Multiplexer Adapters for a total of 32 ports
- One 3299 Model 32 or 3299 Model 32T for a total of 32 ports
- One Telephone Twisted Pair Terminal Multiplexer Adapter for a total of 32 ports.

With the 3270 Port Expansion Feature, they may be configured as follows:

- One 3299 Model 32 or 3299 Model 32T with any combination (up to three) of 3299 Model 2, 3299 Model 32 and Terminal Multiplexer Adapters for a total of 56 ports
- Two 3299 Model 32s for 64 ports
- Two 3299 Model 32T for 64 ports
- One 3299 Model 32 and one 3299 Model 32T for 64 ports
- One Telephone Twisted Pair Terminal Multiplexer Adapter with any combination, up to three, of 3299 Model 2, 3299 Model 3 and Terminal Multiplexer Adapters for a total of 56 ports
- Two Telephone Twisted Pair Terminal Multiplexer Adapter for 64 ports

Two 3299 Model 32s or 3299 Model 32Ts are required to access 64 ports.

One 3299 Model 32 or 3299 Model 32T with combinations of Terminal Multiplexer Adapters and 8-port 3299s (3299 Model 2 or 3299 Model 3) can only access 56 ports. The Terminal Multiplexer Adapters and 8-port 3299s must be removed and a 3299 Model 32 or 3299 Model 32T installed to access ports 55 to 63.

Models 41R and 43R (WNM)

These two models are housed within the IBM 8250 Multiprotocol Intelligent Hub.

- One to four IBM 3299 Model 2 Terminal Multiplexers
- One 3299 Model 32 or 3299 Model 32T Terminal Multiplexer

Note that the maximum number of 3270 ports available in 3174 WNM is 32.

Models 51R, 52R, 53R, 61R, 62R, 63R and 64R

These medium-sized control units have similar attachment flexibility but with a maximum attachment capability of 16 terminals. A base control unit has an integrated 9-port terminal adapter which permits up to nine terminals to be directly attached or, by using one of the following, up to a maximum of 16 terminals can be attached:

- Two 8-port 3299 Terminal Multiplexers
- One 8-port 3299 Terminal Multiplexer for eight terminals, with another eight terminals connected directly to the other eight terminal adapter ports.

Models 81R, 82R, 90R, 91R and 92R

The small control units (Models 81R, 82R, 90R, 91R and 92R) have a maximum attachment capability of eight terminals. The base control unit, except for 90R provides an integrated 4-port terminal adapter which permits up to four terminals to be directly attached, or using an 8-port 3299 Terminal Multiplexer attached to port 0, a maximum of eight terminals can be attached (in this case, the remaining ports of the control unit are disabled). The Model 90R (Tokenway) has an integrated terminal adapter with only 1-port which permits only one terminal to be directly attached, or using an 8-port 3299 Terminal Multiplexer, a maximum of eight terminals can be attached.

1.3.4 IBM Cabling System

When using the 3174 with IBM Cabling System data grade media, cabling to terminals is via direct attachment to the IBM Cabling System media. A balun cable assembly is not required at the 3174 end of the cable. Attached devices may still need baluns at their end.

1.4 3174 Features

A base 3174 comes with a minimum configuration of features as described in Table 1. In some cases, machines shown with 2.4MB diskette drives may have actually been delivered with 1.2MB drives during the introduction of the new models. This would occur if the machine was ordered with Configuration Support-A. These drives will be upgraded to 2.4MB when and if Configuration Support-B or Configuration Support-C is ordered.

Table 1. 3174 Basic Machine Configuration

Model	Storage	Diskette	Number of devices supported
01L, 01R, 02R, 03R	1MB	1.2MB	4-32
51R, 52R, 53R	1MB	1.2MB	9-16
81R, 82R	1MB	1.2MB	4-8
11L, 21L, 12L, 22L 11R, 21R, 12R, 22R 13R, 14R, 23R, 24R	2MB	2.4MB	4-64
61R, 62R, 63R, 64R	2MB	2.4MB	9-16
41R, 43R (WNM)	6MB	2.88MB	4-32
90R	2MB	2.4MB	1 or 8, and token-ring gateway
91R, 92R	2MB	2.4MB	4-8

Note that WNM models 41R and 43R need 2.88MB, 3.5-inch 2ED diskettes.

1.4.1 Hardware Features

The following hardware features are optional; see also Appendix D, "3174 Feature Slot Usage" on page 751.

3270 Port Expansion Feature (#3100)

This feature is applicable to 3174 Models 1xx, and 2xx. It allows these controllers to support 32 additional 3270 devices over coax ports bringing the total number to 64.

For Models 11L, 11R, 12L, 12R, 13R and 14R, this feature provides a terminal adapter and supporting hardware to attach the additional devices. Like the base terminal adapter, this adapter has four Dual Purpose Connectors (DPC), which support attachment of Terminal Multiplexer Adapters or external 3299s.

For Models 2xx this feature provides a replacement planar board with four DPCs.

See 1.3.3, "Multiplexer Configurations" on page 9 for the possible multiplexer configurations when using this feature.

Note: The 3270 Port Expansion Feature requires Configuration Support-B Release 4 or Configuration Support-C.

Terminal Multiplexer Adapter (#3103)

See “3270 Device Attachment via Terminal Multiplexer Adapter” on page 8.

Telephone Twisted Pair Terminal Multiplexer Adapter (#3105)

See “3270 Device Attachment via Terminal Multiplexer Adapter” on page 8.

Fiber Optic Terminal Adapter (#3110)

The Fiber Optic Terminal Adapter provides the ability to attach a 3299 Model 32 to the 3174 Models 1xx, and 2xx via 62.5/125 micron fiber optic media at a distance of up to 4920 feet (1500 meters). It can also be used with 100/140 micron and 50/125 micron fiber optic cable.

The Fiber Optic Terminal Adapter is a card that attaches to the Terminal Adapter or to the 3270 Port Expansion Feature (#3100) via a short coaxial cable in a similar way to the Terminal Multiplexer Adapter. If attached to port 0, it allows the 3299 Model 32 to support a total of 32 terminals.

The maximum number of Fiber Optic Terminal Adapters in any one controller is:

- Three for Models 11L, 11R, 12L, 12R, 13R and 14R without the 3270 Port Expansion Feature
- Six for Models 11L, 11R, 12L, 12R, 13R and 14R with the 3270 Port Expansion Feature
- Three for Models 21L, 21R, 22L, 23R and 24R with or without the 3270 Port Expansion Feature

This feature does not extend the 3174′s ability to support more ports; the maximum still remains at 32 terminals without the 3270 Port Expansion Feature and 64 terminals with the 3270 Port Expansion Feature. Support for multiple Fiber Optic Terminal Adapters allows multiple 3299 Model 32s to be connected to a 3174 via fiber optic cable.

When the Fiber Optic Terminal Adapter is connected to a port on the Terminal Adapter or the 3270 Port Expansion Feature other than port 0, only the first eight ports (0 through 7) on the attached 3299 Model 32 are active. You may choose to do this if you have eight or less terminals to install in electromagnetically noisy environments where coaxial cable may not shield the data signals sufficiently. The prerequisite microcode releases for Fiber Optic Terminal Adapter support are:

- All releases of Configuration Support-C
- Configuration Support-B Release 3.0 or later
- Configuration Support-A Release 5.3 or later

Each Fiber Optic Terminal Adapter requires one available 3174 feature slot. Planning information for determining fiber optic drive distances is supplied in *IBM 3299 Model 032 Planning for Optical Fiber Cable*.

Token-Ring Gateway

There are two features currently available for providing a 3174 token-ring gateway: features #3026 and #3044. Both run at 4 Mbps or 16 Mbps. The 4 Mbps adapter, feature #3025, is no longer available.

Feature #3026 is available for 3174s with the base microcode Configuration Support-A and it includes Configuration Support-S microcode.

Feature #3044 requires Configuration Support-B or Configuration Support-C to operate as a gateway. We recommend that you use Configuration Support-B or Configuration Support-C where possible as it is functionally richer than Configuration Support-S.

Using this feature, the 3174 controller can participate in a token-ring network as a DSPU controller attached to the LAN (without gateway) or as a gateway connecting DSPUs on the token-ring network to a SDLC, X.25 (with the X.25 token-ring gateway RPQ 8Q0743), Frame Relay (with Configuration Support-C Release 5), or channel-attached SNA host. The 3174 gateway-attached dependent terminals (both CUT and ASCII) may access upstream token-ring LAN-attached SNA and TCP/IP hosts.

See 4.5, “3174 Gateways” on page 77 for a full description of 3174 token-ring gateway implementation.

16/4 Mbps Token-Ring Network Gateway (#3026)

This optional feature comprises Configuration Support-S Release 5 Licensed Internal Code, the Type 3A Dual Speed 16/4 Mbps Token-Ring Adapter and a Token-Ring Adapter cable. The Early Token Release function and larger I-Frame sizes on the token ring are supported with this feature. The ring speed (4 Mbps or 16 Mbps) can be selected during customization.

This feature is available for 3174 Models x1L and x2L (local models) and for Models x1R and x2R (remote models) but is not available for Models 8xx or 9xx.

LAN workstations attached to the same token ring as the 3174 gateway can coexist and operate concurrently with this feature. This feature will not be an inhibitor to communication that occur on devices locally attached to the 3174, such as terminals connected to the Terminal Adapter.

If you are upgrading the 3174 to Configuration Support-B or Configuration Support-C, feature #3026 will function the same as feature #3044.

Type 3A (16/4) Communication Adapter - Alternate IML/Gateway (#3044)

If you are installing a 3174 with Configuration Support-B, then this is the gateway adapter you should be using. It costs less than feature #3026 (although more storage is required to run Configuration Support-B) and it provides more function.

Feature #3044 can be used with Configuration Support-A as an alternate configuration. This is described in “Backup Communication Adapter (Alternate IML)” on page 15.

With Configuration Support-B and Configuration Support-C, feature #3044 provides all the function of feature #3026, plus:

- Group polling
- Single Link Multi-Host support
- Support for 250 DSPUs
- Peer Communication LIC (Configuration Support-C) or Peer Communication RPQ (Configuration Support-B) support
- APPN LIC (Configuration Support-C) or Type 2.1 Passthru Gateway RPQ (Configuration Support-B) support
- 8KB RU size (Models 12L and 22L only)

Ethernet Adapter (#3045)

3174 Ethernet connectivity is provided by the Ethernet Adapter feature #3045, which requires Configuration Support-C Release 4 or Release 5. Using this feature, the 3174 controller can participate in an Ethernet network as a DSPU controller attached to the LAN or as a gateway connecting DSPUs on the Ethernet to an SDLC, Frame Relay or channel-attached SNA host. The 3174 gateway attached dependent terminals (both CUT and ASCII) may access upstream Ethernet LAN-Attached SNA and TCP/IP hosts with the same level of support that is provided in a token-ring network.

In both of these configurations, the following functions are available:

- TCP/IP TN3270 support for locally attached ASCII and CUT displays
- APPN
- Peer Communications (for coax-to-coax communication only on the same 3174)

Feature #3045 can be used with Configuration Support C5 as an alternate configuration. This is described in “Backup Communication Adapter (Alternate IML)” on page 15.

Second Diskette Drive (#1048)

A second 5.25-inch diskette drive with 1.25MB or 2.4MB capacity is available as an optional feature. The capacity depends on the microcode level installed. 2.4MB capacity is available only with Configuration Support-B and Configuration Support-C. It is required for downloading operational microcode to Downstream Load (DSL) devices such as:

- IBM 3179, 3192, and the 3472 Graphics Display Stations
- IBM 3193 Image Display Station
- IBM 3290 Information Display Panel

It is also required for downloading operational microcode to the Asynchronous Emulation Adapter (#3020), a Full Copy procedure, central site customization and Central Site Change Management procedures.

While it is possible to use most offline diskette procedures without the optional second diskette drive, there are some procedures that require the second diskette drive. Having a second diskette drive reduces diskette swapping when customizing a 3174 and when running most utility procedures.

The 3174 Models 81R, 82R, 90R, 91R and 92R do not support the second diskette drive.

Second Diskette Drive (#1046)

This optional feature has the same functions as #1048 but provides only 1.2 MB capacity and is supported by all microcode levels. This feature has been superseded by #1048.

The 3174 Models 81R, 82R, 90R, 91R and 92R do not support the second diskette drive.

20MB Fixed Disk Drive (#1056)

This optional feature has the same functions as the second diskette drives but provides a significantly higher capacity and is supported by all current microcode levels.

This feature is strongly recommended if you require Central Site Change Management.

The 3174 Models 81R, 82R, 90R, 91R and 92R do not support the fixed disk drive.

Storage Expansion

The 3174 controller storage capacity (as distinct from disk and diskette capacities) can be expanded by the following optional features:

- #1012, which provides 1MB storage expansion
- #1014, which provides 2MB storage expansion
- #1016, which provides 4MB storage expansion

Storage expansion for the new Models 2xx and 6xx plug directly into the planar board. That avoids the use of an adapter slot.

The 3174 Models 81R, 82R, 90R, 91R and 92R do not support any storage expansion.

Backup Communication Adapter (Alternate IML)

If the primary host link (as designated by the model number) fails, a backup link can be established. A pre-customized control disk must be loaded by IML and one of the following optional backup adapters must be activated:

- #3040 Type 1 Teleprocessing Communication Adapter (V.24)
- #3041 Type 1 Teleprocessing Communication Adapter (V.35)
- #3042 Type 1 Teleprocessing Communication Adapter (V.35) (France only)
- #3043 Type 2 Teleprocessing Communication Adapter (X.21)
- #3044 Type 3A Dual Speed 16/4 Mbps Token-Ring Adapter
- #3045 Ethernet Adapter

Feature #3044 also supports the Early Token Release function and larger I-Frame sizes on the Token-Ring. In conjunction with Configuration Support-B or Configuration Support-C this feature can be used for the Token-Ring Gateway function.

The 3174 Models 81R, 82R, 90R, 91R and 92R cannot have a backup adapter installed.

Concurrent Communication Adapter (CCA)

Depending on the 3174 model, one or two of these optional features can be installed. In addition to the primary host link adapter, a second or third adapter with the same or different host link protocols as the primary adapter (SNA/non-SNA channel attach, BSC, SDLC, X.25, token-ring or Ethernet) can be installed.

Note: Frame Relay communication support does not utilize CCA but only 3174 primary communications link.

Each CCA provides an additional controller appearance in a single 3174. This is accomplished by having a separate microprocessor, control storage and communication interface.

If a CCA is installed and customized, directly attached 3270 displays can access multiple hosts. Up to five MLT sessions can be spread over the primary adapter and the CCAs. The adapters for the different TP interfaces have the following feature codes:

- #3050 Type 1 Concurrent Communication Adapter (V.24/V.28)
- #3051 Type 1 Concurrent Communication Adapter (V.35)
- #3052 Type 1 Concurrent Communication Adapter (V.35) (France only)
- #3053 Type 2 Concurrent Communication Adapter (X.21/V.11).

The maximum number of CCAs supported are as follows:

- Two for Models 0xx, 1xx, 2xx, 61R and 62R
- One for Model 51R, 63R and 64R
- None for Models 52R, 53R, 8xR and 9xR

Up to 64 Kbps are supported by the CCAs for SNA/SDLC and X.25 protocols. Up to 19.2 Kbps are supported by the CCAs for BSC protocol.

The required microcode for these adapter types is Configuration Support-B or Configuration Support-C.

ASCII Support

For additional information, see Chapter 7, “Asynchronous Emulation Adapter (AEA)” on page 263.

General Description: The Asynchronous Emulation Adapter (#3020) provides facilities to handle ASCII communication. 3270 emulation from ASCII displays and printers as well as ASCII emulation from 3270 devices are possible.

This feature consists of an adapter card and microcode. A DSL diskette (#9015), with microcode for the adapter, and a second diskette drive or a fixed disk are required to support this feature.

This feature can coexist with the Token-Ring Gateway feature #3026 or #3044 or Ethernet feature #3045 installed on a 1xx, 2xx, or 6xx Model. This coexistence also requires that Configuration Support-S Release 5, Configuration Support-B, or Configuration Support-C be installed, depending on the type of LAN.

This feature cannot be installed in the 3174 Models 53R, 81R, 82R, 90R, 91R or 92R.

Asynchronous Emulation Adapter: Each adapter provides eight ASCII ports. Each 3174 Model 0xx, 1xx and 2xx can have up to three adapters, providing up to 24 ports (expansion slots permitting). Each 3174 Model 51R, 52R, 61R and 62R can have one adapter, providing up to eight ports.

These ports are in addition to the maximum available on SNA 3174s. The maximum number of device addresses supported by non-SNA 3174s is still 32.

The adapter supports full-duplex, character-mode, asynchronous transmission of seven-bit ASCII data with parity. Odd, even, mark, space, and no-parity encoding are supported. In addition, with Configuration Support-B Release 2 and later releases, 8-bit ASCII characters are supported.

Ports are configurable in any combination of ASCII terminal emulation, 3270 terminal emulation, or ASCII passthrough.

Each port provides an EIA RS-232 electrical interface, and supports transmission speeds of 300 bps to 19.2 Kbps via modems over switched or non-switched communication facilities, or via direct connection without modems.

Serial OEM Interface (SOEMI)

A Serial OEM Interface (SOEMI) is a base function for a non-SNA 3174 Model 01L, 11L, 21L, 12L or 22L that extends the attachment capabilities to a variety of industry devices from independent manufacturers for engineering, scientific and manufacturing environments. A protocol based on structured fields (extended data stream) provides the user with programming flexibility.

Other OEM Adapters: Attachment of instrumentation, measurement and control, and other equipment can be provided via OEM adapters that provide appropriate conversion and control functions to industry standard bus interfaces such as IEEE** 488, IEEE 696, IEEE 796, etc. Applications such as controlling and measurement, robotics, process control, voice synthesis/recognition, medical applications and many others could then be implemented via the SOEMI support.

1.4.2 Microcode Features

Many of the features and functions of the 3174 are implemented in microcode; that is, no special hardware is required to use them. Some of these features are described here.

Response Time Monitor

The response time monitor function is an integral part of the 3174. It provides for enhanced network management by permitting the accurate measurement and recording of transaction times between an inbound host attention (AID) and a user-defined transaction end.

The data is collected in the 3174 and either viewed locally (by a terminal attached to the 3174) or retrieved by a host program such as NetView* Session Monitor for analysis.

Entry Assist

Entry Assist provides display units attached to the 3174 in CUT mode limited local format, entry and edit control. Some DFT mode workstations, such as the 3179-G, 3192-G and the 3472-G, provide entry assist as part of their base function.

Entry Assist used with a full screen editor can be used to:

- Set margins
- Set tabs
- Sound the audible alarm when typing reaches the end of the line
- Wrap words to the next line automatically
- Delete words
- Indicate cursor position

Entry Assist support for ASCII terminals is available with Configuration Support-C Release 2 or later.

For more details on using Entry Assist, see *IBM 3270 Entry Assist User's Guide*.

Type Ahead

The Type Ahead function allows keystroke entry while the keyboard is locked from a previous transaction such as a host I/O or a printer busy condition. Type Ahead is enabled by default during 3174 customization and is available for both 3270 CUT mode and ASCII terminals. When enabled, up to 50 keystrokes can be stacked while the keyboard is locked.

If you fill the queue, the queue full indicator is displayed. This is reset after a host I/O occurs and the queue is processed.

Type Ahead is available on Configuration Support-C, and Configuration Support-B Release 2 or later.

Null/Space Processing

There are two "problem" situations when you are editing text on 3270 displays:

- One is the situation where you are keying in data in the middle of the screen, you press Enter and all the characters you carefully positioned are returned compressed against the left margin of the screen.
- The second is when you are trying to insert characters into a line with spaces at the end and you have to move the cursor to the end of the line to do an EOF on the spaces and then move the cursor back to where you want to insert.

Both these situations arise because 3270 treats space characters differently from nulls.

In the 3270 data stream, a null is X′00′ and a space is X′40′. They both appear on a screen as blank but the space occupies a position on the screen whereas the null does not. Null/space processing can be used to turn nulls into spaces for host transmission when the null precedes a character within an entry field on the screen. A null to space conversion is performed in field positions preceding the cursor as soon as the field is modified. That solves the first problem. The second problem is also addressed. With null/space processing, the blanks at the end of the line can be either nulls or spaces; insert will work either way.

Null/space processing can be turned on or off by the user of any terminal (or logical terminal). It is toggled on or off by pressing the ExSel key followed by the Null/Space Processing key (the N key on most keyboards).

Null/space processing is available on Configuration Support-C and on Configuration Support-B Release 2 or later for use on CUT mode or ASCII terminals.

Single Link Multi-Host Support

This function is provided by microcode only. With this function up to eight hosts can be accessed from the 3174′s primary host connection in any of the following configurations:

- From a 3174 with a LAN Adapter configured as a DSPU and communicating to multiple gateways over a LAN
- Via the 3174 ESCON adapter and then through the ESCON Director to multiple locally attached SNA hosts
- Via an X.25 link, with multiple hosts defined on different virtual circuits through that link
- Via a Frame Relay network, with multiple hosts defined on different Data Link Connection Identifiers (DLCI) in the network

Using MLT support, it is possible to define up to five of these hosts to any one terminal on the 3174; the user may then hot-key between them.

Note: The hosts defined for each terminal are statically defined. A new customization is required to change them.

Remote Gateway Group Poll

The remote 3174 LAN gateway and all attached DSPUs can be serviced with a single poll using this function. Previously, DSPUs had to be individually polled, which limited the performance of the gateway.

With group poll, the gateway responds positively to that poll whenever input is pending from a LAN-attached device.

In this way, long polling lists are avoided within the NCP (improving NCP performance) and the number of unproductive polls is significantly reduced on the line. This in turn reduces the response times for the DSPUs, or allows more DSPUs to be attached to the remote LAN (see 4.7.7, “Group Poll” on page 110 for more details).

To support group polling, NCP must be at V4.3.2 or V5.3 or later. (Alternately, a PTF can be applied to V4.3.1 or V5.2.1.)

Network Asset Management

This function can be used in cooperation with NetView to provide inventory management for both the 3174s and attached terminals in the network.

The 3174 records information about its attached devices every time one is powered on while plugged into a 3174 port. The information includes the device type and characteristics and, with some of the newer terminals, the serial number is also available.

Data can also be entered manually into the 3174 by an operator for record keeping. The Network Asset Management (NAM) data is retrieved to NetView in response to an SNA command on the SSCP-PU session.

To support NAM, VTAM V3.1.1 and NetView R3 for MVS/XA, MVS/ESA, VM/SP, VM/XA on the owning host are required.

For processing the data gathered by NetView, products like Service Level Reporter (SLR), Information Management or other equivalent products are necessary.

Intelligent Printer Data Stream Support

Intelligent Printer Data Stream (IPDS) support for the IBM 4224 Printer, and other IBM All Points Addressable (APA) printers, is a structured field approach to management and control of printer processes. It is designed to allow the presentation of text, raster images, vector graphics, bar codes and previously stored overlays at any point on a page.

IPDS commands within the data stream also enable the host processor to control media handling, error recovery, and the down-loading and management of symbol sets (fonts) and printer stored objects, such as overlays and page segments. The printer can later use these stored objects to construct a printed page. IPDS can significantly reduce the load on the host processor.

Printers capable of IPDS are supported by SNA and non-SNA 3174s.

IPDS depends on programming support outside the controller.

1.4.3 Licensed Internal Code (LIC)

There are four different versions of 3174 microcode currently available. These versions of microcode are now licensed and will be referred to as "Licensed Internal Code" in 3174 documentation.

For convenience and understanding, the term *3174 microcode* or simply *microcode* is used more often in this document.

Microcode Releases/Levels

The latest microcode releases/levels, as of July 1994, are:

- Configuration Support-A Release 5.6
- Configuration Support-S Release 5.6
- Configuration Support-B Release 4.4
- Configuration Support-C Release 5.0

The microcode level is shown on the diskette label. For example, a Configuration Support-C Control diskette at Release 5.0 will have the following information printed on the label:

```
DISKETTE TYPE: 2.4 MB  3174  CONTROL

LICENSED INTERNAL CODE - PROPERTY OF IBM

MACHINE 3174   P/N 74F3319    E/C C98883    ML94167    MICROCODE LVL C5.0
```

Figure 1. 3174 Microcode Release Diskette Label Information

LVL C5.0 means the diskette is Configuration Support-C Release 5 and *ML94167* means the microcode level is at Julian date, day 167 of 1994.

Each 3174 model will support only certain microcode release levels. See B.2, "Old 3174 Feature Summary" on page 741 and B.3, "New 3174 Feature Summary" on page 742 for the release levels supported.

Configuration Support-A

Configuration Support-A is the original microcode offered with the 3174. It provides all of the base functions of the 3174 and includes support for the following features:

- Asynchronous Emulation Adapter (AEA)
- 2.4MB diskette drive
- 20MB fixed disk
- Type 1 Teleprocessing Communication Adapter (V.24/V.28 or V.35) used as an alternate configuration
- Type 2 Teleprocessing Communication Adapter (X.21) used as an alternate configuration
- Type 3 (4 Mbps) Token-Ring Adapter used as an alternate configuration
- Type 3A Dual Speed (16/4 Mbps) Token-Ring Adapter used as an alternate configuration.
- Storage expansion to 4MB
- Central Site Customizing Utility
- Central Site Change Management
- Intelligent Printer Data Stream (IPDS)
- Multiple Logical Terminals (MLT)
- Country Extended Code Page (CECP)
- Response Time Monitor (RTM)
- Terminal Multiplexer Adapter (TMA)
- Network Asset Management (NAM)
- Serial Original Equipment Manufacturer Interface (SOEMI)
- Encrypt/Decrypt

Configuration Support-S

Configuration Support-S is delivered as part of the 3270 Token-Ring Gateway feature #3026. (In the past it was also supplied with the 4 Mbps Token-Ring Gateway adapter #3025.)

Configuration Support-S includes all the functions of Configuration Support-A, plus the gateway support.

Configuration Support-B

Concurrent with the announcement of the 3174 Establishment Controller, IBM also announced Configuration Support-B.

Configuration Support-B Release 1: Release 1 included all the features of Configuration Support-A and Configuration Support-S except for the Encrypt/Decrypt support, the 7232 Dual Control Unit Multiplexer, and Physical Services Header (PSH) protocol on X.25 host connections. In addition, some new functions were included:

- Storage expansion to 6MB
- Concurrent Communication Adapter
- Single link multi-host support
- Token-ring gateway enhancements including:
  - Group polling
  - 250 DSPU support

Since Release 1, there have been three more releases. Each new release adds to the functions provided by the previous release.

Configuration Support-B Release 2: Release 2 was a significant release; it provided many new functions and feature support including:

- Local Format Storage
- Enhancements to AEA including:
  - 8-bit ASCII support enabling NLS and graphics
  - UDT (User-Defined Terminal Table)
  - UDX (User-Defined Translate Table)
- Type Ahead
- Null/Space Processing
- Extended Vital Product Data
- Central Site Control Facility
- Support for Models 21L, 21R and 90R

Configuration Support-B Release 3: Release 3 offers the following:

- Enterprise Systems Connection (ESCON) channel on Models 12L and 22L
- Support for 3299 Model 32
- Enhancements to token-ring gateway support including:
  - Ability of token-ring attached devices to access a host via the CCA
  - Full duplex line support for token-ring gateway

- 8KB RU size for Models 12L and 22L gateways.

- Multiple host access over X.25 networks
- Support for X.25 1984 implementation
- Remote IML via online tests.

Configuration Support-B Release 4: Release 4 offers the following:

- Support for the 3270 Port Expansion Feature (64-port)
- Support for 4 MB storage expansion feature, providing 6 MB total storage on Models 61R, 62R, and 63R.

Configuration Support-B Licensed Internal Code is an optional feature. It is available using the following feature codes for the different models:

- #5010 for Models 0xx, 1xx and 2xx
- #5060 for Models 51R, 53R and 6xR
- #5090 for Models 90R, 91R and 92R

Configuration Support-C

In 1991, IBM announced Configuration Support-C to support ISDN, Peer Communication and APPN.

Configuration Support-C includes all the features in Configuration Support-B. It requires 3MB of memory and either two 2.4MB diskette drives or one 2.4MB diskette drive and a hard disk.

Configuration Support-C is an optional feature. It is available using the following feature codes for the different models:

- #6010 for models 0xx, 1xx, and 2xx
- #6015 to upgrade from Configuration Support-B for Models 0xx, 1xx, and 2xx
- #6060 for Models 51R, 53R and 6xR
- #6065 to upgrade from Configuration Support-B for Models 51R, 53R and 6xR.

Configuration Support-C Release 1: Release 1 with the Advanced Peer-to-Peer Networking (APPN) feature (#7010 or #7060) allows the 3174 to be a network node, providing services to support low-entry networking (LEN) nodes and APPN end nodes (EN).

Release 1 with the Peer Communication feature (#8010 or #8060) allows DOS-based intelligent workstations (with PRPQ P85114 Workstation Peer Communication Support Program) and OS/2-based intelligent workstations (with Extended Services) the ability to communicate with each other and access the resources available on the IBM Token-Ring Network.

Release 1 also provides support for ISDN downstream intelligent workstations

Configuration Support-C Release 2: Release 2 integrates the following end-user enhancements into Configuration Support-C base microcode:

- Split screen
- Copy from session to session
- Local print buffer sharing

- HAP sharing for local copy
- Calculator function
- Token-ring T1 timer/retry count
- 5250 keyboard emulation
- 132 column support via AEA
- Entry Assist support for ASCII
- CSCF IML password suppression

See Chapter 14, "Configuration Support-C Release 2" on page 445 for further information.

Configuration Support-C Release 3: The functional capabilities of the 3174 are extended with Configuration Support-C, Release 3 which supports connections to SNA, APPN, and TCP/IP environments. Release 3 builds on the APPN and Peer Communication (LAN over Coax) capabilities of Release 2.

New APPN enhancements include:

- 3174 APPN NN compatibility in environments where the host is a LEN node, APPN EN, APPN NN, Migration Data Host (MDH) or an Interchange Node (IN).
- Support for multiple links into a LEN subarea from an APPN network comprised of 3174s and other APPN nodes.
- Support for the transfer of 3270 and APPN data streams across a single SDLC or token-ring link between a 3174 and an AS/400 running OS/400 V2R2 or later.

These APPN enhancements complement the new APPN functions provided by VTAM V2R1 and NCP V6R2 and allow APPN node-to-node communications across SDLC, parallel channel and token-ring host links.

Release 3 also provides the following enhancements:

- Integration of TCP/IP Telnet support (RPQ 8Q0935) allows 3270 CUT terminals and ASCII display stations attached to a 3174 to communicate with TCP/IP servers using Telnet.
- Concurrent Communication Adapter (CCA) support is expanded from 32 ports to 64 ports.
- Calculator function enhancements add percent and hexadecimal support.
- Increased flexibility for HAP assignment allows a HAP printer to be assigned an LT other than 1A2.
- Improvements to the customization procedure for 3174 Peer Communication.
- Additional keyboard support for 5250 Emulation.

See Chapter 15, "Configuration Support-C Release 3" on page 481 for further information.

Configuration Support-C Release 4: Release 4 supports only the 3174s with Ethernet capability and fulfills the September 15, 1992, Statement of Direction for 3174 Ethernet LAN support and TN3270 support for TCP/IP. Release 4 enhancements include:

- TCP/IP enhancements such as TN3270 support, TCP/IP dependent host printer support, and SNMP MIB-II support available through RPQ 8Q1041.
- PC-based application sharing solutions.

See Chapter 16, "Configuration Support-C Release 4" on page 487 for further information.

Configuration Support-C Release 5: Release 5, announced in June 1994, includes all functions of Configuration Support-C Release 3 and Ethernet support provided in Configuration Support-C Release 4. In addition to that, the following major enhancements are integrated into the 3174 Licensed Internal Code:

- Advanced Peer-to-Peer Networking (APPN), which:
  - Provides APPN functions for dependent traffic without requiring a boundary attachment to an SNA host.
  - Provides APPN X.25 and APPN Frame Relay communications support.
  - Supports focal points for APPN network management.
  - Supports attachment to APPN boarder nodes.
  - Supports central directory server (CDS).
- Frame Relay Communications feature that supports SNA 3270, LAN Gateway, APPN, and TCP/IP.
- Support for higher speed WAN communications (up to 256 Kbps for X.21 and V.35 for SDLC and Frame Relay communications).
- 5250 Emulation enhancements.
- MLT support for printers.
- HAP support for CCA hosts.
- Multi-host ASCII support that allows devices attached to the 3174 through an AEA Adapters to access multiple hosts.
- Multiple CECP Language support that allows customization of a unique language for each host.
- Personal Systems/55 (PS/55) multistation printer sharing support.

See Chapter 17, "Configuration Support-C Release 5" on page 493 for further information.

1.4.4 Microcode Specify Codes

The following specify codes can be specified when ordering 3174 microcode. The specify codes are used when central site customization and distribution of microcode is desired.

#9005 Inhibit LIC Shipment: This specify code blocks the shipment of Licensed Internal Code and related documentation with the 3174. A Limited Function Utility diskette, which cannot be used to customize the 3174 unlike the full-function Utility diskette, is shipped instead.

You would specify this feature for remote 3174s to which microcode is delivered from a central site, either physically or electronically.

#9006 Central Site Diskette Distribution Aid: This specify code identifies the 3174 as the central site controller and enables the customer to order all combinations of microcode configuration support levels, RPQs and Downstream Load diskettes.

This specify code provides automatic shipment of microcode updates.

#9007 Configuration Support-S Central Site LIC Shipment: This specify code enables the central site customer to order Configuration Support-S LIC for the central site 3174 for customizing purposes only. This specify code is to be used in conjunction with #9006, which identifies the central site 3174. This specify code cannot be ordered on 3174s that have #9005 Inhibit LIC Shipment or on 3174s that are not designated as central site 3174s with #9006.

#9008 Central Site Distribution Aid for Models 21L and 21R: This specify code identifies the Model 21L or 21R as the central site 3174. When the Model 21L or 21R is the central site 3174, only Configuration Support-B Release 2 and later releases apply. Therefore, all the 3174s in the distribution network must operate at Configuration Support-B Release 2 or later. It enables a customer to order the LIC, RPQs, and DSL code for the central site 3174.

#9009 Central Site Distribution Aid for Models 12L and 22L: This specify code identifies the Model 12L or 22L as the central site 3174. When the Model 12L or 22L is the central site 3174, only Configuration Support-B Release 3 and later releases apply. Therefore, all the 3174s in the distribution network must operate at Configuration Support-B Release 3 or later. It enables a customer to order the LIC, RPQs, and DSL code for the central site 3174.

1.4.5 Microcode RPQs

An RPQ (Request for Price Quotation) is an alteration or enhancement, requested by customers, to the functional capabilities provided by the base microcode. An RPQ diskette can contain up to 30 RPQs. Up to ten RPQs can be merged on to a 3174 Control diskette, by selecting the Merge RPQ procedure from the 3174 customization panel.

Occasionally, an RPQ is packaged as a new set of Control and Utility diskettes; in this case, it is referred as a Control Disk RPQ.

Some of the more significant RPQs available are described in this section.

3174 Peer Communication RPQ (8Q0718)

The 3174 Peer Communication RPQ is available with Configuration Support-B. It is also available as the Peer Communication Licensed Internal Code feature with Configuration Support-C.

Note: The Configuration Support-C Peer Communication LIC feature is primarily intended for intelligent workstations coax-attached to the 3174 Token-Ring models (x3R) since the internal bridging function is available only to access the external Token-Ring Network

The 3174 Peer Communication RPQ provides the following function for DOS and OS/2* workstations attached to the 3174 via coax ports.

- Peer-to-peer communication between intelligent workstations, allowing them to form a local area network segment

- Bridge functions to access the IBM Token-Ring Network for functions such as print/file servers
- Local management functions for problem determination of the LAN segment.

There are prerequisites for the intelligent workstations to function as coax-attached peer workstations (also known as 3174-Peer devices). DOS workstations require the IBM 3174 Workstation Peer Communication Support Program, 5799-PHL (PRPQ P85114). OS/2 workstations require Extended Services.

The 3174 Peer Communication RPQ supports LAN applications that enable access to file/print servers attached to the 3174, as well as to workstations and servers attached to IBM Token-Ring LANs.

Support for LAN applications is provided concurrently with support for S/370 host access applications via existing IBM 3270 emulation programs.

The following IBM LAN application programs have been tested for compatibility with the 3174 Peer Communication RPQ:

- IBM Personal Communications/3270 V1.01 and later (see note 1)
- IBM PC LAN Program V1.32
- IBM DOS LAN Requester packaged with the IBM OS/2 LAN Server V1.2
- IBM Advanced Program to Program Communications/PC V1.11
- IBM 3270 Workstation Program V1.12
- IBM AS/400 PC Support Version 1 Release 3 (see note 2)
- IBM PC/Host File Transfer and Terminal Emulator Program (FTTERM) V2.1 (see note 3).

Notes:

1. IBM Personal Communications/3270 supports 3174 Peer Communication only when used in a conventional memory environment. Running in Expanded Memory Specification (EMS) memory is not supported.
2. AS/400 PC Support is not supported with 3278/3279 Emulator Adapter P/N 1602507.
3. FTTERM is supported when communicating with the IBM LAN Asynchronous Communications Server (LANACS).

IBM PC 3270 Emulation Program Entry Level is not compatible with Peer Communication.

In order for a 3174 Peer device to communicate with an SNA host application through a 3174 (all applicable models except the 3174 x3R/x4R), the 3174 is configured as a token-ring gateway. The 3174 Peer devices are treated as DSPUs by the host and they are configured as such in the gateway. These 3174-Peer devices are not restricted to using the 3174 gateway but may use any appropriate gateway.

Capability is provided for the management of the LAN segment formed by the 3174 and the workstations attached to it; this segment is also known as the 3174 Peer segment. Management functions can be accessed via the 3174 online tests, which allow problem diagnosis and updates to the network configuration.

These online tests may also be accessed using the Central Site Control Facility (CSCF). CSCF allows multiple LAN segments to be centrally managed. Refer to *IBM 3174 Establishment Controller Peer Communication User's Guide*, for more detail.

The 3174 Peer Communication RPQ provides approximately one fifth (1/5) the aggregate bandwidth of a 4 Mbps token ring. Response times for server/requester file copy functions will be equal to or better than response times for devices attached to a 3174 Model 11L running Workstation Program Version 1.x. in file transfer mode with an SNA host. Response times will vary with the amount of data being transferred, the location of the server/requester in the configuration, and the 3174 system load.

The 3174 Peer Communication RPQ is intended for customers who require both host interactive access and IBM Token-Ring connectivity for DOS and OS/2 workstations attached to 3174s via existing 3270 wiring and have not rewired (or cannot rewire) the workstation location to the IBM Cabling System.

For customers with existing 3270 wiring, the 3174 Peer Communication RPQ provides a migration path for evolving from a computing environment that is exclusively host interactive, to an environment that also includes LAN capability. It is intended as a migration vehicle until rewiring to the IBM Cabling System can be carried out.

There are several significant differences between the 3174 Peer Communication RPQ support and a token-ring LAN that should be understood. For example, the 3174 Peer Communication RPQ support provides a unique MAC layer function. Together with WPCSP, it allows the 802.2 and NetBIOS protocols to operate in the 3174 Peer Communication environment. Any application that is specific to the Token-Ring MAC layer (802.5) function *will not* operate with the 3174 Peer Communication support.

The following 3174 models and token-ring features can use the 3174 Peer Communication RPQ:

- Model 01L with #3026, #3030 or #3044
- Model 01R with #3026, #3030 or #3044
- Model 02R with #3026, #3030 or #3044
- Model 03R with #3030
- Model 11L with #3026 or #3044
- Model 11R with #3026 or #3044
- Model 12L with #3044
- Model 12R with #3026 or #3044
- Models 13R and 23R
- Model 21L with #3044
- Model 21R with #3044
- Model 22L with #3044
- Model 51R with #3026, #3030 or #3044
- Model 53R with #3030
- Model 61R with #3026 or #3044

- Model 62R with #3026 or #3044
- Model 63R.

Configuration Support-B Release 1.1 or later is required and additional 3174 controller storage is needed for the 3174 Peer Communication RPQ.

The 3174-Peer devices require:

- One of the following computers and associated adapter:
  - IBM PC, PC/XT*, PC/AT, and PS/2 Models 25/30/30-286 with the IBM 3278/3279 Emulation Adapter
  - IBM PS/2 Models 50Z/55/60/70/P70/80 with the IBM 3270 Connection card
- IBM DOS 3.3 or later
- IBM 3174 Workstation Peer Communication Support Program (WPCSP)
- Approximately 70KB of memory is required in the computer for WPCSP

See Chapter 19, “Peer Communication” on page 557 for further information.

T2.1 Passthru Gateway RPQ (8Q0800)

The Type 2.1 Passthru Gateway RPQ, for users of Configuration Support-B, extends the 3174 Token-Ring Gateway support to allow LAN attached devices to establish T2.1 and PU 2.0 sessions with channel and TP attached hosts.

The T2.1 gateway function parallels the existing PU 2.0 support. That is, a logical connection is provided to a LAN attached T2.1 node which gives the appearance that the node is directly attached to the host. The gateway serves to map either the device subchannel addresses or SDLC poll addresses to LAN MAC addresses and vice versa.

The gateway function has been expanded to handle XID3 transfer between the host and the LAN devices. Upon successful completion of the XID3 sequence the gateway “opens” the linkstation and enters a passthrough mode for the data transfers between the host and devices.

Link termination for T2.1 devices is dependent on the protocol of the upstream link (SDLC or channel). Termination can occur as a result of host request, device request, or link failure.

Customization for the Type 2.1 Passthru Gateway RPQ is similar to that of the current gateway support. Prerequisites include the following:

- Type 3A Dual Speed (16/4) Communication Adapter
- Configuration Support-B Licensed Internal Code
- Models 01L, 01R, 02R, 51R may require additional storage
- For 3174 remote models, VTAM V3R2 or later is required
- For 3174 local models with a VM system, VTAM V3R3 is required
- For 3174 local models with an MVS system, VTAM V3R4 is required
- NCP V4R3 is required for 3725
- NCP V5R2 is required for 3720 or 3745

The Type 2.1 Passthru Gateway RPQ will only operate for link connections made via the primary link (TP or Channel) to an SNA host.

See Chapter 6, “X.25 Token-Ring Gateway RPQ” on page 187 for further information.

X.25 Token-Ring Gateway RPQ (8Q0743)

The X.25 Token-Ring Gateway RPQ which was initially based on Configuration Support-B Release 3, extends the 3174 Token-Ring Gateway support by adding connectivity to multiple IBM hosts via the X.25 network.

The current release of the X.25 Token-Ring Gateway RPQ is based on Configuration Support-C Release 3. For the Configuration Support-C Release 5, the planned date of availability of the X.25 Token-Ring Gateway RPQ is December 30, 1994.

The X.25 Token-Ring Gateway RPQ also allows IBM hosts on the token ring to access devices on the X.25 network. A token-ring device communicates with an X.25 device via a session over a switched virtual circuit (SVC). The current X.25 Token-Ring Gateway RPQ does not support permanent virtual circuits (PVCs).

Each 3174 may have up to 200 simultaneous connections (SVCs) between token-ring and X.25 devices. Up to 200 SVCs are available via the primary link with a maximum of 25 SVCs via each CCA; that is, the total number of SVCs is 200 over three physical links. These SVCs can be shared by a pool of PCs.

The X.25 Token-Ring Gateway RPQ would be of benefit in some of the following situations:

- Remote token-ring attached PCs needing access to one or more hosts via the X.25 network
- Sites that need to provide access to one or more local hosts to remote workstations coming in through the X.25 network but either do not have IBM NCP Packet Switching Interface (NPSI) installed in their 37xx or do not have a 37xx Communication Controller
- Sites using X.25 for disaster recovery

See Chapter 6, “X.25 Token-Ring Gateway RPQ” on page 187 for further information.

3174 TCP/IP Telnet RPQ (8Q0935)

The 3174 TCP/IP Telnet RPQ extends the 3174 into the TCP/IP networking environment. Together with Configuration Support-C Release 2 as the base microcode, the RPQ provides a TCP/IP Telnet client function. This function is integrated into the 3174 Configuration Support-C Release 3 and later LIC. It adds support in the 3174 for TCP/IP protocols, allowing the 3174 to communicate directly with TCP/IP hosts via a token ring.

With the 3174 TCP/IP Telnet RPQ, a 3270 CUT, ASCII or DFT-E (CUT side of DFT-E) terminal attached to a 3174 can establish a Telnet session with a TCP/IP server anywhere in the existing LAN/WAN network. The 3174 communicates via its token-ring interface with the TCP/IP host.

The host/server may be attached directly to the same token ring as the 3174, or it may exist anywhere in the network reachable through that token ring and any bridges or routers.

Using 3174 MLT and the TCP/IP TELNET function, a user may access a combination of SNA, ASCII and TCP/IP hosts (up to five hosts) concurrently from a single terminal.

When using TCP/IP, a coax-attached display terminal can access full-screen (24x80 characters) TELNET applications, by emulating a DEC** VT100**, DEC VT220**, DG Dasher 210**, or IBM 3101 terminal.

See Chapter 21, “TCP/IP” on page 605 and the ITSO publication *Using 3174 in TCP/IP Networks*, GG24-4172, for further information.

3174 TCP/IP Enhancement RPQ (8Q1041)

In December 1993, Configuration Support-C Release 4 was announced. Included in this announcement was the 3174 TCP/IP Enhancement RPQ 8Q1041, which will provide:

- TN3270 support
- TCP/IP dependent host printer support
- SNMP MIB-II support

This RPQ was made available in April 1994, and is based on Configuration Support-C Release 4. With RPQ 8Q1041, therefore, the TCP/IP capabilities of the 3174 are extended further.

Note: The RPQ 8Q1041, which is a control disk RPQ for Configuration Support-C Release 4 LIC, enables Token-Ring LAN support (the Configuration Support-C Release 4 base LIC does not allow a token-ring LAN to be customized).

See 21.1.3, “Support with 3174 TCP/IP Enhancement RPQ (8Q1041)” on page 606 and Chapter 9, ″3174 TCP/IP Enhancement RPQ 8Q1041″ in the ITSO publication *Using 3174 in TCP/IP Networks*, GG24-4172 for further information.

3174 IP Forwarding RPQ (8Q1289)

The IP Forwarding RPQ 8Q1289, which is based on Configuration Support-C Release 5 LIC, provides IP forwarding between a LAN interface and a Frame Relay interface. This RPQ enables intelligent workstations that are not attached to the 3174 using Peer Communications, access to TCP/IP hosts via the Frame Relay links.

IP forwarding allows devices on the LAN and Frame Relay to send IP datagrams to the 3174 with a destination IP address other than the 3174′s IP address. If the 3174 has a route to the destination IP address, it will forward the datagram on its way.

Since the 3174 actually provides static IP routing for LANs attached intelligent workstations to TCP/IP hosts, it is also known as IP routing. However, RPQ 8Q1289 does not support routing protocols (RIP, for example) and only static (pre-customized) routes are used in the 3174.

See 21.1.4, “Support with 3174 IP Forwarding RPQ (8Q1289)” on page 607 for further information.

7 Color AEA Support RPQ (8Q1467)

This RPQ allows ASCII devices connected to the 3174 using the 3270 Emulation Feature to display seven colors and four types of highlighting by appearing to the application to have an Extended Attribute Buffer (EAB).

The sequences used to generate the additional colors and highlighting are ANSI commands. These sequences cannot be changed. When using reverse video, the background color sequence is sent. The sequences consist of ′1B5B<parm>6D′X(ESC <left bracket> <parm> m), where <parm> is of the items in the table below:

Table 2. Color/Highlighting Parameters

ASCII Parameter	Hex value of ASCII	Reverse video value	Color/highlight
0	′30′X		All attributes off
1	′31′X		Intense mode on
4	′34′X		Underscore on
5	′35′X		Blink on
7	′37′X		Reverse Video on
30	′3330′X	′3430′X	Normal color (Black)
31	′3331′X	′3431′X	Red
32	′3332′X	′3432′X	Green
33	′3333′X	′3433′X	Yellow*
36	′3336′X	′3436′X	Blue (Cyan)*
35	′3335′X	′3435′X	Pink
36	′3336′X	′3436′X	Turquoise/Cyan
37	′3337′X	′3437′X	White

Note: These colors also send the Intense Mode Sequence except for reverse video.

Customization: The answer to Question 722 must be V6 or U1 in order to use this feature. Any station set with these answers will be automatically set up for 7 color mode.

Station type V6 has been modified to match the UDT.

Limitations:

- The ANSI color and highlight sequences cannot be changed with a UDT.
- Only Station Types U1 and V6 may use this feature.

1.5 Communication Network Management

Communication Network Management products support the 3174 error detection and configuration reporting. However, the enhancements and changes made in the 3174 require the following programs at the specified levels for central site problem determination:

- For all models except those with the LAN feature:
  - NPDA V3R2
    - APAR PP43332 (PTF UP90223) for MVS/370
    - APAR PP43337 (PTF UP90224) for MVS/XA
    - APAR VM22413 (PTF UV90110) for VM
  - NetView.
- For models with the Token-Ring Gateway feature:
  - ACF/VTAM V3R1.1
  - NetView V1R1
- For models with the Ethernet feature:
  - ACF/VTAM V3R4
  - NetView V2R3

Response Time Monitor (RTM) is a base 3174 function. It is supported at the host by:

- NLDM Rel 2 for VM/SP
- NLDM Rel 3 for MVS/370, MVS/XA*, and VSE
- NetView

RTM may also be used without host support.

1.6 Personal Computer Support

1.6.1 3270 Emulation

The 3174 supports IBM PCs and PS/2s configured to operate with:

- IBM Personal Computer 3278/79 Emulation Control Program V1, P/N 6024134 and V2, P/N 8665780.
- IBM PC 3270 Emulation Program, Entry Level, P/N 59X9904.
- IBM PC 3270 Emulation Program Entry Level V1.1, P/N 75X1037
- IBM PC 3270 Emulation Program Entry Level V1.2, P/N 75X1085
- IBM PC 3270 Emulation Program Entry Level V2.0
- 3270 Workstation Program V1.0 (P/N 74X9921) and V1.1 P/N 75X1088
- IBM PC 3270 Emulation Program V3.0, P/N 59X9969
- RT* Personal Computer 3278/79 Emulation Program, PP 5669-052
- IBM Virtual Machine/Personal Computer Release 2 P/N 6467040
- PC/VM Bond Release 2, P/N 6467022

- VM Bond Release 2.1, P/N 6476128
- IBM Virtual Machine/Personal Computer Release 2, P/N 6467040
- Personal Services/PC Release 1.04 (P/N 6403826) or higher
- AIX/RT Workstation Host Interface Program, 5601-189
- DrawMaster* Workstation Support, 5601-100
- Personal Communications/3270 V1.01, P/N 15F7121
- Personal Communications/3270 V2.0, P/N 91F8594 or 91F8595
- Personal Communications/3270 V3.0, P/N 42G0452 or 42G0458
- Personal Communications/3270 V3.1, P/N 79G0425
- Personal Communications/3270 V4.0, P/N 20H1749
- Personal Communications, AS/400 and 3270 V4.0 for Windows, P/N 22H6146
- Personal Communications, AS/400 V4.0 for Windows, P/N20H1624
- OS/2 Extended Edition V1.2, P/N 15F7143 or 15F7144
- OS/2 Extended Edition V1.3, P/N 15F7195 or 15F7196
- OS/2 Extended Services, P/N 96F8326 or 96F8327

Not all of the above listed programs are still supported by IBM.

1.6.2 File Transfer

The 3174 supports the following host file transfer programs which allow the PCs and PS/2s to transfer files:

- PC Bond, PP 5664-298
- VM/PC, PP 5664-319
- MVS/TSO, PP 5665-311
- VM/SP, PP 5664-281
- DISOSS for MVS, PP 5665-290
- DISOSS for VSE, PP 5666-270
- PROFS*, PP 5664-309 (Personal Computer Connection Extended).

1.7 Language Support

The 3174 offers two levels of language support: the basic support and an extended support called Country Extended Code Page (CECP).

1.7.1 National Language Support (NLS)

The 3174 supports the following keyboard languages:

- Austrian/German
- Belgian
- Belgian (New)
- Brazilian
- Brazilian (New)

- Bulgarian Latin
- Canadian Bilingual
- Croatian/Serbian/Slovenian
- Cyrillic
- Cyrillic (Bulgarian)
- Cyrillic (Macedonian/Serbian)
- Cyrillic (Russian)
- Czech
- Danish
- EBCDIC World Trade
- English (UK)
- English (USA)
- English (USA ASCII International)
- English (USA ASCII-7)
- English (USA ASCII-8)
- Finnish
- French
- Greek
- Greek (New)
- Hungarian
- Icelandic
- Italian
- International
- Japanese English
- Japanese Katakana
- Macedonian/Serbian Latin
- Netherlands
- Norwegian
- Polish
- Portuguese
- ROECE Latin
- Romanian
- Slovak
- Spanish
- Spanish-speaking
- Swedish
- Swiss/French (New)
- Swiss/German (New)

- Thai
- Turkish
- Yugoslavic

In addition, some specialized keyboards are supported including:

- APL
- APL2
- EBCDIC (WT)
- TEXT

1.7.2 Country Extended Code Page (CECP)

CECP is an extension of each Latin-based national language code page, to a 191-code-point language code page for the following languages:

- Austrian/German
- Belgian (New)
- Brazilian (New)
- Canadian Bilingual
- Danish
- English (UK)
- English (US)
- Finnish
- French
- Italian
- Netherlands
- Norwegian
- Portuguese
- Spanish
- Spanish-speaking
- Swedish
- Swiss/French (New)
- Swiss/German (New)

When used in conjunction with CECP-capable displays and printers, CECP allows you to use symbols from languages other than the one for which the 3174 is customized.

Devices which support CECP when attached to a 3174 include:

- 3191 Models D, E and L
- 3192 Models C, D, F, L and W
- 3472 InfoWindow*
- 3481/3482 InfoWindow II
- 3812 Printer Model 2

- 3816 Printer Models 01D and 01S
- 4224, 4234 and 6262 printers
- ASCII attached devices

CECP is invoked by responding to customization question 123 with a 1; it also requires the response in question 121 to be one of the CECP-capable languages listed above. It will be active then for all CECP-capable devices powered on and connected to that 3174.

To understand CECP, it is first necessary to know what a code page is. A code page is the table which translates the hexadecimal code sent to the 3174 into commands or into graphical characters (for display or printing). These hexadecimal codes are referred to as *code points* in the code page. 3270 commands use the same code points for all languages; the 3270 commands are confined to using code points X′00′ through X′3F′. The remaining code points (X′40′ through X′FF′) are mapped to graphical characters. However, not all of the available code points in this range are used. Different languages can use different code points for their own unique characters.

Before CECP, inconsistencies exist between different implementations of the code pages, with some languages using different code points for the same character.

With CECP, one universal character set has been defined. This universal set contains 190 characters plus the space character required to support all CECP languages. It is known as *character set 697*.

There are host programming considerations for CECP. First, the host application must be capable of accepting without error all the 190 CECP code points. Second, the application must be using the code points as CECP characters. You should be aware that if you are using some of the code points which were unassigned before CECP was available that you could encounter problems with existing application data bases (see "System Considerations").

System Considerations

You may need to consider whether host programs accept CECP data before customizing for CECP. When CECP is supported, conventions may need to be adopted. IBM host applications, vendor applications, and in-house applications may be affected.

CECP generally doubles the number of valid I/O code points generated from a keyboard and sent inbound. It is the customer′s responsibility to ensure that host programs and data bases can accept CECP data. Be careful of the following:

- Host filters
- Host use of previously defined I/O code points
- Data integrity

You may be required to keep track of which data sets will or will not be CECP.

Host Filters: Filters in host programs could generate undesired results. The filters might reject or translate some CECP-unique graphic code points from their original values to incorrect values. This might cause a data loss, a program check, or undetected, erroneous alteration of data.

Host Use of Previously Undefined I/O Code Points: Since a user could not directly enter previously undefined character code points, a host program could be using those code points for other purposes without causing conflicts before CECP support. However, with CECP support, host usage of these previously undefined code points may now result in conflict with the CECP usage.

One example would be if a host application (such as a data base manager) used the previously undefined character code points as control codes (such as end of file markers).

Another example would be a host application that used the previously undefined character code points as values for a special font (such as APL).

Chapter 2. Installation Planning

The smooth installation of any system or subsystem is usually related to the amount of planning that is performed before the installation. The 3174 is no different in this respect to any other system or subsystem.

The 3174 is designated a customer setup (CSU) machine. This means that you, the customer, is responsible for unpacking, installing, testing and customizing the 3174. If you are familiar with the installation of 3274 Control Units, you will find the 3174 is an easier proposition.

If you are installing a 3174 Model 01L, 11L or 21L, there are a few tasks that will be performed by the IBM Service Representative.

The starting point for planning before the actual installation is the *3174 Site Planning* manual, which contains a Site Planning Checklist. You should use this checklist for planning your installation.

2.1 Host Attachment

Host attachment of the channel and link attached 3174s is the same as an equivalent 3274. I/O and NCP generation should be done as though an equivalent 3274 were being attached.

2.1.1 Local Channel

The 3174 Model 01L, 11L and 21L attaches to the host via parallel channel interface cables (Bus and Tag) in the same way as the 3274 channel attached models. For these models, you will need an IBM Service Representative to perform the following tasks:

- Connecting the 3174 to the channel using Bus and Tag cables.
- Connecting the power control and sequence cable if required.
- Altering the channel priority switches if required. The default setting is for *high priority*.
- Checking the UCW setting if required. UCWs are only used on 43xx and earlier processors running in non-XA/ESA mode. In the later/larger models, for example, 3090* and ES/9000*, the IOCDS is used to define I/O. The IOCDS is prepared by the systems programmer.

The 3174 should be customized before the IBM Service Representative is called. The following customization questions relate to channel operations:

- Question 104: Controller Address
- Question 105: Upper Limit Address
- Question 222: Support of Command retry
- Question 224: Mode of Data Transfer
- Question 225: Channel Burst Size

This is the only part of the installation that needs to be performed by the IBM Service Representative. The rest of the installation is customer setup (see 2.6.1, “CSU Installation” on page 44).

One difference between the 3274 and the 3174 is that the Bus and Tag cables need to be between 1.5 feet (0.455 meters) and 3 feet (0.915 meters) longer to accommodate the 3174. The floor cutout for the cables is different as well. This is because the channel cables attach to the lower right of the 3274 whereas they attach to the top left of the 3174.

The 3174 Models 12L and 22L attach to the S/390 ESCON channels via optical fiber cable (see 2.6.1, "CSU Installation" on page 44).

2.1.2 Remote TP Link

When attaching the communication cable (also known as a modem cable, data set cable or TP interface cable) to the 3174, it is important that you use the cable supplied with the 3174. Cables from a 3274 will not work because the DCE interface is at the end of the IBM-supplied cable, not at the 3174 communication adapter socket.

For example, the 3174 V.35 cable looks like a V.24 cable with an extra stub cable attached at the end. This is not the case. Attempting to remove the V.35 stub cable and using the resulting cable as a V.24 cable will not work. Also, the 3174 is able to detect what kind of cable is attached. If an improper cable is attached, an error occurs.

2.1.3 LAN Upstream

The 3174 Models x3R and x4R provide for LAN communication to an SNA host. Communication to the host is through a host gateway. Typical gateways are: an IBM 37xx Communication Controller with the ELA or TIC with NCP Token-Ring Interconnection (NTRI) feature, or a 3174 with the LAN Gateway feature. The LAN gateway feature is available on local and remote attached 3174 models.

The 3174 Models x3R have a Token-Ring Adapter that provides attachment to the IBM Token-Ring Network and similarly, Models x4R have an Ethernet Adapter that provides attachment to the Ethernet Network.

Like the other large 3174 models, up to 32 terminals may be attached to Models 03R, 13R, 14R, 23R, 24R and 43R, and up to 16 terminals may be attached to the Models 53R, 63R and 64R. Models 13R and 14R may have the 3270 Port Expansion Feature installed for attachment of up to 64 terminals.

2.2 3270 Terminal Attachment

3270 terminals (displays and printers) may be attached to the 3174 in several ways:

- Directly to the Terminal Adapter ports
- To the Terminal Multiplexer Adapter ports
- To the 3299 Terminal Multiplexer ports
- A mix and match of the previous methods

When directly attaching to the IBM Cabling System Type 1 or Type 2 data grade media, no baluns is needed when the Dual Purpose Connector (DPC) is used.

For Telephone Twisted-Pair TMA attachment, see 14.3, "Telephone Twisted-Pair Terminal Multiplexer Adapter" on page 477.

Large 3174s (not Model 2xx)

The large-sized 3174 models have an adapter called the Terminal Adapter (TA). The TA has four BNC connectors which can be used to directly attach up to four terminals. The TA ports are normally used with either a TMA or a 3299 Terminal Multiplexer attached to each of the four ports, giving a total of up to 32 ports on each 3174. The large 3174 models may also have the 3270 Port Expansion Feature installed. This feature provides four more BNC connectors which would be used with either a TMA or a 3299 Terminal Multiplexer. The feature provides an additional 32 ports for the large model 3174s so that a total of 64 devices may be attached.

Terminal Multiplexer Adapter (Models 0xx, 1xx and 2xx only)

This is a 3174 adapter that is customer setup and is plugged into the logic board. The TMAs use different slot positions in the logic board depending on the 3174 model and other installed options (see Appendix D, "3174 Feature Slot Usage" on page 751).

Each TMA is attached to one of the four Terminal Adapter ports with a short coax cable. You may then attach up to eight devices to the TMA ports. If you are using the IBM Cabling System, you do not need baluns when the DPC is used.

3299 Terminal Multiplexer

The 3299 Terminal Multiplexer is a device that multiplexes the datastreams from Category A 3270 devices onto a single cable. It has connectors for attaching the terminals and a connector for attaching a cable to the TA port. The device is powered from a normal wall outlet.

There are four models of the 3299 Terminal Multiplexer: Models 2, 3, 32 and 32T. Model 2 or Model 3 may attach to the 3174 via coax cable or the IBM Cabling System with a DPC. Model 32 can attach via coax, fiber optic or IBM Cabling System media. Model 32T uses TTP to attach devices without having the requirement of impedance matching devices or baluns.

If you use the IBM Cabling System with the Model 2, a DPC at the 3299 Terminal Multiplexer end of the cable is required. When used with the IBM Cabling System, some IBM (older) terminals require baluns at their end of the IBM Cabling System cable.

You may attach 3299 Terminal Multiplexers to any of the four TA ports. This means that you may have a single cable (coax or IBM Cabling System) running out to a cluster of users, where you install a 3299 Terminal Multiplexer. It is at the user work area that you attach the terminals to the 3299 Terminal Multiplexer. This can be a considerable cost saving in cables and makes problem determination easier because of the reduced number of cables running to the same area of the building. You may also ′mix and match′ TMAs and 3299 Terminal Multiplexers on a single 3174, thereby giving you the best combination desired.

WNM 3174s (Models 41R and 43R)

3174 WNM, which is plugged into the IBM 8250 Multiprotocol Intelligent Hub, can attach up to 32 devices through four TA ports.

Medium 3174s (Models 5xR and 6xR)

A medium-sized 3174 can attach up to 16 terminals. At the back of each controller are nine BNC connectors labeled 0 through 8. All nine ports may be used to directly attach terminals, giving up to nine devices on each 3174. However, ports 0 and 8 are special ports and may have 3299 Terminal Multiplexers attached to them. This means that by using one 3299 Terminal Multiplexer attached to port 8 and attaching terminals to ports 0 through 7 you can have up to 16 terminals attached.

Alternatively, you may attach a 3299 Terminal Multiplexer to port 0 and then attach the terminals to the 3299 Terminal Multiplexer. With this configuration, ports 1 through 7 can not be used. You can attach another terminal to port 8 (giving you a total of nine terminals), or attach another 3299 Terminal Multiplexer to port 8 (giving you a total of 16 terminals).

TMAs are not available for the medium-sized 3174 models.

Small 3174s (Models 8xR and 9xR)

The small-sized 3174 models can attach up to eight terminals. At the back of each controller are four BNC connectors labeled 0 through 3. You can have up to four terminals attached directly to these ports or attach a 3299 Terminal Multiplexer to port 0 for a maximum of eight terminals (in this case, ports 1, 2 and 3 cannot be used).

Note: 3174 Model 90R only has one BNC port for connection of a terminal or a 3299 Model 2 or Model 3.

2.3 ASCII Terminal Attachment

An Asynchronous Emulation Adapter feature in a 3174 provides asynchronous serial communication ports for a switched or leased connection to 3270 or ASCII hosts.

The AEA functions provided are:

- **ASCII Terminal Emulation**

  Selected 3270 displays can emulate an IBM 3101 or DEC VT100 display, and 3270 printers can emulate an ASCII printer, for connection to a ASCII host(s) or public data network.

- **3270 Terminal Emulation**

  ASCII displays can emulate a 3178 Model C2 or 3279 Model 2A (4-color display), and ASCII printers can emulate a 3287 Model 2, for connection to an IBM host.

- **ASCII Pass-Through**

  ASCII displays and printers can connect to ASCII hosts and public data networks through the AEA.

See Chapter 7, “Asynchronous Emulation Adapter (AEA)” on page 263 for further information.

2.4 Cabling

The 3174 is designed to work with either coax or the IBM Cabling System, both with or without baluns. However, you should be aware that if you use coax, attached devices may be up to 4920 feet (1.5 km) away; if the IBM Cabling System is used, attached devices may be up to 3280 feet (1.0 km) away if the device requires a balun, or 4920 feet (1.5 km) away if the device supports the DPC. These distances refer to the terminal if it is attached to a TMA or to the 3299 Terminal Multiplexer.

Coax Cabling

If you use coax then your cabling will be the same as for a 3274.

IBM Cabling System

If you use the IBM Cabling System then the 3174 has a facility that you should know about.

Previously, in order to use a 3270 type device on the IBM Cabling System media, it was necessary to install a balun (BALancer/UNbalancer) at each end of the cable. This meant that all of the ports on a controller need to have baluns attached and the device at the other end of the cable also need to have a balun.

Baluns are no longer required at the controller end of the cable when a DPC is used. This is because the Terminal Adapter and the TMAs have been designed with the IBM Cabling System in mind. Devices at the other end of the cable may or may not need a balun depending on the device. For example, the 3299 Model 2 does not need a balun at its end of the cable (3299 Model 2 requires the DPC).

The 3299 Model 32 has DPCs which allow direct attachment to either coax cable or IBM Cabling System without the need for a balun or equivalent. Devices may also be attached to the 3299 Model 32 via specified telephone twisted-pair wire (that is, IBM Cabling System Type 3) and the IBM 3270 Dual Purpose Connector to Twisted-Pair (DPC-T3) Adapter or equivalent.

Refer to the *IBM 3299 Product and Setup Information* for specific information regarding maximum attachment wire lengths.

2.5 Planning For Controller Storage

Certain functions may require that storage expansion features be installed in the 3174. The older 3174 Subsystem Control Units have 1 MB of storage installed in the base machine and are able to support a maximum of 4 MB of storage. The newer 3174 Establishment Controllers have 2 MB of storage installed in the base machine and are able to support a maximum of 6 MB of storage with Configuration Support-B Release 4 or Configuration Support-C.

To support the functions desired, you must plan for additional controller storage if your 3174 configuration includes functions such as:

- Multiple Logical Terminals
- Central Site Change Management
- Asynchronous Emulation Adapter
- Local Format Storage

- Multi-Host Support
- 3270 Port Expansion Feature
- Advanced Peer-to-Peer Networking
- Peer Communication
- Frame Relay Communication
- LAN Gateway (Token-Ring Gateway and Ethernet Gateway)
- ISDN Gateway
- RPQs

See Appendix E, "3174 Storage Requirements" on page 755 when determining amount of storage required.

2.6 Physical Installation

The physical installation of any of the 3174 models is relatively easy. The new machines are customer setup (CSU) so that the IBM Service Representative is only needed to attach the channel interface (Bus and Tag) cables for Models 01L, 11L or 21L.

2.6.1 CSU Installation

Before you begin: Consult the manuals which are shipped with your 3174, particularly the following:

- *3174 Site Planning*
- *3174 Planning Guide*, for your specific microcode release level

To set up and operate: Consult the following manuals:

- *3174 Model 1L, 1R, 2R, 3R, 11L, 11R, 12L, 12R, 13R and 14R User's Guide*
- *3174 Model 21L, 21R, 22L, 23R and 24R User's Guide*
- *3174 Model 51R, 52R, 53R, 61R, 62R, 63R and 64R User's Guide*
- *3174 Model 81R, 82R, 90R, 91R and 92R User's Guide*
- *8250 Workstation Networking Module Installation and Customization Guide* (for Models 41R and 43R)

To install a 3174:

1. Review any 3174 installation tips available on InfoSys or IBMLink*.
2. Remove packaging and place the machine in the position that it will occupy when operational.
3. Power switch:
   - Model 01L, 11L and 21L: Turn the channel interface switch to offline the power control switch to local and the power switch to 0 (off).
   - All others: Move the power switch to 0 (off).
4. Install any optional features that you need and attach any remote communication cables or Token-Ring cable to the adapters.
5. Route the power cord out of the front bottom corner of the control unit and plug it into a grounded electrical outlet.

6. Install the Utility diskette and run diagnostics as described in the *Setup Instructions* in the *3174 User's Guide*.
7. Attach a CUT or DFT/E terminal to port 0 and perform the customization.
8. Communication cables:
   - Model 01L, 11L and 21L: Ask the IBM Service Representative to attach the channel interface and power sequencing (if used) cables to the machine.
   - Model 12L and 22L: Connect fiber optic cable as per the *Setup Instructions* in the *3174 User's Guide*.
   - Attach the communication cable to the data communication equipment or equivalent.
9. Attach the terminal cables to the 3174.
10. Make sure the customized Control diskette is ready and the DSL diskette (if needed) is in drive 2.
11. IML the 3174.
12. Turn the channel interface switch to online for Models 01L, 11L, or 21L and vary the channel addresses online.
13. Activate the 3174 and attached devices.

2.6.2 9309 Rack Enclosure

The 9309 Rack Enclosure provides mounting space and power distribution for 3174 Models 2xx, the rack-mounted controllers. The 9309 is available in two models:

- Model 1 is 1.0 m (39.3 inches) high
- Model 2 is 1.6 m (62.1 inches) high

Both models conform to the 19-inch mounting dimension and universal hole spacing pattern in the Electronic Industries Association (EIA) RS-310C standard for racks, panels, and associated equipment. Both models of the 9309 feature have:

- Minimal floor space requirement
- AC power distribution and sequencing of six outlets
- Emergency power-off control

The outlets provide 220-volt single phase power. Single phase and 3-phase versions of the rack enclosure are available. Each 9309 is provided with an emergency power off control.

The rack-mounted models are specified as being 10 inches in height but, in reality, will take approximately 10.5 inches due to the hole placement in a 9309.

Each 3174 Model 2xx is six EIA units high (an EIA unit is 1.75 inches). Thus, five rack-mounted models can fit in an IBM 9309 Model 2.

In terms of EIA units:

- 9309 Model 1 can accommodate 19 EIA units
- 9309 Model 2 can accommodate 32 EIA units

Thus, five 3174 Model 2xx require 30 of the 32 available EIA units in a 9309 Model 2 rack.

In the *3174 Site Planning* manual, the cable specifications for S/370 channels used for interconnecting rack-mounted 3174 Model 21L within the rack are shown as:

- Cable Group 0790 (2.5 ft)
- Cable Group 0799 (4.5 ft)
- Cable Group 0185 should be used for cables to and from a 9309

Recommendations on rack mounting are contained in the *3174 Site Planning* manual.

Feature #9030 provides rails for mounting the 3174 Model 21L in a 9309, and a shortened power cord for 9309 use.

Note: #9030 is not orderable for the 3174 Model 21R.

2.7 Customization

Customization consists of two phases:

- Planning, which is mostly done prior to installation
- Procedures, which is performed at installation time

See Chapter 3, “Microcode Customization” on page 47 for further information.

Chapter 3. Microcode Customization

Customizing is the process of tailoring the microcode supplied with the 3174 to support various displays, printers, methods of host attachment, features and functions that a particular 3174 will handle.

One of the problems of customizing the 3274 was its “user friendliness,” or comparative lack of it, and often the need to treat each customization slightly differently from the last.

With the introduction of the 3174 Establishment Controller, the customizing process is now much easier and faster, while still retaining the basic advantages of a customizable device:

- Flexibility
- Ease of adding new features and functions
- Ease of upgrading the microcode level
- Central site customization and change management

Simplicity is particularly important to the user with only a small number of controllers, where the need to customize is infrequent which, in turn, precludes the development of a high level of skill in this area. Because of the considerably reduced time required to customize, the large network user also increases productivity as a result of this time saving. These larger organizations can also benefit from the use of central site customizing and Central Site Change Management.

3.1 Microcode Release Differences

With each new release of the 3174 microcode or Licensed Internal Code, new customizing questions have been added to support new features and functions. In some releases, customizing questions have been modified to offer additional options; in other releases, customizing questions have been added or deleted to reflect the changes.

The functional differences between the different releases of Configuration Support-A, S, B and C are discussed in 1.4.3, “Licensed Internal Code (LIC)” on page 20.

3.2 3174 Diskettes Types

All 3174 microcode are delivered on 1.2MB or 2.4MB 5.25-inch diskettes. The only exception is the microcode of 3174 Workstation Networking Module (WNM) Models in which the microcode is delivered on 2.8MB, 3.5 inch diskettes. The diskettes contain the microcode needed for the operation of the 3174, including various utilities used during customization and problem determination. These diskettes consist of the following:

- Control diskette
- Control Extension diskette (with Configuration Support-C only)
- Utility diskette

- Limited Function Utility diskette
- Downstream Load diskettes
- Request For Price Quotation (RPQ) diskettes

Not all of these diskettes are supplied or required by every user.

Control Diskette

Two Control diskettes are delivered with every 3174. A backup may be made from an ordinary IBM High Capacity 1.2MB 5.25 inch diskette or IBM 2ED 2.4MB 5.25 inch diskette (or 3.5 inch diskette for WNM Models), depending on the microcode release level, by using utilities contained on the Utility diskette. We recommend that you make this backup before customizing.

The Control diskette contains the code required for:

- System bring-up
- Normal operation
- Language support
- Diagnostics

After the Control diskette is customized, it also contains:

- Customization parameters
- Any patches applied to correct problems
- Any RPQs for additional functions

When a customized Control diskette is used to IML the 3174, the 3174 is made operational (ready to be put online and allow terminal sessions to become active).

Control Extension Diskette

With Configuration Support-C, more base microcode is supplied on a separate diskette known as the Control Extension diskette, in addition to the normal Control diskette. This Control Extension diskette must be used with the Control diskette to IML the 3174. Hence, Configuration Support-C requires two 2.4 MB diskette drives, or one 2.4 MB diskette drive and a hard disk.

Any DSL code, required for Asynchronous Emulation Adapter and graphics or image displays, and the Advanced Peer-to-Peer Networking and Peer Communication LIC features must also be merged to the Control Extension diskette if these features are needed for your environment.

With the 3174 Value Package, Configuration Support-C base code, Advanced Peer-to-Peer Networking LIC and Peer Communication LIC are pre-loaded on the 20 MB hard disk. Diskettes are provided for backup.

Utility Diskette

The Utility diskette contains the microcode necessary to run various utilities, including the following:

- Customize the Control diskette
- Merge DSL code
- Copy files

- Perform diagnostics
- Manage disk and diskettes
- Upgrade microcode for new releases
- Define devices, for example, for multi-host access
- Define the Printer Authorization Matrix
- Perform central site customizing
- Perform central site change management

Limited Function Utility Diskette

As the name implies, this diskette contains a limited set of utilities to run diagnostics, copy files and identify the customizing keyboard. The LFU should be used at network sites where the 3174 customization changes are managed from the central site. This diskette has fewer utility options and cannot be used to customize the Control diskette, thus preventing unauthorized reconfiguration of the network site 3174.

The LFU is supplied if you order specify code #9005 Inhibit LIC Shipment.

Downstream Load (DSL) Diskette

Downstream Load diskettes are required to support devices or features that need microcode to be downloaded from the 3174. Devices or features needing DSL microcode include the IBM 3290 Information Display Panel, the IBM 3179-G/3192-G/3472-G Graphics Displays, the IBM 3193 Image Display and the Asynchronous Emulation Adapter.

A DSL diskette contains the system bring-up and control microcode required for a specific device or feature. The DSL code for several devices and features can be merged onto one diskette for normal operation.

As previously mentioned, DSL code for Configuration Support-C should be merged onto the Control Extension diskette.

Request for Price Quotation (RPQ) Diskette

An RPQ diskette contains microcode required to support special features or functions requested by customers for specific environments. The RPQ is an alteration or addition to the functional capabilities provided by the base code.

An RPQ is merged onto the Control diskette. Note that:

- There may be up to 30 RPQs per diskette supplied.
- 25 KB of control diskette space is reserved for RPQs.
- Up to 10 RPQs may be merged onto a single Control diskette.

Some RPQs are supplied as a complete set of Control and Utility diskettes. These RPQs are known as “Control Disk RPQs” and must be used as a set. They cannot be merged onto another Control diskette. One example of such a Control Disk RPQ is the X.25 Token-Ring Gateway RPQ 8Q0743.

See 1.4.3, “Licensed Internal Code (LIC)” on page 20 for details of some of the more significant RPQs.

3.3 Planning for Customization

The main tasks necessary for customizing the 3174 are:

1. Planning for the configuration
2. Completing the configuration worksheets, which will then contain responses to be used for the customization procedures
3. Running the customization procedures

Each of these tasks may consist of a number of steps. Each task may be carried out by a different person. Running the customization procedures is the only mandatory task; the preceding two tasks are optional but highly recommended.

To plan for your customization, you should use the worksheets found in the back of the *3174 Planning Guide* for the appropriate microcode release. These worksheets may be freely copied and a set should be made for each 3174 to be customized. When doing this, only include those sheets that you are actually going to use. For example, you only need the BSC sheet from the various communication options sheets if that is the protocol that you will be using. Also, if you do not intend to configure local copy facilities, do not bother to include the PAM (Printer Authorization Matrix) Worksheet.

There are several steps involved in the planning. Which steps need to be carried out will depend on your desired configuration:

- Planning to Configure/Reconfigure
- Planning for Common SNA
- Planning for LAN Gateway (Token-Ring Gateway and Ethernet Gateway)
- Planning for X.25
- Planning for X.25 Token-Ring Gateway (RPQ 8Q0743)
- Planning for ISDN Gateway
- Planning for APPN
- Planning for Peer Communication
- Planning for AEA
- Planning for TCP/IP
- Planning for Frame Relay Communication
- Planning for Multi-Host Support
- Planning for Port Assignment
- Planning for Response Time Monitor
- Planning to Define Devices, including PAM
- Planning to Modify Keyboards
- Planning to Copy Files
- Planning for Merge Procedure
- Planning for Microcode Upgrade
- Planning for Central Site Change Management (CSCM)
- Planning for Encryption (not supported in Configuration Support-B and C).

We will now look at some of these planning steps.

3.3.1 Planning to Configure/Reconfigure

Configuration needs to be done for each 3174 and is similar to the operation needed on a 3274.

At some time in the future a customer may wish to reconfigure when making changes to the hardware, the host, or terminal attachment. For example, a new printer has been added and you wish to define it in the PAM, or you may have changed the protocol from a BSC to an SDLC host attachment. In each of these cases, a new worksheet should be completed reflecting the changes.

3.3.2 Planning for Common SNA

When you attach the 3174 to a host using an attachment type that is not BSC (that is, customizing question 101: Host Attachment response is not a 1), then you must provide responses to some of the questions on the Common SNA panel.

The Common SNA panel allows you to specify whether CSCM and/or APPN will be used, the network ID, control point name, LU name and connection network name.

You should ensure that names used are unique throughout your network.

3.3.3 Planning for LAN Gateway (Token-Ring Gateway or Ethernet Gateway)

LAN attachment is another way to attach a 3174 to SNA hosts. While its upstream link to a host may use channel or SDLC SNA protocols, the 3174 also acts as a gateway for LAN or Peer Communication devices on its downstream side. These devices can then access applications on the host through the 3174 gateway.

The devices on the LAN or Peer Communication segment are configured as downstream PUs (DSPUs). The number of DSPUs that a 3174 gateway can support is dependent on:

- The type of LAN Adapter:
  - 4 Mbps Token-Ring Adapter supports 140 DSPUs maximum.
  - 16/4 Mbps Token-Ring Adapter supports 250 DSPUs maximum.
  - Ethernet Adapter supports 250 DSPUs maximum.
- The microcode release level:
  - Configuration Support-S supports 140 DSPUs maximum.
  - Configuration Support-B and C support 250 DSPUs maximum.
- The hardware model:
  - Models 01L, 01R, and 02R support 140 DSPUs maximum.
  - Model 51R supports 72 DSPUs maximum.
  - Models 11L, 11R, 12L, 12R, 21L, 21R, 22L, 41R, 61R and 62R support 250 DSPUs maximum.
- Whether ISDN DSPUs are configured

  Each ISDN DSPU configured means one less DSPU available for the LAN.

- Whether a 3174 ESCON gateway supports maximum 8KB RU size

  If maximum 8KB RU size is required, the maximum number of DSPUs is reduced to 100.

- All the DSPUs may be assigned to one primary host, or shared across primary and secondary hosts. Each DSPU assigned to one host means one less DSPU available for the other hosts. Each CCA supports 50 DSPUs maximum.

- The amount of controller storage.

Each DSPU is customized in the 3174 gateway to allow mapping of the DSPU′s MAC address and SAP to a channel control unit address (CUADDR) or an SDLC link address (ADDR).

You should ensure you have the right hardware, microcode level, and controller storage required for your 3174 gateway. You should also ensure that each combined LAN and SAP address is unique in your network and is correctly mapped to the host channel or SDLC address assigned by your network administrator.

For further information, see Chapter 4, “LAN Support” on page 69

3.3.4 Planning for X.25

The major difference between configuring for an X.25 attachment compared with the other attachment types is that you get an extra panel 332: X.25 Options to fill in. This panel requires information about the X.25 network, such as:

- Network type
- Logical channel numbers
- Logical channel assignments
- DTE addresses
- Closed user group
- Window size
- Packet size
- Recognized Private Operating Agency
- Connection options
- Incoming and outgoing call options, such as:
  - Reverse charging
  - Packet/window size negotiation
  - Throughput class

You should consult your network administrator for the correct responses to be used from the appropriate X.25 and NPSI parameters.

For further information, see Chapter 5, “X.25 Support” on page 157.

3.3.5 Planning for X.25 Token-Ring Gateway (RPQ 8Q0743)

With the X.25 Token-Ring Gateway RPQ 8Q0743, it is possible for a 3174 Token-Ring Gateway to support connectivity to hosts or PU 2.0 devices in the X.25 network.

Planning for this function requires you to understand the role of the 3174 in providing the gateway connectivity, either as a QLLC primary or a QLLC secondary, for each connection desired. You will also need to decide on the type of connections, open or default, to be used.

Customizing is similar to the normal X.25 support except that a complete set of Control and Utility diskettes is used for the RPQ. Question 150, where you specify the type of Gateway support (LAN and ISDN), the digit 1 must be answered with a 1 and the digit 2 with a 0 to enable the Token-Ring Gateway function.

Again, you should consult your network administrator for the correct responses to be used from the appropriate X.25 and NPSI parameters.

For further information, see Chapter 6, “X.25 Token-Ring Gateway RPQ” on page 187.

3.3.6 Planning for ISDN

Configuration Support-C provides support for the installation of an ISDN BRI Adapter in the 3174. This is a particularly useful means for remote dial-up from PS/2 workstations to host applications, using the 3174 as an ISDN gateway.

The 3174 is customized as an ISDN gateway to support up to 32 devices or workstations in an ISDN network. These devices are seen as DSPUs by the 3174 in the same manner as token-ring DSPUs.

When configuring for ISDN support, the response to question 101: Host Attachment is similar to the response used for a channel or SDLC SNA 3174 LAN Gateway support. The difference is that the digit 2 in question 150: Gateway (LAN and ISDN) needs to be a 1 while the digit 1 is entered with a 0.

You should plan for sufficient addresses to be used for LAN DSPUs and ISDN DSPUs. The total number of addresses is given by the difference between questions 104 and 105. The number of DSPUs allocated for ISDN use is given by your response to question 190: Number of ISDN DSPUs. The remainder can be used for LAN DSPUs.

```
(Q.105 minus Q.104) minus Q.190 = Number of LAN DSPUs available
```

You should consult your network administrator for the correct ID to be used for identifying each ISDN DSPU.

For further information, see Chapter 22, “ISDN” on page 661.

3.3.7 Planning for APPN

Advanced Peer-to-Peer Networking is an enhancement to IBM's Systems Network Architecture and node Type 2.1 architecture. It allows interconnection of peer systems of widely differing sizes into dynamic topology networks.

The 3174 provides APPN functions by means of an APPN Licensed Internal Code feature. This LIC feature enables the 3174 to act as a network node (NN) for communication over LAN, SDLC, X.25, Frame Relay and S/370 parallel channel links.

The 3174 APPN LIC feature is delivered on a 1.2 MB diskette which must be merged onto the Control Extension diskette. Starting with Configuration Support-C Release 5, the APPN feature code is pre-merged onto the Extension diskette.

You are required to specify the network ID, control point name, and connection network name for the 3174 NN during customization. These names should be unique throughout your network.

Note that if the response in question 502: Logical Unit Name is the same as the response in question 511: APPN Control Point Name, CSCM will use the same LU 6.2 as that used for the NN functions.

You should be aware of the need to define a node both as a DSPU (question 940) and as a T2.1 node (Network Resources panel) for it to use shared T2.1/2.0 links.

For further information, see Chapter 18, "APPN" on page 501.

3.3.8 Planning for Peer Communication

Peer Communication allows intelligent workstations attached to a 3174 via existing 3270 wiring to form a LAN segment that may be bridged to an LAN Network. The intelligent workstations, known as 3174-Peer devices, can then communicate with other 3174-Peer devices attached to the same 3174, or to other intelligent workstations on the LAN Network.

Each 3174-Peer device can use a MAC address automatically assigned by the 3174 during operation. Because this address is port-dependent, you should be aware that relocation of your 3174-Peer device to another port will cause you connectivity problems.

A better approach is to assign an address to a 3174-Peer device using naming/addressing conventions established for your network. This will provide port-independent addressing and flexibility for relocating your intelligent workstations as needed. You should discuss the addresses required for your 3174-Peer devices with your network administrator to ensure uniqueness.

If any of the intelligent workstations require host communication, or access to a LAN, or APPN functions, then you need a Type 3A Dual Speed (16/4 Mbps) Token-Ring Adapter. In any of these situations, bridging functions are required and are provided by the Type 3A Dual Speed Token-Ring Adapter.

Note that for host communication, the 3174-Peer device must be defined as a DSPU to the gateway it uses.

For further information, see Chapter 19, "Peer Communication" on page 557.

3.3.9 Planning for AEA

The Asynchronous Emulation Adapter provides the ability for:

- 3270 displays and printers, in ASCII terminal emulation mode, to communicate with ASCII hosts
- ASCII displays and printers, in 3270 terminal emulation mode, to communicate with IBM hosts
- ASCII displays and printers, in ASCII pass-through mode, to communicate with ASCII hosts

When planning for AEA you should use the worksheets in the *3174 Planning Guide.* These should be copied and used for documentation support for each 3174.

When customizing for AEA support, you need to understand various concepts and terminology used, such as port, port type, port set, station, station type, station set, terminal characteristics, modem type, Connection Menu, default destination, and so on. You will also need to know specific information about the display stations, printers, hosts, ports and modems the ASCII devices are attached to.

For further information, see Chapter 7, "Asynchronous Emulation Adapter (AEA)" on page 263.

3.3.10 Planning for TCP/IP

TCP/IP for the 3174 is supported on coaxially attached displays operating in CUT mode and AEA-Attached ASCII displays. TCP/IP support for the 3174 allows these displays to communicate with any TCP/IP server or host (IBM or non-IBM) accessible through LAN (Token-Ring or Ethernet) or Frame Relay network.

The TCP/IP server or host can be attached directly to the LAN or Frame Relay network, or exist anywhere in the network that can be reached by any bridges or routers. MLT support provides up to five concurrent sessions with 3270 hosts, ASCII hosts or TCP/IP destinations for a single display stations.

For AEA-Attached displays, the 3174 uses an ASCII Pass-Through mode of operation to communicate transparently with the TCP/IP application or server. Although TCP/IP does not require an AEA, planning for TCP/IP involves many of the same considerations as planning for AEA, and some additional considerations.

The second digit of the question 700, which comes under the"AEA and TCP/IP Configure" must be answered with a 1 or 2 to set the TCP/IP option on. The worksheets in the *3174 Planning Guide* should be used for documentation purposes.

For further information, see Chapter 21, "TCP/IP" on page 605.

3.3.11 Planning for Frame Relay Communication

Frame Relay is a multiprotocol service that uses virtual circuits. Configuration Support-C Release 5 is required to support 3174 Frame Relay Communication and response 9 to the configuration question 101 activates this facility. Worksheets Frame Relay Description and Frame Relay Optional DLCI Definitions in the *3174 Planning Guide* as well as your Frame Relay network subscription should be used. The 3174 supports up to 254 DLCIs using a Type 1 or Type 2 Communication Adapter.

For SNA, you must define a unique combination of DLCI and SAP for each Frame Relay host on the primary link and every DSPU that will be communicating through the 3174 with a Frame Relay host.

For TCP/IP over Frame Relay, you must define an IP address for the 3174. You do not need to define individual DLCIs for TCP/IP because Inverse Address Resolution Protocol (InARP) is used on the active virtual circuits to identify which virtual circuits can support IP protocols.

For further information, see Chapter 20, “Frame Relay Support” on page 589.

3.3.12 Planning for Multi-Host Support

The 3174 can be configured to access multiple 3270 hosts. Using the MLT function, each terminal connected to a 3174 port can access up to five host sessions. All five sessions can be conducted with one host, or each session can be conducted with a different host.

There are two types of multi-host support:

- Multi-session access via *multiple physical links*

  An example would be a 3270 terminal with MLT accessing hosts via a 3174′s primary communication adapter as well as accessing hosts via the 3174′s CCAs.

  The Concurrent Communication Adapter is a 3174 hardware feature which provides access to an additional (also known as a secondary) 3270 host link.

- Multi-session access via a *single physical link*

  This is more commonly known as Single Link Multi-Host (SLMH) support. An example would be a 3270 terminal with MLT accessing multiple hosts via a 3174-13R′s single upstream Token-Ring Adapter link.

With Configuration Support-B Release 3, SLMH is also extended to X.25 attachments, allowing access up to eight hosts via the primary link, and four hosts on each of the secondary links.

With Configuration Support-B Release 3 or later, therefore, the 3174 provides three types of SLMH support:

- Via ESCON
- Via Token-Ring Network
- Via X.25

Configuration Support-C-C Release 4 or later provides SLMH support via an Ethernet Network

Configuration Support-C Release 5 provides SLMH support via Frame Relay network.

Each of the hosts in a multi-host environment is identified by a 2-character ID (for example, host ID 2D):

- The first character indicates the link type:
  - 1 indicates the primary link
  - 2 or 3 indicates a secondary link (one provided by a CCA)
- The second character indicates the host designation:
  - A indicates the primary host
  - B through H indicates a secondary host

To enable multi-host support, you must respond to question 101 with an M. In addition, you assign each session to the host ID desired via the Logical Terminal Assignment (LTA) panel.

For further information, see Chapter 9, “Multi-Host Connectivity” on page 331.

3.3.13 Planning for Port Assignment

Port assignment allows you to map the sessions through a specific port on the 3174 to host LU addresses (LOCADDRs). The planning requirement is different, depending on your response to question 116: Individual Port Assignment and the microcode level you are using.

Configuration Support-A/S

There are three possible responses to question 116: 0, 1 or 2. You have to use response 1 or 2 if you are providing multi-sessions through the MLT function for CUT devices or using DFT devices, such as the IBM 3290 Information Panel or the IBM 3270 Personal Computer.

Response 0: This response is the default. With this response, the 3174 will automatically assign port addresses and you will not see panel 117: Port Assignment and panel 118: Port Addresses. If you have a Model 0xx, 1xx, or 2xx, then 32 port addresses will be assigned, whether you need them (that is, you do have 32 devices attached) or not. This can be wasteful on addresses. Similarly, 16 addresses for the Models 5xR and 6xR, and eight addresses for Models 8xR and 9xR, will be automatically assigned.

Response 1 This response allows you to specify just the number of sessions per port; the 3174 will automatically assign individual addresses. To do this, simply fill in the number of sessions per port in the #IS column on the 117: Port Assignment panel.***:*** With multi-sessions, the 3174 will assign addresses as follows: First, addresses will be assigned sequentially to all of the primary sessions starting at port zero. When completed, the next available addresses will be assigned to the secondary sessions for each port.

You can put a zero against any port not required at this time so that addresses will not be allocated to it.

When you press PF8 during the actual customizing process, the 3174 will fill in the 118: Port Addresses panel for you. You cannot change the addresses (in hexadecimal) assigned in panel 118; it is for your information only.

Using this response, you should be aware that when updating the port assignment in the future for devices added or removed, all of the addresses will be re-assigned by the 3174. This re-assignment can cause mismatch between device characteristics and LU definitions. To avoid this mismatch, you should use response 2.

Response 2: This response is used if you wish to control the assignment of individual addresses to specific ports. You will probably use this response to prevent the mismatch of devices with their LU definitions, if you have DFT devices, or if you are using the MLT function for CUT terminals with multiple sessions.

When using this response, you have to enter the local addresses in panel 117 in decimal. Once again the 3174 will fill in panel 118 for you.

Configuration Support-B/C

In Configuration Support-B/C, the response to question 116 can be one to four alphanumeric digits grouped into two pairs. The first (leftmost) pair represents the assignment of 3270 address. The second pair represents the assignment of AEA addresses.

Depending on your configuration, you may not be specifying all four digits; you may have a one, two, or four-digit response. The default response is 0 for the first digit, followed by three blanks. If your response to the first digit is 0, 1 or 2, then leave the rest of the digits to the default value (blank).

First Digit Response 0: This response means that the 3174 automatically assigns one address to each 3270 port.

Use this response if you:

- Want only one 3270 address per port
- Do not want to plan for port assignment
- Do not want any AEA addresses assigned

First Digit Response 1: This response means that you specify the number of addresses for each 3270 port and the 3174 will automatically assign individual addresses accordingly. You could put a zero for any port not required at this time so that addresses will not be allocated.

Use this response if you:

- Plan to assign port addresses on a port-by-port basis
- Plan to use MLT on your CUT devices
- Plan to have ASCII devices access 3270 hosts
- Plan to use DFTs with multiple interactive sessions

First Digit Response 2: This response means that you assign the individual addresses to each 3270 port. The reasons for using this response are the same as for responding with a 1.

First Two-Digit Response SX: In this response, S is entered as an alphabet character and X equals a number from 1 to 5. Use this response if you:

- Want to specify the number of addresses to be assigned to each 3270 port

- Answer either part of question 110 with a non-zero response
- Do not plan to have ASCII devices access 3270 hosts
- Plan to use DFTs with multiple interactive sessions

Note that the same number of addresses will be assigned to all 3270 ports and the addresses will be automatically assigned. Responses S1 through S5 are only allowed on SNA host attachments.

Response SXAY: Response SX, with the rightmost digits blank, do not result in AEA port address assignment.

In response SXAY, S and A are entered as alphabet characters, and X and Y equal numbers from 1 to 5. Use this response if you:

- Want to specify the number of addresses to be assigned to each 3270 port and the number of addresses to be assigned to each AEA port
- Want to have the individual addresses automatically assigned
- Plan to have ASCII devices access 3270 hosts
- Answer questions 110 and 703 with non-zero responses

The maximum number of addresses that can be assigned is 253. The customizing utility prioritizes the assignment of addresses. If the number of addresses in your response exceeds 253, either some ports do not get any addresses or they get fewer addresses than you requested.

Do not respond to the AY part of question 116 if:

- The host is non-SNA
- The 3174 model number is 53R

If the response to question 101: Host Attachment is M (for multi-host support), the second part of question 116 appears only for the 1A host.

3.3.14 Planning for Response Time Monitor (RTM)

RTM is a standard function on all 3174s. Ideally it should be used as part of the Communication Network Management (CNM) operation. However, even in a standalone form, it is a valuable tool in the management and control of information systems.

If you do not wish to use RTM, answer question 127: Response Time Monitor Definition with two zeros.

If you wish to use RTM, then the first digit of question 127 asks you whether you have host support for RTM and where the RTM data is displayed (ports 26-00 or 27-00 only, or all ports). Even without host support you can use RTM as a valuable management tool.

The second digit allows you to specify the event used to signify a transaction end:

- When the first character is received on the screen
- When the keyboard becomes unlocked
- When a Change Direction or End Bracket command is received

- When the last character is received on the screen

If the response to question 127 is other than two zeros, you will get another panel (128: RTM Definition) to allow you to classify an RTM measurement into one of five time counters. You can specify the maximum RTM value for four of these counters; the fifth is an overflow counter.

The RTM function will not be discussed further in this publication. For further information, see the appropriate *3174 Functional Description* and *3174 Planning Guide* manuals for your microcode level.

3.3.15 Planning for PAM

Printer Authorization Matrix (PAM) defines which printers the display stations in a cluster can use for local copy, host printing and shared copy operations. With a local copy, data is transferred directly from the display buffer to the printer buffer for printing. With host printing, data is sent from the host to the printer. With shared copy operations, a printer can be used for both local copy and host printing.

If your printers are used only for host printing (that is, no local copy or shared copy operations), you do not need to define a PAM.

The PAM worksheet can be thought of as being in two parts, the top half and the bottom half. The top half defines the printer and the bottom half assigns the display stations that may use it. By using multiple worksheets, you may define up to 47 printers. You can define printers which are attached to the base 3270 adapter ports, the 3270 Port Expansion Feature ports and the AEA ports.

The first field required is the port number of the first printer that you wish to define (port 26-00 cannot be specified). The next field defines the printer mode of operation allowed:

- 0=Host only

  In this mode, only host printing is permitted on the printer; it is protected from local (screen) copies. Since this is the default mode, a PAM is not needed if you only wish to use the printers for host printing and not for local copying.

- 1=Local only

  In this mode, only local copying is permitted on the printer when a display operator presses the Print key. If the display is operating in SNA, the host can initiate a local copy from the display buffer. However, the printer is protected from host-directed print operations.

- 2=Shared

  In this mode, both local copying and host-directed printing is permitted on the same printer. It is possible, therefore, for local copy data to be intermixed with host-directed print data inadvertently. To avoid this, you should follow installation rules and proper programming practices.

The next field allows you to group printers into classes. For example, you may wish to group all of the same type of printers into one class, group all printers on the same floor into another class, or group printers for some other reason.

Finally, in the bottom half of the worksheet, simply put an X on the line corresponding with the printer defined under the port number of any terminal that you wish to authorize for local copy to that printer.

Note that:

- With Configuration Support-A/S, you select the Define PAM option from the Customize Control Disk menu.
- With Configuration Support-B/C, you use a two-digit response for question 800: Printer Authorization Matrix (PAM) on the Device Definition panel to:
  - Not define a PAM, by using a 00 response
  - Define a PAM, excluding printers attached via the 3270 Port Expansion Feature, by using a 10 response
  - Define a PAM for all printers, including printers attached to the 3270 Port Expansion Feature, by using a 11 response

Also, note that the Printer Assignment ID in the OIA identifies the printer or class of printers to which a local copy will be directed.

- A printer class is a number in the range 70 through 85.
- If question 800=10, then a specific printer is indicated by its *port number*, where:
  - 01 through 31 means ports 26-01 through 26-31
  - 32 through 39 means ports 21-00 through 21-07 (the first AEA)
  - 40 through 47 means ports 22-00 through 22-07 (the second AEA)
  - 48 through 55 means ports 23-00 through 23-07 (the third AEA)
- If question 800=11, then a specific printer is indicated by its PAM *entry number*, from 01 through 47.

See “Printer Authorization Matrix (PAM)” on page 316 for further information.

3.3.16 Planning to Modify Keyboard

The purpose of the Modify Keyboard Utility is to create unique keyboard layouts that meet specific user or application requirements. These modified keyboard layouts can be used on IBM display stations with modifiable keyboards.

This utility is not for use with the DFT displays such as the IBM 3179-G Color Graphics Display or the 3192-G Color Graphics Display. The keyboard definition utility for these displays is supplied with their individual DSL code (see the appropriate display description manual).

Most characters, symbols, and functions can be relocated, deleted, or duplicated from almost any key position. However, there are some restrictions:

- The display station used with this utility must be connected to 3174 port 26-00. Terminals with modifiable keyboards must be working in 3278/79 emulation mode.
- Local keys that do not send scan codes to the 3174 should not be used for copy or exchange operations (for example, the SetUp, Copy, or Play keys).
- Typematic assignment cannot be modified.
- Certain keys cannot be copied or moved.

Question 136 refers to four standard keyboard layouts:

- Converged Typewriter
- Converged APL
- Converged Data Entry
- Enhanced Typewriter.

Question 137 refers to which modified keyboard layouts, identified by the keyboard ID A, B, C, or D, are to be configured in the 3174. The total number of standard and modified keyboards cannot exceed four.

Use the Planning to Modify Keyboards chapter of the *3174 Planning Guide* along with the keyboard layout from the worksheet section. Decide which of the keyboards you wish to modify. Fill out the keyboard layout worksheet and use it with the Modify Keyboard Utility.

3.3.17 Planning to Copy Files

These procedures allow you to copy from one diskette to another diskette, from a diskette to a fixed disk, from one fixed disk to another fixed disk, or from a fixed disk to a diskette.

The options available are:

- Full Copy

  This procedure duplicates a diskette, including any customization data present, onto another 1.2 MB or 2.4 MB IBM High Capacity 5.25 inch diskette. It takes just over two minutes for the actual copying process whereas the Copy Customizing Data procedure takes less than half as long. Copying to an unformatted diskette adds about 30 seconds.

- Modify and Copy

  This procedure is similar to the Full Copy but allows you to change some customization responses on the diskette that you are copying to. This is a useful utility if you wish to produce “pattern diskettes” which can then be modified for individual 3174s.

- Copy Customizing Data

  This procedure copies configuration (also known as customizing or customization) data from one Control diskette to another Control diskette at the same release levels.

  You can use this utility to make a backup Control diskette immediately after customizing a Control diskette; it saves time and trouble should the original be lost or damaged. It only takes about one minute for the actual copying process, a considerable saving over the 3274.

  The target diskette must be a Control diskette; hence, IBM supplies two Control diskettes with every microcode package to allow you to easily create a backup.

- Copy Patches

  This procedure copies the patch files from one diskette to another that are at the same release levels. This operation can be performed on both the Control or Utility diskettes.

- Copy PAM

This procedure copies the PAM data from one Control diskette to another Control diskette at the same release levels. With Configuration Support-B and later, the Copy PAM procedure is incorporated in the Copy Device Definition procedure.

- Copy Modified Keyboards

  This procedure copies modified keyboard tables from one Control diskette to another Control diskette at the same release levels.

- Copy RPQs

  This procedure copies merged RPQ data from one Control diskette to another. Be aware that doing so erases any RPQs already on the diskette that you are copying to. To move an RPQ from one diskette to another while retaining the original RPQs, use the Merge RPQ Procedure.

The following copy utilities are available with Configuration Support-B and later:

- Copy Device Definition

  This procedure copies the Device Definition files from one Control disk to another. The Device Definition files can consist of one or more of the following:

  – Logical Terminal Assignment

  – Printer Authorization Matrix

  – Prompts for Extended Vital Product Data

  – Integrated Services Digital Network (Configuration Support-C only).

- Copy Vital Product Data

  This Configuration Support-B procedure copies the Vital Product Data files from one Control disk to another. These Vital Product Data files are not created during 3174 customizing. They are created when a user on an attached terminal uses Online Test 5, Option 2 (Update Controller Vital Data) and Option 4 (Update Port Vital Data) to enter Extended Vital Product Data. Of course, to do this, the Control Disk must be IMLed in the 3174.

  With Configuration Support-C, the Copy Vital Product Data procedure is incorporated in the Copy User Data procedure.

- Copy User Data

  This Configuration Support-C procedure copies Vital Product Data and 3174-Peer parameters from one Control diskette to another. The Vital Product Data is entered on the Control diskette via Online Test 5, Options 2 and 4. The 3174-Peer parameters may be entered through Online Test 9, Option 10 (Update 3174-Peer Bridge Profile) or Option 12 (Update LAN Manager Profile), or changed by the updates received from the LAN Network Manager, or specified during customization.

3.3.18 Planning for Merge Procedures

Merge RPQs

The Merge RPQs procedure, selectable from the Customize Control Disk menu, allows you to:

- Include or omit RPQs resident on a Control diskette at IML time
- Delete RPQs from a Control diskette
- Merge RPQs from an RPQ diskette to the Control diskette

You use Merge RPQs procedure to move RPQs from the IBM-supplied RPQ diskette to the Control diskette, from where you can include or omit them from IML.

Remember an RPQ diskette can have up to 30 RPQs on it. A Control disk has space for 10 RPQs whether they are *included* or *omitted* at IML. If you need more space, then you can delete unwanted RPQs from the Control diskette.

Merge DSL

The Merge DSL procedure, selectable from the Master Menu, allows you to merge the DSL code required for several devices onto one DSL diskette.

If a 3174 has any DSL devices attached, then it must have a second diskette drive or a fixed disk drive for the use of the DSL code. Examples of DSL devices are the IBM 3290 Information Display and the 3179-G Color Graphics Display. The DSL diskette contains microcode needed by the DSL device; the 3174 will download this microcode to the device when the device powers on.

With Configuration Support-C, the Merge DSL procedure is also used to merge the APPN and Peer Communication LIC features (supplied on 1.2 MB DSL diskettes) to the Control Extension diskette.

3.3.19 Planning for Microcode Upgrade

Every now and then, IBM may issue a new level of Utility and Control diskettes for maintenance reasons and/or to add new functions to the 3174. However, the customization data is not available on the new diskettes. The Microcode Upgrade procedure allows you to transfer customization data from an existing Control diskette to the new Control diskette. Note that this procedure copies only the customization data from an older to a newer release level, whereas the Copy Customizing Data procedure copies customization data at the same release levels.

3.3.20 Planning for Central Site Change Management

Using NetView Distribution Manager Release 2 and later or NetView DM/2 V2.1, Central Site Change Management (CSCM) is a method for managing and distributing microcode and customization data to 3174s in a SNA network. To use CSCM, you build a library of 3174 customization data using the Central Site Customizing Utility (CSCU).

The CSCU provides facilities for:

- Creating the base configuration
- Configuring the AEA

- Defining the PAM
- Defining devices (Configuration Support-B/C only)

The microcode and customization data are packaged as “data objects.” Thus, there are data objects for Control microcode, Utility microcode, patches, RPQs, basic configuration data, AEA customization data, PAM customization data, and so on.

CSCM functions allow the 3174 to:

- Retrieve data objects from a 3174 to a NetView Distribution Manager repository
- Send data objects from a NetView Distribution Manager to a network site 3174
- Install data objects on the network site 3174
- Delete data objects which have been installed non-removably (permanently)
- Remove data objects which have been installed removably (temporarily)
- Activate the 3174 when commanded by NetView Distribution Manager

To use CSCU, you select the Central Site Customizing option from the Master Menu.

To use CSCM, you need to respond to questions 500: CSCM Unique, 501: Network ID and 502: Logical Unit Name. Any 3174 that will participate in the CSCM network has to be defined to VTAM as a CSCM device; this is achieved by coding an LU with a LOCADDR=1.

Although CSCM is provided for the 3174 with Configuration Support-A/S Release 4, we recommend that you use the latest releases (Release 5.4), or Configuration Support-B, or Configuration Support-C.

For further information, see the ITSO Books *NetView Distribution Manager Release 2, 3174 CSCM Implementation Guide*, and *NetView DM/2 V2.1 Remote Administrator and New Functions* and also the appropriate *3174 Central Site Customizing User's Guide*.

3.3.21 Planning for Encrypt/Decrypt

The Encrypt/Decrypt Adapter #3680 feature provides an adapter for 3174 Models 01R, 02R and 03R to encrypt and decrypt data between SNA nodes. It is no longer available as of July 7, 1989.

Currently, the Encrypt/Decrypt Adapter is available as an RPQ 8Q0742. This RPQ supports 3174 Models 01R, 02R, 11R and 12R, and requires either Configuration Support-A/S Release 5 or Configuration Support-B Release 4.1.

An Encrypt/Decrypt Utility provides options to:

- Initialize or change the master key value
- Display the verification pattern
- Verify the security of the master key value
- Test the proper functioning of the Encrypt/Decrypt Adapter

To use this utility, you need:

- The adapter security key (this is a real key)
- A master key value (this is a code)
- A control Unit ID

Since the Encrypt/Decrypt Adapter protects your data from unauthorized disclosure, only authorized persons should use these procedures.

For further information, see the Configuration Support-A/S *3174 Utilities Guide*.

3.4 Customizing Procedures

This section describes the procedures used to customize the 3174. If worksheets have been used during planning, customizing the 3174 is a relatively easy process. All you need to do is transfer the worksheet responses to the 3174 customizing panels when prompted.

Like the 3274, the display used for the customizing procedures must be attached to port 0 of the 3174. It must also be a CUT terminal, such as a 3471 or similar, or the CUT mode of a DFT-E terminal, such as the 3472-G.

The *3174 Utilities Guide* contains information on how to:

- Display the Master Menu
- Identify the customizing keyboard
- Configure the Control diskette
- Merge RPQs
- Merge DSL code
- Modify keyboards
- Upgrade microcode

It is not necessary to explain all the procedures because they are really so easy to use, being menu driven. We have included two of the more commonly used procedures here for your convenience.

How To Display the Master Menu

To display the Master Menu:

- Put the Utility diskette in drive 1.
- Hold the Alt 1 button and press IML.
  - The 3174 status display shows 40.
- Press Enter.

  The 3174 will now start loading the microcode from the Utility diskette in drive 1.

If you have two diskette drives:

- Put the Utility diskette in drive 2.
- Hold the Alt 1 button and press IML.
  - The 3174 status display shows 40.
- Type 0240 on the keypad (02 indicates the diskette drive 2).

- Press Enter.

  The 3174 will now start loading the microcode from the Utility diskette from drive 2.

If your Utility microcode is on a fixed disk, you can load it by typing:

- 0340 if it is on the first fixed disk
- 0440 if it is on the second hard disk

As the 3174 loads the Utility microcode, the number in the status display will increment until it reads 7000. When that happens, the Master Menu will be displayed on the CUT terminal attached to port 0.

If the number in the status display stops during the loading process for longer than 45 to 60 seconds, look up the number in the *3174 Status Codes*. For example, the status displays 7080. This code means that there is a problem with the display attached to port 0, such as the display may not be powered on or the coax cable may not be connected.

Identifying Customizing Keyboard

If you wish to use one of the following keyboards to customize the 3174, then you need to identify it *before* you start the customization procedures:

- Austrian/German
- Belgian
- French AZERTY
- Italian
- Japanese English
- Japanese Katakana

If your keyboard is not one listed above, ignore this procedure.

3.5 How to Use the Patch Procedure

Patches are provided to correct for defects found with 3174 microcode. There are two types of patches:

- PC patches

  PC patches are applied to link-edited microcode that is contained on the Control diskette.

  PC patches are prefixed with the letters PC.

- Zap patches

  Zap patches are applied to prelinked microcode that is contained on the Control, Utility (including Limited Function Utility) or DSL diskette.

  Zap patches are prefixed with the letters:

  - ZC for Control microcode
  - ZU for Utility and Limited Function Utility microcode
  - ZM for DSL microcode

To apply patches, type P at the Master Menu. (Note that the patch procedure is not an option on the Master Menu.) When you press Enter, the Patch Menu will be displayed to show options that allow you to:

- Patch a Control diskette
- Patch a Utility diskette
- Patch a DSL diskette
- Patch a Limited Function Utility diskette

You can then take the following actions:

- Add a patch (adding a patch does not make it active)
- Include it in the IML process (that is, make it active)
- Omit it from the IML process (that is, make it inactive)
- Delete it altogether from the diskette

If you are need to add patches, you should carefully follow the specific instructions that are supplied with each patch. The *3174 Maintenance Information* manual for your model includes general instructions on how to apply each type of patch.

3.6 How to Display the Online Test Menu

During normal operation, you may need to look at the 3174 customization data or error logs, or update certain parameters online. You can do so by using the online Test Menu from a CUT display. To display the online Test Menu:

- Hold down the Alt key and press the Test key.
- When Test appears in the OIA, press PF12.

To exit from the online Test Menu:

- Hold down the Alt key and press the Test key again.

Beginning with Configuration Support-B Release 2, the online tests can also be accessed using Central Site Control Facility (CSCF).

3.7 Using CSCF to View Configuration Data

Central Site Control Facility gives you the ability to perform certain online tests from a NetView (Release 3 and later) terminal, including viewing the configuration data for a specific 3174. The NetView operator can test any 3174 attached to the same host as the operator′s terminal by entering the command:

CSCF PU=resname (where resname is the 3174 PU name)

The online Test Menu will be displayed at the NetView terminal. You can then select the test(s) required. Except for certain tests that need to be carried out by a terminal physically attached to a 3174, such as Color Convergence, the online tests selectable via CSCF is the same as those selectable via Alt Test.

For further information, see 13.1, “Central Site Control Facility” on page 433.

Chapter 4. LAN Support

This chapter discusses the 3174s which attach to the LAN network. The type of LAN can be either token-ring network or Ethernet network. It also describes experiences in the installation of 3174 LAN (Token Ring and Ethernet) attached models and gateways in a test environment with different operating systems and other LAN (token-ring and Ethernet) attached devices.

Readers will find useful tips regarding physical installation, customization, operating system considerations, backup/recovery, and performance.

4.1 Token-Ring Concepts

The IBM Token-Ring Network is a general purpose Local Area Network (LAN) with a star-wired ring topology, using baseband signalling and token-passing protocols conforming with IEEE 802.5 standards. Device attachments conforming with IEEE 802.2 and 802.5 standards may communicate over an IBM Token-Ring Network.

The token-passing protocol for ring access control is based on a predefined 24-bit pattern, called a *token*, which continuously circulates around the ring.

When a station has data to transmit, it waits until its station adapter receives a free token (token bit=0). Upon capturing the free token, the station creates a *frame* by setting the token bit to 1. It then inserts source and destination addresses, certain control information and the data to be sent to the destination station, and starts frame transmission.

During the time the frame is being transmitted, no token is available on the ring and no other station can initiate a transmission. Thus, collisions on the ring are avoided. The frame is passed (received, regenerated and retransmitted) from one station to another on the ring until it is received by a station with a matching destination address.

The destination station copies the data to its internal buffers, sets control bits to indicate that it recognized the address and successfully copied the data, and retransmits the frame.

When the frame returns to the source station following successful transmission and receipt, it is removed from the ring. The source station creates a new free token and transmits it on the ring, thereby allowing other stations access. Until the source station releases a free token, the rest of the stations are unable to transmit.

To reduce the amount of time a station has to wait for a free token, a function, known as *Early Token Release*, is available with the 3174 16/4 Mbps Dual Speed Token-Ring Adapter when it is customized for 16 Mbps ring speed operation. With Early Token Release, a sending station releases a free token following frame transmission without waiting for the transmitted frame to return. This enhances the utilization of the ring by allowing one token and one or more frames to circulate on the network at the same time.

4.2 Ethernet Concepts

Ethernet (802.3) is currently the most widely used LAN protocol in the world. Since its introduction to the marketplace in the 1970s it has been established among a wide range of users.

Invented by Xerox** in the early 1970s and brought to the marketplace as Ethernet V.1, the protocol was then developed by a consortium of DEC**, Intel** and Xerox. This consortium brought out a new version of Ethernet in 1980 called Ethernet (DIX) V2. They also published the architecture and took it to the Institute of Electrical and Electronics Engineers (IEEE) to have it accepted as an international standard. The IEEE ratified the Ethernet DIX V2 standards with some slight modifications as IEEE 802.3. The 802.3 standard has since been approved by a number of other organizations including the American National Standards Institute (ANSI) and the International Organization for Standardization (ISO 8802-3). Today both Ethernet V2 and 802.3 LANs are widely implemented across all areas of the marketplace.

CSMA/CD

Carrier Sense Multiple Access with Collision Detection (CSMA/CD) is the name of the protocol used on the Ethernet (802.3) bus to control the operation of the network. An example of CSMA/CD is shown in Figure 2.

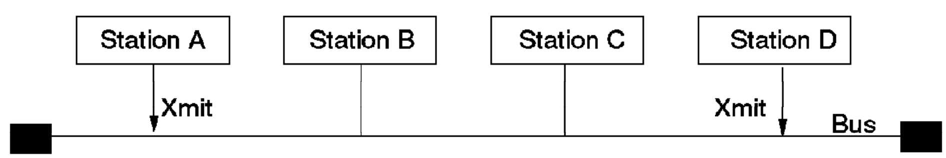


Figure 2. Ethernet CSMA/CD Bus

In a CSMA/CD bus, when a station wants to transmit data on the network bus, it first listens to see if the bus is free (that is, no other station is transmitting). If the bus is available, the station starts transmitting data immediately. If the bus is not available (that is, another station is transmitting), the station waits until the activity on the bus stops and a predetermined period of inactivity follows before it starts transmitting.

If a *collision* occurs (that is, another station starts to transmit at the same time), the stations will stop transmitting data immediately after the collision is detected, but they continue to transmit a jamming signal to inform all active stations about the collision.

In response to this signal, each transmitting station stops transmitting and backs off before attempting to transmit again. This causes each station to wait for a random amount of time before starting the whole process again beginning with the process of carrier sensing. If a station′s subsequent attempt results in another collision, its wait time will be doubled.

This process may be repeated up to 16 times, after which the station, if still unsuccessful, reports a transmission error to the higher layer protocols.

Ethernet Topologies

In an Ethernet (802.3) network, various types of cables can be used to provide the physical link between the workstations. The media used can be thick or thin coax, twisted pair, or fiber optic cable.

Thick coax is also known as 10Base5 or Thicknet. Thin coax is also referred to as 10Base2 or Thinnet. When using coax (thick or thin), this cable acts as the bus to which the workstations are connected. In the case of thick coax, an external transceiver is required. A transceiver is a device which permits the attachment of a workstation cable to the Ethernet. In the case of thin coax, the transceiver can be an external device or mounted onboard the network interface card (NIC).

Coax networks do not require structured wiring in the building, which makes them ideal for use in old buildings. However, they have the disadvantage of not providing management capability and fault isolation. For example, a break in the bus cable will render the whole network idle because all workstations are attached in line along the cable.

To enable the use of structured wiring in an Ethernet environment, a standard known as 10BaseT has been developed which provides a point-to-point link between the workstations and a central *hub* over twisted pair wiring. The hub contains a Multistation Access Unit (MAU) function on each of its ports. It also contains a repeater function which allows these point-to-point segments to communicate with each other. The hubs can also be connected to extend the size of the network and the number of stations that can be attached to them.

Because of the existence of hubs, a 10BaseT network provides a much better management and fault isolation capability than the coax-based networks.

Fiber optic cables are used to provide point-to-point links, typically as a *backbone* between concentrators, to interconnect buildings or cross long distances within a building. However, it is also possible to use fiber optic cables as a means of providing connections to workstations. There are various standards covering the use of fiber optic cables in an Ethernet (802.3) environment. These standards are described briefly in the following sections.

The physical size of a network and the number of stations attached to it varies according to the type of medium used to construct the network. However, users can build a network consisting of mixed topologies by using repeaters and bridges. Also, such mixed topologies are made possible by intelligent hubs such as the IBM 8250, which provide various repeater, bridge, media and management functions via a number of modules which can be installed in the hub. The following sections provide a brief description of the various standards used in Ethernet (802.3) networks.

10Base5 (Thicknet)

The names given to the IEEE 802.3 standards provide some information as to the capabilities and requirements of the implementation. In the case of 10Base5 they have the following meaning:

- 10 indicates the data rate (10 Mbps)
- Base indicates the transmission type (Baseband)
- 5 indicates the maximum cable length (500 meters)

10Base5 (thicknet) uses a very high quality coaxial cable for the bus. This cable is very thick (10 mm in diameter) which makes it difficult to manipulate particularly if it is being run into work areas and needs to go in and out of ducting. The cable is generally marked every 2.5 meters to indicate where transceivers can be attached.

Attachment of workstations to the coaxial cable is done by attaching a transceiver to the cable and attaching the workstation to the transceiver via an AUI (Attachment Unit Interface) cable. This is shown in Figure 3.

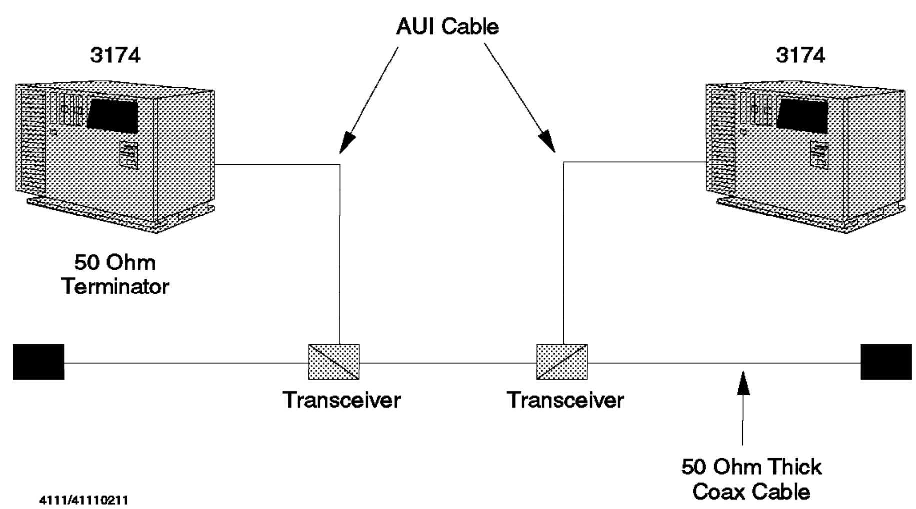


Figure 3. 10Base5 Segment

Note that terminators are used at both ends of the segment to prevent the signal from being reflected back when it reaches the end of the segment.

In modern environments 10Base5 topology is not very practical. The difficulties of manipulating the bus cable, rerouting AUI cables, attaching transceivers, etc., means that installations of this nature are inherently inflexible and unable to accommodate the rate of change that is expected of most local area networks today.

Despite the drawbacks associated with this type of installation, 10Base5 has been widely installed. The use of multiport transceivers with a thinner and more flexible five meter transceiver cable has made it somewhat easier to add or remove workstations and enable most connections to be made without having to manipulate the thick coaxial cable. Also, despite the fact that 10Base5 has become less popular for providing access to the LAN directly it is still widely used, particularly in situations where relatively few attachments are required and change is limited.

10Base2 (Thinnet)

As a means of addressing the problems associated with 10Base5, the 10Base2 standard was defined.

The name 10Base2 was chosen because of the characteristics of this type of network as shown below:

- 10 indicates the data rate (10 Mbps)
- Base indicates the transmission type (Baseband)
- 2 indicates the maximum cable length (200 meters)

Note: the actual length permitted on a 10Base2 segment is 185 meters.

10Base2 uses a much lower grade of coaxial cable than 10Base5. The cable is also a lot thinner and more flexible which makes it easier to manipulate and capable of being brought right up to the workstation. This, in conjunction with the fact that the 10Base2 transceiver function is generally integrated into most of the Ethernet adapters, provides the user with the option to connect the workstation to the bus directly and avoid the use of AUI cable. However, because of the lower quality of the cable, there is a reduction in both the segment length available and number of transceivers supported when compared to 10Base5.

A 10Base2 segment consists of a number of thin coax cables connected to each other via a number of T-connectors. In addition to connecting the two cables together, a T-connector provides a BNC connection for attaching the workstation. The use of BNC type connectors makes adding and removing transceivers a straightforward task in a 10Base2 network.

Because of the relative simplicity of running and attaching stations to it, 10Base2 is often used to extend the services offered by an existing 10Base5 network. 10Base2 and 10Base5 segments can coexist in the same LAN. Repeaters or bridges can be used to connect the segments.

The advantage of 10Base5 in terms of the segment length available can be utilized for parts of the LAN where change will be minimal such as through ducts and risers to provide a backbone bus.

The advantage of 10Base2 in terms of the cable itself being easier to manipulate plus the relative ease with which transceivers can be added and removed can be utilized in areas of the LAN where changes will be made more frequently to the configuration of the network.

10BaseT

The 10BaseT standard was defined by IEEE to address the requirement of running Ethernet/802.3 over the structured cabling systems using twisted pair copper wires. Although, actually completed prior to the EIA/TIA 568 standard, a 10BaseT Ethernet (802.3) LAN requirement would be met by a cabling system that conformed to EIA/TIA 568.

The term 10BaseT stands for the following attributes:

- 10 indicates the data rate (10 Mbps)
- Base indicates the transmission type (Baseband)
- T indicates the medium (Twisted Pair)

10BaseT is a star topology in which the workstations are attached to a central *hub*. The hub acts as a multiport repeater between a number of segments in which each segment is a point-to-point connection between a workstation and a port on the hub.

A segment can also be a point-to-point connection between two hub ports. This would allow you to set up a network consisting of multiple hubs. Also, by taking advantage of bridges and repeaters (which normally are offered as modules which can be installed on these hubs), networks consisting of mixed topologies of 10BaseT, 10Base5, and 10Base2 can be constructed.

4.3 LAN Terminology

In referring to LAN devices in the context of host communication, the following terms are often used:

- Gateway
- Downstream Physical Unit (DSPU)
- Bridge

A *gateway* is the host communication server. It links the LAN to the host network, translating the LAN protocol into that used for the host link. The gateway may also reassemble frames for transmission.

A *DSPU* is the device on the LAN requiring host connection via the gateway. It is also known as a *network station*.

A *bridge* connects one LAN segment to another such that the interconnected segments appear as one logical ring. These segments may be quite close to one another, or they may be separated by great physical distances over the wide area network.

4.4 LAN Addresses

The LAN address field is six bytes (48 bits) long and usually represented as a 12-digit hexadecimal number. It is, with minor variations in format, used as the source address and the destination address in frames sent from network station to network station.

There are two different forms of LAN addresses: a universally administered address and a locally administered address.

Universally Administered Address

A universally administered address (UA) is an address assigned by IEEE and "burned" into the adapter ROM by the manufacturer at the factory. Hence, it is also known as the *burned-in address* or the *hard-coded address*.

Some manufacturers have been assigned universal addresses that contain an organizationally unique identifier. For example, IBM has an identifier of X′10005A′. All IBM Token-Ring and Ethernet cards that use the IBM Token-Ring and Ethernet chip sets have the first six digits (of the 12-digit hexadecimal address) start with X′10005A′.

IEEE ensures uniqueness of the first six digits among vendors; each vendor ensures uniqueness for the other six digits within its organization.

Locally Administered Address

A locally administered address (LAA) is an address typically administered by an network administrator and given to the adapter during customization. Because it can be changed relatively easily, it is also known as the *soft address*.

For a LAN environment without a host connection, the IEEE universal address may be useful. The advantage of using the universal address is its guaranteed uniqueness and the avoidance of local address administration. Be sure to keep a list of stations, some topology information, and the corresponding universal addresses for LAN management.

When a LAN is being set up for host connection through a gateway, the locally administered address is a more suitable implementation. The reasons are:

- Generation of future DSPU devices is impossible for burned-in addresses as you will not know what the address will be.
- If a defective adapter is replaced, you will not have to update the customization to include the new address.
- From an operational point of view (CNM and LAN management) it may be useful to make the address informative and meaningful, instead of a random number.

4.4.1 Example Address Convention

The locally administered address is represented by 12 hexadecimal digits. The general format of such an address is:

```
4000cdddddddd
```

The first four digits are fixed as X′4000′. The first digit 4 indicates a locally administered address; the next three digits are reserved and set to zeros. The last eight digits may have any value less than or equal to X′7FFFFFFF′.

The following is one example of an address convention adopted for an organization. The topology information used is the subarea number of VTAM or NCP, the LAN number where the device is attached and a serial number within this LAN. One digit is used to define the station type.

LOCALLY ADMINISTERED ADDRESS (12 DIGITS)	
FIXED (4 DIGITS)	VARIABLE (LAST 8 DIGITS)
4000	abbccddd

a = Station Type: 0 — Not used (optional) 1 — 37XX Gateway 2 — 3174 Gateway 3 — PS/2 DSPU 4 — 3174 DSPU 5 — AS/400 DSPU 6 — other downstream PUs 7 — reserved 8—F — not allowed
bb = Subarea number of NCP or VTAM
cc = LAN number
ddd= Unique identifier

Figure 4. Locally Administered Adapter Addresses

4.4.2 Getting the 3174 LAN Universal Address

After proper installation of the LAN Adapter, you may obtain its burned-in or universal address by following the steps presented here.

The alphabetic characters of the universal address appear as other symbols; for this reason, the following table is included to help the user to correctly interpret them.

Bits 4-7	Character displayed
A	- (dash)
B	E
C	H
D	L
E	P
F	(blank)

- Insert the Utility diskette into diskette drive 1.
- At the operator panel, press and hold the Alt 1 key.
- Holding the Alt 1 key, press and release the IML key.
- When 40 is displayed, press Enter.
- The display connected to port 26-00 will show the Master Menu.
- Enter a 4; the Diagnostic Test Menu appears.
- If you have a Token-Ring Adapter, enter 3110
  31 is the hardware group (HG) of the adapter.
  10 is the function code (FC) to display universal address.
- 16 digits, for example 453510005A939428, will be displayed. In this example,

4535 is the status code
10005A is IBM′s manufacturer ID
(the first two bits in byte 0 of a UA are 00)
(the first two bits in byte 0 of an LAA are 01)
939428 is the unique portion of this adapter address.

- If you have an Ethernet Adapter, enter 4110
  41 is the hardware group (HG) of the adapter.
  10 is the function code (FC) to display a universal address.
- 16 digits, for example 308210005AC80048, will be displayed. In this example,
  3082 is the status code
  10005A is IBM′s manufacturer ID
  (the first two bits in byte 0 of a UA are 00)
  (the first two bits in byte 0 of an LAA are 01)
  C80048 is the unique portion of this adapter address.
- To make another selection, press Enter.

4.5 3174 Gateways

This section addresses the 3174 LAN feature; however, you should be aware that there are other IBM gateways available. The most suitable gateway will be determined by factors such as the function required, your budget and in many cases on what hardware is already installed.

Other IBM gateways include:

- 3720, 3725 or 3745 Communication Controllers with ACF/NCP and NTRI implemented. This can be used as a very high performance gateway for large token-ring networks as it supports very fast host links and has the benefit of being able to route traffic at the session level.
- The IBM 3172 Interconnect Controller can be used as a local (channel attached) gateway in situations where only a dedicated controller is required (no other device support).
- A PS/2 with OS/2 Communications Manager/2 can be used as a remote gateway for smaller LANs.
- A PS/2 with DOS and an emulator such as Personal Communications/3270 can also be used as a gateway but this is again less functional.

4.5.1 Advantages

Some of the advantages and benefits of the 3174 LAN Gateways are:

- It can be installed in a wide variety of configurations such as local and remote, both 4 Mbps and 16 Mbps for token-ring gateway and 10 Mbps for Ethernet gateway with multiple host support.
- Easy customization and maintenance

  Personnel experienced in customizing the 3174 will have to learn only a few new parameters. These new parameters have default values which, in most cases, will produce ready-to-run configurations.

  Customization for backup units can be avoided if the Copy Customizing Data procedure is used. The Upgrade Microcode procedure allows the customer to upgrade the microcode level of the 3174 gateway. Each procedure will take about two minutes.

- Ring Error Monitor (REM) and Token-Ring Error Alerts facility of the token-ring gateway.

  This facility allows the token-ring errors to flow through the gateway and be reported to NetView in the host as alerts. As several 3174 Token-Ring Gateways can be active at the same time in the token-ring network, additional information can be added to identify which gateway is reporting the alerts.

- Triple function gateway/controller/APPN node

  The 3174 LAN Gateway can also be used as the controller for its attached terminals, as well as a network node for EN,s and LEN,s.

- Efficient backup/recovery

  It is possible to define and IML two 3174 LAN Gateways with the same LAN addresses. The gateway which finishes the IML first will become the active gateway and the other will become the backup gateway. See 4.12, "Backup and Recovery" on page 143.

- Performance versus cost

  The 3174 local gateway can handle from 35 to 40 transactions per second with a utilization of 65 to 70% at a relatively low cost.

- Reliability

  Because the 3174 is dedicated to providing host access to its supported devices, it is not affected by other things happening in the network. A PS/2 gateway, if not dedicated, may require re-booting if a hang occurs in a user program and this would disrupt all users of the gateway.

  If a problem does occur on a 3174, it can be restarted without affecting a large part of the network such as would occur if a 37xx required an IML.

4.5.2 Multi-Host Gateway

One of the major differences between the gateways is the host routing capabilities. In an SNA network, the subarea network has routing designed into it. This is implemented in the SNA layers of VTAM and NCP and it means that with just a single link, a user can access any application in the network so long as it resides on one of the host processors which form part of that network. If you need to access a host processor in another network, then you can use the SNI (SNA Network Interconnect) implementation at the NCP level.

For many reasons, such as complexity, security and software compatibility, many customers choose not to implement SNI. Also, if one of the host processors is an AS/400 or any other processor type which will communicate downstream to a PU T2.0 but not participate in the SNA subarea routing, then an alternate means of connectivity is required.

The routing provided by the 3174 is at a physical level rather than the dynamic routing of the subarea network. You define each terminal's connection at customization time and if the user wishes to change hosts, it is done by hot-keying.

So, the 3174 multi-host support can be used to provide simultaneous access to multiple hosts, either in the same network or in other networks and to a wide variety of hosts in a simpler manner than the NCP gateways; however you will need to install a separate line to each 3174 which requires these additional connections. The SLMH (Single Link Multi-Host) support now available in the 3174 (see 9.3, “Single Link Multi-Host Support” on page 342) improves on this situation but it is still different to NCP routing.

Consider the differences between using SNI and 3174 SLMH. With SNI, only one link is required for anyone in the network to have access to another host. The session is set up by VTAM and the user may be entirely unaware that he or she is connected to a different network.

To achieve this using the SLMH feature of the 3174, a gateway and a separate line would have to be set up on each LAN in the organization where a user requires access to the other network. The user would hot-key to the other session when changing from one host to the other. The decision then comes down to:

- How many users need access to other hosts
- Where they are located
- What kind of hosts
- How much you want to spend on communication lines

4.5.3 Ring Error Monitor or Token-Ring Error Alert for Token-Ring Gateway

The 3174 Token-Ring Gateway microcode includes a function to report token-ring errors to the host. This function is called the Ring Error Monitor or Token-Ring Error Alert; it performs analysis of non-random error conditions on a realtime basis. In case of a failure of one of the stations in the ring, the REM or Token-Ring Error Alert derives information indicating the two consecutive adapters and the media in between them most likely to be causing a failure. Other types of ring errors are also accumulated and reported to NetView when thresholds have been exceeded. The information is presented to the host on the SSCP-PU session in the form of alerts, link events and PD statistics.

This is one of the advantages of the 3174 Token-Ring Gateway compared to the NCP gateway. It presents information about the entire Token-Ring Network to the host, while the TIC (the Token-ring Interface Coupler used on the 37xx Communication Controllers) is only able to report its own status. Token-Ring errors are shown at the operator panel of the 3174 as 5xx and 8xx status codes, and hardware errors of the Token-Ring Adapter are shown as 3xx status codes.

Note: When you elect to customize for the Ring Error Monitor, you must also customize for the Alert function, otherwise the REM data cannot be sent up to the host.

4.5.4 Gateway LAN Adapters

There are four 3174 LAN Adapter features which provide gateway support:

- Feature #3025
- Feature #3026
- Feature #3044
- Feature #3045

Feature #3025

Feature #3025 is now obsolete. It was limited to 4 Mbps and did not support the Early Token Release or the larger ring frame size. It will not be covered in any detail here; however, you may consider it compatible with the new adapters providing they are installed at 4 Mbps and do not use Early Token Release or greater than 2KB frames. Feature #3025, if installed, can be recognized by the card type 9350.

Features #3026 And #3044

Feature #3026 and feature #3044 both use the same hardware adapter. This is card type 9351. The difference between them is that feature #3026 comes with Configuration Support-S and feature #3044 does not have any microcode included. To use feature #3044 as a gateway, you need to have Configuration Support-B or Configuration Support-C installed on your 3174.

Notes:

1. Feature #3026 can be used with Configuration Support-B or Configuration Support-C and you will get the same function as feature #3044. However, you will pay more for this configuration as the price of feature #3026 includes the price of the Configuration Support-S Licensed Internal Code.

2. Feature #3044 will work with Configuration Support-S but unless you have already installed feature #3025 or #3026 on your 3174, you will not be licensed to use Configuration Support-S. Keep in mind that Configuration Support-B or Configuration Support-C provides additional functions, such as multi-host gateway support and group polling.

When you order the gateway feature, you will also receive a 2.4 m (8 ft) adapter cable with a connector to the adapter on one end and an IBM Cabling System data connector at the other end, which can be inserted into an IBM 8228 Multistation Access Unit port or an 8230 Controlled Access Unit Lobe Attachment Module port.

Features #3045

Feature #3045, which is card type 9344 and 3174 Configuration Support-C Release 4 or Release 5, facilitate the 3174 to attach to Ethernet LANs in configurations similar to token-ring configurations supported by the same models of the 3174. This feature provides IEEE 802.3 and Ethernet DIX Version 2 frame format network support. It provides the interface to attach to 10Base5, 10Base2, and 10BaseT networks using one of the following three connectors on the adapter:

- 1OBase5 15-pin D-SUB
- 10Base2 BNC
- 10BaseT RJ-45

Gateway Models Required

The LAN Gateway feature can be installed on any 3174 models except:

- DSPU 3174 Models x3R or x4R
- Smaller 3174 Models 8xR and 9xR

Notes:

1. The Model 90R comes with the gateway already installed.
2. A 3174 with a token-ring gateway (feature #3044 and Configuration Support-B or Configuration Support-C) installed can be customized as a DSPU. You may find this useful for contingency planning (see "Scenario 5: Alternate IML" on page 151).

4.5.5 Gateway Microcode

The gateway is supported by 3174 microcode Configuration Support-S, B or C.

If you are installing feature #3026 you will get Configuration Support-S Control and Utility diskettes to replace your existing Configuration Support-A diskettes. Configuration Support-S, unlike Configuration Support-A, does not support BSC communication, X.25, nor will it operate as a DSPU.

Configuration Support-B or C is the preferred microcode level to use for the 3174 LAN Gateway. It has more function than Configuration Support-S for gateway support and it is still being enhanced, whereas Configuration Support-S will not have any new functions added.

Some Configuration Support-B or C features not supported by Configuration Support-S include the following:

- Group polling
- Support for 250 DSPUs
- Single link multi-host support
- Multi-host gateway (CCA access from gateway)
- X.25 gateway support (via RPQ)
- Duplex multi-point support

Configuration Support-C supports the functions available in Configuration Support-B; in addition, it supports:

- Advanced Peer-to-Peer Networking
- Peer Communication
- Integrated Services Digital Network
- Ethernet
- Frame Relay Communication
- Optimizing Token-Ring T1 timer and retry count
- DLUR

See the appropriate chapter in this document for further information.

4.5.6 Gateway Storage

The amount of 3174 storage required to support the gateway feature depends on:

- Which level of microcode you use

  Configuration Support-B or C is functionally richer than Configuration Support-S but it requires more storage.

- How many DSPUs will be attached to this gateway

To calculate the controller storage required, see Appendix E, "3174 Storage Requirements" on page 755.

For a start, if you are installing a gateway with Configuration Support-B or C, you will need at least 2176KB of storage, which is enough to support up to 28 DSPUs. With 3MB of storage you can service up to 72 DSPUs.

If you installing a gateway and require the Advanced Peer-to-Peer Networking and Peer Communication functions of Configuration Support-C, the minimum storage required is 4MB.

Storage is available for the 3174 in either 1, 2 or 4MB increments to a maximum of 6 MB on the Models 1xx, 2xx, and 6xx. We recommend that you use the larger increments if feature slots are scarce; the storage cards in the large 3174s occupy the same slots as some of the feature cards.

Be aware that the older 3174s (Models 0xx and 5xx) have only 1MB base storage and the newer 3174s (Models 1xx, 2xx, and 6xx) have 2MB of base storage.

Model 90R Gateway Storage

The Model 90R deserves special mention when it comes to calculating storage for your gateway. It uses a subset of Configuration Support-B and has a maximum of 2MB storage. Hence, it has limited capabilities and does not support DSL devices, CSCM, MLT, and so on. However, it is has one base 3270 coax port for attaching one terminal directly (or eight terminals via a 3299 Terminal Multiplexer) and is able to support up to 40 DSPUs as a token-ring gateway.

4.5.7 Devices Supported

The 3174 LAN Gateway feature with Configuration Support-B or C can support up to 250 DSPUs while Configuration Support-S can only support up to 140 token-ring attached DSPUs.

The actual number of DSPUs you should have going through a 3174 LAN Gateway will depend on several factors, including:

- Speed of the upstream communication port(s)
- Response time required
- Use of group polling on remote gateways
- Volume of traffic expected to flow through the gateway
- Storage available in the 3174
- Number of terminal devices attached to the gateway

Devices which can be attached to the 3174 LAN Gateway as DSPUs include the following:

- 3174 Models x3R and X4R
- PC or PS/2 using APPC/PC
- System/36 PU using APPC
- System/36 using 3270 emulation
- AS/400 PU using APPC
- AS/400 using 3270 emulation
- IBM RT System using OEM 3270 emulation
- IBM RS/6000 using OEM 3270 emulation
- IBM 9370
- PC or PS/2 with 3270 Workstation Program 1.1
- PC or PS/2 with OS/2 EE 1.1 or later
- PC or PS/2 with PC 3270 Emulation Program V3.0 operating as a PU
- PC or PS/2 with Personal Communications/3270, either as a stand-alone station or as a gateway for other downstream users
- PC or PS/2 with Communications Manager/2

Note: A PC using PC 3270 Emulation Program V3.0 is a PU through the 3174 LAN Gateway when configured as a:

- Stand-alone station.
- Gateway, supporting other PCs configured as network stations.

  The PC gateway is defined as a DSPU in the 3174 LAN Gateway; the PC network stations are defined as LUs in the PC gateway but are not defined in the 3174 LAN Gateway.
- Gateway with network station; that is, it is a both a gateway supporting other PCs configured as network stations, as well as a network station in its own right.

The number and type of SNA LUs supported by each PU are transparent to the 3174 LAN Gateway. Each DSPU attached to the LAN appears to the host as an addressable PU T2.0.

The local channel attached gateway can only be an SNA device and the DSPUs are addressed as contiguous sub-channel addresses starting from the gateway address.

DSPUs attached to a remote SDLC gateway are addressed as multi-point controllers with contiguous addresses starting from the gateway address.

During customization of the 3174 LAN Gateway a range of LAN addresses for DSPUs are defined. The 3174 LAN Gateway will provide services to DSPU devices with these addresses. If DSPUs have to be added or deleted, a re-customization of the 3174 LAN Gateway is necessary to update the address list.

Coax Attached Devices

Apart from performance considerations, the 3174 LAN Gateway does not affect the operation of the 3270 displays and printers, or intelligent workstations, attached by coax to the 3174.

4.5.8 Host Software Required

The minimum levels of host software required to support the 3174 Token-Ring Gateway are:

- ACF/VTAM under MVS, VM and VSE

  VTAM Version 2 Release 1 and later support the 3174 Token-Ring Gateway.

- ACF/NCP V4.3.1 or V5.2.1 if group polling is required (see 4.7.7, "Group Poll" on page 110). Otherwise no specific version or release is required as the remote 3174s; both gateway and DSPU configurations will appear as controllers on a multi-point line.

- NetView Version 1

- Application programs supporting 3274-41A with Configuration Support-D Rel. 65 need not be altered, unless they interpret certain SNA sense information (see *3174 Planning Guide*).

For a list of the software maintenance required for 3174 Token-Ring Gateway support, see Appendix F, "APARs" on page 779.

The minimum levels of host software required to support the 3174 Ethernet Gateway are:

- ACF/VTAM under MVS, VM

  VTAM Version 3 Release 4 and later support the 3174 Ethernet Gateway.

- ACF/NCP Version 6 Release 1 and later

- NetView Version 2 Release 3

4.6 3174 Local Gateway

The 3174 local gateway is an easy and efficient way to connect DSPU devices to the host. Because it is channel attached, it can handle a very high throughput. The gateway feature can be installed on any 3174 Model xxL configured as an SNA controller.

The following sections describe the environment and definitions required to install a local gateway. See 4.7, "3174 Remote Gateway" on page 99 for similar details on remote gateway installation.

Most of this information is documented from installation experiences at our test facility. Figure 5 on page 85 illustrates the configuration we used.

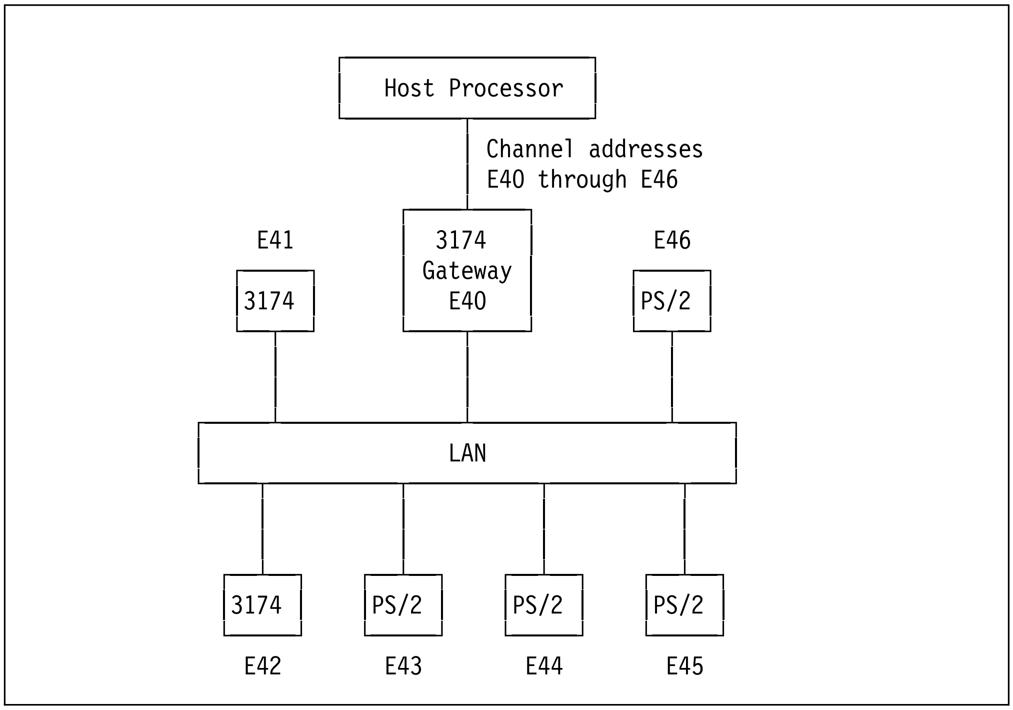


Figure 5. 3174 Local Gateway Configuration

4.6.1 System Definitions

The 3174 local gateway is supported in the following operating system environments:

- MVS
- VM/SP
- VSE (token-ring gateway support only)

Host Addressing

In all of these environments, when using a 3174 local gateway, a LAN device becomes an SNA PU with attached LUs. Each PU appears to VTAM and to the host operating system as if it was a local SNA 3270 control unit. Within VTAM each control unit (PU) is identified by its own separate channel address. The 3174 local gateway resolves this channel address to the device's LAN address by use of an internal table that is defined during customization.

Thus, to begin your host I/O (and VTAM planning), you need to identify the PU requirements for your LAN. Then you need to define for your operating system the channel addresses for the PUs. See 4.5.7, "Devices Supported" on page 82 for a list of downstream devices requiring a defined channel address.

In our example, we have a 3174 local gateway and six PUs using it as a gateway. The addresses defined are E40 for the 3174 local gateway, and E41, E42, E43, E44, E45 and E46 for the DSPUs (a total of seven addresses).

Due to past procedures for addressing devices, to have proper operation of the 3174 local gateway you should:

- Ensure that the host IOCP and host operating system address range start on a hex 16 boundary. That is, the last digit of the address is 0. For example, 200, 240, 2C0, 480, and 860 are valid.
- Try to have the address range defined to the host consist of a multiple of eight devices. That is, the last address will end in hex ′7′ or hex ′F′. The following represent valid ranges:
  – 200 through 207 (8 addresses)
  – 200 through 20F (16 addresses)
  – 200 through 21F (32 addresses)

For our example with six DSPU devices you should, at a minimum, define to the host (IOCP and IO gen) the address range of E40 through E4F.

These are not 3174 restrictions; the 3174 base address does not need to start on a 0 boundary nor does it require a multiple of eight addresses defined. These limitations exist within IOCP and the operating system IOS subsystems. Since I/O and host IOCP generations are not quickly implemented, you should consider defining extra device addresses. A recommendation is to use larger address ranges of 16 or 32 devices for the I/O generation. Thus, instead of generating 16 devices for our simple example above, we would define a block of 32. In VM systems it is mandatory to do this; in MVS and VSE, this addressing is desirable.

Be aware, however, that in defining extra devices, the unused addresses may cause operator messages at host IPL time indicating these addresses are not available. Unused addresses also consume storage on the 3174 and the host.

In addition, you should ensure that the channel having the 3174 local gateway has an appropriate address range to allow for future growth.

Host I/O Configuration Definitions

There are some special considerations for the IOCP when defining the 3174 local gateway because of the number of devices addressed. A non-gateway SNA 3174 supports only one I/O address at a time, whereas the gateway has several.

It is important that you review the following differences and restrictions.

For 370 mode channel operations the unit control word (UCW) sharing differs between the gateway 3174 and the non-gateway 3174. These differences are illustrated in the following table.

Table 3. 3174 Local Gateway IOCP Requirements

Channel Type	Non-gateway 3174	Gateway 3174 (and DSPU Devices)
370 Byte	Non-shared	Shared for 308x or 3090 otherwise non-shared
370 Block	Non-shared	Shared
370/XA Byte	Non-shared	Non-shared
370/XA Block	Non-shared	Shared or non-shared

To specify shared status you code the SHARED= parameter with either Y or YB. Y should be used for S/370 block mode. In 370 and XA byte mode SHARED=N is required. 370 XA block may be specified with YB or N.

For IOCP definitions treat the 3174 LAN Gateway and the LAN addresses as 3791, 3705, or 3725 controllers. Typically a 3791 definition is used with MVS and either 3705 or 3725 with a VM system to agree with the SCP's Input/Output. Since the UNIT=parameter content on the CNTLUNIT statement is not validated, many users are now coding UNIT=3174S (S for SNA) for documentation purposes rather than using 3705, 3725, or 3791L.

The 3174 requires that PROTOCL=D be specified.

Warning

The 3174 local gateway and its associated channel address range must be defined in a *single* CNTLUNIT IOCP statement. Use of multiple CNTLUNIT statements can cause IOS071I Start Pending errors or performance problems.

It is also recommended that the beginning address in the UNITADD parameter ends with hex 0 and that the number of addresses should be a multiple of eight. Remember that the 3174 is fooling the system into thinking that there are multiple real SNA 3174 controllers attached when there is really only one. To make this work correctly the single statement is required to inform IOCP scheduling of only one 3174. A hex 0 boundary for the first address with a multiple of eight makes the definition more consistent with older control units having multiple addresses. The use of xx0 address and multiple of eight addresses will prevent any IOCP (or operating system) scheduling mistakes that could be caused by scheduling techniques that would assume these boundaries.

MVS Definitions

An IODEVICE macro must be coded for the 3174 local gateway and the attached DSPUs. The UNIT parameter of the IODEVICE macro must be coded 3791L. The ADDRESS parameter of the IODEVICE macro allows specification of multiple LAN attached devices. In our example we have coded a range of 16 addresses.

The definition for our example 3174 local gateway is shown in Figure 6.

```
     DEVE40  IODEVICE  UNIT=3791L,ADDRESS=(E40,16)
```

Figure 6. MVS 3174 Local Gateway Definitions

Note: For Models 12L and 22L, the IODEVICE macro is coded 3174.

VM/SP Definitions

The following examples are valid VM definitions for the 3174 local gateway and the attached DSPUs. These definitions can be used if the gateway is attached to a virtual guest machine (for example, VSE/VCNA) or if the gateway is attached to the native VTAM directly under VM.

The definition for our example 3174 local gateway is shown in Figure 7 on page 88.

```
RDEVICE ADDRESS=E40,DEVTYPE=3705,ADAPTER=TYPE4,MODEL=H8,        X
      CPTYPE=NCP
RCTLUNIT ADDRESS=E40,CUTYPE=3705,FEATURE=16-DEVICE
RCHANNEL ADDRESS=E,CHTYPE=BLKMPXR
```

Figure 7. VM Local Gateway Definitions

The FEATURE parameter of the RCTLUNIT macro specifies the maximum number of attached DSPUs supported by a single 3174 local gateway. The value given in the FEATURE parameter must be a multiple of eight.

The definitions for our example DSPUs are shown in Figure 8.

```
RDEVICE ADDRESS=E41,DEVTYPE=3705,ADAPTER=TYPE4,MODEL=H8,       X
      CPTYPE=NCP
RDEVICE ADDRESS=E42,DEVTYPE=3705,ADAPTER=TYPE4,MODEL=H8,       X
      CPTYPE=NCP
RDEVICE ADDRESS=E43,DEVTYPE=3705,ADAPTER=TYPE4,MODEL=H8,       X
      CPTYPE=NCP
RDEVICE ADDRESS=E44,DEVTYPE=3705,ADAPTER=TYPE4,MODEL=H8,       X
      CPTYPE=NCP
RDEVICE ADDRESS=E45,DEVTYPE=3705,ADAPTER=TYPE4,MODEL=H8,       X
      CPTYPE=NCP
RDEVICE ADDRESS=E46,DEVTYPE=3705,ADAPTER=TYPE4,MODEL=H8,       X
      CPTYPE=NCP
```

Figure 8. VM Local DSPU Definitions

With Configuration Support-S, where the 3174 Token-Ring Gateway supports a maximum of 140 DSPUs, the FEATURE parameter should be coded as follows to support the full number: FEATURE=144-DEVICE.

With Configuration Support-B or Configuration Support-C, where the 3174 LAN Gateway supports a maximum of 250 DSPUs, the FEATURE parameter should be coded as FEATURE=256-DEVICE.

The value given in the ADDRESS parameter of the RCTLUNIT macro must end with a 0.

An RDEVICE macro must be coded for the gateway itself and for each LAN attached 3174 or workstation PU.

Warning

If there are more DSPU definitions in the 3174 LAN Gateway than VM RDEVICE macro definitions, any attempt to bring up the gateway will lead to a VTAM hang.

VSE Definitions

VSE/SP 2.1 will not automatically recognize and generate ADD statements for locally attached 3174 Models 01L, 11L, 12L, 21L, and 22L. The user must manually include ADD statements, as shown in Figure 9 on page 89.

For the Gateway:

```
ADD E40,3791L,EML
```

For the DSPUs:

```
ADD E41,3791L,EML
ADD E42,3791L,EML
ADD E43,3791L,EML
ADD E44,3791L,EML
ADD E45,3791L,EML
```

Figure 9. VSE Local Gateway and DSPU Definitions

The emulation parameter (EML) is necessary to inform VSE/SP 2.1 that the 3174 Models 01L, 11L, 12L, 21L or 22L is to be handled as a 3274-A41.

VTAM Definitions

If *n* LAN nodes are supported through a single 3174 gateway, *n+1* VTAM PU macros must be coded for local, channel attached SNA controllers. A sub-channel address must be defined for the gateway and each LAN attached 3174 or workstation PU. The sub-channel address assigned to the gateway must be the lowest address in the LAN, and all sub-channel addresses must be contiguous.

In VTAM Version 3.1.1, the SECNET parameter of the PU macro must be set to YES for all DSPUs but not for the gateway itself.

The size of the host buffers multiplied by the number of host buffers must be large enough to accommodate:

- Link Header (min. 4 bytes, max. 32 bytes) (LH)
- Transmission Header (TH)
- Request Header (RH)
- A minimum of 256 bytes of user data (RU)

The size of the host buffers is defined in the ACF/VTAM start options:

- MVS: the buffsize value of the IOBUF buffer pool
- VSE: the buffsize value of the LFBUF buffer pool

The number of host buffers is defined in the MAXBFRU parameter of the PU macro for the local SNA minor node.

4.6.2 3174 Customization

If the LAN feature is installed on a 3174 already used as a non-SNA or as an SNA channel attached controller, a new customization must be performed with Configuration Support-S, Configuration Support-B or Configuration Support-C, depending on the type of the LAN. If the 3174 was used as a non-SNA controller, the host system definitions must be done again. Remember that the gateway customization can be done in any model of the 3174. (At IML time, the 3174 will determine whether there is any incompatibility between the hardware and the microcode.)

Only those customization questions dealing with the LAN Gateway feature are discussed in this chapter. The 3174 microcode level used is Configuration Support-C Release 5. See Chapter 10, “Connectivity Customization Examples” on page 351 for 3174 LAN Gateway customization examples.

Question 100: Model Designation

Enter *xxL* in response to this question, since the gateway is a channel attached model, where xx is the appropriate model number as written on the box label.

Question 101: Host Attachment

Enter a *5* (SNA-Channel) in response to this question if single host support is required.

Enter an *M* in response to this question if multi-host support is required. If multi-host is chosen, you will be presented with a customization screen for each host you define. Multi-host is covered in more detail in Chapter 9, “Multi-Host Connectivity” on page 331.

Question 102: LAN Adapter Type

The response to this question depends on the LAN Adapter type.

- 1 = Token-Ring
- 2 = Ethernet

Question 080: Token-Ring Address

This question appears if you specify a 1 for question 102.

The response cannot be all zeros. The format of the address is:

```
4000cddddddd
```

Where 4000 is the fixed part of the address
c must not be greater than X′7′
d can be any value from X′0′ to X′F′

See 4.4.1, “Example Address Convention” on page 75.

Question 082: Token-Ring Speed

The response to this question specifies the token-ring speed of the LAN.

- 0 = 4 Mbps - Normal token release
- 1 = 16 Mbps - Normal token release
- 2 = 16 Mbps - Early token release

Note that:

- Response 0 is valid for both feature #3025 and #3044 (Adapter type 9350 and 9351) and it is the default value.
- Response 1 and 2 are valid only for feature #3044 (Adapter type 9351).

Question 084: Ethernet Address

This question appears if you specify a 2 for question 102.

The response cannot be all zeros and the format of the address is similar to question 080.

Question 086: Ethernet Media Type

The response to this question specifies the media type of the Ethernet network.

- 2 = 10Base2
- 5 = 10Base5
- T = 10BaseT

Question 088: Ethernet Frame Format

The response to this question specifies the type of Ethernet frame format you are going to use.

- 1 = IEEE 802.3
- 2 = Ethernet V2
- 3 = Both

The default value is 1.

Question 104: Control Unit Address

Enter the two-digit address of the gateway.

The host system recognizes this as the I/O address assigned to the 3174 LAN Gateway SNA PU. For example, enter 40 if the CUADDR parameter of the VTAM PU macro for the gateway has been coded E40 (E being the channel address).

Question 105: Upper Limit Address

This question works, in conjunction with question 104, to set the range of channel addresses that the 3174 will recognize. Question 104, the lowest actual sub-channel address, and question 105, the upper sub-channel address, provide the range of sub-channels used by the gateway feature. This range defines the number of DSPUs being configured. The sub-channel range is checked to ensure that it does not exceed the maximum number of DSPUs supported by the feature (plus one for the gateway itself). The response to question 105 minus the response to question 104, therefore, cannot be greater than 140 (X′8C′) for Configuration Support-S and 250 (X′FA′) for Configuration Support-B and Configuration Support-C.

Addresses reserved (even if they are not used) cannot be used by other devices on the channel.

If you do not want to define any DSPUs attached to the 3174, your response to question 105 must be 00 or must be equal to the response to question 104. This prevents the LAN customization panels from being presented.

Question 150: Token-Ring Network Gateway

This question applies to Configuration Support-B and requires a single-digit response. (There is no equivalent question in Configuration Support-S since it is intended specifically to support the Token-Ring Gateway feature).

Enter a 1 to include gateway support.

Question 150: Gateway (LAN and ISDN)

This question applies to Configuration Support-C and requires a two-digit response.

Enter a 1 in the first digit to include LAN gateway support. (The second digit response specifies whether you wish to include ISDN gateway support.)

Question 223: Attention Delay Value (SNA)

Although attention delay is not implemented for the 3174 LAN Gateway feature, enter any value between 10 and 99 (ms) to go to the next customization panel. Therefore, any response entered here will be ignored by the gateway microcode.

Question 900: LAN Address and SAP

The format of the LAN Adapter address and SAP is:

4000cddddddd ss

Where 4000cddddddd is the LAN Address specified in question 080 or 084
ss is the SAP address and defaults to X′04′

Question 905: Ring Error Monitor (REM)

This question applies to Configuration Support-S and Configuration Support-B.

The response must be:

- 1 for REM active (default response)
- 0 for REM inactive.

If your response is 1, you must turn on the alert function in question 220: Alert Function so that REM data can be sent to the host.

Question 905: Token-Ring Error Alerts

This question applies to Configuration Support-C.

The response must be:

- 0 to report critical token-ring errors:
  - Beaconing lasting more than one minute
  - Beaconing during adapter opening
  - Auto-removal of the adapter
- 1 to report critical and non-critical token-ring errors:
  - Critical errors as above
  - Temporary beaconing
  - REM-detected 3174 status codes
  - Beaconing lasting less than one minute

- 2 not to report any Token-Ring errors.

  You will probably want this response if you have more than one 3174 connected to the same host and the same token-ring.

If your response is 0 or 1, you must turn on the alert function in question 220: Alert/CMIP Event Report Function so that REM data can be sent to the host.

When the alert function in question 220 is turned on, you should be aware of its impact on question 221: 3174 Alert/CMIP Control Point.

Question 908: Link Subsystem Name

This question applies to Configuration Support-S and Configuration Support-B.

The response must be:

- Six alphanumeric characters with Configuration Support-S and Configuration Support-B Release 2 or earlier.
- Eight alphanumeric characters with Configuration Support-B Release 3 or 4.

The default value is IBMLAN.

This name should be unique (no imbedded blanks) for each 3174. You should use your installation naming conventions because the name identifies the 3174 which sends the alert to the host.

Question 908: LAN Link Subsystem Name

This question applies to Configuration Support-C.

The response must be eight alphanumeric characters (no imbedded blanks).

The default value is IBMLAN.

Question 940: LAN Address Assignment

```
                  _______ 940: LAN Address Assignment _______
                                                                  40/LOCL
                                                           Entry 001 of 006
    S       LAN Address     SAP    T          S       LAN  Address    SAP    T
    40     4000 3174 0001    04
    41     4000 3174 0002    04    1          42     4000 3174 0003    04    1
    43     4000 3001 0036    04    0          44     4000 3001 0016    04    0
    45     4000 3001 9119    04    0          46     4000 3001 0034    04    0

 PF: 3=Quit   4=Default    7=Back   8=Fwd   9=RtnH   10=PageBack   11=PageFwd
```

This question is displayed as a panel with four columns in the left half of the panel and the same four columns repeated in the right half. The panel displays as many half-line entries as are defined by the range of host addresses in questions 104 and 105. The first entry is for the gateway and cannot be altered on this panel; it is already filled based on your responses to question 900. Each of the other entries map a host sub-channel address to a DSPU LAN address.

- S address (column 1)

  Column 1 contains the sub-channel addresses. They are provided automatically and are derived from the range of addresses entered in questions 104 and 105. If the number of addresses is greater than the number of entries fitting on one panel, additional panels will be presented.

- LAN address (column 2)

  Column 2 is where you enter the 12-digit LAN address of each DSPU (see 4.4.1, "Example Address Convention" on page 75).

- SAP (column 3)

  Column 3 defines the service access point (SAP) identifier. The combination of the LAN address and the SAP ID must be unique.

  Some attaching products may appear as multiple SNA physical units. Each of these products has a single LAN address and multiple SAP IDs (refer to the appropriate installation manual for more information for the product you wish to attach). A 3174 DSPU using SLMH is an example of a device with a single LAN address and multiple SAP IDs.

  For a 3174 DSPU running Configuration Support-A, its SAP ID must be entered as 04; this SAP ID is hard-coded within the microcode. Only one link connection is maintained over this SAP.

  For a 3174 local gateway running Configuration Support-S, its SAP ID is also hard-coded as 04 and is forced during the customization (you cannot specify the SAP ID via question 900).

  The SAP ID specified must be a multiple of four in the range of X′04′ through X′EC′; the default is X′04′.

- T (column 4)

  Column 4 allows you to specify the type of device for each DSPU:

  - 0=workstation (default response)
  - 1=3174 Establishment Controller
  - 2=8KB RU devices, valid only for ESCON Attached 3174 Controllers (Q.100=12L or 22L) with Token-Ring Adapter (Q.102=1), if configured to support 8KB RU sizes (Q.241=1).

  Your response will also determine the default maximum I-frame size and maximum transmit window size (maximum-out) presented on the next panel (question 941: LAN Transmission Definition).

  A 0 response sets the I-frame size to 256 bytes and the maxout to 2. A 1 response sets the values to 2042 and 2 respectively. The 0 response is suitable for workstations. However, if you have a 3174 DSPU or any device which can handle large RU sizes then you should use the large values instead as this will improve the efficiency of the LAN.

Question 941: LAN Transmission Definition

```
                  ____ 941: LAN Transmission Definition _____
                                                                  40/LOCL
                                                        Entry 001 of 006
  S       LAN Address    SAP    F   W     S       LAN Address    SAP     F   W
  40    4000 3174 0001    04
  41    4000 3174 0002    04    3   2     42    4000 3174 0003    04     3   2
  43    4000 3001 0036    04    0   2     44    4000 3001 0016    04     0   2
  45    4000 3001 9119    04    0   2     46    4000 3001 0034    04     0   2

 PF: 3=Quit   4=Default    7=Back    8=Fwd    9=RtnH    10=PageBack    11=PageFwd
```

The LAN Transmission Definition panel first presents the default maximum transmit I-frame size (F) and the maximum transmit window size (W) based on the device type response in question 940. The default values are shown in Table 4 on page 95.

Table 4. Default F and W Values Depending on Device Type		
DSPU Device Type	**Default I-Frame Size (F)**	**Default Window Size (W)**
T=0 (workstation)	F=0 (265 bytes)	W=2
T=1 (controller)	F=3 (2042 bytes)	W=2
T=2 (8 KB RU device)	F=5 (8201 bytes)	W=2

If you wish to accept the default values, just press the PF8 key (FWD) and continue the customization process.

If you wish to change the default values, then valid entries for the maximum I-frame size are:

- 0 for 265 bytes
- 1 for 521 bytes
- 2 for 1033 bytes
- 3 for 2042 bytes
- 4 for 4105 bytes
- 5 for 8201 bytes

Notes:

1. For controllers with a 4-Mbps Token-Ring Gateway Adapter, transmit I-frame size (F) ranges from 265 to 2042 bytes.
2. For controllers with a 16/4-Mbps Token-Ring Gateway Adapter, transmit I-frame size (F) ranges from 265 to 2057 bytes.
3. For controllers with a 10-Mbps Ethernet Gateway Adapter, transmit I-frame size (F) ranges from 265 to 1493 bytes.
4. Response 5 is valid only for ESCON Attached 3174 Controllers with 16/4 Token-Ring Gateway Attachment installed.
5. In responding to this question, you need to consider the route over which data will flow. If at link activation, there does not exist a route from the 3174 DSPU to the gateway that supports the specified I-frame size, then the I-frame size is downgraded to the maximum supported by the available route.
6. The maximum I-frame size include the SNA header: six bytes for the transmission header and three bytes for the request/response header.

The maximum window size is the number of I-frames the 3174 LAN Gateway transmits before waiting to receive an acknowledgment. The valid maximum window size is based on your entry for the F field. Current implementation of this algorithm yields the following:

Table 5. Maximum Window Size Depending on Maximum Transmit I-Frame Size	
Max. I-Frame Size (F)	**Max. Window Size (W)**
0 (=265 bytes)	7
1 (=521 bytes)	7
2 (=1033 bytes)	4
3 (=2042 bytes)	2
4 (=4105 bytes)	1
5 (=8201 bytes)	1

The sub-channel address, ring address and SAP ID values from question 940 are also displayed but are protected from modification.

I-Frame Size and Window Size Considerations: This section applies only to 3174-x3R DSPUs using Configuration Support-A or Configuration Support-B Release 1 and describes the following considerations:

- The maximum transmit I-frame size (F field) in question 941 in the 3174 Token-Ring Gateway is related to the maximum receive I-frame size in question 380 in the 3174 DSPU.
- The maximum transmit window size (W field) in question 941 in the 3174 Token-Ring Gateway is related to the maximum receive window size in question 381 in the 3174 DSPU.

In Configuration Support-B Release 2 and later, questions 380 and 381 have been deleted from the customizing panels. The following default receive values are used instead:

- For a 4 Mbps token ring: I-frame size=2042 bytes, window=1
- For a 16 Mbps token ring: I-frame size=4105bytes, window=1

Accepting the default values given by the customizing procedure for the gateway and the DSPU will give an operative environment. However, you should consider the following to improve the performance of the token-ring network and the total system response time.

The I-frame sizes of the 3174 Token-Ring Gateway and the DSPU must be the same. If the DSPU is a 3174, the response to the F field should match the response to question 380.

The W field of the 3174 Token-Ring Gateway specifies the number of frames it will send to the DSPU before suspending transmission to await acknowledgement. Question 381 defines the number of frames that the 3174 DSPU will receive before it sends an acknowledgement (if inbound data is being sent to the host, this Token-Ring acknowledgement will be piggybacked on the data).

The acknowledgement frame sent by the 3174 DSPU adds very little to token-ring congestion. Therefore, it is strongly recommended that you set question 381 to 1. This ensures the receiver (the 3174 DSPU) acknowledges every frame and there is very little chance that the sender (the 3174 Token-Ring Gateway) will have to suspend transmission while waiting for acknowledgement from the receiver. If token-ring congestion is a concern to you, a value greater than 1 could be specified in question 381.

The W field in question 941 should be set to a value greater than the response to question 381. This will allow the 3174 Token-Ring Gateway to continue transmission while the 3174 DSPU is processing the data it received already and sending the response back to the gateway.

If they are equal, then the gateway will probably suspend when it has transmitted the number of frames specified by the W field. This is because the gateway will not receive the acknowledgement until the 3174 DSPU has received all the frames sent by the gateway. That is, there is a waiting delay between transmission and acknowledgement that degrades response times.

The W field value should never be set less than value in question 381 because this will definitely cause suspension of transmission while waiting for acknowledgement, and thus degrade response times.

If the path from the 3174 Token-Ring Gateway to the 3174 DSPU contains Token-Ring bridges, there may be justification for making the difference between the W field and the question 381 value greater than 1. This is because of the delay introduced by the bridge copying data from one ring to another.

In addition, you must remember when specifying W field values that the buffers are retained by the gateway until the data in the buffers are acknowledged. If the W field is significantly large, then the gateway could deplete its buffer resources frequently and thus decrease performance.

If the value in question 381 is set to 1, then the best value for the W field is 2 or 3 if no bridges are used and slightly larger (for example, 4) if bridges are used. These values will allow uninterrupted transmission (by eliminating the waiting for acknowledgement) and will prevent buffer resources in the gateway from being depleted.

4.6.3 Definitions Overview

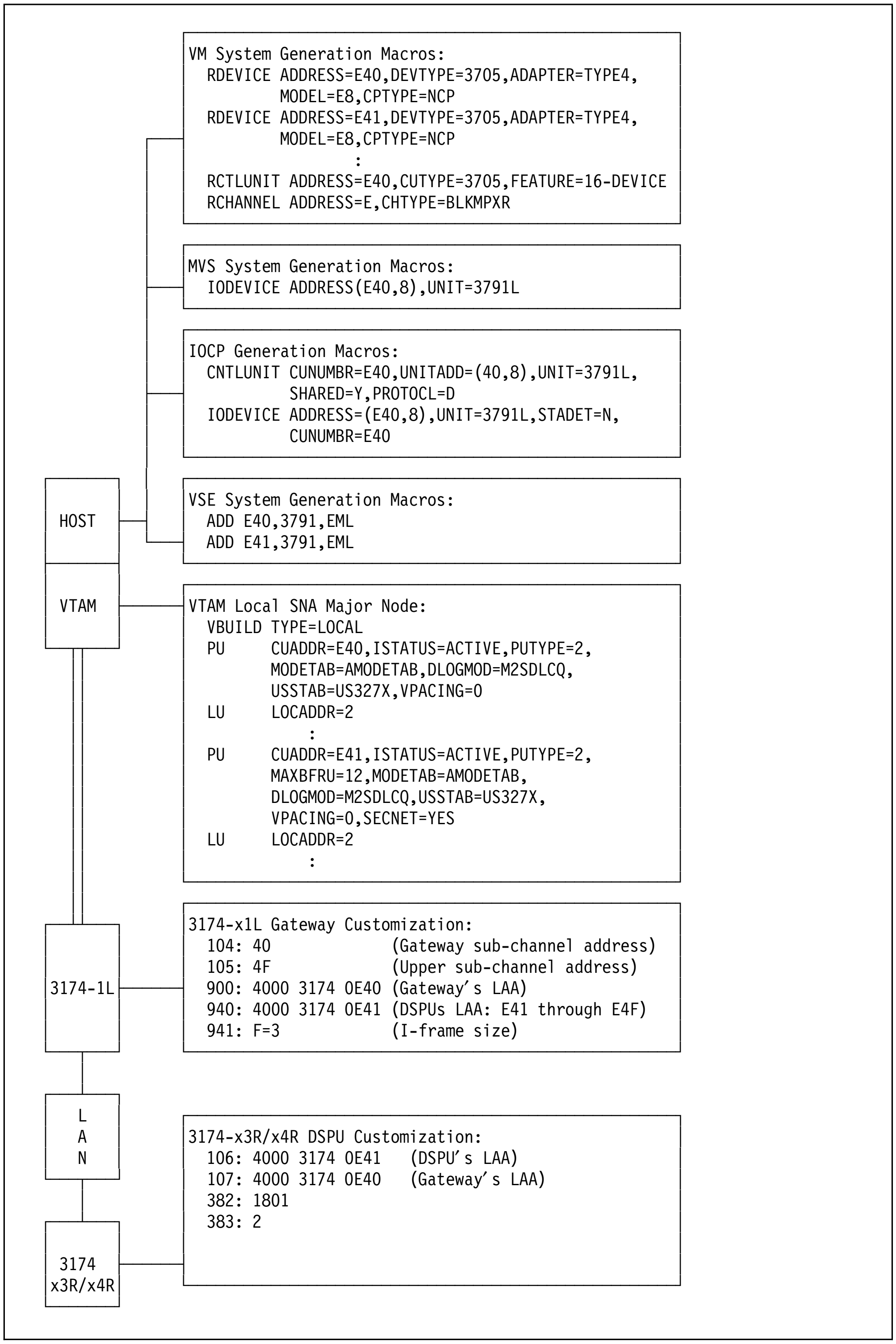


Figure 10. Definitions Overview for 3174 Local Gateway

4.7 3174 Remote Gateway

There is frequently a requirement to access a remote host site across a wide area network based on IBM's System Network Architecture (SNA). The LAN and SNA networks use different protocols at the link level; it is the essential function of a LAN gateway to convert between SNA Synchronous Data Link Control (SDLC) formats, LAN Medium Access Control (MAC) and Logical Link Control (LLC) formats. The conversion is transparent to higher-level protocols such as Logical Unit Type 6.2 and the 3270 data stream.

Remote Gateway Physical Configuration

The 3174 remote gateway, as shown in Figure 11, is attached to the host via a leased full-duplex or half-duplex SDLC line running data half-duplex. SDLC and X.21 switched connections are *not supported*. X.25 switched virtual circuits (SVC) and permanent virtual circuits (PVC) can be supported when using RPQ 8Q0743, *X.25 Token-Ring Gateway.*

Note: A Frame Relay communication can be supported with Configuration Support-C Release 5. See 20.4, "3174 Customization" on page 597 for more information

The 3174 attaches to a 308x, 3090, 4341, 4361, 4381 or 9370 via a 3720, 3725, 3745 or 3746 Communication Controller. It can also attach to a 4361 Integrated Communication Adapter or a 9370 Telecommunications Subsystem Controller.

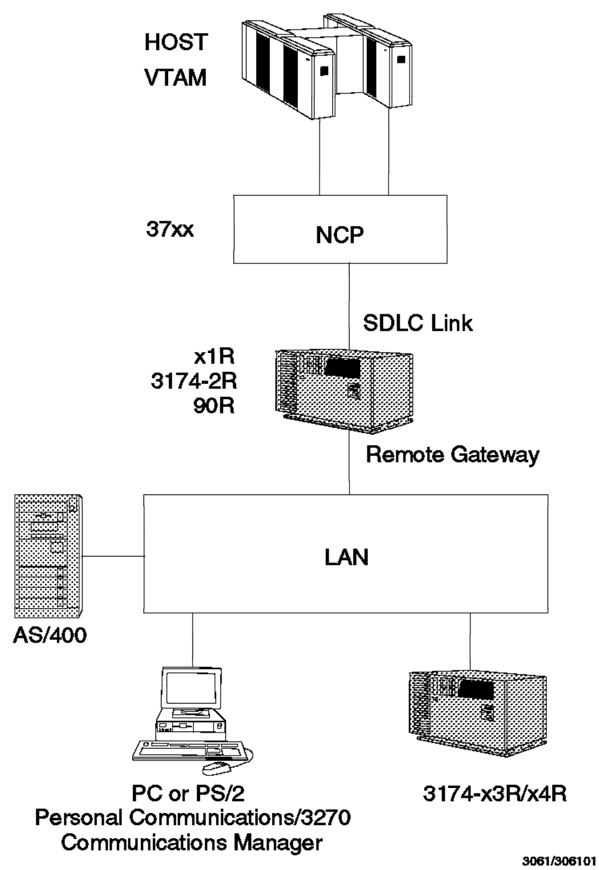


Figure 11. Physical Configuration of 3174 Remote Gateway and DSPUs

Remote Gateway Logical View

VTAM and NCP view the 3174 remote gateway and its DSPUs as stations on a multi-point SDLC link. Outbound data is addressed to DSPUs using SDLC station addresses. The 3174 remote gateway references an address translation table to route the data on to the destination DSPU. It also converts between SDLC and token-ring frame formats by stripping the SDLC link header and trailer and enclosing the remaining TH, RH and RU in MAC/LLC headers and trailers. The process is reversed for inbound data.

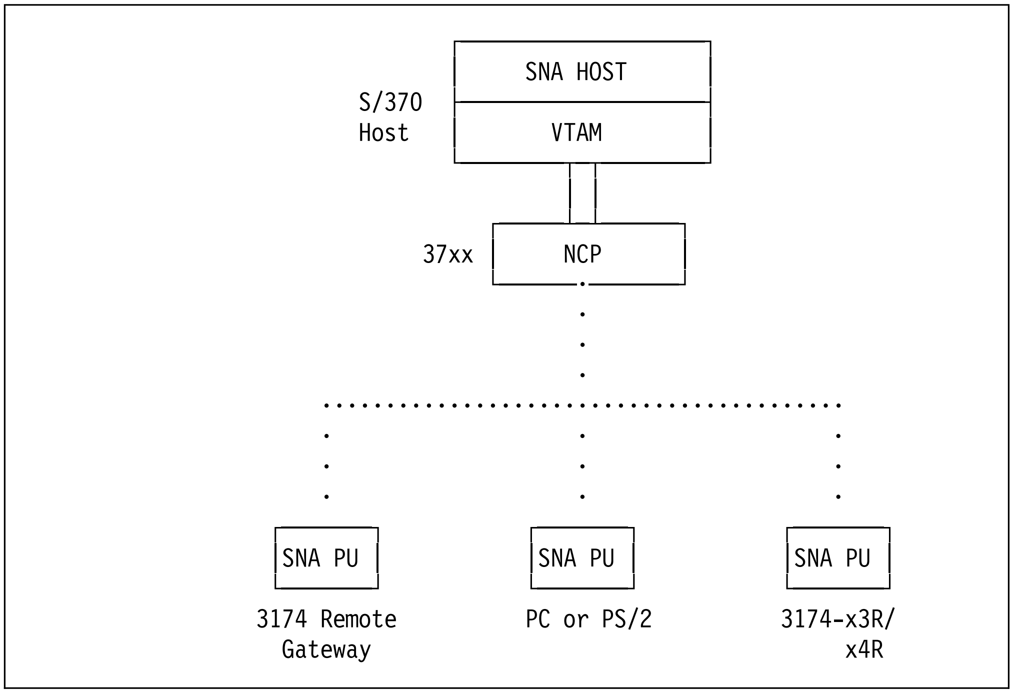


Figure 12. Logical View of 3174 Gateway and DSPUs

4.7.1 Highlights

The following is a summary of the advantages and benefits of the 3174 remote gateway:

- Triple functions: gateway, cluster controller and APPN NN

  The gateway can be installed in a 3174 that is also used as a controller for attached terminals and a network node for EN,s and LEN,s that it serves. Under heavy loads, 3174 capacity may become a critical factor.

  The 3174 LAN Gateway can be attached to a communication link at up to 256 Kbps. This compares favorably with PC-based gateways that have a maximum speed of either 9600 bps or 19.2 Kbps, depending on the model. The faster line speed and lower transmission delays may lead to improved response times for end users.

- Capacity

  The 3174 LAN Gateway is designed to support up to 250 DSPUs, although in practice the actual number supported may be fewer. By comparison, PC-based gateways are limited in any event to five downstream devices (in the case of a DFT-attached PC) or 32 downstream devices (in the case of a PC attached via an SDLC adapter).

The 3174 remote gateway requires no special software at the host apart from an NCP able to support a multi-point link. The gateway itself is an adapter installed by the customer in the 3174. Assuming the installer is familiar with 3174 customization, the microcode is easily prepared.

- Ring Error Monitor and Token-Ring Error Alert

  This capability allows token-ring errors, in the form of alerts, to flow through the 3174 Token-Ring Gateway to the NetView hardware monitor.

- Remote IML

  This capability allows an operator, using a NetView console, to IML a remote 3174 via the online test panels.

- Remote Management

  - Using NetView Distribution Manager or NDM for OS/2, you can customize and upgrade the microcode from the central site.

  - Central Site Control Facility allows local and remote 3174 management by allowing a NetView operator to invoke test and IML commands (see 13.1, “Central Site Control Facility” on page 433 for more details).

- Group poll

  Using the group poll function you can improve on the response times of the remote users and reduce overheads in the NCP (see 4.7.7, “Group Poll” on page 110 for further details).

4.7.2 Implementing Gateway

Implementation of the 3174 remote gateway consists of the following tasks:

- Installing the LAN gateway adapter in the 3174.
- Creating an NCP to support the line and downstream devices.
- Customizing the control microcode for gateway support.
- Customizing the DSPUs.

The material presented here is based on the configuration at ITSO Raleigh Center, as shown in Figure 13 on page 102.

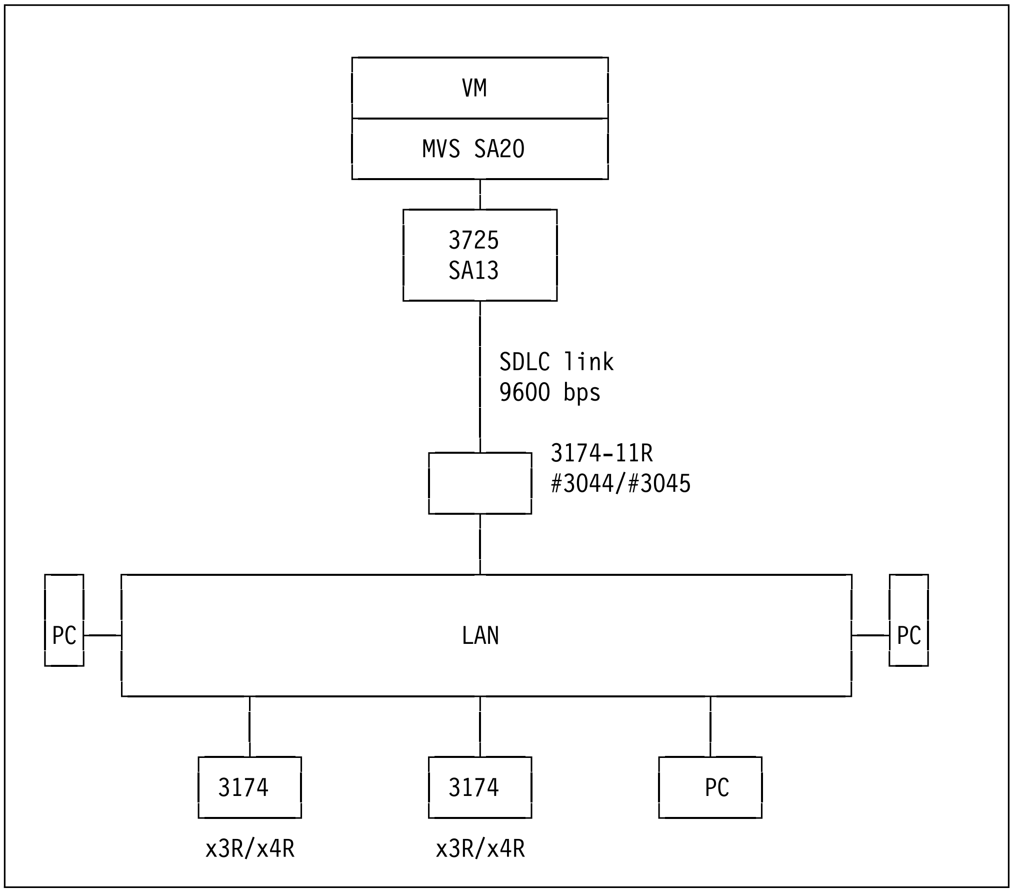


Figure 13. 3174 Remote Gateway Configuration

4.7.3 3174 Customization

Several customization questions are specific to the 3174 remote gateway. The questions described here are for the 3174 microcode Configuration Support-C Release 5 with the responses that are specific to the 3174 remote gateway.

The *3174 Planning Guide*, is the appropriate source of planning information for the other questions. You should regard the material presented here as supplementary information.

Question 100: 3174 Model Designation

No change, just the addition of new models.

Question 101: Host Attachment

This is dependent on whether you are planning for multiple host support, SDLC, X.25 or Frame Relay connection. The valid responses for a 3174 remote gateway are:

- 2=SDLC
- 3=X.25 (Token-Ring LAN adapter only. See note below)
- 9=Frame Relay
- M=Multi-Host Support

Note:

If you are configuring the X.25 attached 3174 with Token-Ring LAN adapter as a remote gateway, it needs the RPQ 8Q0743 - X.25 Token-Ring Gateway. See Chapter 6, "X.25 Token-Ring Gateway RPQ" on page 187 for more details.

Questions 104: Controller Address

The response is the address of the 3174 remote gateway and should match the ADDR operand in the NCP PU statement.

Question 105: Upper Limit Address

The response is the highest address to be used for your DSPU. For the 3174 local gateway, it is the highest sub-channel address; for the 3174 remote gateway, it is the highest SDLC station address.

With a 3174 remote gateway configuration, each DSPU functions logically as a PU on a multi-point line. NCP refers to each DSPU by a one-byte SDLC station address. The question 104 response will be the address of the PU in the 3174 LAN Gateway. The question 105 response will be the highest SDLC station address that can be given to a DSPU. The difference between the two responses is the range of addresses that can be used for LAN DSPUs going through the 3174 remote gateway.

With Configuration Support-C, the range of addresses is also shared with ISDN DSPUs. The number of DSPUs that can be assigned for ISDN is given by question 190: Number Of ISDN DSPUs, and are allocated addresses starting at question 150. Whatever addresses are not allocated to ISDN DSPUs are then available for LAN DSPUs.

For example, assume we have the following responses:

- Question 104=C1
- Question 105=C6
- Question 190=2

In this example, the SDLC address of the 3174 remote gateway will be C1, one ISDN DSPU will be allocated address C6 and the second C5, leaving addresses C4, C3 and C2 available for LAN DSPUs. If question 190 had been 5, then you will not be able to configure for any LAN DSPUs.

You can cater for future growth by customizing for a greater number of addresses than you currently need. Since the theoretical maximum capacity of the gateway is 250 DSPUs, values with a difference of greater than 250 (X′FA′) will be rejected.

Question 080: Token-Ring Address

See "Question 080: Token-Ring Address" on page 90.

Question 082: Token-Ring Speed

See "Question 082: Token-Ring Speed" on page 90.

Question 084: Ethernet Address

See “Question 084: Ethernet Address” on page 91.

Question 086: Ethernet Media Type.

See “Question 086: Ethernet Media Type” on page 91.

Question 088: Ethernet Frame Format

See “Question 088: Ethernet Frame Format” on page 91.

Question 150: LAN Gateway

See “Question 150: Token-Ring Network Gateway” on page 92.

Question 150: Gateway (LAN and ISDN)

See “Question 150: Gateway (LAN and ISDN)” on page 92.

Question 900: LAN Address and SAP

See “Question 900: LAN Address and SAP” on page 92.

Question 905: Ring Error Monitor

See “Question 905: Ring Error Monitor (REM)” on page 92.

Question 905: Token-Ring Error Alerts

See “Question 905: Token-Ring Error Alerts” on page 92.

Question 908: Link Subsystem Name

See “Question 908: Link Subsystem Name” on page 93.

Question 908: LAN Link Subsystem Name

See “Question 908: LAN Link Subsystem Name” on page 93.

Question 912: Group Poll Address

This panel allows you on the gateway 3174 to code an additional polling address, which *must be outside the polling address range* as specified in Questions 104 and 105.

This address must also match the value specified in **GP3174=** for all the PU definitions requiring group poll on the same line group in the NCP definitions. See 4.7.5, “3174 Remote Gateway Performance” on page 106 and 4.7.8, “Host Software Planning” on page 114 for further information.

Question 940: LAN Address Assignment

See also “Question 940: LAN Address Assignment” on page 93.

This panel establishes the address translation table used by the 3174 remote gateway to map SDLC address to LAN addresses.

SDLC addresses are provided automatically in column 1 based on the range of values indicated in questions 104 and 105.

LAN addresses of DSPUs are entered in column 2. The adapter address of the gateway is provided automatically from the response to question 900 and is assigned to the lowest SDLC address.

Column 3 contains the service access point (SAP) address for the DSPU. This is the “port” through which an application in the DSPU requests the services of the underlying communication protocols. A SAP ID must be a multiple of four in the range X′04′ to X′EC′.

The default value is X′04′, the standard SAP ID defined by IBM to interface between SNA and LAN protocols. The required SAP address for devices running PC 3270 Emulation Program V3, APPC/PC and for 3174 Models x3R and x4R is also X′04′. For Workstation Program V1.1 it is X′08′.

In situations where there is a requirement for a DSPU to support multiple SAP IDs (such as when migrating from 3270 emulation to the Workstation Program) it is possible to code the LAN address more than once with different SAP IDs.

Indicate in Column 4 whether the device is a workstation (response=0) or a 3174-x3R/x4R (response=1). The response will also be 1 for an AS/400.

Question 941: LAN Transmission Definition

See “Question 941: LAN Transmission Definition” on page 94.

4.7.4 Definitions Overview

```
  HOST           NCP Definitions:
                   LINE   ADDRESS=(08,FULL),
  VTAM                    DIAL=NO,
                          LNCTL=SDLC,...
                   PU     ADDR=C1,MAXDATA=521,DATAMODE=HALF,
                          GP3174=E1,
                          SECNET=NO
  37xx ----------  LU     LOCADDR=2
                   LU     LOCADDR=3
                   PU     ADDR=C2,MAXADATA=521,DATAMODE=HALF,
                          GP3174=E1,
                          SECNET=YES
                   LU     LOCADDR=2
                   LU     LOCADDR=3
                              :
                   PU     ADDR=C6,MAXADATA=521,DATAMODE=HALF,
                          GP3174=E1,
                          SECNET=YES
                   LU     LOCADDR=2
                   LU     LOCADDR=3

                  3174-x1R/x2R Customization:
                   104: C1                (Gateway address)
 3174-x1R -------  105: C6                (Upper SDLC address)
                   150: 1 0               (Gateway support)
 3174-x2R          900: 4000 3174 0240    (Gateway's LAA)
                   940: 4000 3174 0241    (DSPUs' LAA)
                   941: 3                 (Frame size)

   LAN

                  3174-x3R/x4R DSPU Customization:
                   106: 4000 3174 0241    (DSPU's LAA)
                   107: 4000 3174 0240    (Gateway's LAA)
   3174 ---------  382: 1801              (Frame size)
 x3R/x4R           383: 2
```

Figure 14. Definitions Overview for 3174 LAN Remote Gateway

4.7.5 3174 Remote Gateway Performance

This section discusses some of the performance characteristics of the 3174 remote gateway, concentrating on the SDLC lines. Tuning becomes more critical as more devices use the gateway and traffic volumes increase.

SDLC Multi-Point Lines

The performance characteristics of the 3174 remote gateway are influenced by the SDLC multi-point polling mechanism. A useful reference on this subject is *Tuning and Problem Analysis for NCP SDLC Devices*. A brief summary of the mechanism is provided here.

Service Order Table Polling

When PUs on the link are active, they receive data or are polled for input in the sequence in which they are listed in the Service Order Table (SOT). The time it takes to pass through the SOT determines the rate at which DSPUs receive polls and, therefore, the performance they experience. Inactive PUs are not polled. Factors that affect the time it takes to pass through the SOT include the number of entries being polled (that is, the number of active devices), the line speed and the line propagation delay (the delay induced on transmission due to factors such as modem transit time and line length).

Group Poll

Prior to group poll, data flowing from the stations on the LAN arrived asynchronously at the gateway but were queued at the 3174 until a poll containing the station′s specific address arrives. This waiting for the specific poll at the 3174 increases the response time.

With NCP′s group poll support and Configuration Support-B Release 1 and later, the waiting time is significantly reduced by allowing data from any station, whose address matches the group poll address, to flow inbound when the gateway receives a group poll.

The group poll address is a two-character hexadecimal address that you can specify in question 912: Group Poll Address. This address must be outside the range of addresses specified for questions 104 and 105 and must not be X′FF′.

The levels of host software required to support group poll are as follows:

- NCP V4 Release 3.1
- NCP V5 Release 2.1
- SSP V3 Release 4.1

Each of the above requires Small Programming Enhancements (SPEs). (An SDLC-attached 3174 without the gateway feature cannot use group poll.)

Duplex Multi-Point

Prior to duplex multi-point, you had to define any line that includes a 3174 remote gateway as half-duplex in NCP:

LINE ADDRESS=(linenumber,**HALF**)

This is because the 3174 is an SDLC two-way alternate station; that is, it can send and receive alternately but it cannot send and receive at the same time.

With a 3174 remote gateway, this poses a problem, as shown by the following example:

1. NCP sends data and asks for a response to station A, a DSPU on the LAN.

2. The 3174 LAN Gateway disables its receiver and starts transmitting the response from station A. This is the normal way a two-way alternate station operates.
3. In the meantime, NCP starts transmitting data to station B, another DSPU on the LAN.
4. Because the gateway receiver is disabled, the gateway will not receive the frame(s) sent by NCP for station B.

With Configuration Support-B Release 3 and later, support has been added to allow the 3174 remote gateway to have its receiver enabled while transmitting, vice-versa. You can now define the line which includes a 3174 remote gateway as full duplex in NCP, resulting in potential performance improvements for all users on the line:

LINE ADDRESS=(linenumber,**FULL**)

Note that the SDLC protocol code has not changed; that is, each station continues to be a two-way alternate station.

4.7.6 NCP Tuning Parameters

SERVLIM

Contact polling (the transmission of a SNRM, SNRME or DISC) is not subject to the data polling cycle. After the number of passes through the Service Order Table specified by SERVLIM, the NCP performs one contact poll for a PU. On the next contact poll it looks for an outstanding SNRM, SNRME or DISC for the next entry in the Service Order Table. SERVLIM, thus, determines the ratio of activation/deactivation processing to normal data transfer. Setting the value high (its maximum is 254) means that relatively few attempts are made to contact a PU in order to activate it. While this may help performance for active users by reducing the time spent transmitting and waiting for responses to contact polls, it has a negative impact on resource activation times. This effect may be more marked in the remote LAN environment since two polls are required to establish connectivity between the NCP and each DSPU (see the session activation flow diagram later in the chapter).

In environments where 3270 emulation is being started and terminated frequently and devices powered on and off, which is often the case with PC users, a high value should not be specified. The long wait for the VTAM USS MSG10 message after requesting a host session may be considered unacceptable. During the tests we found that a SERVLIM value of 254 led to resource activation times of some minutes. We recommend setting SERVLIM to 4 as a good starting point for your installation.

SERVICE

By giving a DSPU multiple entries in the Service Order Table it is polled more frequently. This is a good way to give preferential treatment to particular devices. The order of the DSPUs in the table does not have any effect on performance.

It is also possible to reduce the number of entries in the Service Order Table where Personal Communications/3270 is used by customizing one PC as a gateway with several PC network stations rather than customizing each PC as a standalone station. That is, the PC gateway is the only DSPU customized in the

3174 remote gateway and the PC network stations are defined as LUs in the PC gateway. This could reduce the contribution of the polling delay to total response time. However, device path-lengths will increase due to the NetBIOS sessions between gateway and network stations. Furthermore, host access from network stations is dependent on the availability of the PC gateway.

PAUSE

The objective of the PAUSE operand on the LINE macro is to introduce a delay between passes through the Service Order Table so that the impact of excessive negative polling on communication controller CCU utilization is reduced. If the NCP completes a pass through the Service Order Table before the PAUSE time elapses, it waits for the timer to elapse before it begins the next pass. It may be possible to reduce response times by setting PAUSE to 0 if there are few lines competing for CCU cycles. If there are many lines the increased polling that ensues reduces the cycles available for data processing rather than polling and may therefore be harmful to performance. See 4.7.7, “Group Poll” on page 110 for further considerations.

PASSLIM

The objective of the PASSLIM operand is to limit the amount of data transmitted to a PU in one pass through the Service Order Table so that it does not monopolize the link. In order to avoid a staggered screen-paint, it should not be set so low that only a small portion of the screen is sent on each pass through the Service Order Table. For example, it takes about eight PIUs to paint a full 1920 character screen for a single workstation running Personal Communications/3270 since data will be sent to the DSPU in 256-byte segments. If this is a standalone station with only one LU to support, 8 is a suitable value. If it is a PU with multiple LUs to support, setting PASSLIM high enough to allow each LU to receive a full screen on a pass through the table may adversely affect performance of other PUs. As a general rule in such circumstances, you should set PASSLIM less than or equal to MAXOUT.

HDXSP

If HDXSP (Half-Duplex Send Priority) is coded as YES, outbound data is sent as soon as possible without waiting for the turn of the PU in the Service Order Table. This improves performance for large numbers of PUs on a line with low traffic frequency.

PACING

PACING is used to control the flow of traffic on an LU-LU session. It is useful where the secondary LU is a printer or a display that will be doing large amounts of file transfer to and from the host. You may wish to examine the possibility of using inbound and outbound pacing to reduce excessive line utilizations when DSPUs are sending files to and from the host.

Inbound pacing is agreed at BIND time and should therefore be specified in the logmode entry for the device (see Appendix F of *VTAM Programming*).

Outbound pacing can be defined in either the logmode entry or the NCP LU macro. If a non-zero value is coded in the logmode entry, the NCP value is overridden. If a zero entry is coded in the logmode entry, the NCP value is used.

Outbound pacing is particularly useful in preventing the transmission of more data to a device (such as a PC printer) than it can handle and may therefore reduce line utilization.

4.7.7 Group Poll

Using the group poll enhancement, you change the way the NCP handles the devices defined. Instead of sequentially polling each device in the SOT looking for data to receive, it sends a group poll on its first available "free" frame (no data to send), and will accept data from any device defined in the group poll range.

The group poll is set up in the 3174 via customization question 912: Group Poll Address; this identifies the gateway′s group poll address. In the NCP definitions, you specify the gateway′s group poll address in the PU statement for each DSPU participating in group polling. When NCP finds a station (PU) in the SOT for which a transmission is pending, it sends the data and then sends a specific poll to the station address. None of the other 3174′s stations in the network answers this poll because NCP does the address resolution.

If there are no pending transmissions to any stations in the SOT, the NCP polls the gateway using the unnumbered poll command and the gateway′s group poll address. The gateway recognizes this as a group poll and sends traffic from one station, followed by the unnumbered response. In this way it increases the possibility that a poll results in a useful transaction which could increase the response time for end-users.

Group Poll Customization Example

Remote Gateway Physical Configuration

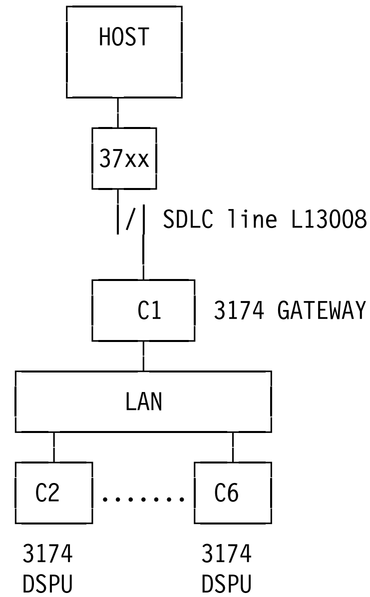


Figure 15. Remote Gateway Physical Configuration

Remote Gateway Logical View

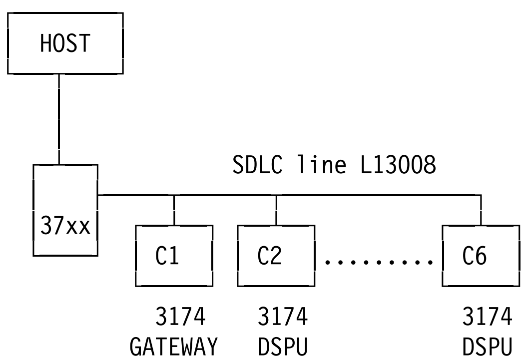


Figure 16. Remote Gateway Logical View

NCP Definitions for Group Poll

This example is an extract from the NCP loaded into a 3725 at the ITSO, Raleigh Center. We have defined line 08 as full duplex to a 3174 Token-Ring Gateway with 3174 DSPUs on the token-ring network.

```
*---------------------------------------------------------------------*
L13008   LINE ADDRESS=(08,FULL),ANS=CONTINUE,CLOCKNG=EXT,DUPLEX=(FULL),X
               ETRATIO=30,ISTATUS=ACTIVE,LPDATS=LPDA2,MAXPU=10,       X
               NPACOLL=YES,PAUSE=.5 1 ,SERVLIM=10,SPEED=9600,         X
               SRT=(,64)
SERVICE  MAXLIST=10,ORDER=(P13008A,P13008B,P13008C,P13008D,P13008E,   X
               P13008F)
P13008A  PU ADDR=C1,DISCNT=(NO),MAXDATA=521,ISTATUS=ACTIVE,MAXOUT=7,PACX
               ING=0,PASSLIM=8,PUDR=NO,PUTYPE=2,GP3174=AE 2
T13008A1 LU LOCADDR=2
T13008A2 LU LOCADDR=3
          :
P13008B  PU ADDR=C2,DISCNT=(NO),MAXDATA=265,ISTATUS=ACTIVE,MAXOUT=7,PACX
               ING=0,PASSLIM=8,PUDR=NO,PUTYPE=2,GP3174=AE 2
T13008B1 LU LOCADDR=2
T13008B2 LU LOCADDR=3
          :
P13008C  PU ADDR=C2,DISCNT=(NO),MAXDATA=265,ISTATUS=ACTIVE,MAXOUT=7,PACX
               ING=0,PASSLIM=8,PUDR=YES,PUTYPE=2
T13008C1 LU LOCADDR=2,MODETAB=AMODETAB,DLOGMOD=M2SDLCQ
T13008C2 LU LOCADDR=3
          :
P13008F  PU ADDR=C6,DISCNT=(NO),MAXDATA=265,ISTATUS=ACTIVE,MAXOUT=7,PACX
               ING=0,PASSLIM=8,PUDR=NO,PUTYPE=2,GP3174=AE 2
T13008F1 LU LOCADDR=2
T13008F2 LU LOCADDR=3
*---------------------------------------------------------------------*
```

Notes:

1 PAUSE value, see note on group poll performance

2 A group poll address, unique to any real 3174 address defined on this line.

SNA Data Flow for Group Poll

The data flow shown in Figure 17 was taken from a trace on line L13008 of the example.

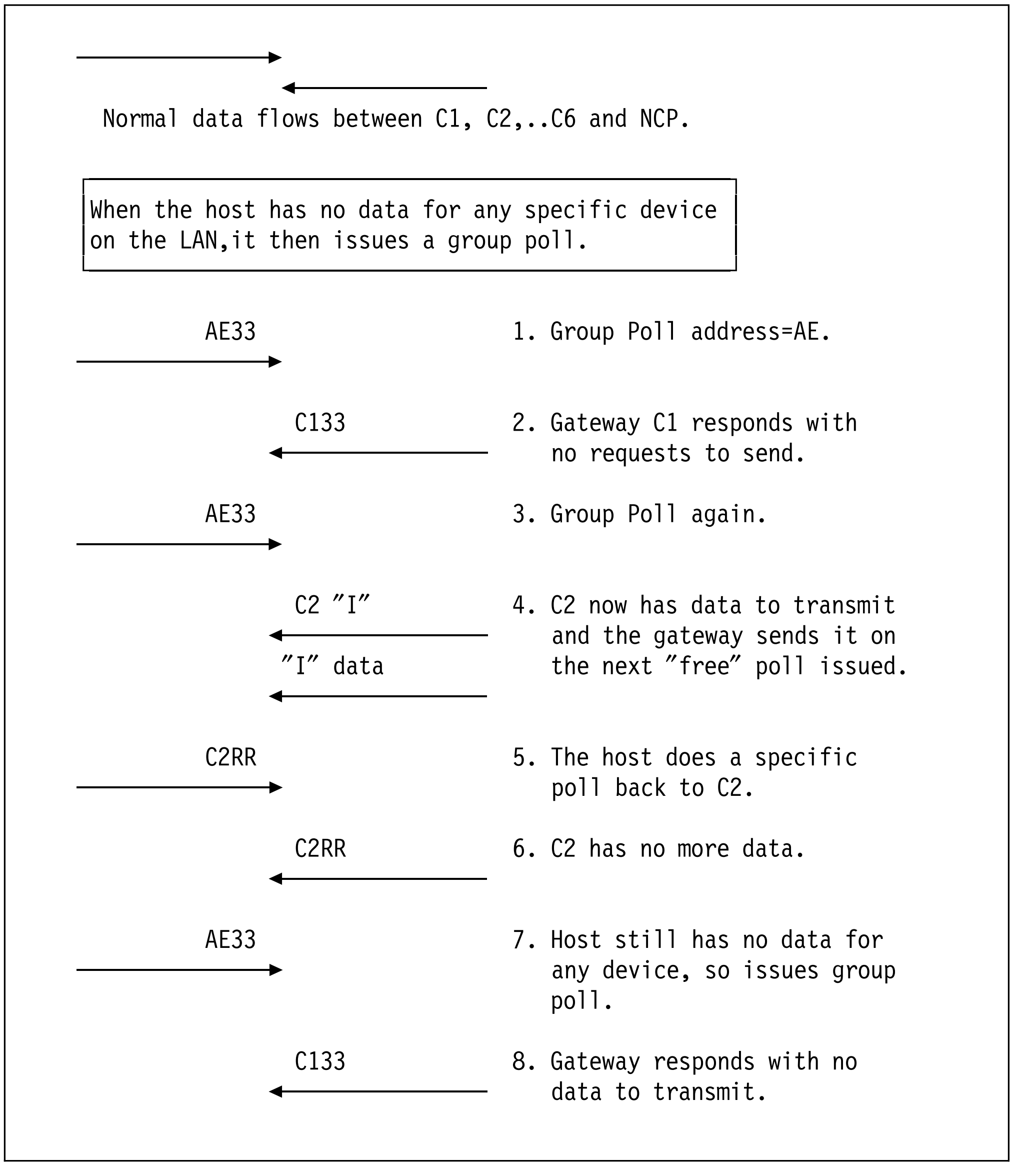


Figure 17. Polling Sequence in a Group Poll Environment

Group Poll Performance

There are several considerations concerning line performance that must be reviewed if using group poll.

As discussed in 4.7.6, “NCP Tuning Parameters” on page 108, the SOT, PAUSE, and HDXSP are tuned to give the best line performance. With group poll added the line handling characteristics are changed.

The first point is that HDXSP=YES is only valid with PAUSE=0; bearing that in mind, you should then look at how PAUSE can affect group poll:

- With PAUSE=0, the NCP will, at the first free poll (no data to transmit), start to send the group poll. It sends the group poll xx times (where xx is the number of active devices multiplied by the SERVLIM parameter).

  For example, with three devices active out of the five devices defined in the SOT and a SERVLIM=10, you would see 30 group polls before a SERVICE poll is performed.

- With a non-zero PAUSE value, at the first free poll you again send the group poll but you only poll one device, not all the active devices in the SOT. So you would see only 10 group polls before a SERVICE poll is performed.

On a large LAN, this can have a significant effect on activation times if you have large numbers of PUs defined.

The 3174 must be upgraded to Configuration Support-B Release 1, and later or Configuration Support-C, and customized for the group poll function via question 912 before this support can be generated in NCP.

The NCP group poll enhancement is described in the cover letter for PTF UR90157 and the following related APARs:

- IR83735 SSP V3R4.1 MVS
- IR83776 SSP V3R4.1 VSE
- IR83775 SSP V3R4.1 VM
- IR83751 NCP V5R2.1 MVS/VSE/VM
- IR83826 NCP V4R3.1 MVS/VSE/VM

4.7.8 Host Software Planning

This section discusses some of the host software planning considerations for the 3174 remote gateway, concentrating on the NCP considerations.

VTAM

There are no specific VTAM considerations although you may need to generate a suitable logmode entry for file transfer. If a 3270 emulation DSPU is to transfer files to and from TSO or CMS at the host it should access these applications using a logmode with the query bit turned on in the PSERVIC macro.

The following logmodes are used by 3270 emulation LUs at the ITSO:

```
M2SDLCQ  MODEENT LOGMODE=M2SDLCQ,FMPROF=X'03',TSPROF=X'03',          X
               PRIPROT=X'B1',SECPROT=X'90',COMPROT=X'3080',           X
               RUSIZES=X'8587',PSERVIC=X'028000000000185000007E00'

M3287SCS MODEENT LOGMODE=M3287SCS,FMPROF=X'03',TSPROF=X'03',         X
               PRIPROT=X'B1',SECPROT=X'90',COMPROT=X'3080',           X
               RUSIZES=X'87C7',PSNDPAC=X'01',SRCVPAC=X'01,            X
               SSNDPAC=X'00',PSERVIC=X'01000000E100000000000000'
```

The first sample is for a display LU. The second is for a printer LU in SNA Character String (SCS) mode. Notice that pacing has been requested from the host to the printer (PSNDPAC and SRCVPAC). This is to prevent data being transmitted to the printer faster than it can be processed.

It is also possible to use the dynamic reconfiguration facility to add DSPUs without the need to regenerate an NCP. This requires the creation of appropriate dynamic reconfiguration data sets in VTAM as described in *VTAM Installation and Resource Definition*.

NetView

No specific changes are required of NetView for the gateway although you will probably want to update CLISTs and online documentation to reflect the new resources. For instance, the LAN introduces a new level of resource names and problem determination procedures may differ from those followed for coaxially-attached terminals.

ACF/NCP

An SDLC multi-point definition should be created in the NCP. Some of the important parameters are indicated in Figure 18. A more complete extract from the NCP used in the tests is included in Appendix G, "VTAM/NCP Definition Examples" on page 783. Parameters which influence performance are discussed in 4.7.6, "NCP Tuning Parameters" on page 108.

```
L13008   LINE ADDRESS=(08,FULL 1 ),ANS=CONTINUE,CLOCKNG=EXT,          X
               DUPLEX=(FULL),ETRATIO=30,ISTATUS=ACTIVE,LPDATS=LPDA2,   X
               MAXPU=10,NPACOLL=YES,PAUSE=.5 2 ,SERVLIM=10 2 ,         X
               SPEED=9600,SRT=(,64)
SERVICE  MAXLIST=10,ORDER=(P13008A,P13008B,P13008C,P13008D,P13008E,    X
               P13008F)
P13008A  PU ADDR=C1,DISCNT=(NO),MAXDATA=521,ISTATUS=ACTIVE,MAXOUT=7,PACX
               ING=0,PASSLIM=8,PUDR=NO,PUTYPE=2,GP3174=AE 3
T13008A1 LU LOCADDR=2
T13008A2 LU LOCADDR=3
          :
P13008B  PU ADDR=C2,DISCNT=(NO),MAXDATA=265,ISTATUS=ACTIVE,MAXOUT=7,PACX
               ING=0,PASSLIM=8,PUDR=NO,PUTYPE=2,GP3174=AE 3
T13008B1 LU LOCADDR=2
T13008B2 LU LOCADDR=3
          :
P13008C  PU ADDR=C2,DISCNT=(NO),MAXDATA=265,ISTATUS=ACTIVE,MAXOUT=7,PACX
               ING=0,PASSLIM=8,PUDR=YES 4 ,PUTYPE=2
T13008C1 LU LOCADDR=2,MODETAB=AMODETAB,DLOGMOD=M2SDLCQ
T13008C2 LU LOCADDR=3
          :
P13008F  PU ADDR=C6,DISCNT=(NO),MAXDATA=265,ISTATUS=ACTIVE,MAXOUT=7,PACX
               ING=0,PASSLIM=8,PUDR=NO,PUTYPE=2,GP3174=AE 3
T13008F1 LU LOCADDR=2
T13008F2 LU LOCADDR=3
```

Figure 18. Extract of NCP Source

Notes:

1 See "LINE" on page 116 for ADDRESS value.

2 See 4.7.7, "Group Poll" on page 110 for explanation of dependencies.

3 See "PU" on page 116 for GP3174 value.

4 See "PU" on page 116 for PUDR value.

LINE

- **ADDRESS** can now be (xxx,FULL) with Configuration Support-B Release 3 or later. Prior to these levels, the ADDRESS parameter can only be coded as half-duplex.
- **MAXPU** specifies the maximum number of PUs this line will support, including the PU in the gateway. You should specify a value high enough to cater for current and anticipated requirements.

SERVICE

- **MAXLIST** indicates the maximum number of entries that will be listed in the Service Order Table. You should define a high enough value to cater for anticipated growth.
- **SERVICE** is a list of the PUs supported by the 3174 gateway (including the PU in the gateway itself). The list builds the Service Order Table that determines the sequence in which PUs receive outbound data or are polled for inbound data.

PU

Three types of PU are shown in Figure 18 on page 115. The first is the PU for the gateway itself. The second is a 3174 with group poll, and the third is a PC attached to the LAN running Personal Communications/3270.

- **ADDR** is the SDLC station address of the PU. The lowest ADDR value is the response to question 104 in the 3174 customization and is the PU inside the gateway 3174. The highest ADDR value should be less than or equal to the response to question 105 in the 3174 customization. The responses to question 940 maps the LAN addresses to the ADDR values.
- **MAXDATA** can be coded as 521 bytes for the 3174 LAN Gateway because it has a larger buffer than the PC. The same value would be coded for a 3174-x3R/x4R DSPU.
- **PUDR**, when specified as YES, permits the deletion of this PU from one line and its addition to another one using the VTAM dynamic reconfiguration facility. This may be the case if the backup strategy involves dynamic reconfiguration.

  Planning for dynamic reconfiguration should also include the allocation of sufficient empty PU control blocks in the NCP and an indication of the maximum number of LUs that can be added to any of the PUs in the pool. This is done via the NUMBER and PU operands of the PUDRPOOL definition statement.
- **GP3174** is specified as GP3174=xx, where xx is a unique polling address not in the ADDR= range used for this line group. This address should match that coded in question 912 in the 3174 remote gateway.

  If you use group poll you should note that you cannot use PUDR as discussed above.

4.7.9 Data Flows

The following diagrams depict the flow of network data through a 3174 remote gateway as DSPUs are activated and deactivated. These diagrams are included to aid problem determination.

Problem Determination Tools

Data flows between the host and DSPUs can be analyzed using two trace tools which complement each other:

- SNA line traces formatted using the Advanced Communication Function/Trace Analysis Program (ACF/TAP).

  These trace data between the host and the gateway.

- The IBM Token-Ring Trace and Performance Program.

  This traces data between the gateway and the DSPU.

DSPU Activation Data Flows

Figure 19 on page 118 outlines the flow of data in a situation where the DSPU and associated LUs are being activated (perhaps as part of a cascaded network initialization procedure) but the end user has not yet requested a 3270 emulation session.

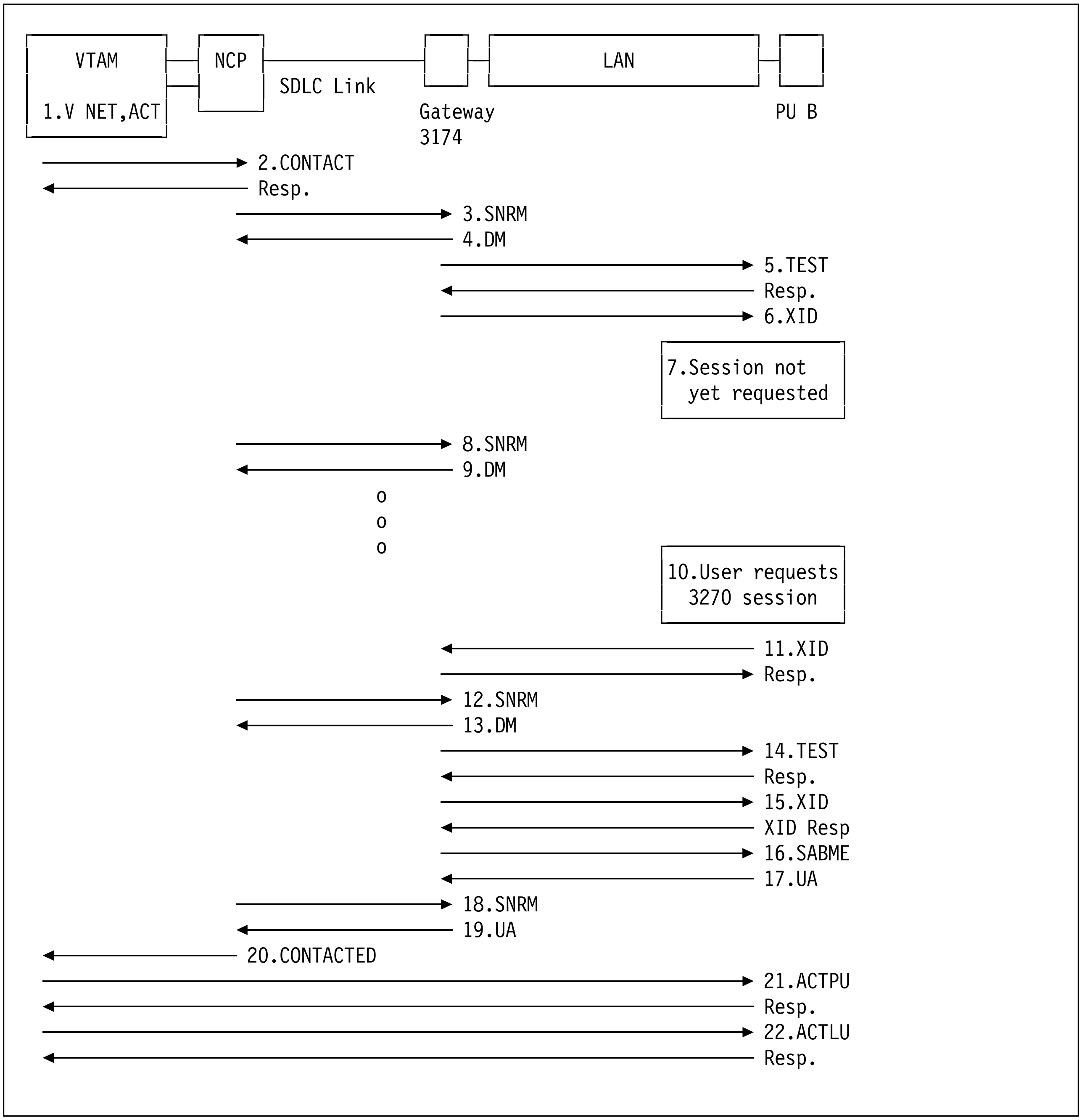


Figure 19. DSPU Activation Data Flows

1. The network operator issues a VARY NET command to activate the DSPU or VTAM initializes resource activation when the NCP major node is activated.
2. VTAM sends a CONTACT request to the NCP.
3. The NCP queues a SNRM request, which is sent when it is the turn of this DSPU to receive a contact poll.
4. The gateway recognizes that it has no link to the DSPU so returns a DM to the NCP in order that it does not timeout waiting for a response and can continue with other processing pending establishment of the link to the DSPU.

5. The gateway 3174 sends a TEST request to the DSPU. This and the subsequent response constitute a basic test of the transmission path between the gateway and the DSPU.
6. The gateway sends an XID to the DSPU. No response is received because 3270 emulation has not been started.
7. The DSPU does not continue link activation activity until a session is requested by the 3270 emulation program.
8. On subsequent passes through the polling cycle, the NCP resends the pending SNRM to the gateway for the DSPU.
9. The gateway recognizes that there still is no link to the DSPU and returns a DM to the SNRM requests.
10. Sometime later the end user requests a 3270 session.
11. An XID flows from the DSPU to the gateway. The gateway returns a response acknowledging the request.
12. Following the session request from the DSPU, the next SNRM received by the gateway re-starts the link activation procedure.
13. The gateway recognizes that there still is no link to the DSPU and returns a DM to the NCP.
14. The gateway sends a TEST request to the DSPU and receives a response.
15. The gateway sends an XID to the DSPU. This time an XID response is received from the DSPU.
16. The gateway sends a SABME, the LAN link connection request command.
17. The DSPU acknowledges the SABME request with a UA (positive response). The link is now established, and both devices reset their send and receive counters.
18. On a subsequent pass through the polling cycle, the NCP resends the pending SNRM to the gateway for the DSPU.
19. The gateway returns a UA to the NCP recognizing that there now exists a LAN link from the gateway to the DSPU.
20. NCP informs VTAM that it has CONTACTED the DSPU.
21. An ACTPU request is eventually sent by VTAM to the DSPU.
22. Positive response to the ACTPU is followed by ACTLUs to the devices attached to the PU.

DSPU Deactivation Data Flows

Figure 20 outlines the sequence of events when a user terminates the 3270 session either by ending the 3270 task or by powering off the workstation.

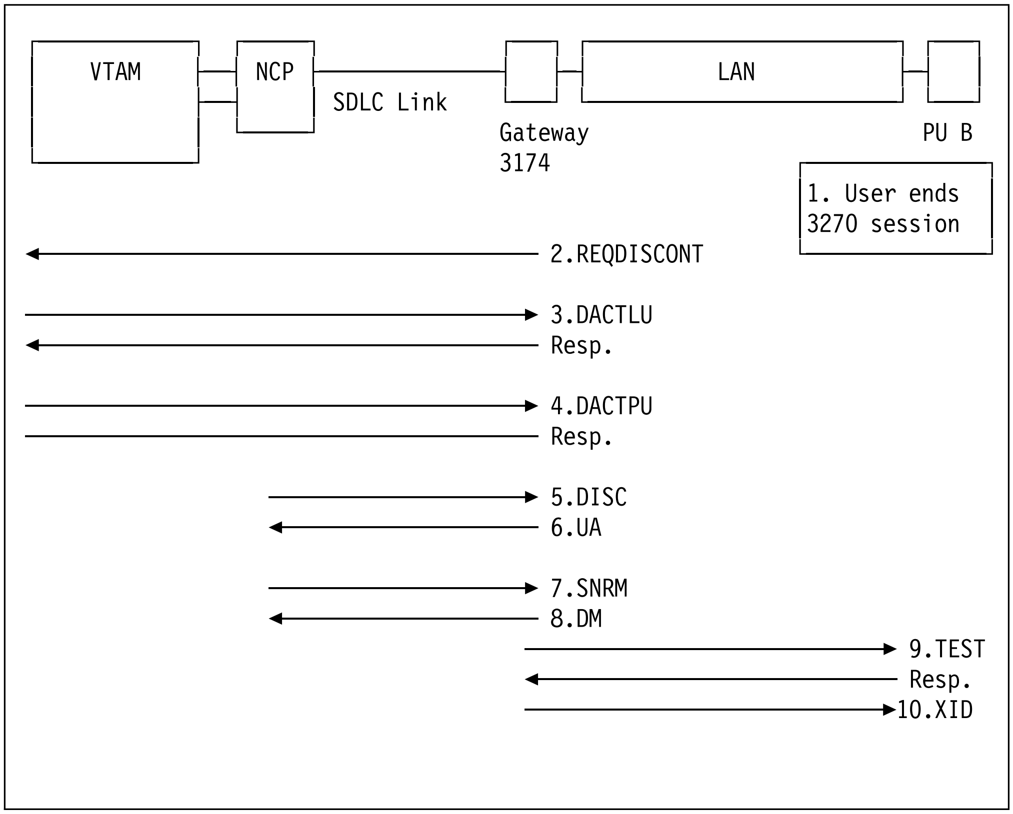


Figure 20. DSPU Deactivation Data Flows

1. The end user terminates the session by ending the 3270 task.
2. The gateway detects the loss of the downstream connection and builds a REQDISCONT RU for transmission to the host. This has byte 3 set to X′81′ indicating the Contact Immediate option.
3. On receipt of the REQDISCONT, VTAM sends DACTLUs for devices attached to the PU. The gateway responds to these on behalf of the DSPU.
4. VTAM sends a DACTPU to deactivate the DSPU. Again, the gateway generates a response.
5. NCP sends a DISC request breaking the SDLC connection between the host and the DSPU.
6. The gateway returns a positive (UA) response to the DISC.
7. The NCP recommences polling of the DSPU as a result of the Contact Immediate option on the REQDISCONT.
8. The DSPU is now registered as PCTD2 by VTAM. The periodic arrival of the SNRM at the gateway causes it to re-attempt connection with the DSPU in the manner described in the previous diagram.

4.8 Gateway Management

This section looks at some of the management aspects of the 3174 LAN Gateway. We will consider some of the facilities available for network management.

4.8.1 3174 Problem Determination Aids

The 3174 test facilities, invoked by pressing Alt+Test from a CUT device, Alt+Scroll Lock from a PC/3270 Workstation running under DOS, Ctrl+Page Down from a PC/3270 running under Windows, or remotely via CSCF and a NetView defined console with Configuration Support-B Release 2 or later have been extended to provide information specific to the LAN Gateway.

The functions accessible from the Test Menu are described in detail in *3174 Customer Extended Problem Determination*, GA23-0217. Shown below are some sample panels from Configuration Support-C Release 5 demonstrating the type of information available relating to the gateway. The following panels are described to give you an idea of the types of information available to help you solve problems.

```
                   _________ 3174 Test Menu  1TEST  _________

     Test      Description                                  page 1 of 2

       0       Terminal check
       1       Display event logs and response time log
       2       Display configuration panels
       3       3270 device status information
       4       Reset logs and cable errors
       5       Display vital data
       6       Display Control Areas
       7       Color convergence
       8       Extended functions and program symbols
       9       LAN tests
      10       Port wrap tests
      11,p     Trace control  p=password
      12       Asynchronous emulation adapter tests
       A,n     Alert to Host ID n  n=1A-1H,2A-2D,3A-3D
       D,n,m   Dump device on port n, HG m  n=0-31 m=26-27


  Select Test; press ENTER ===>
```

Figure 21. 3174 Test Menu 1TEST

This is the main 3174 Test Menu panel 1TEST and option 1 to display the Logs Menu.

```
                   _______________ Logs Menu ________________

    Option     Description            Current log mode:    NORMAL

      1,n      Response time log for host ID n  n=1A-1H,2A-2D,3A-3D
      2        All events logged
      3,n      Hardware group n  n=0-99
      4,n,m    Port n, Hardware group m  n=0-31,m=0-99
      5,xxxx   Status Code  replace x's with search digits
      6,n,m    Host Address n, host ID m  n=0-254,m=1A-1H,2A-2D,3A-3D
      7        Change log mode  normal/intensive
      8        Event log summary  by category and hardware group
      9,n      Host ID n  n=1A-1H,2A-2D,3A-3D






To go directly to other tests, enter: /Test,Option
Select Option; press ENTER ===>
```

Figure 22. 3174 Logs Menu

Choose option 2 of this panel to display the ″All events logged″.

```
                   ___________ Log Records - All ____________

Relative Day/Time since last POR: 004/06:36
Day Time  SC   QA PHG_PN CHG_PN ID HA  Extended data bytes  B1-B16
                                       B1   B3   B5   B7   B9   B11  B13  B15
004 06:35 0854 20  00                  0000 0000
004 06:35 0498 05  00           1A     8014 0001
004 06:35 0854 09  00                  8014 0001 RAI
004 06:34 0854 20  00                  0000 0000
004 06:34 0498 05  00           1A     8014 0001
004 06:34 0854 09  00                  8014 0001 RAI
004 06:33 0854 20  00                  0000 0000
004 06:33 0498 05  00           1A     8014 0001
004 06:33 0854 09  00                  8014 0001 RAI
004 06:32 0854 20  00                  0000 0000
004 06:32 0498 05  00           1A     8014 0001

PHG_PN=PrimaryHG_PN     HG=Hardware Group  SC=Status Code   ID=Host ID
CHG_PN=ConnectionHG_PN  PN=Port Number     QA=Qualifier     HA=Host Address

To go directly to other tests, enter: /Test,Option
Select Test; press ENTER ===>
```

Figure 23. 3174 Event Log

The status codes and qualifiers are interpreted using *3174 Customer Extended Problem Determination*.

Status codes are sent to NetView in the form of NMVTs.

```
                 ____________ LAN Test Menu _____________

     Option     Description

       1        Monitor LAN status
       2        Display LAN adapter status summary
       3        Reset LAN adapter status counters
       4        Display link status summary for all links
       5,*      Display link status summary
       6        Reset link status counters for all links
       7,*      Reset link status counters
       8        Display Gateway host status summary for all links
       8,h      Display host status summary for all host id h
       9        3174-Peer status
       10       3174-Peer bridge profile
       11       3174-Peer bridge status
       12       LAN Manager Profile
       13       Re-open LAN adapter
     * = n or h or h,n  where n=link address h=host ID

 To go directly to other tests, enter: /Test,Option
 Select Option; press ENTER ===>
```

Figure 24. LAN Test Menu

This menu is invoked by selecting option 9 from the 3174 Test Menu 1TEST.

```
                 ______________ LAN Status ______________

 4738-Local LAN Adapter is Token-Ring

 4698-Local LAN Adapter open









 4694-The test has been active for 00000 minutes.




 To go directly to other tests, enter: /Test,Option
 Select Test; press ENTER ===>
```

Figure 25. Token-Ring Status

This menu is invoked by choosing option **1** from the LAN Test Menu and defining the LAN Adapter type as Token-Ring. The LAN Status panel indicates the status of the Token-Ring Adapter. The 4698 message indicates that the adapter is open. It will change to 4697 if the adapter closes for some reason (for example, if the cable is removed from the 8228).

```
                    ________________ LAN Status ________________

4739-Local LAN Adapter is Ethernet

4697-Local LAN Adapter closed

4741-Media Error - Transceiver not working?
                   Cable fault?
                   Cable disconnected?





4694-The test has been active for 00000 minutes.




To go directly to other tests, enter: /Test,Option
Select Test; press ENTER ===>
```

Figure 26. Ethernet Status

This menu is invoked by taking Option **1** from the LAN Test Menu and LAN Adapter type is Ethernet. The LAN Status panel indicates the status of the Ethernet Adapter. The 4697 message indicates that the adapter is closed due to cable disconnection. It will change to 4698 once the adapter opens.

```
                    ————Token—Ring Adapter Status Summary—————

Adapter Address —          40003174000104         Adapter Status — Open

Customized links  — 005                           Active Links — 003

                              Counters             Overflow
 Line Errors                  00000000                 0
 Internal Errors              00000000                 0
 Burst Errors                 00000000                 0
 ARI/FCI Errors               00000000                 0
 Abort Delimiters             00000000                 0
 Lost Frames                  00000000                 0
 Receive Congestion           00000000                 0
 Frame Copied Errors          00000000                 0
 Frequency Errors             00000000                 0
 Token Errors                 00000000                 0




 To go directly to other tests, enter: /Test,Option
 Select ===►_
 PF: 3=Quit                                   12=Test Menu
```

Figure 27. Token-Ring Adapter Status Summary

This menu is invoked by taking Option **2** from the LAN Test Menu. If the LAN Adapter type is Token-Ring the Token-Ring Adapter Status Summary panel indicates the number of errors detected for the token ring by category.

```
                  _____ Ethernet Adapter Status Summary ______

Address - 400031740001   Closed    Links:  Customized - 005   Active - 000

                               Counters         Overflow
Alignment Errors               00000000            0
FCS Errors                     00000000            0
Single Collision Frames        00000000            0
Multiple Collision Frames      00000000            0
SQE Test Errors                00000000            0
Late Collisions                00000000            0
Internal MAC Transmit Errors   00000000            0
Carrier Sense Errors           00000000            0
Excessive Deferrals            00000000            0
Frames Too Long                00000000            0
Frames Too Short               00000000            0
Internal MAC Receive Errors    00000000            0



To go directly to other tests, enter: /Test,Option
Select Test; press ENTER ===>
```

Figure 28. Ethernet Adapter Status Summary

This menu is invoked by taking option **2** from the LAN Test Menu. If the LAN Adapter type is Ethernet the Ethernet Adapter Status Summary panel indicates the number of errors detected for the Ethernet by category.

```
                   -----------Link Status Summary-------------
Link Address              40000031400204    40000031400404    40000031400504
Primary/Secondary             01/00             01/00             01/00
Trans I-frames             00000007 - 0      00000030 - 0     00000007 - 0
Rec I-frames               00000005 - 0      00000022 - 0     00000005 - 0
Transmit Errors            00000000 - 0      00000000 - 0     00000000 - 0
Received Errors            00000000 - 0      00000000 - 0     00000000 - 0
T1 Expired                 00000000 - 0      00000000 - 0     00000000 - 0
Com/Res Ind                01     01         01     01        01     01







 To go directly to other tests, enter: /Test,Option
 Select ===►_
 PF: 3=Quit                              12=Test Menu
```

Figure 29. Link Status Summary

Option 4 of the LAN Test Menu, the Link Status Summary panel, shows traffic characteristics of each DSPU during this counting period, including the number of frames transmitted and received, the number of times the T1 or reply timer expired and the last command/response sent. The Primary/Secondary values indicate the LAN primary and secondary states for the link station, where "01" for primary state identifies the link as being open.

```
                ————————Gateway Host Status Summary————————
Customized Links — 006                              Address Range — C1 — C6

 Host       Link      LAN                  Host       Link      LAN
Address    Status   Address               Address    Status   Address
 C1         02      400031740001 04        C2         00      400000314001 04
 C3         02      400000314002 04        C4         02      400000314003 04
 C5         02      400000314004 04










 To go directly to other tests, enter: /Test,Option
 Select ===►_
 PF: 3=Quit                                  12=Test Menu
```

Figure 30. Gateway Host Status Summary

This panel was introduced in Configuration Support-S Release 2 to show the number of links declared to the microcode at customization time and the status of each link.

Field	Description
Customized Links	The number of links declared in customization
Address Range	The host address range declared in customization
Host Address	The address assigned each link during customization
Link Status	The two-digit status code representing the status of the link • For local models: – 00 = The LAN attached physical unit is in disconnect mode – 02 = The LAN attached physical unit is connected • For remote models: – 00 = SNRM required – 01 = SNRM received – 02 = Connected/active – 03 = Poll timeout
LAN Address	The station address assigned to each link during customization. This address is the six-byte LAN Adapter address followed by the one-byte SAP address.

4.9 Gateway Performance

The performance information presented in this section is intended to provide guidance in planning for your system. For the most current information, the IBM Systems Engineer should consult INFOSYS.

3174 Gateway Utilization

The 3174 LAN Gateway functions as a passthrough multiplexer for LAN traffic to and from a host. Its passthrough capacity determines the upper limit of the traffic flow and, therefore, the total number of workstations and devices that can be usefully accommodated on LAN-attached 3174s. The 3174 LAN Gateway does not care about source or destination device type, only about the characteristics and rate of the traffic.

The utilization of the 3174 with the LAN (Token-Ring) Gateway feature can be summarized in the following table:

CU/Term	TPM	Utilization (%)		
		3174 3R/53R	3174 Gateway	Ring
1/1	6.7	.95	.20	
1/32	214	30	6.5	
10/320	2140		65	15–17

Figure 31. 3174 Utilization with Gateway Feature

The first line in the table shows that the utilization of the 3174 gateway is 0.2 percent when a single terminal attached to a controller is transacting 6.7 type A-1200 transactions per minute (TPM). The next line shows the increase in utilization when the number of terminals on a single 3174 Model 03R is increased to 32, each processing 6.7 transactions per minute. The third line shows the number of terminals and controllers have been increased to 320 and 10 respectively (to 20 in the case of the Model 53R), again, with a transaction load of 6.7 TPM per terminal.

According to this information, the 3174 Token-Ring Gateway can handle a maximum of 35 to 40 transactions per second (TPS) resulting in a controller utilization of 65 to 70 percent. With this traffic, the ring utilization is in the range of 15 to 17 percent. When the aggregate transaction demand from devices attached to 3174 controllers with a token ring starts to exceed the thresholds presented in this document, operations continue without loss of data but response times increase, and data transfer rates drop.

The cited performance characteristics were obtained by customizing for an I-frame size of 2042 bytes on the token-ring network, and a window size of 2.

See customization Question 941. Using a smaller frame-size for large messages substantially increases utilization of the 3174 Token-Ring Gateway for a given amount of data to be transported, because overhead processing increases. As a result, traffic-handling capacity of the 3174 Token-Ring Gateway may be reduced by as much as fifty percent, depending on the application.

For Models 3R and 53R, the answers to configuration Questions 380, 381, 382, and 383 were assumed to be 2042, 1, 2042, and 2, respectively.

Note: With Configuration Support-B Release 2 and later, Questions 380 and 381 have been deleted. See “I-Frame Size and Window Size Considerations” on page 96 for a detailed explanation of the values in these questions.

On the SNA level, one acknowledgement message has been assumed to follow the ″write″ operations in both type A-1200 benchmarks and file transfers. While an SNA acknowledgement message does not add much to response time, it does significantly increase gateway utilization, thereby decreasing the maximum amount of traffic that the gateway can handle.

File Transfer Considerations

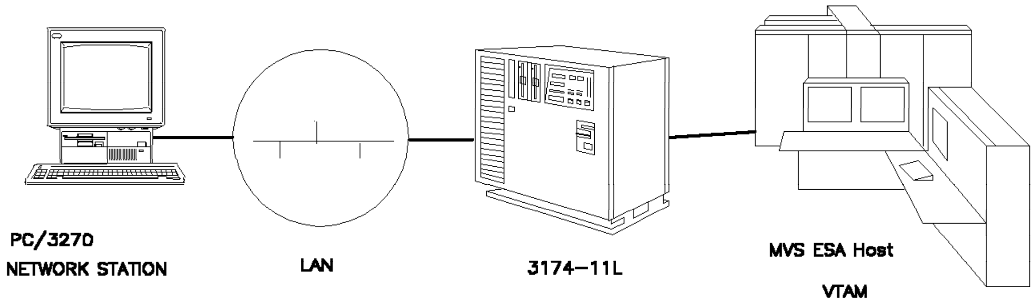
An aggregate rate of concurrent file transfers of 60KB per second would produce 65 percent utilization in the 3174 gateway, which is the recommended maximum. Please consider that file transfer and interactive transactions have to share the resources of the 3174 LAN Gateway. For example, when you want to allow for a combined average file transfer rate of 20 KB per second, do not plan for more than 24 type A-1200 transactions through the gateway. (The actual rate associated with a given file transfer depends on many factors such as workstation type and host support).

3174 DSPU vs. Channel-Attached 3274

Preliminary analysis indicates that it may be possible to migrate from channel attached 3274 control units to the new LAN-attached 3174s and realize an improvement in performance. For short data stream applications, such as alphanumerics, user response times across the LAN can be less than those for direct channel attachment via the current 3274 control units. Major reasons for the performance improvement include a faster processor and channel adapter in the 3174-01L (and even more in the 3174-11L), improvements in microcode, and the ability of the LAN to support data transfer rates in the megabit-per-second range. In a sample analysis, user response times were compared for a simple interactive workload (40-bytes in and 1400-bytes out) on two system configurations. The first configuration consisted of 3278 displays directly attached to 3274 controllers on an S/370 channel.

The second configuration had the 3278 displays on 3174 controllers located within a building complex on the token-ring network. The token-ring network, in turn, is connected to a 3174 controller on an S/370 channel. The subsystem response times (excluding the S/370 response time) for the Token-Ring configuration were 40-80 percent of response times for the channel attached 3274s. The smaller percentage occurred at higher terminal transaction rates where the greater throughput capacity of the 3174 was an advantage. For terminals emulating the 3278, the internal delays of the terminals may be large compared to the subsystem response times, so the improvement may not be noticeable to the user. These preliminary performance analyses were obtained from simulation models using simple, homogeneous workloads. Performance for a particular customer′s workload and environment may be different.

4.10 PC/3270 Attachment to 3174-11L Gateway



PC/3270 CONFIGURATION	3174 CONFIGURATION	VTAM LOCAL SNA MAJOR NODE
LAA=400000004001 Destination Address =400031740004 PIU Size=265	Q900 LAA=400031740004 Q940 Channel Address 41 =400000004001 Q941 Channel Address 41 F=0	CUADDR=B41 PUTYPE=2

Figure 32. PC/3270 Attachment to 3174-11L Gateway

In this connectivity scenario, a Personal Communications/3270 (PC/3270) V4.0 workstation is connected via a LAN to a 3174-11L Establishment Controller acting as a gateway. The PC/3270 V4.0 workstation will have two sessions to the S/370 host.

For this example, we need to do the following:

- Configure the PC/3270 V4.0 workstation to access the 3174-11L gateway
- Customize the 3174-11L gateway to allow the PC/3270 V4.0 workstation to attach as a downstream PU (DSPU)
- Define the 3174-11L as a channel attached SNA major node in VTAM
- Define the PC/3270 V4.0 workstation as a DSPU, with two LUs, in VTAM

Note: Not all of the required configuration, customization or definition screens will be shown, only those that are significant to the example are included.

4.10.1 Configuring PC/3270 for LAN Attachment

```
           Advanced Options for LAN Attachment via 802.2 Protocol    More: -+
--------------------------------------------------------------------------------
Enter the required information.

  Total number of LAN sessions  . . . . . .    2

  Link name   . . . . . . . . . . . . . . .    lan1

  Destination address   . . . . . . . . . .   [400031740004]

  Number of sessions for this gateway   . .   [2]

  Physical Unit ID  . . . . . . . . . . . .   [04001]

  Adapter number  . . . . . . . . . . . . .   [0]

  Remote SAP/Local SAP  . . . . . . . . . .   [04]/[04]

  Block ID  . . . . . . . . . . . . . . . .   [061]

  PIU size  . . . . . . . . . . . . . . . .   [0265]


F1=Help  F3=Exit  F7=Backward  F8=Forward
```

Figure 33. Adv. Opt. for LAN Attachment via 802.2 Protocol Screen (DOS Mode)

On this screen, we configure the PC/3270 V4.0 workstation as follows:

- Specify the destination address (400031740004) of the 3174-11L gateway
- Specify the number of sessions (2) destined for the gateway
- Specify a PUID (04001) for the workstation
- Use the default SAP (04) for the 3174-11L gateway
- Use the default Block ID (061) for the workstation
- Use the default PIU size (265 bytes) for the workstation

In this configuration, the PUID and Block ID are not really necessary. The only parameters that must match are the *destination address* and the *PIU size*. The 3174 does the task of mapping PUs to downstream LAN addresses.

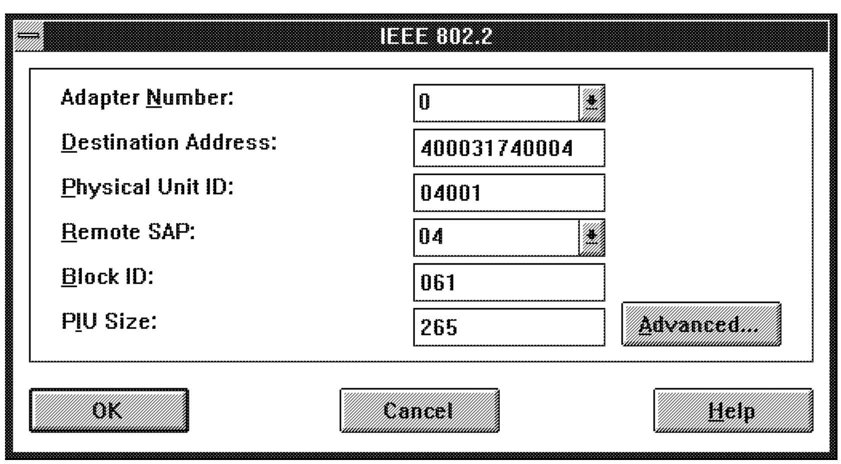


Figure 34. LAN via IEEE 802.2 Link Parameters Window (Windows Mode)

On the PC/3270 V4.0 Windows Mode Customize Communication window choose the LAN card and the LAN via IEEE 802.2 attachment and click on the Configure... button. Open the Link Parameters, which will bring you to the figure shown in Figure 34. Select the same parameters as for Full Function DOS Mode. The advanced link parameters are not used, the default value will match this configuration. To get the second session, you can just start the new customized WorkStation icon twice.

4.10.2 Customizing the 3174-11L Gateway

Next, we customize the 3174-11L with Token-Ring LAN adapter as a gateway for the PC/3270 V4.0 workstation. The 3174-11L has Configuration Support-C Release 5 microcode installed.

```
                 ____________ Model / Attach ____________


 Online Test Password    098 -

 Product Assistance Data
 099 - 3174 NUMBER 4 SN AE206 SNA TRN GATEWAY

 3174 Model              100 - 11L

 Host Attachment         101 - 5    1-BSC             6-SDLC, X.21 Switched
                                    2-SDLC            7-Token-Ring
                                    3-X.25            8-Ethernet
                                    4-Non-SNA Channel 9-Frame Relay
                                    5-SNA Channel     M-Multi-host

 LAN adapter type        102 - 1    0-none
                                    1-Token Ring
                                    2-Ethernet

 NSO selection           103 - 0000000000000000
 Select Test; press ENTER ===>
```

Figure 35. 3174 Model Definition

Questions 98 through 101 specify the 3174 model and host attachment type, and some descriptive information. In this example, we have a 3174-11L that is channel attached to an S/370. If you have a 3174-x1R (that is, a remotely-attached model) as a gateway, the customization is similar as far as the LAN connections are concerned.

```
                    Token-Ring Description

Token-Ring Address:   080 - 4000 3174 0004

Token-Ring Speed      082 - 1   0- 4Mbps
                                1-16Mbps
                                2-16Mbps with early Token Release
```

Figure 36. 3174 Token-Ring Description

Questions 080 and 082 specify the address and the speed of the Token-Ring Adapter of the 3174 Token-Ring Gateway.

If the LAN adapter installed in the 3174 gateway is an Ethernet adapter, the response to Question 102 would be a 2 and the following panel allows you to specify the characteristics of the Ethernet adapter.

```
                    Ethernet Description

Ethernet   Address:       084 - 4000 3174 0004

Ethernet media type       082 - 2  (2-10base2
                                    5-10base5
                                    T-10baseT)

Ethernet frame format     088 - 3  (1-IEEE 802.3
                                    2-Ethernet V2
                                    3-Both)
```

Figure 37. 3174 Ethernet Description

Questions 084, 086 and 088 specify the address, the media type and the frame format of the Ethernet adapter of the 3174 Ethernet Gateway respectively.

```
                 ____________ Local  SNA _____________
                                                                 LOCL

 104 - 40          105 - 5F        108 - 23AE206    110 - 3 0000     116 - S2 __

 121 - 01          123 - 0         125 - 01100110   126 - 01000000   127 - 5 1

 132 - 0 0 0 0     136 - 1 1 0 1   137 - 0 0 0 0    138 - 0

 141 - A           150 - 1 0       165 - 0          166 - A   - 0

 172 - 0           173 - 00000101  175 - 123456     179 - 0 0 0      190 - 00

 213 - 1           215 - 00000     220 - 0

 222 - 0           223 - 10        224 - 2          225 - 4

                                   242 - 0
```

Figure 38. 3174 Local SNA

The *Local (SNA)* screen has most of the questions that define the 3174-11L and the host link. Of interest the for 3174 LAN Gateway are Questions 104, 105, and 150:

- Question 104 is where you specify the 3174-11L address for host attachment. The 3174-11L is attached to subchannel address B40; therefore, we enter 40 as our response to this question.

  Note: Only the last two digits of the address are is required in Questions 104 and 105.

- Question 105 is where you specify, for a 3174 LAN gateway, the upper limit address of DSPUs. A DSPU could be a 3174-x3R/x4R (that is, a token-ring or Ethernet attached model), an AS/400, an OS/2 CM/2 workstation or a PC/3270 V4.0 workstation. Each DSPU requires a subchannel address and also a VTAM PU statement.

  We will use B5F as the upper limit address; therefore, we enter 5F in response to this question. The DSPUs will then have available addresses B41 through B5F.

  In this example, the PC/3270 V4.0 workstation will use address B41. Address B41 will later be related to the LAA of the PC/3270 V4.0 workstation through Question 940.

- Entering a 1 for the first digit of Question 150 specifies the LAN gateway.

```
                 ___________ Common Network ___________
                                                              40/LOCL

 900 - 4000 3174 0004 04       905 - 1          908 - TSCLAN




PF: 3=Quit    4=Default    7=Back    8=Fwd    9=RtnH
```

Figure 39. 3174 Common Network

On the Common Network screen, The last two digits of the question 900 defines the SAP of the 3174-11L an the LAA is picked up from the question 082. This is what you have configured in the PC/3270 V4.0 workstation as the *destination address*.

Question 940

This Question is used to define the mapping of channel addresses to the LAA of the DSPUs, including our PC/3270 V4.0 workstation.

In our example, we configured our PC/3270 V4.0 station with an LAA of 400000004001 in its CONFIG.SYS file. We, therefore, specify 400000004001 as the ″LAN Address″ to match the subchannel address 41. (Since the 3174 is connected to channel B, the address becomes B41.)

The SAP for PC/3270 V4.0 (SNA) is X′04′.

The **T** value on this screen specifies the type of DSPU device: *0* for workstation and *1* for 3174 Establishment Controllers.

```
                   _______ 940: LAN Address Assignment _______
                                                   Entry 001 of 031
  S      LAN  Address    SAP    T         S      LAN  Address    SAP    T
  40    4000 3174 0004    04
  41    4000 0000 4001    04    0         42    4000 0000 4002    04    0
  43    4000 0000 4003    04    0         44    4000 0000 4004    04    0
  45    4000 0000 4005    04    0         46    4000 0000 4006    04    0
  47    4000 0000 4007    04    0         48    4000 0000 4008    04    0
  49    4000 0000 4009    04    0         4A    4000 0000 400A    04    0
  4B    4000 0000 400B    04    0         4C    4000 0000 400C    04    0
  4D    4000 0000 400D    04    0         4E    4000 0000 400E    04    0
  4F    4000 0000 400F    04    0         50    4000 0000 4010    04    0
  51    4000 0000 4011    04    0         52    4000 0000 4012    04    0
  53    4000 0000 4013    04    0         54    4000 0000 4014    04    0
  55    4000 0000 4015    04    0         56    4000 0000 4016    04    0
  57    4000 0000 4017    04    0         58    4000 0000 4018    04    0
  59    4000 0000 4019    04    0         5A    4000 0000 401A    04    0
  5B    4000 0000 401B    04    0         5C    4000 0000 401C    04    0
  5D    4000 0000 401D    04    0         5E    4000 0000 401E    04    0


PF: 3=Quit   4=Default    7=Back   8=Fwd   9=RtnH                11=PageFwd
```

```
                   _______ 940: LAN  Address Assignment _______
                                                   Entry 031 of 031
  S      LAN  Address    SAP    T         S      LAN  Address    SAP    T
  40    4000 3174 0004    04
  5F    4000 0000 401F    04    0


All responses are correct
PF: 3=Quit   4=Default    7=Back   8=Fwd   9=RtnH   10=PageBack
```

Figure 40. 3174 LAN Address Assignment

Question 941

Question 941 will define the frame size and window size of each DSPU.

The F value represents the frame size, or *PIU size.* F=0 will allow a maximum PIU of 265 bytes, to match the value used in our PC/3270 V4.0 configuration.

The W value is the transmit window size, which is the number of frames sent before waiting to receive an acknowledgement.

```
                    ____ 941: LAN  Transmission Definition _____
                                                                    40/LOCL
                                                             Entry 001 of 031
  S      LAN  Address    SAP    F    W     S      LAN  Address    SAP    F    W
  40     4000 3174 0004   04
  41     4000 0000 4001   04    0    7     42     4000 0000 4002   04    0    7
  43     4000 0000 4003   04    0    7     44     4000 0000 4004   04    0    7
  45     4000 0000 4005   04    0    7     46     4000 0000 4006   04    0    7
  47     4000 0000 4007   04    0    7     48     4000 0000 4008   04    0    7
  49     4000 0000 4009   04    0    7     4A     4000 0000 400A   04    0    7
  4B     4000 0000 400B   04    0    7     4C     4000 0000 400C   04    0    7
  4D     4000 0000 400D   04    0    7     4E     4000 0000 400E   04    0    7
  4F     4000 0000 400F   04    0    7     50     4000 0000 4010   04    0    7
  51     4000 0000 4011   04    0    7     52     4000 0000 4012   04    0    7
  53     4000 0000 4013   04    0    7     54     4000 0000 4014   04    0    7
  55     4000 0000 4015   04    0    7     56     4000 0000 4016   04    0    7
  57     4000 0000 4017   04    0    7     58     4000 0000 4018   04    0    7
  59     4000 0000 4019   04    0    7     5A     4000 0000 401A   04    0    7
  5B     4000 0000 401B   04    0    7     5C     4000 0000 401C   04    0    7
  5D     4000 0000 401D   04    0    7     5E     4000 0000 401E   04    0    7



PF: 3=Quit   4=Default    7=Back   8=Fwd   9=RtnH               11=PageFwd
```

```
                    ____ 941: LAN  Transmission Definition _____
                                                                    40/LOCL
                                                             Entry 031 of 031
  S      LAN  Address    SAP    F    W     S      LAN  Address    SAP    F    W
  40     4000 3174 0004   04
  5F     4000 0000 401F   04    0    7


All responses are correct
PF: 3=Quit   4=Default    7=Back   8=Fwd   9=RtnH   10=PageBack
```

Figure 41. 3174 LAN Transmission Definition

4.10.3 VTAM Definitions (Gateway/Workstation)

The 3174-11L, the PC/3270 V4.0 workstation and other DSPUs are defined here in a single local SNA major node. This could have been done in two VTAM node definitions: one for the 3174-11L and its coax terminals, and another for the DSPUs, including our PC/3270 V4.0 workstation.

Each of these downstream stations has two LUs defined. PC/3270 V4.0 supports up to eight LUs for DOS mode and 26 for Windows mode, so you could have the maximum LUs defined under each PU.

We will use a logmode (DLOGMOD) called DYNAMIC. This logmode allows the user to define the screen size at the workstation. VTAM and the host applications can dynamically adjust to the workstation's configured screen sizes.

```
**********************************************************************
* LOCAL SNA MAJOR NODE FOR THE 3174-11L AT B40                       *
**********************************************************************
         VBUILD TYPE=LOCAL
PUB40    PU    CUADDR=B40,              3174-11L GATEWAY              X
               ISTATUS=ACTIVE,                                        X
               MAXBFRU=20,                                            X
               MODETAB=MT3270,                                        X
               DLOGMOD=T3279M2,                                       X
               PACING=0,                                              X
               PUTYPE=2,                                              X
               SECNET=NO,                                             X
               SSCPFM=USSSCS,                                         X
               USSTAB=USSNSCS,                                        X
               VPACING=0
LUB4002  LU    LOCADDR=2,DLOGMOD=T3279M2
LUB4003  LU    LOCADDR=3,DLOGMOD=T3279M2
:
LUB4064  LU    LOCADDR=64,DLOGMOD=T3279M2
LUB4065  LU    LOCADDR=65,DLOGMOD=T3279M2
**********************************************************************
* DOWNSTREAM PC/3270 WORKSTATIONS ON THE 3174-11L                    *
**********************************************************************
PUB41    PU    CUADDR=B41,             EXAMPLE PC ON 3174-11L GATEWAY X
               DLOGMOD=DYNAMIC,                                       X
               ISTATUS=ACTIVE,                                        X
               MAXBFRU=20,                                            X
               MODETAB=MT3270,                                        X
               PACING=0,                                              X
               PUTYPE=2,                                              X
               SSCPFM=USSSCS,                                         X
               USSTAB=USSNSCS,                                        X
               SECNET=YES,                                            X
               VPACING=0
LUB4102  LU    LOCADDR=2
LUB4103  LU    LOCADDR=3
```

Figure 42 (Part 1 of 2). Local SNA Major Node Definition for 3174-11L

```
PUB42     PU    CUADDR=B42,              OTHER PC ON 3174-11L GATEWAY    X
                DLOGMOD=DYNAMIC,                                         X
                ISTATUS=ACTIVE,                                          X
                MAXBFRU=20,                                              X
                MODETAB=MT3270,                                          X
                PACING=0,                                                X
                PUTYPE=2,                                                X
                SSCPFM=USSSCS,                                           X
                USSTAB=USSNSCS,                                          X
                SECNET=YES,                                              X
                VPACING=0
LUB4202   LU    LOCADDR=2
LUB4203   LU    LOCADDR=3
 :
PUB5F     PU    CUADDR=B5F,              OTHER PC ON 3174-11L GATEWAY    X
                DLOGMOD=DYNAMIC,                                         X
                ISTATUS=ACTIVE,                                          X
                MAXBFRU=20,                                              X
                MODETAB=MT3270,                                          X
                PACING=0,                                                X
                PUTYPE=2,                                                X
                SSCPFM=USSSCS,                                           X
                USSTAB=USSNSCS,                                          X
                SECNET=YES,                                              X
                VPACING=0
LUB5F02   LU    LOCADDR=2
LUB5F03   LU    LOCADDR=3
```

Figure 42 (Part 2 of 2). Local SNA Major Node Definition for 3174-11L

4.11 3174 DSPU: Models x3R and x4R

The 3174 Models x3R attach to the token-ring network and the Models x4R attach to the Ethernet network as the primary link and communicate with a host as DSPUs through a gateway. A 3174 Model x3R/x4R can also communicate with multiple hosts via its primary link when using Single Link Multi-Host support.

Each 3174 DSPU can connect up to:

- 16 3270 and 8 ASCII workstations on the smaller models
- 64 3270 (with the 3270 Port Expansion Feature) and 24 ASCII workstations on the larger models.

For DFT workstations with multiple sessions or CUT terminals with the MLT function these controllers support up to 320 LUs (see 9.1, "Multiple Logical Terminal" on page 331 for details).

If you are customizing for multiple gateways then you have to code the additional gateways as you do for all multiple host configurations by specifying an M to question 101 and then defining the additional hosts as normal.

Unlike the PCs attached to the LAN, devices attached to these 3174 models (token-ring models x3R only) are not be able to communicate directly with other devices on the LAN unless:

- For Configuration Support-B, the 3174 has RPQ 8Q0718 for Peer Communication installed (see "3174 Peer Communication RPQ (8Q0718)" on page 26 for further details).
- For Configuration Support-C, the 3174 has Peer Communication feature LIC installed (see Chapter 19, "Peer Communication" on page 557 for futher details).

4.11.1 Hardware Installation

3174 models with the upstream Token-Ring Adapter card are:

- 3174-13R has up to 64 ports and manages up to 320 LUs.
- 3174-23R has up to 64 ports and manages up to 320 LUs.
- 3174-63R has up to 16 ports and manages up to 80 LUs.

3174 models with the upstream Ethernet Adapter card are:

- 3174-14R has up to 64 ports and manages up to 320 LUs.
- 3174-24R has up to 64 ports and manages up to 320 LUs.
- 3174-64R has up to 16 ports and manages up to 80 LUs.

Functionally, the models are identical. You can also change existing 3174-x1R (V.24/V.35 interface) or 3174-x2R (X.21 interface) models to 3174-x3R or x4R models simply by installing the token-ring adapter or the Ethernet adapter and customizing a new control diskette. The available 3174-13R/14R conversion package includes the following:

- Token-ring or Ethernet adapter
- Control and Utility diskettes
- Adapter cable

No additional storage expansion is needed for this conversion. The microcode determines which adapter of the 3174 is operational and customized.

4.11.2 Microcode Required

The microcode includes a Utility diskette and a Control diskette (for Configuration Support-C Control Extension diskette is also needed) with the microcode needed to handle the LAN connection. This microcode is implemented in Configuration Support-A Release 2 and later for Token-Ring LAN and Configuration Support-C Release 4 and later for Ethernet LAN and therefore supports all standard 3174 functions.

4.11.3 Storage Required

There are no additional storage requirements for these models.

Since these downstream PUs communicate with the host through gateways, they appear to the host access methods and applications like a PU type 2.0. Certain sense information generated by these PUs is different from that generated by the 3274 control units (see *3174 Functional Description*).

4.11.4 3174 Customization

Before your 3174 can be used as a downstream cluster controller, it has to be properly customized. Only those customization questions dealing with the LAN attachment are discussed in this chapter. The 3174 microcode level used here is Configuration Support-C Release 5.

If you have to decide whether data should be compressed the recommendation is that locally attached devices should transmit non-compressed data because of the high channel speed and remotely attached devices should compress data to be transmitted because of the lower line speed.

Question 100: Model Designation

The response to this question is x3R or x4R, where x is the model type.

Question 101: Host Attachment

Depending on the response to this question, the next two customization panels displayed relates to the environment chosen. If your response is 7 (Token-Ring Attachment), the next two panels presented are the Token-Ring Description panel and the Local Area Network panel. Similarly, if your response is 8 (Ethernet Attachment), the next two panels presented are the Ethernet Description panel and the Local Area Network panel.

Multi-host configurations and responses are covered in Chapter 9, “Multi-Host Connectivity” on page 331.

Question 102: LAN Adapter Type

The response to this question is a 1 if the LAN Adapter type is Token-Ring Adapter (Models x3R) or a 2 if the LAN Adapter type is Ethernet Adapter (Models x4R).

Question 080: Token-Ring Address

This question appears if you specify a 1 for question 102.

The response cannot be all zeros. The format of the address is:

```
4000cddddddd
```

Where 4000 is the fixed part of the address
c must not be greater than X′7′
d can be any value from X′0′ to X′F′

See 4.4.1, “Example Address Convention” on page 75.

Question 082: Token-Ring Speed

The response to this question specifies the token-ring speed of the LAN.

- 0 = 4 Mbps - Normal token release
- 1 = 16 Mbps - Normal token release
- 2 = 16 Mbps - Early token release

Note that:

- Response 0 is valid for both feature #3025 and #3044 (Adapter type 9350 and 9351) and it is the default value.

- Response 1 and 2 are valid only for feature #3044 (Adapter type 9351).

Question 084: Ethernet Address

This question appears if you specify a 2 for Question 102.

The response cannot be all zeros and the format of the address is similar to Question 080.

Question 086: Ethernet Media Type

The response to this question specifies the media type of the Ethernet Network.

- 2 = 10Base2
- 5 = 10Base5
- T = 10BaseT

Question 088: Ethernet Frame Format

The response to this question specifies the type of Ethernet frame format you are going to use.

- 1 = IEEE 802.3
- 2 = Ethernet V2
- 3 = Both

The default value is 1.

Question 106: LAN and SAP of the 3174

This question applies only to a 3174 to be customized as a DSPU. The response must contain 14 hexadecimal digits for the LAN address and SAP. The first 12 digits contain the LAN address specified in the question 080 for Token-Ring Adapter or Question 084 for Ethernet Adapter and it is fixed. `4000cdddddddd ss`

```
Where - 4000cdddddddd contains the token-ring address or Ethernet
          address specified in Q.082 or Q.084
        - ss is the SAP address and defaults to X'04'
```

Note: The SAP address can only be specified in Configuration Support-B Release 2 and later and Configuration Support-C where SLMH is supported. Previous levels of microcode will force this value to be X′04′.

Question 107: Gateway Address and SAP

This question applies only to a 3174 to be customized as a DSPU. The response must contain 14 hexadecimal digits for the LAN address and SAP of the gateway. `4000cdddddddd ss`

```
Where  4000 is the fixed part of the address
        c    must not be greater than X'7'
        d    can be any value from X'0' to X'F'
        ss   is the SAP address and defaults to X'04'
```

Note: The SAP address can only be specified in Configuration Support-B Release 2 and later and Configuration Support-C where SLMH is supported. Previous levels of microcode will force this value to be X′04′.

The user-specified portion will be determined by the addressing conventions in force in the installation, see 4.4.1, “Example Address Convention” on page 75.

Question 215: Physical Unit Identification

The Physical Unit Identification (PUID) consists of five hexadecimal digits in the range X′00000′ through X′FFFFF′. The default value is X′00000′. Each PUID in the network should be unique because it identifies the 3174 to the host in response to an XID command.

The PUID is mandatory if the 3174 DSPU uses a 37xx gateway and must match the IDNUM parameter in the switched major node for the 3174 DSPU.

The PUID has no significance if the gateway is a 3174. There is no IDNUM parameter in the PU statement of a local SNA node. However, we recommend supplying a unique value since the type of gateway may change (for example, for backup reasons).

Question 382: Transmit I-Frame Size

This question has been given different names in the different releases (the question number stays the same):

- Configuration Support-A - Maximum Transmission I-Frame Size
- Configuration Support-B Release 1 - Maximum Transmission I-Frame Size
- Configuration Support-B Release 2 - Maximum Outbound I-Frame Size
- Configuration Support-B Release 3 - Maximum Ring I-Frame Size
- Configuration Support-B Release 4 - Maximum Ring I-Frame Size
- Configuration Support-C - Transmit I-Frame Size

All of the names refer to the same thing; that is, the maximum size of the I-frame that the 3174 sends over the LAN.

The response consists of four numerical characters (padded with leading zeros if necessary). The default value is 0521.

Notes:

1. The response to this question depends on your gateway and LAN configuration.
2. The I-Frame size should include the length of the SNA transmission header (six bytes) and the request/response header (three bytes).
3. Valid responses are:
   - For a 3174 with a 4 Mbps Token-Ring Adapter installed: 0265 to 2042
   - For a 3174 with a 16/4 Mbps Token-Ring Adapter installed: 0265 to 2057
   - For a 3174 with a 10 Mbps Ethernet Adapter installed: 0265 to 1033

Question 383: LAN Maximum Out

The response specifies the maximum number of link level I-Frames that the 3174 DSPU transmits before it waits for an acknowledgement. It may also be referred to as the transmit window size.

The response must be a number from 1 to 7. The default value is 2.

Notes:

1. The response to this question depends on your gateway and LAN configuration.
2. The following figure specifies valid responses based on the associated I-Frame size given in the response to Question 382.

I—Frame size entered as response to Q.382	LAN Maximum Out
265 <= X <= 521 bytes	7
522 <= X <= 1033 bytes	7
1034 <= X <= 2042 bytes	4

Figure 43. DSPU I-Frame Size and Maximum Out

4.11.5 3174 DSPU with 37xx Gateway

The 3174 DSPU communicating with the host via a 37xx Communication Controller must be defined to VTAM in a switched SNA major node and to NCP as a PU 2.0 attached to a switched SDLC link (the TIC must be defined to NCP as a PU T1 attached to a leased line). The IDBLK number carried in the inbound XID command is 017 (the same as for a 3174/3274 attached to a real switched line).

A 3745 can support 9999 DSPUs, a 3725 can support 2440 DSPUs, and a 3720 can support 522 DSPUs. If a DSPU must communicate through a second gateway (for example, a second TIC or another 3720/25) with a different LAN address, you must re-IML the 3174 with a Control diskette that has the second gateway address customized as the destination, unless you are running multi-host support.

The gateways used for the tests were a 3725 channel attached to the host with two different TICs attached to two different rings and, in another case, a remote 3720 connected via an INN link to a local channel attached 3720.

Differences Between the 3174 DSPU and a PC

The two major differences between a 3174 DSPU and a PC with Personal Communications/3270 using a 37xx gateway are:

1. The 3174 DSPU normally has more than two LUs defined. Adjust your LUDRPOOL parameter accordingly. Likewise, having several LUs per PU affects the MAXLU value on the logical lines PU statement.
2. The 3174 DSPU allows receiving and transmission of larger Token-Ring frames. This impacts your coding of the MAXOUT parameter in the switch major node PU, your specification of frame sizes received, RCVBUFC=, and frames transmitted by the TIC, MAXTSL=.

DSPU Examples.
See Chapter 10, "Connectivity Customization Examples" on page 351 for examples of VTAM, NCP, and 3174 customization questions for 3174s defined as DSPUs.

4.12 Backup and Recovery

4.12.1 3174 Local Gateway

Test Configuration
This section describes the configuration installed at ITSO Raleigh Center to test different backup/recovery scenarios and file transfer from a 3270 PC to different operating systems through different gateways.

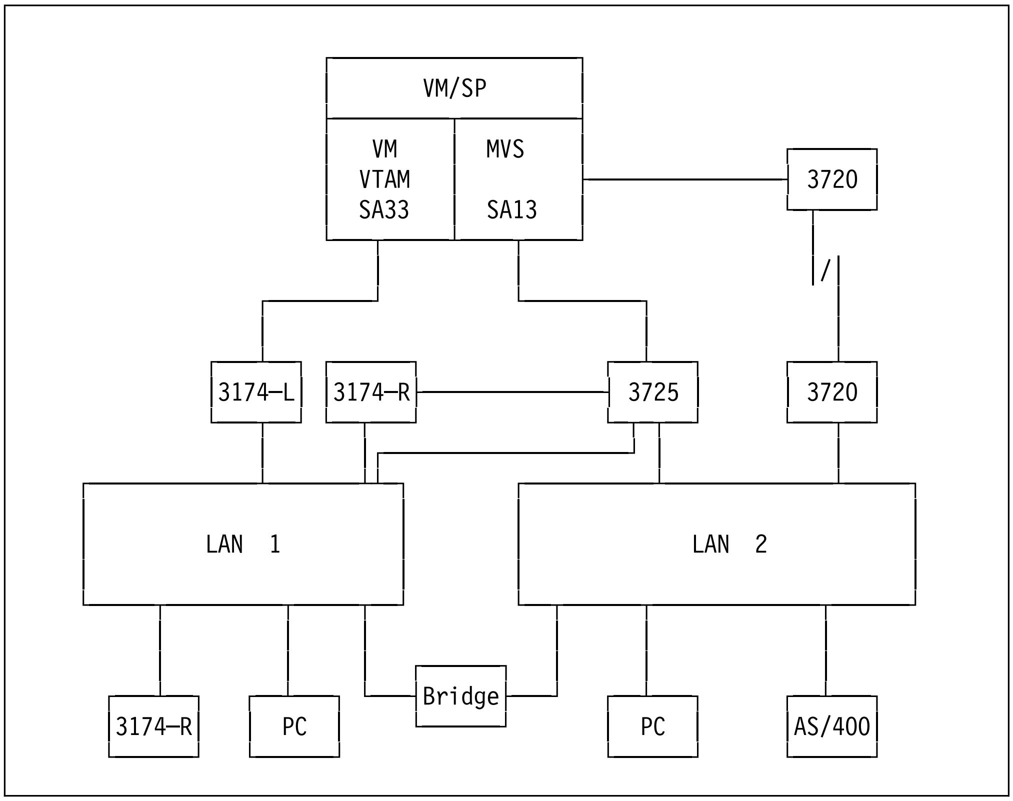


Figure 44. Test Configuration

3174 and 3725 gateways were channel attached to different subareas, one under VM/VTAM and the other under MVS. Both virtual machines were linked via a virtual channel-to-channel connection. The 3720 gateway was line-attached to another 3720 which was in turn channel attached to the same MVS system.

Different DSPUs (such us the 3174-03R, AS/400 and PCs using 3270 emulation or APPC/PC) were set up to test with all the gateways, to different operating systems, and applications.

Two different token-ring LANs linked via a bridge were installed to test backup/recovery scenarios when the gateways were located in the same or different ring of the DSPUs. The 3725 was attached to both rings with two different TICs.

4.12.2 Planning for Backup/Recovery

The 3174 LAN Gateway offers powerful backup/recovery possibilities. Personnel responsible for network planning and installation should consider the information presented here and tailor it to their own environments.

Different scenarios are offered as suggestions for gateway backup and LAN recovery. The number of 3174 LAN gateways, the LAN gateway addresses and the number of hosts are some of the different factors taken in consideration. A scenario with mixed types of gateways is also presented.

Network topology can be accommodated to fit any of these environments. As this document deals with the 3174, you will not find information regarding LAN topologies or LAN design; other manuals should be consulted for such information.

Backup Planning

The following points should be considered for backup planning:

- Number of gateways

  The number of transactions per second that flow through the gateway determines the number of gateways needed. Use different tools (SNAP/SHOT, FIVE3270, 3X74 Performance Guidelines manual, etc.) to determine the load the gateway is going to handle.

  Each gateway should have its own backup controller ready to restart the traffic in case the normal gateway fails.

- Number of hosts

  The number of hosts (and how they are interconnected) determines the way the 3174 LAN Gateways (normal and backup) should be attached.

- LAN topology

  Any LAN topology is accepted by the 3174 LAN Gateways and by the DSPUs. Bridges are transparent from the gateway and DSPU points of view.

Recovery Planning

When the gateway fails, the 3174 DSPUs and all the LAN-attached stations that were using the gateway start sending a TEST command to the gateway address (and only to this address). If there is no answer in the LAN where the DSPUs are attached they send every other TEST command with the broadcast bit on; these commands are propagated through the bridges if they are present. 3174 DSPUs keep sending the TEST command until a backup gateway is activated or the failed gateway is recovered.

In case of failure of one or more DSPUs, the 3174 LAN Gateway only attempts to connect them for each CONTACT received from the host (just one for initial processing). In an error situation where the link was operational and fails, the LAN Adapter attempts recovery; then VTAM is notified with an INOP, and VTAM may attempt recovery one time depending on what was specified to VTAM. The 3174 LAN Gateway does not make a continual attempt to connect by itself.

If you are running Configuration Support-S your 3174 does not have the ability to attach to two different hosts. A second controller should be attached to a different host or to a different channel in the same host; this creates full gateway backup and complete recovery scenario from the gateway and the host points of view.

If two gateways are attached to two different hosts and customized with the same LAN address in two different LANs, they can be active at the same time. In such a scenario, if the normal gateway fails, recovery to the backup gateway by the DSPUs is automatic and almost instantaneous.

- **3174 LAN gateways with same address**

  If you have customized two 3174 LAN Gateways with the same LAN address (on the same LAN), the first 3174 LAN Gateway will IML and open its LAN Adapter successfully. When you IML the second 3174 LAN Gateway, it tries to open its LAN Adapter but will fail because of the duplicate address. It displays a status code of 881-01 (if the two gateways are in the same ring) but stays operational for its coax attached devices.

  If the normal gateway fails you activate, via NetView, the "backup" gateway. Any DSPUs defined in the local major node of the backup gateway is able to re-establish a host session, as the backup gateway has the same LAN address as the now inactive normal gateway. If you need to recover a large number of DSPUs, you may wish to include all the necessary commands in a NetView CLIST.

  If only one host is present, deactivation/activation of the involved local major nodes is necessary. If local major node definitions are located in different hosts, both can be active at the same time.

  If both gateways are attached to different rings connected via a bridge, duplicate address checking is not done. In this case, both 3174 LAN gateways come up initially without returning the status code 881. This is the best recovery approach that can be offered with the 3174 LAN gateway since it requires only a NetView command from the CNM console with no re-IML of DSPUs and/or movement of people. However, you should be aware of the total number of DSPUs for both rings going through one gateway, especially when this total is close to the limit the microcode is able to support.

- **3174 LAN gateways with different addresses**

  Another alternative could be be that you have a normal gateway and a backup gateway with different LAN addresses. The advantage is that both can be active at the same time in the same LAN and they can share the load of the LAN traffic. If one gateway fails, the second can take over if all the DSPUs of the failing gateway are re-IMLed with the operative gateway address. Probably this alternative will not be acceptable in most installations since it is disruptive and requires gateway address changes to each DSPU.

4.12.3 Recovery Scenarios

Scenario 1: One Host with Two 3174 Gateways

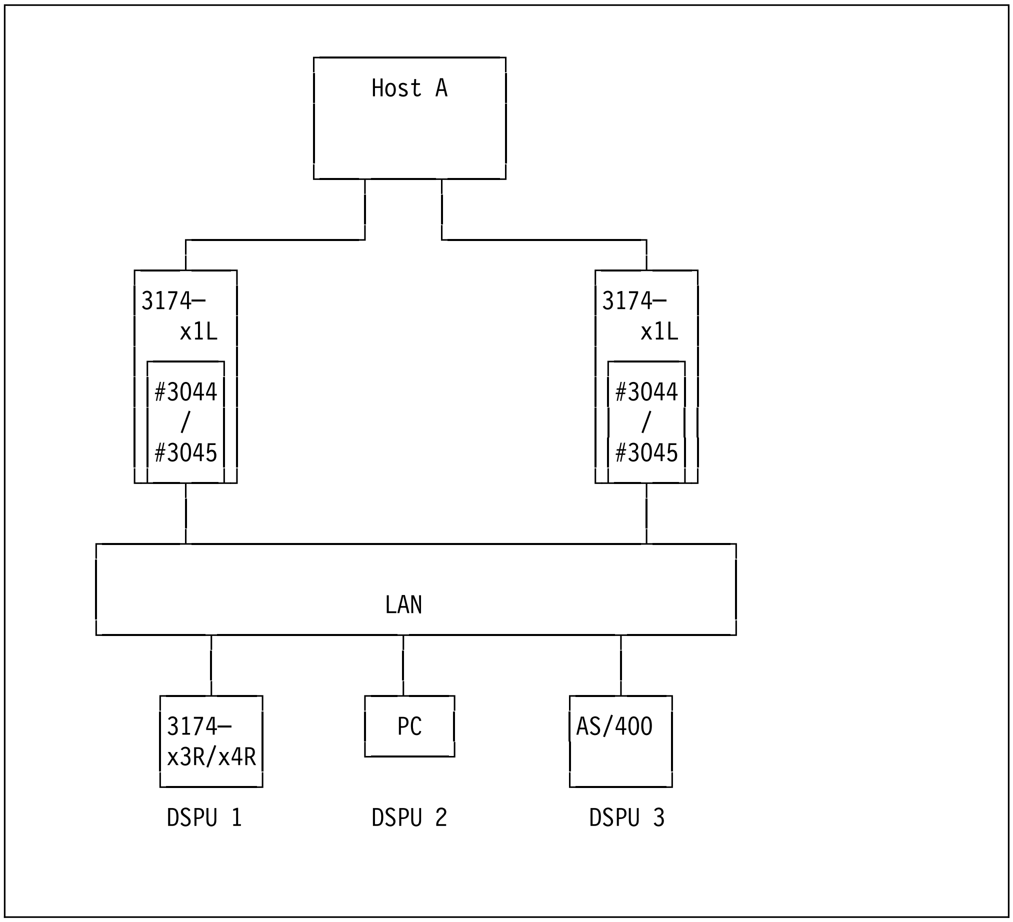


Figure 45. Scenario 1: One Host with Two 3174 Gateways

This is the simplest scenario. The second 3174 LAN Gateway handles the traffic when the normal 3174 LAN Gateway fails.

- Both gateways have the same LAN address.
- All DSPUs point to the LAN gateway address.
- Recovery should be done as described in "Recovery Planning" on page 144.
- For better reliability, each gateway should be attached to a different host channel.

Scenario 2: Two Hosts with Two 3174 Gateways

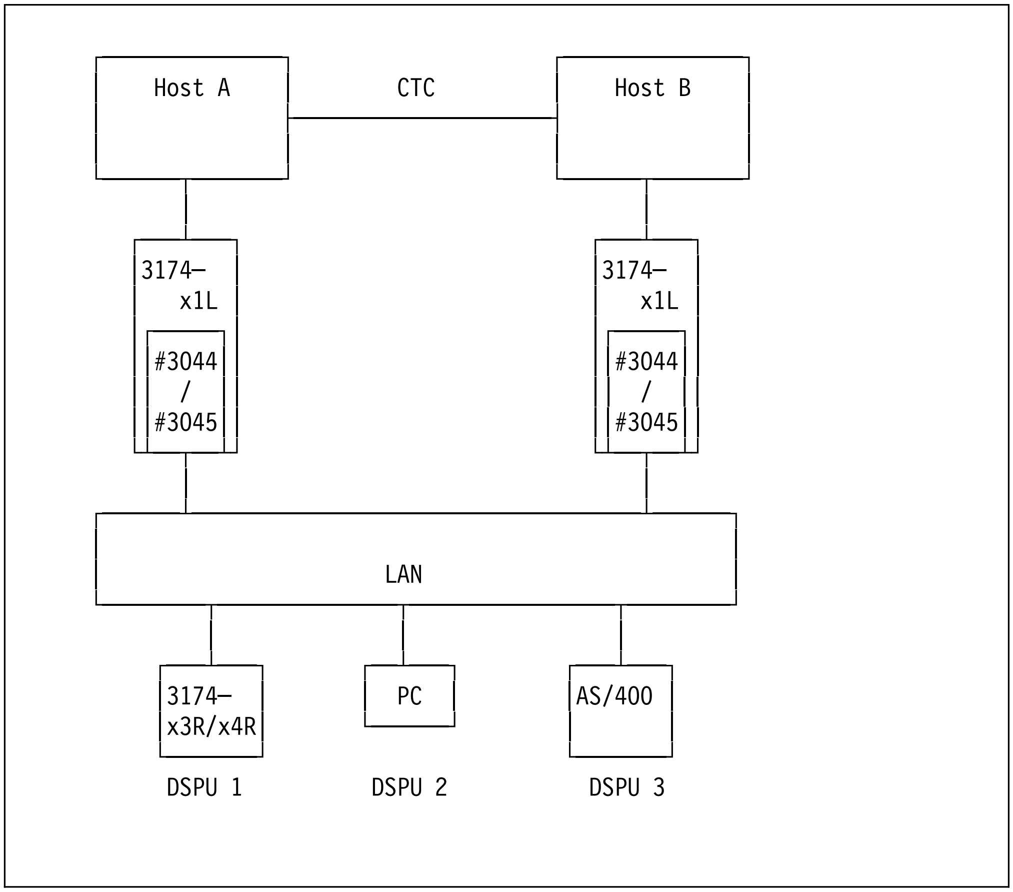


Figure 46. Scenario 2: Two Hosts with Two 3174 Gateways

This scenario is more complex than the previous one. The following points should be considered:

- There is not enough traffic flowing through the gateway to justify more than one active gateway at a time.
- End users need to access applications in both hosts through cross-domain facilities they already have in place. The figure above shows a channel-to-channel facility.
- In order to provide the best recovery capabilities, the second 3174 LAN Gateway should be attached to host B.

<u>**Recovery**</u>:

- **Host resources**

  As two hosts are available in this scenario, VTAM definitions for network resources can be active at the same time. This allows you to recover all the DSPUs with only one ACTIVATE command from the CNM console if the gateway or the host fails.

- **Failure of normal 3174 LAN Gateway**

  Activation of LAN-attached controllers should be done with the procedure already explained. Interactive users of applications in host A should regain access to them through a cross-domain route from host B; users of host B applications access them directly.

- **Failure of host A**

  In this scenario, the normal 3174 LAN Gateway senses that host A has failed and terminates the sessions for its local terminals but keeps the LAN Adapter open, since there was no error in the LAN. This adapter should be forced closed before attempting to recover the traffic through the backup 3174; otherwise the backup 3174 LAN Gateway will find a duplicated address and will not open its own adapter.

  The only way to force the adapter closed is either to physically disconnect the 3174 from the LAN or to interrupt it with an IML (or by powering it off).

  Interactive users of applications in host B get direct connection to this host. Users of applications in host A have to stand by until the host is recovered (or they may access any available application in host B).

- **Failure of host B**

  Users of applications in host A should not be aware that host B is not available. Users of host B will have to stand by until the host is recovered or they may access any available application in host A.

Scenario 3: Two Hosts with Multiple 3174 Gateways

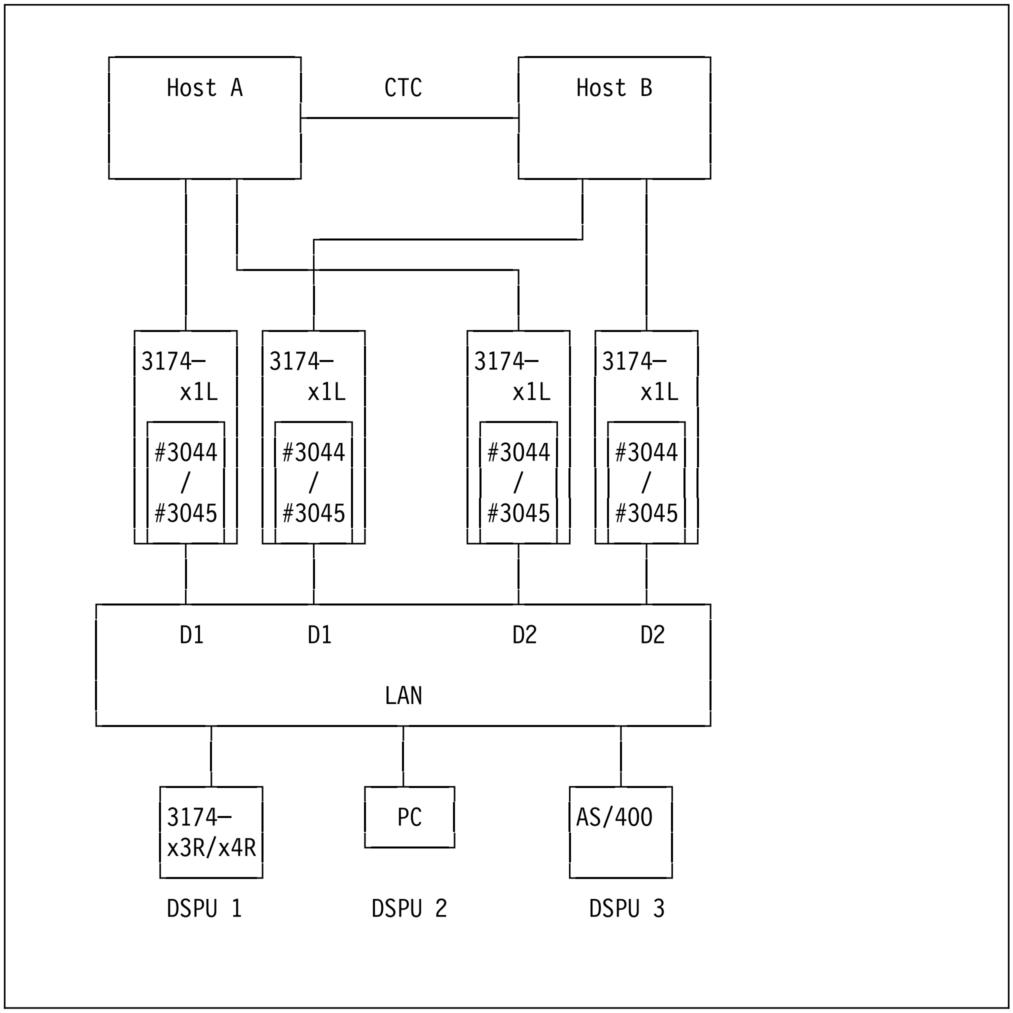


Figure 47. Scenario 3: Two Hosts with Multiple 3174 Gateways

This scenario assumes higher traffic volumes through the gateway, forcing it to have more than one active gateway at any one time. There are three kinds of users: a group which accesses applications only in host A, another group which accesses applications only in host B and a third group which accesses applications in both hosts.

Every 3174 LAN Gateway should have a backup gateway customized with the same address but channel attached to the other host. That is, a normal 3174 with address D1 attached to host A and its backup 3174 with the same address D1 attached to host B.

Recovery procedures are similar to the previous scenarios; the important point to remember here is that the backup 3174 should be attached to a different host. The group of users accessing applications in host A should be routed through the gateway with the D1 address; the group of users accessing applications in host B should be routed through the gateway located in address D2. Multi-host access should be done through the conventional cross-domain links.

Scenario 4: Two Hosts With Mixed Gateway Types

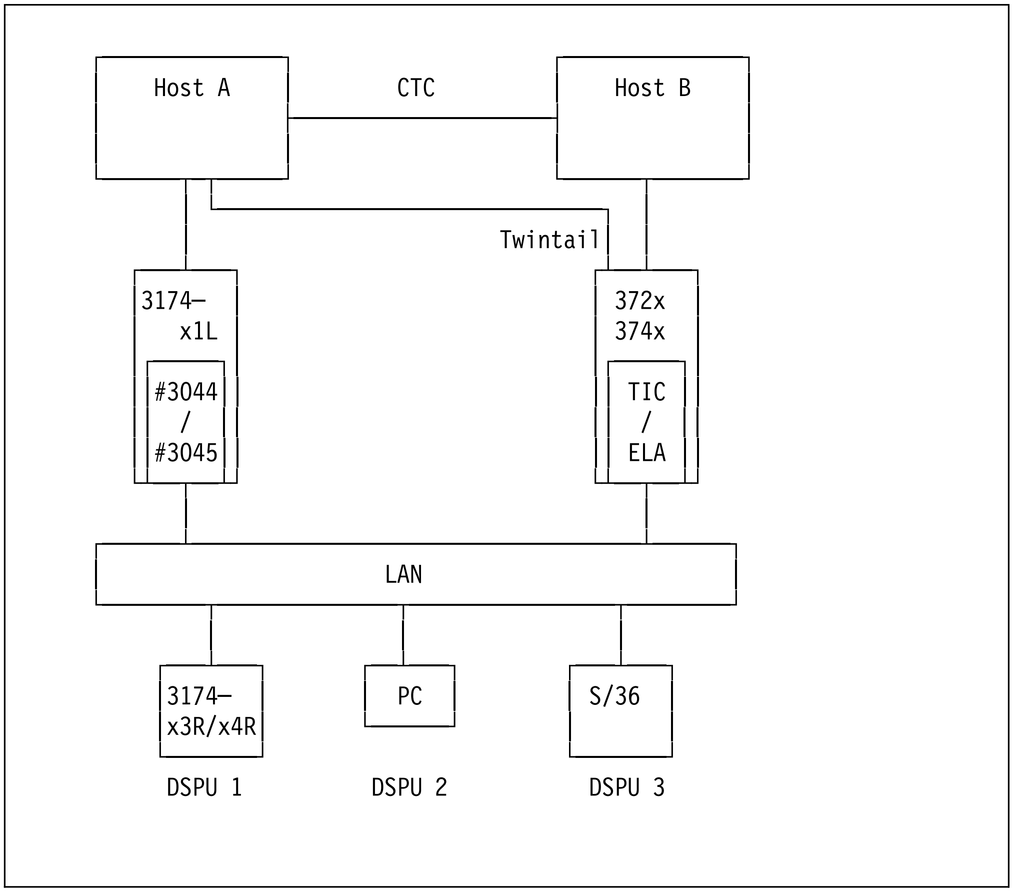


Figure 48. Scenario 4: Two Hosts with Mixed Gateway Types

This scenario considers that a 3174 LAN Gateway is working as the backup for a 37xx, or vice versa. The same considerations given in previous scenarios apply for this one.

Note:

> One important point to remember is that host definitions for the DSPUs are different depending on the gateway they are using.
>
> In the case of the 3174, they are defined as channel attached controllers in a local major node, while in the case of the 37xx, they are defined as remote controllers in a switched major node.

This scenario combines the best of both worlds. It can be used by a customer installing a LAN interface in an existing 37xx and wants to have a full backup/recovery capability without having to install a second 3725.

If gateways are attached to different hosts and different LANs, both gateways and their VTAM resources for the DSPUs can be active at the same time; in this case recovery is automatic and almost instantaneous.

Scenario 5: Alternate IML

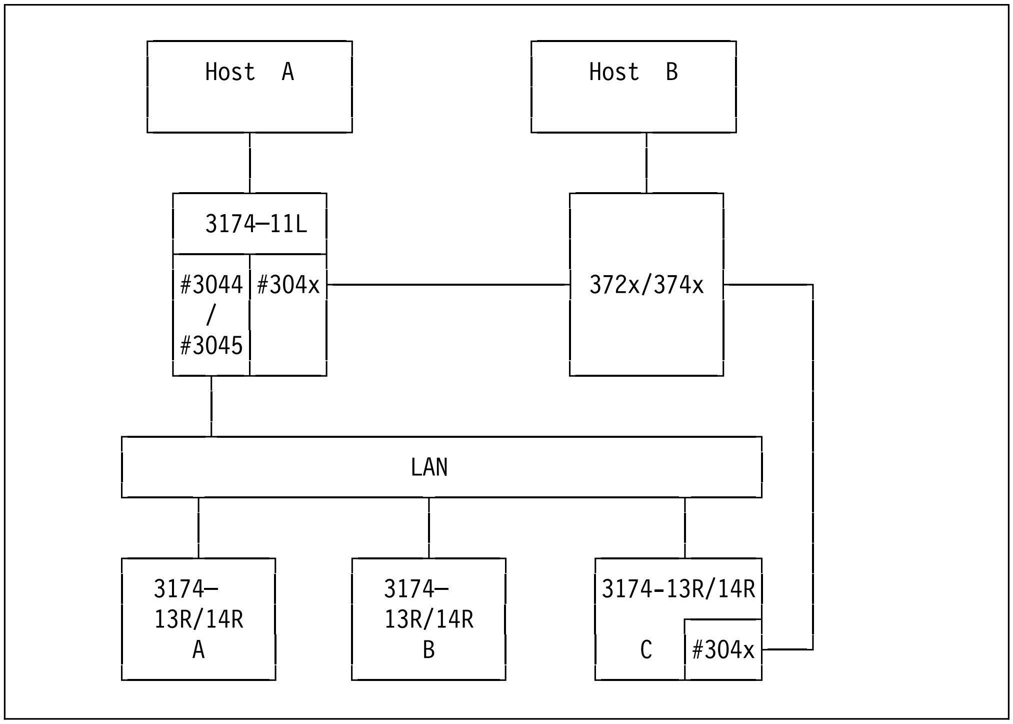


Figure 49. Scenario 5: Alternate IML

For 3174 Models 01L/11L, 03R/13R and 14R, features #3040 through #3043 provide an additional communication adapter with a V.24, V.35 or X.21 interface. These adapters cannot be used concurrently with the primary host link and require an IML after loading another pre-customized Control diskette.

If host A fails, the local channel attached gateway can be re-IMLed with a Control diskette customized for a TP interface, thus giving the Model 11L the appearance of an Model 11R or 12R. The local gateway becomes a remote gateway attached via a TP link and 37xx to host B.

With devices A, B and C, the base microcode (that is, without gateway customized) supports the upstream LAN attachment. In this example, device C also has an alternate TP link (#3040 through #3043) installed. Under normal operation, device C is IMLed as a DSPU.

In a token-ring network, for backup purposes, the customer has also installed a feature #3026, with its accompanying Configuration Support-S microcode customized for gateway functions. If the normal 3174 Token-Ring Gateway fails, device C can be IMLed with its alternate configuration to become a 3174 remote gateway for devices A and B. This may not be a cost-effective solution.

A better alternative would be to install feature #3044 with either Configuration Support-B or Configuration Support-C in device C for a token-ring network. With this adapter/microcode combination, device C can use the #3044 feature for normal operation as a DSPU and for backup operation as a remote gateway. A Control diskette appropriately customized for the alternate configuration must be prepared for backup operation.

In a Ethernet Network, feature #3045 needs to be installed with Configuration Support-C Release 4 or later.

If the 3174 local gateway fails, it disconnects from the LAN. Hence, device C can now be IMLed with the same gateway address, and serve the same DSPUs, as the failed local gateway.

After device C is alternate IMLed as a remote gateway, all LAN attached devices can communicate with host B via the remote gateway C and the 37xx.

Scenario 6: Single Link Multi-Host Support and CCA

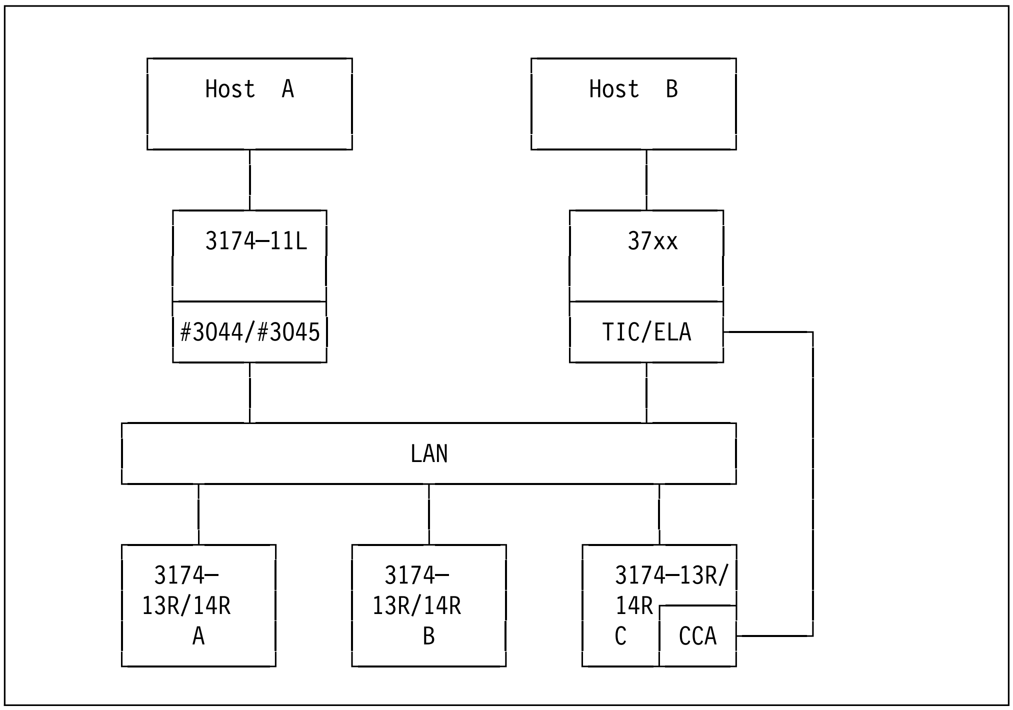


Figure 50. Scenario 6: Single Link Multi-Host Support and CCA

With Configuration Support-B and later and the Concurrent Communication Adapters (feature #3050, #3051 and #3053 for a V.24, V.35 or X.21 interface), new backup possibilities are provided.

From a 3174 with Configuration Support-B or later and up to two CCAs installed, up to three hosts can be accessed concurrently from direct attached devices. DFT devices with multiple host sessions and CUT devices using the MLT function can spread up to five sessions over the primary host link and up to two secondary links in any combination. If host A fails it has no impact on the sessions to host B. The operator can hot-key between those sessions.

In addition to the Concurrent Communication Adapter, Configuration Support-B and later supports concurrent access to as many as eight hosts over the primary LAN link. This support is known as Single Link Multi-Host and is a microcode-only function with no additional hardware requirements (other than controller storage).

What is described for MLT sessions over different CCAs is also true for the multi-host access over a single link and even for the combination of both functions: up to five MLT sessions can be spread over up to ten hosts (eight via the LAN and two via CCAs) from a device directly attached to a 3174. The user can then hot-key between those five sessions.

Scenario 7: Multi-Host LAN Gateway

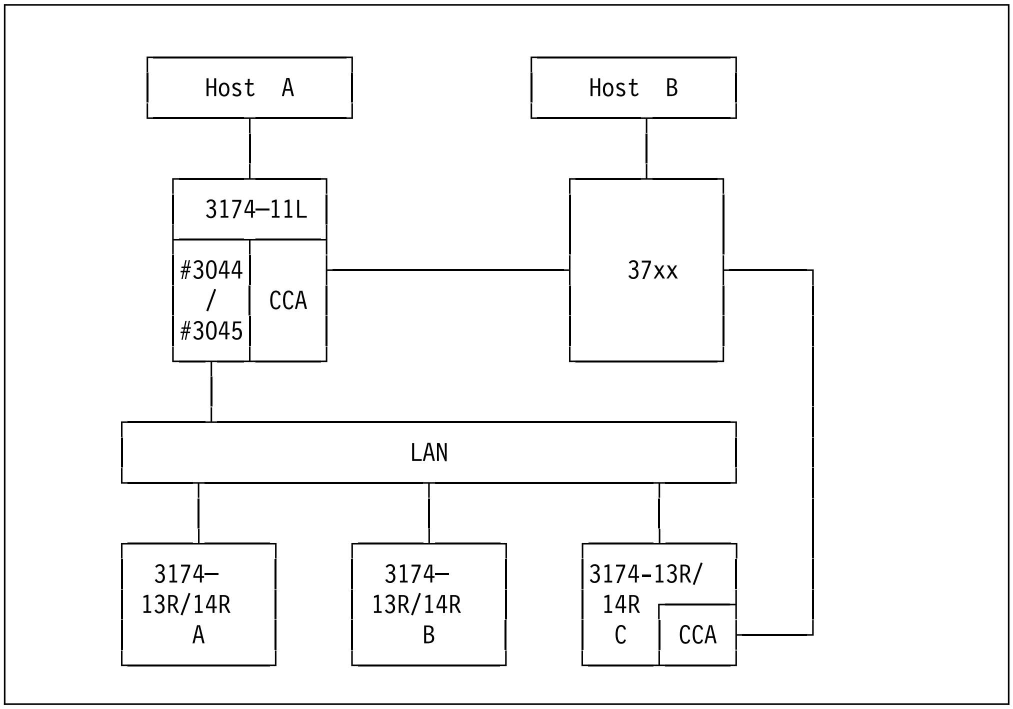


Figure 51. Scenario 7: Multi-Host LAN Gateway

With Configuration Support-B Release 3 and later, the recovery and connectivity options have been further enhanced by allowing a DSPU to access the CCAs installed in the 3174 LAN Gateway.

A terminal on DSPU B using its five available MLT sessions can access host A through the gateway′s primary link. You can also access host B by going through the same gateway and then accessing the CCA and using its host connection. DSPU C has the added connectivity option of using its own CCA as a third path back to host B.

Note: There is a maximum of 50 DSPUs that can access an SNA host through each Concurrent Communication Adapter.

In a remote LAN this method of multiple connections or backup option becomes attractive as there can be considerable cost savings on lines and hardware as you will not require a Concurrent Communication Adapter in each 3174.

In the case of DSPU C a 3174-13R/14R you also have the alternate IML capability and backup TP line. This is also true in the case of the Models 12L, 22L, 23R and 24R.

4.12.4 3174 Remote Gateway

Scenario 1: Alternate Host Attachment

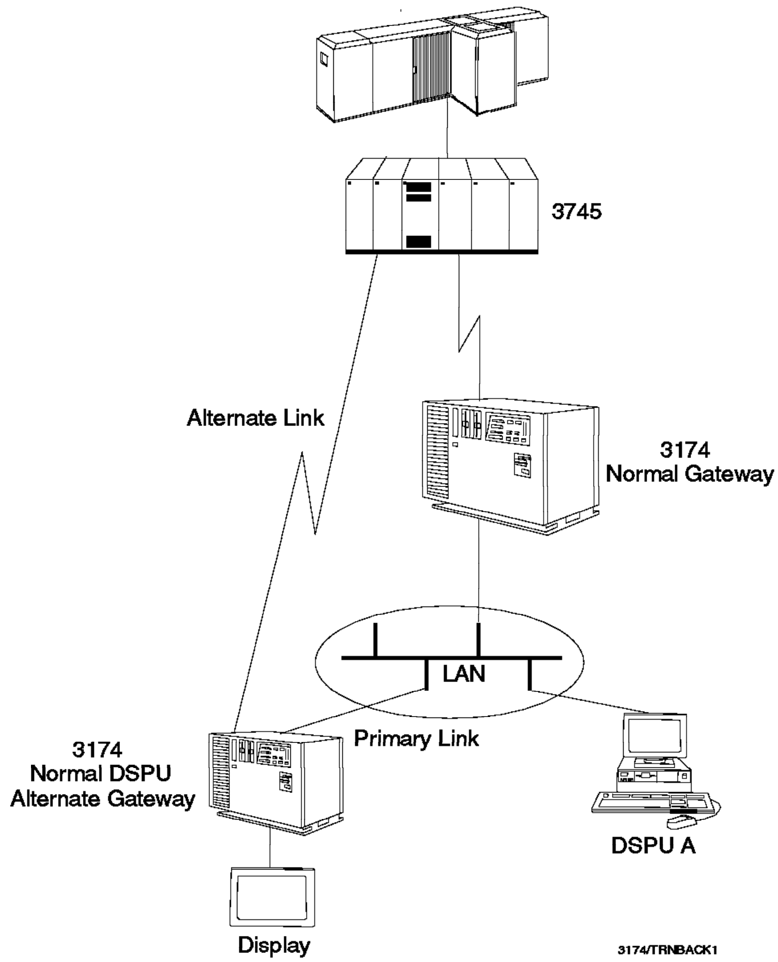


Figure 52. Backup via a 3174-x3R/x4R with an Alternate Host Attachment

This option offers line and controller backup for a 3174 remote gateway using an alternate host attachment feature #3040 (V.24/V.28), #3041 (V.35) or #3043 (X.21) for Models 13R, 14R, 23R and 24R only. These communication adapters cannot be used concurrently with the primary communication adapter and hence requires an re-IML to change them into a remote gateway configuration.

Once re-IMLed, the 3174 (previously a DSPU) can now function as a gateway until the normal line or gateway is fixed. When that happens, you can restore the 3174s to their normal configurations.

If the line to the normal gateway fails, the normal gateway can be re-IMLed as a DSPU to the backup gateway, thus allowing CUT or DFT devices attached to it to continue accessing the host. Note that this is only possible if feature #3044/#3045 is installed.

Scenario 2 - Concurrent Communication Adapter

This option involves installing a CCA feature #3050 (V.24/V.28), #3051 (V.35) or #3053 (X.21) in the normal 3174 LAN Gateway, providing a secondary link to the same host.

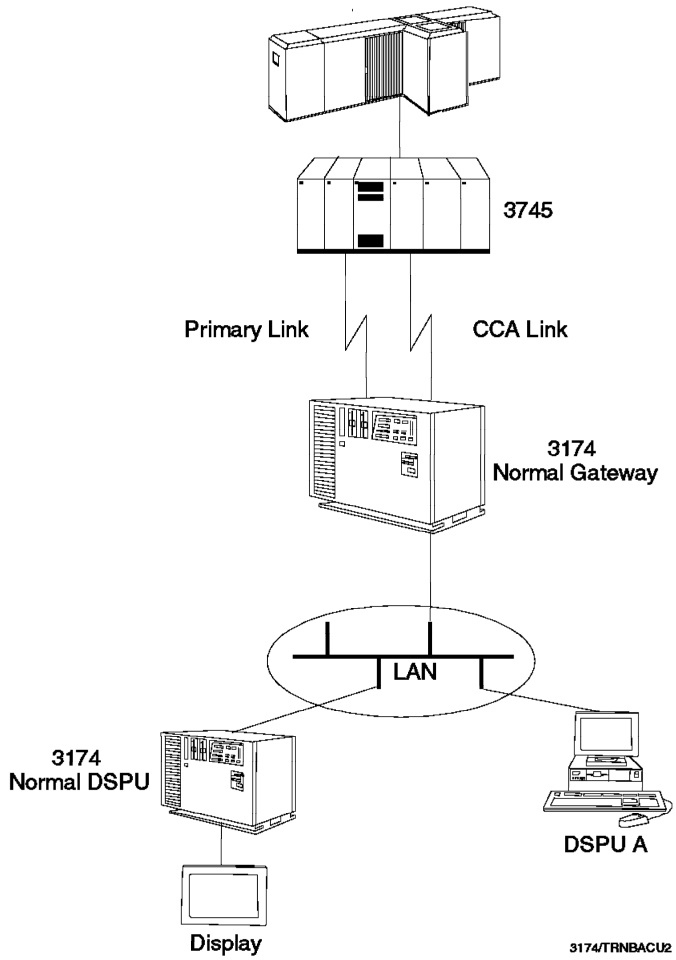


Figure 53. Backup via Normal Gateway with CCA

If the CCA is a leased connection all devices connected to the gateway and DSPUs are able to start a second session to the the host and hence provide concurrent access to the host. With this type of connection the one link is really backup for the other. Note that the CCA is only capable of supporting 50 DSPUs.

4.12.5 Disconnecting/Reconnecting from the LAN

The following figure shows the recovery steps necessary if the connector to the LAN is pulled off at the gateway or at the DSPU.

Operation	Gateway			DSPU		
	Operator Panel	Adapter Status	VTAM Status	Operator Panel	Adapter Status	VTAM Status
Gateway LAN Connector pulled	880—05	CLOSED 4693 wire f.	ACTIV	583—09	OPEN	PSUB 1
LAN reconnect	3174	OPEN	ACTIV	″	″	″
V INACT,F V ACT,DSPU	″	″	″	3174	″	IINOP/ ACTIV
DSPU LAN Connector pulled	3174	OPEN	ACTIV	580—05	CLOSED 4693 wire f.	PSUB1
LAN reconnect	″	″	″	″	″	″
IML DSPU	″	″	″	505—01	OPEN	″
V INACT,F V ACT,DSPU	″	″	″	3174	″	IINOP/ ACTIV

Figure 54. Disconnecting/Reconnecting the LAN

4.12.6 At IML Time

If, for any reason, a 3174 DSPU must be re-IMLed, the result depends on the status of LU-LU sessions at IML time. If no LU-LU session exists, the controller becomes ready immediately at the end of IML. If LU-LU sessions are broken by the IML, the PU must be deactivated with the force option after IML and re-activated again before the 3174 will be become available. The status of the LU-SSCP sessions does not matter.

If, for any reason, a 3174L gateway must be re-IMLed all LU-LU sessions (to the native attached devices and to devices attached to the DSPUs) are ended logically in VTAM. This means that at the end of the IML process all devices become available (under VM/VTAM, all VM sessions to CUT devices are reestablished).

If, for any reason, a 3174 LAN Gateway must be switched offline from the channel, status code 503 will be displayed at the 3174 LAN Gateway and a status code 583 will be displayed at all 3174 DSPUs. After the gateway is switched back online, all 3174s will recover the session with the host and display a status code 3174.

Chapter 5. X.25 Support

The 3174 models that can communicate with host systems through an X.25 Packet Switched Data Network (PSDN) are Models x1R and x2R. With Configuration Support-B Release 3 or later, support in the 3174 conforms to IBM′s X.25 Architecture as detailed in *X.25 1984/1988 DTE/DCE and DTE/DTE Interface Architecture Reference*. It includes considerations for the 1988 CCITT Recommendations X.25 as well as ISO X.25 standards 7776 and 8208. Previous microcode releases support the 1980 CCITT Recommendations.

With the announcement of Configuration Support-C Release 5, APPN traffic can be transported over an X.25 network to other APPN nodes.

See Chapter 18, “APPN” on page 501 for further information.

It is important that you have some X.25 knowledge when connecting to an X.25 PSDN, and several points must be considered before attempting to customize the 3174. This chapter provides:

- A summary of the X.25 features supported by the 3174
- Planning guidelines for installing a 3174 in an X.25 network
- 3174 configuration and operation hints
- Scenarios used to test the 3174 X.25 feature

Further information can be found in the following manuals:

- *3174 Planning Guide*
- *X.25 Guide*
- *3270 Information Display System X.25 Operation*

5.1 3174 Implementation

The older 3174 models can operate up to a maximum speed of 19.2 Kbps; the newer models with Configuration Support-C Release 5 Licensed Internal Code can operate up to a maximum speed of 256 Kbps using an X.25 attachment. The physical interface can be X.21 or X.21bis.

In an X.25 network, the 3174 uses SNA/SDLC protocols at the higher layers for communication, making the transport system transparent. This allows the user to operate as in an SNA environment, establishing sessions with VTAM applications (like TSO, CICS), in one or more domains. The SNA logical link controls supported by the 3174 are:

- Qualified Logical Link Control (QLLC), logical link control type 3
- Physical Services Header (PSH), logical link control type 2

You need to use PSH if the 3174 is to be attached to the X.25 network via a Network Interface Adapter (NIA). With current products, there should be no reason to do this. We recommend that you use QLLC for SNA X.25 attachments because it takes advantage of the integrated X.25 support in IBM host and subsystems. With Configuration Support-B Release 1 and later, PSH is no longer supported.

The 3174 access to the network is a four-wire link using the Link Access Protocol Balanced (LAPB) protocol.

Virtual Circuits

The 3174 supports both switched virtual circuits (SVCs) and permanent virtual circuits (PVCs). A PVC can be thought of as a point-to-point, four-wire leased line. An SVC can be thought of as a point-to-point, four-wire switched line. Sessions between the host and 3174 attached devices are multiplexed on a virtual circuit.

Prior to Configuration Support-B Release 3, only a single X.25 link was supported and within that link only one virtual circuit could be established.

Configuration Support-B Release 3 and later releases as well as Configuration Support-C include many X.25 enhancements. One of the major enhancements is Single Link Multi-Host support over X.25. With these later releases, up to eight hosts on the primary adapter and up to four hosts on each of the secondary adapters (CCA) can be defined. These connections can be a mixture of PVCs and SVCs.

If you use PVCs, the 3174 attempts to open the link at IML time. When customizing, you define a single PVC for each host you wish to access.

If you use SVCs, you can establish a connection in a number of ways including:

- Manually from a Dial screen on the 3174
- The new autocall feature, which initiates the call request automatically whenever the first device with a logical terminal defined to the required host is powered on
- By responding to an incoming call from the host

X.25 Options

The following X.25 options are supported by the 3174:

- Data Packet sizes of 64, 128, 256, or 512 bytes
- Packet-size negotiation
- Modulo 8 or 128 for packet level sequence numbering
- Packet window sizes of 1 to 7 for modulo 8
- Packet window sizes of 1 to 11 for modulo 128
- Packet window size negotiation
- Connection Identifier
- Recognized Private Operating Agency
- Closed User Group
- Reverse charging
- Throughput class negotiation

These options are specified during customization, a summary of which is provided in 5.3, “3174 Customization” on page 161. However we recommend that you use the *3174 Planning Guide* at the correct microcode release level for the detailed responses.

Configuration Support-B Release 3 Enhancements

We have already mentioned some of the new functions available with Configuration Support-B Release 3. In summary, these functions are:

- Support for the 1988 CCITT X.25 Recommendations
- Multiple host access using the primary and Concurrent Communication Adapter links
- Multiple host access using a single link, either primary or CCA
- Autocall/autodisconnect for SVC operation
- Enhancements to X.21 and X.25 Dial screens
- Support for larger PIU sizes to 521 bytes

Configuration Support-C Release 5 Enhancements

APPN NN extends connectivity to X.25 Networks. APPN X.25 support is built on the existing X.25 Single Link Multi-host support and provides equivalent X.25 options.

5.2 Planning for X.25

This section provides some guidance and planning considerations for attaching a 3174 to a X.25 network.

Financial

When planning the network, the main consideration is usually to find the correct balance between the financial cost and the function required. You should be aware that packet switched network costs are usually volume dependent, regardless of whether switched or permanent virtual circuits are used or the distance between the communicating ends. Packet switched networks may be a more economical alternative for terminal locations that are widely dispersed and have low traffic volumes. You need to determine when it is more economical to use leased lines or circuit-switched networks.

The use of X.25 may save on hardware costs. Instead of running multiple lines on a 37xx and using modem racks, multiplexers, banks of switches etc., with X.25, you need only one line into the network for all of your devices (assuming, of course, that it can handle the traffic).

Performance

If you are planning to use X.25 as the protocol in a private SNA network, it adds an overhead to the performance of the network and the capacity of the components such as the 37x5. All other things being equal, SDLC is more efficiently processed in an IBM network.

It is necessary to be aware that in an PSDN, there are no guarantees for continuous throughput. Frequently, PSDNs use flow control mechanisms, such as limiting window sizes or maximum packet lengths, in order to regulate the input/output rate for all users. The user should have a realistic idea of the response times that can be expected. Good performance can be obtained with careful planning and tuning of the definitions used in the network.

Function

With the advent of Single Link Multi-Host support for X.25, the cost of using X.25 may be more attractive for situations where multiple host access is required from remote sites. For example, you can access both an S/370 host and an AS/400 host over a single connection, whereas to do this with SDLC requires either two lines or a host router program such as Host Command Facility (HCF).

5.2.1 Preparing to Customize

When you are customizing a 3174 for X.25, you are asked many questions that require careful preparation. This is especially true if you are using SVCs. X.25 networks offer a wide variety of options and, unfortunately, this makes the job of the network planner more difficult.

You are advised to meet with the company providing the X.25 facilities to discuss your specific requirements, and review these facilities against the X.25 functions supported by your 3174 and host software.

Consider some of the following:

- Level of CCITT Recommendations supported
- Line speed
- Type of virtual circuit (SVC or PVC)
- Number of logical channels to be useds
- Call initiation for a SVC
- Frame window size
- Packet window size
- Parameter negotiation

  This facility allows the negotiation of data flow control parameters on a per call basis and is applicable to SVCs only. When an SVC is established, the DTE and DCE agree about the packet and window sizes, with one packet size and one window size specified for each direction.

- Closed user group

  This facility provides better security because calls can only be established between DTEs belonging to the same group.

- Reverse charge

  This facility permits data communication expenses to be centralized.

- Throughput class negotiation

  This facility allows negotiation of the throughput class to be used, which affects the effective rate at which data can be transferred.

Customizing the 3174 for X.25 involves defining the facilities and options you have subscribed to with your network provider.

5.3 3174 Customization

This section summarizes the specific X.25 questions asked during customization. The *3174 Planning Guide* is where you find the details and sample worksheets for the X.25 customization panels

Question 101: Host Attachment

When customizing for X.25, the response to this question must be 3 for a single host configuration and M for the multi-host support (with Configuration Support-B Release 3 or later releases and with Configuration Support-C).

Question 215: Physical Unit Identification (PUID)

If you are working with a switched virtual circuit (SVC) you must give a unique identifier to the 3174 PU. The value is used in the QXID when the connection is being established (see the SVC examples later in this chapter). If you are using a VTAM host, the PUID must match the IDNUM parameter on the PU macro in the switched major node definition for this 3174. For other host types, there is an equivalent definition for this identifier, such as:

- EXCHID of the AS/400 or System/38
- REMOTE XID of the System/36

Note: PUID is not sent in the XID if the X.25 link is shared T2.0/T2.1 or pure T2.1

Question 372: Autocall/Autodisconnect

This is a new feature for Configuration Support-B Release 3 and later releases. This question requires a two-digit response.

Digit 1 - Enable autocall function:

- 0=No autocall (default response)
- 1=Enable DIAL autocall
- 2=Enable DIRECT autocall (X.21 switched only)

Digit 2 - Enable autodisconnect function:

- 0=No autodisconnect (default response)
- 1=Enable autodisconnect

The autocall and autodisconnect functions are independent of one another; you can enable or disable one without affecting the other.

These functions, if used, may reduce network charges for X.21 switched or X.25 SVC connections:

- With autocall enabled, the 3174 dials the host when the first terminal powers on or when a new logical terminal becomes active, such as happens during a Change Screen sequence. The 3174 will dial the host if a connection does not already exist.
- With autodisconnect enabled, the 3174 disconnects from the host when the last terminal becomes inactive or powers off..

Question 400: Network Type

Note: The response to this question depends on the microcode level.

Prior to Configuration Support-B Release 3, question 400 requires a two-digit response, as follows:

- 00=CCITT recommended network with announced IBM support (default response)
- 01=Connection is to the Netherlands DATANET-1
- 02=Connection is to the UKPSS** or TELENET**.

  UKPSS is the United Kingdom Packet Switched Service; TELENET is the General Telephone and Electronics Communications Corporation service.

With Configuration Support-B Release 3 and later releases, question 400 requires a four-digit response, as follows:

- First two digits:
  - 00=CCITT recommended network with announced IBM support (not DATANET-1) (default response)
  - 01=Connection is to the Netherlands DATANET-1

  Note: Response 02 is no longer valid for this question. Use 00 if your network is UKPSS, TELENET, or any X.25 network for which IBM has announced support.
- Third digit indicates the level of CCITT Recommendation X.25 supported:
  - 0=1980 level (default response)
  - 1=1984 and beyond
- Fourth digit indicates the type of diagnostic codes the 3174 should use for errors reported to the network:
  - 0=Use SNA diagnostic codes (default response)
  - 1=Use ISO diagnostic codes

Question 401: Circuit Type

The 3174 can support four circuit types; which of these should be used will depend on your network subscription.

- 1=Permanent virtual circuit (PVC).
- 2=Incoming (SVC) call only; that is, only the host can call the 3174.
- 3=Outgoing (SVC) call only; that is, only the 3174 can call the host.
- 4=Two-way (SVC) call; that is, either the 3174 or the host can initiate the call to the other. This also the default response.

Question 402: Logical Channel Identifier

Prior to Configuration Support-B Release 3, the response is the logical channel identifier of the virtual circuit specified in question 401, whether it is a PVC or an SVC.

With Configuration Support-B Release 3 and later releases, the response is the logical channel identifier for a PVC only. Of course this means that you have specified the circuit type is PVC in question 401. To specify logical channel identifiers for SVCs, use questions 461 through 466. The response should be in the range 0000 through 4095; refer to your network subscription for this number.

Question 403: Logical Link Control

With Configuration Support-B Release 1 and later releases, this question is not presented because the 3174 no longer supports PSH, only QLLC. If you are customizing Configuration Support-A, then respond as follows:

- 0=PSH control
- 1=QLLC control

PSH protocol support allows the 3174 to communicate with equipment attaching to the network via the Network Interface Adapter (now obsolete). IBM products with integrated X.25 support use QLLC protocols.

Question 409: X.25 Keyboard Support Options

This question allows you to specify how you would use the Extension mode keys for X.25 functions. The response consists of eight digits (default 10100100).

- **Digits 1 and 2: DISC Key**

  The response specifies whether the DISConnect key is enabled and from which port it can be used on an attached terminal.

  – 00=DISC key is not supported.

  – 01=DISC key is supported only on port 26-00 or 27-00; this overrides digit 5 response.

  – 10=DISC key supported according to digit 5 response (default).

  – 11=Not a valid response.

- **Digits 3 and 4: LOCAL and COMM Keys**

  The response specifies whether the LOCAL and COMM keys are enabled and from which port they can be used.

  – 00=LOCAL and COMM keys are not supported.

  – 01=LOCAL and COMM keys are supported on port 26-00 or 27-00; this overrides digit 5 response.

  – 10=LOCAL and COMM keys are supported according to digit 5 response (default).

  – 11=Not a valid response.

- **Digit 5: X.25 Keys**

  The response specifies whether the Extension mode keys for X.25 functions are supported on all attached CUT terminals or only from the CUT terminal attached to port 26-00 or 27-00.

  – 0=X.25 keys supported only on port 26-00 or 27-00 (default)

  – 1=X.25 keys supported on all ports (except those with a DFT attached)

- **Digit 6: Dial Screen Display**

  Valid responses are:

  – 0=Display all fields on the Dial screen.

    This allows the operator to change customized or default values on a per-call basis.

- 1=Display only the HNAD field on the Dial screen.

  This allows the operator to enter or change only the number to be called (default).

- **Digit 7: Disconnect/Local Mode Operation**

  Valid responses are:

  - 0=If no SNA sessions are active, pressing the DISC (SVC) or LOCAL (PVC) key performs operation requested.

    If any session is active, pressing the key once inhibits the rest of the keyboard. Pressing the key a second time (twice) initiates the operation. This is the default response.

  - 1=The DISC (SVC) or LOCAL (PVC) key immediately performs the operation requested, whether sessions are active or not.

- **Digit 8: Reserved**

  This digit is reserved and defaults to 0.

Question 420: Incoming Call Options

Requires an eight-digit response that specifies how the 3174 will handle calls from the host (incoming calls) that include various optional facilities. Refer to your network subscription to determine which facilities are available.

If question 409 digit 6 is 0, then all fields will be displayed on the Dial screen. The operator can change the incoming call responses in the IOPT field if desired.

The response is:

- 0=No (default)
- 1=Yes
- **Digit 1: Host DTE Address**

  Specifies whether to validate the host DTE address in incoming calls.

- **Digit 2 and 3: Reverse-Charge Facility**

  Specify whether to accept incoming calls with reverse-charge facility:

  - 00=Do not accept reverse-charge Call Requests.
  - 01=Accept calls with the reverse-charge facility equal to reverse-charge requested.
  - 10=Accept calls with the reverse-charge facility equal to reverse-charge *not* requested.
  - 11=Accept calls with the reverse-charge facility whether reverse-charges are requested or not.

- **Digit 4: Negotiated Packet Size Facility**

  Specifies whether to accept incoming calls that include the negotiated packet size facility.

- **Digit 5: Negotiated Window Size Facility**

  Determines whether incoming calls that want to change the maximum number of packets that can cross the DTE/DCE interface before receiving an acknowledgment are accepted.

- **Digit 6: Connection Identifier**

Specifies whether to validate the Connection Identifier (CID) on incoming calls (SVC). This may be required in some networks. If specified, the 3174 compares the CID on incoming calls against the value you specify in question 452.

- **Digit 7: Throughput Class Negotiation**

  Specifies whether to accept incoming calls that want to change the communication speed.

- **Digit 8: Reserved**

Question 421: Outgoing Call Options

Requires an eight-digit response that specifies the facilities supported by the 3174 when it calls the host (outgoing calls). Refer to your network subscription to determine which facilities are available.

If question 409 digit 6 is 0, then all fields will be displayed on the Dial screen. The operator can change the outgoing call responses in the OOPT field if desired.

The response is:

- 0=No (default)
- 1=Yes
- **Digit 1: 3174 DTE Address**

  Indicates whether the 3174 DTE address is supplied in the Call Request packet.

- **Digits 2 and 3: Reverse-Charge Facility**

  Specifies whether the 3174 will try to make calls with reverse charging:

  – 00=Do not include reverse-charge request in the Call Request.

  – 01=Request reverse-charge via reverse-charge facility.

  – 10=Request *no* reverse-charge via reverse-charge facility.

  – 11=Invalid response.

- **Digit 4: Negotiated Packet Size Facility**

  Specifies whether the 3174 tries to negotiate the packet size during the session establishment.

- **Digit 5: Negotiated Window Size Facility**

  Specifies whether the 3174 wants to change the packet window size for the call.

- **Digit 6: Connection Identifier**

  Specifies whether the Connection Identifier (CID) is supplied in the Call Request. If specified, the 3174 takes the value you specify in question 452 as its CID.

- **Digit 7: Throughput Class Negotiation**

  Specifies whether to change the communication speed in outgoing calls. This option is not supported by NPSI but the user could get support by using the DATE facility.

- **Digit 8: Reserved**

Question 423: Host DTE Address

Enter a maximum of 15 digits (0 through 9) for the host DTE address. This address is required if the 3174 supports:

- Incoming calls only and the calling host DTE address must be validated
- Outgoing calls only (the host DTE address is used as destination)
- Two-way calls (the host DTE address is used as destination and must be supplied on the outgoing calls)

Whether question 409 digit 6 is 0 or 1, the host DTE address HNAD field is always displayed on the Dial screen. The operator can be change this address to call another host if desired.

Question 424: 3174 DTE Address

Enter a maximum of 15 digits (0 through 9) for the 3174 DTE address. This address may be required if the 3174 supports:

- Outgoing calls only
- Two-way calls (for the outgoing calls)

In both cases, the address is required only if you specify that it is to be included in the outgoing call via the outgoing call options.

Question 430: Negotiated Packet Size

Valid responses are:

- 1=64-byte packet
- 2=128-byte packet
- 3=256-byte packet
- 4=512-byte packet

For SVC: This value defines the maximum packet size that the 3174 can accept in an incoming call, or request in an outgoing call, when packet size is being negotiated (if negotiation is specified in questions 420 or 421). This size can be changed on the Dial screen NPKT field, if displayed.

For PVC: With Configuration Support-B Release 3 and later releases, this value is also used for a PVC where the packet size is not negotiable; it is used to set the packet size. The value used should be compatible with your network and your host.

Question 431: Packet Sequence Numbering

- 0=Modulo 8 (default)
- 1=Modulo 128

Specify 1 if your network supports this and you wish to use the extended packet sequence numbering (refer to your network subscription). Your response affects questions 432 and 435.

Question 432: Negotiated Window Size (NWND) or PVC Window Size

- 01 through 07=Valid range if question 431=0 (modulo 8)
- 01 through 11=Valid range if question 431=1 (modulo 128)

For SVC: The value you select sets the window size limit to which the 3174 can negotiate when processing an incoming call if question 420 digit 5=1. It also sets the window size to be requested in the Call Request packet in an outgoing call if question 421 digit 5=1. The response can be changed on the Dial screen NWND field, if displayed.

For PVC: The value you select sets the window size for the PVC. It remains constant at this value as there is no negotiation.

Question 433: K-Maximum Out

The response is a number from 1 through 7 (default=2).

It specifies the maximum number of link level I-frames that the 3174 can transmit before waiting for an acknowledgement. This is essentially a checking mechanism to ensure that the information exchange is error-free. For an error-free access line, better throughput is obtained if the largest value is used. Refer to your network subscription for the maximum supported.

Question 434: Nonstandard Default Packet Size

Specifies the default packet size which you have subscribed in your network subscription:

- 1=64-byte packet
- 2=128-byte packet (default)
- 3=256-byte packet
- 4=512-byte packet

Before Configuration Support-B Release 3, the response is used to select the 3174 packet size when any of the following conditions applies:

- An outgoing call which does not include the negotiated packet size facility (question 421 digit 4=0)
- An incoming call that does not include the negotiated packet size facility
- For a PVC connection

The response can be changed on the Dial screen DPKT field, if displayed.

With Configuration Support-B Release 3 and later releases, question 434 is not used for a PVC. The PVC gets this value from your response to question 430. The response is now used to select the packet size for an SVC when packet size negotiation is not used.

Table 6 on page 168 shows the relationship between packet size, maximum PIU size (as specified in question 370: Maximum Inbound I-Frame Size) and the number of data packets required.

Table 6. Relationship Between Packet Size, Max. PIU, and Number Of Packets		
Max. PIU Size (Question 370)	**Packet Size**	**Number of Data Packets for Max. PIU Size**
If Q.370=0, max. PIU=265	64 128 256 512	5 3 2 1
If Q.370=1, max. PIU=521	64 128 256 512	9 5 3 2

Question 435: Nonstandard Default Window Size

Specifies the default window size which you have subscribed in your network subscription:

- 01 through 07=Valid range if question 431=0 (modulo 8)
- 01 through 11=Valid range if question 431=1 (modulo 128)

Before Configuration Support-B Release 3, the response is used to select the 3174 window size when any of the following conditions applies:

- An outgoing call which does not include the negotiated window size facility (question 421 digit 5=0)
- An incoming call that does not include the negotiated window size facility

The response can be changed on the Dial screen NWND field, if displayed.

With Configuration Support-B Release 3 and later releases, question 435 is not used for a PVC. The PVC gets this value from your response to question 431. The response is now used to select the window size for an SVC when window size negotiation is not used.

Question 440: Throughput Class Negotiation

The response is used to set the priority for packets in:

- An outgoing call if the throughput class negotiation facility is included (question 421 digit 7=1).
- An incoming call if the throughput class negotiation facility is included (question 420 digit 7=1). In this case, the 3174 will accept the requested throughput class in an incoming call if it less than or equal to your response. If not, your response is returned as the class the 3174 will accept.

Configuration Support-B Release 3 and later releases provides an additional response D, which represents 64,000 bps.

The answer can be changed on the Dial screen TCLS field, if displayed. Refer to your network subscription to determine if this facility is supported.

Question 441: Closed User Group

A response to this question is optional. If used, the two-digit response should be in the range 00 through 99 (use leading zero if necessary). A value entered here is included in the outgoing call request. The response can be changed on the dial screen CUG field, if displayed. Refer to your network subscription to determine if this facility is supported.

Question 442: Recognized Private Operating Agency

A response to this question is optional. If used, the four-digit response should be in the range 0000 through 9999 (use leading zeros if necessary). A value entered here is included in the outgoing call request. The response can be changed on the dial screen RPOA field, if displayed. Refer to your network subscription to determine if this facility is supported.

Question 450: Link Level Transmit Timeout

The response is the T• or Tp value. You should set it to that required in your network subscription. The 3174 timer will be ±20% of the value specified.

You must respond to this question as no default is supplied. The valid range of values is 0001 through 2540, in tenths of a second. For example, 13.5 seconds is specified as 0135; that is, 13.5 divided by 0.1 equals 0135 (padded with a leading zero).

For values greater than 25.0 seconds, the tenths digit is ignored. For example, 26.1 seconds is treated as 0260.

Question 451: Number Of Retries

The response is the N• or Np value. You should set it to that required in your network subscription.

You must respond to this question as no default is supplied. The valid range of values is 01 through 99.

Question 452: Connection Identifier (CID)

An eight-character alphanumeric value that identifies the PU involved in a virtual circuit.

Before X.25 Single Link Multi-Host (that is, before Configuration Support-B Release 3), a 3174 could only communicate with one host over a single virtual circuit, SVC or PVC, through the X.25 network. The 3174 could identify the host by the host DTE address (question 423); similarly, the host could identify the 3174 by the 3174 DTE address (question 424). In this single-host environment, the CID can be used for call verification (like a password) for added security.

With X.25 SLMH (that is, with Configuration Support-B Release 3 and later releases), a 3174 could communicate with several hosts, or have several sessions with the same hosts, simultaneously. The 3174 is able to present multiple PU images to the host or hosts, with each PU image over a separate virtual circuit. The CID provides a means to identify the PU image within the 3174, and is used as follows:

- If question 420 digit 6=1, the response is used to validate the CID in an incoming call.
- If question 421 digit 6=1, the response is included as the CID in an outgoing call.

At the host, CID is coded in the NPSI X25.OUFT macro USRFILD and USRFIL2 parameters. For example, if question 452 response is PRIMARY1, the corresponding NPSI statement would appear as follows:

```
          :
X25.OUFT  INDEX=1,
      USRFILD=010000D7D9C9D4C1,
      USRFIL2=D9E8F100000000
          :
```

Note that the alphanumeric CID in question 452 needs to be coded as hexadecimal values in NPSI.

The response can be changed on the Dial screen CID field, if displayed.

Question 453: Connection Options

This question applies to Configuration Support-B Release 3 and later releases only.

It is an eight-digit field but only the responses in the first two digits are used. Digits 3 through 8 are reserved.

- **Digit 1: CCITT X.25 Architecture Level**:
  - 0=1980 (default)
  - 1=1984 and beyond
- **Digit 2: Diagnostic Code Type**:
  - 0=SNA (default)
  - 1=ISO

  Digit 2 identifies the type of diagnostic codes the 3174 should use for Clear Request or Reset Request packets when breaking the connection with the remote DTE.

The response can be changed on the Dial screen COPT field, if displayed.

Logical Channel Numbering (Questions 461-466)

Before Configuration Support-B Release 3, the 3174 supports only one virtual circuit; its type is specified in question 401: Circuit Type. Whether PVC or SVC, the channel number is specified in question 402: Logical Channel Identifier.

With Configuration Support-B Release 3 and later releases, the 3174 supports multiple virtual circuits:

- If the circuit type is PVC (question 401=1), the channel number is specified in question 402.
- If the circuit type is SVC, the channel numbers are specified as follows:
  - For incoming calls only (question 401=2):
    - Question 461: Lowest Incoming Channel
    - Question 462: Highest Incoming Channel
  - For outgoing calls only (question 401=3):
    - Question 465: Lowest Outgoing Channel
    - Question 466: Highest Outgoing Channel

– For two-way calls (question 401=4):

  - Question 463: Lowest Two-Way Channel
  - Question 464: Highest Two-Way Channel

The total number of channels specified, including PVCs, must not exceed 255. The channel numbers must be assigned in ascending order, as shown in Figure 55.

0	Reserved for Interface Control
1 : n	Q.402: Logical Channel Identifier (PVC)
n+1 : m	Q.461: Lowest Incoming Channel Q.462: Highest Incoming Channel
m+1 : o	Q.463: Lowest Two-Way Channel Q.464: Highest Two-Way Channel
o+1 : p	Q.465: Lowest Outgoing Channel Q.466: Highest Outgoing Channel
: 4095	Not Assigned

Figure 55. Logical Channel Assignments

Some networks used channel 0 for control purposes only; some can assign the Highest Outgoing Channel to be 4095. Refer to your network subscription for the logical channel numbers that should be used.

5.4 Operating Procedures

When the 3174 is IMLed and ready, what you have to do to establish an X.25 connection depends on the type of virtual circuit customized and subscribed to.

5.4.1 Keyboard Mapping

The 3174 permits the operator of an attached CUT device (like a 3178 or 3472) to connect and disconnect from the X.25 network, initiate an outgoing call or to modify incoming call parameters.

To support PVC operations, the following keys are provided:

- LOCAL key to disconnect
- COMM key to reconnect

To support SVC operations, the following keys are provided:

- DIAL key to display the Dial screen, which displays fields for incoming and outgoing call options, ready for an outgoing call
- DISC key to disconnect from the network and go into call ready state
- LOCAL key to disconnect from the network and go into local state

- COMM key to change from the local to the call ready state.

These keys are active when the keyboard enters Extended Select (or Extension) mode, by pressing the ExSel key on current IBM displays. On some older displays, Extended Select can be entered by pressing Alt EOF keys simultaneously. You will get a ► symbol in the OIA when in Extended Select.

Once you are in this mode, you can invoke the X.25 keys. Keyboards vary greatly in layout but on a US English typewriter keyboard, these keys are:

- Character 1 key=DIAL
- Character 2 key=LOCAL
- Character 3 key=COMM
- Character 5 key=DISC

If you are using a different keyboard, then the keys are the ones occupying the same positions on the central keyboard layout. See *3174 Terminal User's Reference for Expanded Functions* or Appendix I, "Keyboard Layouts" on page 803 for keyboard mapping.

Note that the LOCAL, COMM and DISC keys can be enabled and disabled to prevent operator intervention via question 409.

5.4.2 PVC Operations

If you are using PVC, the 3174 operation is similar to that on a leased SDLC line. The 3174 will attempt to open the PVC link when IML completes. Once the link is open, X.25 operation is possible.

In PVC operations, you use the LOCAL and COMM keys (in Extension Mode, represented by the ► symbol) to perform disconnect and reconnect operations, respectively. You may disable these keys through question 409: X.25 Keyboard Support Options, digits 3 and 4.

Disconnect Operation

The ►LOCAL key allows you to disconnect the 3174 from the PVC. When you press ►LOCAL the first time, the 3174 will determine if any SNA sessions are active and will act as shown in Table 7, according to your customized response in question 409.

Table 7. PVC Disconnect Operation

Q.409 Response	**No Sessions Active**	**Sessions Active**
Digit 7=0	Disconnect immediately	Disconnect if LOCAL pressed twice (see note)
Digit 7=1	Disconnect immediately	Disconnect immediately

Note: The Operator Communication Check and Input Inhibited indicators are displayed and no action is taken if ►LOCAL is pressed once.

- To disconnect, press ►LOCAL a second time.
- To cancel the disconnect operation, press Reset.

Reconnect Operation

When the 3174 is in the local state, press ►COMM to restart the network connection. After a short delay to establish link and circuit controls, the PVC link becomes operational and the Network In Use indicator is displayed.

5.4.3 SVC Operations

For an SVC, you may be required to initiate the calls to connect and disconnect the 3174 from the X.25 network.

Autocall/Autodisconnect

With Configuration Support-B Release 3 and later releases, question 372 digit 1 can be customized so that the 3174 will automatically attempt to connect to a X.25 host when the first logical terminal becomes active; that is, when the terminal powers on or when a logical terminal is first reached in the Change Screen sequence.

Question 372 digit 2 can also be customized for automatically disconnecting the 3174 from a X.25 host when the last logical terminal becomes inactive or powers off.

The autocall and autodisconnect functions are independent of one another; you can enable or disable one without the other.

Call Ready/Incoming Call Operation

In the call ready state, the ►DIAL and the ►LOCAL keys are active and an incoming call (from the host) can be processed. No operator action is required for an incoming call. You may, however, change the parameters for accepting an incoming call (see “Dial In Operation”).

Incoming call packets are accepted in the call ready state; the Incoming Call In Process indicator is displayed. When the circuit is connected, the indicator is reset.

Dial In Operation

To initiate an outgoing call, or to modify the call parameters for an incoming or outgoing call, use the ►DIAL key. When the ►DIAL key is pressed in the call ready state, it initiates keyboard reset and clear functions simultaneously. The Dial screen is then displayed (see Figure 56 on page 175 and Figure 57 on page 175) with the Dial-In indicator in the OIA.

To change the call parameters, fill in the desired values, with the I/O (Incoming/Outgoing Call Control) field set to 1, and press Enter. This will validate the field values. If successfully validated, the 3174 will store the values either to allow an incoming call or as parameters in an outgoing call.

To initiate an outgoing call, fill in the desired values, with the I/O (Incoming/Outgoing Call Control) field set to 0, and press Enter. The 3174 initiates the call and an Outgoing Call In Process indicator is displayed in the OIA. When the call is connected, the Network In Use indicator is displayed.

Disconnect Operation

The ►DISC key allows you to disconnect the 3174 from the SVC, similar to the ►LOCAL key in PVC. When you press ►DISC the first time, the 3174 will determine if any SNA sessions are active and will act as shown in Table 8, according to your customized response in question 409 (digit 7 is used for both PVC and SVC).

Table 8. SVC Disconnect Operation

Q.409 Response	**No Sessions Active**	**Sessions Active**
Digit 7=0	Disconnect immediately	Disconnect if LOCAL pressed twice (see note)
Digit 7=1	Disconnect immediately	Disconnect immediately

Note: The Operator Communication Check and Input Inhibited indicators are displayed and no action is taken if ►DISC is pressed once.

- To disconnect, press ►DISC a second time.
- To cancel the disconnect operation, press Reset.

The disconnect sequence can also be initiated by the 3174 receiving a Clear Indication packet. The cause and diagnostic codes from the Clear Indication packet are displayed in the OIA.

When the disconnect is complete, the Call Ready indicator is displayed and the connection can be re-established by an incoming or outgoing call again.

Local Operation

The ►LOCAL key allows you to place the 3174 from a call ready state to a local state for SVC operation. The Local Mode indicator is displayed.

In the local state, all incoming calls and outgoing requests are rejected. The 3174 is disconnected from the link.

To open the link again and place the 3174 into a call ready state, press the ►COMM key.

5.4.4 Dial Screen

If you are using SVCs, you can initiate the connection from a Dial screen. This screen appears when you press the ►DIAL key. The number of fields displayed on the Dial screen depends on your response:

- If question 409 digit 6=0, all fields are displayed.
- If question 409 digit 6=1, only the HNAD field is displayed.

There are two formats of the Dial screen, depending on the microcode level.

Figure 56 on page 175 shows the Dial screen for Configuration Support-A. Note that this screen is also used for Configuration Support-B Releases 1 and 2 but without the QLLC field (Configuration Support-B Release 1 and later releases support only QLLC and, therefore, the PSH option is no longer available).

```
HNAD        =     123456789012345


CID         =     A0000076
NPKT        =     1
NWND        =     07
RPOA        =     1898
CUG         =     32
QLLC        =     1
TCLS        =     9
DPKT        =     1
DWND        =     02
OOPT        =     00000000
IOPT        =     00000000
I/O         =     0
```

Figure 56. X.25 Dial Screen for Configuration Support-A

Figure 57 shows the Dial screen for Configuration Support-B Release 3 and later releases, with the following changes:

- DPKT and DWND are removed because these parameters have slightly different meanings with Configuration Support-B Release 3 and later releases should no longer be changed on a per-call basis.
- COPT (connection options) is added.
- CID is now displayable.

```
HNAD        =     123456789012345


CID         =     A0000076
NPKT        =     1
NWND        =     07
RPOA        =     1898
CUG         =     32
TCLS        =     9
OOPT        =     00000000
IOPT        =     00000000
COPT        =     00000000
I/O         =     0
```

Figure 57. X.25 Dial Screen for Configuration Support-B Release 3 and Later Releases

The I/O field is displayed only in two-way calls. It is used as follows:

- 0=Store the values on the Dial screen and initiates an outgoing call.
- 1=Store the values on the Dial screen only; does not initiate an outgoing call.

The rest of the fields are explained in 5.3, "3174 Customization" on page 161. The Dial screen can be reset after an unsuccessful call by pressing the Reset key after pressing the Clear key. Table 9 on page 176 relates the fields to the customizing questions.

Table 9. Dial Screen Parameters	
Field	**Related Customization Question**
HNAD	Question 423: Host DTE address
CID	Question 452: Connection Identifier
NPKT	Question 430: Negotiated Packet Size
NWND	Question 432: Negotiated Window Size
RPOA	Question 442: Recognized Private Operating Agency
CUG	Question 441: Closed User Group
TCLS	Question 440: Throughput Class Negotiation
DPKT	Question 434: Nonstandard Default Packet Size
DWND	Question 435: Nonstandard Default Window Size
OOPT	Question 421: Outgoing Call Options
IOPT	Question 420: Incoming Call Options
COPT	Question 453: Connection Options

5.5 Packet Types

The following briefly describes the X.25 packet types supported by the 3174. Some of these packet types are used in the test scenarios.

- **Call Request (SVC)**

  Sent by the 3174 when an outgoing call is made using the dial operation or when an autocall is performed for the first logical terminal powered on. The packet contains the host DTE address and optional information, input during customization, which matches your network subscription.

- **Incoming Call (SVC)**

  Received by the 3174 when the host is initiating a call. The packet contains information which is validated against the call parameters you have customized.

- **Call Accepted (SVC)**

  Sent by the 3174 after it has accepted an Incoming Call packet.

- **Call Connected (SVC)**

  Received by the 3174 as confirmation that the remote DTE has accepted the 3174′s Call Request packet. The SVC is now in data-ready state and SNA protocols may begin.

- **Clear Request (SVC)**

  Sent by the 3174 when a disconnect is initiated by the operator using the DISC key, by the network during normal circuit termination, when autodisconnect is configured and the last logical terminal powers off, or when certain errors are detected. Cause and diagnostic codes are included (see *3174 Status Codes* manual).

- **Clear Indication (SVC)**

  Received by the 3174 as a result of a normal clearing sequence, or as a result of problems detected by the network or the remote DTE. The 3174 responds with a Clear Confirmation packet and logs the cause and diagnostic codes.

- **Clear Confirmation (SVC)**

  Sent by the 3174 to acknowledge receipt of a Clear Indication packet, or received by the 3174 as an acknowledgement from the network to a Clear Request it (the 3174) had sent.

- **Reset Request (PVC)**

  Sent by the 3174 when it detects certain X.25 errors. It logs cause and diagnostic codes, and then attempts to reopen the circuit. The SNA layers must be reactivated through a QSM (SNRM), ACTPU, ACTLU sequence.

  The Reset Request is also sent by the 3174 when the LOCAL key is pressed.

- **Reset Indication (PVC|SVC)**

  Received by the 3174 when problems are detected by the network or by the remote DTE. It logs cause and diagnostic codes, and then stops the circuit. The SNA layers must be reactivated through a QSM (SNRM), ACTPU, ACTLU sequence.

- **Reset Confirmation (PVC|SVC)**

  Sent by the 3174 to acknowledge receipt of a Reset Indication packet, or received by the 3174 as an acknowledgement from the network to a Reset Request it (the 3174) had sent.

- **Restart Request (PVC|SVC)**

  Sent by the 3174 when it is resetting the link after it has detected certain X.25 errors, or an open-link operation is performed. Open-link operations are performed when:

  – The 3174 is IMLed.

  – Local mode has been entered and the COMM key is pressed.

  – The link has been closed because of an error condition. In this event, the 3174 logs cause and diagnostic codes, and then immediately attempts to re-open the link.

- **Restart Indication (PVC|SVC)**

  Received by the 3174 from the remote DTE requesting to initialize packet level operation. The 3174 responds with a Restart Confirmation packet and shuts the link down.

- **Restart Confirmation (PVC|SVC)**

  Sent by the 3174 to acknowledge receipt of a Restart Indication packet, or received by the 3174 when link initialization has completed as a result of a Restart Request.

- **Data (PVC|SVC)**

  Used to send and receive data once the circuit has been established.

- **Receive Not Ready (PVC|SVC)**

  When received by the 3174, it stops transmission until a Receive Ready packet is received. The 3174 does not send a Receive Not ready packet.

- **Receive Ready (PVC|SVC)**

Sent by the 3174 in response to any Data packet that is received unless an outgoing Data packet is ready for transmission.

When received by the 3174, it indicates that the 3174 may continue transmission.

- **Diagnostic (PVC|SVC)**

  Received by the 3174 when a reset, clear, or restart packet is not appropriate. The 3174 logs the cause and diagnostic information but takes no further action.

5.6 Test Scenarios

The 3174 was tested with different hosts (System/36, System/38, System 308x and a System 3090) installed at ITSC Raleigh. Data flows from the different tests made with the 3174 in an X.25 environment are presented. They can be used as a guide to the normal control flows expected. Scenarios for System/38 are not presented here because data obtained was exactly the same as for System/36.

The following IBM products were used:

- 3174 using microcode level Configuration Support-A Release 1.4
- 3174 using microcode level Configuration Support-B Release 3 for the multi-host scenario
- NPSI V1R4.3
- NPSI V2R1 for the multi-host scenario
- VTAM V3R1.1
- VTAM V3.3 ESA for the multi-host test
- NCP V4R2.0
- X.25 Interconnection PRPQ V1.R1.0 (XI)
- System/36* SSP Release 5
- System/38* CPF Release 8

Using microcode level Configuration Support-C it would be obtained similar data flows.

5.6.1 3174 as a PVC

Different scenarios were tested with the 3174 in a PVC environment. The connections to a VTAM system and System 36/38 were tested; the results can be observed in the following figures.

Access To A VTAM System

This test includes host access using a PSDN (Case A) and using XI instead of an X.25 network (Case B).

Case A: X.25 Connection Through TYMNET

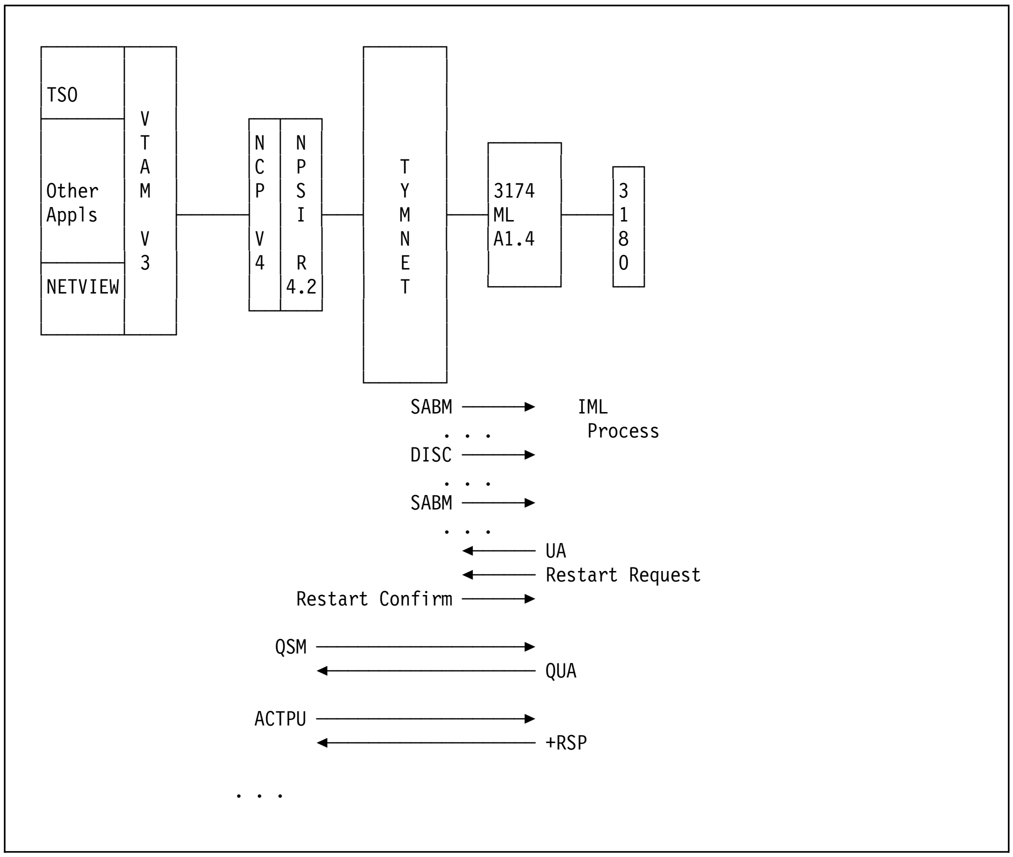


Figure 58. Case A: X.25 Connection through TYMNET

Case B: X.25 Connection Using XI

The following scenario shows the configuration used for Case B. As it can be seen, XI was used instead of the X.25 Network.

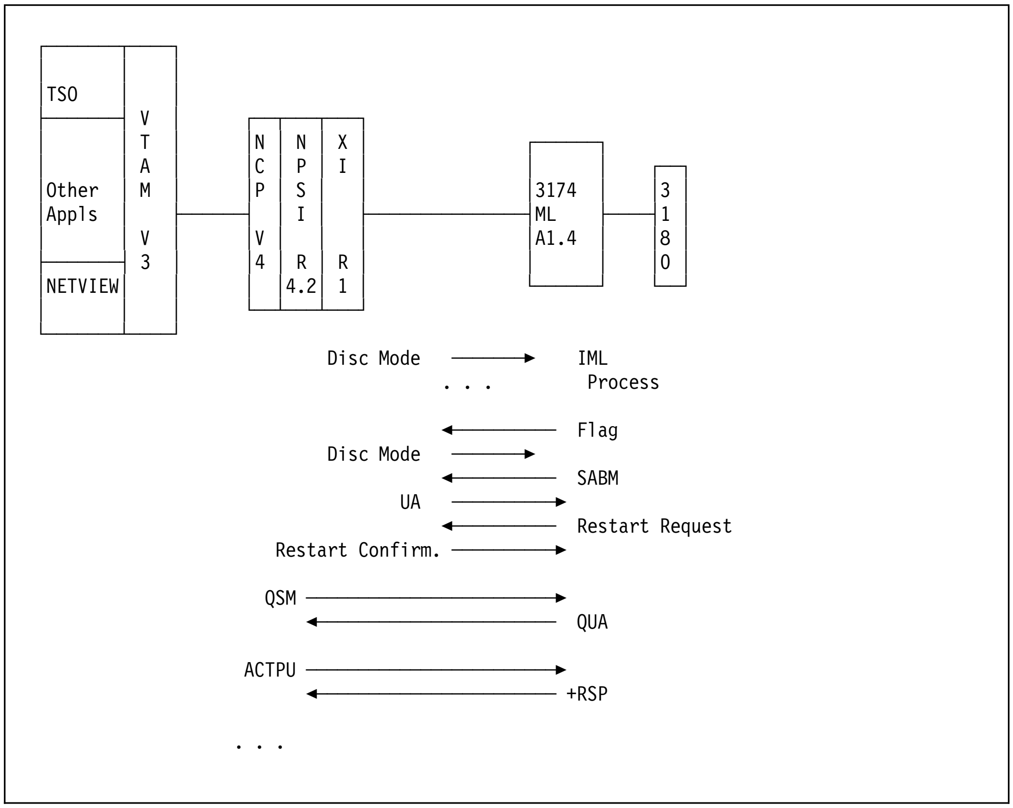


Figure 59. Case B: X.25 Connection Using XI

Access to System/36

Again, two different scenarios were tested:

- Case A: Accessing S/36 host using a PSDN.
- Case B: Accessing S/36 host via XI.

Configurations for these tests and the resulting data flows are presented below.

Case A: Connecting through TYMNET

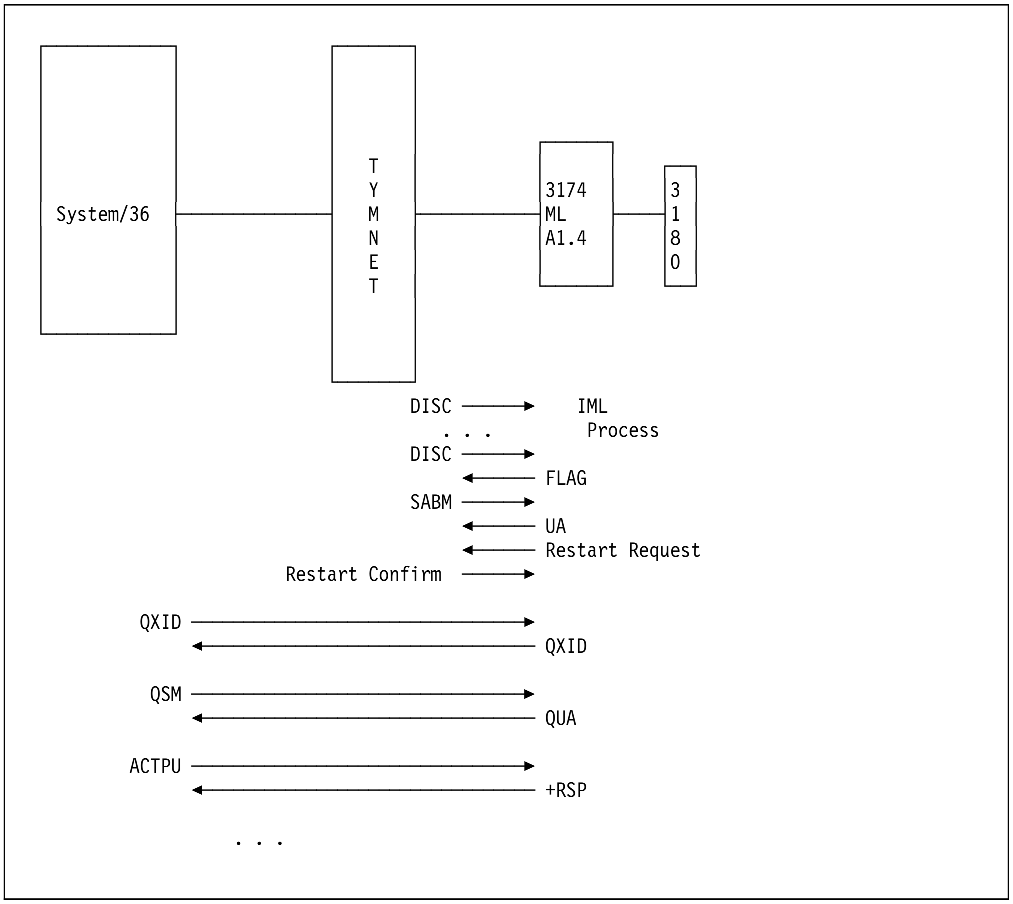


Figure 60. Case A: Connecting through TYMNET

Case B: Connecting through XI, Using XI as a DCE

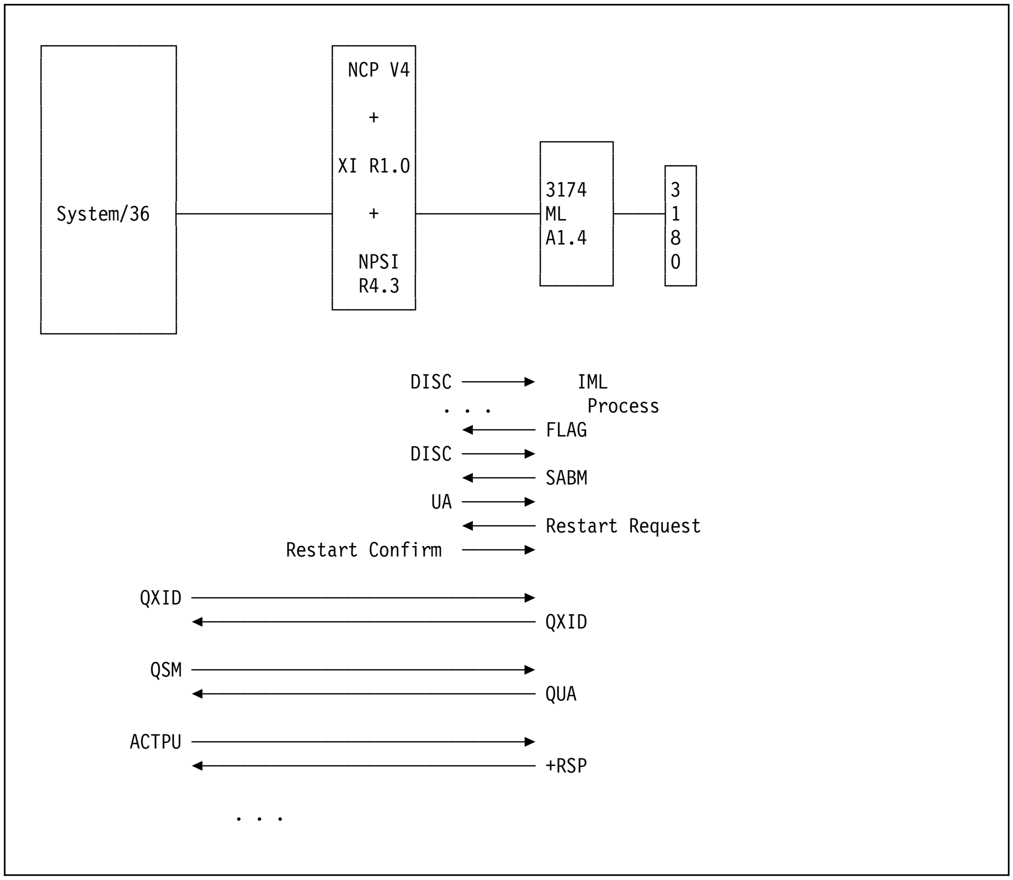


Figure 61. Case B: Connecting through XI, Using XI as a DCE

Access to Multi-Hosts

In this case, even though there was really only one host, the 3174 sees four different hosts over different PVCs. SVCs could have been used instead for one or any of the connections.

The 3725 used is simulating a PSDN by having STATION=DCE specified in the X25.MCH macro of the NCP gen. VTAM and NCP see four different PUs downstream.

Multi-Host Configuration, Using NPSI as a DCE

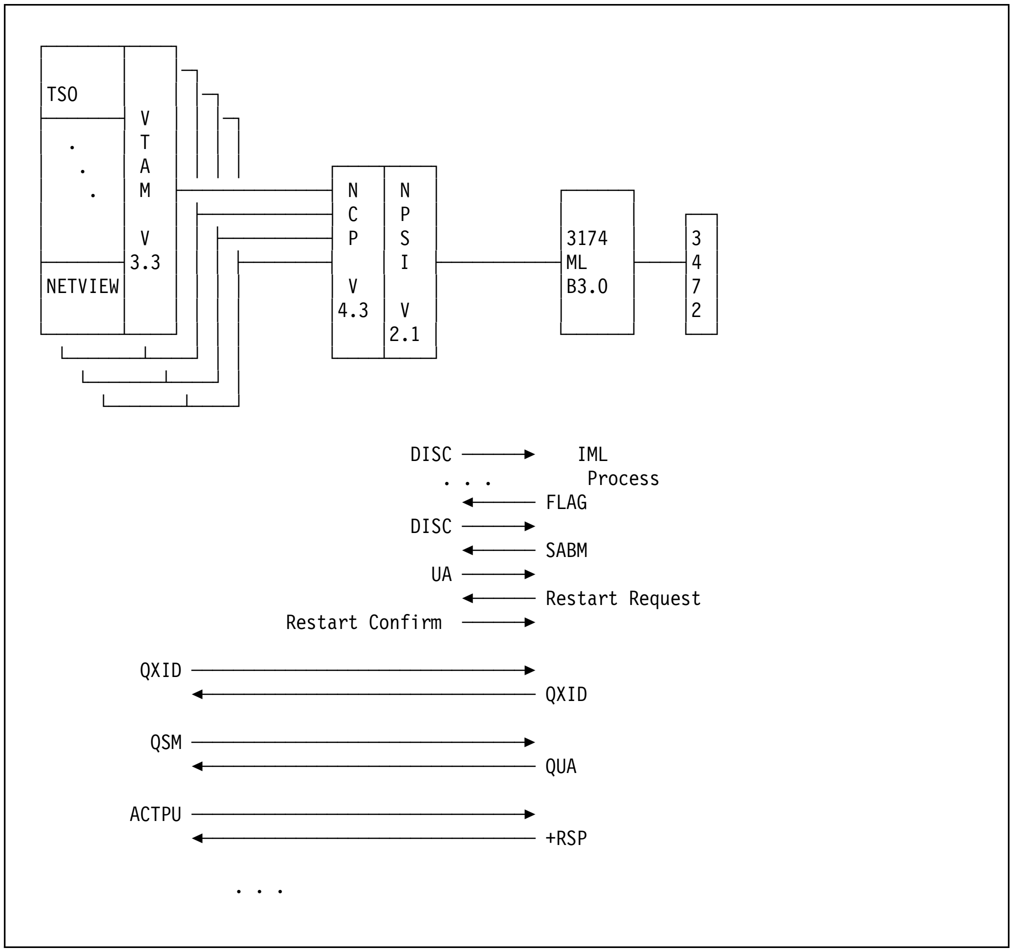


Figure 62. Multi-Host Configuration, Using NPSI as a DCE

5.6.2 3174 as an SVC

The ability of the 3174 to work in a SVC was tested too; in one test the 3174 started the connection by making an outgoing call and in the other, the 3174 waited for the call which is initiated from the host. Connections to a VTAM system and System 36/38 were tested again.

Access to a VTAM System

This test included host access using a PSDN (Case A) and using XI (Case B). The incoming call and the outgoing call capability of the 3174 were tested.

Case A: Connecting through TYMNET (Outgoing Call)

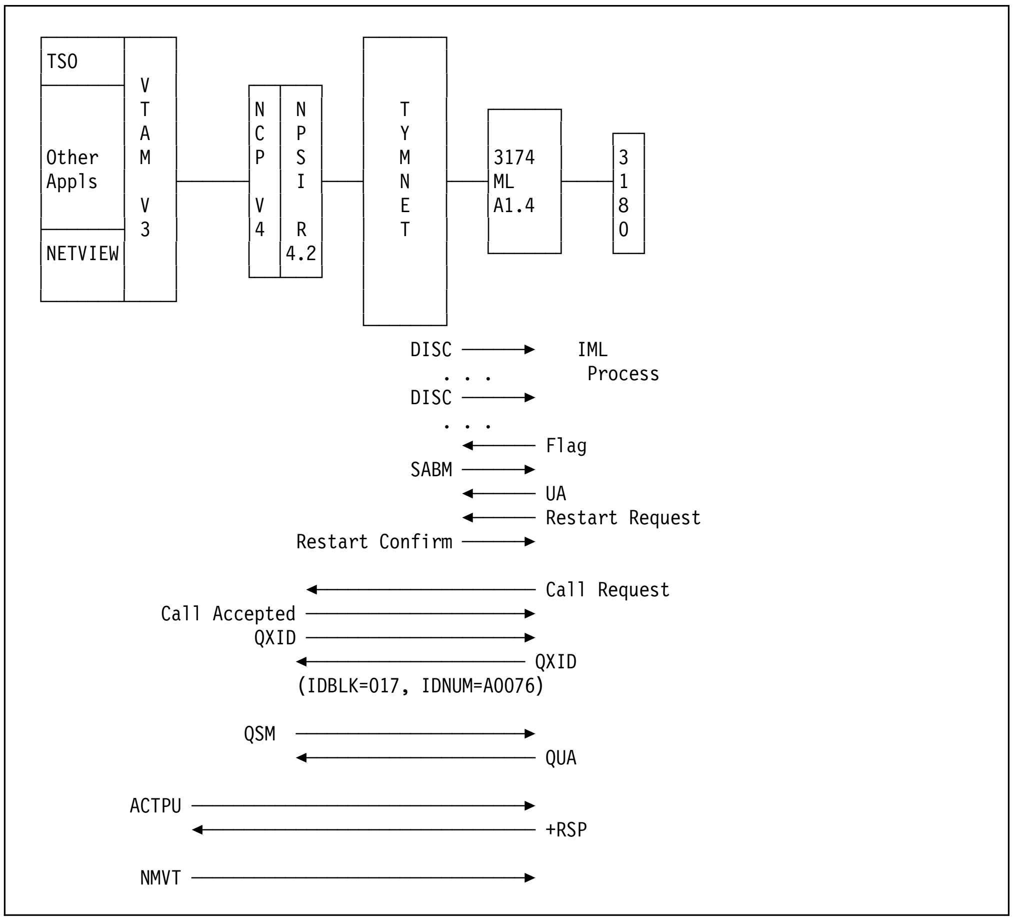


Figure 63. Case A: Connecting through TYMNET (Outgoing Call)

Case B: Using XI (Incoming Call)

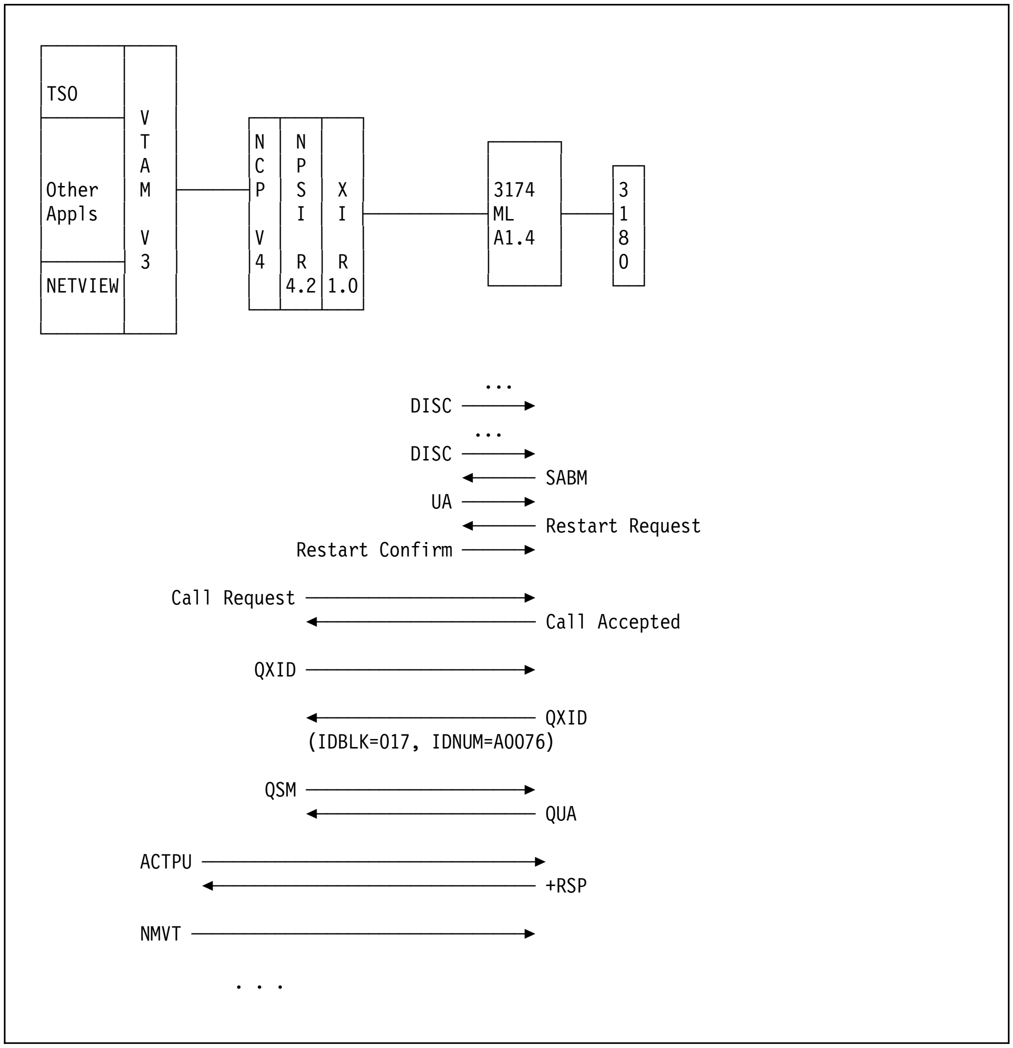


Figure 64. Case B: Using XI (Incoming Call)

Chapter 6. X.25 Token-Ring Gateway RPQ

With the support described in Chapter 4, "LAN Support" on page 69, the 3174 can act as a gateway (either local or remote) for other 3174s and workstations. These other 3174s and workstations are DSPUs accessing the 3174 gateway via a LAN.

With the support described in Chapter 5, "X.25 Support" on page 157, the 3174 can connect up to 16 host systems using Single Link Multi-Host (available with Configuration Support-B Release 3 and later releases) via an X.25 network. In this environment, the 3174 acts as a QLLC secondary station communicating with the QLLC primary station at the host end (NPSI in 37xx Communication Controller, or the integrated X.25 support in other hosts). The PU 2.0 function in this QLLC secondary station serves the LUs that are locally attached to the 3174. Hence, this PU is sometimes referred to as the *Local PU*.

One common requirement is to combine the functions provided by the Token-Ring Network and X.25 support: a 3174 Token-Ring Gateway that connects to the X.25 network, using X.25 Single Link Multi-Host, and allowing other 3174s and workstations as DSPUs to access up to 16 host systems. The Request for Price Quotation (RPQ) 8Q0743 X.25 Token-Ring Gateway is provided to meet this requirement.

With the X.25 Token-Ring Gateway RPQ, the 3174 acts as a gateway to allow other 3174s and workstations on the Token-Ring to access multiple hosts in the X.25 network. The 3174 gateway can be connected to the X.25 hosts via the same (one) X.25 network or up to three different X.25 networks. In this environment, the 3174 still acts as a QLLC secondary station, with the exception that it is also a gateway. Hence, it is referred to as a *QLLC secondary gateway*.

The X.25 Token-Ring Gateway RPQ provides another important function: the 3174 can also act as a gateway to allow PU 2.0 devices in the X.25 network, such as other 3174s and workstations, to access hosts on the Token-Ring. In this environment, the 3174 acts as a QLLC primary station as well as being a gateway to the hosts on the Token-Ring. Hence, it is referred to as a *QLLC primary gateway*.

It should be noted that all the X.25 support functions can exist together in one 3174. In other words, a 3174 can be a local PU, a QLLC secondary gateway and a QLLC primary gateway all at the same time and provide Single Link Multi-Host access over the X.25 network.

Details of the capabilities provided by X.25 Token-Ring Gateway RPQ will be described in this chapter, which assumes you have prior knowledge of X.25 networking (see Chapter 5, "X.25 Support" on page 157). This chapter uses material from the following publications:

- *X.25 Token-Ring Gateway RPQ 8Q0743 Cover Letter*, (provided with the RPQ package)
  - P/N 71F9161 - Configuration Support B - Release 3
  - P/N 43G3268 - Configuration Support C - Release 3
- *3174 Planning Guide*, for the appropriate release
- *3174 X.25 Operation*.

6.1 Hardware/Software Requirements

This section details the hardware and software requirements for the 3174 gateway, other 3174s and workstations using the gateway, and host systems.

6.1.1 3174 Requirements

To use the X.25 Token-Ring Gateway RPQ, you need the following in the 3174 gateway:

- Configuration Support-B Release 3 and later or Configuration Support-C Release 2.1 and later Licensed Internal Code

  The current release of the X.25 Token-Ring Gateway RPQ is based on Configuration Support-C Release 3[1] offered as a "Control Disk RPQ," which means that the X.25 Token-Ring Gateway RPQ is packaged as a set of Control and Utility diskettes, not to be merged with the Control and Utility diskettes you are currently using.

- At least 3MB of controller storage
- Type 3A Dual Speed 16/4 Mbps Communication Adapter (the Token-Ring Adapter card)
- For Models 01L, 11L, 21L and 22L: Concurrent Communication Adapter(s) or Alternate host attachment to allow connection X.25 network. In case of Alternate host attachment, the 3174 must be customized as an x1R or x2R model

Model 3174-x3Rs support the X.25 Token-Ring Gateway RPQ when an alternate configuration is selected. The appropriate Alternate IML adapter must be installed. For example, a 3174-13R must have a Type 1 Teleprocessing Communication Adapter (feature #3040) with additional controller storage. Using the X.25 Token-Ring Gateway RPQ microcode, you can now configure the 3174-13R as a 3174-11R X.25 Token-Ring Gateway.

6.1.2 Diskettes installation

The RPQ provides a set of five diskettes which replace the diskettes provided when the standard Configuration Support-C is ordered. They are:

- A CONTROL diskette
- A UTILITY diskette
- A CONTROL EXTENSION DSL diskette
- An APPN DSL diskette
- A PEER DSL diskette

Note:

Even if the APPN or the PEER are not configured it is mandatory that the APPN and PEER DSL diskettes be merged with the CONTROL EXTENSION DSL diskette at the time of the RPQ installation.

[1] For CS-C Release 5, the planned date of availability of the X.25 Token-Ring Gateway RPQ is December 30, 1994.

6.1.3 3174 Models Supported

Table 10 shows the 3174 models supported by the X.25 Token-Ring Gateway RPQ.

Table 10. 3174 Models Supported By X.25 Token-Ring Gateway RPQ

Model	Attachment		
	Primary Link	**First CCA**	**Second CCA**
01L	No(*)	Yes	Yes
01R	Yes	Yes	Yes
02R	Yes	Yes	Yes
11L	No(*)	Yes	Yes
12L	No(*)	Yes	Yes
11R	Yes	Yes	Yes
12R	Yes	Yes	Yes
21L	No(*)	Yes	Yes
21R	Yes	Yes	Yes
22L	No(*)	Yes	Yes
22R	Yes	Yes	Yes
41R	Yes	N/A	N/A
51R	Yes	No(**)	N/A
61R	Yes	Yes	No(**)
62R	Yes	Yes	No(**)
90R	Yes(***)	N/A	N/A

```
N/A =Model does not support this feature.
(*)  =X.25 connection not possible on primary link of local models.
(**) =CCA card slot is used by the Token-Ring Adapter.
(***)=The number of simultaneous gateway connections cannot be more
      than 40.  In addition, it is limited by the largest window
      size value and by the maximum of 0.5M storage available, on
      this model, for the RPQ (see Table 11 on page 190).
```

6.1.4 3174 Controller Storage

3174 controller storage requirements depend on the number of simultaneous connections and the largest window size to be used. The following questions affect the largest window size:

- Question 420: Incoming Call Options (digit 5=Negotiated Window Size Facility)
- Question 421: Outgoing Call Options (digit 5=Negotiated Window Size Facility)
- Question 431: Packet Sequence Numbering
- Question 432: Negotiated Window Size (NWND) or PVC Window Size
- Question 435: Nonstandard Default Window Size

The largest window size is determined as follows:

- If question 420 digit 5=1, then the largest window size is given by your response in question 432 as follows:
  - If question 431=0, then question 432=01 through 07 (modulo 8).
  - If question 431=1, then question 432=01 through 11 (modulo 128).
- If question 420 digit 5=0, then the largest window size is given by your response in question 435 as follows:
  - If question 431=0, then question 435=01 through 07 (modulo 8).
  - If question 431=1, then question 435=01 through 11 (modulo 128).

Table 11 shows the additional storage required for a given window size and number of simultaneous connections. For example, if you specify a window size of 6 (question 432 or 435) and you need 1 to 116 simultaneous connections, then the minimum additional storage required is 1 MB.

Table 11. 3174 Additional Storage Required For X.25 Token-Ring Gateway RPQ

Largest Window Size	**Simultaneous Connections With Additional:**			
	0.5MB	**1.0MB**	**1.5MB**	**2.0MB**
2	1-54	55-178	179-200	
3	1-48	49-158	159-200	
4	1-43	44-141	142-200	
5	1-39	40-128	129-200	
6	1-35	36-116	117-197	198-200
7	1-33	34-108	109-183	184-200
8	1-30	31-99	100-168	169-200
9	1-28	29-92	93-156	157-200
10	1-26	27-86	87-146	147-200
11	1-25	26-82	83-139	140-196

6.2 Simultaneous Connections

The connections can share, on a contention basis, a pool of X.25 Switched Virtual Circuits (SVC) and/or use a set of Permanent Virtual Circuit s (PVC).

The RPQ allows up to 200 simultaneous SVC and PVC connections between token-ring and X.25 devices for a 3174 Controller. These connections can involve 1 to 200 X.25 unique destinations (Data Terminal Equipment numbers) and 1 to 200 token-ring attached devices. Each X.25 link (Primary and Secondary) has its own pool of SVCs and its own set of PVCs.

Your 3174 Communication Adapter(s) configuration determines the number of possible gateway connections:

- When only the Primary Link is installed, its supports up to 200 gateway connections
- When the Primary and one or two Secondary Link(s) are installed, it supports a total of 200 gateway connections with a maximum of 20 on each Secondary.

For example, assume all three links are installed and the secondary are configured for 20 SVCs each. In this case, the secondary pools each have 20 SVCs and the primary pool can only have a maximum of 160 SVCs.

Your X.25 network subscription must allow for the maximum number of connections required.

6.3 Bridge Protocol Considerations

The 3174 X.25 Token-Ring Gateway function appears as a *bridge* to the token-ring devices.

The token-ring attached products must be able to generate all-routes broadcast messages. Consequently, these token-ring attached products must support the bridge protocol.

6.4 Token-Ring PU 2.0 Devices

The PU 2.0 devices that can be attached to a Token-Ring to use a 3174 X.25 Token-Ring Gateway are:

- 3174 Models x3R
- 3174-Peer Device
- PS/2 or PC using IBM OS/2 Extended Edition V1.1 or later
- PS/2 or PC using IBM Communications Manager/2
- PS/2, PC or 3270-PC using 3270 Workstation Program V1.1 (with maintenance release 1.1.2 or later)
- PS/2 or PC using APPC/PC (as a PU 2.0 node)
- Personal Communications/3270 V1.01 or later
- Any device supporting:
  - PU 2.0
  - IEEE 802.2 Logical Link Control Sub-Layer
  - Bridge connectivity

A token-ring attached device that needs simultaneous connections with more than one host through a given gateway must support multiple Data Link Control (DLC) connections with the gateway. This means that the token-ring attached device must implement multiple PU images within the device.

6.5 Token-Ring Hosts

The hosts that can be attached to a token ring to use a 3174 X.25 Token-Ring Gateway are:

- AS/400 or 9370, via direct attachment to the token ring
- S/370 or S/390, via a 37xx NCP/NTRI attachment
- S/370 or S/390, via a 3174 local or remote Token-Ring Gateway

6.6 X.25 PU 2.0 Devices

The PU 2.0 devices that can be attached to an X.25 network are:

- 3174 Establishment Controller
- PS/2
- Programmable Network Access (PNA)
- Devices supporting QLLC Secondary

6.7 X.25 Hosts

The hosts that can be attached to an X.25 network via a 37xx Communication Controller and NPSI are:

- 308x
- 3090
- 4361
- 4381
- 9370
- 9x21

Note:

Both SVC and PVC connections are supported via NCP/NPSI but the PVC connections need to have the APARs reference IR23851 and IR24784 installed in NPSI.

Also, the following IBM hosts provide integrated X.25 connections (that is without a 37xx Communication Controller), and can be accessed from the token-ring PUs attached to the 3174 but through SVC connections only.

- S/36
- S/38
- AS/400

The token-ring devices will use the 3174 X.25 Token-Ring Gateway to communicate through the X.25 network with these hosts.

6.8 Host Link Protocols

Using an X.25 Token-Ring Gateway RPQ on one of the 3174 links does not affect the attachment types used on other links; for example, it is possible to configure a 3174 so that a user of a locally attached terminal switches from a session with an X.25 host to a session with an SDLC host or an APPN host.

Except for the following list of host link protocol considerations, there are no restrictions on the protocol used on either the Primary Host of the Primary Link (1A) or the Primary Host of the Secondary Link(s) (2A,3A).

- The Primary Link (1A, 1B-1H) protocol must be SNA when any Secondary Link is configured with the X.25 Token-Ring Gateway RPQ.
- The Primary link can be customized or not for APPN:

  - If customized for APPN, the following attachments are supported:
    - Local Channel
    - SDLC
  - If not customized for APPN, the following attachments are supported:
    - Local Channel
    - SDLC
    - X.21 or X.25
- The Primary Link does not necessarily have to be configured with the X.25 Token-Ring Gateway RPQ.

  Note: The Primary Link cannot be customized for the X.25 Token-Ring Gateway RPQ if it is customized for APPN or for the ISDN Gateway. In this case, the X.25 Token-Ring Gateway RPQ will have to be customized on a Secondary Link.
- Token-ring related alerts are reported on the PU owning the Token-Ring Adapter (Primary Link).
- The X.25 Token-Ring Gateway RPQ can coexist in a controller with Secondary Link(s) configured for a non-SNA protocol. In this configuration, only the 3174 locally attached terminals can access the Secondary Link(s) non-SNA hosts.

6.9 X.25 Network Type Supported

The X.25 networks that can be attached to a 3174 with X.25 Token-Ring Gateway RPQ are the same as those supported by 3174 Configuration Support-B Release 3 and later releases (see the description of question 400: Network Type). Note that, with this release, Single Link Multi-Host via the X.25 connection is supported.

6.10 Functional Description

With the X.25 Token-Ring Gateway RPQ, the 3174 can act as a:

- QLLC secondary gateway
- QLLC primary gateway
- QLLC combined gateway

These new capabilities are additional to its role as a QLLC secondary station, providing PU support to locally attached LUs (the local PU function). All the X.25 support functions can exist together in one 3174. In other words, a 3174 can be a local PU, a QLLC secondary gateway and a QLLC primary gateway all at the same time and provide Single Link Multi-Host access over the X.25 network.

6.10.1 QLLC Secondary Gateway

Figure 65 on page 194 represents a schematic diagram of a QLLC Secondary configuration.

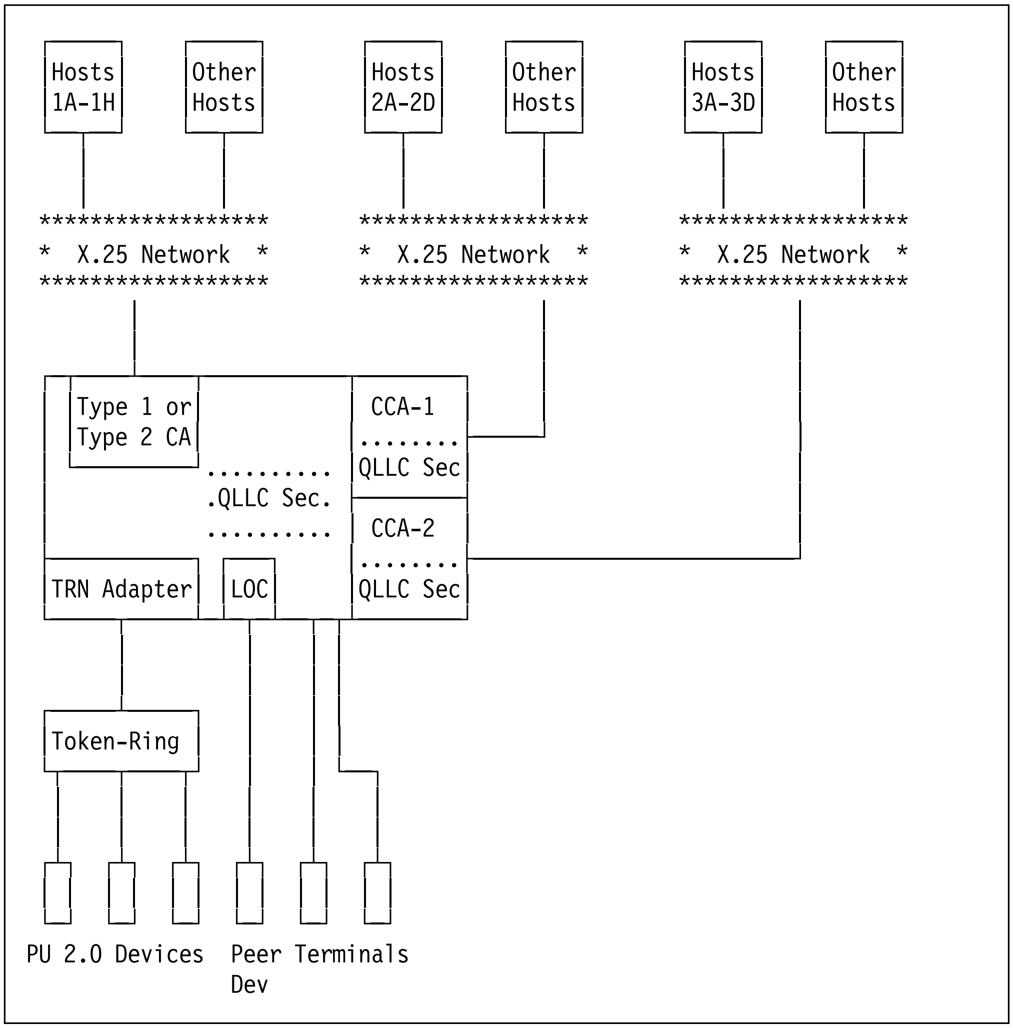


Figure 65. 3174 Token-Ring Gateway (QLLC Secondary) to X.25

- Terminals can communicate with:
  - Hosts 1A to 1H via the primary link
  - Hosts 2A to 2D via the CCA-1 link
  - Hosts 3A to 3D via the CCA-2 link
- PU 2.0 devices on TRN or PU 2.0 Peer devices can communicate with any host on X.25 network

Figure 66 on page 195 shows a typical configuration.

X25QSEC

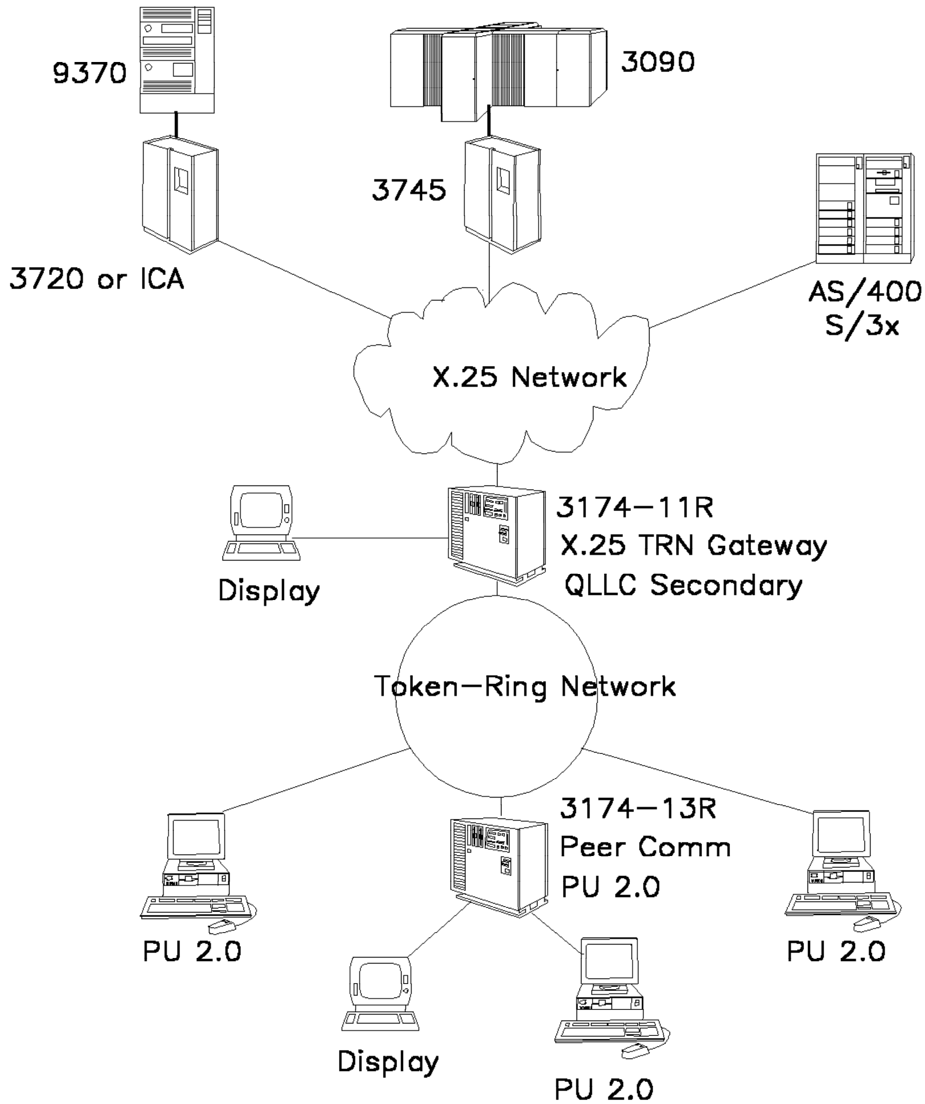


Figure 66. 3174 QLLC Secondary Gateway: Physical Configuration

In this example, the PS/2 is a PU 2.0 device coax attached to the 3174-13R with Peer Communication active. The 3174-11R acts as a QLLC secondary gateway to allow the PS/2 (or any PU 2.0 attached to the Token-Ring) to access the 9370, 3090 or AS/400 hosts on the X.25 network. The display attached to the 3174-11R gateway is also able to access any host attached to the primary or secondary links.

Figure 67 on page 196 shows the logical view of this configuration.

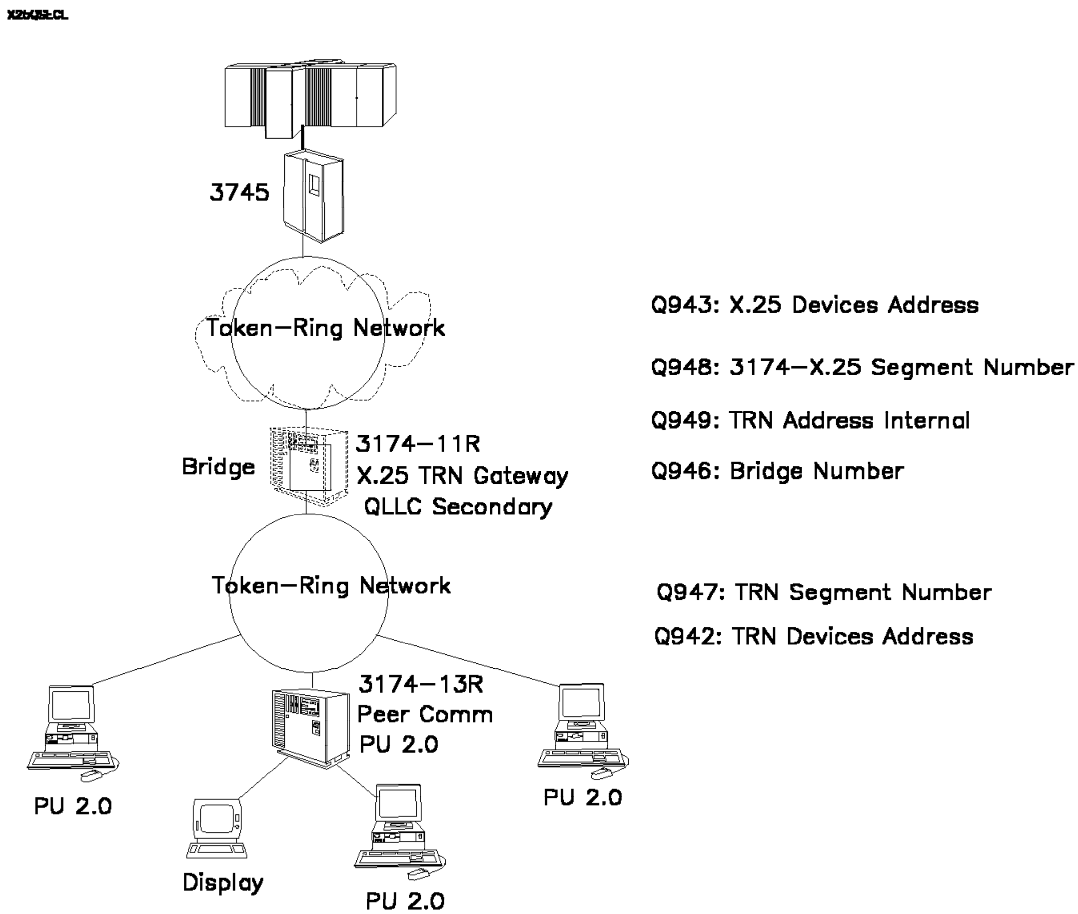


Figure 67. 3174 QLLC Secondary Gateway: Logical View

From a logical viewpoint, the 3174-11R gateway provides a bridge between the devices on the real token ring and the host attached to the “virtual ring,” which is really the X.25 network. The token-ring devices are seen by the host as PU 2.0 devices attached through the 3174-11R gateway. Depending on the “front-end” attached to the host, these PU 2.0 devices may be defined as local SNA major nodes (in the case of a 3174 “front-end”) or as switched major nodes (in the case of a 3745/NPSI “front-end”).

6.10.2 QLLC Primary Gateway

Figure 68 represents a schematic diagram of a QLLC Primary configuration. The QLLC Primary function of the 3174 (2) allows the following possible connections:

- Terminals can communicate with:
  - Hosts 1A to 1H via the primary link
  - Hosts 2A to 2D via the CCA-1 link
  - Hosts 3A to 3D via the CCA-2 link
- PU 2.0 devices on the X.25 network can communicate with any host on token-ring network.

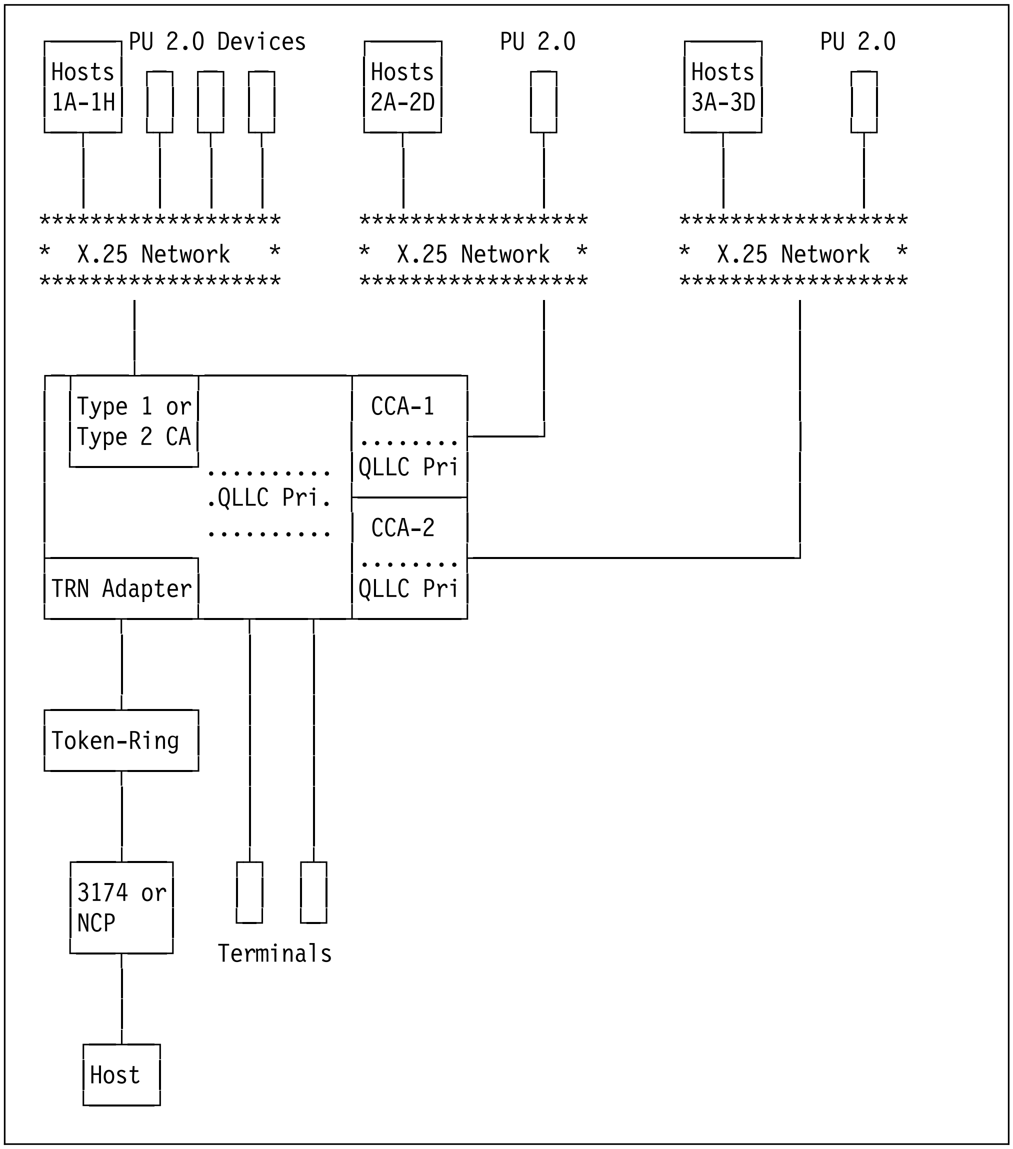


Figure 68. 3174 QLLC Primary Connecting to Token-Ring Hosts

Figure 69 on page 198 shows a typical configuration.

X25QPRI

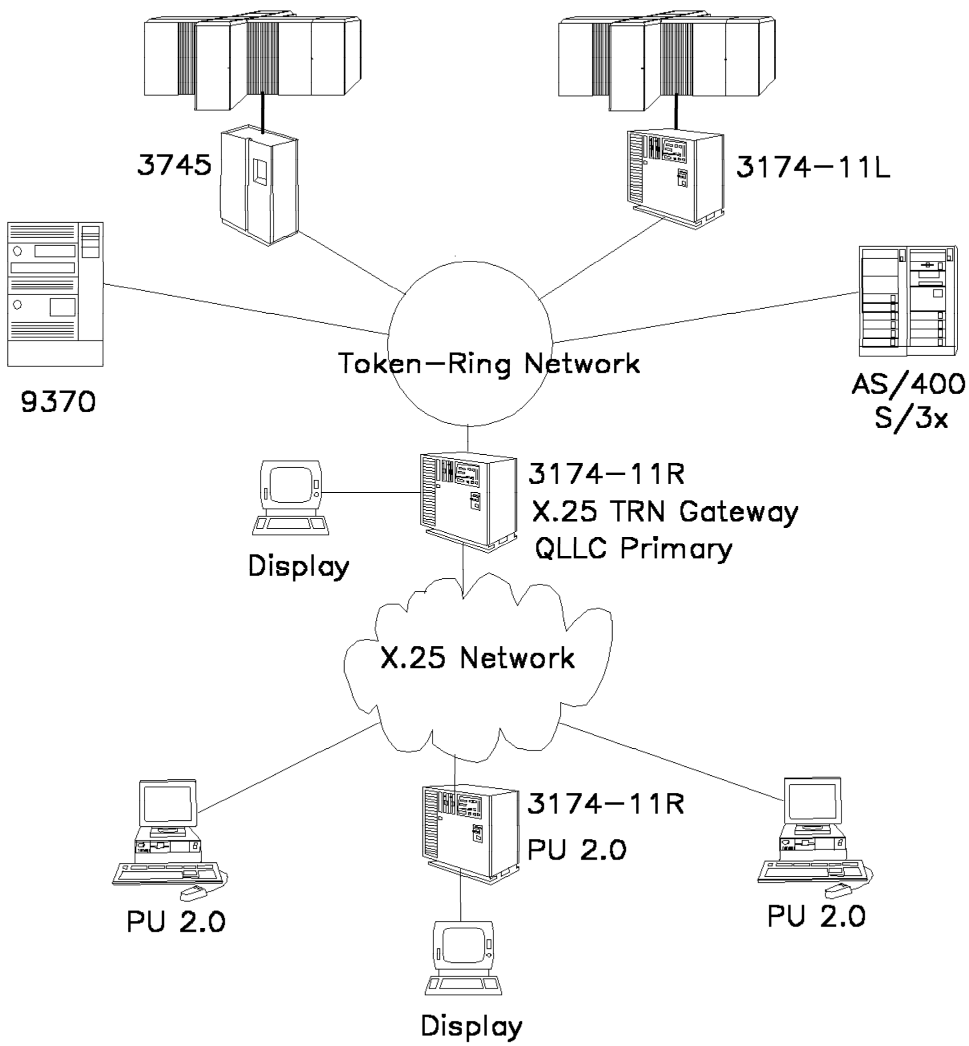


Figure 69. 3174 QLLC Primary Gateway: Physical Configuration

In this example, one 3174-11R is a PU 2.0 device attached to the the X.25 network. The other 3174-11R, attached to the token ring, acts as a QLLC primary gateway to allow the 3174-11R PU 2.0 device (or any PU 2.0 device attached to the X.25 network) to access the 9370, 3090 or AS/400 hosts on the Token-Ring. The display attached to the 3174-11R gateway is also able to access any host attached to the primary link.

Figure 70 on page 199 shows the logical view of this configuration.

X25QPRIL

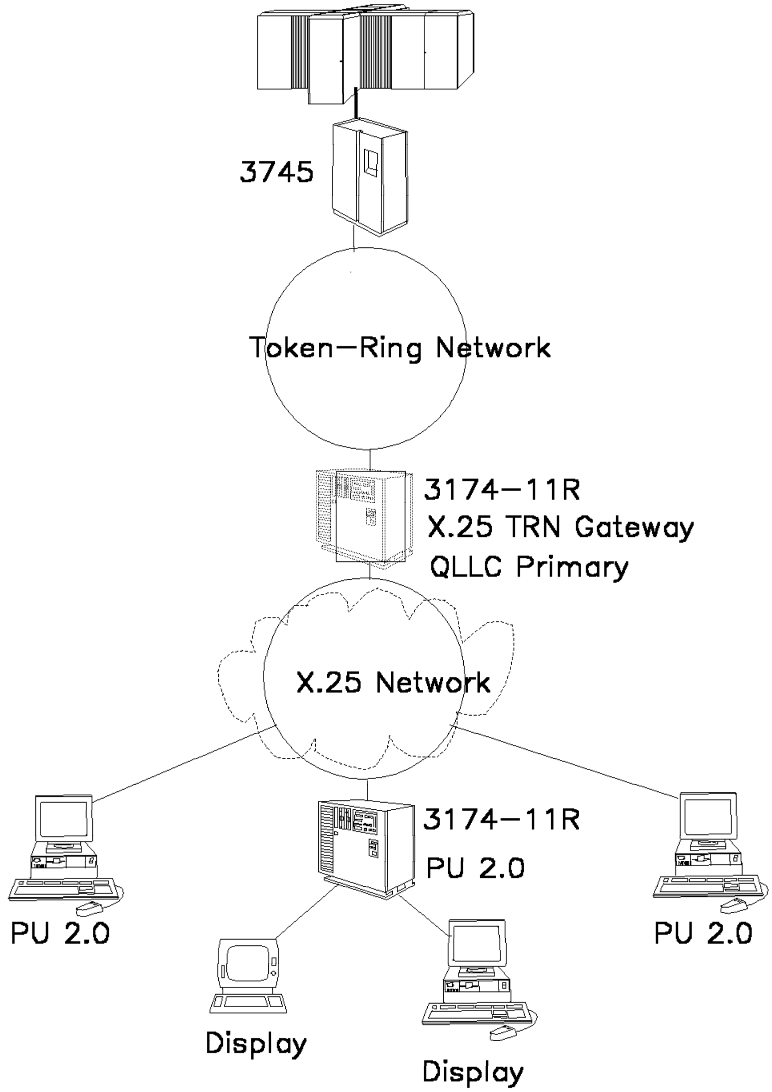


Figure 70. 3174 QLLC Primary Gateway: Logical View

From a logical viewpoint, the 3174-11R gateway provides a bridge between the hosts on the real token ring and the PU 2.0 devices attached to the "virtual ring," which is really the X.25 network. The X.25 devices are seen by the host as PU 2.0 DSPUs attached through the 3174-11R gateway.

6.10.3 QLLC Combined Gateway

Figure 71 on page 200 represents a possible combination of the QLLC Gateway functions.

- Terminals attached to 3174-A can communicate with:
  - Hosts 1A to 1H via the primary link
  - Hosts 2A to 2D via CCA
- PU 2.0 devices on TRN-1 and PU 2.0 Peer devices on the 3174-A can communicate with:
  - Any host attached to X.25 Network-1 via QLLCS-2
  - Any host attached to X.25 Network-2 via QLLCS-3

- Any host attached to TRN-2 via QLLCS-3 and QLLCP-1

- Terminals attached to 3174-B can communicate with:
  - Hosts 1A to 1H via the primary link
- PU 2.0 devices on TRN-2 and PU 2.0 Peer devices on the 3174-B can communicate with:
  - Any host attached to X.25 Network-2 via QLLCS-1
- Host on TRN-2 can communicate with:
  - Any PU 2.0 device on TRN-1 via QLLCP-1 and QLLCS-3
  - Any PU 2.0 device on X.25 Network-2 via QLLCP-1

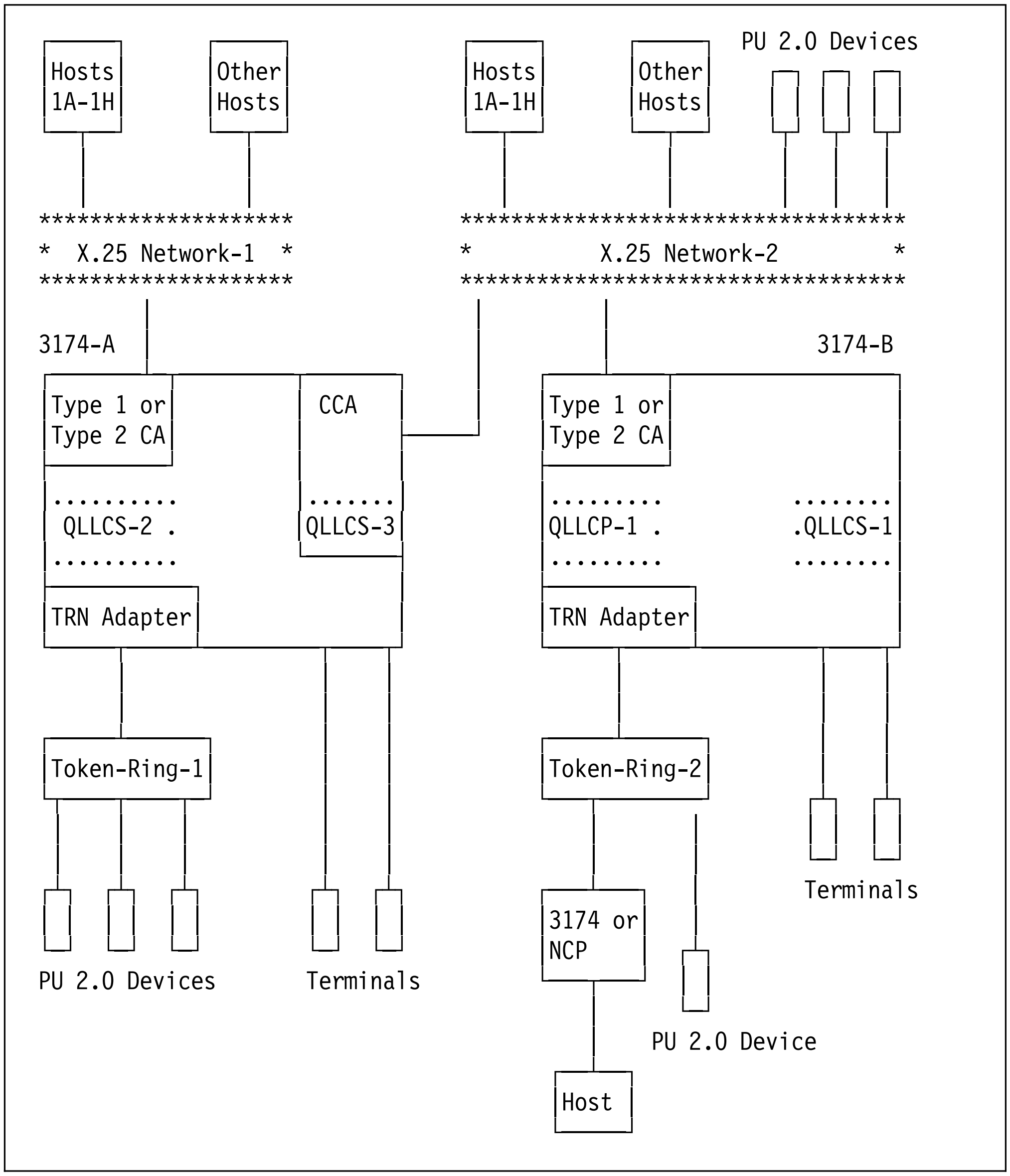


Figure 71. 3174 Combined QLLC Gateway

6.11 Identifying Connecting Devices

Before you install and customize a 3174 gateway, you should take an overall view of the token-ring and X.25 devices you are trying to connect.

Using the configuration shown in Figure 72 as an example, you wish to connect device A on Token Ring 1 with host B via NPSI, and host C via Token Ring 2. Device A cannot directly address either of these hosts because of the X.25 network.

By installing the X.25 Token-Ring Gateway RPQ in 3174 GW-1 and GW-2, these 3174s will perform a bridging function between device A and host B, and device A and host C.

Note that device D can either be a 37xx Communication Controller with NTRI (NCP Token-Ring Interconnection) or another 3174. If another 3174 is used, you do not install the X.25 Token-Ring Gateway RPQ is this 3174.

Figure 72 shows the physical connection desired.

Device A is connected so as to access host B and host C through the Token-Rings and X.25 network.

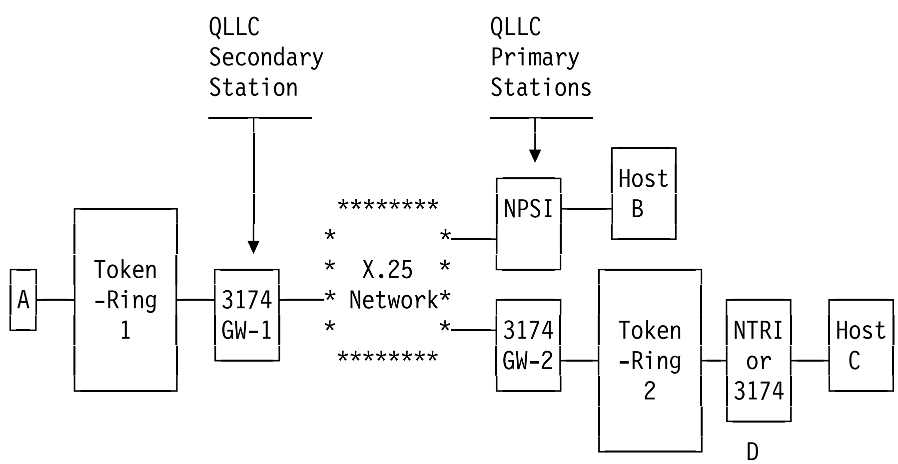
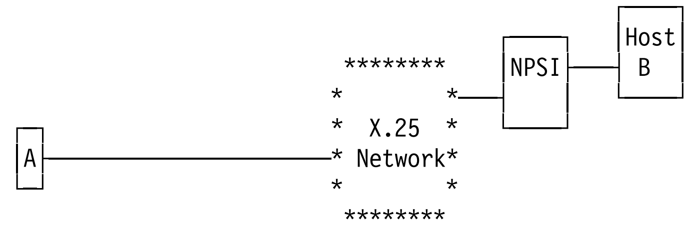


Figure 72. Physical Connection

From a logical viewpoint, however, the device A and hosts B and C see each other as shown in Figure 73 on page 202.

Logical View From Host B

Host B sees device A as if it were connected through an X.25 network.



Logical View From Host C

Host C sees device A as if it were connected through bridged Token-Rings.

Logical View From Device A

Device A also sees hosts B and C as if they were connected through bridged Token-Rings.

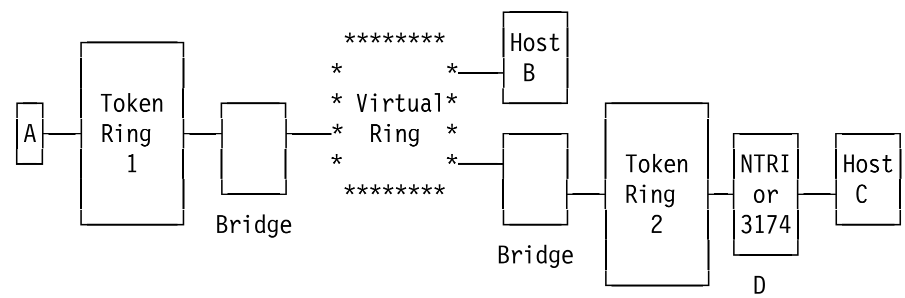


Figure 73. Logical Views

To identify the connecting devices (in this case, devices include host and PU 2.0 devices), Device A, host B and host C are each assigned a token-ring address when customizing the 3174 gateways (Device A and host B addresses in GW-1, and host C address in GW-2). Host B does not have a real token-ring address since it is not attached to a real token ring. However, it will still be assigned an address using the token-ring address format (a “virtual” token-ring address) which will be used by device A when it wishes to communicate with host B.

During call establishment, the Call Request packet contains a Call User Data (CUD) field. The CUD, in turn, contains an eight-byte Connection Identifier (CID) which is used to identify the two ends of the connection.

We need a way, however, to specify the six-byte (12-hexadecimal digit) source/origin and destination token-ring addresses in the CID. This is done by allocating a two-byte field for a source short identifier (SID) and another two-byte field for a destination SID in the CID. The SIDs are then related to Token-Ring addresses via entries in the 3174 gateway customization panels. Using these entries, the 3174 gateways are able to map the Token-Ring addresses to SIDs, and vice versa. Thus, the 3174 gateway transforms source and destination Token-Ring addresses into source and destination SIDs, places them in the Call Request packet CID and sends the packet through the X.25 network.

6.12 Connection Identifier

In an X.25 Call Request packet, shown in Figure 74, is a 12-byte field known as the Call User Data (CUD).

```
              Bit   8    7    6    5    4    3    2    1
                  ┌──────────────────────┬─────────────────────┐
                  │    General Format    │   Logical Channel   │
         Octet 0  │      Identifier      │    Group Number     │
                  ├──────────────────────┴─────────────────────┤
               1  │           Logical Channel Number           │
                  ├────────────────────────────────────────────┤
                  │           Packet Type Identifier           │
               2  │   0    0    0    0    1    0    1    1     │  Call Request
                  ├────────────────────────────────────────────┤
                  │               Address Block:               │
                  │        Calling DTE Address Length          │
             3-n  │        Called  DTE Address Length          │
                  │        Calling DTE Address                 │
                  │        Called  DTE Address                 │
                  ├────────────────────────────────────────────┤
             n+1  │              Facility Length               │
               :  ├────────────────────────────────────────────┤
               :  │                Facilities                  │
               :  ├────────────────────────────────────────────┤
               m  │               Call User Data               │
                  └────────────────────────────────────────────┘
```

Figure 74. Call Request Packet

The CUD field is made up of several sub-fields, as shown in Figure 75. Note that the last eight bytes are used for the Connection Identifier (CID).

```
              Bit   8    7    6    5    4    3    2    1
                  ┌────────────────────────────────────────────┐
                  │            Protocol Identifier             │
         Octet 0  │   1    1    r    r   DCI   0    1    1     │
                  ├────────────────────────────────────────────┤
                  │          Field Format Identifier           │
               1  │   x    x    x    x    x    x    x    x     │
                  ├────────────────────────────────────────────┤
                  │                 Reserved                   │
               2  │   0    0    0    0    0    0    0    0     │
                  ├────────────────────────────────────────────┤
                  │                 Reserved                   │
               3  │   0    0    0    0    0    0    0    0     │  ─────────
                  ├────────────────────────────────────────────┤      ▲
               4  │          X.25 Gateway Identifier           │      │
                  ├────────────────────────────────────────────┤      │
               5  │              QLLC Identifier               │      │
                  ├────────────────────────────────────────────┤  Connection
             6-7  │              Destination SID               │  Identifier
                  ├────────────────────────────────────────────┤      │
             8-9  │                Origin SID                  │      │
                  ├────────────────────────────────────────────┤      │
           10-11  │                 Not Used                   │      ▼
                  └────────────────────────────────────────────┘  ─────────

          Notes:   DCI = 0 for standard diagnostic codes
                   DCI = 1 for SNA-specific diagnostic codes
                   r = reserved and set to 0
                   Not Used = set to blanks (X'40')
```

Figure 75. Call User Data

The figure shows the values that can be contained in each field of the Connection Identifier (CID):

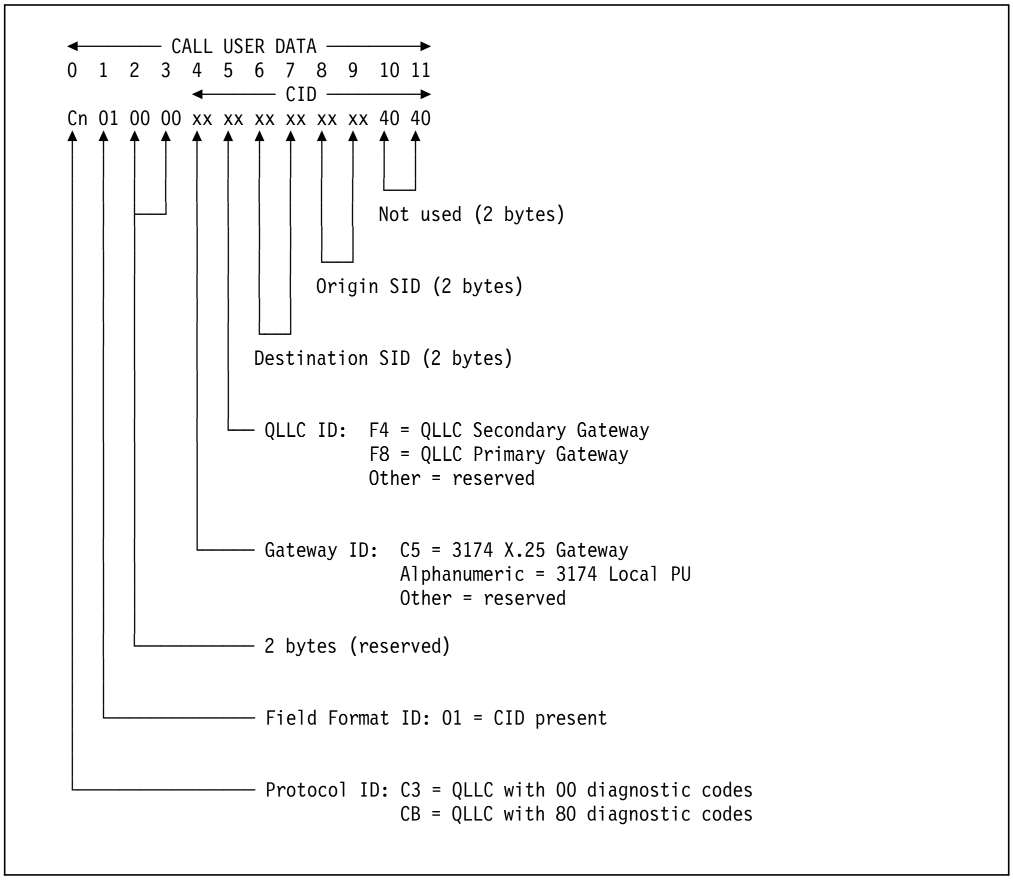


Figure 76. Call User Data Contents

The meaning of the various fields are explained below:

- **Protocol Identifier**

  The Protocol Identifier (PI) is used by IBM SNA X.25 DTEs to distinguish between SNA-to-SNA connections and SNA-to-non-SNA connections, as well as the selection of the LLC procedure to be used for the SNA-to-SNA connections.

  The Diagnostic Code Indicator (DCI) is the only bit that can change:

  – If the 3174 initiates a call, the DCI bit is set according to your response in question 400: Network Type digit 4 (SNA or ISO diagnostic codes) and question 453: Connection Options digit 2 (diagnostic code type). Depending on the DCI setting, the Protocol Identifier may either be X′C3′ or X′CB′. The default is X′C3′.

  – If NPSI initiates a call, the CUD0 and CTCP keywords will set the PI.

- **Field Format Identifier**

  The Field Format Identifier (FFI), when present, defines the format of the rest of the CUD field. With current products, the FFI can either be X′00′ or X′01′:

  – If FFI=00, then the CID is not present and an incoming call is routed to the local PU function within the 3174.

– If FFI=01, then the call is routed to either the QLLC primary gateway or the QLLC secondary gateway function within the 3174, depending on the QLLC ID value.

- **X.25 Gateway Identifier**

  The following values select the function within the 3174 gateway:

  – X′C5′ (character E)=3174 X.25 Token-Ring Gateway

  – Any other alphanumeric character=3174 local PU

  – Any other characters are reserved

- **QLLC ID**

  The following values select the QLLC protocol to be used by the 3174 gateway:

  – X′F4′ (character 4)=QLLC secondary protocols

  – X′F8′ (character 8)=QLLC primary protocols

  – Any other characters are reserved

- **Destination SID**

  Is a two-byte field that maps to a destination Token-Ring address via customization in the 3174 gateway.

- **Origin SID**

  Is a two-byte field that maps to an origin Token-Ring address via customization in the 3174 gateway.

- **Not Used**

  Is a two-byte field that is not used and set to X′40′ (blanks).

In customizing the 3174 gateway, the eight characters in question 452 are used to specify the CID as described below:

- First character=X.25 Gateway Identifier
- Second character=QLLC ID
- Third and fourth characters=Destination SID
- Fifth and sixth characters=Source/Origin SID
- Seventh and eighth characters=blanks

6.13 Types of Connections

X.25 charges are usually based on connection time, traffic volume (number of packets) and the number of call attempts. To assist in controlling these charges and manage the SVCs you have subscribed to for your X.25 Token-Ring Gateway environment, the X.25 Token-Ring Gateway RPQ offers three types of connection:

- Default Connection
- Demand Connection
- Open Connection

6.13.1 Default Connection

This type of connection is desirable for relatively permanent connections, such as between a 3174-x3R on a token ring to a host on the X.25 network, or for devices not capable of initiating or re-establishing a connection, such as printers. The connection is automatically established or re-established whenever appropriate, for example, when the 3174-x3R completes IML.

The 3174 reserves one SVC for each Default Connection. For Default Connections, the Token-Ring device, the X.25 device and connection between them must all be explicitly defined to the 3174 during customization. To allow control over the SVC, you can specify the retry count, retry delay and inactivity timer values in question 943.

- Inactivity timer

  You can specify the time limit after which, if no activity occurs on the connection, the SVC will be cleared. This option prevents unnecessary X.25 charges. Note that the token ring link is kept active. The 3174 gateway will reactivate the SVC (disruptively) when the user attempts to use the Token-Ring device.

- Automatic bring-up (retries)

  Whenever the 3174 gateway link to the X.25 network is established or reset, the 3174 gateway tries to start each Default Connection. If a connection cannot be started, either because the Token-Ring device is not active or the X.25 call fails, the 3174 gateway may retry the connection.

  If the call fails because of one of the following reasons, the call will be retried:

  - The number is busy.
  - The network is congested.
  - The remote DTE is not available.

  Other call failures indicate errors that cannot be recovered without user intervention; therefore, the call will not be retried.

  The 3174 gateway will retry the connection according to the customized retry options. You can specify:

  - No retries
  - A specific number of retries with specified time frequency
  - Infinite retries with specified time frequency

  For each retry, the 3174 gateway ensures the token-ring device is available before placing the X.25 call.

6.13.2 Demand Connection

This type of connection is desirable for operator-driven connections, such as from a PC, or those of relatively short duration, such as for file transfer or database inquiry/update. Demand connections share the remaining SVCs in the pool which are not used for Default Connections.

There are really two types of Demand Connections:

- Demand Connection is the term used to refer to a “secured” connection on demand.

- Open Connection is the term used to refer to an “unsecured” connection on demand (described in the next section).

For Demand Connections (that is, secured demand connections) all X.25 and Token-Ring devices must be explicitly defined to the 3174 gateway. This allows you to specifically define which of your users can gain access to the X.25 network.

6.13.3 Open Connection

An Open Connection is a Demand Connection with one of the devices in a possible connection, either the X.25 device or the Token-Ring device, not defined in the 3174 gateway. An X.25 device or a token-ring device may be defined for Open Connection:

- If an X.25 device is defined for Open Connection, any *undefined* Token-Ring device may connect to it on demand.
- If a Token-Ring device is defined for Open Connection, any *undefined* X.25 device may connect to it on demand.

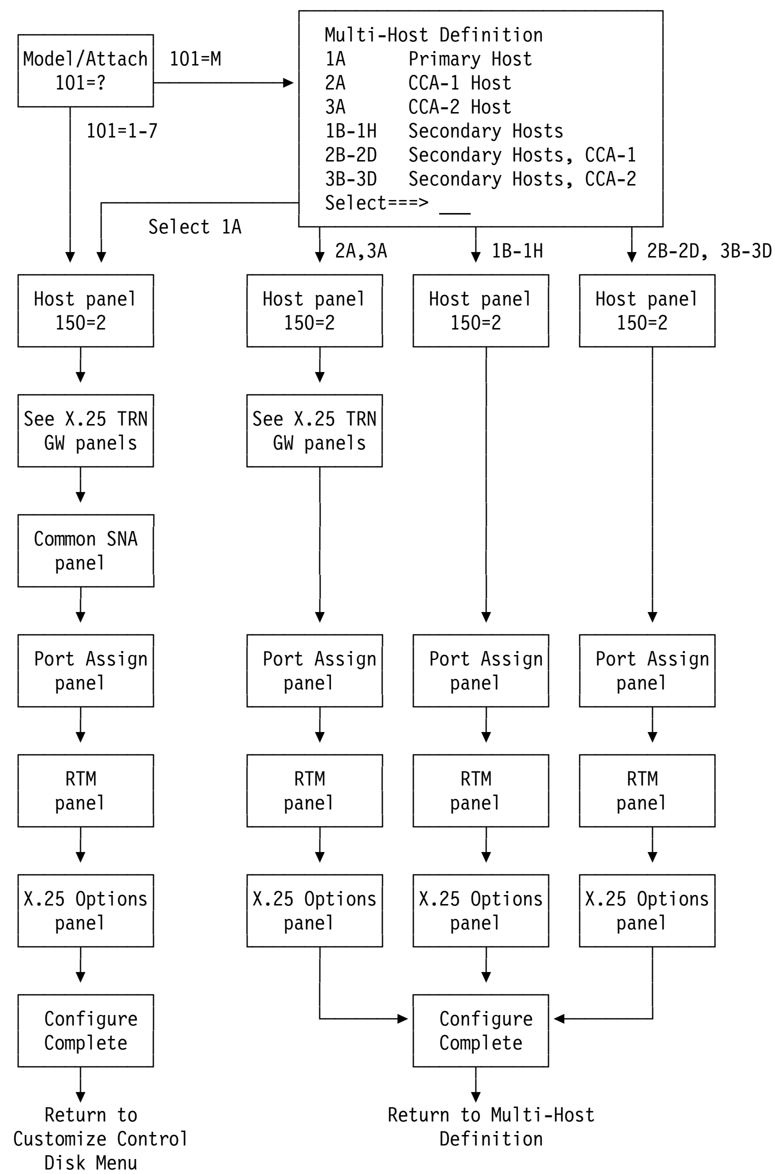
Using Open Connections minimizes the amount of information you must provide when customizing the 3174 gateway. It also allows you to add devices to your network without having to re-customize the 3174 gateway.

Security is maintained, in this case, by host security functions. There could be a small overhead in X.25 costs caused by users trying to access hosts without authority.

6.14 3174 Customization

This section describes the questions and responses required to customize the 3174 gateway, using the Utility and Control diskettes supplied with the RPQ.

6.14.1 Configure Panel Flow



6.14.2 X.25 Token-Ring Gateway Panel Flow

```
To access the X.25 TRN Gateway panels:
  |                    * Host Attachment=3 (X.25) on PRI or SEC link
  |                    * Question 150=2
  v
+-------------+          Token-Ring Gateway
| 900 TRN GW  |          900=Token-Ring Address (3174)
|             |          905=Ring Error Monitor
+-------------+          908=Link Subsystem Name
      |                  911=Ring Speed
      v
+-------------+          TRN Devices Address Assignment
|942 TRN Addr |          SID
| Assignment  |          Ring Address
+-------------+          SAP
      |                  I-Frame size
      v                  Window size
+-------------+          X.25 Devices Address Assignment
|943 X.25 Add |          Destination X.25 SID
| Assignment  |          Destination X.25 Ring Address
+-------------+          Host ID
      |                  DTE Number
      |                  Retry Count
      |                  Retry Delay
      v                  Inactivity Timeout
+-------------+          X.25 Gateway Default/Open Connections
|944 X.25 Def |          TRN Devices SID
| /Open Conn  |          X.25 Devices SID
+-------------+          X.25 Gateway Protocol
      v
+-------------+          X.25 Gateway Bridge Information
|945 X.25 GW  |          946=Bridge Number
|Bridge Info  |          947=Token-Ring Segment Number
+-------------+          948=3174-X.25 Segment Number
      |                  949=TRN Address for Internal Use
      v
```

Question 101: Host Attachment

When customizing for 3174 gateway functions, the response to this question must be 3 (for X.25 attachment).

Question 150: X.25 Token-Ring Network Gateway Controller

There are only two valid responses for this question:

- 0=This 3174 does not act as a gateway to the host.
- 2=This 3174 does act as an X.25 Token-Ring Gateway.

Note that 1 is not a valid response.

When customizing for 3174 gateway functions, the response must be 2.

Question 215: Physical Unit Identification

This is required for all switched connections, including the X.25 connection. It should match the IDNUM in the switched major node definition for the 3174 gateway.

Question 401: Circuit Type

Specify one of the responses for an SVC; that is, either 2, 3, or 4.

Question 423: Host DTE address (HNAD)

This is the host DTE address. Your X.25 administrator will give you this number. This number can be changed on the Dial screen HNAD field.

If you are using two 3174s separated by an X.25 network, then question 423 will contain the other 3174′s DTE address.

Question 424: 3174 DTE address

This is the 3174 DTE address. Your X.25 administrator will give you this number.

If you are using two 3174s separated by an X.25 network, then question 424 will contain the DTE address of the 3174 you are customizing.

Question 467: X.25 Options for Primary Host on any Link

Response:

xxxx = value from 001 to 200 (use leading zeros).

The Default response is 0000.

Your response determines the number of SVCs dedicated to the gateway. This number must be within the range of the maximum number of SVCs which have been subscribed for the link.

If several gateways (X.25, Remote, Local) are configured in the same 3174, the total number of physical gateway connections allowed by the token-ring adapter remains limited to 250.

Question 900: TRN Address for the Gateway

Find out from your LAN administrator what unique locally administered address should be given to the 3174 you are customizing. (You cannot use a universally administered address.) It should be in the following format:

4000cddddddd ss

Where 4000 is the fixed part of the address
c must not be greater than X′7′
d can be any value from X′0′ to X′F′
ss is the SAP address and defaults to X′04′

Note the following differences in the use of this Token-Ring address:

- When the 3174 is acting as a local or remote Token-Ring Gateway, this address is used as the destination for the DSPUs on the token-ring.
- When the 3174 is acting as an X.25 Token-Ring Gateway, this address is no longer the destination for the DSPUs on the token-ring. The 3174 gateway now performs as a bridge between the Token-Ring DSPUs and the X.25 hosts. Therefore, the destination for the DSPUs on the Token-Ring is the ring address assigned to the X.25 hosts via question 943.

If you are customizing the 3174 as a multiple gateway, then the LAA address is the same; only the SAPs are different.

Question 942: Token-Ring Devices Address Assignment

Question 942 allows you to relate the address of a Token-Ring device to a short ID (SID). When the 3174 gateway receives a call for a device on the token-ring, it uses the destination SID contained in the Call Request packet CID field to map to the Token-Ring address of the device.

For Open Connections from Token-Ring devices, you need not enter their addresses in this panel.

```
 ________942: T-R  Devices Address Assignment _________
                                                               X.25
                                                Entry 001 of 256
  SID     Ring Address    SAP  F  W       SID   Ring Address     SAP  F  W

  00     xxxx xxxx xxxx    xx  2  2       01    xxxx xxxx xxxx    xx  2  2
  02     xxxx xxxx xxxx    xx  2  2       03    xxxx xxxx xxxx    xx  2  2
  04     xxxx xxxx xxxx    xx  2  2       05    xxxx xxxx xxxx    xx  2  2
  06     xxxx xxxx xxxx    xx  2  2       07    xxxx xxxx xxxx    xx  2  2
  08     xxxx xxxx xxxx    xx  2  2       09    xxxx xxxx xxxx    xx  2  2
  0A     xxxx xxxx xxxx    xx  2  2       0B    xxxx xxxx xxxx    xx  2  2
  0C     xxxx xxxx xxxx    xx  2  2       0D    xxxx xxxx xxxx    xx  2  2
  0E     xxxx xxxx xxxx    xx  2  2       0F    xxxx xxxx xxxx    xx  2  2
  10     xxxx xxxx xxxx    xx  2  2       11    xxxx xxxx xxxx    xx  2  2
  12     xxxx xxxx xxxx    xx  2  2       13    xxxx xxxx xxxx    xx  2  2
  14     xxxx xxxx xxxx    xx  2  2       15    xxxx xxxx xxxx    xx  2  2
  16     xxxx xxxx xxxx    xx  2  2       17    xxxx xxxx xxxx    xx  2  2
  18     xxxx xxxx xxxx    xx  2  2       19    xxxx xxxx xxxx    xx  2  2
  1A     xxxx xxxx xxxx    xx  2  2       1B    xxxx xxxx xxxx    xx  2  2
  1C     xxxx xxxx xxxx    xx  2  2       1D    xxxx xxxx xxxx    xx  2  2



PF: 3=Quit  4=Default   7=Back   8=Fwd   9=RtnH   (10=PageBack) (11=PageFwd)
```

Figure 77. Token-Ring Devices Address Assignment Panel

- **SID**

  The SID (short ID) field is displayed automatically and cannot be modified. The SID values range from 00 to FF.

  Entries need not be filled in sequence; you may select only the SIDs you wish to use when assigning token-ring devices.

- **Ring Address**

  Your response is the 12-character hexadecimal address of the token-ring device. It can be either a locally administered address or a universal address.

  The format of a locally administered address is:

  4000cddddddd

  Where 4000 is the fixed part of the address
  c must not be greater than X'7'
  d can be any value from X'0' to X'F'

  The format of a universal address is:

  mmmmmmuuuuuu

  Where mmmmmm is the manufacturer ID assigned by IEEE (10005A for IBM)
  uuuuuu is the unique portion for each adapter card

- **SAP**

  Your response is the two-character hexadecimal service access point of the Token-Ring device. It must be a multiple of 4 in the range of X′04′ to X′EC′.

  Some attaching products, including a 3174 that is configured for Single Link Multi-Host support, may appear as multiple SNA PUs. Each of this PU will have a common Token-Ring address (since there is only one token-ring adapter) but will be uniquely identified by its SAP.

- **F**

  The F field allows you to specify the maximum size I-frame, including additional bytes for the SNA header, on the token-ring. The valid responses are:

  - 0=265 bytes
  - 1=521 bytes
  - 2=1033 bytes (default response)

  See “Question 941: LAN Transmission Definition” on page 94 for further information.

- **W**

  The W field allows you to specify the maximum out (transmit window size); that is, the number of transmits before waiting to receive an acknowledgement.

  The valid response ranges from 1 to 7. See “Question 941: LAN Transmission Definition” on page 94 for further information. The default response is 2.

Question 943: X.25 Devices Address Assignment

Question 943 allows you to assign a locally administered token-ring address to each X.25 device to be contacted by the 3174 gateway and map each address to a short ID. You can also specify the parameters to be used to establish the connection to the device.

Each X.25 device addressable by the 3174 gateway has a separate entry in this panel. An X.25 device may be represented more than once to allow a choice of connection parameters.

Entries need not be filled in sequence; you may select only the SIDs you wish to use when assigning X.25 devices.

```
          ______ 943: X.25 Devices Address Assignment ________
                                                                    X.25
                                                       Entry 001 of 256
   Dest  X.25                Host    DTE Number          RC  RD  Inac
   SID   Ring Address        ID                                  Time

   00    xxxx xxxx xxxx       __     _______________      0   2    2
   01    xxxx xxxx xxxx       __     _______________      0   2    2
   02    xxxx xxxx xxxx       __     _______________      0   2    2
   03    xxxx xxxx xxxx       __     _______________      0   2    2
   04    xxxx xxxx xxxx       __     _______________      0   2    2
   05    xxxx xxxx xxxx       __     _______________      0   2    2
   06    xxxx xxxx xxxx       __     _______________      0   2    2
   07    xxxx xxxx xxxx       __     _______________      0   2    2
   08    xxxx xxxx xxxx       __     _______________      0   2    2
   09    xxxx xxxx xxxx       __     _______________      0   2    2
   0A    xxxx xxxx xxxx       __     _______________      0   2    2
   0B    xxxx xxxx xxxx       __     _______________      0   2    2
   0C    xxxx xxxx xxxx       __     _______________      0   2    2
   0D    xxxx xxxx xxxx       __     _______________      0   2    2




PF: 3=Quit  4=Default   7=Back   8=Fwd   9=RtnH   (10=PageBack) (11=PageFwd)
```

Figure 78. X.25 Devices Address Assignment

- **Dest SID**

  The Dest SID (destination short ID) field is displayed automatically and cannot be modified. The SID values range from 00 to FF.

- **X.25 Ring Address**

  Your response is the 12-character hexadecimal Token-Ring address to be associated with the X.25 device. When establishing a connection to the X.25 device, a device on this Token-Ring will use the address you specify here as the destination (and not the Token-Ring address of the 3174 gateway you are customizing).

- **Host ID**

  The host ID is a two-digit response as follows:

  – The first digit is a number that indicates the link.

  – The second is a letter that indicates the host.

  For example, host ID 1A is the primary host on the primary link. Valid host IDs are:

  – Primary link: 1A through 1H

  – Secondary link (CCA 1): 2A through 2D

  – Secondary link (CCA 2): 3A through 3D

  You should use the host ID of the X.25 host you are customizing. The virtual circuit characteristics customized for this host will be used when the associated token-ring address is the destination[2].

- **DTE Number**

  The response is a maximum of 15 digits.

[2] With this RPQ, the ″host″ is only a X.25 device which may in fact be a PU 2.0 or another 3174 gateway.

This field will override the response you may have given in question 423: Host DTE Address, thus allowing you to call other X.25 hosts, using the virtual circuit characteristics for the given host ID.

- **Retry Count (RC)**

  The Retry Count allows you to specify how many times the 3174 gateway will try to establish the connection.

  Valid responses are:

  0 =No retry (default response)
  1 =1 retry
  2 =2 retries
  3 =5 retries
  4 =10 retries
  5-8 =Reserved (not used)
  9 =Infinite retries (only active with Default Connections)

  For a QLLC secondary gateway, you should select 0 (no retry) because the host and the Token-Ring devices will perform the retry themselves.

  For a QLLC primary gateway, your selected type of connection should be considered:

  – Default Connections

    If you select 9 (infinite retries), the link establishment is initiated by the 3174.

    If you select 0 (no retry), the link establishment is initiated by the device(s).

  – Demand Connections

    As the device shares the remaining pool of SVCs, you should select 0 (no retry).

  – Open Connections

    You should select 0 (no retry) as the connection is mainly user driven.

- **Retry Delay (RD)**

  The Retry Delay allows you to specify how long the 3174 gateway should wait between retry attempts.

  Valid responses are:

  0 =Reserved
  1 =1-2 minutes
  2 =2-3 minutes (default response)
  3 =5-6 minutes
  4 =10-11 minutes
  5 =20-21 minutes
  6 =30-31 minutes
  7 =60 minutes
  8-9 =Reserved (not used)

- **Inac Time**

  The Inac Time allows you to specify an inactivity timer value. When this timer expires without activity on the X.25 connection, the 3174 gateway will clear the SVC but will maintain the link to the Token-Ring device. In this condition, the 3174 gateway does not issue X.25 calls until a user attempts to use the token-ring device. This option prevents unnecessary X.25 expenses.

Valid responses are:

0 =None (default response)
1 =5-6 minutes
2 =15-16 minutes
3 =30-31 minutes
4 =60 minutes
5 =2 hours
6 =4 hours
7-9 =Reserved

The X.25 inactivity timeout value must be set to 0 for Default Connections since by definition they are permanent connections.

Question 944: X.25 Gateway Default/Open Connections

Using this panel, you can specify the Default Connections or the Open Connections that are allowed through the 3174 gateway.

With Default Connections, the devices at both ends of the connection are “tied together” by entering their respective SIDs on the the same entry line. In the first entry line shown in Figure 79 on page 216, the token-ring device with a SID 22 will establish a connection with the X.25 device with a SID 10 by default whenever it is active. Such a connection may be used for a token-ring attached 3174-13R to access an S/370 host via a 3174-11R gateway.

With Open Connections, only the device at one end of the connection is specified; that is, its SID is entered on an entry line in the appropriate column. The other end is left “open” by specifying a SID XX. In the second entry line shown in Figure 79 on page 216, any token-ring device is allowed to establish a connection with the X.25 device with a SID 10 when desired (that is, a connection on demand). Such a connection may be used for a token-ring attached PS/2 to access an S/370 host via a 3174-11R gateway. Like a “wildcard,” the SID XX allows any token-ring attached device that specifies the token-ring address corresponding to SID 10 as the destination to establish a connection with the SID 10 device.

```
        ________944: X.25 Gateway Default / Open Connections_____
                                                        Entry 001 of 250
Token Ring         X.25               X.25 Gateway      X.25 PVC
Devices SID        Devices SID        Protocol          LCID

22                 10                 __                __
XX                 10                 __                __
__                 __                 __                __
__                 __                 __                __
__                 __                 __                __
__                 __                 __                __
__                 __                 __                __
__                 __                 __                __
__                 __                 __                __
__                 __                 __                __
__                 __                 __                __
__                 __                 __                __
__                 __                 __                __
__                 __                 __                __



 PF: 3=Quit  4=Default   7=Back   8=Fwd   9=RtnH   (10=PageBack) (11=PageFwd)
```

Figure 79. X.25 Gateway Default/Open Connections Panel

- **Token-Ring Devices SID**

  The response is the SID you have specified for a token-ring device in question 942 that will use either a Default Connection or an Open Connection to communicate with an X.25 device.

  Refer to Table 12 on page 217 for further description.

- **X.25 Devices SID**

  The response is the SID you have specified for an X.25 device in question 943 that will use either a Default Connection or an Open Connection to communicate with a token-ring device.

  Refer to Table 12 on page 217 for further description.

- **X.25 Gateway Protocol**

  The valid responses are:

  04 If the target X.25 device must be accessed with the 3174 gateway acting as the QLLC secondary station.

  08 If the target X.25 device must be accessed with the 3174 gateway acting as the QLLC primary station.

- **X.25 PVC LCID**

  Response:**0000-4095**

  This decimal value is the channel identifier for the PVC circuit to be used for Default Connection between the T-R and the X.25 devices specified for this 944 panel entry.

Table 12. Default/Open Connection			
T-R Devices SID	**X.25 Devices SID**	**X.25 Gateway Protocol**	**Description**
′bb′	′aa′	′04′ or ′08′	Default Connection between token-ring device ′bb′ defined in question 942 and X.25 device ′aa′ defined in question 943. If the Default Connection must be done trough a PVC, the LCID of this PVC must be specified.
′XX′	′aa′	Not Required	**1** Any token-ring device is allowed to connect with an X.25 device ′aa′ defined in question 943 with SID ′aa′. • For QLLC secondary, any token-ring device, whether or not it is defined in question 942, can call a specific X.25 host ′aa′ defined in question 943. For example, any campus token-ring device can call a central X.25 host. • For QLLC primary, any token-ring host, whether or not it is defined in question 942, can call a X.25 device ′aa′ (such as a remote printer) defined in question 943. Not supported for connections through PVCs.
′bb′	′XX′	Not Required	**2** Any X.25 device is allowed to connect with Token-Ring device ′bb′ defined in question 942. This is specified so that you can accept calls from any unrecognized X.25 origin SID (not defined in question 943) or from an X.25 origin SID with a value of ′XX′ in the Call User Data field of the Call Request packet. In this case, the host address characteristics will be used. • For QLLC secondary, any X.25 host, whether or not it is defined in question 943, can call a specific Token-Ring device ′bb′ defined in question 942. • For QLLC primary, any X.25 device, whether or not it is defined in question 943, can call a specific Token-Ring host ′bb′ defined in question 942 **3** Not supported for connections through PVCs.

3 Only one connection is allowed by Token-Ring protocols between a specific pair of token-ring addresses (including SAPs). In order to allow a ring-attached host (for example, via a 3174 channel or SDLC gateway) to support multiple simultaneous connections with X.25 terminals that have not been explicitly customized in question 943, a unique ring address is assigned for each simultaneous connection to the specified host ring address. These unique addresses start at the value specified by question 949.

For each new connection, the lowest unused address for that host is chosen and the source SAP value is the value of the gateway protocol (04 or 08).

If eight simultaneous connections are the desired maximum for the 3174 channel or SDLC gateway, it should be customized to recognize the first eight addresses indicated by question 949.

1 By specifying ′XX′ for a token-ring device SID, you do not have to uniquely specify every token-ring device in question 942.

2 By specifying ′XX′ for an X.25 device SID, you do not have to uniquely specify every X.25 device in question 943.

For each XX entry, the X.25 Gateway Protocol field is not required:

- For a connection requested from a token-ring device the frame includes the correct destination SAP (DSAP), either 04 or 08. A DSAP 04 will select the QLLC secondary gateway function and a DSAP 08 will select the QLLC primary gateway function in the 3174. Any other values will be rejected.
- For a connection requested from an X.25 device, the Call Packet includes the correct QLLC ID, either F4 or F8. A QLLC ID 04 will select the QLLC secondary gateway function and a QLLC ID 08 will select the QLLC primary gateway function in the 3174. Any other values will be rejected.

Question 945: X.25 Gateway Bridge Information

When the X.25 Token-Ring Gateway RPQ is customized, the 3174 forms a bridge that attaches one X.25 segment to a Token-Ring LAN segment. The token-ring devices see the X.25 devices as if they were on a bridged ring.

Figure 80 shows the bridge and the 3174-X.25 segment within the 3174 gateway, the Token-Ring and X.25 networks and devices, and their associated parameters.

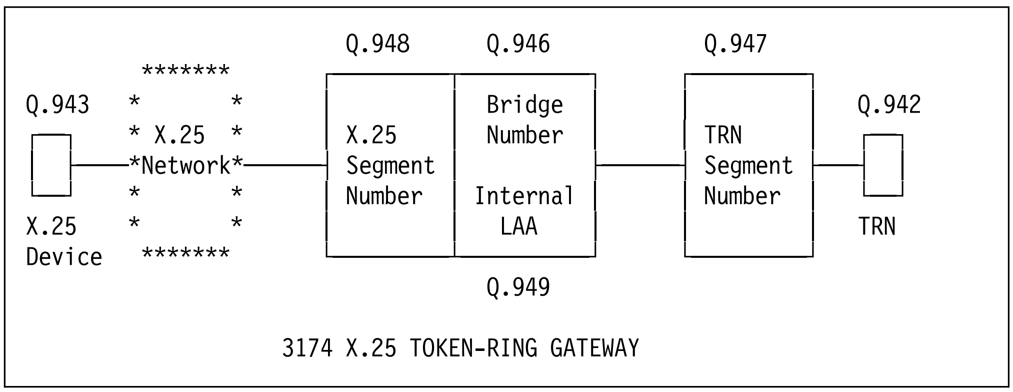


Figure 80. X.25 Gateway Bridge Parameters

When the 3174-Peer Bridge function is also customized, the bridge is used by both the X.25 Token-Ring Gateway RPQ and the 3174-Peer; the Peer and X.25 devices share the same segment. So, the bridge profile which is entered during two different phases of the customization is checked according to the following rules:

- Answers to questions 670 and 946 (Bridge number) must be equal
- Answers to questions 671 and 947 (Token-Ring Segment number) must be equal
- Answers to question 672 (3174-Peer Segment number) and questions 948 (3174-X.25 Segment number) must be equal

See Chapter 19, “Peer Communication” on page 557 for more information on 3174 Peer Communication feature.

Note:

The Peer devices which need to access the X.25 Gateway must use a ring address in the range defined through the question 660. That means that this address must not be overriden by the package used in the Peer device.

When the 3174-Peer Bridge function is customized in any other 3174 token-ring device (not in the 3174 running X.25 Token-Ring Gateway RPQ), for example, the 3174-13R of Figure 83 on page 221, the X.25 Gateway Bridge Information responses (questions 94xs) entered in the 3174 X.25 Token-Ring Gateway and the 3174-Peer Bridge Profile responses (questions 67x) entered in 3174 Token-Ring Device during the customization is checked according to the following rules:

- answers to questions 670 and 946 (Bridge number) must not be equal
- answers to questions 671 and 947 (Token-Ring Segment number) may be equal or not equal and depends on the physical Token-Ring segments of the 3174s.
- answers to question 672 (3174-Peer Segment number) and questions 948 (3174-X.25 Segment number) must not be equal

See Chapter 19, "Peer Communication" on page 557 for more information on 3174 Peer Communication feature.

Figure 81 shows a 3174 X.25 Token-Ring Gateway with Peer Communication feature customized.

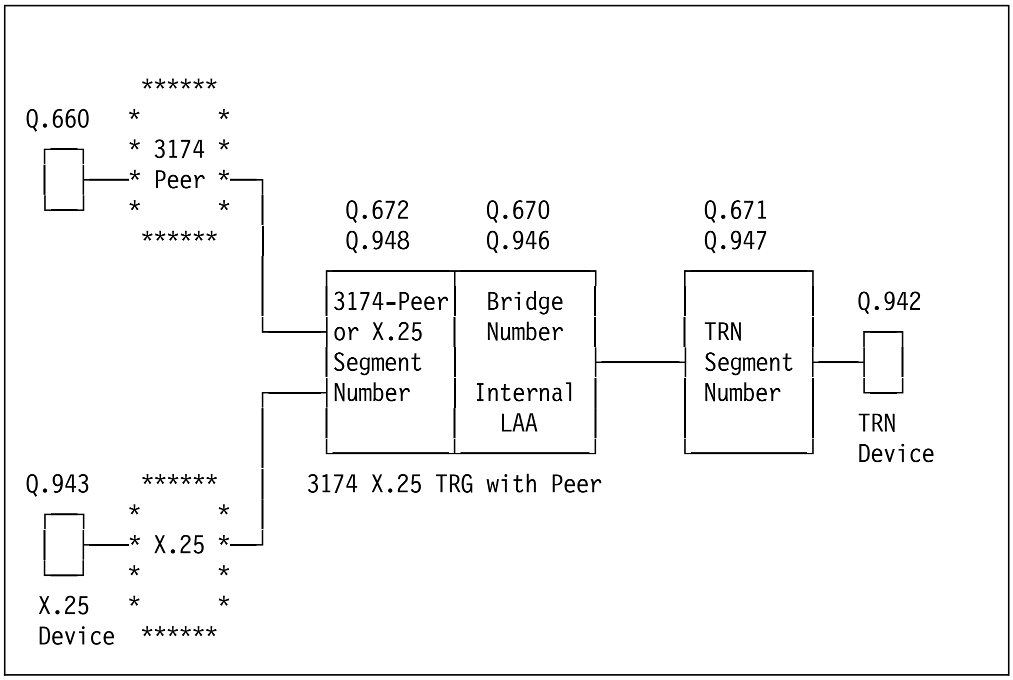


Figure 81. X.25 Gateway Bridge Parameters for 3174 X.25 TRG with Peer

The bridge function of the 3174 gateway is customized using the panel shown in Figure 82 on page 220.

```
          945: X.25 Gateway Bridge Information

946 - 1                  Bridge Number (0-F)

947 - xxx                Token-Ring Segment Number (001-FFF)

948 - xxx                3174-X.25 Segment Number (001-FFF)

949 - xxxx xx            T-R Address for Internal Use (000000 - 7FFFFE)
                         4000 xxxx xx --





PF: 3=Quit   4=Default   7=Back   8=Fwd   9=Rtnh
```

Figure 82. X.25 Gateway Bridge Information Panel

Question 946: Bridge Number

The response is the number you assigned to the internal bridge within the 3174 gateway. Valid bridge numbers are 0 through F, with a default value 1.

If the 3174-Peer bridge function is requested (question 651=Y), the answer must be equal to question 670.

Question 947: Token-Ring Segment Number

The response is the number you assigned to the real Token-Ring to which the 3174 gateway and other devices are attached. Valid segment numbers are 000 through FFF, with no default response. You should ask your network administrator for this number.

If the 3174-Peer bridge function is requested (question 651=Y), the answer must be equal to question 671.

Question 948: 3174-X.25 Segment Number

The response is the number you assigned to the internal ring within the 3174 gateway. Valid segment numbers are 000 through FFF, with no default response. You should ask your network administrator for this number.

If the 3174-Peer bridge function is requested (question 651=Y), the answer must be equal to question 672.

Question 949: T-R Address for Internal Use

The response is a six-digit number that will be the starting address of a range of 512 consecutive locally administered addresses for internal use. These addresses should be within the range X′000000′ through X′7FFFFE′. You should ask your network administrator for 512 consecutive LAAs starting from your response to question 949.

Example, if your response is 3174 02 , the range of addresses reserved for the internal use of the gateway will be 4000 3174 0200 to 4000 3174 03FF.

These addresses must be exclusively reserved for the gateway RPQ and cannot be used by any other ring device accessing the gateway. Also, the ring address defined in question 900 must be defined with a value out of this range.

6.14.3 Microcode Upgrade

The Microcode Upgrade facility is not fully supported by the RPQ. All the panels which are specific to the X.25 Gateway (panels 942, 943, 944 and 945) have to be reentered manually.

6.14.4 Central Site Change Management

The Central Site Change Management (CSCM) facility is supported by the X.25 Token-Ring Gateway RPQ.

6.15 Scenario 1: Open Connection (from Token-Ring Device Only)

X25SC1

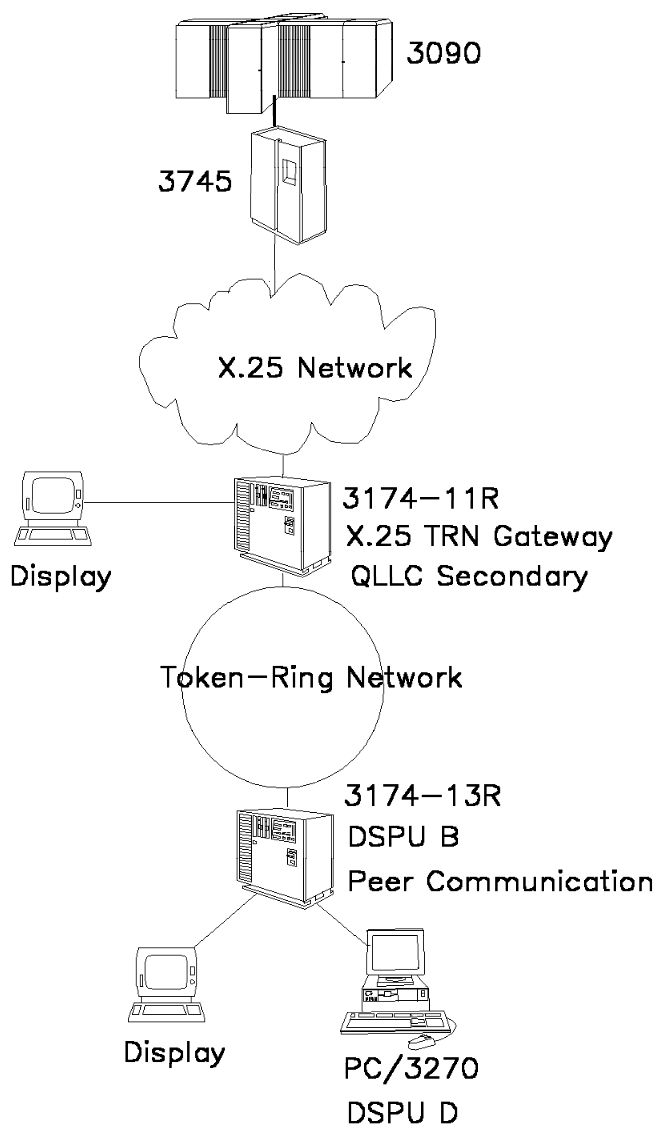


Figure 83. Scenario 1: Open Connection (from Token-Ring Device Only)

6.15.1 Description

Scenario 1 is an example of an Open Connection from a token-ring device. In this scenario, any device on the token-ring is allowed to access a specific X.25 device via a 3174-11R X.25 Token-Ring Gateway. The connection is initiated from the Token-Ring device only.

For Scenario 1:

- A PS/2 (D) is coax attached to a 3174-13R. The PS/2 will start Personal Communications/3270 emulation to access the host; that is, the PS/2 is the token-ring device that will initiate the Open Connection to the X.25 device.
- The 3174-13R has Configuration Support-C Release 1 with Peer Communication enabled. It does not have X.25 Token-Ring Gateway RPQ installed.

  For now, it has IMLed successfully and will bridge the PS/2 to the real Token-Ring (see Chapter 19, "Peer Communication" on page 557 for this bridging function) but does not take part in the X.25 networking.
- A 3174-11R has the X.25 Token-Ring Gateway RPQ installed and customized as an X.25 Token-Ring Gateway attached to the X.25 network.
- A 3745/NPSI is also attached to the X.25 network and acts as a front-end to the 3090 host.

  The 3745/NPSI is the X.25 device for the connection.

Notes:

1. The destination for the PS/2 for host access is the Token-Ring address assigned to the 3745 during 3174-11R gateway customization (question 943) and not the address of the 3174-11R gateway.
2. VTAM in the host sees the 3174-11R gateway and the PS/2 as switched major nodes.

Figure 84 on page 223 shows an overview of the definitions required for Scenario 1.

6.15.2 Definitions Overview

```
  ┌──────┐    VTAM Definitions
  │ Host │     3174-11R:                PC/3270:
  └──┬───┘      IDBLK=017                IDBLK=061
     │          IDNUM=31742              IDNUM=44992
  ┌──┴───┐
  │ 3745 │
  └──┬───┘
     │
    ┌┴────┐
    │Host │
    │DTE  │
    └┬────┘
     │201000300  3174-11R Customization
****************  Q100: 11R    Q101: 3
* X.25 Network *  Q150: 2
****************  Q215: 31742
     │201000600   Q900: 400031740002 04
    ┌┴────┐       Q942: No entries required for Open Connection
    │3174 │       Q943: SID=10 X25addr=400037450001 HostID=1A
    │DTE  │             DTE Number=201000300
    └┬────┘       Q944: TRNSID=XX   X25SID=10   X25GWProt=Not reqd
     │            Q401: 4
  ┌──┴─────┐      Q420: 00000000     Q421: 00000000
  │X.25 Seg│      Q423: 201000300    Q424: 201000600
  ├────────┤      Q452: ________     Q463: 1   Q464: 8   Q467: 4
  │ Bridge │
  └──┬─────┘      Q946: 1
     │3174-11R    Q947: BB3
┌────┴────────┐   Q948: 001
│ TRN  Network│   Q949: 222299
└──┬──────┬───┘
   │      │
┌──┴──────┐│
│3174-13R ││
└─────────┘│
           │
     ┌─────┴──┐   PC/3270 Configuration
     │ PC/3270│    Destination Address=400037450001
     └────────┘    Remote SAP=04
                   PUID=44992
                   Block ID=061

                  CONFIG.SYS
                   device=C:\WPCSP\DXML1MOD.SYS 400031744992
```

Figure 84. Scenario 1: Definitions Overview

6.15.3 3174-11R Gateway Customization

```
                _____________ Model / Attach _____________



    098 -

    099 - 11R GATEWAY WITH 8Q0743 RPQ

    100 - 11R

    101 - 3





Select Test; press ENTER ===>

PF:  3=Quit  8=Fwd  12=Test Menu
```

- Question 99 is a user comment.
- Question 100 is the 3174 model number.
- Question 101 is the host attachment type (3=X.25, M=Multihost).

  Only one upstream link will be used for Scenario 1.

```
                __________________ X.25 __________________

 104 - C1        108 - 0000000   110 - 0         116 - 2_ __

 121 - 01        123 - 0         125 - 00000000  126 - 00000000  127 - 0 0

 132 - 0 0 0 0   136 - 1 0 0 1   137 - 0 0 0 0   138 - 0

 141 - A         150 - 2         165 - 1         166 - A

 173 - 00000000  175 -           179 - 0 0 0

 213 - 1         215 - 31742     220 - 0         365 - 0

 370 - 0         372 - 0 0



Select Test; press ENTER ===>

PF:  3=Quit  7=Back  8=Fwd  12=Test Menu
```

- Question 150=2 means the 3174 will be an X.25 Token-Ring Gateway.
- Question 215 is the PUID of the 3174-11R gateway. It must match the PU IDNUM parameter in the switched major node definition for the 3174-11R gateway.

```
                ___________ Token-Ring Gateway ___________

 900 - 4000 3174 0002 04    905 - 0            908 - IBMLAN

 911 - 0










Select Test; press ENTER ===>

PF:  3=Quit  7=Back  8=Fwd  12=Test Menu
```

- Question 900 is where you enter the locally administered address of the 3174-11R gateway.

  This is *not* the destination address for PS/2 D.

```
                ____942: T-R Devices Address Assignment_____

  SID     Ring Address     SAP   F   W     SID     Ring Address     SAP   F   W

  00      XXXX XXXX XXXX   XX    2   2     01      XXXX XXXX XXXX   XX    2   2
  02      XXXX XXXX XXXX   XX    2   2     03      XXXX XXXX XXXX   XX    2   2
  04      XXXX XXXX XXXX   XX    2   2     05      XXXX XXXX XXXX   XX    2   2
  06      XXXX XXXX XXXX   XX    2   2     07      XXXX XXXX XXXX   XX    2   2
  08      XXXX XXXX XXXX   XX    2   2     09      XXXX XXXX XXXX   XX    2   2
  0A      XXXX XXXX XXXX   XX    2   2     0B      XXXX XXXX XXXX   XX    2   2
  0C      XXXX XXXX XXXX   XX    2   2     0D      XXXX XXXX XXXX   XX    2   2
  0E      XXXX XXXX XXXX   XX    2   2     0F      XXXX XXXX XXXX   XX    2   2
  10      XXXX XXXX XXXX   XX    2   2     11      XXXX XXXX XXXX   XX    2   2
  12      XXXX XXXX XXXX   XX    2   2     13      XXXX XXXX XXXX   XX    2   2
  14      XXXX XXXX XXXX   XX    2   2     15      XXXX XXXX XXXX   XX    2   2
  16      XXXX XXXX XXXX   XX    2   2     17      XXXX XXXX XXXX   XX    2   2
  18      XXXX XXXX XXXX   XX    2   2     19      XXXX XXXX XXXX   XX    2   2
  1A      XXXX XXXX XXXX   XX    2   2     1B      XXXX XXXX XXXX   XX    2   2
  1C      XXXX XXXX XXXX   XX    2   2     1D      XXXX XXXX XXXX   XX    2   2

Select Test; press ENTER ===>

PF:  3=Quit  7=Back  8=Fwd  12=Test Menu
```

Scenario 1 is an example of an Open Connection.

- Therefore, no entries are required for PS/2 D.
- In fact, since there are no entries for any Token-Ring device, any token-ring device can start an Open Connection if the "wildcard" SID XX for Token-Ring devices is mapped to an X.25 device in question 944. This flexibility allows you to add devices to the Token-Ring as desired.

```
                ____942: T-R Devices Address Assignment_____

  SID     Ring Address     SAP   F   W     SID     Ring Address     SAP   F   W

  F0      XXXX XXXX XXXX   XX    2   2     F1      XXXX XXXX XXXX   XX    2   2
  F2      XXXX XXXX XXXX   XX    2   2     F3      XXXX XXXX XXXX   XX    2   2
  F4      XXXX XXXX XXXX   XX    2   2     F5      XXXX XXXX XXXX   XX    2   2
  F6      XXXX XXXX XXXX   XX    2   2     F7      XXXX XXXX XXXX   XX    2   2
  F8      XXXX XXXX XXXX   XX    2   2     F9      XXXX XXXX XXXX   XX    2   2
  FA      XXXX XXXX XXXX   XX    2   2     FB      XXXX XXXX XXXX   XX    2   2
  FC      XXXX XXXX XXXX   XX    2   2     FD      XXXX XXXX XXXX   XX    2   2
  FE      XXXX XXXX XXXX   XX    2   2     FF      XXXX XXXX XXXX   XX    2   2

Select Test; press ENTER ===>

PF:  3=Quit  7=Back  8=Fwd  12=Test Menu
```

- Preceding screens are not shown.
- This screen shows that the highest SID entry number is FF (if needed).

```
                   ____943: X.25 Devices Address Assignment_____

  Dest    X.25              Host    DTE Number        RC    RD    Inac
  SID     Ring Address       ID                                   Time

   00     XXXX XXXX XXXX     __     _______________   0     2      2
   01     XXXX XXXX XXXX     __     _______________   0     2      2
   02     XXXX XXXX XXXX     __     _______________   0     2      2
   03     XXXX XXXX XXXX     __     _______________   0     2      2
                :
          (other entries deleted to save paper)
                :
   10     4000 3745 0001     1A     201000300______   0     2      2
   11     XXXX XXXX XXXX     __     _______________   0     2      2
   12     XXXX XXXX XXXX     __     _______________   0     2      2
                :
          (other entries deleted to save paper)
                :
   FF     XXXX XXXX XXXX     __     _______________   0     2      2

Select Test; press ENTER ===>

PF:  3=Quit  7=Back  8=Fwd  12=Test Menu
```

- Enter the locally administered address of the X.25 device (the 3745 in our scenario). While the 3745 is not actually on a ring, the 3174 gateway performs a bridge function to the 3745 as if it were on a ring. So we have assigned a unique LAA for the 3745.
- The host ID is 1A because we are accessing it through the primary link and it is the only host.
- Retry Count (RC) defaults to 0 (no retry). We have used this default as recommended for QLLC secondary access. This means that the response for Retry Delay (RD) has no meaning.
- The inactivity timer (Inac Time) defaults to 2. This means that after the connection is inactive for 15-16 minutes, the SVC will be cleared but the link between the 3174-11R gateway and PS/2 will be maintained.

```
_944: X.25 Gateway Default/Open Connections__

 Token Ring         X.25              X.25 Gateway
 Devices SID        Devices SID       Protocol

     XX                 10                __
     __                 __                __
     __                 __                __
     __                 __                __
     __                 __                __
     __                 __                __
     __                 __                __
     __                 __                __
     __                 __                __
     __                 __                __
     __                 __                __
     __                 __                __
     __                 __                __
     __                 __                __

Select Test; press ENTER ===>

PF:  3=Quit  7=Back  8=Fwd  12=Test Menu
```

- The first entry shows that any token-ring device (SID XX) will be allowed to connect to the X.25 device with SID 10.
- The X.25 Gateway Protocol field is not required when either the Token-Ring Devices SID or the X.25 Devices SID is an XX.
- PS/2 D will specify a destination address of 400037450001 and a remote SAP 04.
- The 3174-11R gateway maps the destination address to SID 10, the host ID and DTE number via question 943.
- The 3174-11R gateway uses the remote SAP 04 to select the QLLC secondary function within itself for the connection.

```
____945: X.25 Gateway Bridge Information_____

   946 - 1              Bridge Number (0-F)

   947 - BB3            Token-Ring Segment Number (001-FFF)

   948 - 001            3174-X.25 Segment Number (001-FFF)

   949 - 2222 99        T-R Address for Internal Use (000000-7FFFFE)
                        4000 XXXX XX --

Select Test; press ENTER ===>

PF:  3=Quit  7=Back  8=Fwd  12=Test Menu
```

- For a discussion of these parameters, see the appropriate description of individual questions in earlier sections.

```
___________ 332:  X.25 Options ___________

   400 - 00 1 0        401 - 4       402 - ____

   409 - 10100100      420 - 00000000               421 - 00000000

   423 - 201000300______             424 - 201000600______

   430 - 1             431 - 0       432 - 07       433 - 7

   434 - 1             435 - 07

   440 - A             441 - __      442 - ____

   450 - 0300          451 - 10      452 - ________ 453 - 10000000

   461 -               462 - ____    463 - 0001     464 - 0008

   465 - ____          466 - ____    467 - 0004

Select Test; press ENTER ===>

PF:  3=Quit  7=Back  12=Test Menu
```

- The Common SNA panel and other panels not shown are not significant to our scenario.

6.15.4 VTAM Definition for 3174-11R Gateway

```
***********************************************************************
*         VTAM SWITCHED MAJOR NODE FOR 3174-11R THRU X25NET           *
***********************************************************************
        VBUILD MAXGRP=5,               REQUIRED                         X
               MAXNO=12,               REQUIRED                         X
               TYPE=SWNET              REQUIRED
PU11R    PU    ADDR=C1,                COULD BE ANYTHING (NOT USED)     X
               IDBLK=017,              3174/3274 BURNED IN              X
               IDNUM=31742,            3174-11R  PUID                   X
               DISCNT=NO,                                               X
               MAXOUT=1,                                                X
               MODETAB=AMODETAB,                                        X
               MAXPATH=2,                                               X
               VPACING=0,                                               X
               PACING=0,                                                X
               PUTYPE=2,                                                X
               DLOGMOD=M2SDLCQ,                                         X
               USSTAB=US327X
LU11R2   LU    LOCADDR=2
LU11R3   LU    LOCADDR=3
         :
LU11R9   LU    LOCADDR=9
```

Note matching parameters in 3174-11R customization.

- IDBLK for a 3174 (or 3274) is always 017.
- IDNUM matches your response to question 215 (PUID).

6.15.5 VTAM Definition for PS/2 (PC/3270)

```
***********************************************************************
*         VTAM SWITCHED MAJOR NODE FOR PS/2 THRU X25NET               *
***********************************************************************
        VBUILD MAXGRP=5,               REQUIRED                         X
               MAXNO=12,               REQUIRED                         X
               TYPE=SWNET              REQUIRED
PUPS2    PU    ADDR=C1,                COULD BE ANYTHING (NOT USED)     X
               IDBLK=061,              PS/2 BLOCK ID                    X
               IDNUM=44992,            PS/2 PHYSICAL UNIT ID            X
               DISCNT=NO,                                               X
               MAXDATA=265,                                             X
               MAXOUT=7,                                                X
               MODETAB=AMODETAB,                                        X
               MAXPATH=2,                                               X
               VPACING=0,                                               X
               PACING=0,                                                X
               PUTYPE=2,                                                X
               DLOGMOD=M2SDLCQ,                                         X
               USSTAB=US327X
LUPS22   LU    LOCADDR=2
         :
LUPS29   LU    LOCADDR=9
```

Note matching parameters in PC/3270 Advanced Options configuration screen.

- IDBLK matches the Block ID.
- IDNUM matches the Physical Unit ID.

6.15.6 NCP/NPSI Definition for 3745

```
        OPTIONS NEWDEFN=(YES,ECHO,NOSUPP),USERGEN=(X25NPSI,FNMNDFGN)
        PCCU CUADDR=E1F,          SA20 WTCOS MVS/ESA VM ADDR          X
              :
        BUILD BFRS=(240),         NCP BUFFER SIZE                     X
              :
              VERSION=V5R4,       NDF VERSION INDICATOR               X
              X25.PREFIX=X,       ALL NAMES START WITH X              X
              X25.IDNUMH=2,       MUST MATCH WITH SWITCH MAJ.         X
              X25.SNAP=NO,        SNAP TRACE NOT INCLUDED             X
              X25.MCHCNT=1,       NUMBER OF PHYSICAL LINKS            X
              X25.MAXPIU=17K,     LESS THAN 255 TIMES BFRS            X
              X25.USGTIER=4       NPSI USAGE TIER
        SYSCNTRL OPTIONS=(BHSASSC,ENDCALL,MODE,RCNTRL,RCOND,RECMD,RIMMX
              ,NAKLIM,SESSION,SSPAUSE,XMTLMT,STORDSP,DLRID,RDEVQ)
        HOST INBFRS=10,           NCP BUFFERS  ALLOCATION             X
              :
**********************************************************************
* NPSI V3R3  CONNECTION TO X25NET                                    *
**********************************************************************
        X25.NET DM=YES,                                               X
              CPHINDX=3,                                              X
              NETTYPE=1,                                              X
              OUHINDX=3
        X25.VCCPT INDEX=1,                                            X
              MAXPKTL=128,                                            X
              VWINDOW=7,       PACKET LEVEL WINDOW 7                  X
              INSLOW=(100,50)
        X25.VCCPT INDEX=2,                                            X
              MAXPKTL=512,                                            X
              VWINDOW=7,       PACKET LEVEL WINDOW 7                  X
              INSLOW=(100,50)
        X25.VCCPT INDEX=3,     ON DCE/DTE LINKS TO IMPROVE THRUPUT    X
              MAXPKTL=1024,    MAX. PACKET SIZE = 4096                X
              VWINDOW=7,       MAX. WINDOW SIZE = 7                   X
              INSLOW=(100,50)
        X25.OUFT INDEX=1
        X25.OUFT INDEX=2,OPTFACL=20AA
***********************************************************************
*       MCH TO X25NET                                                 *
***********************************************************************
L05000  X25.MCH ADDRESS=000,   CONTROLLER LINE ADDRESS                X
              ANS=CONT,                                               X
              CUDO=(NULL),                                            X
              CONNECT=NO,                                             X
              CTCP=(00),                                              X
              DBIT=NO,                                                X
              DIRECT=YES,                                             X
              FRMLGTH=131,     128 + 3 (PACKET HEADER)                X
              FTPI=NO,                                                X
              GATE=GENERAL,                                           X
              IDBLKG=064,      LLC4:    IDBLK=064                     X
              IDBLKP=065,      PAD :    IDBLK=065                     X
              ITRACE=YES,                                             X
              LCGDEF=(0,20),   20 VC'S                                X
              LCNO=NOTUSED,                                           X
              LLCLIST=(LLC0,LLC2,LLC3,LLC4,LLC5),                     X
              LSPRI=NO,                                               X
              LUNAME=(L05000A1),                                      X
              MACB=(X05000X,X05000R),                                 X
              MBITCHN=NO,                                             X
              MWINDOW=7,       FRAME WINDOW                           X
```

Figure 85 (Part 1 of 2). Scenario 1: NCP/NPSI Definition for 3745

```
              NCPGRP=G05X1,                                          X
              NDRETRY=1,                                             X
              NPRETRY=7,                                             X
              OWNER=M20,                                             X
              PAD=INTEG,                                             X
              PKTMODL=8,                                             X
              PLPIGGYB=YES,                                          X
              PUNAME=P05000A,                                        X
              PWPROT=NO,                                             X
              SPEED=9600,                                            X
              SPNQLLC=NO,                                            X
              STATION=DTE,                                           X
              SUBADDR=NO,                                            X
              SVCINN=0,                                              X
              TDTIMER=1,                                             X
              TPTIMER=3,                                             X
              T1TIMER=1
        X25.LCG LCGN=0          LOGICAL CHANNEL GROUP 0
**********************************************************************
*       SVC'S 3 - 20 X25NET                                          *
**********************************************************************
        X25.VC LCN=(3,20),      18 SWITCHED VC'S                     X
              ANS=CONT,         SESSION CONTINUATION                 X
              CALL=INOUT,                                            X
              IDNUMT=3600,      IDNUM DEFINED EXPLICITELY            X
              NCPGRP=G05X3,                                          X
              OUFINDX=1,                                             X
              TYPE=S,           SWITCHED                             X
              VCCINDX=1
        X25.END
**********************************************************************
* GENERATED BY X25NPSI
G05X2    GROUP DIAL=NO,                                              X
              :
* GENERATED BY X25NPSI
G05X3    GROUP DIAL=YES,                                             X
              LEVEL2=BALNAVL2,                                       X
              LEVEL3=BALNAVL3,                                       X
              LEVEL5=NCP,                                            X
              LINEADD=NONE,                                          X
              COMPTAD=NO,                                            X
              COMPOWN=YES,                                           X
              COMPSWP=NO,                                            X
              COMPACB=NO,                                            X
              LINEAUT=YES,                                           X
              LNCTL=SDLC,                                            X
              NPACOLL=NO,                                            X
              TIMER=(BALNATER,,BALNATST,BALNATLS),                   X
              TYPE=NCP,                                              X
              USERID=(5688035,BALSBDT,NORECMS),                      X
              XIO=(BALNAVXL,BALNAVXS,BALNAVXI,BALNAVXK)
              :
* GENERATED BY X25NPSI
XL000004 LINE CALL=INOUT,      <======= Used by PS/2 D in the test   X
              UACB=XA000004
* GENERATED BY X25NPSI
XP000004 PU ANS=CONT,                                                X
              PUTYPE=(1,2)
* GENERATED BY X25NPSI
XL000003 LINE CALL=INOUT,      <======= Used by 3174-11R in test     X
              UACB=XA000003
* GENERATED BY X25NPSI
XP000003 PU ANS=CONT,                                                X
              PUTYPE=(1,2)
              :
        GENEND INIT=BALINIMD,                                        X
              UGLOBAL=BALNMGOP
```

Figure 85 (Part 2 of 2). Scenario 1: NCP/NPSI Definition for 3745

6.15.7 PS/2 PC/3270 Configuration

There are two options for Peer support available:

- Workstation Peer Communication Support Program
- IBMXLN Peer NDIS drivers

Using Workstation Peer Communication Support Program

CONFIG.SYS File

```
REM *     Workstation Peer Communication Support Program     *
DEVICE=C:\DOS50\HIMEM.SYS
DOS=HIGH
DEVICE=C:\DOS50\ANSI.SYS
DEVICE=C:\DOS50\SMARTDRV.SYS 512 128
DEVICE=C:\WPCSP\DXMA0MOD.SYS
DEVICE=C:\WPCSP\DXMA1MOD.SYS
DEVICE=C:\WPCSP\DXML1MOD.SYS 400031744992
DEVICE=C:\WPCSP\DXMT0MOD.SYS O=Y ES=1 EST=1
SHELL=C:\DOS\COMMAND.COM /P /E:2000
COUNTRY=001,437,C:\DOS50\COUNTRY.SYS
LASTDRIVE=E
BUFFERS=10
FILES=32
FCBS=16,8
```

Figure 86. Scenario 1: CONFIG.SYS File for PS/2 Using Peer Communication

Using IBMXLN.DOS

The IBMXLN.DOS driver is available with new 3270 Connection Cards or via Bulletin Board.

PROTOCOL.INI

```
'PROTMAN_MOD'
        DRIVERNAME = PROTMAN$
'DXMAIDXCFG'
        DXME0_NIF = DXME0.NIF
        DXMJ0MOD_NIF = DXMJ0MOD.NIF
        SMCDOSJP_NIF = SMCDOSJP.NIF
        SMCDOSJP2_NIF = SMCDOSJP.NIF
        SMCDOSAT_NIF = SMCDOSAT.NIF
        SMCDOSAT2_NIF = SMCDOSAT.NIF
        SMCDOSMC_NIF = SMCDOSMC.NIF
        SMCDOSMC2_NIF = SMCDOSMC.NIF
'DXME0_NIF'
        DRIVERNAME = DXME0$
        BINDINGS = IBMXLN_MOD
'IBMXLN_MOD'
        DRIVERNAME = IBMXLN$
        MAXTRANSMITS = 6
        NETADDRESS = "400031744992"
```

Figure 87. Scenario 1: PROTOCOL.INI File for PS/2 Using Peer Communication

CONFIG.SYS File

```
REM *------------------------------------------------*
REM * IBMXLN NDIS DEVICE DRIVER SUPPORT              *
REM *------------------------------------------------*
DEVICE=C:\WIN\HIMEM.SYS
DOS=HIGH
DEVICE=C:\DOS61\SETVER.EXE
DEVICE=C:\WIN\EMM386.EXE NOEMS
FILES=50
BUFFERS=30
LASTDRIVE=Z
DEVICE=C:\WIN\SMARTDRV.EXE /DOUBLE_BUFFER
STACKS=9,256
DEVICE=C:\LSP\PROTMAN.DOS /I C:\LSP
DEVICE=C:\IBLXLN\IBMXLN.DOS
DEVICE=C:\LSP\DXMAOMOD.SYS 001
DEVICE=C:\LSP\DXMEOMOD.SYS N ,10,0,0,0
DEVICE=C:\LSP\DXMTOMOD.SYS  E ES=2 EST=2 O=N
```

Figure 88. Scenario 1: CONFIG.SYS File for PS/2 Using Peer Communication

Attachment Types Screen

```
                               Attachment Types                    More: -+
--------------------------------------------------------------------------------
Enter the required information.

  Total number of sessions for:

  Distributed Function Terminal (DFT) . . . . . . . . .   [0]

  LAN via 802.2 protocol  . . . . . . . . . . . . . . .   [0]

  LAN via NETBIOS . . . . . . . . . . . . . . . . . . .   [0]

  3174 Peer Communication . . . . . . . . . . . . . . .   [2]

  Synchronous Data Link Control (SDLC)  . . . . . . . .   [0]

  Asynchronous Data Link Control (ASYNCH) . . . . . . .   [0]
    (for attachment to a Series/1 SNA gateway only)

  CCITT X.25 Network (X.25) . . . . . . . . . . . . . .   [0]



F1=Help  F3=Exit  F7=Backward  F8=Forward
```

Figure 89. Scenario 1: Attachment Types Screen

Advanced Options for 3174 Peer Communication Screen

```
                 Advanced Options for 3174 Peer Communication        More: -+
--------------------------------------------------------------------------------
Enter the required information.

  Total number of LAN sessions  . . . . . .    2

  Link name  . . . . . . . . . . . . . . .    lan1

  Destination address  . . . . . . . . . .   [400037450001]

  Number of sessions for this gateway   . .   [2]

  Physical Unit ID  . . . . . . . . . . . .   [44992]

  Adapter number  . . . . . . . . . . . . .   [0]

  Remote SAP/Local SAP  . . . . . . . . . .   [04]/[04]

  Block ID  . . . . . . . . . . . . . . . .   [061]

  PIU size  . . . . . . . . . . . . . . . .   [0256]


F1=Help  F3=Exit  F7=Backward  F8=Forward
```

Figure 90. Scenario 1: Advanced Options for 3174 Peer Communication Screen

6.15.8 Connection Initiation (from Token-Ring Device Only)

The connection to the host can only be initiated from the PS/2. The following sequence of events occur:

1. User starts PC/3270 emulation.
2. PS/2 generates a frame with:
   - X′04′ as SSAP, X′04′ as DSAP
   - X′400031744992′ as the source address
   - X′400037450001′ as the destination address.
3. 3174 gateway maps:
   - Source address to SID XX (no entry) via question 942
   - Destination address to SID 10, DTE Number 201000300 and host ID 1A via question 943
   - Origin TRN SID XX to destination X.25 SID 10 via question 944.
4. 3174 gateway generates a Call Request packet with:
   - Packet Type Identifier: 00001011
   - Calling Address: 201000600
   - Called Address: 201000300
   - Called User Data CID:

     Cx 01 0000 C5 F8 F1F0 E7E7 4040 (Cx=C3 or CB)

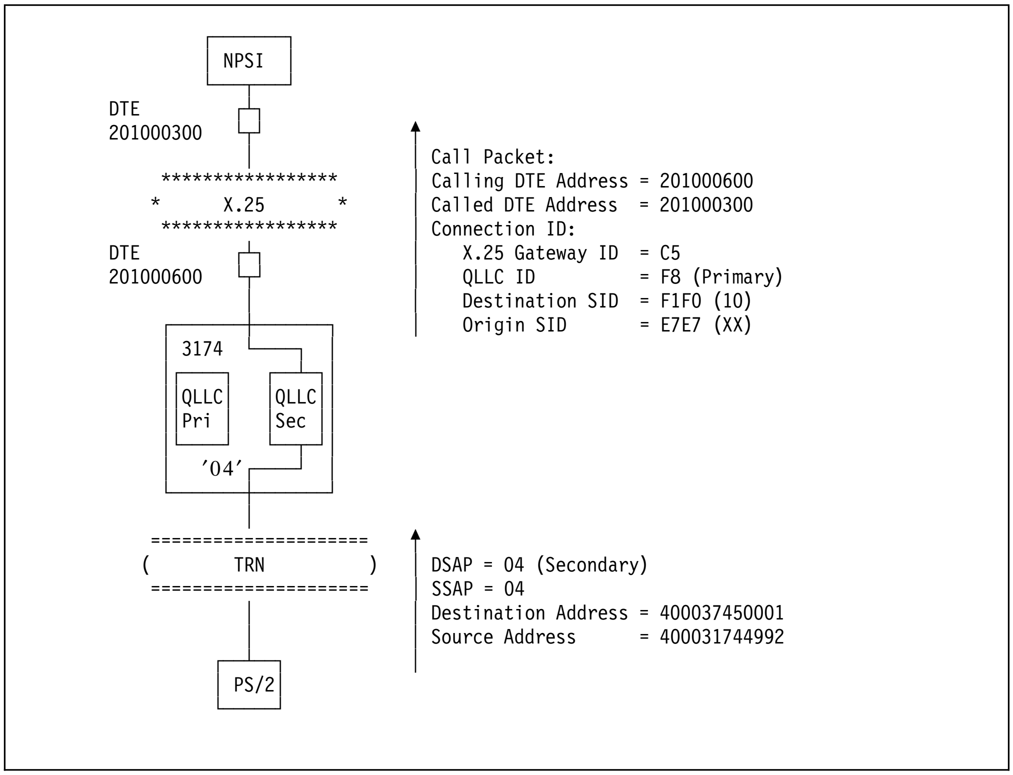


Figure 91. Scenario 1: Connection Initiation (from Token-Ring Device Only)

6.16 Scenario 2: Default Connection

X25SC2

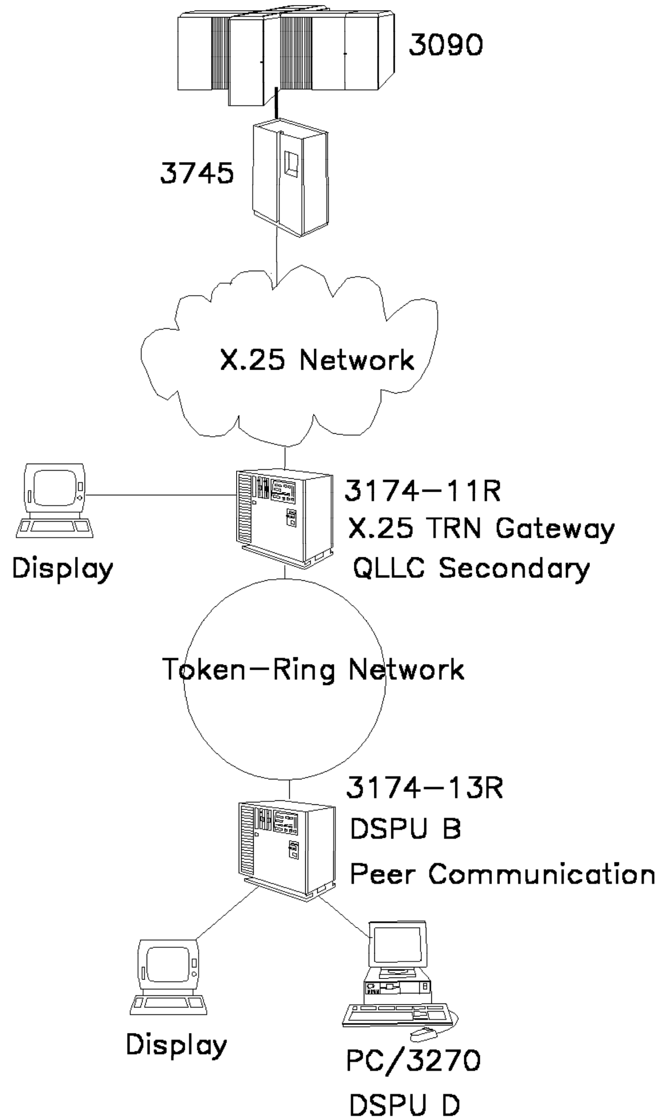


Figure 92. Scenario 2: Default Connection

6.16.1 Description

Scenario 2 is an example of a Default Connection. In this scenario, a specific device on the token ring will access a specific X.25 device via a 3174-11R X.25 Token-Ring Gateway. The connection can be initiated from either device.

Scenario 2 adds to Scenario 1 with the following highlighted:

- We will customize the 3174-13R from Scenario 1 as the token-ring device that will establish a connection to the X.25 device by default; that is, whenever it has IMLed successfully.

  Remember that the 3174-13R has Configuration Support-C Release 1 with Peer Communication enabled but does not have the X.25 Token-Ring Gateway RPQ installed.

After it has IMLed successfully, it will continue to bridge the PS/2 to the real token ring.

- The 3174-11R has the X.25 Token-Ring Gateway RPQ installed and customized as an X.25 Token-Ring Gateway attached to the X.25 network, for both the PS/2 (D) and the 3174-13R.
- The 3745/NPSI is attached to the X.25 network and acts as a front end to the 3090 host.

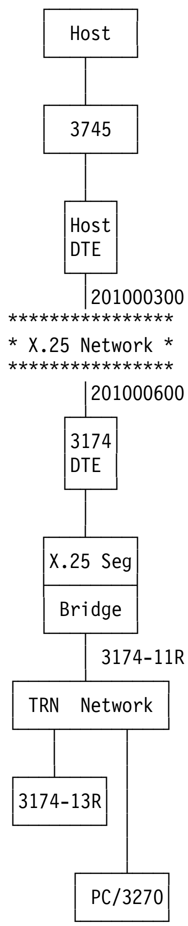
  The 3745/NPSI is the X.25 device for the connection.

Notes:

1. The destination for the 3174-13R for host access is the token-ring address assigned to the 3745 during 3174-11R gateway customization (question 943) and not the address of the 3174-11R gateway.
2. The 3174-13R SID (the token-ring device) is "tied" to the 3745 SID (the X.25 device) through an entry in question 944.
3. VTAM in the host sees the 3174-11R gateway, the PS/2 and the 3174-13R as switched major nodes.

Figure 93 on page 236 shows an overview of the definitions required for Scenario 2.

6.16.2 Definitions Overview




```
VTAM Definitions
 3174-11R:          PC/3270:           3174-13R:
  IDBLK=017          IDBLK=061          IDBLK=017
  IDNUM=31742        IDNUM=44992        IDNUM=31743

3174-11R Customization
 Q100: 11R    Q101: 3
 Q150: 2
 Q215: 31742
 Q900: 400031740002 04
 Q942: SID=22 TRNaddr=400031740003 SAP=04
 Q943: SID=10 X25addr=400037450001 HostID=1A
       DTE Number=201000300
 Q944: TRNSID=XX   X25SID=10   X25GWProt=Not reqd
       TRNSID=22   X25SID=10   X25GWProt=04
 Q401: 4
 Q420: 00000000     Q421: 00000000
 Q423: 201000300    Q424: 201000600
 Q452: ________     Q463: 1   Q464: 8   Q467: 4

 Q946: 1
 Q947: BB3
 Q948: 001
 Q949: 222299

3174-13R Customization
 Q100: 13R    Q101: 7
 Q106: 400031740003 04      Q107: 400037450001 04
 Q215: 31743

PC/3270 Configuration
 Destination Address=400037450001
 Remote SAP=04
 PUID=44992
 Block ID=061

CONFIG.SYS
 device=C:\WPCSP\DXML1MOD.SYS 400031744992
```

Figure 93. Scenario 2: Definitions Overview

6.16.3 3174-11R Gateway Customization

```
             _____________ Model / Attach _____________



    098 -

    099 - 11R GATEWAY WITH 8Q0743 RPQ

    100 - 11R

    101 - 3





 Select Test; press ENTER ===>

 PF:  3=Quit  8=Fwd  12=Test Menu
```

Responses remain the same as in Scenario 1.

- Question 99 is user comment.
- Question 100 is the 3174 model number.
- Question 101 is the host attachment type (3=X.25, M=Multihost).

  Only one upstream link will be used for Scenario 2 (as in Scenario 1).

```
             __________________ X.25 __________________

  104 - C1         108 - 0000000   110 - 0         116 - 2_ __

  121 - 01         123 - 0         125 - 00000000  126 - 00000000   127 - 0 0

  132 - 0 0 0 0    136 - 1 0 0 1   137 - 0 0 0 0   138 - 0

  141 - A          150 - 2         165 - 1         166 - A

  173 - 00000000   175 -           179 - 0 0 0

  213 - 1          215 - 31742     220 - 0         365 - 0

  370 - 0          372 - 0 0



 Select Test; press ENTER ===>

 PF:  3=Quit  7=Back  8=Fwd  12=Test Menu
```

Responses remain the same as in Scenario 1.

- Question 150=2 means the 3174 will be an X.25 Token-Ring Gateway.
- Question 215 is the PUID of the 3174-11R gateway. It must match the IDNUM parameter in the switched major node PU definition for the 3174-11R gateway.

```
             ___________ Token-Ring Gateway ___________

  900 - 4000 3174 0002 04    905 - 0            908 - IBMLAN

  911 - 0









 Select Test; press ENTER ===>

 PF:  3=Quit  7=Back  8=Fwd  12=Test Menu
```

Responses remain the same as in Scenario 1.

- Question 900 is where you enter the locally administered address of the 3174-11R gateway.

  This is *not* the destination address for PS/2 D.

```
                ____942: T-R Devices Address Assignment_____


  SID     Ring Address    SAP   F   W     SID     Ring Address    SAP   F   W

  00      XXXX XXXX XXXX   XX   2   2     01      XXXX XXXX XXXX   XX   2   2
  02      XXXX XXXX XXXX   XX   2   2     03      XXXX XXXX XXXX   XX   2   2
  04      XXXX XXXX XXXX   XX   2   2     05      XXXX XXXX XXXX   XX   2   2
  06      XXXX XXXX XXXX   XX   2   2     07      XXXX XXXX XXXX   XX   2   2
  08      XXXX XXXX XXXX   XX   2   2     09      XXXX XXXX XXXX   XX   2   2
  0A      XXXX XXXX XXXX   XX   2   2     0B      XXXX XXXX XXXX   XX   2   2
  0C      XXXX XXXX XXXX   XX   2   2     0D      XXXX XXXX XXXX   XX   2   2
                :
         (other entries deleted to save paper)
                :
  22      4000 3174 0003   04   2   2     23      XXXX XXXX XXXX   X
  24      XXXX XXXX XXXX   XX   2   2     25      XXXX XXXX XXXX   XX   2   2
  26      XXXX XXXX XXXX   XX   2   2     27      XXXX XXXX XXXX   XX   2   2
                :
         (other entries deleted to save paper)
                :
  FE      XXXX XXXX XXXX   XX   2   2     FF      XXXX XXXX XXXX   XX   2   2

Select Test; press ENTER ===>

PF:  3=Quit  7=Back  8=Fwd  12=Test Menu
```

Scenario 2 is an example of a Default Connection.

- An entry is required for the token-ring device 3174-13R.
- Since there are no entries for other token-ring devices, any other token-ring device can start an Open Connection if the "wildcard" SID XX for token-ring devices is mapped to an X.25 device in question 944. This flexibility allows you to add other devices to the token ring as desired.

```
                    ____943: X.25 Devices Address Assignment_____


  Dest     X.25              Host    DTE Number        RC     RD     Inac
  SID      Ring Address       ID                                     Time

   00      XXXX XXXX XXXX     __     _______________    0      2      2
   01      XXXX XXXX XXXX     __     _______________    0      2      2
   02      XXXX XXXX XXXX     __     _______________    0      2      2
   03      XXXX XXXX XXXX     __     _______________    0      2      2
                 :
           (other entries deleted to save paper)
                 :
   10      4000 3745 0001     1A     201000300______    0      2      2
   11      XXXX XXXX XXXX     __     _______________    0      2      2
   12      XXXX XXXX XXXX     __     _______________    0      2      2
                 :
           (other entries deleted to save paper)
                 :
   FF      XXXX XXXX XXXX     __     _______________    0      2      2

Select Test; press ENTER ===>

PF:  3=Quit  7=Back  8=Fwd  12=Test Menu
```

Responses remain the same as in Scenario 1.

- Enter the locally administered address of the X.25 device (the 3745 in our scenario). While the 3745 is not actually on a ring, the 3174 gateway performs a bridge function to the 3745 as if it were on a ring. So we have assigned a unique LAA for the 3745.
- The host ID is 1A because we are accessing it through the primary link and it is the only host.
- Retry Count (RC) defaults to 0 (no retry). We have used this default as recommended for QLLC secondary access. This means that the response for Retry Delay (RD) has no meaning.
- The inactivity timer (Inac Time) defaults to 2. This means that after the connection is inactive for 15-16 minutes, the SVC will be cleared but the link between the 3174-11R gateway and PS/2 will be maintained.

```
                _944: X.25 Gateway Default/Open Connections__


  Token Ring        X.25              X.25 Gateway
  Devices SID       Devices SID       Protocol

     XX                10               __
     22                10               04
     __                __               __
     __                __               __
     __                __               __
     __                __               __
     __                __               __
     __                __               __
     __                __               __
     __                __               __
     __                __               __
     __                __               __
     __                __               __
     __                __               __

Select Test; press ENTER ===>

PF:  3=Quit  7=Back  8=Fwd  12=Test Menu
```

The first entry is for Scenario 1.

- The first entry shows that any token-ring device (SID XX) will be allowed to connect to the X.25 device with SID 10. For further description, see 6.15, "Scenario 1: Open Connection (from Token-Ring Device Only)" on page 221.

The second entry is added for Scenario 2.

- The second entry shows that the token-ring device SID 22 (3174-13R) is "tied" to the X.25 SID 10 (3745/NPSI).
- The 3174-13R will be customized for a destination address 400037450001 SAP 04 in question 107.
- The 3174-11R gateway maps the destination address to a destination SID 10, host ID and DTE number via question 943.
- The 3174-11R gateway uses the DSAP 04 to select the QLLC secondary function within itself for the connection.
- The X.25 Gateway Protocol field is 04 because the 3174-11R gateway must use QLLC secondary protocol to communicate with the target X.25 device (3745/NPSI), which is the QLLC primary.

```
                ____945: X.25 Gateway Bridge Information_____


    946 - 1              Bridge Number (0-F)


    947 - BB3            Token-Ring Segment Number (001-FFF)


    948 - 001            3174-X.25 Segment Number (001-FFF)


    949 - 2222 99        T-R Address for Internal Use (000000-7FFFFE)
                         4000 XXXX XX --





Select Test; press ENTER ===>

PF:  3=Quit  7=Back  8=Fwd  12=Test Menu
```

Response remain the same as in Scenario 1.

- For a discussion of these parameters, see the appropriate description of individual questions in earlier sections.

```
            ___________ 332:  X.25 Options ___________


    400 - 00 1 0        401 - 4       402 - ____

    409 - 10100100      420 - 00000000               421 - 00000000

    423 - 201000300______             424 - 201000600______

    430 - 1             431 - 0       432 - 07       433 - 7

    434 - 1             435 - 07

    440 - A             441 - __      442 - ____

    450 - 0300          451 - 10      452 - ________ 453 - 10000000

    461 -               462 - ____    463 - 0001     464 - 0008

    465 - ____          466 - ____    467 - 0004

Select Test; press ENTER ===>

PF:  3=Quit  7=Back  12=Test Menu
```

- The Common SNA panel and other panels not shown are not significant to our scenario.

6.16.4 3174-13R Customization

```
            _____________ Model / Attach _____________




    098 -

    099 - 3174 THROUGH X25 GATEWAY

    100 - 13R

    101 - 7





Select Test; press ENTER ===>

PF:  3=Quit  8=Fwd  12=Test Menu
```

Customizing the 3174-13R to access the host through a 3174 X.25 Token-Ring Gateway is no different from customizing it to access the host through an ordinary 3174 Token-Ring Gateway, except for the destination address.

```
           ___________ Token-Ring Network ___________

 106 - 4000 3174 0003 04   107 - 4000 3745 0001 04   108 - 0000000

 110 - 1 0000              116 - 2_ __

 121 - 01      123 - 0     125 - 00000000            126 - 00000000   127 - 0 0

 132 - 0 0 0 0             136 - 1 0 0 1             137 - 0 0 0 0    138 - 0

 141 - A                   165 - 0                   166 - A          168 - 0

 173 - 00000000            175 -                     179 - 0 0 0

 213 - 1                   215 - 31743               220 - 0

 382 - 0521                383 - 2                   384 - 0


Select Test; press ENTER ===>

PF:  3=Quit  7=Back  8=Fwd  12=Test Menu
```

The destination address is specified in question 107.

- With a 3174 Token-Ring Gateway (either local or remote), question 107 specifies the 3174 gateway address as the destination.
- With a 3174 X.25 Token-Ring Gateway, question 107 specifies the X.25 device address as the destination.

  In Scenario 2, the destination is the 3745/NPSI address specified in question 943.

6.16.5 VTAM Definition For 3174-13R

```
**********************************************************************
*         VTAM SWITCHED MAJOR NODE FOR 3174-13R THRU X25NET          *
**********************************************************************
        VBUILD MAXGRP=5,              REQUIRED                        X
               MAXNO=12,              REQUIRED                        X
               TYPE=SWNET             REQUIRED
PU13R    PU    ADDR=C1,               COULD BE ANYTHING (NOT USED)    X
               IDBLK=017,             3174/3274 BURNED IN             X
               IDNUM=31743,           3174-13R  PUID                  X
               DISCNT=NO,                                             X
               MAXOUT=1,                                              X
               MODETAB=AMODETAB,                                      X
               MAXPATH=2,                                             X
               VPACING=0,                                             X
               PACING=0,                                              X
               PUTYPE=2,                                              X
               DLOGMOD=M2SDLCQ,                                       X
               USSTAB=US327X
LU13R2   LU    LOCADDR=2
LU13R3   LU    LOCADDR=3
         :
LU13R9   LU    LOCADDR=9
```

Figure 94. Scenario 2: VTAM Definition for 3174-13R

Note matching parameters in 3174-13R customization.

- IDBLK for a 3174 (or 3274) is always 017.
- IDNUM matches your response to question 215 (PUID).

6.16.6 Other Definitions

The following remain the same as in Scenario 1:

- VTAM definition for the 3174-11R gateway
- VTAM definition for the PS/2 (PC/3270)
- NCP/NPSI definition for the 3745
- PS/2 CONFIG.SYS file and PC/3270 configuration

6.16.7 Connection Initiation from Token-Ring Device

1. User IMLs 3174-13R.
2. 3174-13R generates a frame with:
   - X′04′ as SSAP, X′04′ as DSAP
   - X′400031740003′ as the source address
   - X′400037450001′ as the destination address
3. 3174 gateway maps:

- Source address to SID 22 via question 942
- Destination address to SID 10, DTE Number 201000300 and Host ID 1A via question 943
- Origin TRN SID 22 to destination X.25 SID 10 via question 944

4. 3174 gateway generates a Call Request packet with:
   - Packet Type Identifier: 00001011
   - Calling Address: 201000600
   - Called Address: 201000300
   - Called User Data CID:

     Cx 01 0000 C5 F8 F1F0 F2F2 4040 (Cx=C3 or CB)

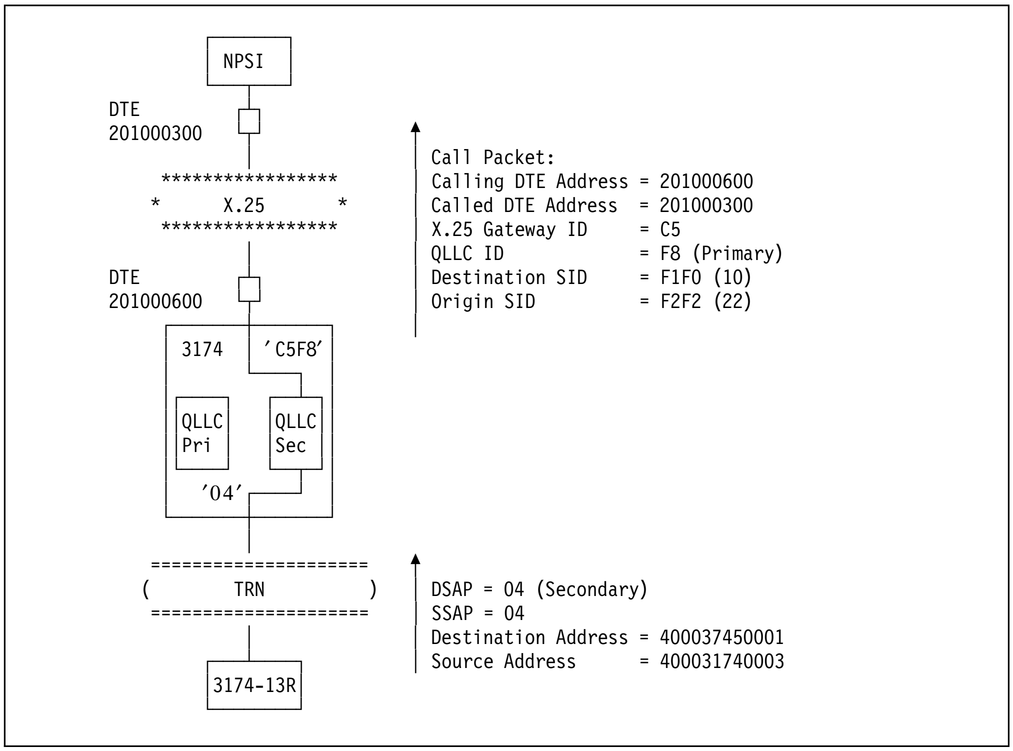


Figure 95. Scenario 2: Connection Initiation from QLLC Secondary Gateway

6.16.8 Connection Initiation from X.25 Device

1. NPSI generates a Call Request packet with:
   - Packet Type Identifier: 00001011
   - Calling Address: 201000300
   - Called Address: 201000600
   - Called User Data CID:

     Cx 01 0000 C5 F4 F2F2 F1F0 4040 (Cx=C3 or CB)

2. 3174 gateway maps:
   - Origin X.25 SID 10 to destination TRN SID 22 via question 944
   - Origin SID 10 to source address 400037450001 via question 943

- Destination SID 22 to destination address 400031740003 via question 942.

3. 3174 gateway generates a frame with:
   - X'04' as SSAP
   - X'04' as DSAP
   - X'400037450001' as the source address
   - X'400031740003' as the destination address

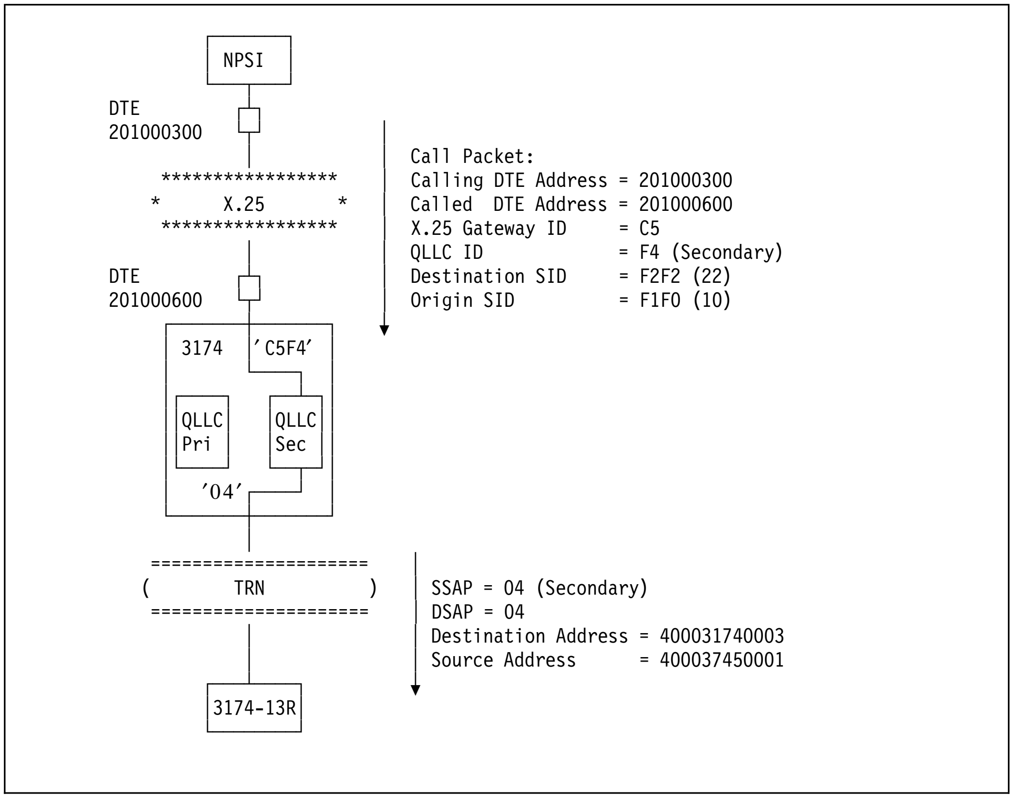


Figure 96. Scenario 2: Connection Initiation from NPSI

6.17 Scenario 3: Open Connection (from X.25 Device Only)

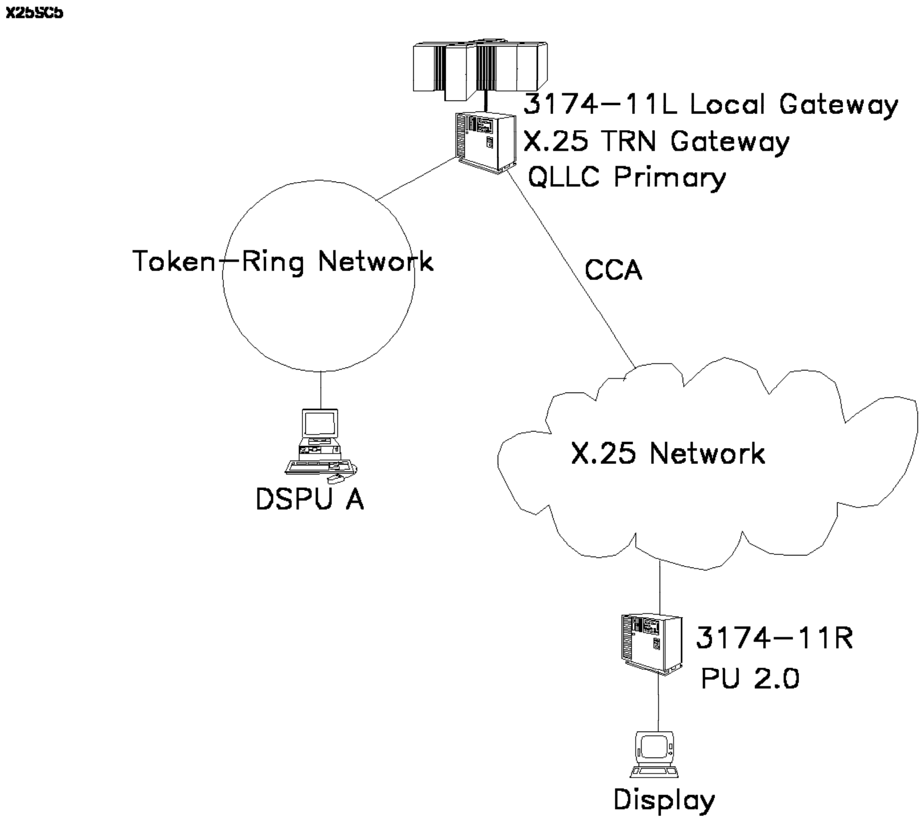


Figure 97. Scenario 3: Open Connection (From X.25 Device Only)

6.17.1 Description

Scenario 3 is an example of an Open Connection from an X.25 device. In this scenario, any device on the X.25 network is allowed to access a specific Token-Ring host via a 3174-11L X.25 Token-Ring Gateway. The connection is initiated from the X.25 device only.

For Scenario 3:

- A 3174-11R is connected to the X.25 network as the X.25 device that will initiate the Open Connection. For now, it does not have the X.25 Token-Ring Gateway RPQ installed.

  Note that it is a PU 2.0 device for its attached terminals; that is, the terminal LUs are using the 3174 local PU function.

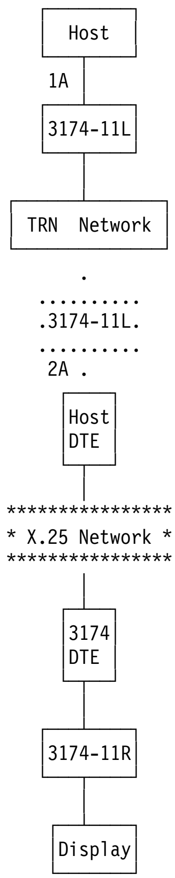
- A 3174-11L is attached to the 3090 host channel via its primary adapter and to a token ring via its token-ring adapter.
- The 3174-11L also has the X.25 Token-Ring Gateway RPQ installed and customized as an X.25 Token-Ring Gateway attached to the X.25 network via a Concurrent Communication Adapter. Like a 3745/NPSI, it acts as a front end to the 3090 host and is the token-ring device for this connection.

Notes:

1. The 3174-11R is customized as for normal access to the X.25 network.
2. VTAM in the host sees the 3174-11L gateway and the 3174-11R device as local SNA major nodes.
3. The 3174-11L gateway sees the 3174-11R as a DSPU, as if it were attached to its token ring.

Figure 98 shows an overview of the definitions required for Scenario 3.

6.17.2 Definitions Overview




```
VTAM Definitions
 3174-11L:                  3174-11R:
  PU CUADDR=E40...           PU CUADDR=E41...
  LU LOCADDR=02...           LU LOCADRR=02...

3174-11L Customization
 Q100: 11L
 Q101: M
1A Host
 Q104: 40     Q105: 46
 Q150: 1
 Q900: 400031740001 08
 Q940: 40=400031740001 08
       41=400070000000 08
       42=400070000001 08
2A Host
 Q104: C1
 Q150: 2
 Q900: 400031740001 04
 Q942: SID=10 TRNaddr=400031740001 SAP=08
 Q943: No entries required for Open Connection
 Q944: TRNSID=10   X25SID=XX   X25GWProt=Not reqd
 Q946: 1
 Q947: BB3
 Q948: 001
 Q949: 700000
 Q420: 00000000           Q421: 00000000
 Q423: 201000600          Q424: 201000300
 Q452: ________

3174-11R Customization
 Q100: 11R
 Q101: 3
 Q104: C1
 Q150: 0            Q215: 00000
 Q401: 4
 Q420: 00000000     Q421: 00000100
 Q423: 201000300    Q424: 201000600
 Q452: E810XX       Q463: 1   Q464: 8
```

Figure 98. Scenario 3: Definitions Overview

6.17.3 3174-11L Gateway Customization

```
              ____________ Model / Attach ____________



    098 -

    099 - 11L RPQ 8Q0743 GATEWAY THROUGH CCA

    100 - 11L

    101 - M






Select Test; press ENTER ===>

PF:  3=Quit  8=Fwd  12=Test Menu
```

In Scenario 3, we need to customize the 3174-11L for multi-host connectivity.

```
             ________ Multi-Host Definition _________

Select a Host ID and press ENTER

Host  Adapter    Host      Hardware    Include      Host Descriptor
 ID    Type     Attach      Group      in IML
 1A     1         5          00           1      RPQ_CHANNEL________
 2A     1         3          51           1      RPQ_X25____________
 3A     _         _          __           _      ___________________
 __     _         _          __           _      ___________________
 __     _         _          __           _      ___________________
 __     _         _          __           _      ___________________
 __     _         _          __           _      ___________________
 __     _         _          __           _      ___________________
 __     _         _          __           _      ___________________
 __     _         _          __           _      ___________________
 __     _         _          __           _      ___________________
 __     _         _          __           _      ___________________

Select Test; press ENTER ===> 1A

PF:  3=Quit  7=Back  8=Fwd  12=Test Menu
```

- The 1A link is via the SNA channel.
- The 2A link (CCA) is to the X.25 network.

We will now proceed with customizing the 1A attachment.

```
              _____________ Local (SNA) ______________
                  1A = RPQ CHANNEL

 104 - 40         105 - 46       108 - 0000000    110 - 1         116 - 2_ __

 121 - 01         123 - 0        125 - 00000000   126 - 00000000  127 - 0 0

 132 - 0 0 0 0    136 - 1 0 0 1  137 - 0 0 0 0    138 - 0

 141 - A          150 - 1        165 - 0          166 - A         168 - 0

 173 - 00000000   175 -          179 - 0 0 0

 213 - 1          215 - 00000    220 - 0

 222 - 0          223 - 10       224 - 2          225 - 4




Select Test; press ENTER ===>

PF:  3=Quit  7=Back  8=Fwd  12=Test Menu
```

- Note question 150=1 as it is the gateway for the token-ring devices, such as DSPU A, on the real token-ring network.

```
             ___________ Token-Ring Gateway ___________
                 1A = RPQ CHANNEL

 900 - 4000 3174 0001 08    905 - 0            908 - IBMLAN

 911 - 0













Select Test; press ENTER ===>

PF:  3=Quit  7=Back  8=Fwd  12=Test Menu
```

- Question 900 is the token-ring address of the 3174-11L. Note that the SAP for this address is 08.

```
             _______ 940: Ring Address Assignment _______
                 1A = RPQ CHANNEL

  S      Ring Address    SAP    T        S      Ring Address    SAP    T
  40    4000 3174 0001    08
  41    4000 7000 0000    08    1        42    4000 7000 0001    08    0
  43    4000 7000 0002    08    1        44    XXXX XXXX XXXX
  45    XXXX XXXX XXXX                   46    XXXX XXXX XXXX













Select Test; press ENTER ===>

PF:  3=Quit  7=Back  8=Fwd  12=Test Menu
```

- The token-ring addresses 400070000000 through 400070000002 are mapped to host addresses. These token-ring addresses are assigned to the devices calling in from the X.25 network, just as if they were on the token-ring network.

```
             ____ 941: Ring Transmission Definition _____
                 1A = RPQ CHANNEL

  S      Ring Address    SAP    F   W     S      Ring Address    SAP    F   W
  40    4000 3174 0001    08
  41    4000 7000 0000    08    3   2     42    4000 7000 0001    08    0   2
  43    4000 7000 0002    08    3   2     44
  45                                      46













Select Test; press ENTER ===>

PF:  3=Quit  7=Back  8=Fwd  12=Test Menu
```

- The frame and window sizes for DSPUs can be changed on this panel if desired.

```
               _______________ Common SNA _______________
                   1A = RPQ CHANNEL

    500 - 0          501 - _______    502 - _______





Select Test; press ENTER ===>

PF:  3=Quit  7=Back  8=Fwd  12=Test Menu
```

- The Common SNA panel and other panels not shown are not significant to our scenario.

```
              _________ Multi-Host Definition __________

Select a Host ID and press ENTER

Host   Adapter    Host      Hardware    Include      Host Descriptor
 ID     Type     Attach      Group      in IML
 1A      1         5          00          1      RPQ_CHANNEL________
 2A      1         3          51          1      RPQ_X25____________
 3A      _         _          __          _      ___________________
 __      _         _          __          _      ___________________
 __      _         _          __          _      ___________________
 __      _         _          __          _      ___________________
 __      _         _          __          _      ___________________
 __      _         _          __          _      ___________________
 __      _         _          __          _      ___________________
 __      _         _          __          _      ___________________
 __      _         _          __          _      ___________________
 __      _         _          __          _      ___________________

Select Test; press ENTER ===> 2A

PF:  3=Quit  7=Back  8=Fwd  12=Test Menu
```

- We will now customize the attachment to the X.25 network.

```
               __________________ X.25 __________________
                   2A = RPQ X25

 104 - C1                     110 - 1         116 - 0_ __

                              125 - 00*****0                  127 - 0 0

                                                              139 - 00

                150 - 2       165 - 1

                              179 - 0 0 0

 213 - 1        215 - 00000   220 - 0                         365 - 0

 370 - 0        372 - 0 0



Select Test; press ENTER ===>

PF:  3=Quit  7=Back  8=Fwd  12=Test Menu
```

- Question 150=2 to enable the X.25 Token-Ring Gateway function for the 2A attachment.

```
              ___________ Token-Ring Gateway ___________
                  2A = RPQ X25

 900 - 4000 3174 0001 04    905 - 0            908 - IBMLAN

 911 - 0















Select Test; press ENTER ===>

PF:  3=Quit  7=Back  8=Fwd  12=Test Menu
```

- Question 900 is the token-ring address of the 3174-11L. Note that the SAP for this address is 04.

```
              ____942: T-R Devices Address Assignment_____
                  2A = RPQ X25

  SID     Ring Address    SAP   F   W     SID     Ring Address    SAP   F   W

  00      XXXX XXXX XXXX   XX   2   2     01      XXXX XXXX XXXX   XX   2   2
  02      XXXX XXXX XXXX   XX   2   2     03      XXXX XXXX XXXX   XX   2   2
  04      XXXX XXXX XXXX   XX   2   2     05      XXXX XXXX XXXX   XX   2   2
  06      XXXX XXXX XXXX   XX   2   2     07      XXXX XXXX XXXX   XX   2   2
  08      XXXX XXXX XXXX   XX   2   2     09      XXXX XXXX XXXX   XX   2   2
  0A      XXXX XXXX XXXX   XX   2   2     0B      XXXX XXXX XXXX   XX   2   2
  0C      XXXX XXXX XXXX   XX   2   2     0D      XXXX XXXX XXXX   XX   2   2
  0E      XXXX XXXX XXXX   XX   2   2     0F      XXXX XXXX XXXX   XX   2   2
  10      4000 3174 0001   08   2   2     11      XXXX XXXX XXXX   XX   2   2
  12      XXXX XXXX XXXX   XX   2   2     13      XXXX XXXX XXXX   XX   2   2
  14      XXXX XXXX XXXX   XX   2   2     15      XXXX XXXX XXXX   XX   2   2
  16      XXXX XXXX XXXX   XX   2   2     17      XXXX XXXX XXXX   XX   2   2
  18      XXXX XXXX XXXX   XX   2   2     19      XXXX XXXX XXXX   XX   2   2
  1A      XXXX XXXX XXXX   XX   2   2     1B      XXXX XXXX XXXX   XX   2   2
  1C      XXXX XXXX XXXX   XX   2   2     1D      XXXX XXXX XXXX   XX   2   2

Select Test; press ENTER ===>

PF:  3=Quit  7=Back  8=Fwd  12=Test Menu
```

- The 3174-11L address SAP 08 is assigned to SID 10.

```
                  ____943: X.25 Devices Address Assignment_____
                  2A = RPQ X25

  Dest     X.25              Host    DTE Number        RC    RD     Inac
  SID      Ring Address       ID                                    Time

   00      XXXX XXXX XXXX     __     _______________   0     2      2
   01      XXXX XXXX XXXX     __     _______________   0     2      2
   02      XXXX XXXX XXXX     __     _______________   0     2      2
   03      XXXX XXXX XXXX     __     _______________   0     2      2
   04      XXXX XXXX XXXX     __     _______________   0     2      2
   05      XXXX XXXX XXXX     __     _______________   0     2      2
   06      XXXX XXXX XXXX     __     _______________   0     2      2
   07      XXXX XXXX XXXX     __     _______________   0     2      2
   08      XXXX XXXX XXXX     __     _______________   0     2      2
   09      XXXX XXXX XXXX     __     _______________   0     2      2
   0A      XXXX XXXX XXXX     __     _______________   0     2      2
   0B      XXXX XXXX XXXX     __     _______________   0     2      2
   0C      XXXX XXXX XXXX     __     _______________   0     2      2
   0D      XXXX XXXX XXXX     __     _______________   0     2      2

Select Test; press ENTER ===>

PF:  3=Quit  7=Back  8=Fwd  12=Test Menu
```

- No entries are required on this panel for an Open Connection from X.25 devices.

```
                  _944: X.25 Gateway Default/Open Connections__
                  2A = RPQ X25

  Token Ring          X25                 X25 Gateway
  Devices SID         Devices SID         Protocol

      10                  XX                 __

Select Test; press ENTER ===>

PF:  3=Quit  7=Back  8=Fwd  12=Test Menu
```

- Token-ring device SID 10 is mapped to any device calling in from the X.25 network.

```
                  ____945: X.25 Gateway Bridge Information_____
                  2A = RPQ X25

    946 - 1              Bridge Number (0-F)

    947 - BB3            Token-Ring Segment Number (001-FFF)

    948 - 001            3174-X25 Segment Number (001-FFF)

    949 - 7000 00        T-R Address for Internal Use (000000-7FFFFE)
                         4000 XXXX XX --

Select Test; press ENTER ===>

PF:  3=Quit  7=Back  8=Fwd  12=Test Menu
```

- Question 949 provides the middle six digits of the DSPU token-ring addresses. In this case, it is 700000.
- The first X.25 device calling in is assigned the token-ring address 400070000000, the second X.25 device calling in is assigned the token-ring address 400070000001, and so on.
- By assigning token-ring addresses to the X.25 devices, the X.25 Token-Ring Gateway allows mapping of the token-ring addresses to host addresses and, hence, allows access to the host.

```
              ____________ 332:  X.25 Options ____________
                  2A = RPQ X25

    400 - 00 1 0        401 - 4       402 - ____

    409 - 10100100      420 - 00000000               421 - 00000000

    423 - 201000600                   424 - 201000300______

    430 - 1             431 - 0       432 - 07       433 - 7

    434 - 1             435 - 07

    440 - A             441 - __      442 - ____

    450 - 0300          451 - 10      452 - ________ 453 - 10000000

    461 - ____          462 - ____    463 - 0001     464 - 0008

    465 - ____          466 - ____    467 - 0004

Select Test; press ENTER ===>

PF:  3=Quit  7=Back  8=Fwd  12=Test Menu
```

- Various X.25 options are specified on this panel.

6.17.4 3174-11R Customization

```
              _____________ Model / Attach _____________

    098 -

    099 - 11R TO X25 NETWORK AS PU2 DEVICE

    100 - 11R

    101 - 3

Select Test; press ENTER ===>

PF:  3=Quit  8=Fwd  12=Test Menu
```

- Finally, we customize the 3174-11R as the X.25 PU 2.0 device calling in to the 3174-11L X.25 Token-Ring Gateway.
- The primary attachment of the 3174-11R is to the X.25 network.

```
              __________________ X.25 __________________

 104 - C1         108 - 0000000   110 - 0          116 - 2_ __

 121 - 01         123 - 0         125 - 00000000   126 - 00000000   127 - 0 0

 132 - 0 0 0 0    136 - 1 0 0 1   137 - 0 0 0 0    138 - 0

 141 - A          150 - 0         165 - 1          166 - A          168 - 0

 173 - 00000000   175 -           179 - 0 0 0

 213 - 1          215 - 00000     220 - 0          365 - 0

 370 - 0          372 - 0 0

Select Test; press ENTER ===>

PF:  3=Quit  7=Back  8=Fwd  12=Test Menu
```

- The 3174-11R is customized for X.25 attachment.
- Question 150=0 as we are using the 3174-11R as a standalone PU 2.0 device with no gateway functions.

```
              _______________ Common SNA _______________

    500 - 0          501 - ________    502 - ________

Select Test; press ENTER ===>

PF:  3=Quit  7=Back  8=Fwd  12=Test Menu
```

- The Common SNA panel and other panels not shown are not significant to our scenario.

```
           ___________ 332:  X.25 Options ___________

    400 - 00 1 0        401 - 4       402 -

    409 - 10100100      420 - 00000000               421 - 00000100

    423 - 201000300_____              424 - 201000600_____

    430 - 1             431 - 0       432 - 07       433 - 7

    434 - 1             435 - 07

    440 - A             441 - __      442 - ____

    450 - 0300          451 - 10      452 - E810XX__  453 - 10000000

    461 -               462 - ____    463 - 0001     464 - 0008

    465 - ____          466 - ____    467 - 0004

Select Test; press ENTER ===>

PF:  3=Quit  7=Back  12=Test Menu
```

- Various X.25 options are specified on this panel.

6.17.5 VTAM Definitions for 3174-11L Gateway And 3174-11R

```
***********************************************************************
*  DEFINITIONS FOR LOCAL 3174-11L                                     *
***********************************************************************
RABQ40Y VBUILD TYPE=LOCAL
RABP40   PU     CUADDR=E40,ISTATUS=ACTIVE,PUTYPE=2,MAXBFRU=10,
               MODETAB=AMODETAB,DLOGMOD=M2SDLCQ,USSTAB=US327X,
               VPACING=0
*
RABT4002 LU    LOCADDR=2
RABT4003 LU    LOCADDR=3
***********************************************************************
*  DEFINITIONS FOR 3174-11R - SEEN AS A DSPU BY 3174-11L              *
***********************************************************************
RABP41   PU     CUADDR=E41,ISTATUS=ACTIVE,PUTYPE=2,MAXBFRU=10,
               MODETAB=AMODETAB,DLOGMOD=M2SDLCQ,USSTAB=US327X,
               VPACING=0,SECNET=YES
*
RABT4102 LU    LOCADDR=2
RABT4103 LU    LOCADDR=3
```

Figure 99. Scenario 3: VTAM Definitions for 3174-11L Gateway and 3174-11R

6.17.6 Connection Initiation (from X.25 Device Only)

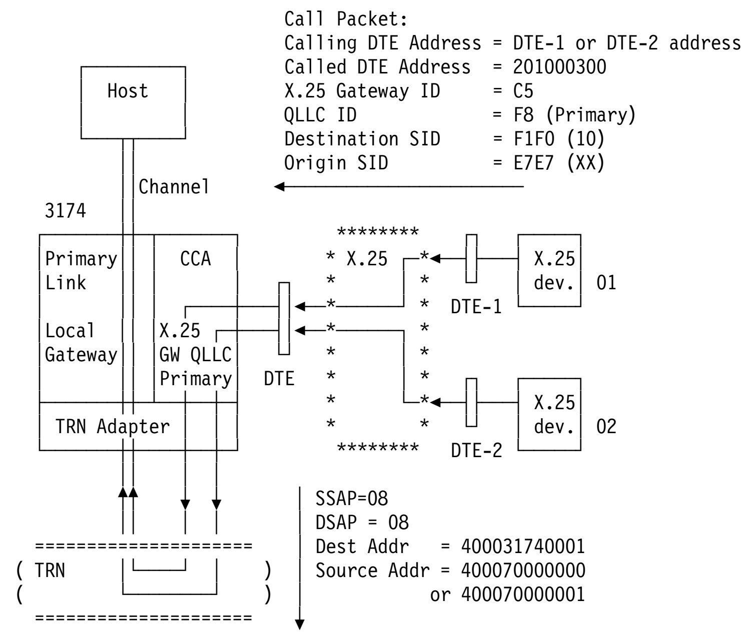


Figure 100. Scenario 3: Connection Initiation (from X.25 Device Only)

6.18 Scenario 4: Open Connection (from Token-Ring and X.25 Devices)

X25SC5B

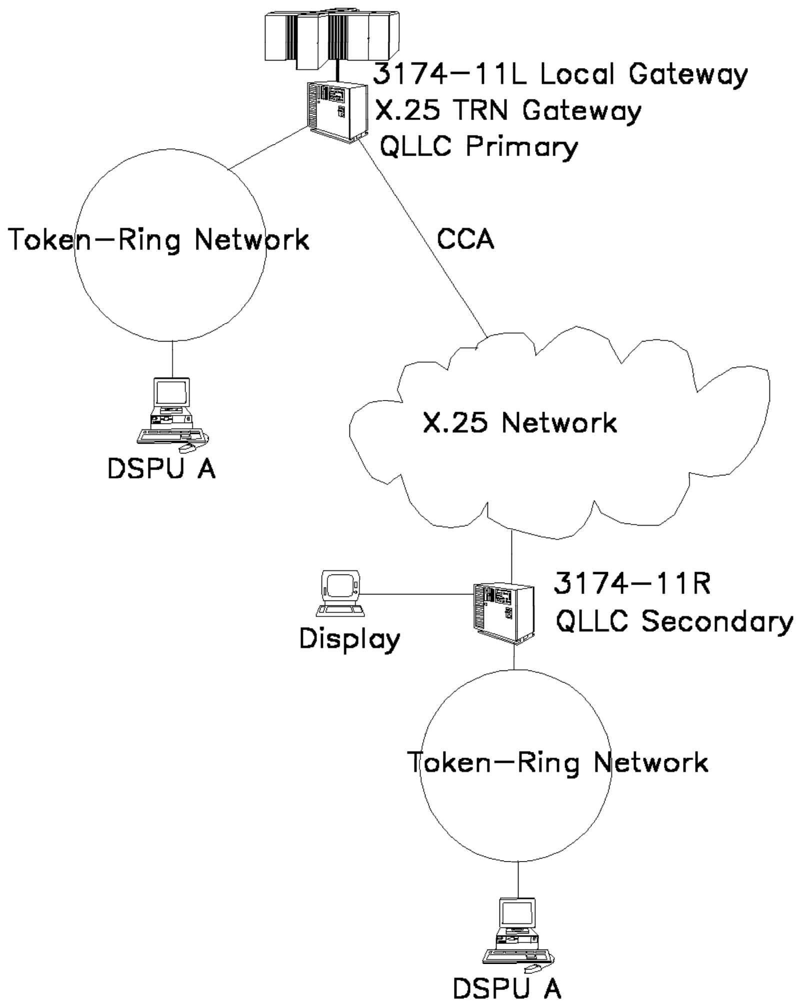


Figure 101. Scenario 4: Open Connection (from Token-Ring and X.25 Devices)

6.18.1 Description

Scenario 4 adds to Scenario 3 by making the 3174-11R, which is just a PU 2.0 device in Scenario 3, into a QLLC secondary gateway as well. It is an example of an Open Connection from both Token-Ring devices and X.25 devices. In this scenario, any token-ring device attached to the 3174-11R gateway is allowed to access a specific X.25 device, and any X.25 device coming in through the 3174-11L gateway is allowed to access a specific token-ring host.

For Scenario 4:

- The 3174-11R from Scenario 3 is now installed with the X.25 Token-Ring Gateway RPQ and customized as an X.25 Token-Ring Gateway.

  Note that it is still a PU 2.0 device for its attached terminals; that is, the terminal LUs are using the 3174 local PU function.

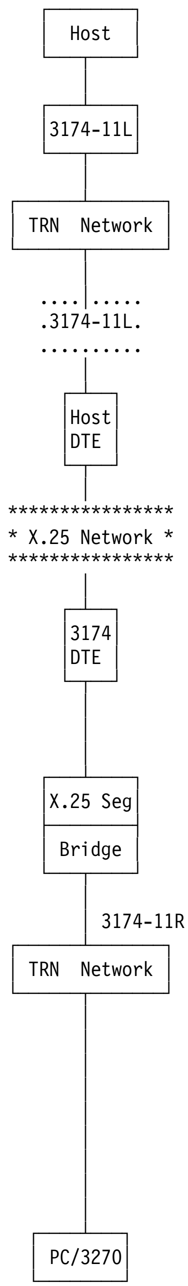
- A PS/2 (A) is attached to the token ring to access the 3090 host via the 3174-11R gateway.
- The 3174-11L from Scenario 3 operates, as in that scenario, as an X.25 Token-Ring Gateway via its CCA.

Notes:

1. The 3174-11R is now a PU 2.0 device and X.25 Token-Ring Gateway.
2. VTAM in the host sees the 3174-11L gateway, the 3174-11R gateway, and the PS/2 as local SNA major nodes.
3. The 3174-11L gateway sees the 3174-11R and the PS/2 as DSPUs, as if they were attached to its token ring.

Figure 102 on page 256 shows an overview of the definitions required for Scenario 4.

6.18.2 Definitions Overview



VTAM Definitions

```
 3174-11L:          3174-11R:          PC/3270:
  PU CUADDR=E40..    PU CUADDR=E41..    PU CUADDR=E42..
  LU LOCADDR=02..    LU LOCADRR=02..    LU LOCADDR=02..
```

3174-11L Customization

```
 Q100: 11L
 Q101: M
```

1A Host

```
 Q104: 40   Q105: 46
 Q150: 1    Q215: 00000
 Q900: 400031740001 08
 Q940: 40=400031740001 08
       41=400070000000 08
       42=400070000001 08
```

2A Host

```
 Q104: C1
 Q150: 2    Q215: 00000
 Q900: 400031740001 04
 Q942: SID=10 TRNaddr=400031740001 SAP=08
 Q943: No entries required for Open Connection
 Q944: TRNSID=10   X25SID=XX   X25GWProt=Not reqd
 Q946: 1
 Q947: BB3
 Q948: 001
 Q949: 700000
 Q423: 201000600         Q424: 201000300
 Q452: ________          Q463: 0001      Q464: 0008
                         Q467: 0008
```

3174-11R Customization

```
 Q100: 11R    Q101: 3
 Q150: 2
 Q215: 00000
 Q900: 400070000000 08
 Q942: SID=02 TRNaddr=400070000001 SAP=08
 Q943: SID=10 X25addr=400031740001 HostID=1A
       DTE Number=201000300
 Q944: TRNSID=XX   X25SID=10   X25GWProt=Not reqd


 Q401: 4
 Q420: 00000100     Q421: 00000100
 Q423: 201000300    Q424: 201000600
 Q452: E810XX       Q463: 1   Q464: 8   Q467: 4

 Q946: 1
 Q947: BB2
 Q948: 001
 Q949: 222299
```

PC/3270 Configuration

```
 Destination Address=400031740001
 Remote SAP=04
 PUID=00000
 BlockID=061
```

CONFIG.SYS

```
 device=C:\LSP\DXMCOMOD.SYS 400070000001
```

Figure 102. Scenario 4: Definitions Overview

6.18.3 3174-11L Gateway Customization

See customization panels in Scenario 3 (nothing has changed).

6.18.4 3174-11R Gateway Customization

```
            ____________ Model / Attach ____________

   098 -

   099 - 11R GATEWAY WITH RPQ 8Q0743

   100 - 11R

   101 - 3

Select Test; press ENTER ===>

PF:  3=Quit  8=Fwd  12=Test Menu
```

- We will now customize the 3174-11R used in Scenario 3 as a stand-alone PU 2.0 X.25 device, and turn it into an X.25 Token-Ring Gateway.

```
            ________________ X.25 ________________

 104 - C1        108 - 0000000   110 - 0        116 - 2_ __

 121 - 01        123 - 0         125 - 00000000  126 - 00000000  127 - 0 0

 132 - 0 0 0 0   136 - 1 0 0 1   137 - 0 0 0 0  138 - 0

 141 - A         150 - 2         165 - 1        166 - A        168 - 0

 173 - 00000000  175 -           179 - 0 0 0

 213 - 1         215 - 00000     220 - 0        365 - 0

 370 - 0         372 - 0 0

Select Test; press ENTER ===>

PF:  3=Quit  7=Back  8=Fwd  12=Test Menu
```

- Question 150 response is changed to 2.

```
            __________ Token-Ring Gateway __________

 900 - 4000 7000 0000 08    905 - 0           908 - IBMLAN

 911 - 0

Select Test; press ENTER ===>

PF:  3=Quit  7=Back  8=Fwd  12=Test Menu
```

- Question 900 is the token-ring address of the 3174-11R gateway.

```
                   ____942: T-R Devices Address Assignment_____

  SID     Ring Address    SAP   F   W     SID     Ring Address    SAP   F   W

  00      XXXX XXXX XXXX   XX   2   2     01      XXXX XXXX XXXX   XX   2   2
  02      4000 7000 0001   04   2   2     03      XXXX XXXX XXXX   XX   2   2
  04      XXXX XXXX XXXX   XX   2   2     05      XXXX XXXX XXXX   XX   2   2
  06      XXXX XXXX XXXX   XX   2   2     07      XXXX XXXX XXXX   XX   2   2
  08      XXXX XXXX XXXX   XX   2   2     09      XXXX XXXX XXXX   XX   2   2
  0A      XXXX XXXX XXXX   XX   2   2     0B      XXXX XXXX XXXX   XX   2   2
  0C      XXXX XXXX XXXX   XX   2   2     0D      XXXX XXXX XXXX   XX   2   2
  0E      XXXX XXXX XXXX   XX   2   2     0F      XXXX XXXX XXXX   XX   2   2
  10      XXXX XXXX XXXX   XX   2   2     11      XXXX XXXX XXXX   XX   2   2
  12      XXXX XXXX XXXX   XX   2   2     13      XXXX XXXX XXXX   XX   2   2
  14      XXXX XXXX XXXX   XX   2   2     15      XXXX XXXX XXXX   XX   2   2
  16      XXXX XXXX XXXX   XX   2   2     17      XXXX XXXX XXXX   XX   2   2
  18      XXXX XXXX XXXX   XX   2   2     19      XXXX XXXX XXXX   XX   2   2
  1A      XXXX XXXX XXXX   XX   2   2     1B      XXXX XXXX XXXX   XX   2   2
  1C      XXXX XXXX XXXX   XX   2   2     1D      XXXX XXXX XXXX   XX   2   2

Select Test; press ENTER ===>

PF:  3=Quit  7=Back  8=Fwd  12=Test Menu
```

- The PS/2, with token-ring address 400070000001 (see its CONFIG.SYS file address parameter) is mapped to SID 02. (This mapping, however, is not used as we will allow an Open Connection from any Token-Ring device to access the 3174-11L through the 3174-11R gateway.

```
                       ____943: X25 Devices Address Assignment_____

  Dest     X25               Host    DTE Number        RC    RD    Inac
  SID      Ring Address       ID                                   Time

   0E      XXXX XXXX XXXX     __     _______________    0     2      2
   0F      XXXX XXXX XXXX     __     _______________    0     2      2
   10      4000 3174 0001     1A     201000300______    0     2      2
   11      XXXX XXXX XXXX     __     _______________    0     2      2
   12      XXXX XXXX XXXX     __     _______________    0     2      2
   13      XXXX XXXX XXXX     __     _______________    0     2      2
   14      XXXX XXXX XXXX     __     _______________    0     2      2
   15      XXXX XXXX XXXX     __     _______________    0     2      2
   16      XXXX XXXX XXXX     __     _______________    0     2      2
   17      XXXX XXXX XXXX     __     _______________    0     2      2
   18      XXXX XXXX XXXX     __     _______________    0     2      2
   19      XXXX XXXX XXXX     __     _______________    0     2      2
   1A      XXXX XXXX XXXX     __     _______________    0     2      2
   1B      XXXX XXXX XXXX     __     _______________    0     2      2

Select Test; press ENTER ===>

PF:  3=Quit  7=Back  8=Fwd  12=Test Menu
```

- The 3174-11L on the other end of the X.25 network connection is assigned as the destination SID 10.

```
                       _944: X.25 Gateway Default/Open Connections__

  Token Ring          X25                 X25 Gateway
  Devices SID         Devices SID         Protocol

      XX                  10                  __
      __                  __                  __
      __                  __                  __
      __                  __                  __
      __                  __                  __
      __                  __                  __
      __                  __                  __
      __                  __                  __
      __                  __                  __
      __                  __                  __
      __                  __                  __
      __                  __                  __
      __                  __                  __
      __                  __                  __

Select Test; press ENTER ===>

PF:  3=Quit  7=Back  8=Fwd  12=Test Menu
```

- In this mapping, any token-ring device is allowed to access the X.25 device SID 10.

```
____945: X.25 Gateway Bridge Information_____

946 - 1              Bridge Number (0-F)

947 - BB2            Token-Ring Segment Number (001-FFF)

948 - 001            3174-X25 Segment Number (001-FFF)

949 - 2222 99        T-R Address for Internal Use (000000-7FFFFE)
                     4000 XXXX XX --

Select Test; press ENTER ===>

PF:  3=Quit  7=Back  8=Fwd  12=Test Menu
```

- In this scenario, question 949 is not significant.

```
________________ Common SNA ________________

500 - 0          501 - ________    502 - ________

Select Test; press ENTER ===>

PF:  3=Quit  7=Back  8=Fwd  12=Test Menu
```

- The Common SNA panel and other panels not shown are not significant to our scenario.

```
____________ 332:  X.25 Options ____________

400 - 00 1 0        401 - 4        402 -

409 - 10100100      420 - 00000100              421 - 00000100

423 - 201000300______              424 - 201000600______

430 - 1             431 - 0        432 - 07        433 - 7

434 - 1             435 - 07

440 - A             441 - __       442 - ____

450 - 0300          451 - 10       452 - E810XX__  453 - 10000000

461 -               462 - ____     463 - 0001      464 - 0008

465 - ____          466 - ____     467 - 0004

Select Test; press ENTER ===>

PF:  3=Quit  7=Back  12=Test Menu
```

- Various X.25 options are specified on this panel.

6.18.5 PS/2 (PC/3270) Configuration

Attachment Types Screen

```
                              Attachment Types                    More: -+
------------------------------------------------------------------------------
Enter the required information.

  Total number of sessions for:

  Distributed Function Terminal (DFT) . . . . . . . . .   [0]

  LAN via 802.2 protocol  . . . . . . . . . . . . . . .   [1]

  LAN via NETBIOS . . . . . . . . . . . . . . . . . . .   [0]

  3174 Peer Communication . . . . . . . . . . . . . . .   [0]

  Synchronous Data Link Control (SDLC)  . . . . . . . .   [0]

  Asynchronous Data Link Control (ASYNCH) . . . . . . .   [0]
    (for attachment to a Series/1 SNA gateway only)

  CCITT X.25 Network (X.25) . . . . . . . . . . . . . .   [0]


F1=Help  F3=Exit  F7=Backward  F8=Forward
```

Figure 103. Scenario 4: Attachment Types Screen

Adv. Options for LAN Attachment via 802.2 Protocol Screen

```
          Advanced Options for LAN Attachment via 802.2 Protocol      More: -+
------------------------------------------------------------------------------
Enter the required information.

  Total number of LAN sessions  . . . . . .   1

  Link name  . . . . . . . . . . . . . . .   lan1

  Destination address  . . . . . . . . . .  [400031740001]

  Number of sessions for this gateway  . .  [1]

  Physical Unit ID . . . . . . . . . . . .  [00000]

  Adapter number . . . . . . . . . . . . .  [0]

  Remote SAP/Local SAP . . . . . . . . . .  [08]/[04]

  Block ID . . . . . . . . . . . . . . . .  [061]

  PIU size . . . . . . . . . . . . . . . .  [0265]


F1=Help  F3=Exit  F7=Backward  F8=Forward
```

Figure 104. Scenario 4: Advanced Options for LAN Attachment Screen

CONFIG.SYS File

```
REM *---------------------------------------------------------------*
REM *               LAN Support Program                             *
REM *---------------------------------------------------------------*
DEVICE=C:\DOS50\HIMEM.SYS
DOS=HIGH
DEVICE=C:\DOS50\ANSI.SYS
DEVICE=C:\DOS50\SMARTDRV.SYS 512 128
DEVICE=C:\LSP\DXMA0MOD.SYS
DEVICE=C:\LSP\DXMC0MOD.SYS 400070000001
SHELL=C:\DOS\COMMAND.COM /P /E:256
LASTDRIVE=E
BUFFERS=10
FILES=20
FCBS=16,8
```

Figure 105. Scenario 4: CONFIG.SYS for PS/2 Using 802.2 Protocol

6.18.6 VTAM Definitions for 3174-11L Gateway, 3174-11R Gateway And PS/2

```
***********************************************************************
*  DEFINITIONS FOR LOCAL 3174-11L                                     *
***********************************************************************
RABQ40Y VBUILD TYPE=LOCAL
RABP40   PU     CUADDR=E40,ISTATUS=ACTIVE,PUTYPE=2,MAXBFRU=10,
               MODETAB=AMODETAB,DLOGMOD=M2SDLCQ,USSTAB=US327X,
               VPACING=0
RABT4002 LU    LOCADDR=2
RABT4003 LU    LOCADDR=3
***********************************************************************
*  DEFINITIONS FOR 3174-11R GATEWAY - SEEN AS A DSPU BY 3174-11L      *
***********************************************************************
RABP41   PU     CUADDR=E41,ISTATUS=ACTIVE,PUTYPE=2,MAXBFRU=10,
               MODETAB=AMODETAB,DLOGMOD=M2SDLCQ,USSTAB=US327X,
               VPACING=0,SECNET=YES
RABT4102 LU    LOCADDR=2
RABT4103 LU    LOCADDR=3
***********************************************************************
*  DEFINITIONS FOR PS/2 - SEEN AS A DSPU BY 3174-11L                  *
***********************************************************************
RABP42   PU     CUADDR=E42,ISTATUS=ACTIVE,PUTYPE=2,MAXBFRU=10,
               MODETAB=AMODETAB,DLOGMOD=M2SDLCQ,USSTAB=US327X,
               VPACING=0,SECNET=YES
RABT4102 LU    LOCADDR=2
RABT4103 LU    LOCADDR=3
```

Figure 106. Scenario 4: VTAM Definitions for 3174 Gateways and PS/2

Chapter 7. Asynchronous Emulation Adapter (AEA)

This chapter describes the 3174 Asynchronous Emulation Adapter (AEA). It provides an overview of the AEA functions and a summary of the major functional enhancements introduced in Configuration Support-B Release 2, and other enhancements introduced in Configuration Support-C Release 2 and Release 5 Licensed Internal Code. An example AEA configuration, including customization panel responses and an explanation of the customization process, is also provided. This configuration example was tested at ITSO Raleigh Center.

7.1 Introduction

Many customers have ASCII terminals (displays and printers) which they wish to integrate into their existing 3270 network for access to both 3270 and ASCII hosts. At the same time, they also wish to use their 3270 terminals to access both 3270 and ASCII hosts. The protocols and datastreams used for asynchronous communication between ASCII hosts and terminals (collectively known as ASCII devices), however, are quite different from those used between 3270 hosts and terminals.

To satisfy the demand for integration of ASCII devices into 3270 networks, IBM announced 3174 support for ASCII communication in 1987. This support consists of a hardware adapter, the Asynchronous Emulation Adapter (AEA), and microcode functions in the 3174.

In 1990, significant enhancements to the original AEA support were introduced with Configuration Support-B Release 2. AEA support was further enhanced in Configuration Support-C Release 2 (1992) and Release 5 (1994).

7.2 Description

The AEA feature allows you to attach ASCII hosts and terminals to the 3174, using either a direct attachment cable or via a switched or non-switched line. Each adapter card contains the microprocessor, storage, control logic, and an I/O panel with eight RS-232C interface connectors for attaching ASCII devices. An additional diskette containing microcode to support the adapter is also required.

Three major functions are provided by the AEA:

- **3270 Terminal Emulation**, which allows ASCII displays and printers (including PCs or PS/2s emulating ASCII terminals) to emulate 3270 terminals and communicate with 3270 hosts.
- **ASCII Terminal Emulation**, which allows 3270 displays and printers to emulate certain ASCII terminals and communicate with ASCII hosts.
- **ASCII Pass-Through**, which allows ASCII terminals to communicate with ASCII hosts *through* the 3174.

In addition, there are a number of functions provided to manage this environment such as:

- Destination switching
- Switched line management

- Support for “smart” modems
- Network management support
- Local copy facilities
- Customization support

The AEA can be ordered as feature #3020, which provides the adapter card, a downstream load diskette for the AEA microcode, and a wrap plug for testing. The number of adapters that can be installed in a 3174 depends on the model number and the available slots. Each of the large-sized 3174 floor-standing Models 1xx and the rack-mounted Models 2xx can have up to three adapters installed. Note, however, that each Model 2xx machine only has a maximum of five card slots. You should, therefore, plan for the configuration of these models carefully. For example, if you wish to have 32 coax ports and 24 asynchronous ports, you would have to use 3299 Terminal Multiplexers instead of Terminal Multiplexer Adapter cards so as to minimize the number of slots used.

Each of the medium-sized 3174 Models 5xR and 6xR (except the Model 53R which does not support the AEA feature) can have only one adapter installed. Because of storage constraints the Model 52R cannot support either Configuration Support-B or Configuration Support-C and, therefore, will not benefit from the enhancements introduced in Configuration Support-B Release 2 and later releases.

The 3174 WNM Models 41R and 43R as well as the small-sized 3174 Models 8xR and 9xR do not support the AEA feature.

7.3 Storage Requirements

Additional controller storage is required when the AEA is configured for base functions. If you wish to use large-screen support or MLT, additional storage is required for these also. See Appendix E, “3174 Storage Requirements” on page 755 for details on calculating the amount of storage you need.

7.4 Disk Requirements

The AEA requires either a second diskette drive or a fixed disk to accommodate the additional microcode required for the adapter. This AEA microcode is supplied on a 1.2MB DSL diskette.

Before Configuration Support-C Release 1, the AEA microcode can be merged with microcode to support other DSL devices (such as the 3472-G) onto one 1.2MB DSL diskette.

With Configuration Support-C Release 1 and later releases, the AEA microcode is merged with microcode to support other DSL devices onto the 2.4MB Control Extension diskette.

7.5 Adapter Installation

To install the AEA, you should use the *Asynchronous Emulation Adapter Customer Set Up Instructions*, which is supplied with the feature.

After installing the AEA(s), you should perform a Card Verification Test. The wrap plug included with the AEA package is required for this test, which is described in detail in the AEA set up instructions manual. After a successful completion of the Card Verification Test, the 3174 is ready for customization.

When customization is completed, the AEA code should be installed in one of the following:

- A single DSL diskette in drive 2, containing only the AEA microcode
- A merged DSL diskette in drive 2, containing the AEA microcode and microcode used for other DSL devices
- Merged onto the fixed disk, if a fixed disk is used

The AEA microcode is loaded into the AEA adapter at each 3174 IML.

7.6 Network Management

ASCII terminals attached to the AEA are supported by most 3174 network management functions. Specific AEA tests are available from option 12 of the Test Menu. Some of the functions include:

- Test ports
- Connect to smart modem
- Transmit and receive test data
- Display device status and errors

Error Log and Alerts: The 3174 logs errors and generate alerts to the primary host for conditions including:

- Permanent link outages
- Permanent calling outages
- Station outages
- Temporary error counts exceeded

Response Time Monitor: The AEA supports the full set of RTM functions. An ASCII device can be used in test mode to display the RTM logs and to display the LTTI (Last Transaction Time Indicator) in the Operator Information Area.

Vital Product Data: There is currently no support available in ASCII terminals for Vital Product Data or VPD; however, you can enter and store the data manually in the 3174 just as you would for the "pre-VPD" terminals. See 13.2.1, "Vital Product Data" on page 439 for details on VPD.

7.7 Configuration Support-B Release 2 AEA Enhancements

AEA support in the 3174 was significantly enhanced with the introduction of Configuration Support-B Release 2 and a new level of AEA DSL microcode. To get these enhancements, you must upgrade to at least Configuration Support-B Release 2.

If you are upgrading from Configuration Support-A, you may also require to upgrade your diskette drive in order to handle the 2.4 MB diskette format that Configuration Support-B uses. You will also require more controller storage to run Configuration Support-B.

The enhancements to the AEA support are implemented entirely in the Licensed Internal Code with Configuration Support-B Release 2 and later releases. These enhancements are:

- Additional support for 3270 CUT terminals in ASCII emulation mode:
  - Data General Dasher D210
  - DEC VT220 (7-bit and 8-bit)
  - Extended Attribute Buffer support (uses the 3270 terminal EAB to provide enhanced mapping of ASCII character attributes)
- Improved support for ASCII terminals in 3270 emulation mode:
  - MLT access to the primary host on the primary link
  - ROLM** Cypress, Cedar, Juniper
  - DEC VT220 (7-bit or 8-bit)
  - Tektronix 4205**
  - Wyse 50/60**
- User-Defined Translate Table (UDX) for ASCII terminals
- User-Defined Terminal Table (UDT) and keyboard mapping for ASCII terminals
- Miscellaneous 3287 printer support for ASCII printers
- Additional per-port password capability
- A new device type (for example, ASCII plotter) for use only as a system printer
- IBM GDDM* graphics for ASCII devices
- National Language Support (NLS) for IBM and OEM ASCII terminals
- Support for large format ASCII screens (30x80 and 32x80)

7.8 Configuration Support-C Release 2 AEA Enhancements

Configuration Support-C Release 2 offers the following new functions and enhancements for ASCII workstations :

- 132 column support via AEA

  132 column support via AEA allows both ASCII terminal emulation (3270 device emulating an ASCII terminal) and 3270 terminal emulation (ASCII device emulating a 3270 device) to display up to 132 columns of data on a

single line (for terminals that are able to display 132 columns). See 14.2.8, "132-Column Support via AEA" on page 472 for further information.

- Entry Assist support for ASCII devices

  Entry Assist support for ASCII devices extends 3174 Entry Assist capabilities to ASCII devices. Entry Assist provides tab, word wrap, margin, and audible End of Line (EOL) signal to terminal operators using applications that involve entry and editing of text material. See 14.2.9, "Entry Assist Support for ASCII" on page 475 for further information.

- HAP sharing for local copy

  An ASCII printer attached to an ASCII workstation that is, in turn, attached to a 3174 AEA, can receive local copy data from any workstation attached to the same 3174. (This function is also available to a printer attached to a 3270 workstation.) See 14.2.3, "HAP Sharing for Local Copy" on page 459 for further information.

- Dynamically Defined Dependent Logical Units

  VTAM dynamically defines a dependent LU definition for an ASCII workstation attached to a 3174 capable of supporting the dynamic definition of dependent LUs. (This function is also available to 3270 displays and printers attached to the same 3174. The function is also provided by Configuration Support-B Release 4.1.) See Chapter 11, "Dynamic Definition of Dependent LUs (DDDLU)" on page 393 for further information.

7.9 Configuration Support-C Release 5 AEA Enhancements

Configuration Support-C Release 5 offers the following new enhancements for ASCII workstations:

- ASCII Multiple Host Support

  This support allows ASCII terminals and printers attached to the 3174 via AEA to access hosts that are attached via the 3174 Single Link Multiple Host Support (SLMH) or via the Concurrent Communication Adapter (CCA).

  Note:

  This function was previously provided for Configuration Support-C only via RPQ 8Q0933.

7.10 AEA Connectivity

The following sections describe the connectivity supported by the AEA for various devices (displays, printers, modems) and hosts.

7.10.1 ASCII Host Support

The AEA is designed to be compatible with a wide range of ASCII hosts; at the ITSO, we tested an asynchronous connection to the IBM Information Network and a dial up connection to a DEC host.

7.10.2 3270 Host Support

The AEA allows ASCII devices to have 3270 host sessions using the following upstream protocols:

- Local channel (SNA and non-SNA)
- ESCON
- SDLC
- BSC
- Token ring
- Ethernet
- Frame Relay
- X.25

AEA with MLT and Multi-Host Support

The Multiple Logical Terminal (MLT) function allows an ASCII display or printer to act as multiple logical terminals. Each logical terminal has its own 3270 host address and can interact independently with its own host application in 3270 emulation mode. By using the Change Screen key sequence, an ASCII display can access any host attached via the primary host link, any of the other hosts attached via the secondary host link(s) or any ASCII host attached via an AEA. Access to the host is made through either the connection menu or the default destination procedure.

Therefore with Configuration Support-C Release 5, using AEA configured for MLT, you can access up to five 3270 host sessions, ASCII hosts sessions or a mix of 3270 and ASCII host sessions.

Connection menus can be defined as the default display for the terminal at power up time, or else the terminal can be connected to a default destination. The connection menu can then be invoked at a later time by a special key sequence. See 7.12.5, “AEA Default Destination Panel” on page 307.

7.10.3 AEA Downstream Support

The AEA downstream connectivity is summarized in the following diagram.

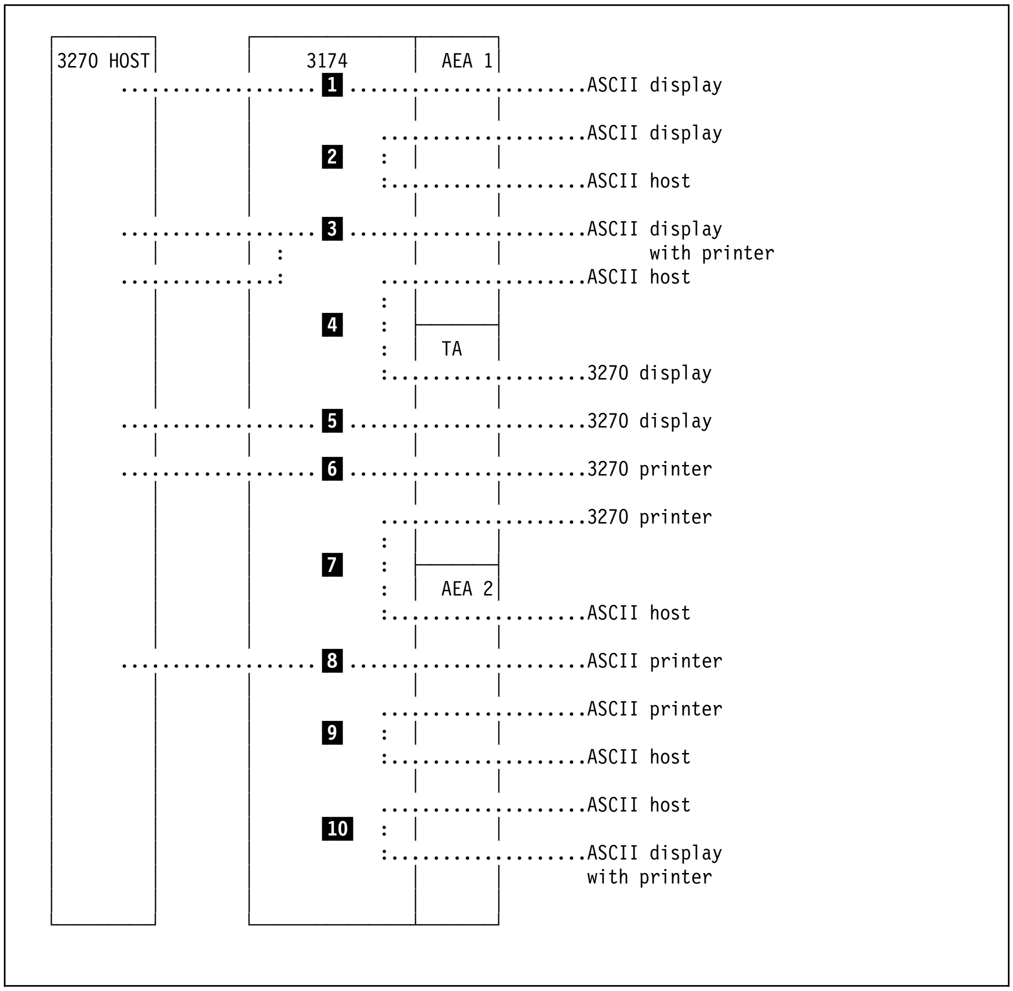


Figure 107. Connectivity Summary for Asynchronous Emulation Adapter

Notes:

1 The ASCII display is mapped to appear to the 3270 host as a 3270 terminal in CUT mode. This can be monochrome or color.

2 An ASCII display is connected to an ASCII host in pass-through mode. The ASCII display and the ASCII host need not be on the same adapter. For example, the ASCII display on AEA 1 could be connected to an ASCII host on AEA 2.

3 An ASCII display with an attached printer is mapped to the 3270 host as a 3270 display and a 3270 printer.

4 A 3270 display in CUT mode emulating an ASCII terminal can connect to an ASCII host.

5 A 3270 display session is not affected by the AEA. In addition, a menu can be added for the display operator to select an alternate connection to an ASCII host.

6 A 3270 printer session is not affected by the AEA. However, printer definitions are static and, unlike display sessions, cannot be switched by the operator. The printer is currently attach to a port defined for a 3270 host session. If you wish to print from an ASCII host, you will have to re-attach the printer to another port with the ASCII host defined (for example, to the printer port in **7**).

7 A 3270 printer (excluding 4250 image printers and SOEMI devices) can be mapped to an ASCII host as a generic ASCII printer.

8 An ASCII printer can be mapped to appear as a 3287 printer to the 3270 host.

9 Pass-through from an ASCII printer to an ASCII host is supported.

10 Pass-through from an ASCII display with a printer attached to an ASCII host.

7.10.4 Supported 3270 Displays

Using the AEA, all CUT mode displays with US English Typewriter keyboards and at least 1920 characters per screen are capable of emulating ASCII terminal types:

- IBM 3101
- DEC VT100
- DEC VT220 (Configuration Support-B Release 2 and later releases)
- Dasher 210 (Configuration Support-B Release 2 and later releases)

The ASCII terminal emulation capability is in addition to the base 3270 display ability to perform in a 3270 environment.

CUT mode terminals include 3278, 3279, 3178, 3179 (not G models) 3180, 3191, 3192 (not G models), 3471 and 3472 (see note below). Also a PC or PS/2 running a 3270 CUT mode emulator is supported.

Note: DFT terminals are not supported on the 3174 AEA feature but DFT/E terminals, such as the 3472-G, can have a CUT mode session and, therefore, can have an ASCII session.

7.10.5 Supported 3270 Printers

The following 3270 US English printers are supported by the AEA either for local copy from ASCII terminals emulating 3270 displays or as mapped ASCII printers.

- 3287 Models 1 and 2
- 3289 Models 1 and 2
- 3230 Model 2
- 3262 Models 3 and 13
- 3268 Model 2
- 4224
- 4214
- 4234
- 4245

7.10.6 Supported ASCII Displays

The following ASCII displays emulate monochrome 3270 devices to a 3270 host when attached to the AEA:

- ADDS Viewpoint A-2**
- ADDS Viewpoint 78**
- ANSI 3.64 terminals**
- DEC VT100
- DEC VT220 (Configuration Support-B Release 2 and later releases)
- DEC VT52
- Hazeltine 1500**
- Esprit Executive 10/78**
- Hewlett-Packard 2621B**
- IBM 3101
- IBM 3161
- IBM 3163
- IBM 3164
- IBM FTTERM (monochrome)
- ROLM Cedar, Cypress and Juniper
- Lear Siegler ADM 3A**
- Lear Siegler ADM 5**
- Lear Siegler ADM 11**
- Lear Siegler ADM 12**
- Lear Siegler ADM 1178**
- Televideo 912**
- Televideo 970**
- Minitel 1B**
- Wyse 50/60**

The following ASCII displays emulate four-color 3270 devices to a 3270 host when attached to the AEA:

- DEC VT241**
- Tektronix 4205** two color only (Configuration Support-B Release 2 and later releases)
- IBM 3164
- IBM FTTERM (color)

There are many other displays which work, for example, most PCs, and PS/2s if they are emulating an ASCII terminal. It is, however, the customers responsibility to test terminals other than those listed above.

It is also possible with Configuration Support-B Release 2 and later releases to modify the supplied UDTs to support a similar or related terminal. *3174 AEA Description and Reference* provides examples of UDTs for:

- DEC VT240**
- Tektronix 4207/8/9**
- Tektronix 4105**

ASCII devices used to emulate a 3270 device on the AEA must be capable of:

- Supporting one of the speeds provided by the AEA (300, 600, 1200, 2400, 4800, 9600 and 19200 bps) on a RS-232 interface. Transmit and receive speeds must be equal.
- Operating in full duplex character mode.
- Supporting the 7-bit code defined by ANSI 3.4 (before Configuration Support-B Release 2).
- Supporting the 7-bit or 8-bit code defined by ANSI 3.4 (with Configuration Support-B Release 2 and later releases).
- Supporting one of the flow control procedures that the AEA supports.
- Displaying at least a 24 row x 80 column screen.

If using a device not listed above, then consider that it should match one of the displays from the list in the following respects:

- The control sequences used for 3270 emulation:
  - Cursor Position
  - Line Erase
  - Screen Erase
  - Highlighting (if available)
  - Status Line Control (if available)
  - Printer Port Sharing (if available)
  - Terminal Setup and Reset.
- Control codes and graphic characters must preserve the same codes and characters on both 3270 displays and ASCII displays.
- The keyboard layout must send the same codes and controls sequences to the AEA.
- The terminal must handle the End-Of-Line and End-Of-Screen condition in the same manner as 3270 displays.

7.10.7 Supported ASCII Printers

ASCII printers, when attached to the AEA, emulate a 3287 with a 2 KB print buffer. If they are attached to an SNA 3174, SNA Character String (SCS) datastream is supported as well. With the graphics support in Configuration Support-B Release 2 and later releases, structured field processing is also supported.

The basic AEA requires printers capable of:

- Supporting one of the speeds provided by the 3174 AEA (300, 600, 1200, 2400, 4800, 9600 and 19200 bps) on a RS-232 interface. Transmit and receive speeds must be equal.
- Operating in full duplex character mode.
- Supporting the 7-bit code defined by ANSI 3.4 (before Configuration Support-B Release 2).
- Supporting the 7-bit or 8-bit code defined by ANSI 3.4 (with Configuration Support-B Release 2 and later releases).
- Supporting one of the flow control procedures that the AEA supports or is capable of printing at the full line speed.
- Supporting either ASCII upper and lower case or folding lower case to upper case.
- Supporting Carriage Return (CR) and Line Feed (LF); CR should not perform LF automatically.
- Not requiring delay characters to allow for mechanical motion.

With UDT and UDX support the connectivity options available are better but you need to define the characteristics yourself.

The printer should support one of the following character sets:

- US ASCII
- ISO 8859-1.2
- DEC MCS
- PC Code Page 850

Otherwise, with Configuration Support-B Release 2 or later releases, you may specify a User-Defined Translate (UDX) table.

IBM ASCII printers supported include:

- 4201 Proprinter and Proprinter II
- 4202 Proprinter XL
- 4207 Proprinter X24
- 4208 Proprinter XL24
- 4224 Printer Models 301, 302, and 3E3

ASCII plotters are also supported (see 7.17, "ASCII Plotter Support" on page 319).

7.10.8 Supported Modems

Modems used to connect ASCII hosts and devices to the AEA can use leased line, limited distance or switched lines. They should be asynchronous, provide equal transmit and receive speeds and conform to EIA RS-232 or CCITT V.24/V.28 specifications.

Table 13 on page 274 lists the signals and pins used by the AEA.

Table 13. AEA Modem Pin Assignment

Pin Number	Signal Name
1	GND (Frame Ground)
2	TD (Transmit Data)
3	RD (Receive Data)
4	RTS (Request To Send)
5	CTS (Clear To Send - optional)
6	DSR (Data Set Ready)
7	SG (Signal Ground)
8	CD (Carrier Detect) or RLSD (Receive Line Signal Detect)
20	DTR (Data Terminal Ready)
22	RI (Ring Indicator)
25	BSY (Busy Out - optional, not RS-232C)

The following “smart modems” are also supported for PABXs and public switched networks:

- Hayes 300, 1200 and 1200B **
- IBM 5841
- MICOM 3012+ and 3024+ **

7.10.9 ASCII Attachment Cabling

Be very careful about the wiring in RS-232 cables. Incorrectly wired cables may cause such signals as Data Terminal Ready (DTR) or Data Set Ready (DSR) to be in the wrong state at the wrong time, and the result usually is that absolutely nothing happens. RS-232 cables come in many varieties with anywhere from three to 25 wires in the cable. The wires may pass straight through, or almost any number may be crossed in the cable. Pin 6 at one end of the cable may be Pin 20 at the other end, or Pin 5 may be jumpered to Pin 8 at one end and a single wire then goes to Pin 4 at the other end. The RS-232 cable currently in use for attaching an asynchronous ASCII terminal to an OEM host communication port is, in many cases, not the proper cable for attaching the same device to the AEA RS-232 port. The key is to understand which connection is being made (modem, null modem, or direct) and then follow the cable diagrams in *3174 Site Planning*, or the *3174 AEA Description and Reference*.

7.11 AEA Example Configuration

The following section describes a sample configuration of the 3174 with the AEA feature installed. Figure 108 illustrates the configuration set up at our test site. This was customized using Configuration Support-B Release 3 and the responses are shown in 7.12, "3174 Customization" on page 276. In this example, all displays are configured with three LTs and are able to connect to any of the hosts.

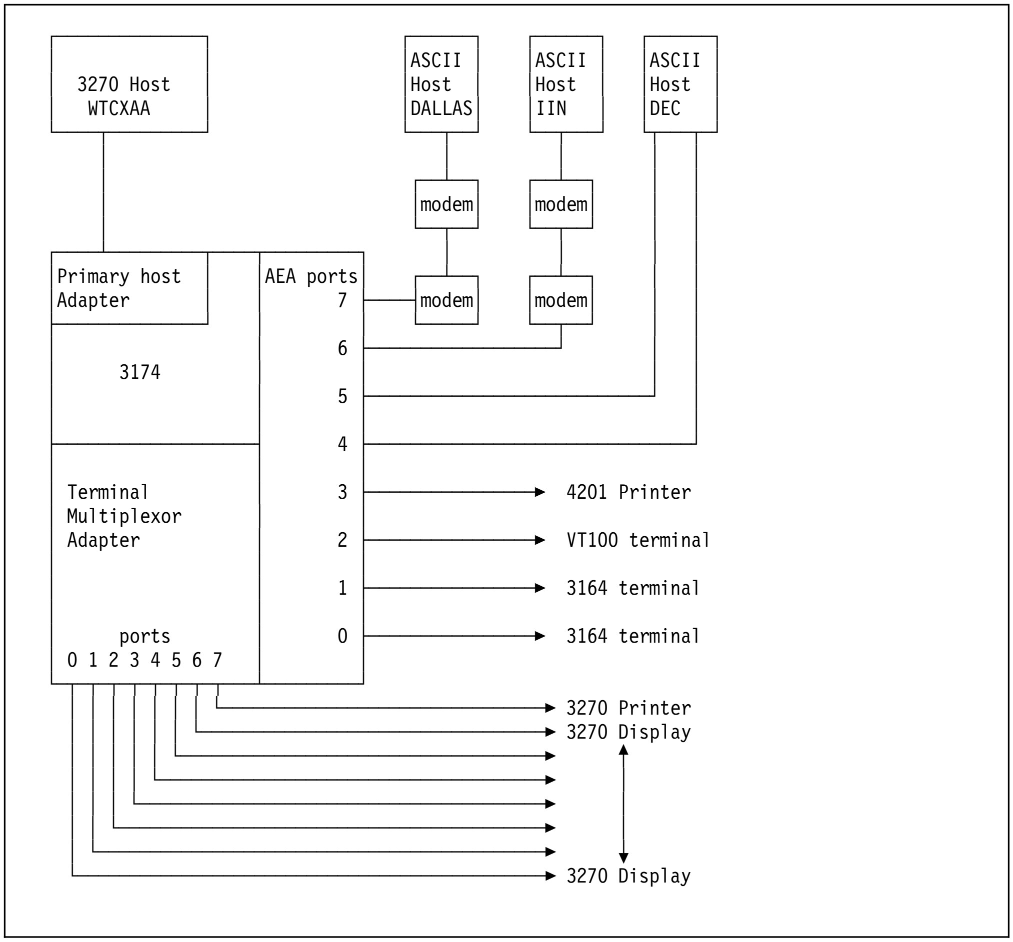


Figure 108. AEA Physical View

7.12 3174 Customization

The ASCII world deals with many different types of terminals with a wide variety of features and operating parameters. Customizing the AEA to support an ASCII environment can be a complex procedure. A successfully configured 3174 is dependent largely on the care taken to prepare and plan for the customization. Therefore, it is important to follow the steps outlined in the *3174 Planning Guide* and to use the planning worksheets provided. These worksheets are a great help because many of the parameters need to be determined before going into the actual customizing process. This process is designed around having the worksheets completed in sequence. If you have performed AEA customization several times before, you may feel comfortable in taking some short cuts but if it is your first time use the worksheets.

To begin customizing, you need the following:

- 3174 Control and Utility diskettes
- 3174 Planning Guide
- Copies of the planning worksheets
- Characteristics of the ASCII devices and hosts you are connecting

Although AEA operation requires the AEA code to be loaded into the 3174, customizing does not. The actual AEA code is loaded during IML.

In the following sections, we describe AEA customization and work through an example where the configuration shown in Figure 108 on page 275 is customized. But first, a look at some of the AEA terminology.

7.12.1 AEA Customizing Terminology

During AEA customizing, you will encounter some unique terms including the following:

- Connection Menu

  A menu list of all the available host connections for a given terminal. The menu appears on the terminal′s screen according to customizing definitions.

- Default Destination

  A host to which the terminal is connected when it is initially turned on. If a host is not defined as the default destination, the Connection Menu is displayed.

- ASCII Terminal Emulation

  A 3270 terminal emulating an ASCII terminal.

- 3270 Terminal Emulation

  An ASCII terminal emulating a 3270 terminal.

- AEA Station

  Any facility supported by the AEA, either ASCII or 3270, host or terminal, printer or display.

- AEA Station Set

  One or more AEA stations with the same attributes.

- AEA Port

Any 3174 port, either coax or ASCII, which uses the AEA functions.

- AEA Port Set

  One or more AEA ports having the same physical characteristics. If more than one station set is defined for a port set, then a display using that port set is presented with a menu prompting for the desired station set.

- AEA Port Set panel

  The AEA Port Set panel is used by both AEA and MLT functions. The AEA function uses it to define the port type (that is, direct, switched, non-switched, or 3270 coax) and the modem type for each station set. MLT is defined in the AEA port set by specifying a session limit for every device.

  Note: Before Configuration Support-B Release 2, ASCII devices could only have a single session and the session limit for ASCII devices was forced to a blank.

- AEA Port to Port Set Map panel

  This is a customizing panel used to associate the AEA port sets with the physical 3174 ports. There is an entry for each 3174 port to which a port set is assigned.

- AEA Station Set panel

  This is the customizing panel which describes the characteristics of the stations which participate in the AEA operation and maps them to a port set. The AEA Station Set definitions comprise many options of which you need to define a subset depending on the station type you are defining.

- Port Assignment

  If the AEA feature is used on a 3174 with the MLT feature, the Port Assignment panel must be completed. The Port Assignment panel defines which physical 3174 port supports which logical terminal.

7.12.2 AEA Customizing Worksheets

Worksheet numbers are dependent on the microcode release level.

With Configuration Support-B Release 3, which is used in our example configuration, the worksheets used for customizing the AEA are:

- Worksheet 15 - 3270 Attachment Diagram

  On this sheet, you group each 3270 port into a port set. You use this sheet to plan for the attachment of 3270 terminals to an ASCII host.

- Worksheet 16 - ASCII Attachment Diagram

  This sheet is used to group the ASCII ports into port sets.

- Worksheet 17 - AEA Configure
- Worksheet 18 - AEA Port Set
- Worksheet 19 - AEA Port-to-Port Set Map
- Worksheet 20 - AEA Station Set
- Worksheet 21 - AEA Default Destination

In addition there are other worksheets to fill out if you are modifying or creating UDTs or UDXs.

Worksheets 17 to 21 are in the same format as the actual screens you use to customize. The first two planning worksheets, 15 and 16, are not like any screen but they are probably the key to getting it right because this is where you decide all the names and groups you will use.

7.12.3 AEA Customizing Flowchart

The following chart is a guide to the AEA customization process.

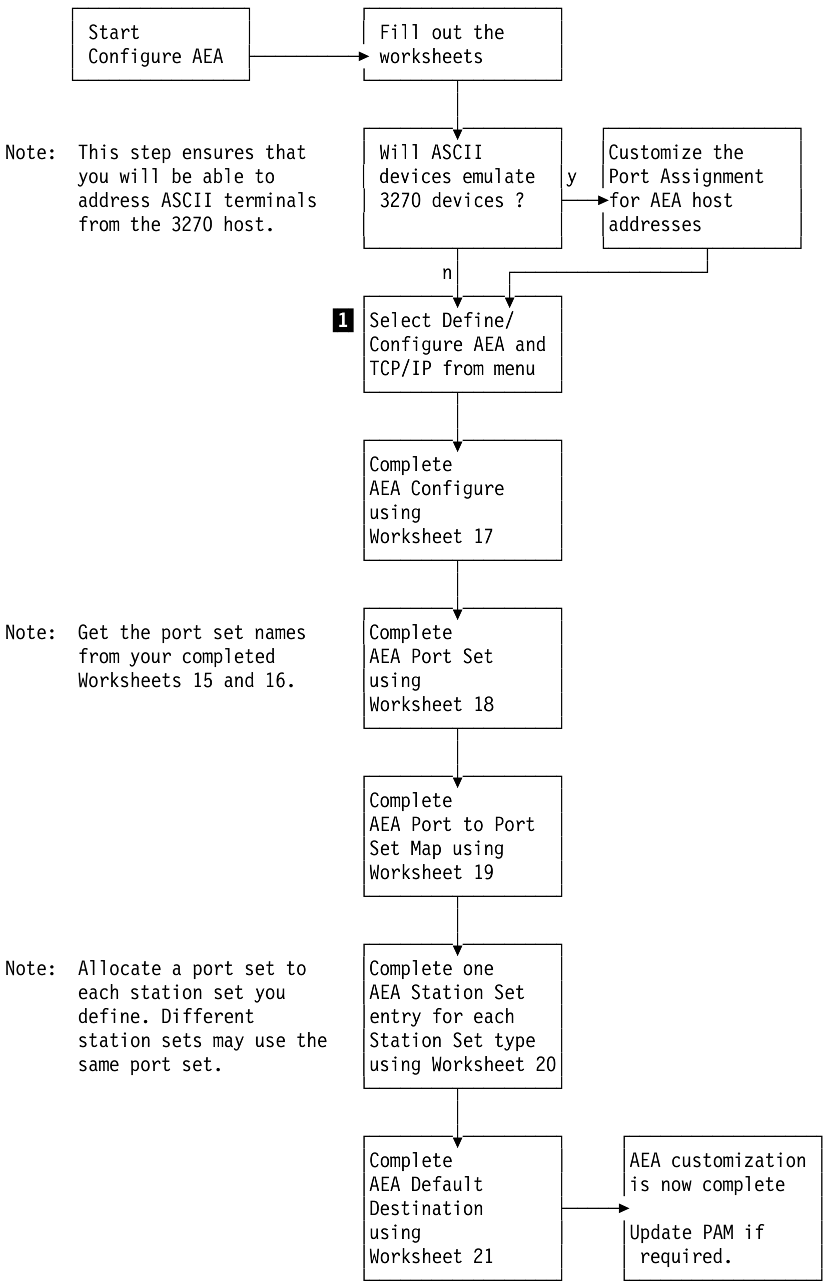


Figure 109. AEA Customizing Overview

Note:

1 With Configuration Support-C Release 3 and later, the customization panels for AEA and TCP/IP has to be selected by taking the option 5 (Define AEA and TCP/IP) from the 3174 Customize Control Disk menu and then choosing option 1 (Configure AEA and TCP/IP) from the AEA and TCP/IP menu.

see Chapter 21, "TCP/IP" on page 605 for the TCP/IP definitions.

1 With Configuration Support-B Release 2 and later releases up to Configuration Support-C Release 2, the customization panels for AEA is selected by taking the option 5 (Configure AEA) from the 3174 Customize Control Disk menu and then choosing option 1 (Configure AEA) from the AEA menu.

7.12.4 AEA Customizing Questions

The questions asked during AEA customization are briefly described in this section.

Question 110: MLT Configuration Level

Before configuring the AEA, make sure that you have this question answered in your host(s) definition. If the answer for this question is non-zero (0=No MLT), you need a response to question 116 as well. This sets up the host addresses used by both 3270 and ASCII terminals when they are connected to a 3270 host. The AEA Connection Menu, if used, lists the session under the host name you specify in the station set definition.

If you specify ASCII MLT in question 703 (Configuration Support-B Release 2 and later) then you must also specify MLT support for question 110. See 9.1, “Multiple Logical Terminal” on page 331 for more information on MLT.

AEA Configure Panel

This panel is different for microcode levels before Configuration Support-B Release 2. Figure 110 shows the panel for Configuration Support-B Release 2 and later releases up to Configuration Support-C Release 2. The main differences are:

- Addition of two new questions: 702 and 703
- Deletion of the prompt for the AEA password (question 701)

  Password is now specified at the port set level.

```
                ___________AEA Configure___________


     700 - 1

     702 - 1

     703 - 1

     710 - 00000000      711 - 00000000      712 - 00000000      713 - 00000000
```

Figure 110. AEA Configure Panel (Configuration Support-B Release 2 and Later Releases up to Configuration Support-C Release 2)

Figure 111 on page 281 shows the panel for Configuration Support-C Release 3 and later. The major difference is that the question 700 requires a double-digit response since it combines the AEA and TCP/IP features.

```
                 ________AEA and TCP/IP Configure________


    700 - 1 0

    702 - 1

    703 - 1

    710 - 00000000     711 - 00000000     712 - 00000000     713 - 00000000
```

Figure 111. AEA Configure Panel (Configuration Support-C Release 3 and Later)

Question 700: Configure the AEA Feature

This question applies to Configuration Support-B Release 2 and later releases up to Configuration Support-C Release 2 and requires a single-digit response.

Response:

- 0=Turns off the AEA feature and maintains any AEA configuration data previously stored (default response).
- 1=Initiates configuration procedure for the AEA feature, or use previously configured data, and turns on the AEA.

Question 700: Configure the AEA and TCP/IP Feature

This question applies to Configuration Support-C Release 3 and later and requires a double-digit response. The first digit is for the AEA feature and the second digit is for the TCP/IP feature. See Chapter 21, "TCP/IP" on page 605 for the appropriate responses.

Digit 1 Response:

- 0=Turns off the AEA feature and maintains any AEA configuration data previously stored (default response).
- 1=Initiates configuration procedure for the AEA feature, or use previously configured data, and turns on the AEA.

Question 701: Password for ASCII Displays on Switched Lines

Question 701 has been removed with Configuration Support-B Release 2 and later releases. See port set definition for entering passwords.

You may enter up to eight alphanumeric characters (no blank or space allowed) as the password for all ASCII display stations which operates on switched lines. If there is no response for this question, the user is not prompted for a password.

Question 702: Control Key Assignment

This question applies to Configuration Support-B Release 2 and later releases only and allows you to specify the control key when using ASCII emulation.

Response:

- 0=Use the Alt key (same as before Configuration Support-B Release 2)
- 1=Use the Ctrl key (default response)

Question 703: Request MLT for AEA

This question applies to Configuration Support-B Release 2 and later releases only and allows you to specify if you are using MLT on ASCII terminals.

Response:

- 0=No AEA MLT support (default response)
- 1=Request AEA MLT support

Question 710: Miscellaneous ASCII Feature Options (A)

Eight digits (0=No or 1=Yes). The default response is 00000000.

Response:

- **Digit 1 - Reverse Video Blanks-to-Hyphen Option**

  The response is valid with Configuration Support-B Release 2 and later releases.

  For 3270 displays *without* EABs, specifying this bit as 1 results in reverse video blanks displaying as hyphens.

- **Digit 2 - Automatic New Line After End of Print**

  The response is valid with Configuration Support-B Release 4 and later releases.

  Specifying this bit as 1 results in an automatic new line only if the column pointer is in a position other than column 1.

  Specifying this bit as a 0 results in an automatic new line regardless of where the column pointer is located.

- **Digit 3 - DSR Timing for Activating Connections**

  The response is valid with Configuration Support-B Release 4 and later releases.

  Specifying this bit as a 1 results in the AEA recognizing that a connection has been established on switched or direct ports if DSR remains high for 500 milliseconds in response to the AEA raising DTR and RTS. This allows for faster connections on lines where the leads are stable.

  When this bit is specified as a 0, DSR must remain high for two seconds in response to the AEA raising DTR and RTS.

- **Digit 4 - DSR Timing for Deactivating Connections**

  The response is valid with Configuration Support-B Release 4 and later releases.

  When this bit is specified as a 1, the AEA will not immediately deactivate a connection for a direct or switched port when DSR drops. Instead, it will time how long DSR remains low. If it is low for less than two seconds, the connection will remain active. If it is low for more than two seconds, the connection will be deactivated.

When this bit is specified as a 0, the AEA will deactivate a connection for direct and switched ports as soon as DSR drops.

- **Digit 5 - Printer Keyboard Option**

  The response is valid with Configuration Support-B Release 4 and later releases.

  When this bit is set to 1, it causes the AEA to ignore all inputs from the ASCII printer except the pacing data.

- **Digit 6 - Status Line Update Option**

  The response is valid with Configuration Support-B Release 4 and later releases.

  When this bit is set to 1, it causes the AEA to update the status line after it finishes updating the data portion of the screen. If you are using FTHLLAPI programs that expect the status line to be updated after the entire screen is written, you must set this bit.

- **Digit 7 - Ignore Dim On/Dim Off Sequence**

  The response is valid with Configuration Support-C Release 1 and later releases.

  For ASCII emulation of the Data General D210, specifying this digit as 1 results in the sequences for turning the dim attribute on and off being ignored.

- **Digit 8 - Reserved**

Question 711: Miscellaneous ASCII Feature Options (B)

Eight digits (0=No or 1=Yes). The default response is 00000000.

Response:

- **Digit 1 - Send TERMSELF when Device Disconnects**

  The response is valid with Configuration Support-B Release 4 and later releases.

  Specifying this bit as a 1 results in TERMSELF being sent when a device in session with a 3270 SNA host application disconnects.

  Specifying this bit as a 0 results in an UNBIND being sent when a device in session with a 3270 SNA host application disconnects.

- **Digit 2 - SLU Capability of Power Off Request**

  The response is valid with Configuration Support-B Release 4 and later releases.

  Specifying this bit as a 1 results in a value of X′00′ for the Secondary LU capability byte of control vector X′0C′ for Power Off Notify requests. This prevents a SNA host application from retaining data between sessions.

  Specifying this bit as a 0 results in a value of X′10′ for the Secondary LU Capability byte of control vector X′0C′ for a Power Off Notify Request.

- **Digit 3 - Disconnect on UNBIND**

  The response is valid with Configuration Support-C Release 1 and later releases.

For ASCII devices in 3270 emulation mode, the device will be disconnected upon receipt of an UNBIND other than types 2 or 3.

When the AEA port is defined with multiple sessions, an UNBIND on any of the sessions causes the line connection to be broken. This function allows a host application to not only terminate the LU-LU session but also to terminate the switched line connection as well.

- **Digits 4 through 8 - Reserved**.

Question 712: Miscellaneous ASCII Feature Options (C)

Eight digits (0=No or 1=Yes). The default response is 00000000. All digits are reserved, even with Configuration Support-C Release 5.

Response:

- **Digits 1 through 8 - Reserved**.

Question 713: Miscellaneous ASCII Feature Options (D)

Eight digits (0=No or 1=Yes). The default response is 00000000. All digits are reserved, even with Configuration Support-C Release 5.

Response:

- **Digits 1 through 8 - Reserved**.

Port Set Definitions

Following are examples of AEA Port Set panels:

- Figure 112 on page 285 shows the panel used with Configuration Support-B Release 1 and earlier releases. A password for *all* ASCII display stations on switched lines can be specified in question 701. For ASCII devices, the session limit is 1.
- Figure 113 on page 285 shows the panel used with Configuration Support-B Release 2 and later releases. A password can be specified for each port set. The session limit for ASCII devices can be greater than 1 because they support MLT with these releases.

When the screen is first displayed, the entry fields are blank. The entries shown in Figure 113 on page 285 are for our example configuration.

```
                    _________AEA Port Set________


       Name            Session      Port        Modem
                        Limit       Type        Type
  1 =  3270DSP_           3           1           -
  2 =  3270PRT_           1           1           _
  3 =  3164DSP_           _           3           _
  4 =  VT100D__           _           2           1
  5 =  4201PRT_           _           3           _
  6 =  DECHOST_           _           3           _
  7 =  IBMIN___           _           2           1
  8 =  DALLAS__           _           2           1
  9 =  ________           _           _           _
 10 =  ________           _           _           _
 11 =  ________           _           _           _
 12 =  ________           _           _           _
 13 =  ________           _           _           _
 14 =  ________           _           _           _
 15 =  ________           _           _           _
 16 =  ________           _           _           _
```

Figure 112. AEA Port Set Panel with Configuration Support-B Release 1 and Earlier Releases

```
                        _________AEA Port Set________


       Name            Session      Port        Modem        Password
                        Limit       Type        Type
  1 =  3270DSP_           3           1           -          ________
  2 =  3270PRT_           1           1           _          ________
  3 =  3164DSP_           3           3           _          ________
  4 =  VT100D__           3           2           1          IBMITSC_
  5 =  4201PRT_           1           3           _          ________
  6 =  DECHOST_           1           3           _          ________
  7 =  IBMIN___           1           2           1          ________
  8 =  DALLAS__           1           2           1          ________
  9 =  ________           _           _           _          ________
 10 =  ________           _           _           _          ________
 11 =  ________           _           _           _          ________
 12 =  ________           _           _           _          ________
 13 =  ________           _           _           _          ________
 14 =  ________           _           _           _          ________
 15 =  ________           _           _           _          ________
 16 =  ________           _           _           _          ________
```

Figure 113. AEA Port Set Panel for Configuration Support-B Release 2 and Later Releases

Response Field	**Description**
Name	Is the name you assign to each set of ports. A maximum of 16 port set names is allowed. In our example, entry number 1 is a 3270 display with three MLT sessions, entry number 2 is a 3270 printer, and so on. We suggest that you assign meaningful names so that you can easily recognize the port sets they refer to.

Session Limit Is the maximum number of sessions permitted for a device within a port set. All devices belonging to the same port set will have the same session limit.

The session limit for 3270 devices should match the number of host addresses assigned in the Port Assignment table (question 117):

- If the number of host addresses is less than the session limit, sessions without host addresses cannot access 3270 host.

  For example, if a 3270 display attached to port 26-00 has a session limit of three and the number of host addresses assigned is two, then the 3270 display can only have two 3270 host sessions.

- If the number of host addresses is more than the session limit, the excess addresses will not be used.

  For example, if the 3270 display attached to port 26-00 has a session limit of three and the number of host addresses assigned is four, then the 3270 display can only have three 3270 host sessions and one host address will be unused.

Port Type Specifies the type of port for each port set; that is, how the ASCII devices are connected to the AEA port:

- 1=3270 devices
- 2=Switched (for ASCII devices connected via modems and switched lines)
- 3=Direct (for ASCII devices connected via null modems)
- 4=Non-Switched (for ASCII devices connected via modems and non-switched lines).

Modem Type Specifies the type of modem used for the port:

- 1=Hayes (or Hayes-compatible)
- 2=MICOM (or MICOM-compatible)
- 3=IBM
- 4=Other (modems that meet the AEA specifications).

For 3270 port sets, do not respond (leave blank).

Password Can be up to eight characters and is used to verify ASCII device users. If nothing is entered, then a password is not requested. If entered, then a password is requested when the ASCII terminal connects to the 3174.

Port to Port Set Map

The next AEA customization panel is the Port to Port Set Map. This panel is used to assign AEA ports (the definition of an AEA port being a 3174 port, either coax or ASCII, which uses the AEA functions) to the port sets defined in the previous panel.

Figure 114 on page 287 shows the panel used with Configuration Support-B Release 3 and earlier releases. It includes the responses used for our example configuration.

Figure 115 on page 288 shows the panel used with Configuration Support-B Release 4 and later releases; that is, after the introduction of the 3270 Port Expansion Feature (hardware group 27).

For our example using Configuration Support-B Release 3,the panel is divided into three sections:

- The first section is for 3270 ports belonging to hardware group 26, divided into four groups of eight.
- The second section is for the three AEAs which may be installed, hardware groups 21, 22 and 23.
- The third section is a list of the valid port sets that you have specified previously in the AEA Port Set panel.

To customize this panel, enter the port set number (from the list at the bottom of the panel) in the appropriate position for each 3174 port that you wish to use as an AEA port. This information should be on Worksheet 15 for 3270 ports and Worksheet 16 for ASCII ports.

```
                 _________ AEA Port to Port Set Map _________

 Type the port set number to group the 3174 ports

    3270 Ports        0   1   2   3   4   5   6   7
  26-00 to 26-07      1_  1_  1_  1_  1_  1_  1_  2_
  26-08 to 26-15      __  __  __  __  __  __  __  __
  26-16 to 26-23      __  __  __  __  __  __  __  __
  26-24 to 26-31      __  __  __  __  __  __  __  __

    AEA Ports
  21-00 to 21-07      3_  3_  4_  5_  6_  6_  7_  8_
  22-00 to 22-07      __  __  __  __  __  __  __  __
  23-00 to 23-07      __  __  __  __  __  __  __  __

  Port Sets
  1 = 3270DSP         2 = 3270PRT        3 = 3164DSP        4 = VT100D
  5 = 4201PRT         6 = DECHOST        7 = IBMIN          8 = DALLAS
  9 =                10 =               11 =               12 =
 13 =                14 =               15 =               16 =
```

Figure 114. AEA Port to Port Set Map Panel (Configuration Support-B Release 3 and Earlier Releases)

```
                  ________ AEA Port to Port Set Map ________

   Type the port set number to group the 3174 ports

      3270 Ports       0   1   2   3   4   5   6   7
    26-00 to 26-07     1_  1_  1_  1_  1_  1_  1_  2_
    26-08 to 26-15     __  __  __  __  __  __  __  __
    26-16 to 26-23     __  __  __  __  __  __  __  __
    26-24 to 26-31     __  __  __  __  __  __  __  __






    Port Sets
    1 = 3270DSP        2 = 3270PRT        3 = 3164DSP        4 = VT100D
    5 = 4201PRT        6 = DECHOST        7 = IBMIN          8 = DALLAS
    9 =               10 =               11 =               12 =
   13 =               14 =               15 =               16 =
```

Figure 115 (Part 1 of 3). AEA Port to Port Set Map Panel (Configuration Support-B Release 4 and Later Releases)

```
                  ________ AEA Port to Port Set Map ________

   Type the port set number to group the 3174 ports

      3270 Ports       0   1   2   3   4   5   6   7
    27-00 to 27-07     __  __  __  __  __  __  __  __
    27-08 to 27-15     __  __  __  __  __  __  __  __
    27-16 to 27-23     __  __  __  __  __  __  __  __
    27-24 to 27-31     __  __  __  __  __  __  __  __






    Port Sets
    1 = 3270DSP        2 = 3270PRT        3 = 3164DSP        4 = VT100D
    5 = 4201PRT        6 = DECHOST        7 = IBMIN          8 = DALLAS
    9 =               10 =               11 =               12 =
   13 =               14 =               15 =               16 =
```

Figure 115 (Part 2 of 3). AEA Port to Port Set Map Panel (Configuration Support-B Release 4 and Later Releases)

```
            _________ AEA Port to Port Set Map _________

  Type the port set number to group the 3174 ports

     AEA Ports       0   1   2   3   4   5   6   7
   21-00 to 21-07    3_  3_  4_  5_  6_  6_  7_  8_
   22-00 to 22-07    __  __  __  __  __  __  __  __
   23-00 to 23-07    __  __  __  __  __  __  __  __





   Port Sets
   1 = 3270DSP       2 = 3270PRT       3 = 3164DSP       4 = VT100D
   5 = 4201PRT       6 = DECHOST       7 = IBMIN         8 = DALLAS
   9 =              10 =              11 =              12 =
  13 =              14 =              15 =              16 =
```

Figure 115 (Part 3 of 3). AEA Port to Port Set Map Panel (Configuration Support-B Release 4 and Later Releases)

Station Set Definition (Questions 721-787)

The AEA Station Set panel is used to define the characteristics of the displays, printers, hosts, datastreams, lines, and others, used with the AEA.

You can define up to 30 station sets, using the PF11 key to advance to more definition panels. Use PF8 when you have finished. Two station sets are defined on each panel. Each station set number, station set name, station set type and associated port set you enter are assigned on Worksheets 15 and 16. Station set types are listed in Table 14 on page 295 for reference. The remaining questions depend on the station type.

For ASCII displays you may define the same port set name to several station sets. A user of an ASCII display belonging to this port set will be prompted to select the terminal type being used, from a list of terminal types presented with the prompt. The station set name entered on this panel will also appear on the prompt screen.

Configuration Support-B Release 2 and later releases include several additional questions for the AEA Station Set panel. Compare Figure 116 on page 290 and Figure 117 on page 290, where the additional questions are shown highlighted.

```
          __________AEA Station Set__________


 1  721 - ________________________  722 - __  723 - ________
    725 - 1
    731 - 1     732 - 1    733 - 0  734 - _  735 - 0  736 - 1  737 - _
    741 - 000   742 - 015  743 - 1
    751 - _     752 - ________________________________________________
    761 - 1     762 - 1    763 - 1  764 - 1
    771 - 1     772 - 1    773 - 1  774 - 1  775 - 1
    781 - 0     782 - 0    783 - 066

 2  721 - ________________________  722 - __  723 - _______
    725 - 1
    731 - 1     732 - 1    733 - 0  734 - _  735 - 0  736 - 1  737 - _
    741 - 000   742 - 015  743 - 1
    751 - _     752 - ________________________________________________
    761 - 1     762 - 1    763 - 0  764 - 1
    771 - 1     772 - 1    773 - 1  774 - 1  775 - 1
    781 - 0     782 - 0    783 - 066
```

Figure 116. AEA Station Set Panel (Configuration Support-B Release 1 and Earlier Releases)

```
               _____________ AEA Station Set ______________


 1  721 - ________________________  722 - __  723 - ________    725 - 1
    731 - 1    732 - 1    733 - 0   734 - _   735 - 0  736 - 1  737 - _
    741 - 000  742 - 015  743 - 1   744 - 0   745 - 0  746 - 0 0
    751 - _    752 - ________________________________________________
    761 - 1    762 - 1    763 - 1   764 - 1  765 - 0
    771 - 1    772 - 1    773 - 1   774 - 1   775 - 1  776 - 1
    781 - 0  782 - 0  783 - 066  784 - 1  785 - 11111000  786 - 132  787 - 0


 2  721 - ________________________  722 - __  723 - ________    725 - 1
    731 - 1    732 - 1    733 - 0   734 - _   735 - 0  736 - 1  737 - _
    741 - 000  742 - 015  743 - 1   744 - 0   745 - 0  746 - 0 0
    751 - _    752 - ________________________________________________
    761 - 1    762 - 1    763 - 1   764 - 1   765 - 0
    771 - 1    772 - 1    773 - 1   774 - 1   775 - 1  776 - 1
    781 - 0  782 - 0  783 - 066  784 - 1  785 - 11111000  786 - 132  787 - 0
```

Figure 117. AEA Station Set Panel (Configuration Support-B Release 2 and Later Releases)

The station set definitions used in our example are shown in the following panels.

```
                    _____________AEA Station Set____________


 1  721 - WTCXAA ITSC MVS4_______   722 - 3H  723 - _______    725 - 1
    731 - 1    732 - 1    733 - 0   734 - _   735 - 0  736 - 1  737 - _
    741 - 001  742 - 015  743 - 1   744 - 0   745 - 0  746 - 0 0
    751 - _    752 - _______________________________________________
    761 - 1    762 - 1    763 - 1   764 - 1   765 - 0
    771 - 1    772 - 1    773 - 1   774 - 1   775 - 1  776 - 1
    781 - 0  782 - 0  783 - 066  784 - 1  785 - 11111000  786 - 132  787 - 0


 2  721 - DEC HOST_______________   722 - AH  723 - DECHOST_    725 - 1
    731 - 1    732 - 1    733 - 3   734 - 7   735 - 4  736 - 1  737 - 7
    741 - 000  742 - 015  743 - 0   744 - 0   745 - 0  746 - 0 0
    751 - 1    752 - _______________________________________________
    761 - 1    762 - 1    763 - 0   764 - 1   765 - 0
    771 - 1    772 - 1    773 - 1   774 - 1   775 - 1  776 - 1
    781 - 0  782 - 0  783 - 066  784 - 1  785 - 11111000  786 - 132  787 - 0
```

Figure 118. AEA Station Set Panel (Part 1 of 5)

Station Set 1 - WTCXAA ITSC MVS4: This station set defines the IBM host (question 722 = 3H). Most of the other questions are disregarded for an IBM host. Question 721 is the Station Set Name. This name appears, as entered here, on the Connection Menu. The Connection Menu appears on an AEA terminal's screen if a default host destination is not defined for it. The Station Set Name should, therefore, be a meaningful one for the user.

Station Set 2 - DEC HOST: This is set up as a directly attached ASCII host. An ASCII host requires many options to be defined to the AEA; these options are explained later in this section.

```
              ____________ AEA Station Set _____________


 3  721 - IBM INFORMATION NETWORK_  722 - AH  723 - IBMIN___    725 - 1
    731 - 1    732 - 1    733 - 3   734 - 6   735 - 2  736 - 1  737 - 6
    741 - 000  742 - 002  743 - 0   744 - 0   745 - 0  746 - 0 0
    751 - 1    752 - T9W5559960______________________________________
    761 - 1    762 - 1    763 - 0   764 - 1   765 - 0
    771 - 1    772 - 1    773 - 1   774 - 1   775 - 1  776 - 1
    781 - 0  782 - 0  783 - 066  784 - 1  785 - 11111000  786 - 132  787 - 0


 4  721 - 3270 DISPLAYS___________  722 - 3D  723 - 3270DSP_    725 - 1
    731 - 1    732 - 1    733 - 0   734 - _   735 - 0  736 - 1  737 - _
    741 - 000  742 - 015  743 - 1   744 - 0   745 - 0  746 - 0 0
    751 - 2    752 - ________________________________________________
    761 - 1    762 - 1     763 - 1   764 - 1   765 - 0
    771 - 1    772 - 1     773 - 1   774 - 1   775 - 1  776 - 1
    781 - 0  782 - 0  783 - 066  784 - 1  785 - 11111000  786 - 132  787 - 0
```

Figure 119. AEA Station Set Panel (Part 2 of 5)

Station Set 3 - IBM INFORMATION NETWORK: This station set is defined for an autodial feature. It defines what appears to the 3174 as an ASCII host. Actually, it defines a 3708 protocol converter whose local telephone number is 9-555-9960. As a result, this station set allows any display attached to the 3174, including 3270 displays, to dial out to the remote IBM host, using ASCII protocol for the dial link.

Note the syntax of question 752 (phone number). When autodial is used, a modified Hayes command set is used. In this example, the user is not allowed to enter the Hayes ATDT command. The user should use Ws instead of commas for pause characters.

Station Set 4 - 3270 DISPLAYS: There are only four relevant questions to respond to for 3270 displays. They are the station set name, the station set type (3D), the port set name it will use and the Connection Menu option.

```
                    ____________ AEA Station Set _____________


 5  721 - 3270 PRINTERS___________  722 - 3P  723 - 3270PRT_    725 - 0
    731 - 1    732 - 1    733 - 0   734 - _   735 - 0  736 - 1  737 - _
    741 - 000  742 - 015  743 - 1   744 - 0   745 - 0  746 - 0 0
    751 - _    752 - ________________________________________________
    761 - 1    762 - 1    763 - 1   764 - 1   765 - 0
    771 - 1    772 - 1    773 - 1   774 - 1   775 - 1  776 - 1
    781 - 0  782 - 0  783 - 066  784 - 1  785 - 11111000  786 - 132  787 - 0


 6  721 - 3164 DISPLAYS___________  722 - I3  723 - 3164DSP_    725 - 1
    731 - 1    732 - 1    733 - 7   734 - _   735 - 3  736 - 1  737 - _
    741 - 000  742 - 015  743 - 0   744 - 0   745 - 0  746 - 0 0
    751 - _    752 - ________________________________________________
    761 - 1    762 - 1    763 - 1   764 - 1   765 - 0
    771 - 1    772 - 1    773 - 1   774 - 1   775 - 1  776 - 1
    781 - 0  782 - 0  783 - 066  784 - 1  785 - 11111000  786 - 132  787 - 0
```

Figure 120. AEA Station Set Panel (Part 3 of 5)

Station Set 5 - 3270 PRINTERS: There are only three relevant questions to respond to for 3270 printers. They are the station set name, the station set type (3P) and the port set name.

Station Set 6 - 3164 DISPLAYS: This station set defines a direct-attached 3164 running at 19.2 Kbps. We use one of the standard station types of I3. Baud rate is set to 19200 bps and parity to none. Obviously, the display must be set up to match these parameters.

In our tests we actually used a 3151 terminal. If we had defined it as such using I2 or I3 station types, we would not get the operator information on the status line. We would have to toggle it on and off using the Esc ? keystroke sequence (see *Terminal User's Reference for Expanded Functions*). We found, however, this did not highlight data because a 3164 is a color display and does not use highlighting.

If you are using Configuration Support-B Release 2 and later releases, you can create a new UDT definition for a monochrome 3164 and the highlighting should work then.

```
                 ____________ AEA Station Set _____________


7  721 - VT100 DISPLAYS__________  722 - V1  723 - VT100D__    725 - 1
   731 - 1    732 - 1    733 - 0   734 - _   735 - 0  736 - 1  737 - 6
   741 - 000  742 - 015  743 - 1   744 - 0   745 - 0  746 - 0 0
   751 - _    752 - ________________________________________________
   761 - 1    762 - 1    763 - 1   764 - 1   765 - 0
   771 - 1    772 - 1    773 - 1   774 - 1   775 - 1  776 - 1
   781 - 0  782 - 0  783 - 066  784 - 1  785 - 11111000  786 - 132  787 - 0


8  721 - 4201 PRINTERS___________  722 - AP  723 - 4201____    725 - 1
   731 - 1    732 - 1    733 - 7   734 - _   735 - 3  736 - 1  737 - _
   741 - 000  742 - 015  743 - 1   744 - 0   745 - 0  746 - 0 0
   751 - _    752 - ________________________________________________
   761 - 1    762 - 1    763 - 1   764 - 1   765 - 0
   771 - 1    772 - 1    773 - 1   774 - 1   775 - 1  776 - 1
   781 - 0  782 - 0  783 - 066  784 - 1  785 - 11111000  786 - 132  787 - 0
```

Figure 121. AEA Station Set Panel (Part 4 of 5)

Station Set 7 - VT100 DISPLAYS: This station set defines a dial up port with autobaud/autoparity set. This means that the terminal may be set at any desired parity and baud rate and the control unit adjusts itself based upon the CR.CR (Carriage Return, period, Carriage Return) sequence typed at the terminal.

Station Set 8 - 4201 PRINTERS: This station set is for an ASCII printer for attachment to the 3270 host.

```
                AEA Station Set

 9  721 - DALLAS DEC SYSTEM VT100_  722 - AH  723 - DALLAS__    725 - 1
    731 - 1    732 - 1    733 - 3   734 - 4   735 - 4  736 - 1  737 - 4
    741 - 001  742 - 015  743 - 0   744 - 0   745 - 0  746 - 0 0
    751 - 1    752 - T9W12145555555_________________________________
    761 - 1    762 - 1    763 - 0   764 - 1   765 - 0
    771 - 1    772 - 1    773 - 1   774 - 1   775 - 1  776 - 1
    781 - 0  782 - 0  783 - 066  784 - 1  785 - 11111000  786 - 132  787 - 0


10  721 - ________________________  722 - __  723 - ________    725 - 1
    731 - 1    732 - 1    733 - 0   734 - _   735 - 0  736 - 1  737 - _
    741 - 000  742 - 015  743 - 1   744 - 0   745 - 0  746 - 0 0
    751 - _    752 - ________________________________________________
    761 - 1    762 - 1    763 - 1   764 - 1   765 - 0
    771 - 1    772 - 1    773 - 1   774 - 1   775 - 1  776 - 1
    781 - 0  782 - 0  783 - 066  784 - 1  785 - 11111000  786 - 132  787 - 0
```

Figure 122. AEA Station Set Panel (Part 5 of 5)

Station Set 9 - DALLAS DEC SYSTEM VT100: The last station set is for another dial up ASCII host using VT100 emulation.

The following sections provide brief descriptions of each station set customizing question.

Question 721: Station Set Name

This name identifies the station set. Use a unique and meaningful name because it will be appear on the terminal menus (see the note on ASCII displays on 289).

Question 722: Station Type

Table 14 lists the station types supported and the corresponding responses required. New station types supported by Configuration Support-C Release 2 and later are shown highlighted.

Table 14 (Page 1 of 2). AEA Station Types

Station Set Type	**Response**
3270 Host	3H
3270 Display	3D
3270 Printer	3P
ASCII Host	AH
ASCII Plotter	AL
ASCII Printer	AP
TCP/IP Host	TH
ADDS View Point A1 and A2	A2
ADDS View Point/78	A7
Hazeltine 1500	E1
Esprit Executive 10/78	E7
FTTERM Color	FC
FTTERM Monochrome	FM
Hewlett Packard 2621B	H2

Table 14 (Page 2 of 2). AEA Station Types	
Station Set Type	**Response**
IBM 3101	I1
IBM 3151/3161/3162/3163	I2
IBM 3151/3161/3162/3163	I3
IBM 3164	I4
IBM 3151/3161/3162/3163 with 3708 cartridge	I5
IBM 3151 Model 31, 41, 51, 61 (see Note 1)	**I6**
IBM 3162 (27x132) (see Note 2)	**I7**
Lear Siegler ADM 11 or 12	L1
Lear Siegler ADM 3A or 5	L3
Lear Siegler ADM 11/78	L7
Minitel 1B	M1
IBM 3162 Model 870	R0
ROLM Cypress, Cedar and Juniper	R1
ANSI 3.64 Terminal	S1
Televideo 912	T1
Televideo 970	T7
DEC VT100	V1
DEC VT241 (see Note 1)	V2
DEC VT52	V5
DEC VT220 (see Note 1)	V6
DEC VT100 (43x80)	**V7**
Wyse 50/60	W1
Tektronix 4205	X4
User Defined Table 1	U1
User Defined Table 2	U2
User Defined Table 3	U3
User Defined Table 4	U4
User Defined Table 5	U5
User Defined Table 6	U6

Notes:

1. These terminal types support 24x80 and 24x132 screen sizes.
2. This terminal type also supports 24x80 screen size.
3. Station types shown highlighted are additionally supported with Configuration Support-C Release 2 and later.

Question 723: Port Set Name

The response for this question is up to eight alphanumeric characters (blanks permitted). The port set name identifies the port set which has been assigned to this station set. These names should correlate with your entries in the AEA Port Set panel.

Question 725: Host Connection Menu Option

The response specifies whether display station users in this station set are able to select a host connection from a Connection Menu which appears on the screen after IML.

- 0=Not allowed to select alternative host connections from the Connection Menu.

  With this option, the user can only access the host connection defined as the default destination (see 7.12.5, "AEA Default Destination Panel" on page 307).

- 1=Allowed to select alternative host connections from the Connection Menu (default response).

Question 731: Flow Control Type

The response specifies the type of flow control to be used between the 3174 and the ASCII host, display station or printer. The correct flow control must be specified otherwise overrun errors will result.

Valid responses are:

- 0=No flow control

  The AEA will not recognize or apply any type of flow control.

- 1=XON/XOFF (default response)

  The AEA will transmit and receive XON and XOFF to control data flow.

  If XON/XOFF is selected for an ASCII host using D210 datastream, it is effective in one direction only. The AEA will send XON/XOFF to the ASCII host to control data flow. The AEA will treat any XON/XOFF received from the ASCII host as a normal character and not use it for flow control.

- 2=DTR (applies only to non-switched port types)

  When the AEA detects a drop in DSR, it will stop transmission to the attached device.

  When the AEA wants the attached device to stop transmission, it will drop the DTR lead, which is cabled to the attached device's DSR lead.

- 3=RFS, also known as CTS (applies only to direct port types).

Question 732: XON/XOFF Transmission Resumption

If XON/XOFF is used, the response indicates the signal which the 3174 must receive to resume transmitting after it has received an XOFF:

- 1=Resume after any character is received (default response)
- 2=Resume only after XON is received.

You should use the default as this precludes display station ″hang-ups″ caused by an accidental transmission of XOFF.

Question 733: Line Speed

This response specifies the line speed of the connection:

- 0=Autobaud/Autoparity (default response)
- 1=300 bps
- 2=600 bps

- 3=1200 bps
- 4=2400 bps
- 5=4800 bps
- 6=9600 bps
- 7=19200 bps

For a host or a printer, autobaud is not valid; for these devices, a line speed must be specified. (The first response should only mean "autobaud" and not "autobaud/autoparity," as used in the *3174 Planning Guide*, although they are closely related. After all, parity is specified in a separate question 735.)

For a display, use this response to specify either autobaud or a specific line speed. Autobaud indicates the AEA will determine the speed of the connecting display when it receives the first three characters from the display. The display user must type in CR.CR (Carriage Return, period, Carriage Return).

Notes:

1. If question 733=autobaud, then question 735 must be autoparity.
2. If autobaud is not specified, all terminals assigned to the same port set must be set at the same speed.
3. If the line speed specified is incorrect, response to transmissions may be absent or garbled.
4. For an ASCII host that supports a range of line speeds, specify the lowest speed here and specify the highest speed in question 734.
5. For an ASCII host that supports only one line speed, specify the speed here and skip question 734.

Question 734: Line Speed (ASCII Host Upper Limit)

This question is used in conjunction with question 733 to specify the range of speeds supported by an ASCII host:

- Question 733=lower speed limit
- Question 734=upper speed limit

Valid responses are:

- 2=600 bps
- 3=1200 bps
- 4=2400 bps
- 5=4800 bps
- 6=9600 bps
- 7=19200 bps.

There is no default for question 734. A response is required only if a range of speeds needs to be specified.

Note:

The speed specified here must be less than the speed specified in question 737, otherwise dialing out is not possible.

Question 735: Parity

The response specifies the type of the parity bit for a given station set (displays, hosts and printers):

- 0=Autobaud/Autoparity (default response)
- 1=Odd
- 2=Even
- 3=None
- 4=Space
- 5=Mark

For a host or a printer, autoparity is not valid. (The first response should only mean "autoparity" and not "autobaud/autoparity," as used in the *3174 Planning Guide*, although they are closely related. After all, speed is specified in a separate question 733.)

For a display, use this response to specify either autoparity or a specific parity bit type (if any). Autoparity indicates the AEA will determine the parity bit type of the connecting display when it receives the first three characters from the display. The display user must type in CR.CR (Carriage Return, period, Carriage Return).

Notes:

1. If question 733=autobaud, then question 735 must be autoparity.
2. If the parity specified is incorrect, the response to transmissions may be absent or garbled.
3. Because of hardware limitations, 8-bit Mark and Space parity is not supported.
4. Some ASCII hosts may specify the use of 8-bit, no parity but experience has shown that the 3174 will work on these systems using 7-bit space parity.

Question 736: Stop Bits

The response is the number of stop bits required per character:

- 1=One stop bit (default response)
- 2=Two stop bits

If incorrectly specified, response to transmissions may be absent or garbled.

Question 737: Maximum Modem Line Speed

The response determines the speed at which commands are sent to your modem:

- 1=300 bps
- 2=600 bps
- 3=1200 bps
- 4=2400 bps
- 5=4800 bps
- 6=9600 bps
- 7=19200 bps.

There is no default response to this question.

Notes:

1. You must respond to this question if you have an IBM or Hayes modem on switched lines and question 733=autobaud.
2. The speed specified here must be greater than the speed specified in question 734, otherwise dialing out is not possible.

Question 741: Switched Disconnect Timeout (3270 Host Only)

The question applies only to 3270 hosts using BSC or local non-SNA protocols. It provides additional security when an ASCII terminal on a switched line disconnects. The response specifies how long (in minutes), after the disconnection, the AEA port associated with this station should be held unavailable to take advantage of a host session timeout security feature. The response must match the system definitions for the host session timeout security feature and should be provided by the system programmer.

The response is a three-digit number of minutes, ranging from 000 (default response) to 254. Use leading zeros if required.

Question 742: Inactivity Timeout

The response specifies the time an AEA port may remain idle before the connection is broken and the port made available to other users. The timer is reset when data is received from ASCII display stations or hosts. For printer connections, the timer is reset when data is sent to the printer.

You should take the following into account when setting a value:

- Line (phone) cost
- Importance of access of this station set
- Port value (importance of access of other display stations to this port).

The response is a three-digit number of minutes, ranging from 000 to 254 (default response 015). Use leading zeros if required. If 000 is specified, it means indefinite timeout (do not break the connection no matter how long it remains idle).

Question 743: Prompt for Universal/Specific Keyboard Map

The response specifies whether the terminal user will be prompted to select a specific keyboard map for the terminal type being used or a universal keyboard map for all the terminal types supported by the AEA. The valid responses are:

- 0=Do not display prompt
- 1=Display prompt (default response).

A specific keyboard map makes use of the keyboard nomenclature. For example, to do a 3270 BACKTAB function on a DEC VT100 keyboard, you would use the BACKSPACE key. However, to perform the same 3270 function on a DEC VT241 keyboard, you would use the FIND key. Therefore, specific keyboard mapping is recommended if only a few terminal types are used since the user needs to know the specific keystroke sequence for each keyboard type.

A universal keyboard map uses the same keystroke sequence to perform the same 3270 function on every keyboard type supported. For example, the keystroke sequence for the BACKTAB function is the same (Ctrl B) on a DEC VT100 or VT241 keyboard.

If you decide not to display the prompt, the keyboard will have a specific mapping.

For more information on keyboard mappings, see *Terminal User's Reference for Expanded Functions*.

Question 744: Number of Bits per Character

The valid responses are:

- 0=7 bits per character (default response)
- 1=8 bits per character

The response must be the same for all stations in a port set.

Question 745: ASCII Display Character Set

This question applies only to ASCII displays. The valid responses are:

- 0=US ASCII (default response)
- 1=IBM 3101 CS1
- 2=IBM 316X CS1 and CS2
- 3=ISO 8859/1.2
- 4=DEC MCS (requires 8-bit to be specified in question 744)
- 5=DEC NRC

Question 746: Translate Option

The two-digit response specifies the translate tables to be used for transmitting data (leftmost digit) and receiving data (rightmost digit). Valid responses for the two digits are:

- 0=Default table (US ASCII, CS1, CS1/2, ISO 8859, MCS, NRC)
- 1=User-Defined Translate table 1
- 2=User-Defined Translate table 2
- 3=User-Defined Translate table 3

If you select the default table response, then question 745 will determine which one of the six default tables will actually be used.

Question 751: Data Stream Supported by the ASCII Host

A response is required for ASCII hosts and specifies the datastream supported:

- 1=Host uses VT100 datastream
- 2=Host uses 3101 datastream
- 3=Host uses Data General D210 datastream (US English only)
- 4=Host uses VT220 7-bit datastream
- 5=Host uses VT220 8-bit datastream

There is no default response for this question.

Question 752: ASCII Host Phone Number

The response is the phone number of the ASCII host. It is required if this host is the default destination of a printer and the port type is switched. It is sent to an autodial modem when a connection to this host is requested.

The phone number can include control characters which the modem uses to perform certain operations, for example, "wait for second dial tone".

The 3174 customization procedures allow a limited character set. Therefore, certain modem control characters that may not be entered have substitutes provided. Table 15 shows the substitute characters for IBM and Hayes modems.

Table 15. IBM and Hayes Modem Control Character Substitutes

Function	Modem Character	3174 Substitute
Pause (wait for second dial tone)	,	W
Switch to pulse dialing	P	P
Switch to tone dialing	T	T
Numbers supported	0 thru 9	0 thru 9

Table 16 shows the substitute characters for MICOM modems.

Table 16. MICOM Modem Control Characters

Function	Modem Character	3174 Substitute
Pause (wait for second dial tone)	K	K
Switch to pulse dialing	$	P
Switch to tone dialing	&	T
Numbers supported	0 thru 9	0 thru 9

You can embed a control character into the phone number string even if it does not have a 3174 substitute. This is possible by using the prefix Xnn where X=hexadecimal designator and nn=hexadecimal character value. For example, the response entered in question 752 for a Hayes modem is:

T9WWP1234567X52

This means that WW is the substitute control character for two commas, and X52 is the hexadecimal number for letter R. The dial string sent to the Hayes modem will look like this:

T9,,P1234567R

If you have a modem type of Other, the phone number can be any character A through Z or 0 through 9. The 3174 sends the ASCII hexadecimal equivalents for each character to the modems. To generate characters other than A through Z or 0 through 9, use the hexadecimal X to indicate that the two characters following it are ASCII data and are not to be translated. For example, the response entered in question 752 for an Other modem is:

ATDT1X2BX2B8005551212

The dial string sent to the Other modem will look like this: ATDT1,,8005551212

Question 761: Auto XON/XOFF (DEC VT100/VT220 Data Stream)

Note: Questions 761 through 765 apply to ASCII hosts that use a DEC VT100/VT220 datastream. These questions define the options setup in the VT100/VT220 terminals.

Question 761 specifies whether Auto XON/XOFF is active:

- 0=Auto XON/XOFF disabled
- 1=Auto XON/XOFF enabled (default response)

Question 762: Wraparound Option (DEC VT100/VT220 Data Stream)

Wraparound results in a new line being generated when a character is typed after the cursor has reached the right margin. The response specifies whether wraparound is operational:

- 0=Wraparound is disabled
- 1=Wraparound is enabled (default response)

Question 763: New Line Option (DEC VT100/VT220 Data Stream)

The response specifies whether a line feed will occur:

- 0=New line is disabled

  Pressing the Return key will result in a carriage return only.

- 1=New line is enabled (default response)

  Pressing the Return key or receipt of a line feed will result in a carriage return and line feed.

Question 764: Margin Bell (DEC VT100/VT220 Data Stream)

The response specifies whether the margin bell is operational:

- 0=Margin bell is disabled
- 1=Margin bell is enabled (default response)

  An audible alarm will be sounded when the cursor reaches the 72nd position.

Question 765: DEC Host ASCII Character Set (DEC VT100/VT220 Data Stream)

The response specifies the character set used by the ASCII host using DEC VT100 or DEC VT220 datastream:

- 0=DEC NRC (default response)
- 1=DEC MCS

Question 771: Automatic Line Feed for Cursor Control (IBM 3101 Data Stream)

Note: Questions 771 through 776 apply to ASCII hosts that use the IBM 3101 datastream. These questions define the options setup in the IBM 3101 terminals.

Question 771 specifies whether the automatic line feed is operational:

- 0=Automatic line feed is disabled
- 1=Automatic line feed is enabled (default response)

Receipt of a carriage return will result in a carriage return and line feed.

Question 772: Carriage Return/Carriage Return-Line Feed Selection (IBM 3101 Data Stream)

The response specifies whether a line feed will occur:

- 0=Carriage return only
- 1=Carriage return and line feed (default response)

Question 773: Automatic New Line for Cursor Control (IBM 3101 Data Stream)

The response specifies whether the cursor will automatically move to the first character position on the next line after it reaches the 80th cursor position:

- 0=Automatic new line is disabled
- 1=Automatic new line is enabled (default response)

Question 774: Scrolling (IBM 3101 Data Stream)

The response specifies whether scrolling will be supported for the display stations:

- 0=Scrolling is disabled
- 1=Scrolling is enabled (default response)

Question 775: Line Turnaround Character (IBM 3101 Data Stream)

The response specifies the line turnaround character:

- 0=EOT (End Of Transmission)
- 1=CR (Carriage Return) (default response)
- 2=XOFF (Transmitter OFF)
- 3=ETX (End Of Text)

Question 776: IBM ASCII Host Character Set

The response specifies the character set used by the ASCII host using IBM 3101 datastream:

- 1=ISO 8859/1.2 (default response)
- 2=IBM 3101 CS1
- 3=IBM 316X CS1 and CS2

Question 781: Attached Printer Prompt

Note: Questions 781 through 787 apply to ASCII printers. These questions define the printer attributes.

The AEA supports an ASCII display and a printer attached to the display's auxiliary port over a single communication link. The display and its attached printer appear as distinct LUs to the host. Printing can be accomplished from the ASCII display or initiated from the host.

Question 781 specifies whether you wish to prompt the user regarding any attached printer:

- 0=No (do not prompt the user) (default response)
- 1=Yes (prompt the user)

- 2=Assumed (do not prompt the user but assume a printer is attached).

The following prompt will be displayed at connection time:

```
DO YOU HAVE A PRINTER ATTACHED TO THIS TERMINAL?
(1=YES, 0=NO) ======> _
```

The user can then decide whether or not to let the AEA manage the attached printer. If the response is 1, host printing is allowed on the attached printer if the port has been assigned two host addresses (one for the display and one for the printer).

Note: If you have printers attached to ASCII displays, you must indicate an MLT level greater than zero in question 110.

Question 782: Use Of Form Feed

The response specifies whether a printer can perform a form feed:

- 0=Printer does not support form feed (default response)
- 1=Printer supports form feed

Question 783: Page Length

The response specifies the page length for an attached printer. If the printer does not support form feed, this count is used to emulate form feeds in the 3270 datastreams.

A valid response is 001 through 255 (use leading zeros). The default page length is 066.

Question 784: Printer Character Set

The response specifies which translate table (AEA-supplied or user-defined) will be used:

- 1=US ASCII (default response)
- 2=ISO 8859/1.2
- 3=DEC MCS
- 4=PC Code Page 850
- 5=User-Defined Translate table 1
- 6=User-Defined Translate table 2
- 7=User-Defined Translate table 3

Question 785: ASCII Printer Options

The response consists of eight digits for specifying printer options (0=No, 1=Yes). The default is 11111000.

Note:

> These options apply to LU3 (DSC/DSE) datastream and local copies. The 3174 treats a local copy as if it were an LU3 (DSC/DSE) print.
>
> Abbreviations used:
>
> - CR=Carriage Return
> - EM=End Of Message

- FF=Form Feed
- MPP=Maximum Print Position
- NL=New Line

Digit 1 - Carriage Return

0= A CR at MPP+1 performs an NL operation.
1= A CR at MPP+1 performs a CR. The NL operation is suppressed.

Digit 2 - New Line

0= A NL at MPP+1 performs two NL operations.
1= A NL at MPP+1 performs one NL operation.

Digit 3 - Form Feed options:

0= An FF followed by data takes up a print position.

The printer will form feed to a new page and print a space in the first print position of the first print line. The print element will then move to the second print position, ready for printing.
1= An FF followed by data does not take up a print position.

The printer will form feed to a new page. The print element will move to the first print position of the first print line, ready for printing.

Digit 4 - Print Element Positioning

Digit 4 is affected by digit 7 as follows:

- If digit 7=1, then digit 4 is overridden.
- If digit 7=0, then digit 4 response is used as described below.

0= When an FF is in the last buffer position of the print buffer, one print position is used by the FF character. The printer will form feed to a new page and the printer element will move to the second print position of the first line; execution of the FF ends the print.

Because digit 7=0, an automatic NL operation moves the print element to the first print position of the second line. The result is a blank line at the top of the new page.

1= When an FF is in the last buffer position, no print position is used by the FF character. The printer will form feed to a new page and the the print element moves to the first print position of the first line. The automatic NL is suppressed and there is no blank line at the top of the new page.

Digit 5 - Null Lines

Digit 5 options are only valid for LU3 (DSC/DSE) formatted prints.

0= Lines that contain only non-printable fields or nulls are suppressed. Attributes, CR, NL and EM are treated as nulls.

1= Null lines are printed as blanks. CR, NL and EM are honored.

Digit 6 - Valid FF

0= The FF is valid only in column 1 or at MPP+1; otherwise it is printed as a space.

1= An FF is valid in any buffer position.

Digit 7 - Automatic NL/FF

0= At the completion of a print operation, an automatic NL is executed.

1= At the completion of a print operation, an automatic FF is executed.

If digit 7=1, then digit 4 is overridden.

If you would like an FF after local copy, digit 7 must be configured as a 1. However, you should be aware that this will cause an FF after LU3 (DSC/DSE) print as well.

Assume the FF is at the end of the print and valid because it meets one or the other of the conditions for validity stated in digit 6:

- If digit 4=0 and digit 7=0, then the FF results in the print element being moved to the first print position of the *second line* of the new page.
- If digit 4=1 and digit 7=1, then the FF results in the print element being moved to the first print position of the *first line* of the new page.

Assume the FF is at the end of the print and invalid because digit 6=0 and the FF is not in column 1 or at MPP+1:

- Digit 4 is ignored.
- If digit 7=0, then an automatic NL is executed at the completion of the print operation.
- If digit 7=1, then an automatic FF is executed at the completion of the print operation.

Digit 8: Reserved.

Question 786: Page Width

The response specifies the page width for an attached printer.

A valid response is 001 through 255 (use leading zeros). The default page width is 132.

Question 787: LU 1 SCS Transparency Translation

The response determines how the printer LU 1 SCS transparency data is to be translated:

- 0=LU 1 transparent data is not translated (default response)

  Transparent data is passed through to the ASCII printer and should be in a format that is compatible with the printer.

- 1=LU 1 transparent data is translated.

  Transparent data is translated according to the printer translate table selected in question 784.

7.12.5 AEA Default Destination Panel

This panel is used to indicate the initial default connection and to define (for MLT devices) how many sessions are allowed. The station set number in the LT column determines, for that MLT, what initial connection (default destination) is established. Blanks in any column means that the default destination is the Connection Menu.

AEA Default Destination

Station Set	Station Set Name	Session Limit	LT1	LT2	LT3	LT4	LT5
1	WTCXAA ITSC MVS4	0					
2	DEC HOST	1					
3	IBM INFORMATION NETWORK	1					
4	3270 DISPLAYS	3	1		1		
5	3270 PRINTERS	1	1				
6	3164 DISPLAYS	3					
7	VT100 DISPLAYS	3					
8	4201 PRINTERS	1	2				
9	DALLAS DEC SYSTEM VT100	1					
10		0					
11		0					
12		0					
13		0					
14		0					
15		0					

Figure 123. AEA Default Destination Panel

Field Name — **Description**

Station Set
Is the station set number to the left of question 721 in the AEA Station Set panel. It is a protected field.

Station Set Name
Is the station set name you specify in question 721 in the AEA Station Set panel. It is a protected field.

Session Limit
Is the session limit you specify in the AEA Port Set panel. It is a protected field.

Session
The LTx columns allow you to specify the station set number which is to be the default destination for each logical terminal. If no default destination is specified for an LT (blank), then that LT will display the Connection Menu. The number of destinations cannot exceed the session limit.

In our example:

- A 3270 DISPLAYS station set will have its first and third sessions automatically connect to the WTCXAA ITSC MVS4 station set by default. The second session will display the Connection Menu.
- A 3270 PRINTERS station set will automatically connect to the WTCXAA ITSC MVS 4 station set by default.
- A 4201 PRINTERS station set will automatically connect to DEC HOST station set by default.
- All other display station sets will initially display the Connection Menu.

7.13 User-Defined Tables

With Configuration Support-B Release 2 and later releases, you can define your own terminal and translate tables, using options on the Configure AEA menu. These tables provide a means to interpret data from any ASCII display or printer, and sending data that can be understood by an ASCII display or printer. These tables are referred to as:

- UDT - User-Defined Terminal table
- UDX - User-Defined Translate table

They are only used for 3270 Terminal Emulation; that is, an ASCII terminal communicating with a 3270 host via the AEA. They are not used for ASCII Terminal Emulation mode.

7.13.1 User-Defined Terminal Table (UDT)

A UDT allows you to construct ASCII terminal definitions to be used to attach terminals that are not in the list of AEA-supported standard terminals or that require unique definitions not found in the AEA-provided terminal tables.

You can create and store up to six UDTs, using station types U1 to U6, either by building them from scratch or using the AEA-provided terminal tables as models. To use the UDT created, you would then specify the station type, for example U3, in question 722 when customizing for the unique terminal station set.

Defining UDT

When defining a UDT, you are prompted for the following:

- **UDT Number**

  You specify a number (U1, U2, U3, U4, U5 or U6) to identify the table.

- **Name**

  The name is optional and helps to identify a UDT table during customizing.

- **Model**

  A list of AEA-provided terminal tables is displayed during customizing. You can select a table by its number and use it as a model to build your definitions instead of building from scratch.

UDT Attributes

Attributes which can be defined in a UDT include:

- **Last Line Reserved For Status**

  To specify whether a display terminal can use the 25th line for displaying the status.

- **Status Line Character Set**

  To specify whether special characters can be displayed on the status line.

- **Status Line Clear Option**

  To specify the options for clearing the status line.

- **Use Cursor Sequence on Status Line**

  To specify whether the Set Cursor command can be used on the status line.

- **Scrolling On**

To specify whether the screen will scroll if a character is sent to the last cursor position.

- **Cursor Wraps at End of Line**

  To specify whether the cursor will move automatically from column 80 of one line to column 1 of the next line.

- **Color Supported**

  To specify whether color is supported on the display.

- **Cursor Class**

  To specify how the Set Cursor command is formatted.

- **Cursor Sequence**

  To specify, in hexadecimal, the actual character sequence to perform a Set Cursor command.

- **Alternate Screen Size**

  To specify the alternate screen size that may be displayed.

- **Graphics Query Reply**

  To specify that the terminal will send a Character Set Query Reply, indicating graphics support, in response to a host Read Partition Query.

- **Graphics Input Wait Time**

  To specify the amount of time the terminal will wait between transmissions to the 3174.

- **Graphics Input Ending Sequence**

  To specify, in hexadecimal, the actual character sequence that will indicate the end of a Graphics Input mode.

- **Graphics Input Length**

  To specify the maximum number of characters that can be received during Graphics Input mode before data is sent to the host.

- **ASCII Inbound Sequences**

  A panel that relates each 3270 function to the ASCII command sequences the terminal sends *to the AEA* to invoke that function.

  Each 3270 function can be invoked using one of two ASCII sequences; the panel allows you to specify a primary and an alternate sequence. The primary sequence is the one normally used. The alternate sequence provides a second method to invoke the same function. You may wish, for example, to have two different terminal keys perform the same 3270 function.

- **ASCII Outbound Sequences**

  A panel to map each terminal command/order to the ASCII command sequences the AEA sends *to the terminal* to invoke that command or order.

7.13.2 User-Defined Translate Table (UDX)

When 3270 Terminal Emulation is used, ASCII characters are translated to EBCDIC for transmission to the host, and EBCDIC characters are translated to ASCII for transmission to the terminal. The AEA supports six standard translation tables:

- US ASCII
- IBM 3101 CS1
- IBM 316x CS1 and CS2
- ISO 8859/1.2
- DEC MCS
- DEC NRC.

You can create an additional three translate tables. To use the UDX created, you would specify the translate table to be used in question 746 when customizing for the terminal station set.

Defining UDX

When defining a UDX, you are prompted for the following:

- **UDX Number**

  You specify a number (1, 2 or 3) to identify the table.

- **Name**

  The name is optional and helps to identify a UDX table during customizing.

- **Language**

  You specify the keyboard language code used. You should use the same response as in question 121, otherwise unpredictable results may occur.

- **CECP**

  You specify whether CECP is supported. You should use the same response as in question 123, otherwise unpredictable results may occur.

- **Model**.

  A list of AEA-provided translate tables is displayed during customizing. You can select a table by its number and use it as a model to build your definitions instead of building from scratch.

After entering these values, the outbound and inbound translate tables are displayed, based on the model selected. These tables can then be modified and saved:

- **EBCDIC Outbound Sequences**

  A table that translates each EBCDIC character received from a 3270 host to an ASCII character before being sent to the ASCII terminal.

- **ASCII Inbound Sequences**

  A table that translates each ASCII character received from the ASCII terminal to an EBCDIC character before it is sent to the 3270 host.

7.14 Operation

In this section, we will look at some aspects of using the AEA. For a detailed description on the use of the AEA terminals, see *Terminal User's Reference for Expanded Functions*.

7.14.1 Keyboards

The ASCII keyboard is different from the 3270 keyboard; many of the keys required to perform 3270 functions do not exist. To emulate a 3270 display correctly it is necessary to simulate these keys. The same is true for 3270 terminals emulating ASCII terminals. Some of the special keystrokes required are covered in the following text.

3270 Special Keys

Table 17 shows the key sequences used by some 3270 keyboards to access the Connection Menu.

Table 17. Key Sequence to Access Connection Menu

Keyboard Type	Key Sequence
Base 87 key (3278 type)	Alt+EOF+M
Converged 122/4 keys in 3278 emulation **1**	Alt+EOF+M
Converged 122/4 keys in native mode	ExSel+M
Enhanced 102/103 keys **2**	ExSel+M

Note:

1 The Converged keyboard is recognized by the cross-shape of the cursor movement (arrow) keys.

2 The Enhanced keyboard is recognized by the upside down T-shape of the cursor movement (arrow) keys.

Special Control Sequences for 3270 Emulation

When using an ASCII display station to emulate a 3270 terminal, the ASCII display user may need a number of 3270 functions, such as:

- Return to Connection Menu
- Keyboard Reset
- Operator Information Area Toggle
- Test Request
- Response Time Monitor (LTTI)
- Clear Screen

Figure 124 on page 313 lists the key sequences required for these functions on the more common ASCII terminals.

ASCII Terminal	Connection Menu	3270 Reset	OIA Toggle	TEST Request	RTM LTTI	Clear Screen
ADDS VP						
- A2	Esc B M	Ctrl R	Esc ?	Esc T	Esc B —	Ctrl C
- 78	Alt Erase EOF M	Reset	Esc ?	Test	Alt Erase EOF —	Clear
DEC VT						
- 52	Ctrl B M	Ctrl R	Ctrl ?	Esc T	Ctrl L —	Ctrl C
- 100	Ctrl B M	Ctrl R	Esc ?	Esc T	Ctrl L —	Ctrl C
- 241	Ctrl B M	Ctrl R	Esc ?	Esc T	Ctrl L —	Ctrl C
ESPRIT - 10/78	Ctrl L M	Reset	Esc ?	TEST	Ctrl L —	Clear
HZ 1500	Esc B M	Ctrl R	Ctrl ?	Esc T	Esc B —	Clear
HP 2621	Ctrl B M	Ctrl R	Ctrl ?	Esc T	Ctrl B —	Ctrl C
IBM						
- 3101	Alt L M	Alt R	Alt W	Alt T	Alt L —	Clear
- 3151	Ctrl L M	Ctrl R	Esc ?	Ctrl T	Ctrl L —	Clear
- 3161/3	Ctrl L M	Ctrl R	Esc ?	Ctrl T	Ctrl L —	Clear
LEAR SGL						
- ADM3A	Esc B M	Ctrl R	Esc ?	Esc T	Esc B —	Ctrl C
- ADM5A	Esc B M	Ctrl R	Esc ?	Esc T	Esc B —	Ctrl C
- ADM11	Esc B M	Ctrl R	Esc ?	Ctrl T	Esc B —	Clear
- ADM11	Esc B M	Ctrl R	Esc ?	Ctrl T	Esc B —	Clear
- 11/78	Alt Erase EOF M	Reset	Esc ?	Test	Alt Erase EOF —	Clear
TVI 912	Ctrl B M	Ctrl R	Esc ?	Ctrl T	Ctrl B —	Ctrl C
TVI 970	Ctrl B M	Ctrl R	Esc ?	Esc T	Ctrl B —	Clear

Figure 124. Special Keys for 3270 Emulation on ASCII Keyboards

7.14.2 ASCII Operator Information Area

Some ASCII terminals have an Indicator Line similar to a 3270′s OIA line. Some of these terminals use symbols that are essentially the same as 3270 symbols. For these terminals, Indicator Line mapping is easy.

The problem appears with those ASCII displays which have only ASCII-typical graphics or do not allow the use of the 25th line. The AEA maps an ASCII graphical symbol as closely as possible to the required 3270 indicator and uses it for user notification. In addition, the AEA provides a Status Inquiry key sequence that causes an emulated OIA line to appear on the ASCII display′s 24th line. The Status Inquiry key sequence is usually Esc ?. VT52 is the only display known that uses Ctrl ? keystrokes as the Status Inquiry sequence.

When the Indicator Line uses the 24th line, normal keyboard operation is allowed except for keying on the 24th line. To remove or refresh the Indicator Line, the user toggles the Status Inquiry key sequence.

Status Inquiry is not available or needed on displays which have the Indicator Line.

The Print Ident function which allows local copy printer address reassignment is the only function which can be keyed into the Indicator Line.

In 3270 Terminal Emulation, changing the local copy printer ID works a little differently. When Print Ident is pressed, the cursor does not move to the printer ID field in the Indicator Line. Instead, it remains where it is and the new ID keyed in will appear in the ID field.

For more information, see *Terminal User's Reference for Expanded Functions*.

7.15 Printing in an AEA Environment

7.15.1 3270 Printer Emulation

The AEA allows certain ASCII printers to appear as if they were 3287 printers with a 2 KB buffer. SCS support is also assumed. When the 3270 host supports these emulated printers, the following 3287 functions are not supported:

- Extended Character Set Adapter (ECSA)
- Programmed Symbols (PS)
- SNA Character String (SCS) support for Structure Fields and Attribute Processing (SFAP)
- Data Analysis - APL
- Extended Print Buffer (EPB)
- Screen Image Print Operation of 480, 960, 2560 and 3564 bytes
- Character Sets - ASCII-B, Data Analysis - APL/Text or Katakana
- World Trade languages

Printer Operating Functions

When an ASCII printer emulates a 3287 printer, the following functions are supported:

- Maximum Print Position (MPP) is always 132 and cannot be changed.
- Lines Per Inch (LPI) is the ASCII printer default at power on. If the ASCII printer provides line spacing control, it might be used. Page Length for the appropriate printer station set is specified during station set customization (question 783).
- The ASCII printer must be capable of receiving dual case data or be able to fold upper case characters into lower case, and vice versa.
- If the ASCII printer does not support form feed, the AEA sends line feeds until the number of lines per page (page length) is reached.

Host Datastream Printer Controls

The following DSC/DSE (LU3) orders are supported:

- CR - Carriage Return
- EM - End of Message
- FF - Form Feed
- NL - New Line

The following SCS (LU1) orders are supported:

- BEL - Sound Bell
- BS - Back Space (if the ASCII printer supports the BS order natively)
- CR - Carriage Return
- ENP - Enable Presentation
- FF - Form Feed
- HT - Horizontal Tab
- INP - Inhibit Presentation
- IRS - Inter-record Separator (always as New Line)
- NL - New Line
- SHF - Set Horizontal Format
- SVF - Set Vertical Format
- TRN - Transparent Mode
- VCS - Vertical Channel Select
- VT - Vertical Tab

7.15.2 ASCII Printer Emulation

The AEA allows the 3287 type of printers to emulate ASCII printers. All ASCII character sets can be printed by these emulated ASCII printers. In addition, the AEA supports a very basic set of ASCII controls; controls supported are shown in Table 18.

Table 18. ASCII Control Codes Supported by 3287 Printers - ASCII Emulation

Control Character	Hex Code	Action Taken
BEL	X'07'	Sound audible alarm
CR	X'0D	Carriage return
FF	X'0C'	Form feed
HT	X'09'	Tab-skip to next multiple of 8
LF	X'0A'	Carriage return, line feed
US	X'1F'	Carriage return, line feed
VT	X'0B'	Carriage return, line feed
XON (DC1)	X'11'	Request the host to resume transmission
XOFF (DC3)	X'13'	Request the host to stop transmission

ASCII Printer Advanced Characteristics

Advanced ASCII printer capabilities not supported by a 3287 (for example, underscoring and programmable fonts) are not supported on the ASCII emulated printers.

ASCII Printer Status Indication

Some ASCII printers send status indication to their hosts. These status indications announce events such as Out-Of-Paper condition, Buffer Full, etc. If the ASCII emulated printer buffer is full, or any other unready condition occurs, the AEA initiates a flow control indication (XOFF or DTR drop) but does not send the status to the ASCII host.

7.15.3 Local Copying

The use of ASCII and 3270 printers as copy printers for 3270 and ASCII displays (in any combination) is supported except for ASCII plotters. Use the Printer Authorization Matrix to set this up.

With Configuration Support-C Release 2 and later releases, it is now possible to perform local copy functions from a display station (ASCII or 3270) to a printer that is attached to a another display station (ASCII or 3270). See also 14.2.3, "HAP Sharing for Local Copy" on page 459 for further description and customization.

Printer Authorization Matrix (PAM)

With Configuration Support-A, the user selects the Define PAM option on the Customize Control Disk Menu to access the PAM definition panels. With Configuration Support-B Release 1 and later releases, the PAM panels are accessed via the Define Devices option on the same menu.

```
                    ______________ PAM Definition ______________
 Entry     Printer        Mode           Class
            Port                   7          8
                                   01234 56789 012345
   1       26 - 07         1       ..X.. ..... ......

   2       26 - 15         1       ..X.. ..... ......

   3       26 - 23         2       ..X.. ..... ......


 Entry           3270 Display Ports               ASCII Display Ports
                     1           2           3    HG 21    HG 22    HG 23
      HG  01234 56789 01234 56789 01234 56789 01  01234567 01234567 01234567
    1 26  ..... ...X. ..... ..... ..... ..... ..  ........ ........ ........
      27  ..... ..... ..... ..... ..... ..... ..
    2 26  ..... ...X. ..... ..... ..... ..... ..  ........ ........ ........
      27  ..... ..... ..... ..... ..... ..... ..
    3 26  ..... ...X. ..... ..... ..... ..... ..  ........ ........ ........
      27  ..... ..... ..... ..... ..... ..... ..

    Select ===>

 PF: 3=Quit    4=Default    7=Back    8=Fwd    10=Page Back    11=Page Fwd
```

Figure 125. Printer Authorization Matrix Panel

PAM Description: The PAM panel is divided into two halves. The upper half defines the printer, its mode of operation and the class to which it belongs. The lower half identifies the displays which will use those printers.

The following describes each field on the PAM panel:

Field **Description**

Entry
The entry number is used to identify the printer assigned. The same entry number is used in the lower half to point to the printer. The maximum number of printer assignments (entries) is 47.

Printer Port
You enter the hardware group (first two digits) and port number (second two digits) to which the printer is attached.

Valid hardware groups are:

- 26 for the base port attachment
- 27 for the 3270 Port Expansion Feature attachment
- 21, 22 and 23 for AEA attachment

Valid port numbers are:

- 01 to 31 for 3270 ports on hardware group 26

  You cannot assign a printer to port 26-00 regardless of the mode of operation. This makes sense as a display is required at port 26-00 for customization and other operational control functions.

- 00 to 31 for 3270 ports on hardware group 27
- 00 to 07 for AEA ports on hardware groups 21, 22 and 23

Mode
Defines the mode of printer operation:

- 0=Host mode only
- 1=Local mode only
- 2=Shared mode (both host and local printing)

Host mode means that a printer operates under 3270 host control. Host control is the default mode for each printer that is not assigned in the PAM. Therefore, a printer that is used for host printing only need not be assigned in the PAM (you can if you want to but it is unnecessary). A printer in host mode is protected from local copy, unless it is operating with BSC protocols. (With BSC, the BSC Copy command does not use the PAM; it is directed to the *to* device and specifies the *from* device as a command parameter.)

Local mode means that a printer is used for local copying only, regardless of the host attachment or communication protocol. The display user initiates a local copy by pressing the Print key. The host can also initiate a local copy from the display buffer if the display is under SNA. However, the host cannot use the printer for host directed printing.

Shared mode means that a printer can be used for both host directed printing and local copy. The efficiency of local copy operations in shared mode depends on the communication protocol.

In SNA, the shared printer may perform a local copy if:

- The printer is not in session with a primary LU in the host.

- Between Bracket Printer Sharing is allowed (question 213=1) and the printer is not in an in-bracket state with the PLU in the host.

In non-SNA, shared mode is a less efficient choice for local copy. Host application sessions are longer so that there are fewer opportunities for a local copy between host communications.

Class You may group printers into classes based, for example, on their physical characteristics (type font, character set, type of forms mounted), location, or security. The PAM panel allows you to assign a printer to a class, or several classes, or none at all. Class numbers range from 70 to 85.

To assign a printer, enter an X under the class or classes to which the printer will belong. For example, you may group several printers into class 72 (see upper half of Figure 125 on page 316) and authorize the display on port 26-08 to use any of them (see lower half of Figure 125 on page 316). If the user does a local copy, the local copy will be sent to an available printer in that class.

The user may also select a particular printer by its class ID by first pressing the Ident key and entering the class number next to the printer symbol in the OIA.

Display Port You enter an X under the display port for each display authorized to use a particular printer identified by that entry. Several displays may be authorized on a given printer; a display may also be assigned to use several printers for local copying.

The Select prompt may be used to locate a particular entry number without having to scroll forward or backward through several panels. If, for instance, the user is searching for entry number 21, he should enter L21 in the Select field and press Enter. Entry 21 will be displayed.

7.16 ASCII Graphics Support

The ASCII graphics support in Configuration Support-B Release 2 and later releases allows 3270 host programs, such as GDDM, to control specific AEA attached terminals in graphics mode. The AEA allows host-generated graphics data to pass through to the display, and allows terminal-generated graphics input to pass through to the host application. These terminals are also supported for 3270 emulation and the 3174 maintains the terminal's display image independent of the graphic presentation space. The host application and the terminal are responsible for the graphic display space; graphics data is simply passed through the 3174 to the device. Graphics data requires the 8-bit character support of Configuration Support-B Release 2 and later releases.

Supported devices include:

- DEC VT240/241
- Tektronix 4205

Other devices are supported through a UDT.

7.17 ASCII Plotter Support

The AEA supports many ASCII plotters. They are treated the same way as ASCII printers except that you cannot do a local print. Specify a station type of AL in question 722 to get ASCII plotter support.

To support the ASCII plotter, the host application should use the LU1 datastream and must send all data using the transparent-mode order. You should also customize question 787 not to translate the LU1 SCS transparent data, which will then be passed unchanged to the ASCII plotter. Because the data is not modified by the 3174, your host application must format the datastream that is required by the ASCII plotter.

7.18 AEA Security

The main security concern with the AEA is that a user can access 3270 applications from ASCII terminals through the public switched telephone network. The AEA, however, does provide several security features to minimize or prevent unauthorized access:

- The user can specify an access password as follows:
  - Question 701, for all ASCII display stations on switched lines (Configuration Support-B Release 1 and earlier releases).
  - AEA Port Set Panel, for each port set (Configuration Support-B Release 2 and later releases).

  The ASCII terminal user is prompted to enter the password when he initiates the connection to the AEA port. The AEA breaks the connection if the incorrect password is supplied three times. results in terminal disconnection.
- Question 725: Host Connection Menu Option, which can allow users to access the host defined as the default destination but not be able to select alternative host connection. This feature provides some security by reducing the connection flexibility of a sensitive port.
- Question 741: Switched Disconnect Timeout, which prevents unauthorized access to an IBM host session.
- Question 742: Inactivity Timeout, which allows the AEA to terminate sessions that have been idle for a specified period. This prevents an unauthorized user from taking over an authorized connection that was not properly terminated (for example, by line faults) or unattended.
- The AEA supports session outage notification:
  - On all 3174s, the 3270 host is notified of a session interruption by an unexpected session start indication (device end status for non-SNA, NOTIFY for SNA).
  - An SNA 3174 will also send an UNBIND or TERMSELF, depending on your response to question 711 digit 1, when the connection breaks.
  - To prevent an SNA host application from retaining data between sessions (the host application may expect the same authorized user is using the second session), you can customize question 711 digit 2.

– To allow the host application to terminate the LU-LU session *as well as* terminate the switched line connection upon receiving an UNBIND, you can customize question 711 digit 3.

Chapter 8. ESCON Connection

Previously, communication between IBM hosts and the channel attached 3174 is carried out in parallel across *bus* (data transmission) and *tag* (control signal) copper cables. These cables are bulky and have distance and speed limitations. In most cases, the 3174 can only be a few hundred feet from the CPU. This restricts the placement of the 3174.

Each parallel cable consists of eight wires. Each bit in a byte is transmitted over one wire. Because of differences in quality of the individual wires, all the eight bits do not arrive at the destination at the same time. The longer the bits have to travel, the greater they get out of synchronization. Parallel cables are, therefore, limited in distance to a maximum of 122 meters (400 feet).

A new approach to the interconnection of channels and devices is known as the Enterprise Systems Connection (ESCON) Architecture*, which uses fiber optic cables instead of bus and tag copper cables for channel connection. Fiber optic cables carry the transmission of control and data signals, encoded as light pulses, over much greater distances and at greater speeds than the copper cables allow. Because the light pulses are transmitted in one direction only, each channel cable requires two fibers: one for transmit and one for receive. Unlike parallel channel cables, the eight bits in a byte are transmitted one after another through the fiber. Hence, these cables are also known as serial optical channel cables.

With the announcement of the ESCON architecture, new host processors, control units and devices are introduced. The 3174s that support this architecture are the Model 12L (floor-standing) and the Model 22L (rack-mounted). The microcode that support these 3174 ESCON models are Configuration Support-B Release 3 and later releases. Although both 3174 ESCON models (Model x2L) can be attached directly to a host ESCON channel using fiber optic cabling, there are advantages to be gained by attaching through an ESCON Director.

8.1 ESCON Director

An ESCON Director is a switching box that attaches to a 3174 Model x2L (and other I/O devices) on one side and to one or more host systems (or another ESCON Director) on the other. Figure 126 on page 322 shows the physical connectivity possible.

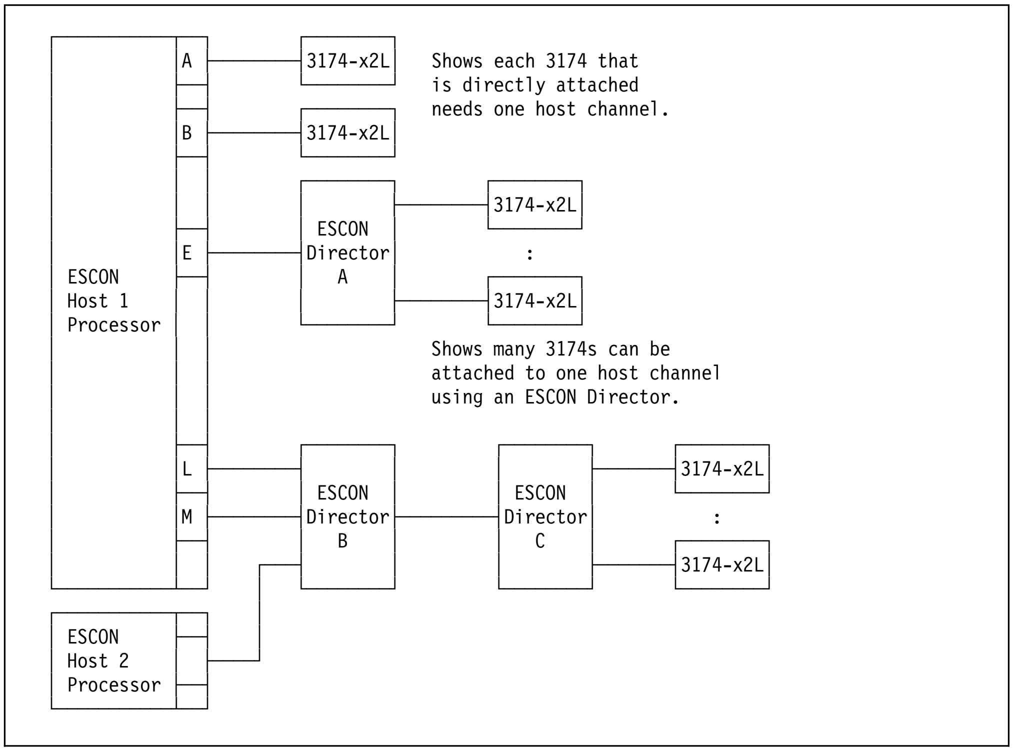


Figure 126. 3174 ESCON Connectivity

Using ESCON Directors provide the following advantages:

- Multi-Access

  When an ESCON Director is installed between processor channels and I/O controllers, each channel can connect, dynamically, to multiple controllers and other channels. For example, if a 60-port ESCON Director Model 2 is attached to four channels, those four channels can access up to 56 control units. If a 3174 is attached it can be accessed by all four hosts.

  The multi-access capability also reduces the need for manual switches, allowing control units that have a single ESCON adapter interface to access multiple ESCON channels on one or several systems without manual operation.

- Simplified connectivity and sharing

  An ESCON Director greatly reduces the number of channel adapters and physical cable connections required to share devices among multiple systems. One control unit connection to the ESCON Director can provide all of the required connectivity for a multi-image configuration.

- Multiple concurrent operations

  An ESCON Director can handle multiple concurrent data transfers. If the director is configured with 60 ports, 30 pairs of ports can actively transfer data at channel speeds.

- Less disruptive installation and reconfiguration

  An ESCON Director may be configured to allow new processors or I/O to be added to or deleted from the configuration, dynamically, without loss of system availability. Fiber optic cables may be plugged into the ESCON Director while the systems are running.

Additional configuration capabilities include partitioning the directors for isolating I/O devices or system images, dedicating paths through an ESCON Director, and storing alternate configurations.

8.2 3174 ESCON Models

The models of the 3174 that support the ESCON Adapter are:

- Model 12L: ESA/390 SNA and non-SNA (floor-standing)
- Model 22L: ESA/390 SNA and non-SNA (rack mounted)

Both ESCON models support:

- Eight host connections (via the ESCON Director)
- 64 coax attached devices (with the 3270 Port Expansion Feature)
- Single Link Multiple-Host
- Multi-host gateway
- 8KB RU size.

These features are discussed in detail later.

Note: It is not possible to upgrade any 3174 to an ESCON model. For example, a 3174 Model 11L or Model 13R *cannot* be upgraded to a Model 12L.

New 3174s shipped with the ESCON Adapter, unlike parallel channel attached units, are customer installed. The new ESCON Adapter uses the same slot as the parallel channel adapter and they appear as logical equivalents. The cabling from the ESCON Adapter is 62.5/125 micron multi-mode fiber. Both models will also support trunk cabling that includes 50/125 micron fiber optic cabling.

8.3 Hardware/Software Requirements

The following are required to support 3174 ESCON models.

System Software:

- MVS/SP SP Version 3 Release 1.0E (MVS/ESA*) with appropriate PTFs
- VM/ESA Version 1 Release 1 (ESA Feature)
- ACF/VTAM Version 3 Release 3 for MVS/ESA with appropriate PTFs
- ACF/VTAM Version 3 Release 3 for VM/ESA

Microcode Level:

- Configuration Support-B Release 3 or later releases
- Configuration Support-C

Hardware:

- ES/9000 processors with ESCON channels for direct attachment
- ESCON Director Model 1 and Model 2 for indirect attachment
- Fiber optic cabling

  The 3174 Models 12L and 22L supports fiber optic links that include 62.5/125 micron, 800 MHz-km bandwidth trunk cable up to 3 km, and 50/125 micron, 800 MHz-km bandwidth trunk cable up to 2 km. The use of 50/125 micron cables requires the use of additional jumpers and connectors. A duplex to duplex 62.5/125 micron cable is supplied with the 3174. The manual *Planning for Enterprise Systems Connection Links* should always be consulted when customer requirements include fiber optic trunk facilities.

Cables should be ordered with the 3174. They come in standard lengths between 4 meters (12 feet) and 122 meters (400 feet).

8.4 APPN/APPC for ESCON

Configuration Support-C with the APPN LIC feature allows the 3174 to behave as an APPN network node. It also provides the T2.1 connectivity to the host. However, the 3174 ESCON models do not support APPN over ESCON channels.

APPN support for ESCON channel connections will be provided in Configuration Support-C Release 6[3] and, with the ESCON Director, the 3174 can have T2.1 link capability for up to 8 host connections, improving the connectivity to S/390 and POWER parallel processors.

8.5 Peer Communication for ESCON Models

The Peer Communication LIC feature allows coax attached workstations running the appropriate software to work together as if they were on a LAN. The 3174 ESCON models do support Peer Communication.

See 19.11, "Peer Workstation Requirements" on page 577 for more information.

8.6 Connectivity Options

The ESCON channel architecture uses a point-to-point switching device, the ESCON Director. The ESCON Director enables the 3174 ESCON models to access up to eight hosts. It also acts as a repeater to further increase the maximum distance between the host processor and the 3174 ESCON models. With two ESCON Directors in the path, the 3174 ESCON models can be located up to nine km. from the host processor. Using two ESCON Directors with ESCON XDF* Channels, the 3174 ESCON models can be located up to 43 km. from the host processor.

One important point with ESCON architecture is that each I/O device is logically attached point-to-point to the host, whether the physical attachment is direct or via one or more ESCON Directors.

With direct attachment, each I/O device (including the 3174 ESCON models) uses one host channel. Unlike parallel channel attachment, daisy-chaining multiple I/O devices off one ESCON channel is not supported. Instead, multiple I/O devices are attached to individual ports on an ESCON Director which, in turn, is attached to one ESCON channel on the host.

[3] The Planned Availability Date for Configuration Support-C Release 6 is 1Q/95.

Single Link Multi-Host

Utilizing an ESCON Director, it is possible to connect a 3174 ESCON model to eight different hosts.

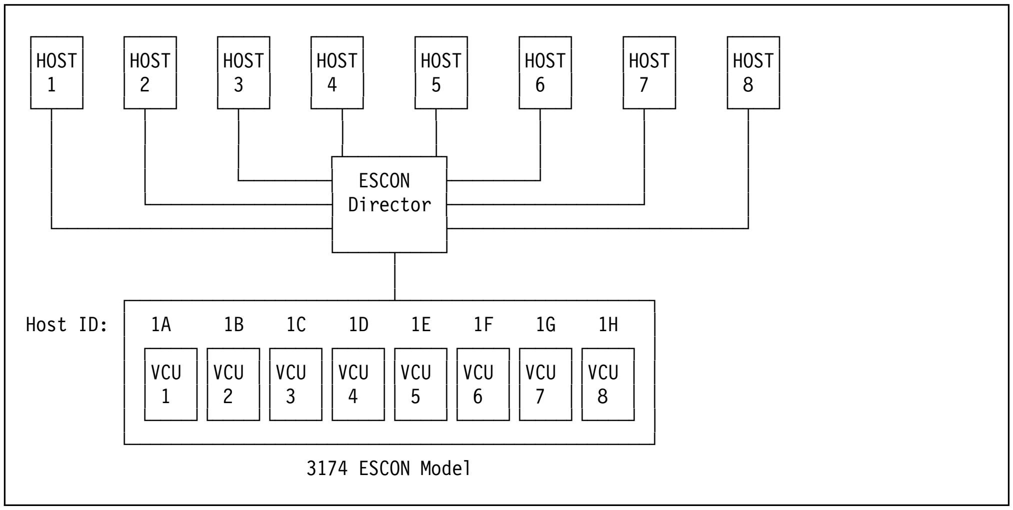


Figure 127. ESCON Single Link Multi-Host

Given the SNA architecture, the 3174 can only ever be connected to one host. The ESCON Single Link Multi-Host support is provided by introducing the concept of multiple *virtual control units* within one *physical control unit*.

The virtual control unit, VCU, is functionally a 3174 connected to *one and only one* host through an ESCON Director over an ESCON channel. There can be up to eight VCUs inside one 3174, which means there can be up to eight logically connected hosts at any one time.

The physical control unit is the physical 3174 itself, as well as the microcode that controls all its functions.

A display user attached to one of the 3174 ports can, by using the MLT support, hot-key between any five of the eight possible ESCON connected hosts.

The 3174 ESCON model customized as a non-SNA control unit can hold only one logical path. Question 240 allows you to specify the controller logical address; this question applies only to SNA channel attachment. Therefore, multi-host support for master console functions is not available with non-SNA 3174-x2L. The non-SNA support for a single host requires Configuration Support-B Release 4 and MVS/ESA V4.2 + APARs OY43246, OY43282, and OY45143.

Multi-Host Gateway

Figure 128 on page 326 shows an example of using the 3174 ESCON model as a gateway to multiple (two) hosts.

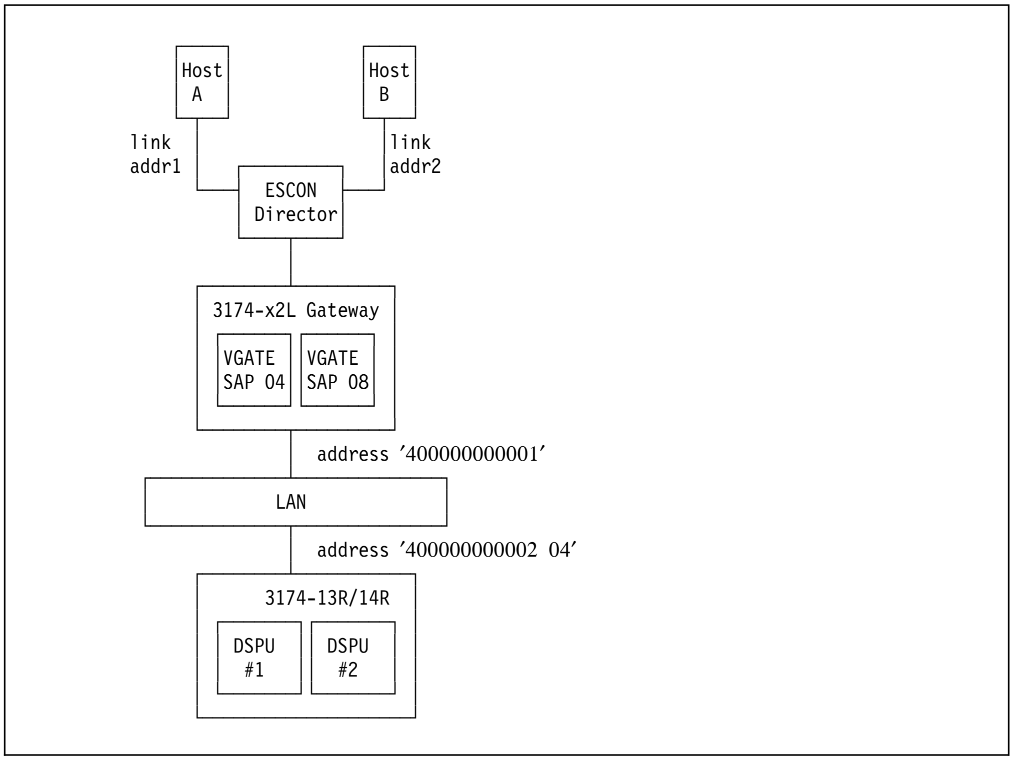


Figure 128. Single Link Multi-Host Gateway

Using the above diagram and the following table we can see that we are able to define multiple link addresses with a single sub-channel. Each link is associated with a different host in the ESCON environment, and the subchannel under that link address is associated with a PU defined for a given host.

	Link address	Sub/chan	LAN address
Local PU	01	C0	locally attached terminals
DSPU 1	01	C1	400000000002 04 (gtwy SAP 04)
Local PU	02	C0	locally attached terminals
DSPU 2	02	C1	400000000002 04 (gtwy SAP 08)

Figure 129. Addressing Example

8.7 MVS MCS Console Support

The following APARs allow display stations supported by MVS/ESA V4.2 and attached to the 3174 Models 12L and 22L to be used as MVS MCS consoles:

- OY43282
- OY43246

The following APAR allows a display station attached to an 3174 Model 12L or 22L to be used as a console by the MVS Stand-Alone Dump program:

- OY45143

Notes:

1. The 3174 ESCON model must be customized to operate in non-SNA mode.
2. The support provided by these three APARs is available in MVS/ESA SP V4.2 only. Support is not available for prior releases of MVS/ESA.
3. Use of the 3174 ESCON models in non-SNA mode as MVS consoles is limited to a single link to a single host.

8.8 8 KB RU Size

8 KB RU size capability is supported by the 3174 Models 12L and 22L only. This capability is supported in various configurations, depending on the type of devices supported through, or attached to, the 3174. Following is a summary chart showing the level of 8 KB RU size support.

Configuration	CUT/DFT Devices (transmit/receive)	Token-Ring Devices (transmit/receive)
Base ESCON SNA (x2L)	2048/8192	N/A
Base ESCON SLMH	2048/8192	N/A
Base LAN DSPU (x3R/x4R)	2048/8192	N/A
ESCON LAN gateway	2048/8192	8192/8192
ESCON SLMH LAN gateway	2048/8192	8192/8192

```
N/A    Not Applicable
ESCON  Enterprise Systems Connection
SLMH   Single Link Multi-Host
```

The following restrictions apply when configuring a LAN Gateway. with respect to 8 KB RU support:

- If you configure any DSPU with 8 KB RU support then the maximum number of DSPUs through the gateway is limited to 100, regardless of what the other DSPUs have been configured for. This is a restriction on the 16/4 Mbps Token-Ring LAN Adapter.
- 8 KB RU capability is only supported when a 16/4 Mbps Token-Ring LAN Adapter is installed, otherwise the configuration will be downgraded. This applies to the DSPUs as well as the gateway configurations.

8.9 3174 Customization

Prior to customization you should note that the panel on the front of the 3174 has been changed and the Channel Online/Offline switch is no longer present. You now key in a sequence on the front panel to achieve the same function.

On the 3174 Operator Panel key in:

```
17XX     where XX  = 00 to switch offline
           and XX  = 01 to switch online
```

When the offline sequence is entered, communication with all hosts is terminated until either:

- The 3174 is IMLed

- The 3174 is IMLed remotely by NetView
- The online sequence is entered on the keypad

Question 100: 3174 Model Designation

You specify 12L or 22L for a 3174 ESCON model. By coding one of these values you change the options in question 101.

Question 101: Host Attachment

Question 101 is where you specify the host connection type. By coding either 12L or 22L in question 100, the following responses are valid:

- 4=Non-SNA channel attachment
- 5=SNA channel attachment

When questions 100 and 101 are customized to support the ESCON attachment, the following questions are not displayed during customization:

- Question 222: Support of Command Retry
- Question 223: Attention Delay Value
- Question 224: Mode of Data Transfer
- Question 225: Channel Burst Speed

Question 105: Upper Limit Address

This is a two character address to specify the address range.

If you are going to use 8 KB RU sizes, specified in question 241, then there is a limit of 100 DSPUs definable for the 3174 gateway you are customizing. This limit means that the difference between question 104 and question 105 cannot be greater than X′64′.

Question 240: Controller Logical Address

Question 240 applies to 3174 Models 12L and 22L only.

The response is a single character that is used to identify a logical control unit to its upstream host. The response can be in the range 0 through 9 and A through F. The default response is 0 on the 1A host; on other hosts, the default response is X.

Note: Your response must correspond to the CUADDR parameter of the CNTLUNIT macro in the IOCP.

Question 241: RU Maximum Size

Question 241 applies to 3174 Models 12L and 22L only.

The response is the maximum RU size you will allow. Valid responses are:

- 0=4KB RU maximum (default response)
- 1=8KB RU maximum

Question 940: LAN Address Assignment

The device type (T field) allows you to specify DSPU devices that will use the 8 KB RU support. Valid responses are:

- 0=Workstation (default response)
- 1=3174 Establishment Controller
- 2=8KB RU devices. (not applicable for Ethernet networks)

Response 2 is valid only if question 241=1 (8 KB RU support). Your response will determine the default values for I-frame size and maximum out (transmit window size) on the LAN Transmission Definition panel.

Question 941: LAN Transmission Definition

The transmit I-frame size (F field) allows you to specify the maximum frame size supported by the 8KB RU devices. Valid responses are:

- 0=256 bytes
- 1=521 bytes
- 2=1033 bytes
- 3=2042 bytes (for Token-Ring) or 1493 bytes (for Ethernet)
- 4=4105 bytes (not applicable for Ethernet networks)
- 5=8201 bytes (not applicable for Ethernet networks)

The default depends on the your response to the device type (T field) in question 940.

8.10 Customization Example

For an example of an ESCON SLMH LAN gateway, please see 10.6, “Example 6: SLMH Gateway with ESCON” on page 372. This example includes the customization options for the 3174, VTAM, the ESCON Director, and the IOCP definitions.

Chapter 9. Multi-Host Connectivity

This chapter discusses the options available to achieve multi-host connectivity, using 3174 features and functions such as the Multiple Logical Terminal, Concurrent Communication Adapter, Single Link Multi-Host support, ESCON Director, AEA, X.25, and Frame Relay. Configuration Support-B or later microcode and additional controller storage are required to support multi-host connectivity. Details on 3174 customization are provided in Chapter 10, “Connectivity Customization Examples” on page 351.

9.1 Multiple Logical Terminal

The Multiple Logical Terminal function enables a 3270 Control Unit Terminal (CUT), or an ASCII terminal in 3270 emulation, to interact with as many as five host sessions using one physical display. Each session can be connected to a 3270 host or an ASCII host. The display screen and keyboard are owned by a single session at a time. This session is the *active or foreground session*. The other sessions are maintained by the 3174 and are called *background sessions*. A background session becomes active when the user jumps to it from another session in a round-robin fashion, using the Change Screen key sequence. (The Change Screen key sequence varies depending on the terminal type.)

Each session that is connected to a 3270 host requires that the the host address be customized in the 3174. The number of host sessions is limited by the type of host connection (SNA or non-SNA) and by controller storage. A session that is connected to an ASCII host does not require a 3270 host address be assigned to it. A connection to an ASCII host requires an Asynchronous Emulation Adapter (AEA) be installed in the 3174. Access to the ASCII host is defined through the 3174 customizing procedure.

9.1.1 Supported 3270 Hosts via Primary Adapter

The connection between a 3174 and a 3270 host can be established across the following links:

- SNA channel
- SNA SDLC
- Non-SNA channel
- Non-SNA BSC
- X.21/X.25
- Frame Relay
- Token ring
- Ethernet

9.1.2 Supported 3270 Hosts via CCA

In addition to the primary connection, if you have installed one of the Concurrent Communication Adapters (V.24, V.35, and X.21), you can have multiple sessions over:

- SNA SDLC

- Non-SNA BSC
- X.21/X.25

9.1.3 Supported ASCII Hosts

The connection between a 3174 and an ASCII host requires the Asynchronous Emulation Adapter (AEA) feature #3020 to be installed in the 3174. Access to the ASCII host can be on a session basis via a Connection Menu or the default destination customized during AEA customizing procedures. Each ASCII host connection uses one AEA port.

9.1.4 Supported Devices

The following CUT displays are supported by MLT:

- 3278 (excluding Model 1)
- 3179 (excluding Model G)
- 3279
- 3180
- 3191
- 3192 (excluding Model G)
- 3194 (operating in CUT mode)
- 3471
- 3472 (excluding Model G)
- 3481
- 3482

This includes all model types. Any other coax attached terminal which fully emulates one of the supported displays above can also take advantage of the MLT capability.

DFT terminals are not affected by the MLT function. These devices cannot use the Change Screen key sequence to switch between MLT sessions; DFT terminals provide multiple sessions through their own microcode.

With Configuration Support-B Release 1 and earlier releases, MLT was not supported on ASCII terminals although you did have a Connection Menu which allowed you to select the desired host connection.

With Configuration Support-B Release 2 and later releases, ASCII terminals now support MLT sessions.

With Configuration Support-C Release 5, 3174 coax-attached printers can support up to five host sessions.

9.1.5 MLT Prerequisites

To implement MLT, you you should be aware of the additional storage requirements, weighting factors and MLT levels. See Appendix E, "3174 Storage Requirements" on page 755 for information on determining the additional storage required.

9.1.6 Programmed Symbols (PS) Considerations

A Programmed Symbols screen should be assigned to the primary session only. While the primary session is in background, Programmed Symbols Set update can occur.

9.1.7 3174 Customization

The MLT function does not require special hardware (other than the additional controller storage required). You will, however, have to customize the 3174 to provide this function.

Question 110: MLT Storage Support

Question 110 refers to the required MLT configuration level (Configuration Support-A and S, and Configuration Support-B Releases 1, 2 and 3), or the amount of storage allocated to support MLT (Configuration Support-B Release 4 and Configuration Support-C).

For Configuration Support-B Release 3 and earlier releases, question 110 requires a one-digit response. A non-zero response is required for MLT. Valid responses are:

- 0=No MLT (default response)
- 1=MLT Level 1
- 2=MLT Level 2
- 3=MLT Level 3
- 4=MLT Level 4
- 5=MLT Level 5
- 5=MLT Level 6 (added for Configuration Support-B Releases 2 and 3)

For Configuration Support-B Release 4 and Configuration Support-C, question 110 consists of a two-part response. A non-zero response to either part is required for MLT. If you respond to one part with a non-zero value, you must respond to the other part with zero(s).

First-part (one-digit) response: A non-zero response specifies the MLT level required and results in a preset amount of controller storage being allocated to support MLT. Valid responses are:

	Host ID	**Valid Non-zero Response**
Models 01L through 24R	1A	1 to 8
Models 41R, 43R, 51R, 53R, 61R, 62R, 63R, 64R	1A	1 to 8
Concurrent Communication Adapters	2x and 3x	1 or 2

The preset amount of storage allocated is as follows:

MLT Level	Storage Allocated
1	64KB
2	128KB
3	512KB
4	896KB
5	1152KB
6	1536KB
7	2048KB
8	2688KB

Second-part (four-digit) response: A non-zero response specifies the amount of storage in kilobytes to support MLT. Valid responses are:

	Host ID	Minimum Response	Maximum Response
Models 1L through 24R	1A	0001KB	2784KB
Models 41R, 43R, 51R, 53R, 61R, 62R, 63R, 64R	1A	0001KB	2784KB
Concurrent Communication Adapters	2x and 3x	0001KB	0128KB

See Appendix E, “3174 Storage Requirements” on page 755 for information on determining the additional storage required.

Question 125: Miscellaneous Feature Options (A)

Question 125 digit 7 specifies the alarm function for background sessions in an MLT environment. Valid responses are:

- 0=Background alarm is enabled (default response)
- 1=Background alarm is disabled for background sessions

This option has effect only when question 110 is customized with a non-zero response and digit 6=0 (File Transfer Aid). A response 1 enables the alarm to be sounded when a update occurs to a screen in the background session.

Question 116: Individual Port Assignment

Question 116 allows you to specify how the host addresses are to be assigned to the 3174 ports (both 3270 and AEA); that is, whether addresses are to be assigned automatically or individually. The response required depends on the microcode release level. See 3.3.13, “Planning for Port Assignment” on page 57 for further information.

Question 117: Port Assignment

Question 117 allows you to assign the host addresses to the 3174 ports (both 3270 and AEA), using the Port Assignment panel.

Port Assignment Panel: The Port Assignment Panel is used to assign host LU addresses (LOCADDRs) to the 3174 physical ports. This panel is divided into two sections; one for the 3270 ports provided by hardware groups 26 and 27, and the other for the AEA ports provided by hardware groups 21, 22 and 23.

When assigning LOCADDRs to a 3174 port, you should take into account the display model attached to that port. If an LU (LOCADDR) defined for a Model 3, 4 or 5 display is assigned to a port with a 3278 Model 2 display attached, then every attempt to access an LU (LT) that is bigger than the 3278 Model 2 capability results in a program check. On the other hand, if a display attached to a port is set up for a screen size (or model) larger than the LUs that are assigned to that port, an automatic model change will occur whenever a Change Screen key is pressed and another session to a LT is invoked.

```
          __________ 117: Port Assignment __________

       Host addresses                      Host addresses
Port  IS  1   2   3   4   5        Port  IS  1   2   3   4   5
26-00 3 002 003 004 ___ ___        26-01 3 008 009 010 ___ ___
26-02 3 011 012 013 ___ ___        26-03 3 014 015 016 ___ ___
26-04 3 017 018 019 ___ ___        26-05 3 020 021 022 ___ ___
26-06 3 023 024 025 ___ ___        26-07 1 026 ___ ___ ___ ___
26-08 0 ___ ___ ___ ___ ___        26-09 0 ___ ___ ___ ___ ___
26-10 0 ___ ___ ___ ___ ___        26-11 0 ___ ___ ___ ___ ___
26-12 0 ___ ___ ___ ___ ___        26-13 0 ___ ___ ___ ___ ___
26-14 0 ___ ___ ___ ___ ___        26-15 0 ___ ___ ___ ___ ___
26-16 0 ___ ___ ___ ___ ___        26-17 0 ___ ___ ___ ___ ___
26-18 0 ___ ___ ___ ___ ___        26-19 0 ___ ___ ___ ___ ___
26-20 0 ___ ___ ___ ___ ___        26-21 0 ___ ___ ___ ___ ___
26-22 0 ___ ___ ___ ___ ___        26-23 0 ___ ___ ___ ___ ___
26-24 0 ___ ___ ___ ___ ___        26-25 0 ___ ___ ___ ___ ___
26-26 0 ___ ___ ___ ___ ___        26-27 0 ___ ___ ___ ___ ___
26-28 0 ___ ___ ___ ___ ___        26-29 0 ___ ___ ___ ___ ___
26-30 0 ___ ___ ___ ___ ___        26-31 0 ___ ___ ___ ___ ___
```

Figure 130. Port Assignment Panel (3270 Ports)

```
          __________ 117: Port Assignment __________

       Host addresses                      Host addresses
Port  IS  1   2   3   4   5        Port  IS  1   2   3   4   5
21-00 3 005 006 007 ___ ___        21-01 3 027 028 029 ___ ___
21-02 3 030 031 032 ___ ___        21-03 3 033 034 035 ___ ___
21-04 1 036 ___ ___ ___ ___        21-05 0 ___ ___ ___ ___ ___
21-06 0 ___ ___ ___ ___ ___        21-07 0 ___ ___ ___ ___ ___
22-00 0 ___ ___ ___ ___ ___        22-01 0 ___ ___ ___ ___ ___
22-02 0 ___ ___ ___ ___ ___        22-03 0 ___ ___ ___ ___ ___
22-04 0 ___ ___ ___ ___ ___        22-05 0 ___ ___ ___ ___ ___
22-06 0 ___ ___ ___ ___ ___        22-07 0 ___ ___ ___ ___ ___
23-00 0 ___ ___ ___ ___ ___        23-01 0 ___ ___ ___ ___ ___
23-02 0 ___ ___ ___ ___ ___        23-03 0 ___ ___ ___ ___ ___
23-04 0 ___ ___ ___ ___ ___        23-05 0 ___ ___ ___ ___ ___
23-06 0 ___ ___ ___ ___ ___        23-07 0 ___ ___ ___ ___ ___
```

Figure 131. Port Assignment Panel (AEA Ports)

Following is a description of each of the Port Assignment Panels fields:

Field	Description
Port	This column lists the port numbers beginning with 26-00, that is, hardware group 26 port 00. • Hardware group 26 indicates the base 3270 ports. • Hardware group 27 indicates the 3270 Port Expansion Feature ports. • Hardware groups 21, 22 and 23 indicate the AEA ports.
#IS	This column indicates the number of 3270 host sessions assigned to each port.
LT1 through 5	These fields are the host addresses (LOCADDRs) assigned to that port.

Note: AEA requires additional customizing questions to be answered and some additional panels to be defined.

Question 118: Port Address

Question 118 is really a panel displaying the host addresses you have assigned in the Port Assignment panel previously. The addresses are shown in hexadecimal and cannot be modified (protected fields). If you need to change an address, press PF7 to return to the Port Assignment in question 117.

Question 168: Additional Extension Mode Key

Question 168 is needed for PCs attached to the 3174 that use 3270 CUT mode emulation programs to access MLT. (It is also required for PCs in ASCII Terminal Emulation.) Valid responses are:

- 0=No additional Extension mode key is defined (default response)
- 1=The Home key is an additional Extension mode key.
- 2=The Print ID key is an additional Extension mode key

The need to define an additional key is because many (older) 3270 emulation programs do not completely emulate the keystrokes provided by a 3278/79 CUT display. For example, key sequences that require an Alt shift are ignored by the emulation program and are not sent to the 3174. One such key sequence, Alt Insert, is required to Change Screen when using MLT.

To provide the Change Screen function, question 168 allows you to define an Extension mode key (to substitute for the Alt key which is ignored). You can choose to use either the Home key or the Print ID key as the substitute Alt key.

Response 0: If your CUT emulation program ignores the Alt Insert key sequence, you cannot Change Screen and, therefore, MLT cannot be used.

Response 1: The Home key generates the required Alt sequence. To Change Screen, press and release the Home key and then press the Insert key.

Response 2: The Print ID key generates the required Alt sequence. To Change Screen, press and release the Print ID key and then press the Insert key.

To invoke the Print ID function, press the Print ID key twice.

9.1.8 Change Screen Key

You will find the Change Screen key (sometimes called the *Hot Key* or *Jump Key*) located at different positions on different keyboard layouts. The location of this key depends on the keyboard type, the terminal mode of operation (whether 3278 Emulation mode or Native mode) and your response to question 168.

Figure 132 on page 337 shows the expected Change Screen key sequence for the different keyboard types.

Keyboard Type	Key Location
Base (87-key) keyboard (non-text)	Alt + Insert
Base (87-key) keyboard (text)	Alt + PA2
Converged (122/124-key) keyboard *	
– 3278 Emulation Mode	Alt + Insert
– Native Mode	Alt + PA2
Enhanced (102/103-key) keyboard **	Alt + Home

Notes:

* The Converged keyboard is recognized by the CROSS shape of the Cursor Move Keys (arrows).

** The Enhanced keyboard is recognized by the UPSIDE DOWN T shape of the Cursor Move Keys (arrows).

Figure 132. Change Screen Key Location

See Appendix I, "Keyboard Layouts" on page 803 for further information.

9.1.9 Display Model ID

When you set the model ID for the display (for example, 3192, 3180, etc.), it is essential that the selected screen size matches the largest session for this display. For example, if one of the sessions on this display is equal to a Model 4 screen size (80x43), you should set the display model ID to 4.

If one of the sessions has the Create Partition capability which enables it to work in Extended - Explicit Partition mode, you should select the appropriate model ID for Explicit Partition. Figure 133 on page 338 shows the model IDs required for 3180 and 3192.

Display	Model ID Implicit	Model ID Explicit	Screen Size
3180	2	6	24 x 80
	3	7	32 x 80
	4	8	43 x 80
	5	9	27 x 132 or 24 x 80
3192/D	2	2+	24 x 80
	3	3+	32 x 80
	4	4+	43 x 80
	5	5+	27 x 132 or 24 x 80
3192/C	2	2+	24 x 80
	3	3+	32 x 80

Figure 133. Display Model ID

9.1.10 Session Integration

Programmed Symbols (PS) Display

The first MLT session on each 3174 port is defined as the primary session (LT-1). If a PS screen is attached to this port, it must always be assigned to the primary session only. When the primary session is in the background, a PSS screen update can occur.

During the Load PS operation, the active session′s display will either go blank or flash momentarily. The active session is not affected except for the brief visual disruption which occurs during the Load PS operation.

Session Presentation Delay

When changing between sessions which are defined as different screen sizes, there will be a slight delay while the display switches to the new screen size.

Shift Lock, Caps Lock and APL On

Shift Lock, Caps Lock and APL On status are preserved for each session.

Entry Assist (DOC Mode)

Each session preserves its own Entry Assist format definitions. The user must set up each session that needs Entry Assist.

9.1.11 Local Copy Considerations

When local copy is invoked and the printer is printing, you are able to Change Screen. You do not have to wait for print completion to change the session. As a matter of fact, it is possible to invoke a local copy on one session, change to the second session, invoke a local copy from there (it will wait in the queue until the first local copy is completed) and change to the third session while session one is still printing and session two is waiting in the queue.

When local copy is invoked in one session and you jump to another session (while the printer is still printing the previous session′s invocation), the Printer Printing indicator does not indicate that the printer is still printing. You have to be aware that the printer may still be busy with a task from a previous session. The Printer Busy indicator will be displayed when you try to invoke local copy.

CCA Local Copy

If a display has a session through a CCA, you can local copy to a printer that is also assigned to a host via the CCA. local copy will not work if the display is on a CCA session and the printer is defined through the primary link.

Printer Authorization Matrix (PAM)

The Printer Authorization Matrix (PAM) is defined during customization. PAM definitions are for a physical port; therefore, all secondary sessions will have access to the printer that is defined for the primary session.

If a Print ID is changed during a session, it affects all sessions on this port until the next Print ID change.

9.2 Concurrent Communication Adapter (CCA)

The Concurrent Communication Adapter provides a host attachment that is additional to that provided by the primary communication adapter. Each CCA allows the 3174 to be attached to a host via a separate teleprocessing link.

Each CCA appears to the host to be a separate 3174, with its own microprocessor, controller storage and teleprocessing interface. The CCA communicates independently with different hosts using different network protocols. With SDLC and X.25 it can handle transmission speeds of up to 256 Kbps, and with BSC network protocol up to 19.2 Kbps.

There are two types of CCA: Type 1 and Type 2.

- The Type 1 CCA has a V.24 or V.35 interface for remote attachment using BSC, SNA/SDLC and X.25 network protocols.
- The Type 2 CCA has an X.21 interface for remote attachment using SNA/SDLC and X.25 network protocols.

Up to two CCAs may be installed per 3174, depending on the model (see “Concurrent Communication Adapter (CCA)” on page 16 for details).

Displays attached to a 3174 with the CCA are able to concurrently access 3270 applications in multiple hosts. Control Unit Terminals (CUTs), which are configured as Multiple Logical Terminals (MLTs) during customization, and Distributed Function Terminals (DFTs) can have this multi-host access.

With the Configuration Support-C Release 5, AEA-attached ASCII displays that are configured as MLTs can also access multiple hosts attached via the CCA.

Direct-attached 3270 displays can access 3270 applications via the primary host link or the secondary host link(s) through the CCA. ASCII displays with MLT support can access ASCII host applications via the AEA or 3270 applications via the primary link or the secondary host link(s) through the CCA.

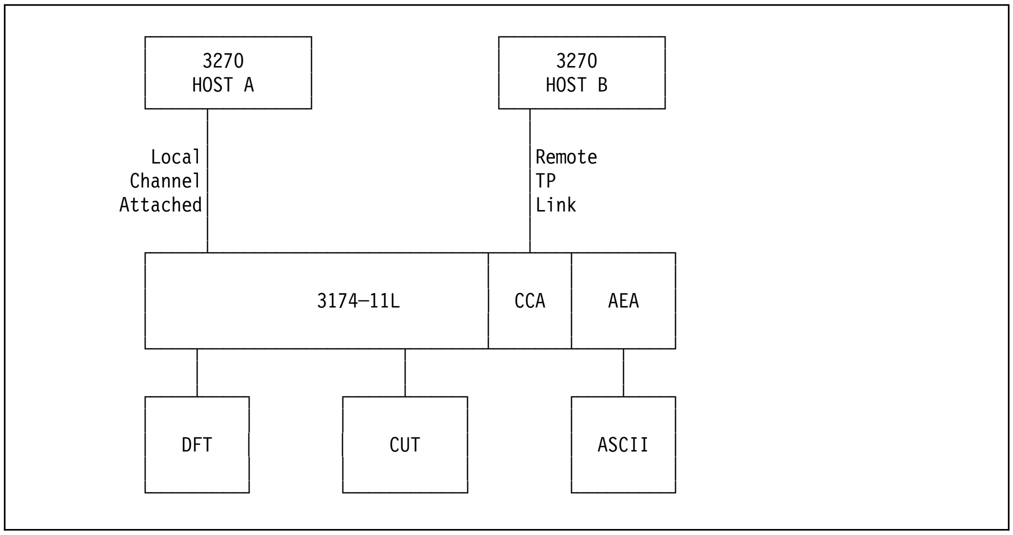


Figure 134. 3174 Multi-Host with Concurrent Communication Adapter

Figure 134 shows a 3174 channel attached to a primary host (A) and TP attached to a secondary host (B) via a CCA. CUT and DFT displays are coax attached and ASCII displays are AEA attached to the the 3174. Both the CUT displays and the ASCII displays are customized for MLT. The CUT, DFT and ASCII displays can access up to five sessions distributed over the two hosts.

Session alerts are sent to the host where the session is bound; hardware alerts are sent to the primary host. It is therefore recommended that the primary host be SNA since these alerts are only sent on SNA. 3174 SNA alerts are high-priority events requiring immediate attention. The 3174 SNA alert function sends problem determination information, collected by the 3174 or entered by an operator, to the NetView hardware monitor.

9.2.1 Supported Devices

The following devices are supported and enhanced by using the Concurrent Communication Adapter:

CUT Displays: Supported CUT displays include:

- 3178
- 3179 (except G models)
- 3180
- 3191
- 3192 (except G models)
- 3471, 3742
- 3481, 3482

The Multiple Logical Terminal (MLT) function allows a CUT display to act as multiple logical terminals. Each logical terminal has its own host address and can interact independently with its own host application. (For more information on MLT, see 9.1, “Multiple Logical Terminal” on page 331.) By using the Change Screen key, a CUT display can access the primary host attached via the primary host link, any of the other hosts attached via the secondary host link(s), and any ASCII host attached via an AEA.

DFT Displays: Supported DFT displays include:

- 3192-G one host session and one printer session
- 3193 two host sessions
- 3194 four host sessions
- 3290 four host sessions
- 3472-G five host sessions

The multiple interactive sessions (MIS) capability allows a DFT display to act as multiple logical terminals. Each logical terminal has its own address and can interact independently with its own host application.

When assigning addresses to ports supporting DFTs, you should check the DFT device documentation for the number and type of sessions supported for that DFT. For example, some DFT displays may support only three host sessions and one printer session.

Displays with multiple session capabilities provide for limited switching capability and the level of switching depends on the primary host link protocol. When the primary link is SNA, DFTs have access to sessions on the primary link and any secondary link; when the primary link is non-SNA, DFTs have access only to sessions on the primary link.

ASCII Displays: Supported ASCII displays include:

- DEC VT100, VT220
- IBM 3101, 3161, 3163, 3164

The Multiple Logical Terminal (MLT) function allows an ASCII display to act as multiple logical terminals. Each logical terminal has its own host address and can interact independently with its own host application in 3270 emulation mode. (For more information on MLT, see 9.1, “Multiple Logical Terminal” on page 331.) By using the Change Screen key sequence, an ASCII display can access any host attached via the primary host link, any of the other hosts attached via the secondary host link(s) or any ASCII host attached via an AEA. Access to host is made through either the connection menu or the default destination procedure. Refer to the *3174 Terminal User's Reference for Expanded Functions* for more information on MLT operation.

3270 Printers: With Configuration Support-C Release 5, 3174 coax-attached printers can participate up to five host sessions.

ASCII Printers: With Configuration Support-C Release 5, 3174 AEA-attached ASCII printers can also participate up to five host sessions similar to coax-attached printers.

9.3 Single Link Multi-Host Support

Single Link Multi-Host (SLMH) support is a microcode function for 3174s attached to the IBM LAN as DSPUs, an ESCON channel, a X.25 network or Frame Relay network. To support SLMH, Configuration Support-B or later microcode and additional controller storage is required (see Appendix E, “3174 Storage Requirements” on page 755).

9.3.1 SLMH Via LAN

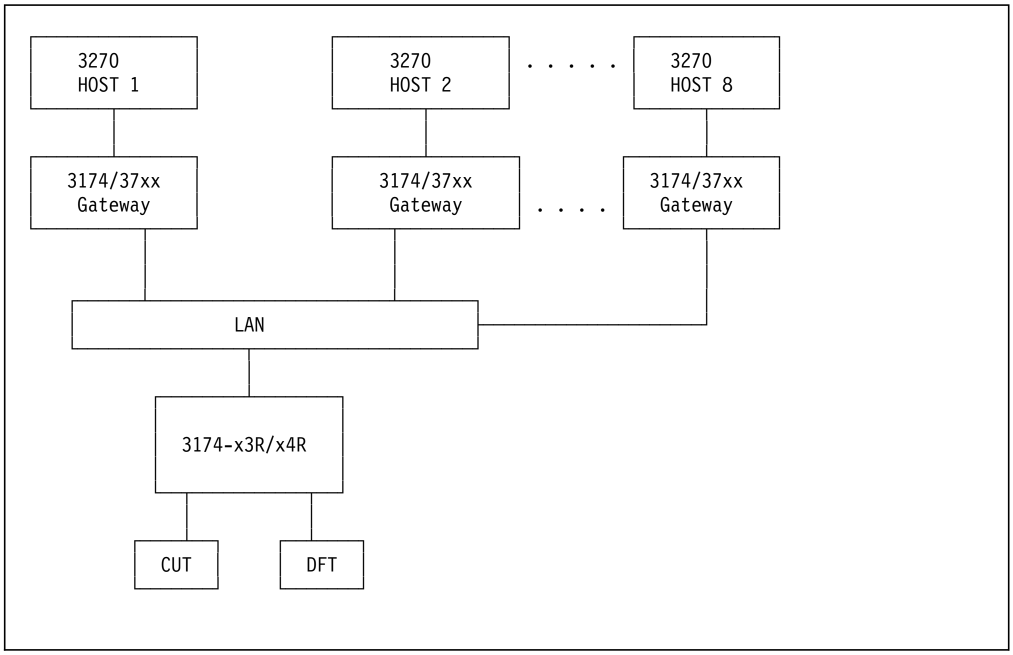


Figure 135. SLMH DSPU via LAN

In this example, the single link to the multiple hosts is provided by the primary communication adapter – the token-ring adapter in the case of 3174-x3R or Ethernet adapter in the case of 3174-x4R. Communication with each 3270 host is via an appropriate gateway. Access to eight 3270 hosts can be configured. However, each display can have sessions with only five of those 3270 hosts.

Note that SLMH support is a microcode-only function that is provided by Configuration Support-B and later releases. It does not require the use of any CCA, although the CCA can be used in conjunction with SLMH (see Figure 136 on page 343).

For 3174 customization details, see 10.3, “Example 3: SLMH via Token-Ring” on page 360. This example is valid in a similar manner for an Ethernet network.

9.3.2 SLMH With CCA

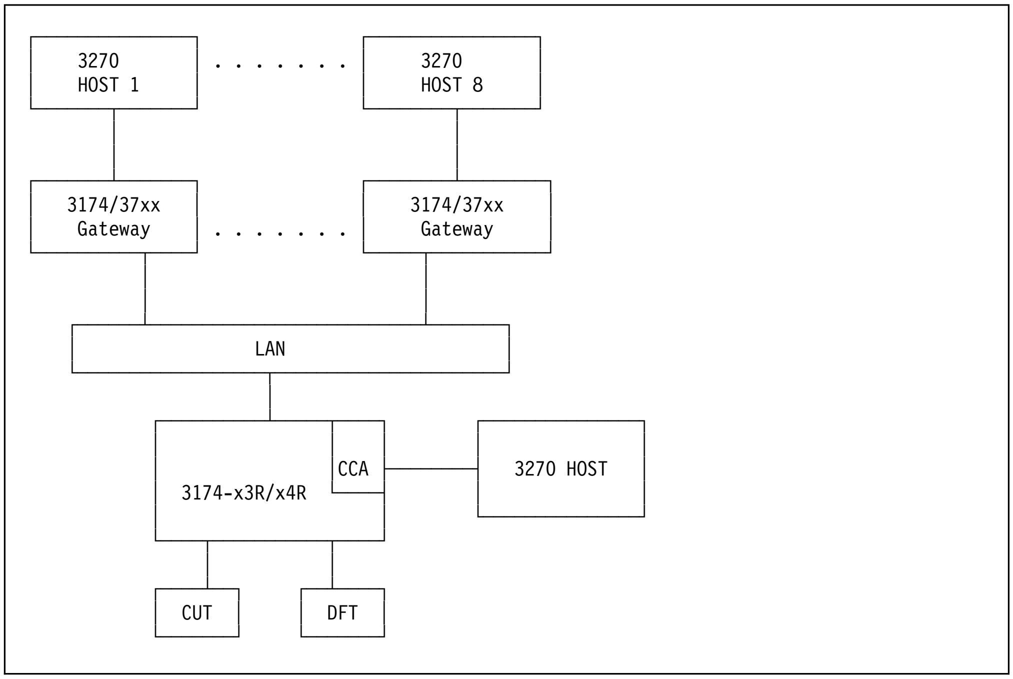


Figure 136. SLMH with CCA

In this example, SLMH is used in conjunction with the CCA. The CUT and DFT displays have access to hosts 1 through 8. In addition, the terminals can also access the 3270 host via the CCA. As before, each display is limited to a maximum of five sessions or LTs.

For 3174 customization details, see 10.4, “Example 4: SLMH with CCA” on page 365.

9.3.3 SLMH with AEA

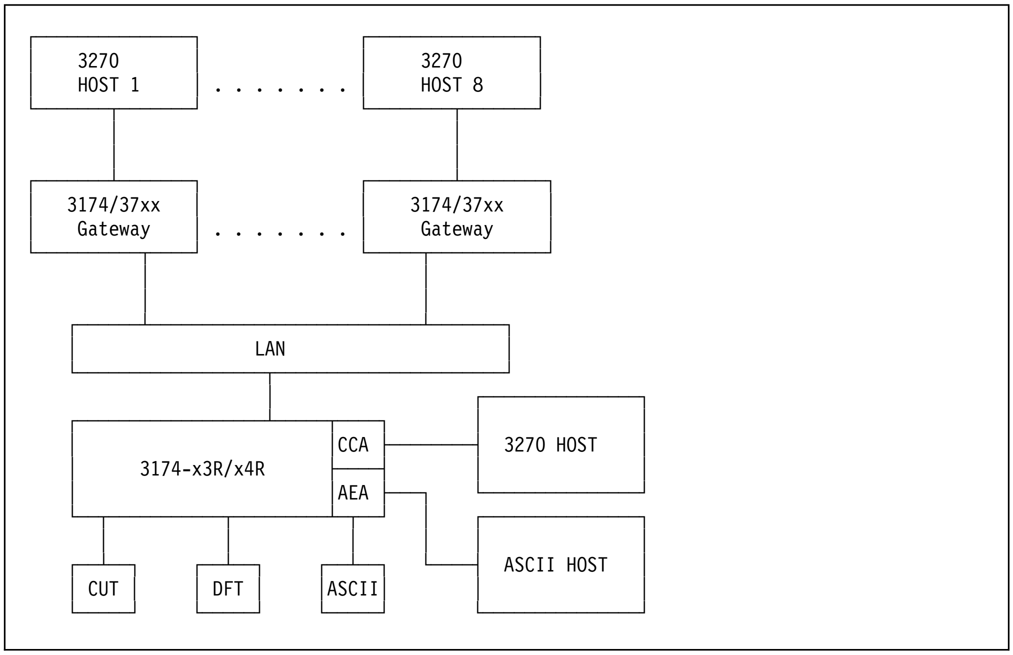


Figure 137. SLMH with AEA

In this example, an AEA has been added for the attachment of ASCII hosts and terminals. The host connectivity supported are as follows:

- A CUT display can have one or more of its five sessions with an ASCII host.
- A DFT display cannot access an ASCII host; the CUT side of a DFT/E display (such as a 3472-G Graphics Display) can access an ASCII host.
- An ASCII display can access ASCII hosts or 3270 hosts attached via the primary link and secondary (CCA) link(s).

Note: The installation of more than one communication adapter in the same 3174 could affect performance and end-user response times. Also, care should be taken when planning for storage requirements. If sufficient storage is not installed in the 3174, some functions will be deconfigured (function will not operate or will operate at a lower level) when the 3174 is IMLed.

9.3.4 SLMH LAN Gateway

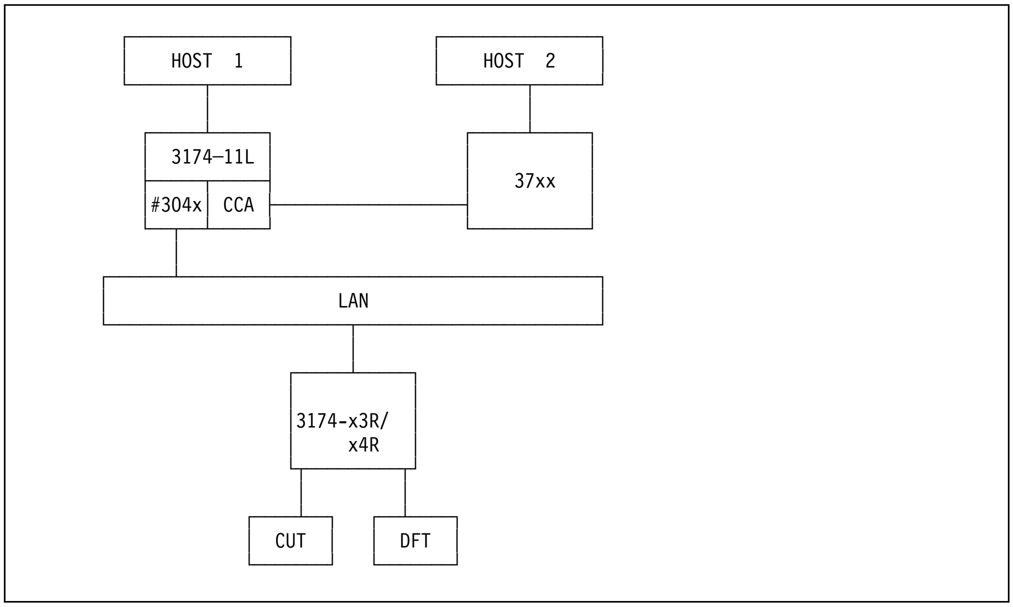


Figure 138. SLMH Gateway via LAN

With Configuration Support-B Release 3and later, connectivity options have been further enhanced by allowing a DSPU to access the CCA installed in a 3174 gateway. For example, a terminal on the 3174-x3R/x4R can now access host 1 via the Token-Ring Adapter/Ethernet Adapter and the primary link; it can also access host 2 via the Token-Ring Adapter/Ethernet Adapter and the secondary link provided by the CCA. In effect, the 3174-11L now acts as two Token-Ring Gateways/Ethernet Gateways: one gateway via the primary link and one gateway via the CCA.

The maximum number of DSPUs that can access a SNA host through each Concurrent Communication Adapter is 50.

For 3174 customization details, see 10.5, “Example 5: SLMH Token-Ring Gateway” on page 367.

9.3.5 SLMH with ESCON

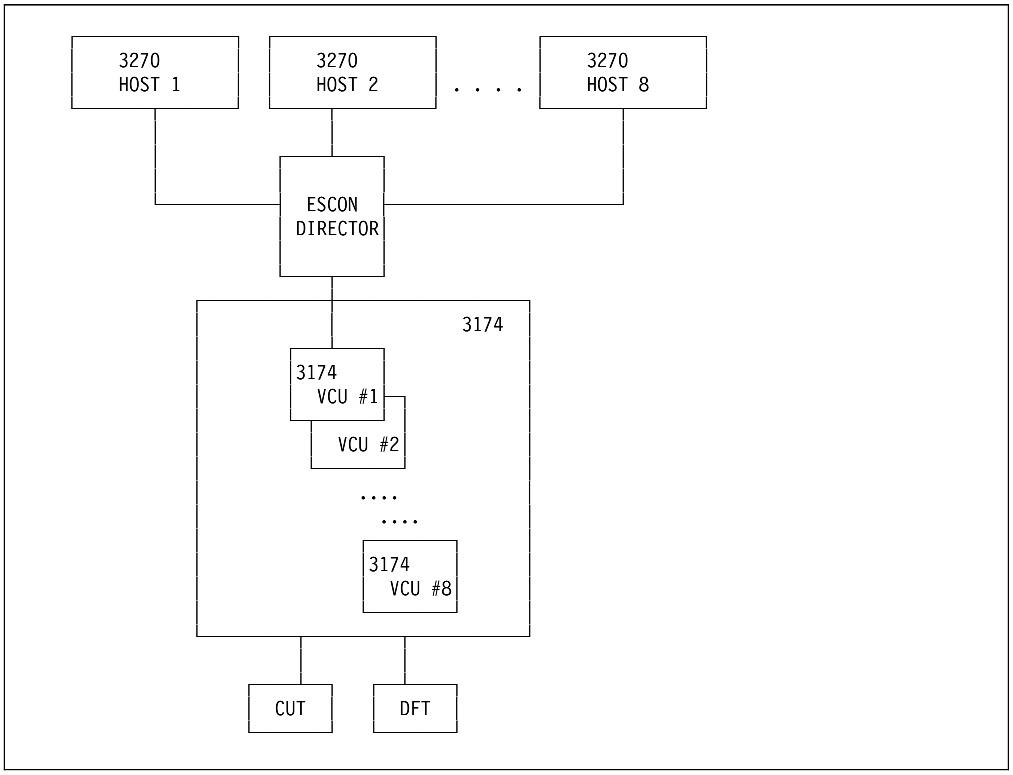


Figure 139. SLMH with ESCON

Using an ESCON Director, you can connect a 3174 ESCON model to eight hosts.

In this example, each ESCON host is connected to the one 3174-x2L. From each host's perspective, the 3174 appears as individual controller (a "virtual control unit"). Using MLT, a terminal can access up to five of the eight hosts connected.

9.3.6 SLMH Gateway with ESCON

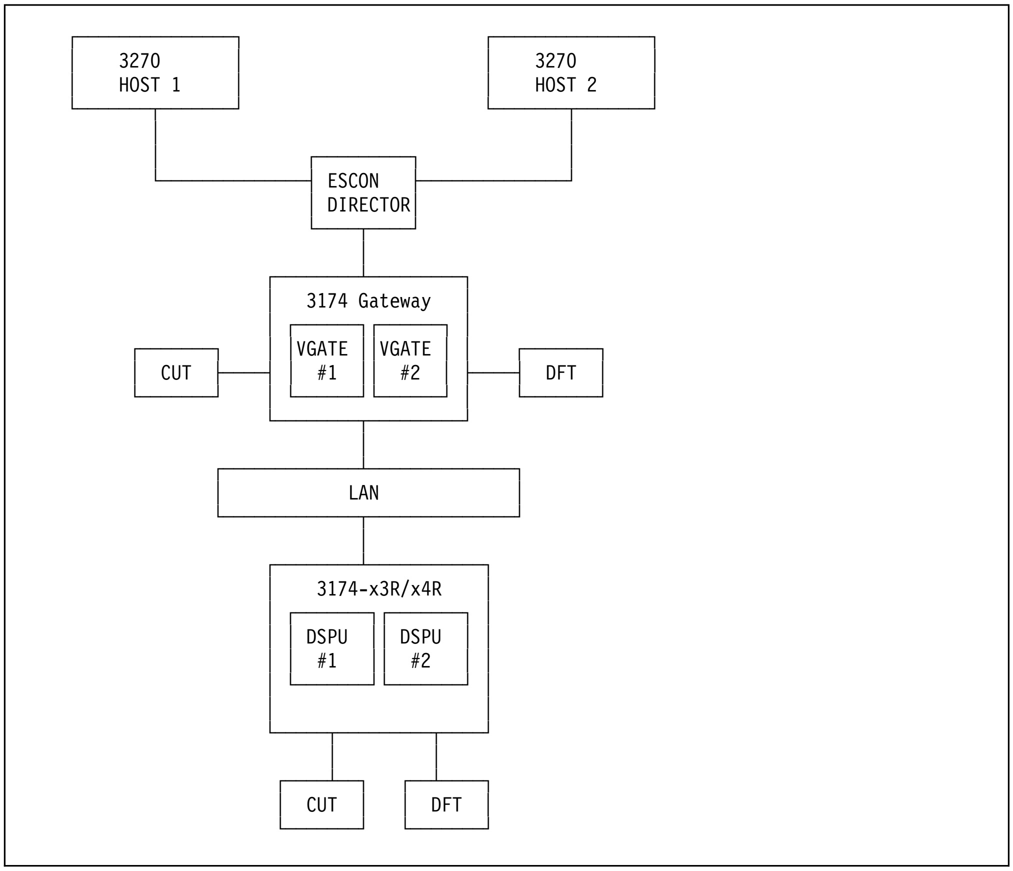


Figure 140. SLMH Gateway with ESCON

In this example, the 3174-x3R/x4R has two host connections, both via the same physical gateway (the 3174-x2L). The 3174-x2L appears as two logical gateways. Host A uses gateway #1 to talk to DSPU #1, and is totally independent of host B communication. The ESCON Director performs the routing to the appropriate host.

For 3174 customization details, see 10.6, "Example 6: SLMH Gateway with ESCON" on page 372.

9.3.7 SLMH with X.25 or Frame Relay

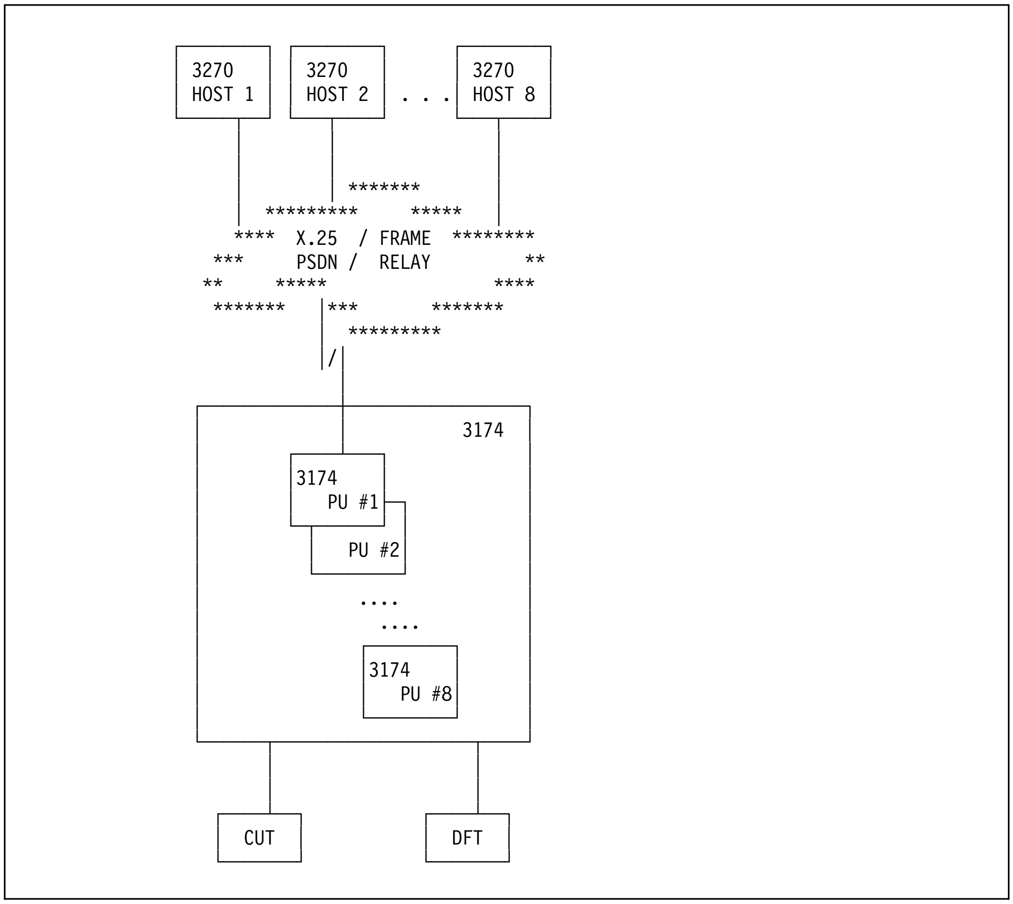


Figure 141. SLMH with X.25 or Frame Relay

With Configuration Support-B Release 3, SLMH connectivity is extended to X.25 network attachments. You can access up to eight X.25 hosts via the primary communication adapter and up to four X.25 hosts via each CCA, giving a total of 16 X.25 hosts for each 3174.

For more information on X.25 refer to Chapter 5, "X.25 Support" on page 157.

For 3174 customization details, see 10.7, "Example 7: SLMH with X.25" on page 380.

With Configuration Support-C Release 5, SLMH connectivity is extended to Frame Relay network attachments and it is possible to access up to eight Frame Relay hosts via the primary communication adapter.

Note: Frame Relay via CCA is not supported.

For more information on Frame Relay refer to Chapter 20, "Frame Relay Support" on page 589.

9.3.8 Multiple Connectivity

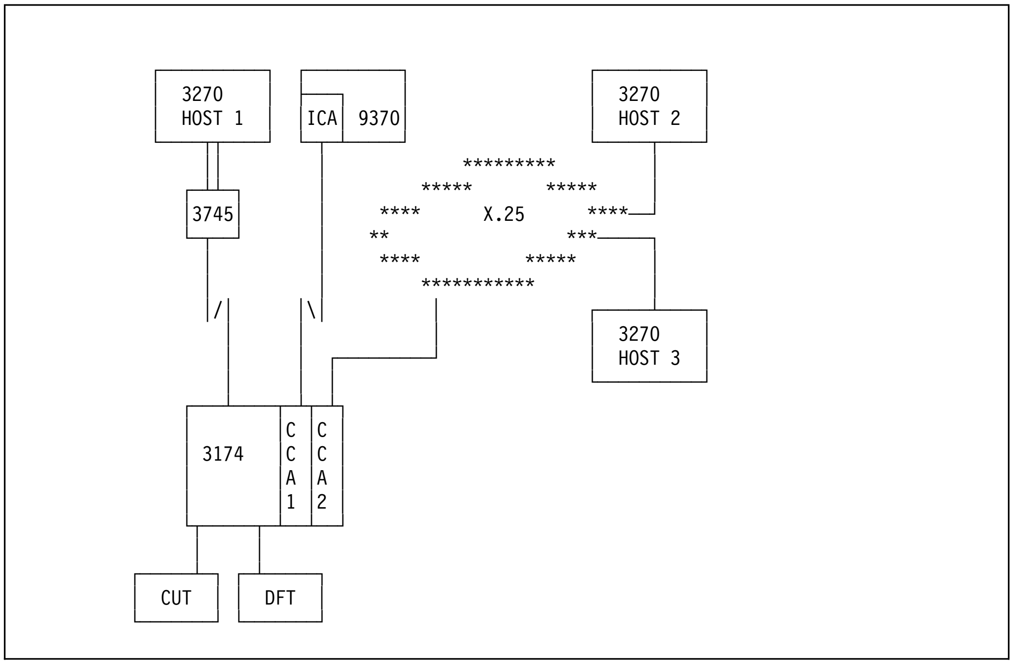


Figure 142. Multiple Connectivity Example

In this example, a 3174 is shown with multiple upstream physical connections:

- The primary communication adapter is attached to host A via an SDLC line.
- The first CCA is attached to host B via an ICA.
- The second CCA is attached to host C and host D via the X.25 network.

Using MLT, you can Change Screen from a session with host A to a session with host B, to another session with host C, and then using SLMH over the X.25 connection, to another session with host D.

9.4 3174 Customization

All the examples shown use the multi-host capability of the 3174; this capability has to be selected at the start of the 3174 customization.

```
                  ____________ Model / Attach ____________


 Online Test Password    098 - 3174

 Product Assistance Data
 099 - DSPU WITH SLMH AND CCA

 3174 Model              100 - 13R

 Host Attachment         101 - M    1-BSC            6-SDLC, X.21 Switched
                                    2-SDLC           7-Token-Ring
                                    3-X.25           8-Ethernet
                                    4-Non-SNA Channel 9-Frame Relay
                                    5-SNA Channel    M-Multi-host

 LAN adapter type        102 - 1    0-none
                                    1-Token Ring
                                    2-Ethernet

 NSO selection           103 - 0000000000000000




CMD===>
```

This panel is presented when you select the Configure option from the Customize Control Disk Menu.

- Question 099 allows you to enter comments, for example, reference information about the 3174.
- Question 100 specifies the 3174 model number.
- Question 101 is where you specify the host attachment. For the multi-host examples described previously, your response must be M to customize for multi-host support.

  When you specify M as the host attachment, then the Multi-Host Definition panel will be presented.

```
                ________ Multi-Host Definition __________

 Select a Host ID and press ENTER

 Host   Adapter    Host     Hardware    Include      Host Descriptor
  ID     Type     Attach     Group      in IML

  1A                7                              GATEWAY_LINK_1______
  2A      1         2         51           1       CCA_HOST_LINK_2_____
  3A      _         _         __           _       ____________________
  1B                                       1       GATEWAY_LINK_3______
  1C                                       1       GATEWAY_LINK_4______
  __                                       _       ____________________
  __                                       _       ____________________
  __                                       _       ____________________
  __                                       _       ____________________
  __                                       _       ____________________
  __                                       _       ____________________
  __                                       _       ____________________


CMD===>
```

In this example Multi-Host Definition panel:

- Host ID 1A is the primary host on the primary link. We specify host attachment 7 to define this as a physical link to a Token-Ring Network.
- Host ID 2A is the primary host on the first secondary (CCA) link. We specify host attachment 2 to define this as a physical link to an a SDLC line. Since the adapter type is Type 1 CCA, a 1 is specified under ″Adapter Type″ and a 51 is entered to indicate the hardware group.
- Host ID 1B and 1C are SLMH (logical) connections; they are secondary hosts via the primary link. As such, they assume the physical attributes of host ID 1A.

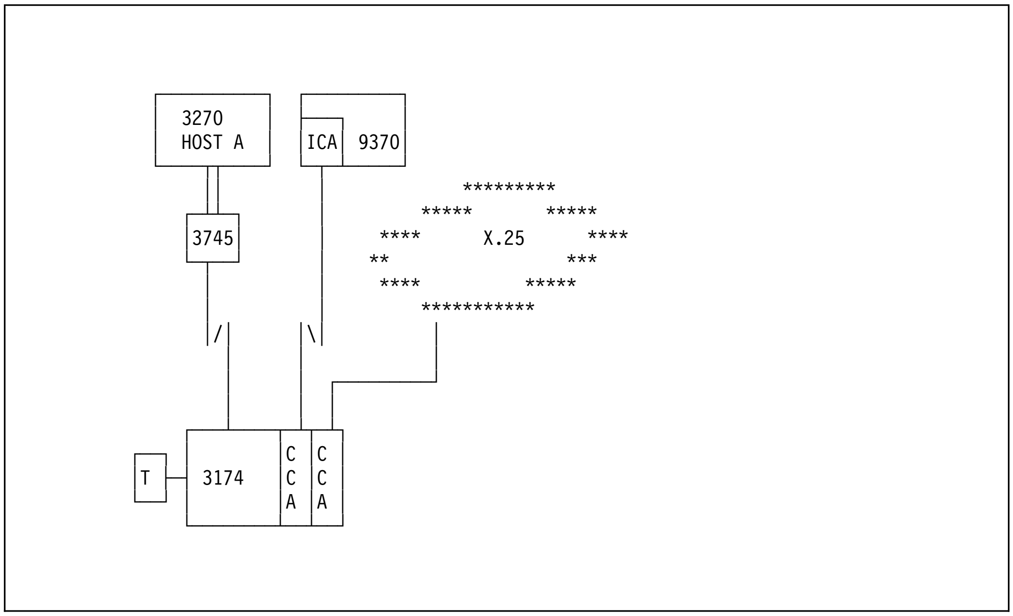
The Host Descriptor field is where you enter a description of each host session that is meaningful for your users. As you customize each host in turn, by selecting the host ID in the command line, the description for the selected host is displayed in subsequent panels to identify the host you are customizing. This description is also displayed in the OIA after the 3174 is IMLed.

Once a host has been selected, the customization process and panels are the same as if just coding a normal single link 3174.

Chapter 10. Connectivity Customization Examples

The following examples were set up in the ITSO, Raleigh Center.

For a detailed account of a specific function you should consult the relevant chapter in this document and the *3174 Planning Guide*.



The format of all the examples is:

- A diagram and a brief description of the scenario
- 3174 customization panels that are significant to the example
- NCP and VTAM definitions

In the examples of this chapter the Token-ring networks can be replaced by Ethernet networks and the x3R models by x14R models without greatly affecting 3174 customization panels. SLMH support is the same for both Token-ring and Ethernet networks.

10.1 Example 1: Remote 3174

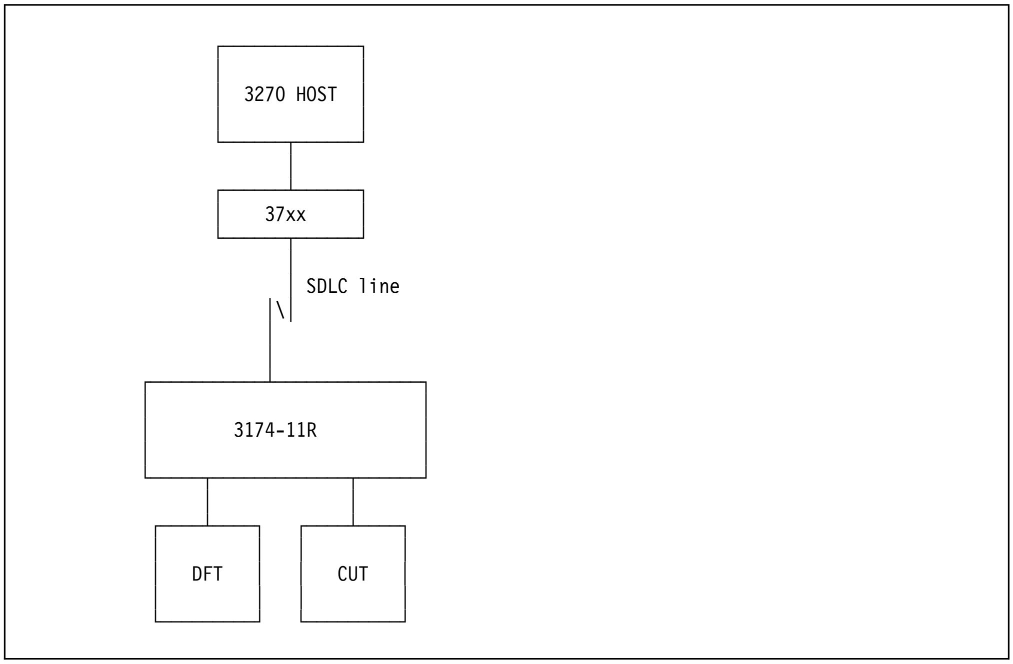


Figure 143. Remote 3174

This is an example of a remote 3174 connected over an SDLC line (line #08), attached to a 3725 running NCP V4.3.1.

Remote 3174 Customization

```
            _____________ Model / Attach _____________

Online Test Password    098 -

Product Assistance Data
                        099 - 11R REMOTE 3174

3174 Model              100 - 11R

Host Attachment         101 - 2    1-BSC             6-SDLC, X.21 Switched
                                   2-SDLC            7-Token-Ring
                                   3-X.25            8-Ethernet
                                   4-Non-SNA Channel 9-Frame Relay
                                   5-SNA Channel     M-Multi-host

LAN adapter type        102 - 0    0-none
                                   1-Token Ring
                                   2-Ethernet

NSO selection           103 - 0000000000000000


CMD===>
```

- Question 099 is user comments or useful information.
- Question 100 specifies the 3174 model number.
- Question 101 specifies the host attachment type (2=SDLC).

```
                  _________________ SDLC _________________

  104 - C1          105 - 00        108 - 23N6503   110 - 1         116 - 1_ _

  121 - 01          123 - 1         125 - 00100100  126 - 00000000  127 - 5 3

  132 - 0 0 0 0     136 - 1 1 1 1   137 - 0 0 0 0   138 - 0

  141 - A           150 - 0         165 - 1         166 - A         168 - 0

  173 - 10100101    175 -           179 - 0 0 0

  213 - 1           215 - 00000     220 - 0

  310 - 0           313 - 1         317 - 0         318 - 0         340 - 0

  365 - 0           370 - 1
```

This is where you define the SDLC attachment to the host.

- Question 104 is the PU polling address. **1**
- Question 116 specifies individual port address assignment (see 3.3.13, "Planning for Port Assignment" on page 57).

```
                  __________ 117: Port Assignment __________

        Host addresses                        Host addresses
Port  IS  1   2   3   4   5           Port  IS  1   2   3   4   5
26-00 2 002 010 ___ ___ ___           26-01 2 003 011 ___ ___ ___
26-02 2 004 012 ___ ___ ___           26-03 2 005 013 ___ ___ ___
26-04 2 006 014 ___ ___ ___           26-05 2 007 015 ___ ___ ___
26-06 2 008 016 ___ ___ ___           26-07 2 009 017 ___ ___ ___
26-08 0 ___ ___ ___ ___ ___           26-09 0 ___ ___ ___ ___ ___
26-10 0 ___ ___ ___ ___ ___           26-11 0 ___ ___ ___ ___ ___
26-12 0 ___ ___ ___ ___ ___           26-13 0 ___ ___ ___ ___ ___
26-14 0 ___ ___ ___ ___ ___           26-15 0 ___ ___ ___ ___ ___
26-16 0 ___ ___ ___ ___ ___           26-17 0 ___ ___ ___ ___ ___
26-18 0 ___ ___ ___ ___ ___           26-19 0 ___ ___ ___ ___ ___
26-20 0 ___ ___ ___ ___ ___           26-21 0 ___ ___ ___ ___ ___
26-22 0 ___ ___ ___ ___ ___           26-23 0 ___ ___ ___ ___ ___
26-24 0 ___ ___ ___ ___ ___           26-25 0 ___ ___ ___ ___ ___
26-26 0 ___ ___ ___ ___ ___           26-27 0 ___ ___ ___ ___ ___
26-28 0 ___ ___ ___ ___ ___           26-29 0 ___ ___ ___ ___ ___
26-30 0 ___ ___ ___ ___ ___           26-31 0 ___ ___ ___ ___ ___
```

Here we specify that two sessions be allocated to each terminal on ports 26-00 through 26-07. The host addresses that you enter here are related to the LOCADDRs in the LU definitions. **2**

```
                   ______ Logical Terminal Assignment _______
                                                        801=2

  Port LT1 LT2 LT3 LT4 LT5                Port LT1 LT2 LT3 LT4 LT5

26-00 1A1 1A2 ___ ___ ___               26-01 1A1 1A2 ___ ___ ___
26-02 1A1 1A2 ___ ___ ___               26-03 1A1 1A2 ___ ___ ___
26-04 1A1 1A2 ___ ___ ___               26-05 1A1 1A2 ___ ___ ___
26-06 1A1 1A2 ___ ___ ___               26-07 1A1 1A2 ___ ___ ___
26-08 ___ ___ ___ ___ ___               26-09 ___ ___ ___ ___ ___
26-10 ___ ___ ___ ___ ___               26-11 ___ ___ ___ ___ ___
26-12 ___ ___ ___ ___ ___               26-13 ___ ___ ___ ___ ___
26-14 ___ ___ ___ ___ ___               26-15 ___ ___ ___ ___ ___
26-16 ___ ___ ___ ___ ___               26-17 ___ ___ ___ ___ ___
26-18 ___ ___ ___ ___ ___               26-19 ___ ___ ___ ___ ___
26-20 ___ ___ ___ ___ ___               26-21 ___ ___ ___ ___ ___
26-22 ___ ___ ___ ___ ___               26-23 ___ ___ ___ ___ ___
26-24 ___ ___ ___ ___ ___               26-25 ___ ___ ___ ___ ___
26-26 ___ ___ ___ ___ ___               26-27 ___ ___ ___ ___ ___
26-28 ___ ___ ___ ___ ___               26-29 ___ ___ ___ ___ ___
```

The Logical Terminal Assignment panel allows you to assign host sessions to each coax attached devices. All the terminals in this example have two sessions, 1A1 and 1A2, to the host. 1A1 will be the first active session when the terminal is powered on.

NCP Line Definitions

```
*-------------------------------------------------------------------*
L13008   LINE ADDRESS=(08,HALF),ANS=CONTINUE,CLOCKNG=EXT,DUPLEX=(HALF),X
               ETRATIO=30,ISTATUS=ACTIVE,LPDATS=LPDA2,MAXPU=10,        X
               NPACOLL=YES,PAUSE=.5,SERVLIM=10,SPEED=9600,             X
               SRT=(,64)
*-------------------------------------------------------------------*
*        SERVICE MACRO SPECIFICATION FOR SDLC (LINE 008)            *
*-------------------------------------------------------------------*
         SERVICE MAXLIST=10,ORDER=(P13008A,RADP08B,P13008C,P13008D,P130X
               08E,P13008F)
*-------------------------------------------------------------------*
P13008A  PU ADDR=C1 1 ,DISCNT=(NO),MAXDATA=521,                        X
               ISTATUS=ACTIVE,MAXOUT=7,                                X
               PACING=0,PASSLIM=8,PUDR=YES,PUTYPE=2,RETRIES=(,4,5),    X
               SSCPFM=USSSCS,USSTAB=US327X,VPACING=0
T13008A1 LU LOCADDR=2 2
T13008A2 LU LOCADDR=3
T13008A3 LU LOCADDR=4
T13008A4 LU LOCADDR=5
T13008A5 LU LOCADDR=6
T13008A6 LU LOCADDR=7
T13008A7 LU LOCADDR=8
T13008A8 LU LOCADDR=9
T13008A9 LU LOCADDR=10
T13008AA LU LOCADDR=11
T13008AB LU LOCADDR=12
T13008AC LU LOCADDR=13
T13008AD LU LOCADDR=14
T13008AE LU LOCADDR=15
T13008AF LU LOCADDR=16
T13008B0 LU LOCADDR=17
*-------------------------------------------------------------------*
```

Notes:

1 Question 104 should match the value of the PU ADDR.

2 The addresses defined in the 3174 panel should match the LU LOCADDR values specified.

10.2 Example 2: Local 3174 with CCA

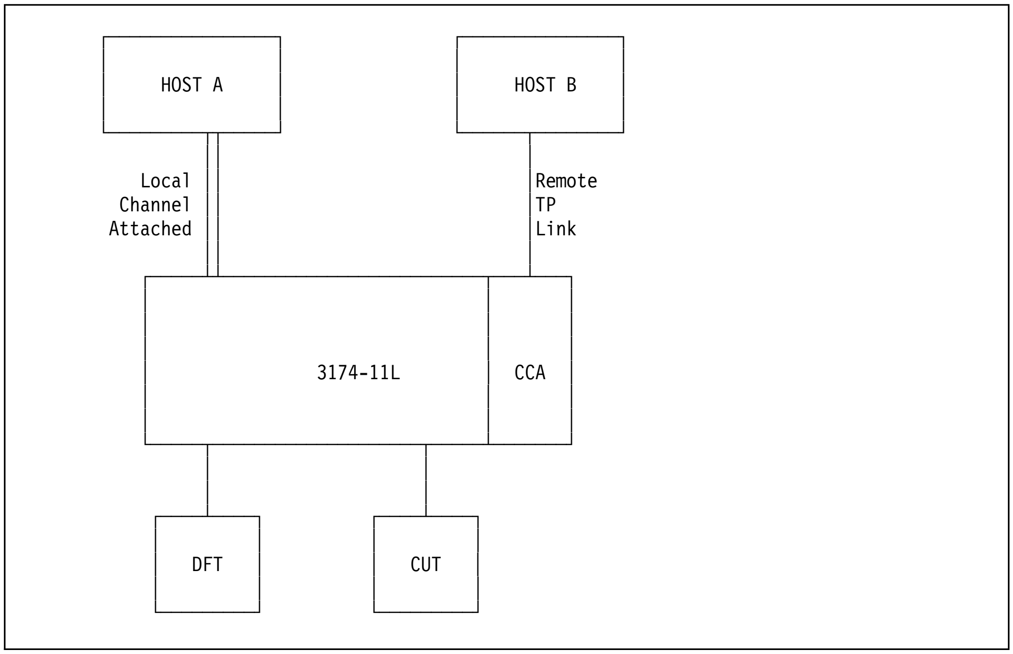


Figure 144. Local 3174 with CCA

This is an example of a 3174 channel attached to host A. It also has a CCA installed and attached to a SDLC line to host B; this line could, in fact, be to host A with the CCA being used as an alternate route. Terminals attached to the 3174 will be allowed to access both hosts.

Local 3174 Customization

```
                  _____________ Model / Attach _____________


 Online Test Password    098 - 3174

 Product Assistance Data
 099 - 11L LOCAL 3174 WITH CCA

 3174 Model              100 - 11L

 Host Attachment         101 - M    1-BSC            6-SDLC, X.21 Switched
                                    2-SDLC           7-Token-Ring
                                    3-X.25           8-Ethernet
                                    4-Non-SNA Channel 9-Frame Relay
                                    5-SNA Channel    M-Multi-host

 LAN adapter type        102 - 0    0-none
                                    1-Token Ring
                                    2-Ethernet

 NSO selection           103 - 0000000000000000




CMD===>
```

In this example, we will customize for multi-host support.

- Question 101 response is M for multi-host attachment.

```
                 ________ Multi-Host Definition __________

Select a Host ID and press ENTER

Host   Adapter    Host      Hardware     Include       Host Descriptor
 ID     Type     Attach      Group       in IML

 1A               5                                 LOCAL_HOST_LINK_____
 2A       1       2           51           1        CCA_HOST_LINK_______
 3A       _       _           __           _        ____________________
 __                                        _        ____________________
 __                                        _        ____________________
 __                                        _        ____________________
 __                                        _        ____________________
 __                                        _        ____________________
 __                                        _        ____________________
 __                                        _        ____________________
 __                                        _        ____________________
 __                                        _        ____________________
```

- Host ID 1A is defined for SNA channel attachment.
- Host ID 2A is defined for SDLC attachment (the CCA link).

```
                 ______________ Local (SNA) _______________
                      1A = LOCAL HOST LINK

 104 - 40         105 - 00        108 - 23N6233    110 - 1          116 - 1_ __

 121 - 01         123 - 0         125 - 00000000   126 - 00000000   127 - 0 0

 132 - 0 0 0 0    136 - 1 1 1 1   137 - 0 0 0 0    138 - 0

 141 - A          150 - 0         165 - 0          166 - A          168 - 0

 173 - 00000000   175 -           179 - 0 0 0

 213 - 1          215 - 00000     220 - 0

 222 - 1          223 - 10        224 - 3          225 - 4
```

After entering 1A on the command line you are presented with the standard host panel for channel definitions. Your responses are related to the parameters coded in the local SNA major node defined for the 3174 in host A.

- Question 104 matches the CUADDR value. **1**

Note: You know which host you are customizing by referring to the line below the panel heading. The description you entered in the Host Descriptor field on the Multi-Host Definition panel is displayed.

```
                 __________ 117: Port Assignment __________
                      1A = LOCAL HOST LINK
         Host addresses                          Host addresses
Port  IS  1   2   3   4   5             Port  IS  1   2   3   4   5
26-00 2 002 010 ___ ___ ___             26-01 2 003 011 ___ ___ ___
26-02 2 004 012 ___ ___ ___             26-03 2 005 013 ___ ___ ___
26-04 2 006 014 ___ ___ ___             26-05 2 007 015 ___ ___ ___
26-06 2 008 016 ___ ___ ___             26-07 2 009 017 ___ ___ ___
26-08 0 ___ ___ ___ ___ ___             26-09 0 ___ ___ ___ ___ ___
26-10 0 ___ ___ ___ ___ ___             26-11 0 ___ ___ ___ ___ ___
26-12 0 ___ ___ ___ ___ ___             26-13 0 ___ ___ ___ ___ ___
26-14 0 ___ ___ ___ ___ ___             26-15 0 ___ ___ ___ ___ ___
26-16 0 ___ ___ ___ ___ ___             26-17 0 ___ ___ ___ ___ ___
26-18 0 ___ ___ ___ ___ ___             26-19 0 ___ ___ ___ ___ ___
26-20 0 ___ ___ ___ ___ ___             26-21 0 ___ ___ ___ ___ ___
26-22 0 ___ ___ ___ ___ ___             26-23 0 ___ ___ ___ ___ ___
26-24 0 ___ ___ ___ ___ ___             26-25 0 ___ ___ ___ ___ ___
26-26 0 ___ ___ ___ ___ ___             26-27 0 ___ ___ ___ ___ ___
26-28 0 ___ ___ ___ ___ ___             26-29 0 ___ ___ ___ ___ ___
26-30 0 ___ ___ ___ ___ ___             26-31 0 ___ ___ ___ ___ ___
```

The host addresses specified are the LU LOCADDR values defined for the 3174 in host A. **2**

VTAM Definitions (Local 3174)

```
*-------------------------------------------------------------------*
*        LOCAL 3174-11L DEFINITIONS FOR AOC                         *
*-------------------------------------------------------------------*
HSNA040 VBUILD TYPE=LOCAL
RAPP40   PU    CUADDR=E40 1 ,ISTATUS=ACTIVE,PUTYPE=2,MAXBFRU=10,     X
               MODETAB=AMODETAB,DLOGMOD=M2SDLCQ,USSTAB=US327X,       X
               VPACING=0
RAPT400 LU     LOCADDR=2 2
RAPT401 LU     LOCADDR=3
RAPT402 LU     LOCADDR=4
RAPT403 LU     LOCADDR=5
RAPT404 LU     LOCADDR=6
RAPT405 LU     LOCADDR=7
RAPT406 LU     LOCADDR=8
RAPT407 LU     LOCADDR=9
RAPT408 LU     LOCADDR=10
RAPT409 LU     LOCADDR=11
RAPT4010 LU    LOCADDR=12
RAPT4011 LU    LOCADDR=13
RAPT4012 LU    LOCADDR=14
RAPT4013 LU    LOCADDR=15
RAPT4014 LU    LOCADDR=16
RAPT4015 LU    LOCADDR=17
*-------------------------------------------------------------------*
```

Notes:

1 Question 104 should match the CUADDR value.

2 The host addresses assigned to the ports should match the LOCADDR values.

```
                  __________________ SDLC __________________
                     2A = CCA HOST LINK

 104 - C1         105 - 00                          110 - 1          116 - 1_ __

                                  125 - 00*****0                     127 - 0 0

                                                                     139 - 00

                  150 - 0         165 - 1

                                  179 - 0 0 0

 213 - 1          215 - 00000     220 - 0

 310 - 0          313 - 1         317 - 0           318 - 0          340 - 0

 365 - 0          370 - 1
```

On this panel, we define the secondary (CCA) host link. In this example, it is an SDLC V.24 link.

- Question 104 matches the ADDR value in the PU definition. **3**

Note: The host descriptor ID is now showing "2A = CCA HOST LINK," the same description you entered in the Multi-Host Definition panel.

```
                  __________ 117: Port Assignment __________
                     2A = CCA HOST LINK
         Host addresses                           Host addresses
Port  IS  1   2   3   4   5               Port  IS  1   2   3   4   5
26-00 2 002 010 ___ ___ ___               26-01 2 003 011 ___ ___ ___
26-02 2 004 012 ___ ___ ___               26-03 2 005 013 ___ ___ ___
26-04 2 006 014 ___ ___ ___               26-05 2 007 015 ___ ___ ___
26-06 2 008 016 ___ ___ ___               26-07 2 009 017 ___ ___ ___
26-08 0 ___ ___ ___ ___ ___               26-09 0 ___ ___ ___ ___ ___
26-10 0 ___ ___ ___ ___ ___               26-11 0 ___ ___ ___ ___ ___
26-12 0 ___ ___ ___ ___ ___               26-13 0 ___ ___ ___ ___ ___
26-14 0 ___ ___ ___ ___ ___               26-15 0 ___ ___ ___ ___ ___
26-16 0 ___ ___ ___ ___ ___               26-17 0 ___ ___ ___ ___ ___
26-18 0 ___ ___ ___ ___ ___               26-19 0 ___ ___ ___ ___ ___
26-20 0 ___ ___ ___ ___ ___               26-21 0 ___ ___ ___ ___ ___
26-22 0 ___ ___ ___ ___ ___               26-23 0 ___ ___ ___ ___ ___
26-24 0 ___ ___ ___ ___ ___               26-25 0 ___ ___ ___ ___ ___
26-26 0 ___ ___ ___ ___ ___               26-27 0 ___ ___ ___ ___ ___
26-28 0 ___ ___ ___ ___ ___               26-29 0 ___ ___ ___ ___ ___
26-30 0 ___ ___ ___ ___ ___               26-31 0 ___ ___ ___ ___ ___
```

This panel assigns the number of sessions and the host addresses to the 3270 ports for the secondary (CCA) link.

We have assigned 16 host addresses to only eight coaxial ports, 26-00 through 26-07. **4**

```
                   ______ Logical Terminal Assignment _______
                                                          801=2

 Port LT1 LT2 LT3 LT4 LT5                 Port LT1 LT2 LT3 LT4 LT5

26-00 1A1 1A2 2A1 2A2 ___                26-01 1A1 1A2 2A1 2A2 ___
26-02 1A1 1A2 2A1 2A2 ___                26-03 1A1 1A2 2A1 2A2 ___
26-04 1A1 1A2 2A1 2A2 ___                26-05 1A1 1A2 2A1 2A2 ___
26-06 1A1 1A2 2A1 2A2 ___                26-07 1A1 1A2 2A1 2A2 ___
26-08 ___ ___ ___ ___ ___                26-09 ___ ___ ___ ___ ___
26-10 ___ ___ ___ ___ ___                26-11 ___ ___ ___ ___ ___
26-12 ___ ___ ___ ___ ___                26-13 ___ ___ ___ ___ ___
26-14 ___ ___ ___ ___ ___                26-15 ___ ___ ___ ___ ___
26-16 ___ ___ ___ ___ ___                26-17 ___ ___ ___ ___ ___
26-18 ___ ___ ___ ___ ___                26-19 ___ ___ ___ ___ ___
26-20 ___ ___ ___ ___ ___                26-21 ___ ___ ___ ___ ___
26-22 ___ ___ ___ ___ ___                26-23 ___ ___ ___ ___ ___
26-24 ___ ___ ___ ___ ___                26-25 ___ ___ ___ ___ ___
26-26 ___ ___ ___ ___ ___                26-27 ___ ___ ___ ___ ___
26-28 ___ ___ ___ ___ ___                26-29 ___ ___ ___ ___ ___
```

On this panel, we assign the host sessions to each 3270 port.

In this example, all the ports are assigned identically. Each terminal has four sessions (or four LTs); the first two sessions will attach to host A via the primary link, the next two sessions will attach to host B via the CCA link.

NCP Line Definitions

```
*--------------------------------------------------------------------*
L1300A   LINE ADDRESS=(OA,HALF),ANS=CONTINUE,CLOCKNG=EXT,DUPLEX=(HALF),X
               ETRATIO=30,ISTATUS=ACTIVE,LPDATS=LPDA2,MAXPU=10,        X
               NPACOLL=YES,PAUSE=.5,SERVLIM=10,SPEED=9600,SRT=(,64)
*--------------------------------------------------------------------*
*        SERVICE MACRO SPECIFICATION FOR SDLC (LINE 00A)             *
*--------------------------------------------------------------------*
         SERVICE MAXLIST=10,ORDER=(P1300AA,RADP0AB,P1300AC,P1300AD,P130X
               0AE,P1300AF)
*--------------------------------------------------------------------*
P13008A  PU ADDR=C1, 3 DISCNT=(NO),MAXDATA=521,                        X
               ISTATUS=ACTIVE,MAXOUT=7,                                X
               PACING=0,PASSLIM=8,PUDR=YES,PUTYPE=2,RETRIES=(,4,5),    X
               SSCPFM=USSSCS,USSTAB=US327X,VPACING=0
T13008A1 LU LOCADDR=2 4
T1300AA2 LU LOCADDR=3
T1300AA3 LU LOCADDR=4
T1300AA4 LU LOCADDR=5
T1300AA5 LU LOCADDR=6
T1300AA6 LU LOCADDR=7
T1300AA7 LU LOCADDR=8
T1300AA8 LU LOCADDR=9
T1300AA9 LU LOCADDR=10
T1300AAA LU LOCADDR=11
T1300AAB LU LOCADDR=12
T1300AAC LU LOCADDR=13
T1300AAD LU LOCADDR=14
T1300AAE LU LOCADDR=15
T1300AAF LU LOCADDR=16
T1300AB0 LU LOCADDR=17
*--------------------------------------------------------------------*
```

Notes:

3 As in the channel definitions, question 104 is the host address for the 3174. For the CCA, question 104 should match the ADDR value in the PU definition.

4 The host addresses in the Port Assignment panel should match the LU LOCADDR values.

10.3 Example 3: SLMH via Token-Ring

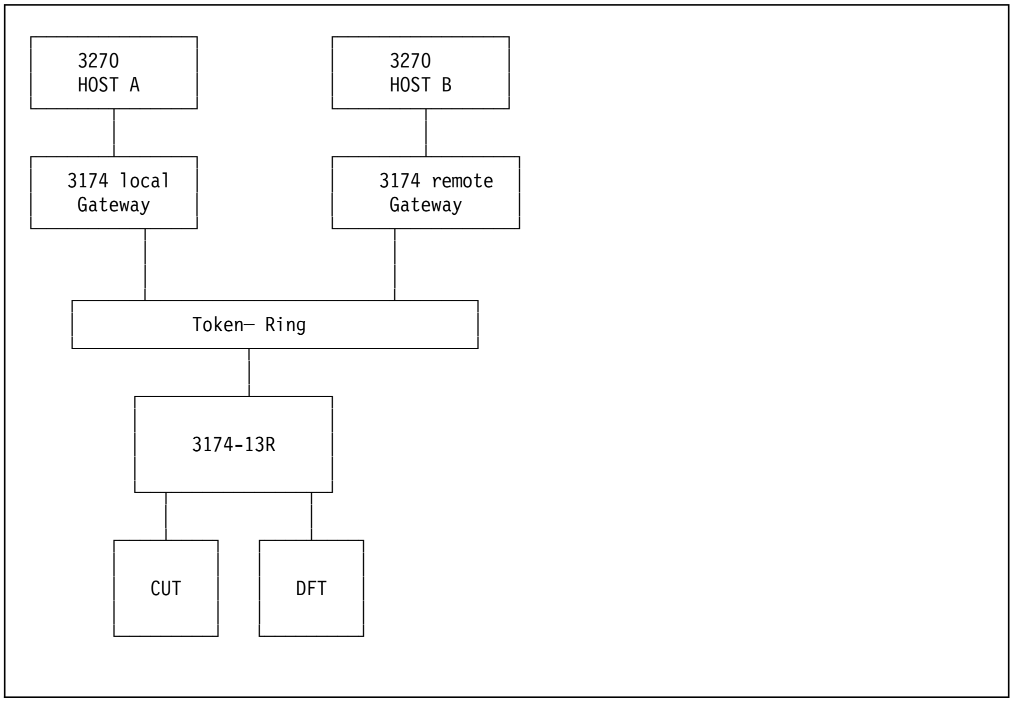


Figure 145. Single Link Multi-Host Connectivity

In this example we have a 3174-13R as a DSPU with two host attachments over the Token-Ring. Each terminal on the 3174 has one session via the local 3174 gateway and another session via the remote 3174 gateway. For details on how to customize a 3174 LAN Gateway see 4.5, "3174 Gateways" on page 77.

Note: The customization panels that are showed in this example assume a Token Ring Network. The same level of support is provided for an Ethernet Network with minor customization panel changes. (E.g., Question 100= 14R, instead of 13R).

DSPU 3174 Customization

```
               _____________ Model / Attach _____________

 Online Test Password    098 - 3174

 Product Assistance Data
 099 - DSPU WITH SLMH

 3174 Model              100 - 13R

 Host Attachment         101 - M    1-BSC             6-SDLC, X.21 Switched
                                    2-SDLC            7-Token-Ring
                                    3-X.25            8-Ethernet
                                    4-Non-SNA Channel 9-Frame Relay
                                    5-SNA Channel     M-Multi-host

 LAN adapter type        102 - 0    0-none
                                    1-Token Ring
                                    2-Ethernet

 NSO selection           103 - 0000000000000000

CMD===>
```

- For multi-host attachment, respond to question 101 with M.

```
                ________ Multi-Host Definition __________

Select a Host ID and press ENTER

Host   Adapter    Host      Hardware    Include      Host Descriptor
 ID     Type     Attach      Group      in IML

 1A                7                                LOCAL_GATEWAY_LINK__
 2A       _        _          __          _         ____________________
 3A       _        _          __          _         ____________________
 1B                                       1         REMOTE_GATEWAY_LINK_
 __                                       _         ____________________
 __                                       _         ____________________
 __                                       _         ____________________
 __                                       _         ____________________
 __                                       _         ____________________
 __                                       _         ____________________
 __                                       _         ____________________
 __                                       _         ____________________
```

Here we specify the multi-host definitions. Unlike Example 2, where we use host IDs 1A and 2A, we are now customizing for SLMH and will use the *same* physical link (the primary communication adapter link). The second host on this single link is identified by the host ID 1B.

Host 1A Customization

```
                ___________ Token-Ring Network ___________
                     1A = LOCAL GATEWAY LINK

 106 - 4000 3174 9999 04   107 - 4000 0000 3174 04   108 - 23V2645

 110 - 1                   116 - 2_ __

 121 - 01      123 - 1     125 - 00000000            126 - 00000000   127 - 5 3

 132 - 0 0 0 0             136 - 1 1 1 1             137 - 0 0 0 0    138 - 0

 141 - A                   165 - 0                   166 - A          168 - 0

 173 - 00000000            175 -                     179 - 0 0 0

 213 - 1                   215 - 00000               220 - 1

 382 - 2057                383 - 2                   384 - 2
```

This panel is displayed after we enter 1A on the command line on the Multi-Host Definition panel. Here we define the primary link to the primary host via the 3174 local gateway.

- Question 106 is the address of the 3174-13R. **1**
- Question 107 is the address of the 3174 local gateway. **2**

```
                __________ 117: Port Assignment __________
                     1A = LOCAL GATEWAY LINK
          Host addresses                          Host addresses
Port  IS  1   2   3   4   5              Port  IS  1   2   3   4   5
26-00 1 002 ___ ___ ___ ___              26-01 1 003 ___ ___ ___ ___
26-02 1 004 ___ ___ ___ ___              26-03 1 005 ___ ___ ___ ___
26-04 1 006 ___ ___ ___ ___              26-05 1 007 ___ ___ ___ ___
26-06 1 008 ___ ___ ___ ___              26-07 1 009 ___ ___ ___ ___
26-08 1 010 ___ ___ ___ ___              26-09 1 011 ___ ___ ___ ___
26-10 1 012 ___ ___ ___ ___              26-11 1 013 ___ ___ ___ ___
26-12 1 014 ___ ___ ___ ___              26-13 1 015 ___ ___ ___ ___
26-14 1 016 ___ ___ ___ ___              26-15 1 017 ___ ___ ___ ___
26-16 0 ___ ___ ___ ___ ___              26-17 0 ___ ___ ___ ___ ___
26-18 0 ___ ___ ___ ___ ___              26-19 0 ___ ___ ___ ___ ___
26-20 0 ___ ___ ___ ___ ___              26-21 0 ___ ___ ___ ___ ___
26-22 0 ___ ___ ___ ___ ___              26-23 0 ___ ___ ___ ___ ___
26-24 0 ___ ___ ___ ___ ___              26-25 0 ___ ___ ___ ___ ___
26-26 0 ___ ___ ___ ___ ___              26-27 0 ___ ___ ___ ___ ___
26-28 0 ___ ___ ___ ___ ___              26-29 0 ___ ___ ___ ___ ___
26-30 0 ___ ___ ___ ___ ___              26-31 0 ___ ___ ___ ___ ___
```

Here we assign one host address for each each of the 16 ports. The host addresses match the LU LOCADDR values. **3**

3174 Local Gateway Customization

```
              ______________ Local (SNA) _______________

104 - 40        105 - 46        108 - 23N6233   110 - 0         116 - 0  _

121 - 01        123 - 0         125 - 00000000  126 - 00000000  127 - 5 3

132 - 0 0 0 0   136 - 1 1 1 1   137 - 0 0 0 0   138 - 0

141 - A         150 - 1         165 - 0         166 - A         168 - 0

173 - 00000000  175 -           179 - 0 0 0

213 - 1         215 - 00000     220 - 1

222 - 1         223 - 10        224 - 3         225 - 4
```

In this 3174 local gateway panel, we see that Questions 104 and 105 specify the range of addresses through the gateway. These host addresses are defined in the local SNA major node definition for the 3174 local gateway.

```
              _______ 940: Ring Address Assignment _______


 S      Ring Address    SAP    T          S      Ring Address    SAP    T
 40    4000 0000 3174    04
 41    4000 3174 9999    04    1          42    XXXX XXXX XXXX    04    1
 43    XXXX XXXX XXXX    04    0          44    XXXX XXXX XXXX    04    0
 45    XXXX XXXX XXXX    04    0          46    XXXX XXXX XXXX    04    0
```

- The 3174 local gateway (Token-Ring address 400000003174) is assigned to host address 40.

  Host address 40 is, in turn, defined as PU RAPP40 (CUADDR=E40) in the VTAM definitions.

- The 3174-13R DSPU (Token-Ring address 400031749999) is assigned to host address 41.

  Host address 41 is, in turn, defined as PU RAPP41 (CUADDR=E41) in the VTAM definitions.

VTAM Definitions (Local 3174)

```
*---------------------------------------------------------------------*
HSNA040 VBUILD TYPE=LOCAL
RAPP40   PU     CUADDR=E40 2 ,ISTATUS=ACTIVE,PUTYPE=2,                X
                 MAXBFRU=10,MODETAB=AMODETAB,DLOGMOD=M2SDLCQ,         X
                 USSTAB=US327X,VPACING=0
RAPT400 LU      LOCADDR=2
RAPT401 LU      LOCADDR=3
   :               :
RAPT40E LU      LOCADDR=17
*---------------------------------------------------------------------*
RAPP41   PU     CUADDR=E41 1 ,ISTATUS=ACTIVE,PUTYPE=2,                X
                 MAXBFRU=10,MODETAB=AMODETAB,DLOGMOD=M2SDLCQ,         X
                 USSTAB=US327X,VPACING=0,SECNET=YES
RAPT410 LU      LOCADDR=2
RAPT411 LU      LOCADDR=3
   :               :
RAPT41E LU      LOCADDR=17 3
*---------------------------------------------------------------------*
```

Notes:

1 Question 106 is the 3174-13R Token-Ring address, mapped to host address CUADDR=E41.

2 Question 107 is the 3174 local gateway Token-Ring address, mapped to host address CUADDR=E40.

3 LU definitions for the 3174-13R in host A.

Host 1B Customization

```
              ___________ Token-Ring Network ___________
                   1B = REMOTE GATEWAY

 106 - 4000 3174 9999 04   107 - 4000 1111 3174 04

                           116 - 1_ __

                           125 - 00*****0                        127 - 0 0



                           165 - 0

                                                179 - 0 0 0

                           215 - 00000          220 - 0         221 - 0

 382 - 2057                383 - 2
```

Here we define our attachment to the second host via the remote gateway.

- Question 106 is again the 3174-13R Token-Ring address. **4**
- Question 107 is the 3174 remote gateway Token-Ring address. **5**

```
              __________ 117: Port Assignment __________
                   1B = REMOTE GATEWAY
        Host addresses                          Host addresses
Port  IS  1   2   3   4   5             Port  IS  1   2   3   4   5
26-00 1 002 ___ ___ ___ ___             26-01 1 003 ___ ___ ___ ___
26-02 1 004 ___ ___ ___ ___             26-03 1 005 ___ ___ ___ ___
26-04 1 006 ___ ___ ___ ___             26-05 1 007 ___ ___ ___ ___
26-06 1 008 ___ ___ ___ ___             26-07 1 009 ___ ___ ___ ___
26-08 1 010 ___ ___ ___ ___             26-09 1 011 ___ ___ ___ ___
26-10 1 012 ___ ___ ___ ___             26-11 1 013 ___ ___ ___ ___
26-12 1 014 ___ ___ ___ ___             26-13 1 015 ___ ___ ___ ___
26-14 1 016 ___ ___ ___ ___             26-15 1 017 ___ ___ ___ ___
26-16 0 ___ ___ ___ ___ ___             26-17 0 ___ ___ ___ ___ ___
26-18 0 ___ ___ ___ ___ ___             26-19 0 ___ ___ ___ ___ ___
26-20 0 ___ ___ ___ ___ ___             26-21 0 ___ ___ ___ ___ ___
26-22 0 ___ ___ ___ ___ ___             26-23 0 ___ ___ ___ ___ ___
26-24 0 ___ ___ ___ ___ ___             26-25 0 ___ ___ ___ ___ ___
26-26 0 ___ ___ ___ ___ ___             26-27 0 ___ ___ ___ ___ ___
26-28 0 ___ ___ ___ ___ ___             26-29 0 ___ ___ ___ ___ ___
26-30 0 ___ ___ ___ ___ ___             26-31 0 ___ ___ ___ ___ ___
```

We assign one host address for each of the 16 ports for attachment to the second host. The host addresses match the LU LOCADDR values in the NCP definition for the 3174-13R (PU RADP08B). **6**

```
               ______ Logical Terminal Assignment _______
                                                  801=2

 Port LT1 LT2 LT3 LT4 LT5               Port LT1 LT2 LT3 LT4 LT5

26-00 1A1 1B1 ___ ___ ___               26-01 1A1 1B1 ___ ___ ___
26-02 1A1 1B1 ___ ___ ___               26-03 1A1 1B1 ___ ___ ___
26-04 1A1 1B1 ___ ___ ___               26-05 1A1 1B1 ___ ___ ___
26-06 1A1 1B1 ___ ___ ___               26-07 1A1 1B1 ___ ___ ___
26-08 1A1 1B1 ___ ___ ___               26-09 1A1 1B1 ___ ___ ___
26-10 1A1 1B1 ___ ___ ___               26-11 1A1 1B1 ___ ___ ___
26-12 1A1 1B1 ___ ___ ___               26-13 1A1 1B1 ___ ___ ___
26-14 1A1 1B1 ___ ___ ___               26-15 1A1 1B1 ___ ___ ___
26-16 ___ ___ ___ ___ ___               26-17 ___ ___ ___ ___ ___
26-18 ___ ___ ___ ___ ___               26-19 ___ ___ ___ ___ ___
26-20 ___ ___ ___ ___ ___               26-21 ___ ___ ___ ___ ___
26-22 ___ ___ ___ ___ ___               26-23 ___ ___ ___ ___ ___
26-24 ___ ___ ___ ___ ___               26-25 ___ ___ ___ ___ ___
26-26 ___ ___ ___ ___ ___               26-27 ___ ___ ___ ___ ___
26-28 ___ ___ ___ ___ ___               26-29 ___ ___ ___ ___ ___
```

Using the LTA panel we now assign two host sessions to each coax port.

- 1A1 maps the first session to host A.
- 1B1 maps the second session to host B.

Thus, each terminal has two sessions or LTs; LT-1 to host A and LT-2 to host B.

3174 Remote Gateway Customization

```
____________ Token-Ring Gateway ____________

900 - 4000 1111 3174 04    905 - 1            908 - IBMLAN

911 - 2                    912 - 00
```

- Question 900 is the 3174 remote gateway Token-Ring address. **5**

```
_______ 940: Ring Address Assignment _______

S      Ring Address    SAP    T          S      Ring Address    SAP    T
C1    4000 1111 3174    04
C2    4000 3174 9999    04    0          C3    XXXX XXXX XXXX    04    0
C4    XXXX XXXX XXXX    04    0          C5    XXXX XXXX XXXX    04    0
C6    XXXX XXXX XXXX    04    0
```

- The 3174 remote gateway (Token-Ring address 400011113174) is assigned to host address C1.

  Host address C1 is, in turn, defined as PU P13008A (ADDR=C1) in the NCP definitions.
- The 3174-13R DSPU (Token-Ring address 400031749999) is assigned to host address C2.

  Host address C2 is, in turn, defined as PU RADP08B (ADDR=C2) in the NCP definitions.

NCP Line Definitions

```
*--------------------------------------------------------------------*
L13008   LINE ADDRESS=(08,FULL),ANS=CONTINUE,CLOCKNG=EXT,DUPLEX=(FULL),X
               ETRATIO=30,ISTATUS=ACTIVE,LPDATS=LPDA2,MAXPU=10,NPACOLL=X
               YES,PAUSE=.5,SERVLIM=10,SPEED=9600,SRT=(,64)
*--------------------------------------------------------------------*
P13008A  PU ADDR=C1 5 ,DISCNT=(NO),MAXDATA=521,MAXOUT=7,               X
               PACING=0,PASSLIM=8,PUDR=YES,PUTYPE=2,RETRIES=(,4,5),    X
               SSCPFM=USSSCS,USSTAB=US327X,VPACING=0,GP3174=AE
T13008A0 LU LOCADDR=2
T13008A1 LU LOCADDR=3
   :          :
T13008AE LU LOCADDR=17
*--------------------------------------------------------------------*
RADP08B  PU ADDR=C2 4 ,DISCNT=(NO),MAXDATA=265,MAXOUT=7,               X
               PACING=0,PASSLIM=8,PUDR=YES,PUTYPE=2,RETRIES=(,4,5),    X
               SSCPFM=USSSCS,USSTAB=US327X,VPACING=0,GP3174=AE
RADT08B0 LU LOCADDR=2
RADT08B1 LU LOCADDR=3
   :          :
RADT08BE LU LOCADDR=17 6
*--------------------------------------------------------------------*
```

Notes:

4 Question 106 is the Token-Ring address of the 3174-13R DSPU, mapped to host address ADDR=C2.

5 Question 107 is the Token-Ring address of the 3174 remote gateway, mapped to host address ADDR=C1.

6 LU definitions for the 3174-13R DSPU.

10.4 Example 4: SLMH with CCA

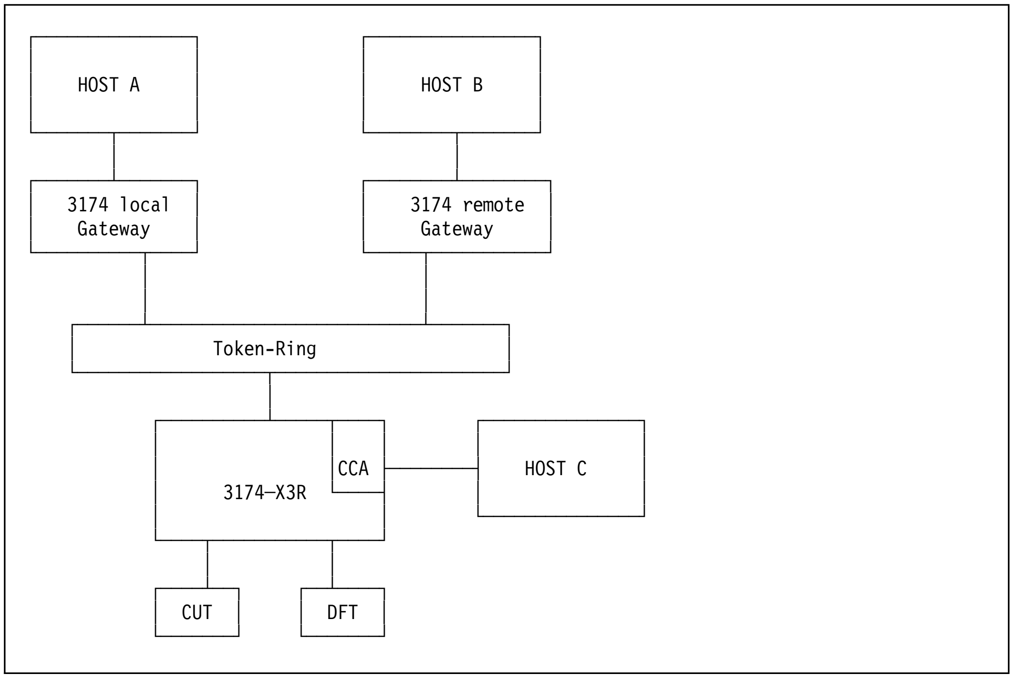


Figure 146. SLMH with CCA

This example is the same as Example 3, except with the addition of a CCA in the 3174-13R for a third host connection. This CCA attached via an SDLC V.24 line to an NCP. The 3174-13R will be re-customized to add this third host connection.

DSPU 3174 Customization

```
                   _____________ Model / Attach _____________

 Online Test Password    098 - 3174

 Product Assistance Data
 099 - DSPU WITH SLMH AND CCA

 3174 Model              100 - 13R

 Host Attachment         101 - M    1-BSC             6-SDLC, X.21 Switched
                                    2-SDLC            7-Token-Ring
                                    3-X.25            8-Ethernet
                                    4-Non-SNA Channel 9-Frame Relay
                                    5-SNA Channel     M-Multi-host

 LAN adapter type        102 - 0    0-none
                                    1-Token Ring
                                    2-Ethernet

 NSO selection           103 - 0000000000000000

CMD===>
```

- For multi-host attachment, respond to question 101 with M.

```
              ________ Multi-Host Definition __________

Select a Host ID and press ENTER

Host   Adapter    Host      Hardware     Include      Host Descriptor
 ID     Type      Attach     Group       in IML

 1A                 7                               LOCAL_GATEWAY_LINK__
 2A      1          2          51           1       CCA LINK____________
 3A      _          _          __           _       ____________________
 1B                                         1       REMOTE_GATEWAY_LINK_
 __                                         _       ____________________
 __                                         _       ____________________
 __                                         _       ____________________
 __                                         _       ____________________
 __                                         _       ____________________
 __                                         _       ____________________
 __                                         _       ____________________
 __                                         _       ____________________
```

After specifying M for question 101, we are presented with this panel. Here we code the SLMH definitions (1A and 1B), and the CCA host (2A).

The 1A and 1B host definitions are as shown in Example 3 and will not be repeated here.

Host 2A Customization

```
              __________________ SDLC __________________
                   2A = CCA LINK

 104 - C1        105 - 00                        110 - 1         116 - 1_ __

                                125 - 00*****0                   127 - 0 0

                                                                 139 - 00

                 150 - 0        165 - 1

                                179 - 0 0 0

 213 - 1         215 - 00000    220 - 0

 310 - 0         313 - 1        317 - 0          318 - 0         340 - 0

 365 - 0         370 - 1
```

After entering 2A on the command line in the Multi-Host Definition panel, we can customize the link from the CCA to host C. The customizing responses and the NCP definitions for the CCA are the same as in 10.2, “Example 2: Local 3174 with CCA” on page 355.

```
              ______ Logical Terminal Assignment ________
                                                 801=2

 Port LT1 LT2 LT3 LT4 LT5                 Port LT1 LT2 LT3 LT4 LT5

26-00 1A1 1B1 2A1 ___ ___                26-01 1A1 1B1 2A1 ___ ___
26-02 1A1 1B1 2A1 ___ ___                26-03 1A1 1B1 2A1 ___ ___
26-04 1A1 1B1 2A1 ___ ___                26-05 1A1 1B1 2A1 ___ ___
26-06 1A1 1B1 2A1 ___ ___                26-07 1A1 1B1 2A1 ___ ___
26-08 1A1 1B1 2A1 ___ ___                26-09 1A1 1B1 2A1 ___ ___
26-10 1A1 1B1 2A1 ___ ___                26-11 1A1 1B1 2A1 ___ ___
26-12 1A1 1B1 2A1 ___ ___                26-13 1A1 1B1 2A1 ___ ___
26-14 1A1 1B1 2A1 ___ ___                26-15 1A1 1B1 2A1 ___ ___
26-16 ___ ___ ___ ___ ___                26-17 ___ ___ ___ ___ ___
26-18 ___ ___ ___ ___ ___                26-19 ___ ___ ___ ___ ___
26-20 ___ ___ ___ ___ ___                26-21 ___ ___ ___ ___ ___
26-22 ___ ___ ___ ___ ___                26-23 ___ ___ ___ ___ ___
26-24 ___ ___ ___ ___ ___                26-25 ___ ___ ___ ___ ___
26-26 ___ ___ ___ ___ ___                26-27 ___ ___ ___ ___ ___
26-28 ___ ___ ___ ___ ___                26-29 ___ ___ ___ ___ ___
```

After the CCA connection has been defined, you need to add a third LT to each port to allow access to host C. As shown in this LTA panel, the sessions are assigned as follows:

- The first LT is assigned to the first host on the primary link (host ID 1A1).

  The second LT is assigned to the second host on the primary link (host ID 1B1).

  Both these LTs use SLMH to access host A and host B.

- The third LT is assigned to the first host on the secondary link (host ID 2A1).

10.5 Example 5: SLMH Token-Ring Gateway

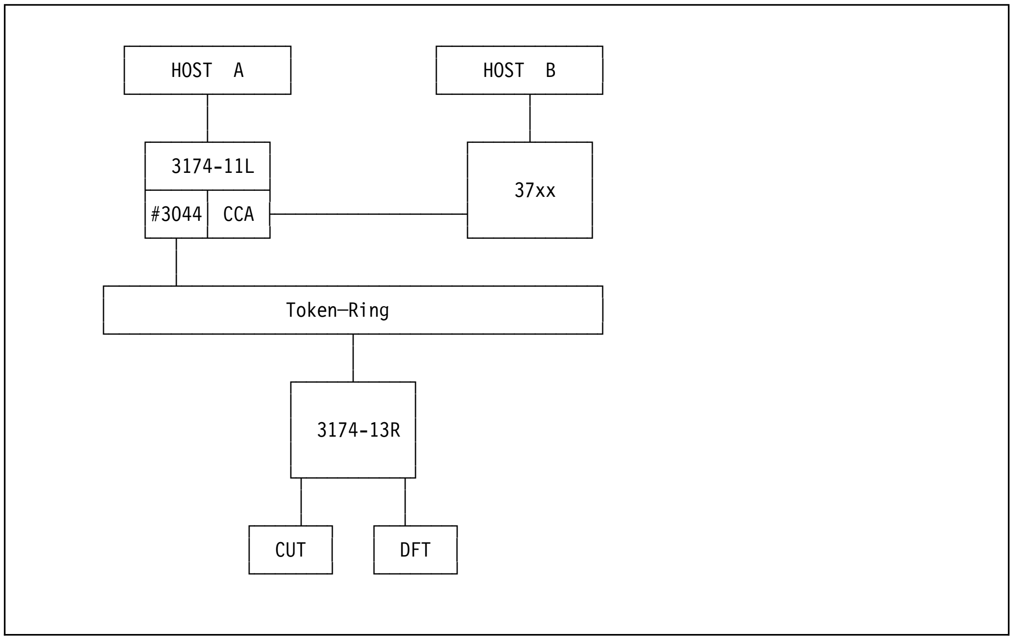


Figure 147. SLMH Token-Ring Gateway

In this example, the 3174-13R provides multi-host connectivity by using SLMH to reach hosts A and B via the 3174-11L Token-Ring Gateway. The 3174-11L also provides multi-host connectivity by providing multiple upstream physical attachments. The 3174-11L, in effect, acts as two gateways, with one gateway allowing access to host A via the channel attachment and the other gateway allowing access to host B via the CCA attachment.

3174 Local Gateway Customization

```
                  _____________ Model / Attach _____________

 Online Test Password    098 - 3174

 Product Assistance Data
 099 - 3174 11L MULTIPLE UPSTREAM PHYSICAL

 3174 Model              100 - 11L

 Host Attachment         101 - M    1-BSC             6-SDLC, X.21 Switched
                                    2-SDLC            7-Token-Ring
                                    3-X.25            8-Ethernet
                                    4-Non-SNA Channel 9-Frame Relay
                                    5-SNA Channel     M-Multi-host

 LAN adapter type        102 - 0    0-none
                                    1-Token Ring
                                    2-Ethernet

 NSO selection           103 - 0000000000000000




CMD===>
```

The 3174-11L gateway will be customized for multi-host support. Question 101 response is, therefore, an M.

```
                ________ Multi-Host Definition __________

Select a Host ID and press ENTER

Host   Adapter    Host      Hardware    Include       Host Descriptor
 ID     Type     Attach      Group      in IML

 1A                5                               LOCAL_HOST_LINK_____
 2A      1         2          51           1       CCA_HOST_LINK______
 3A      _         _          __           _       ___________________
 __                                        _       ___________________
 __                                        _       ___________________
 __                                        _       ___________________
 __                                        _       ___________________
 __                                        _       ___________________
 __                                        _       ___________________
 __                                        _       ___________________
 __                                        _       ___________________
 __                                        _       ___________________
```

On this panel, we define host ID 1A as channel attached, and host ID 2A as an SDLC attachment via the CCA.

```
                ______________ Local (SNA) _______________

                     1A = LOCAL HOST LINK

 104 - 40         105 - 46        108 - 23N6233    110 - 1          116 - 1_

 121 - 01         123 - 0         125 - 00000000   126 - 00000000   127 - 0 0

 132 - 0 0 0 0    136 - 1 1 1 1   137 - 0 0 0 0    138 - 0

 141 - A          150 - 1         165 - 0          166 - A          168 - 0

 173 - 00000000   175 -           179 - 0 0 0

 213 - 1          215 - 00000     220 - 0

 222 - 1          223 - 10        224 - 3          225 - 4
```

For the host ID 1A (the channel attachment):

- Question 104 is the controller address in VTAM. **1**
- Question 105 is the upper limit address. **2**
- Question 150 has the Token-Ring Gateway function enabled. **3**

```
                __________________ SDLC __________________

                     2A = CCA HOST LINK

 104 - C1         105 - C6                         110 - 1          116 - 1_ _

                                  125 - 00*****0                    127 - 0 0

                                                                    139 - 00

                  150 - 1         165 - 1

                                  179 - 0 0 0

 213 - 1          215 - 00000     220 - 0

 310 - 0          313 - 1         317 - 0          318 - 0          340 - 0

 365 - 0          370 - 1
```

For the host ID 2A (the CCA attachment):

- Question 104 is the controller address in NCP. **4**
- Question 105 is the upper limit address. **2**
- Question 150 has the Token-Ring Gateway function enabled. **3**

```
___________ Token-Ring Gateway ___________

            1A = LOCAL HOST LINK

900 - 4000 0000 3174 04    905 - 1            908 - IBMLAN

911 - 1
```

```
______ 940: Ring Address Assignment ______

            1A = LOCAL HOST LINK

 S      Ring Address    SAP    T        S      Ring Address    SAP    T
 40    4000 0000 3174    04
 41    4000 3174 9999    04    1        42    XXXX XXXX XXXX    04    1
 43    XXXX XXXX XXXX    04    1        44    XXXX XXXX XXXX    04    0
 45    XXXX XXXX XXXX    04    0        46    XXXX XXXX XXXX    04    0
```

- Question 900 is the channel gateway Token-Ring address.
- Question 940 assigns the Token-Ring addresses for the channel gateway and the 3174-13R DSPU to host addresses as follows:
  - Host address 40 to Token-Ring address 400000003174 SAP 04 for the channel gateway. **6**
  - Host address 41 to Token-Ring address 400031749999 SAP 04 for the 3174-13R DSPU. **8**

```
___________ Token-Ring Gateway ___________

            2A = CCA HOST LINK

900 - 4000 0000 3174 08    905 - 1            908 - IBMLAN

911 - 1                    912 - 00
```

```
______ 940: Ring Address Assignment ______

            2A = CCA HOST LINK

 S      Ring Address    SAP    T        S      Ring Address    SAP    T
 C1    4000 0000 3174    08
 C2    4000 3174 9999    04    0        C3    XXXX XXXX XXXX    04    0
 C4    XXXX XXXX XXXX    04    0        C5    XXXX XXXX XXXX    04    0
 C6    XXXX XXXX XXXX    04    0
```

- Question 900 is the CCA gateway Token-Ring address.
- Question 940 assigns the Token-Ring addresses for the CCA gateway and the 3174-13R DSPU to host addresses as follows:
  - Host address C1 to Token-Ring address 400000003174 SAP 08 for the CCA gateway. **7**
  - Host address C2 to Token-Ring address 400031749999 SAP 04 for the 3174-13R DSPU. **8**

VTAM Definitions (Local 3174)

```
HSNA040 VBUILD TYPE=LOCAL
RAPP40    PU     CUADDR=E40 1 ,ISTATUS=ACTIVE,PUTYPE=2,MAXBFRU=10,       X
                 MODETAB=AMODETAB,DLOGMOD=M2SDLCQ,USSTAB=US327X,         X
                 VPACING=0
RAPT400 LU       LOCADDR=2
RAPT401 LU       LOCADDR=3
   :                :
RAPT40E LU       LOCADDR=17
*-------------------------------------------------------------------*
RAPP41    PU     CUADDR=E41 5 ,ISTATUS=ACTIVE,PUTYPE=2,MAXBFRU=10,       X
                 MODETAB=AMODETAB,DLOGMOD=M2SDLCQ,USSTAB=US327X,         X
                 VPACING=0,SECNET=YES
RAPT410 LU       LOCADDR=2
RAPT411 LU       LOCADDR=3
   :                :
RAPT41E LU       LOCADDR=17
*-------------------------------------------------------------------*
```

NCP Definitions (CCA)

```
*-------------------------------------------------------------------*
L13008   LINE ADDRESS=(08,FULL),ANS=CONTINUE,CLOCKNG=EXT,DUPLEX=(FULL),X
               ETRATIO=30,ISTATUS=ACTIVE,LPDATS=LPDA2,MAXPU=10,NPACOLL=X
               YES,PAUSE=.5,SERVLIM=10,SPEED=9600,SRT=(,64)
*-------------------------------------------------------------------*
P13008A  PU ADDR=C1 4 ,DISCNT=(NO),MAXDATA=521,MAXOUT=7,                X
               PACING=0,PASSLIM=8,PUDR=YES,PUTYPE=2,RETRIES=(,4,5),    X
               SSCPFM=USSSCS,USSTAB=US327X,VPACING=0,GP3174=AE
T13008A0 LU LOCADDR=2
T13008A1 LU LOCADDR=3
   :           :
T13008AE LU LOCADDR=17
*-------------------------------------------------------------------*
RADP08B  PU ADDR=C2 5 ,DISCNT=(NO),MAXDATA=265,MAXOUT=7,                X
               PACING=0,PASSLIM=8,PUDR=YES,PUTYPE=2,RETRIES=(,4,5),    X
               SSCPFM=USSSCS,USSTAB=US327X,VPACING=0,GP3174=AE
RADT08B0 LU LOCADDR=2
RADT08B1 LU LOCADDR=3
   :           :
RADT08BE LU LOCADDR=17
*-------------------------------------------------------------------*
```

Notes:

1 and **4** Question 104 is the polling address for each host.

2 Question 105 specifies the address range using the gateway.

3 Question 150 must be specified as 1 to allow the 3174-11L to act as gateways to hosts A and B.

5 Is the 3174 DSPU polling address.

6 and **7** The Token-Ring address is the same for both the channel and CCA gateway since it is the same physical Token-Ring Adapter. The SAP is used, in combination with the Token-Ring address, to distinguish one gateway from the other:

- SAP 04 for the channel gateway.
- SAP 08 for the CCA gateway.

8 The 3174-13R DSPU is defined in both gateways with the same Token-Ring address and SAP.

DSPU 3174 Customization

```
                ________ Multi-Host Definition __________

 Select a Host ID and press ENTER

 Host   Adapter    Host      Hardware    Include      Host Descriptor
  ID     Type     Attach      Group      in IML

  1A                7                                CHANNEL_HOST_______
  2A      _         _          __           _        ___________________
  3A      _         _          __           _        ___________________
  1B                                        1        CCA_HOST___________
  __                                        _        ___________________
  __                                        _        ___________________
  __                                        _        ___________________
  __                                        _        ___________________
  __                                        _        ___________________
  __                                        _        ___________________
  __                                        _        ___________________
  __                                        _        ___________________
```

Here we customize the SLMH function for the 3174-13R:

- Host ID 1A is specified for a token-ring Network host attachment (Host Attach=7).
- Host ID 1B is specified as the secondary host.

```
                ___________ Token-Ring Network ___________
                     1A = CHANNEL HOST

  106 - 4000 3174 9999 04   107 - 4000 0000 3174 04   108 - 23V2645

  110 - 1                   116 - 1_ __

  121 - 01      123 - 1     125 - 00100100            126 - 00000000   127 - 0

  132 - 0 0 0 0             136 - 1 1 1 1             137 - 0 0 0 0    138 - 0

  141 - A                   165 - 0                   166 - A          168 - 0

  173 - 10100101            175 -                     179 - 0 0 0

  213 - 1                   215 - 00000               220 - 0

  382 - 2057                383 - 2                   384 - 2
```

For host ID 1A:

- Question 106 is the 3174-13R token-ring address. 8
- Question 107 is the destination 3174-11L channel gateway address (note: SAP 04). 6

```
                ___________ Token-Ring Network ___________
                     1B = CCA HOST

  106 - 4000 3174 9999 04   107 - 4000 0000 3174 08

                            116 - 1_ __

                            125 - 00*****0                          127 - 0 0


                            165 - 0

                                                     179 - 0 0 0

                            215 - 00000              220 - 0        221 - 0

  382 - 2057                383 - 2
```

For host ID 1B:

- Question 106 is the 3174-13R token-ring address. 8
- Question 107 is the destination 3174-11L CCA gateway address (note: SAP 08). 7

10.6 Example 6: SLMH Gateway with ESCON

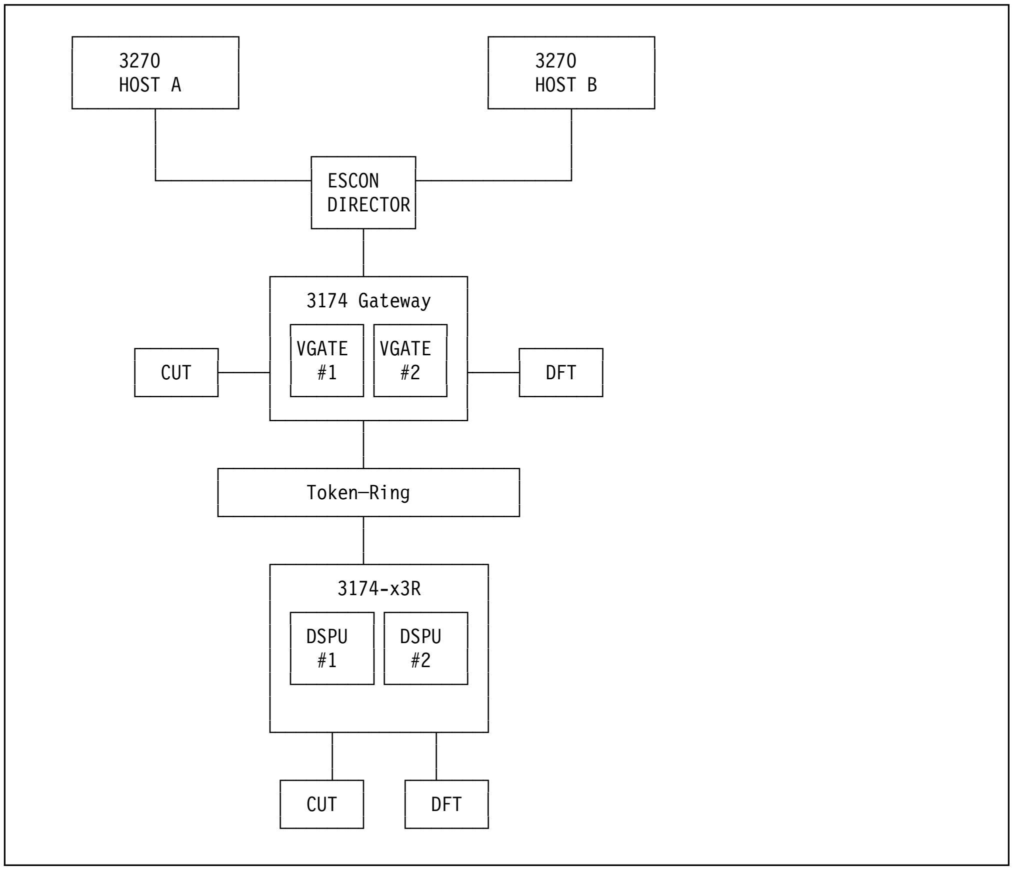


Figure 148. SLMH Gateway with ESCON

In this example, a 3174-12L (ESCON model) is connected via an ESCON Director to two hosts. The gateway has two *logical* gateways defined, one to each host.

ESCON 3174 Customization

```
              _____________ Model / Attach _____________


 Online Test Password    098 -

 Product Assistance Data
 099 - ESCON 3174 MULTIPLE GATEWAY

 3174 Model              100 - 12L

 Host Attachment         101 - M    1-BSC            6-SDLC, X.21 Switched
                                    2-SDLC           7-Token-Ring
                                    3-X.25           8-Ethernet
                                    4-Non-SNA Channel 9-Frame Relay
                                    5-SNA Channel    M-Multi-host

 LAN adapter type        102 - 0    0-none
                                    1-Token Ring
                                    2-Ethernet

 NSO selection           103 - 0000000000000000


CMD===>
```

- As with the other SLMH examples, we respond with an M for question 101 to define multi-host attachments.
- By specifying the model number as 12L, default values for an ESCON connection are displayed as responses.

```
                ________ Multi-Host Definition __________

 Select a Host ID and press ENTER

 Host   Adapter    Host      Hardware    Include      Host Descriptor
  ID     Type     Attach      Group      in IML

  1A                5                                PRIMARY_SNA_CH30____
  __       _        _          __           _        ____________________
  __       _        _          __           _        ____________________
  1B                                        1        VCU2_1B_CH37________
  __                                        _        ____________________
  __                                        _        ____________________
  __                                        _        ____________________
  __                                        _        ____________________
  __                                        _        ____________________
  __                                        _        ____________________
  __                                        _        ____________________
  __                                        _        ____________________
```

- On this panel we define the primary host (1A) attachment as SNA channel (Host Attach=5). In this example, the attachment is to the ESCON Director.
- Host ID 1B will default to the same as host ID 1A.

```
                ______________ Local (SNA) _______________
                     1A = PRIMARY SNA CH30

  104 - 60         105 - 6F        108 - 1234567    110 - 1          116 - 1_ _

  121 - 01         123 - 0         125 - 00000100   126 - 00000000   127 - 0 0

  132 - 0 0 0 0    136 - 1 1 1 1   137 - 0 0 0 0    138 - 0

  141 - A          150 - 1         165 - 0          166 - A          168 - 1

  173 - 00000000   175 -           179 - 1 0 1

  213 - 1          215 - 00000     220 - 3


  240 - 0          241 - 1
```

For host ID 1A:

- Question 104 is the controller address. **1**
- Question 105 is the upper limit address. **2**
- Question 150 indicates the Token-Ring Gateway function is enabled.
- Question 240 is the controller logical address. **3**
- Question 241 is the maximum RU size. **4**

```
                __________ 117: Port Assignment __________
                     1A = PRIMARY SNA CH30
        Host addresses                          Host addresses
 Port  IS  1   2   3   4   5            Port  IS  1   2   3   4   5
 26-00 1 002 ___ ___ ___ ___            26-01 1 003 ___ ___ ___ ___
 26-02 1 004 ___ ___ ___ ___            26-03 1 005 ___ ___ ___ ___
 26-04 0 ___ ___ ___ ___ ___            26-05 0 ___ ___ ___ ___ ___
 26-06 0 ___ ___ ___ ___ ___            26-07 0 ___ ___ ___ ___ ___
 26-08 0 ___ ___ ___ ___ ___            26-09 0 ___ ___ ___ ___ ___
 26-10 0 ___ ___ ___ ___ ___            26-11 0 ___ ___ ___ ___ ___
 26-12 0 ___ ___ ___ ___ ___            26-13 0 ___ ___ ___ ___ ___
 26-14 0 ___ ___ ___ ___ ___            26-15 0 ___ ___ ___ ___ ___
 26-16 0 ___ ___ ___ ___ ___            26-17 0 ___ ___ ___ ___ ___
 26-18 0 ___ ___ ___ ___ ___            26-19 0 ___ ___ ___ ___ ___
 26-20 0 ___ ___ ___ ___ ___            26-21 0 ___ ___ ___ ___ ___
 26-22 0 ___ ___ ___ ___ ___            26-23 0 ___ ___ ___ ___ ___
 26-24 0 ___ ___ ___ ___ ___            26-25 0 ___ ___ ___ ___ ___
 26-26 0 ___ ___ ___ ___ ___            26-27 0 ___ ___ ___ ___ ___
 26-28 0 ___ ___ ___ ___ ___            26-29 0 ___ ___ ___ ___ ___
 26-30 0 ___ ___ ___ ___ ___            26-31 0 ___ ___ ___ ___ ___
```

Here we code a sample of four terminals for the primary host.

```
                ___________ Token-Ring Gateway ___________
                     1A = PRIMARY SNA CH30

  900 - 4000 0000 0000 04    905 - 1             908 - IBMLAN

  911 - 2
```

- Question 900 is the token-ring address of the gateway; SAP 04 for host A.

```
_______ 940: Ring Address Assignment _______
     1A = PRIMARY SNA CH30

S     Ring Address    SAP   T        S     Ring Address    SAP   T
60   4000 0000 0000    04
61   4000 0000 0001    04   0        62   4000 0000 0002    04   0
63   4000 0000 0003    04   0        64   4000 0000 0004    04   0
65   XXXX XXXX XXXX    04   0        66   XXXX XXXX XXXX    04   0
```

- The Token-Ring Gateway address is assigned to host address 60. **1**
- The Token-Ring address for the 3174-13R DSPU is assigned to host address 64.

```
____ 941: Ring Transmission Definition _____
     1A = PRIMARY SNA CH30

S     Ring Address    SAP   F  W     S     Ring Address    SAP   F  W
60   4000 0000 0000    04
61   4000 0000 0000    04   5  2     62   4000 0000 0002    04   5  2
63   4000 0000 0003    04   5  2     64   4000 0000 0004    04   5  2
65   XXXX XXXX XXXX    04   5  2     66   XXXX XXXX XXXX    04   5  2
```

Note the response that can be specified in the F field (the transmit I-frame size). A response of 5 indicates an 8 KB RU size; this response can only be specified if question 241 is set to 1. **4**

VTAM Definitions (Local 3174) For Primary Host

```
*----------------------------------------------------------------------*
LSE00    VBUILD TYPE=LOCAL
CSE60    PU    CUADDR=E60 1 ,DISCNT=NO,ENCR=OPT,ISTATUS=ACTIVE,        X
               PACING=0,PUTYPE=2,SSCPFM=FSS,VPACING=0,                 X
               MODETAB=LMT3270
SE0601   LU    LOCADDR=2,ISTATUS=ACTIVE
SE0602   LU    LOCADDR=3,ISTATUS=INACTIVE
SE0603   LU    LOCADDR=4,ISTATUS=INACTIVE
SE0604   LU    LOCADDR=5,ISTATUS=INACTIVE
  :                :
*----------------------------------------------------------------------*
CSE6F    PU    CUADDR=E6F 2 ,DISCNT=NO,ENCR=OPT,ISTATUS=ACTIVE,        X
               PACING=0,PUTYPE=2,SSCPFM=FSS,VPACING=0,                 X
               MODETAB=LMT3270
SE06F1   LU    LOCADDR=2,ISTATUS=ACTIVE
SE06F2   LU    LOCADDR=3,ISTATUS=INACTIVE
SE06F3   LU    LOCADDR=4,ISTATUS=INACTIVE
SE06F4   LU    LOCADDR=5,ISTATUS=INACTIVE
*----------------------------------------------------------------------*
```

Notes:

1 This is the CUADDR value from VTAM.

2 Matches the upper range of devices defined through the gateway for the primary host.

3 The controller logical address is used by the ESCON Director and can range from 0 through 9 and A through F. The 15 possible addresses are used to switch between the hosts connected to the ESCON Director.

For the primary host, we are on CHIPID 30 and in the CNTLUNIT macro CUADD=0 in the IOCP definitions. So we set question 240 to 0.

VTAM CUADDR 60 through 6F are set on CHIPID 30 for host A.

4 This sets the maximum RU size.

Host 1B Customization

```
               _______________ Local (SNA) _______________
                    1B = VCU2 1B CH37

104 - 80         105 - 8F                                        116 - 1_ _

                                 125 - 00*****0                  127 - 0 0


                 150 - 1         165 - 0

                                 179 - 1 0 1

                 215 - 00000     220 - 3            221 - 0


240 - 7
```

For host ID 1B:

- Question 104 is the controller address for host B. **5**
- Question 105 is the upper limit address. **6**
- Question 150 indicates the Token-Ring Gateway function is enabled.
- Question 240 is the controller logical address. **7**

```
               ____________ Token-Ring Gateway ____________
                    1B = VCU2 1B CH37

900 - 4000 0000 0000 08    905 - 1             908 - IBMLAN

911 - 2
```

For host B we use the same Token-Ring address as host A but with a SAP ID 08.

```
               _______ 940: Ring Address Assignment _______
                    1B = VCU2 1B CH37

 S      Ring Address    SAP    T         S      Ring Address    SAP    T
 80    4000 0000 0000    08
 81    4000 0000 0001    04    0         82    4000 0000 0002    04    0
 83    4000 0000 0003    04    0         84    4000 0000 0004    04    0
 85    XXXX XXXX XXXX    04    0         86    XXXX XXXX XXXX    04    0
```

- The Token-Ring Gateway address is assigned to host address 80.
- The Token-Ring address for the 3174-13R DSPU is assigned to host address 84.

```
               ____ 941: Ring Transmission Definition _____
                    1B = VCU2 1B CH37

 S      Ring Address    SAP    F   W     S      Ring Address    SAP    F   W
 80    4000 0000 0000    08
 81    4000 0000 0001    04    5   2     82    4000 0000 0002    04    5   2
 83    4000 0000 0003    04    5   2     84    4000 0000 0004    04    5   2
 85    XXXX XXXX XXXX    04    5   2     86    XXXX XXXX XXXX    04    5   2
```

The ring transmission parameters are the same as those for host A.

```
            __________ 117: Port Assignment __________
                 1B = VCU2 1B CH37
         Host addresses                        Host addresses
Port  IS  1   2   3   4   5           Port  IS  1   2   3   4   5
26-00 1 002 ___ ___ ___ ___           26-01 1 003 ___ ___ ___ ___
26-02 1 004 ___ ___ ___ ___           26-03 1 005 ___ ___ ___ ___
26-04 0 ___ ___ ___ ___ ___           26-05 0 ___ ___ ___ ___ ___
26-06 0 ___ ___ ___ ___ ___           26-07 0 ___ ___ ___ ___ ___
26-08 0 ___ ___ ___ ___ ___           26-09 0 ___ ___ ___ ___ ___
26-10 0 ___ ___ ___ ___ ___           26-11 0 ___ ___ ___ ___ ___
26-12 0 ___ ___ ___ ___ ___           26-13 0 ___ ___ ___ ___ ___
26-14 0 ___ ___ ___ ___ ___           26-15 0 ___ ___ ___ ___ ___
26-16 0 ___ ___ ___ ___ ___           26-17 0 ___ ___ ___ ___ ___
26-18 0 ___ ___ ___ ___ ___           26-19 0 ___ ___ ___ ___ ___
26-20 0 ___ ___ ___ ___ ___           26-21 0 ___ ___ ___ ___ ___
26-22 0 ___ ___ ___ ___ ___           26-23 0 ___ ___ ___ ___ ___
26-24 0 ___ ___ ___ ___ ___           26-25 0 ___ ___ ___ ___ ___
26-26 0 ___ ___ ___ ___ ___           26-27 0 ___ ___ ___ ___ ___
26-28 0 ___ ___ ___ ___ ___           26-29 0 ___ ___ ___ ___ ___
26-30 0 ___ ___ ___ ___ ___           26-31 0 ___ ___ ___ ___ ___
```

Again as with host A, just four local terminals are assigned.

```
            ______ Logical Terminal Assignment _______
                                          801=2

 Port LT1 LT2 LT3 LT4 LT5              Port LT1 LT2 LT3 LT4 LT5

26-00 1A1 1B1 ___ ___ ___             26-01 1A1 1B1 ___ ___ ___
26-02 1A1 1B1 ___ ___ ___             26-03 1A1 1B1 ___ ___ ___
26-04 ___ ___ ___ ___ ___             26-05 ___ ___ ___ ___ ___
26-06 ___ ___ ___ ___ ___             26-07 ___ ___ ___ ___ ___
26-08 ___ ___ ___ ___ ___             26-09 ___ ___ ___ ___ ___
26-10 ___ ___ ___ ___ ___             26-11 ___ ___ ___ ___ ___
26-12 ___ ___ ___ ___ ___             26-13 ___ ___ ___ ___ ___
26-14 ___ ___ ___ ___ ___             26-15 ___ ___ ___ ___ ___
26-16 ___ ___ ___ ___ ___             26-17 ___ ___ ___ ___ ___
26-18 ___ ___ ___ ___ ___             26-19 ___ ___ ___ ___ ___
26-20 ___ ___ ___ ___ ___             26-21 ___ ___ ___ ___ ___
26-22 ___ ___ ___ ___ ___             26-23 ___ ___ ___ ___ ___
26-24 ___ ___ ___ ___ ___             26-25 ___ ___ ___ ___ ___
26-26 ___ ___ ___ ___ ___             26-27 ___ ___ ___ ___ ___
26-28 ___ ___ ___ ___ ___             26-29 ___ ___ ___ ___ ___
```

We now assign host sessions to the terminals attached to the 3174-12L. Each terminal will have two sessions, one to each host.

VTAM Definitions (Local 3174) For Host 1B

```
*----------------------------------------------------------------------*
LSE01    VBUILD TYPE=LOCAL
CSE80    PU     CUADDR=E80 5 ,DISCNT=NO,ENCR=OPT,ISTATUS=ACTIVE,       X
                PACING=0,PUTYPE=2,SSCPFM=FSS,VPACING=0,                X
                MODETAB=LMT3270
SE0801   LU     LOCADDR=2,ISTATUS=ACTIVE
SE0802   LU     LOCADDR=3,ISTATUS=INACTIVE
SE0803   LU     LOCADDR=4,ISTATUS=INACTIVE
SE0804   LU     LOCADDR=5,ISTATUS=INACTIVE
  :                :
*----------------------------------------------------------------------*
CSE8F    PU     CUADDR=E8F 6 ,DISCNT=NO,ENCR=OPT,ISTATUS=ACTIVE,       X
                PACING=0,PUTYPE=2,SSCPFM=FSS,VPACING=0,                X
                MODETAB=LMT3270
SE08F1   LU     LOCADDR=2,ISTATUS=ACTIVE
SE08F2   LU     LOCADDR=3,ISTATUS=INACTIVE
SE08F3   LU     LOCADDR=4,ISTATUS=INACTIVE
SE08F4   LU     LOCADDR=5,ISTATUS=INACTIVE
*----------------------------------------------------------------------*
```

Notes:

5 This is the CUADDR value from VTAM.

6 Matches the upper range of devices defined through the gateway for host 1B.

7 This is the CUADD value defined in the IOCP for the 3174-12L in host 1B. It is on CHIPID 37 and CUADD=7, so question 240 is set to 7.

CUADDR 80 through 8F are set on CHIPID 37 for host B.

9032 ESCON Director Matrix

```
-1.0------------------9032 ACTIVE MATRIX------------------------------

 ==>                               9032 Name: 3174 Development

 Addr    Address Name       H B C  E0 1 2 3 4 5 6 7 8 9 A B C D E F
-E0 VM_SYSA_CH2001______    _ _ __  a a a P a a a a a a a a a a a a
-E1 ____________________    _ _ __  a a a a a a a a a a a a a a a a
-E2 PRINTER07___________    _ B __  a a a a a a a a a a a a a a a a
-E3 ____________________    _ _ __  a a a a a a a a a a a a a a a a
-E4 ____________________    _ _ __  a a a a a a a a a a a a a a a a
-E5 ____________________    _ _ __  a a a a a a a a a a a a a a a a
-E6 ____________________    _ _ __  a a a a a a a a a a a a a a a a
-E7 ____________________    _ _ __  a a a a a a a a a a a a a a a a
-E8 ____________________    _ _ __  a a a a a a a a a a a a a a a a
-E9 ____________________    _ _ __  a a a a a a a a a a a a a a a a
-EA ____________________    _ _ __  a a a a a a a a a a a a a a a a
-EB ____________________    _ _ __  a a a a a a a a a a a a a a a a
-EC ____________________    _ _ __  a a a a a a a a a a a a a a a a
-ED ____________________    _ _ __  a a a a a a a a a a a a a a a a
-EE SNA_60-80(Q240=0-7)_    _ _ __  a a a a a a a a a a a a a a a a
-EF ____________________    _ _ __  a a a a a a a a a a a a a a a a

F1=Help       F3=End          F6= Process
F7=Backward   F8=Forward      F10=Left          F11=Right
```

```
-1.0------------------9032 ACTIVE MATRIX------------------------------

 ==>                               9032 Name: 3174 Development

 Addr    Address Name       H B C  F0 1 2 3 4 5 6 7 8 9 A B C D E F
-F0 ____________________    _ _ __  \ a a a a a a a a a a a a a a a
-F1 ____________________    _ _ __  a \ a a a a a a a a a a a a a a
-F2 ____________________    _ _ __  a a \ a a a a a a a a a a a a a
-F3 ____________________    _ _ __  a a a \ a a a a a a a a a a a a
-F4 CHIPID 30_(Q240=0)__    _ _ __  a a a a \ a a a a a a a a a a a
-F5 CHIPID_31_(Q240=1)__    _ _ __  a a a a a \ a a a a a a a a a a
-F6 ____________________    _ _ __  a a a a a a \ a a a a a a a a a
-F7 ____________________    _ _ __  a a a a a a a \ a a a a a a a a
-F8 CHIPID_37_(Q240=7)__    _ _ __  a a a a a a a a \ a a a a a a a
-F9 ____________________    _ _ __  a a a a a a a a a \ a a a a a a
-FA ____________________    _ _ __  a a a a a a a a a a \ a a a a a
-FB ____________________    _ _ __  a a a a a a a a a a a \ a a a a
-FC ____________________    _ _ __  a a a a a a a a a a a a \ a a a
-FD ____________________    _ _ __  a a a a a a a a a a a a a \ a a
-FE ____________________    _ _ __  a a a a a a a a a a a a a a \ a
-FF ____________________    _ _ __  a a a a a a a a a a a a a a a \

F1=Help       F3=End          F6= Process
F7=Backward   F8=Forward      F10=Left          F11=Right
```

From the two screens shown above, extracted from the ESCON Director control console, we can see the attachments for our setup.

- On port EE (physical port) into the ESCON Director, we have a fiber channel from our 3174-12L gateway.
- On port F4, we have a fiber channel from host A on CHIPID 30.
- On port F8, we have a fiber channel from host B on CHIPID 37.

Notes:

3 and **7** This value matches that in question 240 for each logical device (VCU) associated with the one physical device.

8 Defines which physical port on the ESCON Director the 3174 definitions are associated with.

9 Define the lower address range.

10 Define the upper address range.

IOCP Definitions

```
*-------------------------------------------------------------------*
        CHPID PATH=((30)),TYPE=S,SWITCH=00
        CHPID PATH=((37)),TYPE=S,SWITCH=00
*-------------------------------------------------------------------*
* CHPID 30 CHANNEL 30 CONTROL UNITS                                 *
*-------------------------------------------------------------------*
        CNTLUNIT CUNUMBR=3000,        3174 SNA     ADDRESS=3000     +
              UNIT=3705,                                            +
              PATH=30,                                              +
              LINK=(F1),                                            +
              CUADD=0,                                              +
              UNITADD=((00,1))
                  :
        CNTLUNIT CUNUMBR=3003,        3174 SNA     ADDRESS=3060-306F+
              UNIT=3705,                                            +
              PATH=30,                                              +
              LINK=(EE), 8                                          +
              CUADD=0, 3                                            +
              UNITADD=((60,16)) 9 10
*-------------------------------------------------------------------*
* CHPID 37 CHANNEL 37 CONTROL UNITS                                 *
*-------------------------------------------------------------------*
        CNTLUNIT CUNUMBR=3700,        3174 SNA     ADDRESS=3700     +
              UNIT=3705,                                            +
              PATH=37,                                              +
              LINK=(F1),                                            +
              CUADD=7,                                              +
              UNITADD=((00,1))
                  :
        CNTLUNIT CUNUMBR=3703,        3174 SNA     ADDRESS=3780-308F+
              UNIT=3705,                                            +
              PATH=37,                                              +
              LINK=(EE), 8                                          +
              CUADD=7, 7                                            +
              UNITADD=((80,16)) 9 10
*-------------------------------------------------------------------*
```

DSPU 3174 Customization

```
                  ________ Multi-Host Definition __________

Select a Host ID and press ENTER

Host   Adapter    Host      Hardware     Include       Host Descriptor
 ID     Type     Attach      Group       in IML

 1A                 7                                HOST__A____________
 2A       _         _          __           _        ___________________
 3A       _         _          __           _        ___________________
 1B                                         1        HOST__B____________
 __                                         _        ___________________
 __                                         _        ___________________
 __                                         _        ___________________
 __                                         _        ___________________
 __                                         _        ___________________
 __                                         _        ___________________
 __                                         _        ___________________
 __                                         _        ___________________
```

Here we define the SLMH function for the 3174-13R. The attachment to host ID 1A is defined as Token-Ring Network (Host Attach=7). The attachment to host ID 1B will be the same as host ID 1A.

```
                  ___________ Token-Ring Network ___________
                       1A = HOST  A

 106 - 4000 0000 0004 04   107 - 4000 0000 0000 04   108 - 23V2645

 110 - 1                   116 - 1_ __

 121 - 01      123 - 1     125 - 00100100            126 - 00000000   127 - 0

 132 - 0 0 0 0             136 - 1 1 1 1             137 - 0 0 0 0    138 - 0

 141 - A                   165 - 0                   166 - A          168 - 0

 173 - 10100101            175 -                     179 - 0 0 0

 213 - 1                   215 - 00000               220 - 0

 382 - 2057                383 - 2                   384 - 2
```

For host ID 1A:

- Question 106 is the 3174-13R Token-Ring address.
- Question 107 is the destination gateway address to host A (note: SAP 04).

```
                  ___________ Token-Ring Network ___________
                       1B = HOST  B

 106 - 4000 0000 0004 04   107 - 4000 0000 0000 08

                           116 - 1_ __

                           125 - 00*****0                           127 - 0 0


                           165 - 0

                                                    179 - 0 0 0

                           215 - 00000              220 - 0         221 - 0

 382 - 2057                383 - 2
```

For host ID 1B:

- Question 106 is the 3174-13R Token-Ring address (same as for host ID 1A).
- Question 107 is the destination gateway address to host B (note; SAP 08).

10.7 Example 7: SLMH with X.25

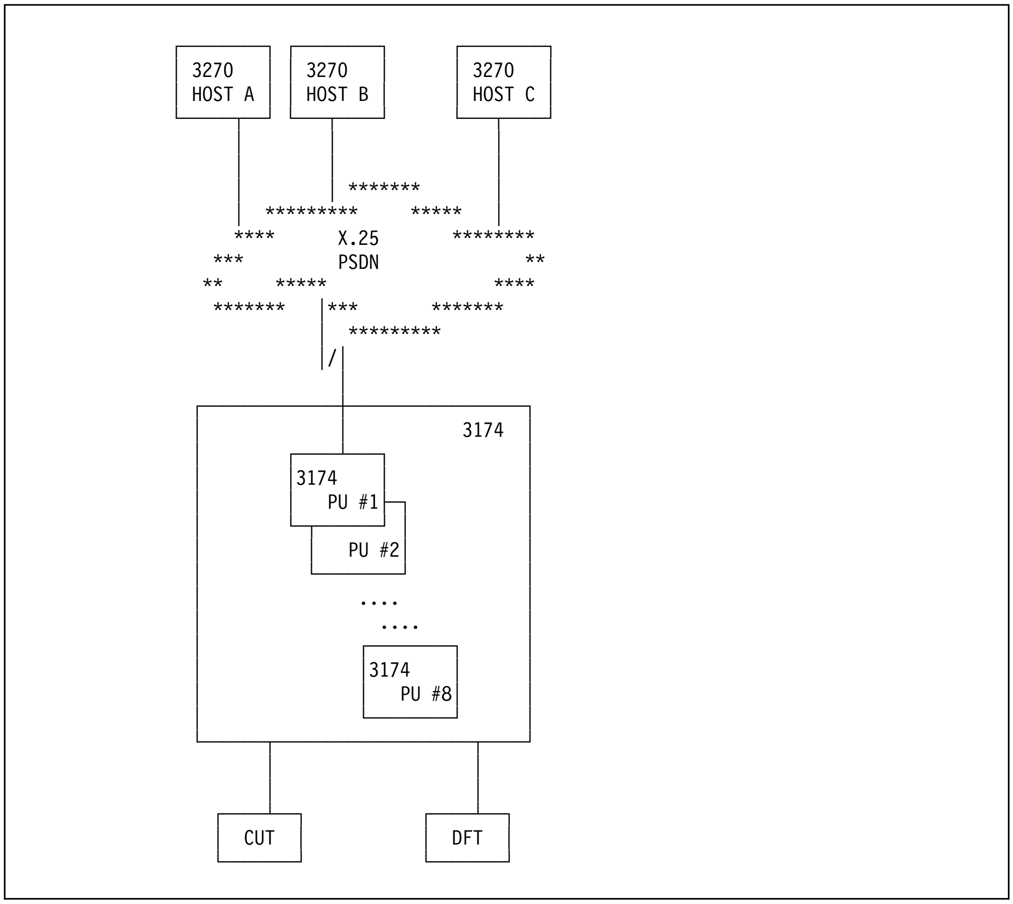


Figure 149. X.25 Single Link Multi-Host

In this example, we configured the 3174 to have five host connections, with four connections defined as PVCs and one connection as an SVC. In our test environment, we had to define all of the PVCs over one MCH. In a normal situation, you would code one PVC in each NPSI for the individual hosts.

X.25 3174 Customization

```
            ____________ Model / Attach ____________



    098 -

    099 - X25 SLMH

    100 - 11R

    101 - M
```

For SLMH, respond to question 101 with an M.

```
                ________ Multi-Host Definition __________

Select a Host ID and press ENTER

Host   Adapter    Host      Hardware    Include      Host Descriptor
 ID     Type     Attach      Group      in IML

 1A                3                              X25_PRIMARY_HOST_A__
 2A      _         _          __          _       __________________
 3A      _         _          __          _       __________________
 1B                                       1       X25_HOST_B_________
 1C                                       1       X25_HOST_C_________
 1D                                       1       X25_HOST_D_________
 1E                                       1       SWITCHED X25 _______
 __                                       _       __________________
 __                                       _       __________________
 __                                       _       __________________
 __                                       _       __________________
 __                                       _       __________________
```

Here we name the X.25 hosts we wish to access from the 3174. Since this is a SLMH configuration, we have only one physical link, defined as the 1A attachment. The secondary hosts are defined as 1B, 1C, 1D and 1E. Ensure that you include these host definitions in the IML, otherwise they will not be available for access.

For host ID 1A, specify Host Attach=3 for X.25 attachment; host ID 1B, 1C, 1D and 1E will assume the same attachment as host ID 1A.

Host 1A Customization (First PVC)

```
                __________________ X.25 __________________
                     1A = X25 PRIMARY HOST A

 104 - C1         108 - 23N6503   110 - 6          116 - S1 __

 121 - 01         123 - 0         125 - 00000000   126 - 00000000   127 - 0 0

 132 - 0 0 0 0    136 - 0 0 0 0   137 - 0 0 0 0    138 - 0

 141 - A          165 - 1         166 - A          168 - 0

 173 - 00000000   175 -           179 - 0 0 0

 213 - 1          215 - 00000     220 - 0          365 - 0

 370 - 0          372 - 0 0
```

For host ID 1A, customize the 3174 to match the NCP definition for this 3174 in host A.

- Question 104 is the controller address. **1**

```
                __________ 117: Port Assignment __________
                     1A = X25 PRIMARY HOST A
         Host addresses                          Host addresses
Port  IS  1   2   3   4   5          Port  IS  1   2   3   4   5
26-00 1 002 ___ ___ ___ ___          26-01 1 003 ___ ___ ___ ___
26-02 1 004 ___ ___ ___ ___          26-03 1 005 ___ ___ ___ ___
26-04 1 006 ___ ___ ___ ___          26-05 1 007 ___ ___ ___ ___
26-06 1 008 ___ ___ ___ ___          26-07 1 009 ___ ___ ___ ___
26-08 1 010 ___ ___ ___ ___          26-09 1 011 ___ ___ ___ ___
26-10 1 012 ___ ___ ___ ___          26-11 1 013 ___ ___ ___ ___
26-12 1 014 ___ ___ ___ ___          26-13 1 015 ___ ___ ___ ___
26-14 1 016 ___ ___ ___ ___          26-15 1 017 ___ ___ ___ ___
26-16 1 018 ___ ___ ___ ___          26-17 1 019 ___ ___ ___ ___
26-18 1 020 ___ ___ ___ ___          26-19 1 021 ___ ___ ___ ___
26-20 1 022 ___ ___ ___ ___          26-21 1 023 ___ ___ ___ ___
26-22 1 024 ___ ___ ___ ___          26-23 1 025 ___ ___ ___ ___
26-24 1 026 ___ ___ ___ ___          26-25 1 027 ___ ___ ___ ___
26-26 1 028 ___ ___ ___ ___          26-27 1 029 ___ ___ ___ ___
f6-28 1 030 ___ ___ ___ ___          26-29 1 031 ___ ___ ___ ___
26-30 1 032 ___ ___ ___ ___          26-31 1 033 ___ ___ ___ ___
```

For host A, we assign one host address to each of the 32 ports on the 3174. These host addresses match the LU LOCADDR values in the NCP definition. **2**

```
___________ 332:  X.25 Options ___________
         1A = X25 PRIMARY HOST A

400 - 00 0 0        401 - 1       402 - 0001

409 - 10101010      420 - 00000000                421 - 00000000

423 -                             424 -

430 - 1             431 - 0       432 - 02        433 - 2

434 - 1             435 - 02

440 - 9             441 - __      442 - ____

450 - 0010          451 - 05      452 - _______   453 - 10000000

461 - 0005          462 - 0010    463 - 0011      464 - 0020

465 - 0021          466 - 0030
```

X.25 parameters for host ID 1A:

- Question 401 is the circuit type (1=PVC).
- Question 402 is the Logical Channel Identifier. **3**

  In this example, it is logical channel 0001.
- Questions 461 to 466 are the channel definitions.
- Question 461 specifies the lowest incoming channel.

NCP Definition (First PVC)

```
*-------------------------------------------------------------------*
XL13008A X25.LINE LCN=1, 3  FIRST PVC                                X
               DSTNODE=BNN,                                          X
               LLC=LLC3,                                             X
               TYPE=P,                                               X
               VCCINDX=1
*-------------------------------------------------------------------*
XP13008A X25.PU PUTYPE=2,                                            X
               ISTATUS=ACTIVE,                                       X
               ADDR=C1, 1                                            X
               MAXDATA=265,                                          X
               MAXOUT=7,                                             X
               SSCPFM=USSSCS,                                        X
               MODETAB=AMODETAB,                                     X
               USSTAB=US327X
*-------------------------------------------------------------------*
T13008A1 X25.LU LOCADDR=2 2 ,DLOGMOD=M2SDLCQ
T13008A2 X25.LU LOCADDR=3,DLOGMOD=M2SDLCQ
    :              :
T1308A32 X25.LU LOCADDR=33,DLOGMOD=M2SDLCQ
*-------------------------------------------------------------------*
```

Notes:

PU XP13008A is the definition for the 3174 in host A.

1 Question 104 relates to the polling address specified in the PU definition.

2 In the Port Assignment panel, the host addresses match the LU LOCADDR values.

3 Question 402 defines the virtual circuit number used for this host.

Host 1B Customization (Second PVC)

```
              __________________ X.25 __________________
                   1B = X25 HOST B

 104 - C1                                         116 - S1 __

                              125 - 00*****0                      127 - 0 0

                 165 - 1
                              179 - 0 0 0

                 215 - 00000      220 - 0         221 - 0

 370 - 0         372 - 0 0
```

For host ID 1B:

- Question 104 is the controller address. **4**

  This value should match that of the NCP ADDR parameter for this PU.

```
              __________ 117: Port Assignment __________
                   1B = X25 HOST B
        Host addresses                          Host addresses
Port  IS  1   2   3   4   5            Port  IS  1   2   3   4   5
26-00 1 002 ___ ___ ___ ___            26-01 1 003 ___ ___ ___ ___
26-02 1 004 ___ ___ ___ ___            26-03 1 005 ___ ___ ___ ___
26-04 1 006 ___ ___ ___ ___            26-05 1 007 ___ ___ ___ ___
26-06 1 008 ___ ___ ___ ___            26-07 1 009 ___ ___ ___ ___
26-08 1 010 ___ ___ ___ ___            26-09 1 011 ___ ___ ___ ___
26-10 1 012 ___ ___ ___ ___            26-11 1 013 ___ ___ ___ ___
26-12 1 014 ___ ___ ___ ___            26-13 1 015 ___ ___ ___ ___
26-14 1 016 ___ ___ ___ ___            26-15 1 017 ___ ___ ___ ___
26-16 1 018 ___ ___ ___ ___            26-17 1 019 ___ ___ ___ ___
26-18 1 020 ___ ___ ___ ___            26-19 1 021 ___ ___ ___ ___
26-20 1 022 ___ ___ ___ ___            26-21 1 023 ___ ___ ___ ___
26-22 1 024 ___ ___ ___ ___            26-23 1 025 ___ ___ ___ ___
26-24 1 026 ___ ___ ___ ___            26-25 1 027 ___ ___ ___ ___
26-26 1 028 ___ ___ ___ ___            26-27 1 029 ___ ___ ___ ___
26-28 1 030 ___ ___ ___ ___            26-29 1 031 ___ ___ ___ ___
26-30 1 032 ___ ___ ___ ___            26-31 1 033 ___ ___ ___ ___
```

As with the primary host, we assign one host address to each of the 32 ports automatically. **5**

Note: The customization panels for host ID 1C and 1D are not shown; they are the same as those for host ID 1B.

```
              ___________ 332:  X.25 Options ___________
                   1B = X25 HOST B

                      401 - 1       402 - 0002

   409 - 10101010     420 - 00000000               421 - 00000000

   423 -

   430 - 1                          432 - 02


   440 - 9            441 - __      442 - ____

                                    452 - _______   453 - 00000000
```

X.25 options for host ID 1B:

- Question 401 is the circuit type (1=PVC).
- Question 402 is the Logical Channel Identifier.

  In this example, it is logical channel 0002.

Note: X.25 option screens for host ID 1C and 1D are not shown. Additional PVC connections configured will use logical channels 0003 for host 1C and 0004 for host 1D.

NCP Definition (Second PVC)

```
*---------------------------------------------------------------------*
XL13008B X25.LINE LCN=2, 6  SECOND PVC                                X
               DSTNODE=BNN,                                           X
               LLC=LLC3,                                              X
               TYPE=P,                                                X
               VCCINDX=1
```

```
*-----------------------------------------------------------------------*
XP13008B X25.PU PUTYPE=2,                                                 X
               ISTATUS=ACTIVE,                                            X
               ADDR=C1, 4                                                 X
               MAXDATA=265,                                               X
               MAXOUT=7,                                                  X
               SSCPFM=USSSCS,                                             X
               MODETAB=AMODETAB,                                          X
               USSTAB=US327X
*-----------------------------------------------------------------------*
T13008B1 X25.LU LOCADDR=2, 5 DLOGMOD=M2SDLCQ
T13008B2 X25.LU LOCADDR=3,DLOGMOD=M2SDLCQ
    :              :
T1308B32 X25.LU LOCADDR=33,DLOGMOD=M2SDLCQ
*-----------------------------------------------------------------------*
```

Notes:

PU XP13008B is the definition for this 3174 in host B.

4 Question 104 relates to the polling address specified in the PU definition.

5 The host addresses in the Port Assignment panel match the LU LOCADDR values.

6 Question 402 defines the virtual circuit number used for this host.

Host 1E Customization (SVC)

```
                 _________________ X.25 _________________
                      1E = SWITCHED X25

 104 - C1                                  116 - S1 __

                            125 - 00*****0                     127 - 0 0

                 165 - 1
                            179 - 0 0 0


                 215 - 00000    220 - 0         221 - 0

 370 - 0         372 - 0 0
```

We now customize the switched connection to host E.

- Question 104 is the controller address. **7**

  For X.25, this is the secondary station address.

```
                 __________ 117: Port Assignment __________
                      1E = SWITCHED X25
         Host addresses                          Host addresses
Port  IS  1   2   3   4   5              Port  IS  1   2   3   4   5
26-00 1 002 ___ ___ ___ ___              26-01 1 003 ___ ___ ___ ___
26-02 1 004 ___ ___ ___ ___              26-03 1 005 ___ ___ ___ ___
26-04 1 006 ___ ___ ___ ___              26-05 1 007 ___ ___ ___ ___
26-06 1 008 ___ ___ ___ ___              26-07 1 009 ___ ___ ___ ___
26-08 1 010 ___ ___ ___ ___              26-09 1 011 ___ ___ ___ ___
26-10 1 012 ___ ___ ___ ___              26-11 1 013 ___ ___ ___ ___
26-12 1 014 ___ ___ ___ ___              26-13 1 015 ___ ___ ___ ___
26-14 1 016 ___ ___ ___ ___              26-15 1 017 ___ ___ ___ ___
26-16 1 018 ___ ___ ___ ___              26-17 1 019 ___ ___ ___ ___
26-18 1 020 ___ ___ ___ ___              26-19 1 021 ___ ___ ___ ___
26-20 1 022 ___ ___ ___ ___              26-21 1 023 ___ ___ ___ ___
26-22 1 024 ___ ___ ___ ___              26-23 1 025 ___ ___ ___ ___
26-24 1 026 ___ ___ ___ ___              26-25 1 027 ___ ___ ___ ___
26-26 1 028 ___ ___ ___ ___              26-27 1 029 ___ ___ ___ ___
26-28 1 030 ___ ___ ___ ___              26-29 1 031 ___ ___ ___ ___
26-30 1 032 ___ ___ ___ ___              26-31 1 033 ___ ___ ___ ___
```

As with the other hosts, we have assigned one host address to each of the 32 ports automatically (by responding to question 116 with S1). **8**

```
___________ 332:  X.25 Options ___________
     1E = SWITCHED X25

        401 - 4       402 -

409 - 10101010      420 - 00000000              421 - 00000000

423 - 3174__________

430 - 1                        432 - 02


440 - 9             441 - __       442 - ____

                                   452 - _______  453 - 00000000
```

X.25 options for host ID 1E:

- Question 401 is the circuit type (4=two-way SVC).
- Question 402 is the Logical Channel Identifier.

  The LCN used for this session will be taken from the pool we defined in questions 461 through 466, depending on the type of call.

```
______ Logical Terminal Assignment ________
                                       801=1

 Port LT1 LT2 LT3 LT4 LT5               Port LT1 LT2 LT3 LT4 LT5

26-00 1A1 1B1 1C1 1D1 1E1              26-01 1A1 1B1 1C1 1D1 1E1
26-02 1A1 1B1 1C1 1D1 1E1              26-03 1A1 1B1 1C1 1D1 1E1
26-04 1A1 1B1 1C1 1D1 1E1              26-05 1A1 1B1 1C1 1D1 1E1
26-06 1A1 1B1 1C1 1D1 1E1              26-07 1A1 1B1 1C1 1D1 1E1
26-08 1A1 1B1 1C1 1D1 1E1              26-09 1A1 1B1 1C1 1D1 1E1
26-10 1A1 1B1 1C1 1D1 1E1              26-11 1A1 1B1 1C1 1D1 1E1
26-12 1A1 1B1 1C1 1D1 1E1              26-13 1A1 1B1 1C1 1D1 1E1
26-14 1A1 1B1 1C1 1D1 1E1              26-15 1A1 1B1 1C1 1D1 1E1
26-16 1A1 1B1 1C1 1D1 1E1              26-17 1A1 1B1 1C1 1D1 1E1
26-18 1A1 1B1 1C1 1D1 1E1              26-19 1A1 1B1 1C1 1D1 1E1
26-20 1A1 1B1 1C1 1D1 1E1              26-21 1A1 1B1 1C1 1D1 1E1
26-22 1A1 1B1 1C1 1D1 1E1              26-23 1A1 1B1 1C1 1D1 1E1
26-24 1A1 1B1 1C1 1D1 1E1              26-25 1A1 1B1 1C1 1D1 1E1
26-26 1A1 1B1 1C1 1D1 1E1              26-27 1A1 1B1 1C1 1D1 1E1
26-28 1A1 1B1 1C1 1D1 1E1              26-29 1A1 1B1 1C1 1D1 1E1
```

Finally, having defined five X.25 hosts (1A through 1E), we allocate one host session to each of the five logical terminals at each port. **10**

NCP Definition (SVC)

```
*---------------------------------------------------------------------*
         X25.VC LCN=(5,10), 11        6 SVC'S                          X
               VCCINDX=1,                                              X
               NCPGRP=X2508P1,                                         X
               OUFINDX=1,                                              X
               CALL=OUT,            NPSI INITIATES CALL                X
               TYPE=S
*---------------------------------------------------------------------*
         X25.VC LCN=(11,15),       5 SVC'S                             X
               VCCINDX=1,                                              X
               NCPGRP=X2508P2,                                         X
               OUFINDX=1,                                              X
               CALL=INOUT,          CALLS BOTH WAYS                    X
               TYPE=S
*---------------------------------------------------------------------*
         X25.VC LCN=(16,20),       5 SVC'S                             X
               VCCINDX=1,                                              X
               NCPGRP=X2508P3,                                         X
               OUFINDX=1,                                              X
               CALL=IN,            REMOTE DTE INITIATES CALL           X
               TYPE=S
*---------------------------------------------------------------------*
```

VTAM Definitions (SVC)

```
SWX25TES VBUILD MAXGRP=15,           REQUIRED NUMBER OF PATH GROUPS  X
               MAXNO=15,             REQUIRED NUMBER OF DIALNO       X
               TYPE=SWNET            REQUIRED
*-------------------------------------------------------------------*
X25PUE   PU    ADDR=C1, 7                                            X
               IDBLK=017,                                            X
               IDNUM=00000,                                          X
               DISCNT=YES,                                           X
               MAXOUT=7,                                             X
               MAXDATA=255,                                          X
               MODETAB=AMODETAB,                                     X
               MAXPATH=20,                                           X
               VPACING=0,                                            X
               PUTYPE=2,                                             X
               SSCPFM=USSSCS,                                        X
               DLOGMOD=M2SDLCQ,                                      X
               USSTAB=US327X
*-------------------------------------------------------------------*
PATHX251 PATH  DIALNO=2222222222*317411111130101, 9                  X
               GRPNM=X2508P1,                                        X
               GID=1,                                                X
               PID=1
*-------------------------------------------------------------------*
PATHX252 PATH  DIALNO=2222222222*317411111130101,                    X
               GRPNM=X2508P2,                                        X
               GID=1,                                                X
               PID=2
*-------------------------------------------------------------------*
PATHX253 PATH  DIALNO=2222222222*317411111130101,                    X
               GRPNM=X2508P3,                                        X
               GID=1,                                                X
               PID=3
*-------------------------------------------------------------------*
T13008E1 LU    LOCADDR=2 8
T13008E2 LU    LOCADDR=3
T13008E3 LU    LOCADDR=4
    :             :
T1308E32 LU    LOCADDR=33
```

Notes:

7 The address parameter should match on question 104 in the NCP PU definition.

8 The host addresses should match the LU LOCADDR values.

9 For an explanation of the dial parameter, see *X.25 NPSI Planning and Installation*.

10 This panel shows the sequence of LTs accessed when you use the Change Screen key.

11 We will have four PVCs and one SVC connection. Therefore, we begin numbering the SVCs in question 461 starting at 0005 to ensure that the numbering will be in the correct sequence.

It should be noted that the switched definitions shown here are included as an example only and were not tested.

NCP Definition Listing

The is the complete NCP definitions used to test X.25 SLMH. It is not a true-to-life scenario because all the hosts are physically the same host but it illustrates how to customize the 3174.

In reality, if there were separate hosts using NPSI, then you would code one PU definition in the NCP/NPSI definition in each host (you can use the PU definition in this listing).

Extracts from this listing are used in the previous pages.

```
*----------------------------------------------------------------------*
*      NCP/NPSI DEFINITIONS FOR X.25 MULTI-HOST TESTING                *
*----------------------------------------------------------------------*
* NCPBUILD BUILD - ADD THE FOLLOWING STATEMENTS                        *
*----------------------------------------------------------------------*
               X25.PREFIX=X,       ALL NAMES START WITH X               X
               X25.IDNUMH=02,      MUST MATCH WITH SWITCH MAJOR NODE IDX
               X25.SNAP=YES,       SNAP TRACE INCLUDED                  X
               X25.MCHCNT=1,       NUMBER OF PHYSICAL LINKS             X
               X25.MAXPIU=5K       LESS THAN MAXBFRU TIMES UNITSZ
*----------------------------------------------------------------------*
*      X.25 NETWORK                                                    *
*----------------------------------------------------------------------*
X3174    X25.NET CPHINDX=1,                                             X
               NETTYPE=1,                                               X
               OUHINDX=1,                                               X
               DM=YES
         X25.VCCPT INDEX=1,                                             X
               MAXPKTL=128,                                             X
               VWINDOW=3,           PACKET LEVEL WINDOW 3               X
               INSLOW=(100,50)
*----------------------------------------------------------------------*
*      FIRST MCH                                                       *
*----------------------------------------------------------------------*
MCH01    X25.MCH   ADDRESS=08,      CONTROLLER LINE ADDRESS             X
               ANS=STOP,                                                X
               LCGDEF=(0,4),        4 PVC                               X
               FRMLGTH=259,         256 + 3 (PACKET HEADER)             X
               MWINDOW=7,           FRAME WINDOW SIZE                   X
               STATION=DCE,         USED TO SIMULATE X.25 NETWORK       X
               ENABLTO=3,                                               X
               DSABLTO=3,                                               X
               TDTIMER=1,                                               X
               TPTIMER=3,                                               X
               NPRETRY=10,                                              X
               NDRETRY=1,           CODED TO MATCH  STATION=DCE         X
               SUBADDR=NO,                                              X
               LLCLIST=(LLC3),                                          X
               LCNO=NOTUSED,                                            X
               DBIT=NO,                                                 X
               PAD=NO,                                                  X
               PKTMODL=8,                                               X
               GATE=NO,                                                 X
               ITRACE=YES,                                              X
               SPEED=9600,          DEFAULT                             X
               T1TIMER=1
```

```
*--------------------------------------------------------------------*
         X25.LCG LCGN=0             LOGICAL CHANNEL GROUP ZERO
*--------------------------------------------------------------------*
*      X.25 LINE / PU / LU MACROS                     (LINE 008)     *
*      EACH LINE DEFINES A PVC                                       *
*--------------------------------------------------------------------*
XL13008A X25.LINE LCN=1,            FIRST PVC                         X
               DSTNODE=BNN,                                           X
               LLC=LLC3,                                              X
               TYPE=P,                                                X
               VCCINDX=1
*--------------------------------------------------------------------*
XP13008A X25.PU PUTYPE=2,                                             X
               ISTATUS=ACTIVE,                                        X
               ADDR=C1,                                               X
               MAXDATA=265,                                           X
               MAXOUT=7,                                              X
               SSCPFM=USSSCS,                                         X
               MODETAB=AMODETAB,                                      X
               USSTAB=US327X
*--------------------------------------------------------------------*
T13008A1 X25.LU LOCADDR=2,DLOGMOD=M2SDLCQ
T13008A2 X25.LU LOCADDR=3,DLOGMOD=M2SDLCQ
T13008A3 X25.LU LOCADDR=4,DLOGMOD=M2SDLCQ
T13008A4 X25.LU LOCADDR=5,DLOGMOD=M2SDLCQ
T13008A5 X25.LU LOCADDR=6,DLOGMOD=M2SDLCQ
T13008A6 X25.LU LOCADDR=7,DLOGMOD=M2SDLCQ
T13008A7 X25.LU LOCADDR=8,DLOGMOD=M2SDLCQ
T13008A8 X25.LU LOCADDR=9,DLOGMOD=M2SDLCQ
T13008A9 X25.LU LOCADDR=10,DLOGMOD=M2SDLCQ
*--------------------------------------------------------------------*
XL13008B X25.LINE LCN=2,            SECOND PVC                        X
               DSTNODE=BNN,                                           X
               LLC=LLC3,                                              X
               TYPE=P,                                                X
               VCCINDX=1
*--------------------------------------------------------------------*
XP13008B X25.PU PUTYPE=2,                                             X
               ISTATUS=ACTIVE,                                        X
               ADDR=C1,                                               X
               MAXDATA=265,                                           X
               MAXOUT=7,                                              X
               SSCPFM=USSSCS,                                         X
               MODETAB=AMODETAB,                                      X
               USSTAB=US327X
*--------------------------------------------------------------------*
T13008B1 X25.LU LOCADDR=34,DLOGMOD=M2SDLCQ
T13008B2 X25.LU LOCADDR=38,DLOGMOD=M2SDLCQ
T13008B3 X25.LU LOCADDR=42,DLOGMOD=M2SDLCQ
T13008B4 X25.LU LOCADDR=46,DLOGMOD=M2SDLCQ
T13008B5 X25.LU LOCADDR=50,DLOGMOD=M2SDLCQ
T13008B6 X25.LU LOCADDR=54,DLOGMOD=M2SDLCQ
T13008B7 X25.LU LOCADDR=58,DLOGMOD=M2SDLCQ
T13008B8 X25.LU LOCADDR=62,DLOGMOD=M2SDLCQ
T13008B9 X25.LU LOCADDR=66,DLOGMOD=M2SDLCQ
```

```
*--------------------------------------------------------------------*
XL13008C X25.LINE LCN=3,            THIRD PVC                         X
               DSTNODE=BNN,                                           X
               LLC=LLC3,                                              X
               TYPE=P,                                                X
               VCCINDX=1
*--------------------------------------------------------------------*
XP13008C X25.PU PUTYPE=2,                                             X
               ISTATUS=ACTIVE,                                        X
               ADDR=C1,                                               X
               MAXDATA=265,                                           X
               MAXOUT=7,                                              X
               SSCPFM=USSSCS,                                         X
               MODETAB=AMODETAB,                                      X
               USSTAB=US327X
*--------------------------------------------------------------------*
T13008C1 X25.LU LOCADDR=35,DLOGMOD=M2SDLCQ
T13008C2 X25.LU LOCADDR=39,DLOGMOD=M2SDLCQ
T13008C3 X25.LU LOCADDR=43,DLOGMOD=M2SDLCQ
T13008C4 X25.LU LOCADDR=47,DLOGMOD=M2SDLCQ
T13008C5 X25.LU LOCADDR=51,DLOGMOD=M2SDLCQ
T13008C6 X25.LU LOCADDR=55,DLOGMOD=M2SDLCQ
T13008C7 X25.LU LOCADDR=59,DLOGMOD=M2SDLCQ
T13008C8 X25.LU LOCADDR=63,DLOGMOD=M2SDLCQ
T13008C9 X25.LU LOCADDR=67,DLOGMOD=M2SDLCQ
*--------------------------------------------------------------------*
XL13008D X25.LINE LCN=4,            FOURTH PVC                        X
               DSTNODE=BNN,                                           X
               LLC=LLC3,                                              X
               TYPE=P,                                                X
               VCCINDX=1
*--------------------------------------------------------------------*
XP13008D X25.PU PUTYPE=2,                                             X
               ISTATUS=ACTIVE,                                        X
               ADDR=C1,                                               X
               MAXDATA=265,                                           X
               MAXOUT=7,                                              X
               SSCPFM=USSSCS,                                         X
               MODETAB=AMODETAB,                                      X
               USSTAB=US327X
*--------------------------------------------------------------------*
T13008D1 X25.LU LOCADDR=36,DLOGMOD=M2SDLCQ
T13008D2 X25.LU LOCADDR=40,DLOGMOD=M2SDLCQ
T13008D3 X25.LU LOCADDR=44,DLOGMOD=M2SDLCQ
T13008D4 X25.LU LOCADDR=48,DLOGMOD=M2SDLCQ
T13008D5 X25.LU LOCADDR=52,DLOGMOD=M2SDLCQ
T13008D6 X25.LU LOCADDR=56,DLOGMOD=M2SDLCQ
T13008D7 X25.LU LOCADDR=60,DLOGMOD=M2SDLCQ
T13008D8 X25.LU LOCADDR=64,DLOGMOD=M2SDLCQ
T13008D9 X25.LU LOCADDR=68,DLOGMOD=M2SDLCQ
*--------------------------------------------------------------------*
        X25.END
*--------------------------------------------------------------------*
```

10.8 Example 8: 3174 with AEA

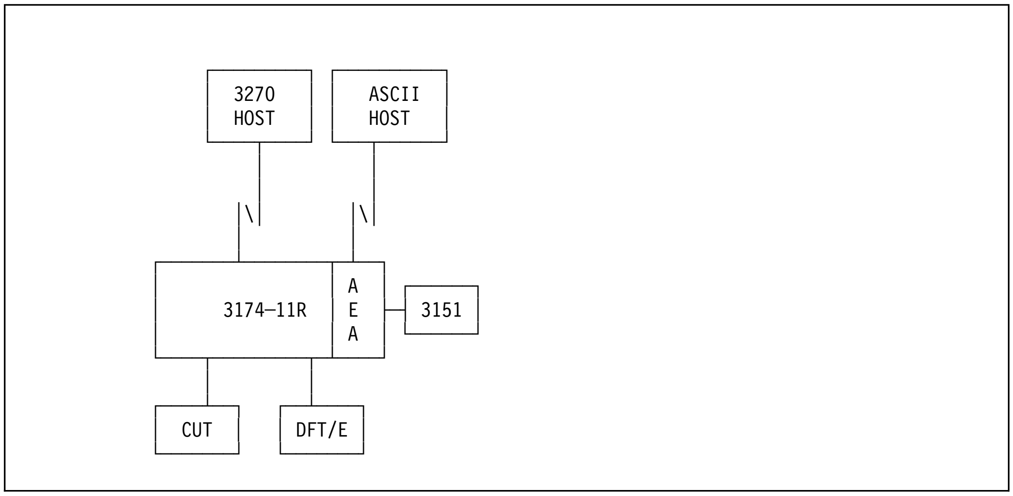


Figure 150. Remote 3174 with an AEA

Due to the nature of AEA connections and the complexity of the required parameters of the OEM hosts, the connectivity example is discussed in Chapter 7, "Asynchronous Emulation Adapter (AEA)" on page 263.

10.9 Example 9: SLNM with Frame Relay

The Multi-Host Support Type for Frame Relay is *Single-Link Multi-Host Support* and can be defined on the Communication Adapter (CA) only. The Concurrent Communication Adapter (CCA) is not supported as link to a Frame Relay Network, but can be used concurrently as secondary Host-Link via SDLC.

In the example shown in Figure 151 on page 391, we will cover practically all customization questions introduced with the Frame Relay feature, regarding Single-Link Multi-Host for PU2.0 Host-Link, APPN and Gateway definitions.

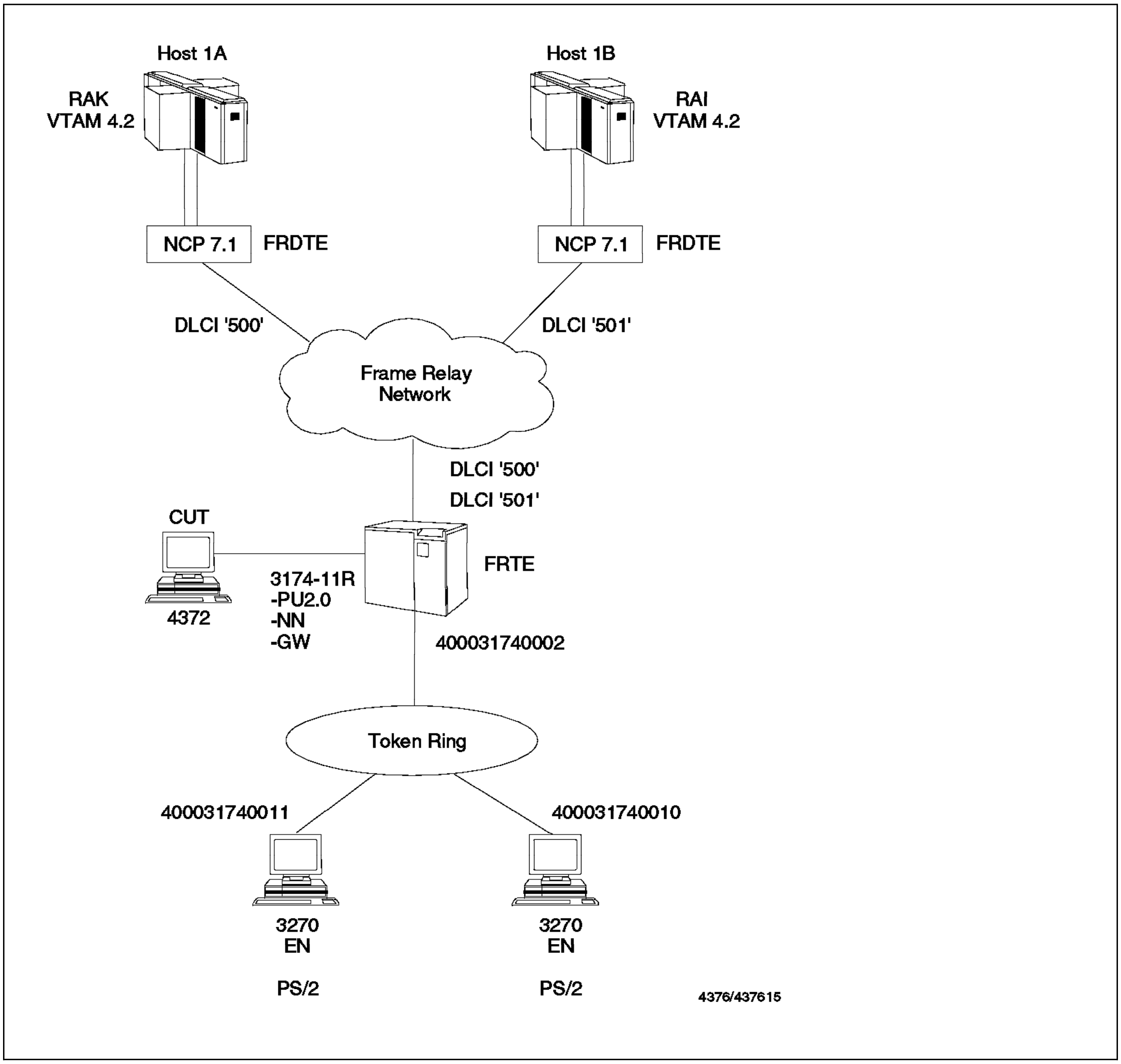


Figure 151. Example Scenario

See Chapter 20, “Frame Relay Support” on page 589 and the new ITSO document *3174 in Higher Speed WAN and Multiprotocol Networks*, GG24-4376 for further information. This book provides guidance in implementing 3174 Frame Relay support in various scenarios and, native Frame Relay support for native SNA, APPN and, TCP/IP protocols are examined in common scenarios that mostly reflect real world configurations.

Chapter 11. Dynamic Definition of Dependent LUs (DDDLU)

Dynamic Definition of Dependent Logical Units (DDDLU) provides the ability to dynamically create VTAM definitions for dependent LUs at power-on time. With the appropriate levels of software and microcode, VTAM builds the LU definitions using model LU statements defined in VTAM and product information supplied by the 3174, without operator intervention. DDDLU, therefore, provides the following benefits:

- You do not need to code an LU definition for each logical terminal. This is a great saving in time and effort, especially when using Multiple Logical Terminal (MLT) support in a large network environment.
- With DDDLU, definitions are created only when needed. Therefore, you do not need to reserve LU definitions in anticipation of future use. This can be a great saving in storage (control blocks) on the host.
- Terminal devices can be added, replaced and moved without pre-definition. There is no need to shutdown the network or parts of the network during these changes. This increased flexibility is especially important to users with fairly large and/or dynamic networks.

11.1 Host Requirements

The following host software are required to support DDDLU:

- ACF/VTAM V3.4.1 for MVS/ESA
- ACF/VTAM V3.4 for VM/SP and VM/ESA
- ACF/VTAM V3.4 for VSE/ESA*
- ACF/NCP V5.4 if the 3174 is attached through an NCP

11.2 3174 Requirements

The following lists the 3174 models supported and the microcode release level required.

11.2.1 3174 Models Supported

The following 3174 models support DDDLU:

- Models 01L, 01R, 02R, 03R, 51R, 53R
- Models 11L, 11R, 12R, 13R, 14R, 61R, 62R, 63R, 64R, 90R, 91R, 92R
- Models 21L, 21R, 22R, 23R, 24R
- Models 12L, 22L
- Models 41R, 43R

11.2.2 3174 Microcode Requirements

The minimum level of 3174 microcode required is one of the following:

- Configuration Support-B Release 4.1
- Configuration Support-C Release 1.1 or later

Note that Configuration Support-C Release 1 does not support DDDLU. References to 3174 support for DDDLU are mentioned in the program announcements for the different releases of ACF/VTAM mentioned previously. The introduction of Configuration Support-C Release 2 provided the first opportunity to announce this 3174 enhancement.

11.3 Functional Description

With the newer levels of VTAM, IBM supplies a new exit with the product tapes: the Selection of Definitions for Dependent Logical Units (SDDLU). This SDDLU exit supports the Dynamic Definition of Dependent LU (DDDLU) function, which defines LUs to VTAM when a 3174 or its attached device (display or printer) powers on, rather than during major node activation.

The device must be attached to a 3174 capable of supporting DDDLU (that is, with the right level of microcode) and the 3174 PU must be defined with the appropriate parameters (LUGROUP and LUSEED).

Given the correct levels of VTAM and 3174 microcode, and appropriate PU definition:

- VTAM is able to send an ACTPU Format 1 to the 3174.
- The 3174 checks that the ACTPU Format 1 contains the correct control vector and bit setting indicating VTAM supports unsolicited Reply Product Set ID (PSID) NMVTs from the 3174.
- The 3174 then loops through its Port Assignment table and sends in a Reply PSID NMVT for each device that is powered on and needs to communicate with that host.

  Contained in the Reply PSID NMVT are information such as the device (or machine) type, model number and assigned local address (or addresses, when Multiple Logical Terminal is customized).

  For devices that support Vital Product Data (VPD), the machine type and model number are supplied at manufacture. For devices that do not support VPD, user-defined data can be used for DDDLU.
- VTAM passes the PSID information to the SDDLU exit.
- The SDDLU exit concatenates the machine type and model number together to form a seven-character LU acronym. The exit then uses the LU acronym to select a model LU definition from a set of model LU definitions in an LUGROUP major node.
- The SDDLU exit next constructs the LU name using the LUSEED name defined in the 3174 PU and the PSID local address.
- The SDDLU exit passes the model LU definition and constructed LU name to VTAM.
- VTAM builds the LU definition for each logical terminal and activates the LU.

For each device that powers on after the initial ACTPU processing, the 3174 will send an unsolicited Reply PSID to VTAM, resulting in the dynamic definition process being executed once again.

DDDLU support extends to devices communicating with both the primary or secondary hosts, with the LUs dynamically defined in the corresponding hosts. DDDLU support is also available for ASCII devices attached via the Asynchronous Emulation Adapter.

11.4 VTAM Major Node Types

DDDLU is supported by the following major node types:

- Channel attached major nodes
- NCP major nodes
- Local SNA major nodes
- Switched major nodes
- Packet major nodes (VM and VSE only)

11.5 DDDLU Supported Devices

Some of the newer devices supply their own Vital Product Data. This VPD is known as device-defined data and includes the device (or machine) type, model number and plant of manufacture (see Figure 152). The machine type and model number are sent in the Reply PSID to VTAM and are used by the SDDLU exit to support DDDLU.

```
BKBCP231          ______ Port Vital Data - PN 00, HG 26 ______


                      Device-defined          User-defined

Device type:             3472                    ____
Model number:            F00                     ___
Plant of manufacture:    23                      __
Serial number:           00F0678                 _______
Release level:
Engineering change data:  09F4604 09F4605

                                      B1 B2 B3 B4 B5 B6 B7 B8 B9 B10
Device characteristics (hexadecimal): 01 11 C1 04 43 00 10 A9

* = data not supplied by device

Location: __________________________________________________


To go directly to other tests, enter: /Test,Option
Select Test; press ENTER ===>

PF:  3=Quit  7=Back  8=Fwd  12=Test Menu
```

Figure 152. Display Vital Product Data

For devices that do not supply device-defined VPD, you can specify user-defined VPD, including the machine type and model number, via Online Test 5 Option 4 (Update Port VPD). The user-defined machine type and model number will then be sent in the Reply PSID to VTAM support DDDLU.

If both device-defined and user-defined data are present for a device, only the device-defined data is sent in the Reply PSID. The device-defined data overrides the user-defined data.

If the 3174 is IMLed, the device-defined VPD stored in the controller storage is lost. The user-defined data, however, is saved because it is stored on the Control diskette (or fixed disk).

11.5.1 3270 Devices

The following 3270 devices provide device-defined VPD.

MACHINE TYPE (M/T)	MODEL NUMBER	PRODUCT SET ID (PSID) SUPPORT		
		M/T	MODEL	COMMENTS
3179	1	Y	N	No user data
3179	G	Y	Y	No user data
3180	1	Y	N	No user data
3191(1)	A, B	Y	N	No user data
3191(1)	D, E, L	Y	Y	No user data
3192(1)	C, D, F, L, W	Y	Y	No user data
3192(1)	G	Y	Y	No user data
3193	10,20	Y	Y	No user data
3194	C,D,H (EX. H50)	Y	Y	No user data
3194	H50	Y	Y	No user data
3290		Y	N	No user data
3471		Y	Y	No user data
3472	FC, FD, FA, FG, CG5	Y	Y	Support user data
3481		Y	Y	No user data
3482		Y	Y	Support user data
8530(3)	E21, E31	N	Y	PS/2 Model 30-286
8550(2)	021, 031, 061	N	Y	PS/2 Model 50
8555SX	031, 061	N	Y	PS/2 Model 55
8560(2)	041, 071	N	Y	PS/2 Model 60
8565SX	061, 121	N	Y	PS/2 Model 65
8570(2)	A21, E61, 121	N	Y	PS/2 Model 70
8580(2)	041, 071, 111, 311	N	Y	PS/2 Model 80
5162(3)	286	N	Y	PC XT
5170(3)	099, 239, 319, 339	N	Y	PC AT
5170(3)	068 with fixed disk	N	Y	PC AT

Figure 153. 3270 Devices Supporting PSID Information

```
Notes:

(1) The following 3270 devices have an associated VPD model number:

    3270 Device       VPD Model Number
    -----------       ----------------
    3191 A/B              3191 000
    3191 D/E/L            3191 015
    3192 C/L              3192 030
    3192 D                3192 020
    3192 F                3192 035
    3192 W                3192 025
    3471 B10              3471 xxx
    3472 FC               3472 xxx
    3472 FD               3472 xxx
    3472 FA               3472 xxx
    3472 FG               3472 xxx
    3472 CG5              3472 xxx

(2)  Requires OS/2 Extended Edition and FC 2000.

(3)  Requires OS/2 Extended Edition and FC 2507 or FC 5050.
```

11.5.2 Personal Communications/3270 Support

DDDLU is supported for PS/2 workstations coax attached to the 3174 and running in CUT or DFT modes, for both single and multiple session support. You can specify user-provided VPD using the PCSUTIL utility.

11.6 DDDLU Process

Figure 154 on page 398 shows an overview of the DDDLU process of building an LU definition for a 3472 display attached to a 3174.

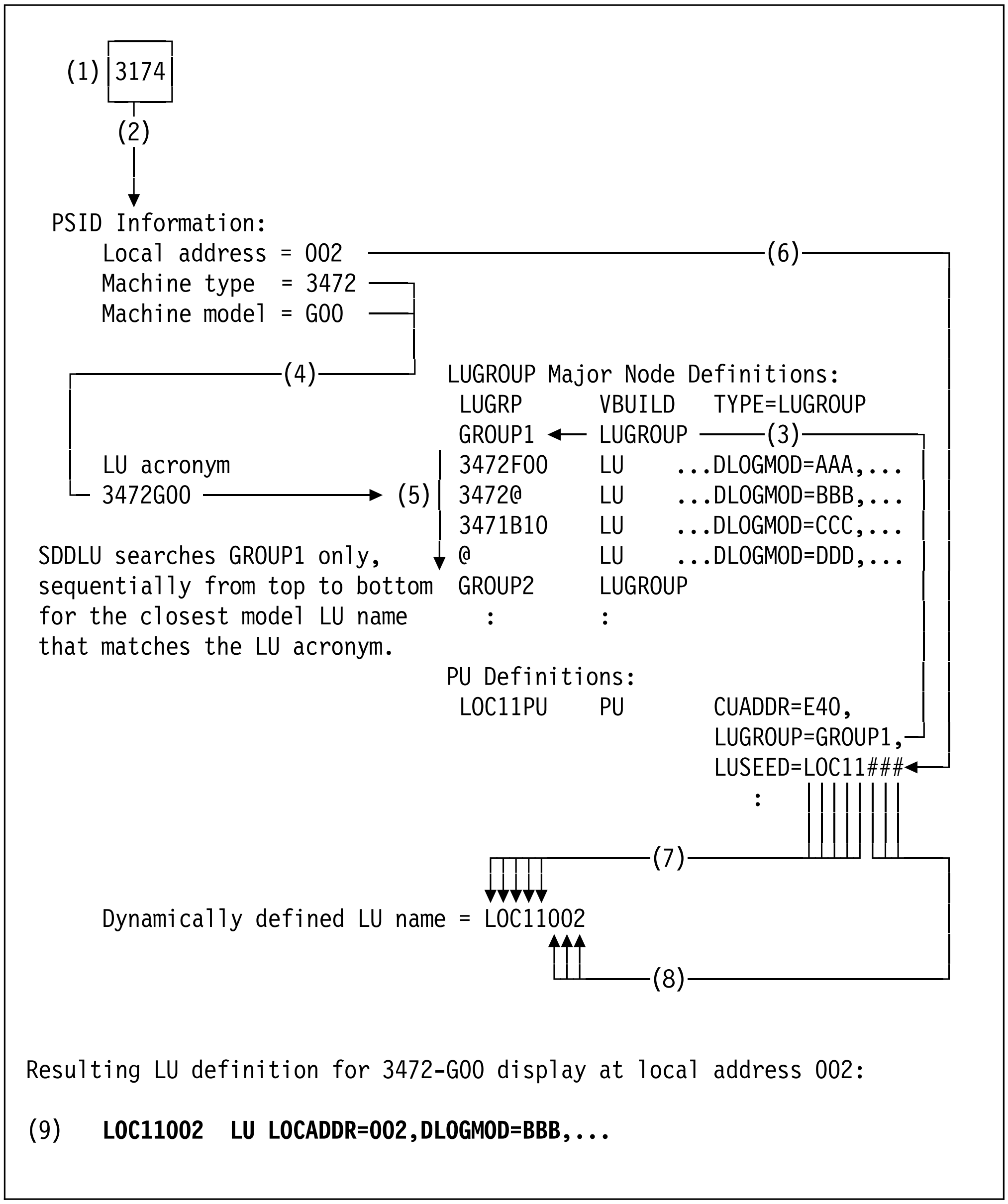


Figure 154. DDDLU Overview

The following describes an example process of building a dynamic definition for a display attached to a 3174:

(1) The 3174 is IMLed, the display is powered on and the PU major node is activated.

(2) The 3174 sends in a Reply Product Set ID (PSID) NMVT containing the machine type, model number and local address (or addresses) customized for all devices powered on to VTAM

(3) VTAM checks the PU definition for an LU at the address passed in the PSID. If an LU definition does not exist, VTAM checks if the PU has an LUGROUP coded to support DDDLU. In this example, the LUGROUP parameter points to the set of model LU definitions to be used (GROUP1).

(4) VTAM calls and passes the PSID information to the SDDLU exit. The SDDLU exit concatenates PSID machine type and model number to form an LU acronym.

(5) The SDDLU exit compares the LU acronym with each model LU name, character by character, for a match. The search proceeds sequentially from the top to the bottom of the group.

In this example, there is no perfect match for the LU acronym 3472G00. The SDDLU exit, however, will find a match with the second entry 3472@ (the @ character represents any character). If no match had been found, the last entry @ would have been used.

(6) The SDDLU exit uses the PSID local address to replace the # characters in the LUSEED name. With three # characters specified, it will use the decimal form of the local address. If two # characters had been specified, it would have used the hexadecimal form.

(7) The SDDLU exit uses the specific characters of the LUSEED name to form the first part of the LU name.

(8) The SDDLU exit uses the local address to form the second part of the LU name.

(9) The SDDLU exit passes the LU name created and model definitions to VTAM. VTAM builds the LU definition for the display and activates the display LU.

The dynamic definition is rebuilt if the device powers off and a new device powers on at the same local address. The dynamic definition is also rebuilt if the device powers off and powers back on after its LUGROUP major node has been recycled.

LU Acronym

During power-on processing, the 3174 will send a device′s machine type and model number to VTAM, which will concatenate the two fields together (in that ordering sequence) to form an LU acronym. The LU acronym is used to identify a matching model LU name within a set of model LU definitions.

For example, if a device machine type is 3472 and its model number is 003, then the resulting LU acronym is 3472003. This LU acronym is then used to search the set of model LU definitions pointed to by the 3174 PU definition LUGROUP parameter for a matching model LU name.

11.7 3174 PU Definition

To enable DDDLU, two additional parameters must be added to the 3174 PU definition: LUGROUP and LUSEED.

Local PU Example Definition

Figure 155 shows an example of a PU definition for a channel attached 3174 which supports DDDLU.

```
*-------------------------------------------------------------------*
*  3174-11L LOCAL PU DEFINITION FOR DDDLU                           *
*-------------------------------------------------------------------*
LOC11   VBUILD TYPE=LOCAL
LOC11PU  PU    CUADDR=E40,ISTATUS=ACTIVE,PUTYPE=2,MAXBFRU=10,         X
               LUGROUP=GROUP1,LUSEED=LOC11###,                        X
               VPACING=0
LOC11PRT LU LOCADDR=05,MODETAB=MTJS328X,DLOGMOD=SCS3262
```

Figure 155. Example Local PU Definition for DDDLU

Note that you can specify static LU definitions as well. In this example, the LU with LOCADDR=05 is statically defined. You may wish to have static definitions, for example, for certain devices which require unique logmode parameters.

Note also that the parameters for a dynamically defined LU comes from the model LU definition. Any parameters coded on the PU statement will sift down to the statically defined LUs but not the dynamically defined LUs.

Remote PU Example Definition

Figure 156 shows the PU definition for an NCP attached 3174 before being modified for DDDLU.

```
         :
P06143A  PU ADDR=C1,              CLUSTER ADDRESS = 01             X
               MAXDATA=265,       MAXIMUM AMOUNT OF DATA           X
               MAXOUT=7,          MAX SDLC FRAMES BEFORE RESPONSE  X
               PACING=0,          PACING SET BY BIND IMAGE         X
               PASSLIM=8,                                          X
               PUDR=YES,                                           X
               PUTYPE=2,                                           X
               RETRIES=(,4,5),    7 RETRY PER SECOND FOR 5 TIMES   X
               DISCNT=(NO),       (V) VTAM                         X
               ISTATUS=ACTIVE,    (V) VTAM                         X
               SSCPFM=USSSCS,     (V) VTAM                         X
               USSTAB=US327X,     (V) VTAM                         X
               VPACING=0          (V) VTAM
*              STATOPT=('3174',NOACTY)
T06143A1 LU LOCADDR=2,            FIRST LU MUST BE LOCADDR=2       X
               MODETAB=MODEVR,DLOGMOD=VR03270,                     X
               ISTATUS=ACTIVE     (V) VTAM
T06143A2 LU LOCADDR=3,                                             X
               MODETAB=MODEVR,DLOGMOD=VR03270,                     X
               ISTATUS=ACTIVE     (V) VTAM
T06143A3 LU LOCADDR=4,                                             X
               MODETAB=MODEVR,DLOGMOD=VR03270,                     X
               ISTATUS=ACTIVE     (V) VTAM
T06143A4 LU LOCADDR=5,                                             X
               MODETAB=MODEVR,DLOGMOD=VR03270,                     X
               ISTATUS=ACTIVE     (V) VTAM
         :
```

Figure 156. NCP PU and LU Definitions before DDDLU Support

Figure 157 on page 401 shows the PU definition for the same 3174 required to support DDDLU. In this example, the VTAM dynamic reconfiguration capability is used to activate the new PU definition.

```
*-------------------------------------------------------------------*
*  SDLC 3174-11R CONTROL UNIT                                       *
*-------------------------------------------------------------------*
         VBUILD TYPE=DR
         DELETE FROM=L06143
P06143A  PU
         ADD TO=L06143
P06143A  PU ADDR=C1,              CLUSTER ADDRESS = 01
               LUGROUP=GROUP1,    DDDLU GROUP                       X
               LUSEED=CCA###,     DDDLU LU NAME SEED                X
               MAXDATA=521,       MAXIMUM AMOUNT OF DATA            X
               MAXOUT=7,          MAX SDLC FRAMES BEFORE RESPONSE   X
               PACING=0,          PACING SET BY BIND IMAGE          X
               PASSLIM=8,                                           X
               PUDR=YES,                                            X
               PUTYPE=2,                                            X
               RETRIES=(,4,5),    7 RETRY PER SECOND FOR 5 TIMES    X
               DISCNT=(NO),       (V) VTAM                          X
               ISTATUS=ACTIVE,    (V) VTAM                          X
               SSCPFM=USSSCS,     (V) VTAM                          X
               USSTAB=US327X,     (V) VTAM                          X
               VPACING=0          (V) VTAM
```

Figure 157. NCP PU Definitions Modified to Support DDDLU

The additional parameters are used as described in the following sections.

PU LUGROUP Parameter

LUGROUP=*name* points to a group (or set) of model LU definitions contained in an LUGROUP major node that will be searched for a matching LU acronym. Note that the name specified here is the name of the set of model LU definitions within an LUGROUP major node and not the name of the LUGROUP major node.

PU LUSEED Parameter

LUSEED=*pattern name* is used as a pattern or seed to build unique LU names during dynamic definition. The following rules must be followed in specifying an LUSEED name:

- Two or three hash characters must be specified within the name.
- The hash characters must be contiguous.
- The name must not start with the hash character

Examples of valid LUSEED names are:

- LOC11### (three hash characters at the end)
- REM13## (two hash characters at the end)
- CCA##LU (two hash characters imbedded)

In building an LU name, the hash characters are replaced by the device local address:

- If two hash characters are specified, the hexadecimal form of the local address is used.
- If three has characters are specified, the decimal form of the local address is used.

11.8 LUGROUP Major Node

The model LU definitions, as previously mentioned, are contained in an LUGROUP major node. Figure 158 shows an example LUGROUP major node that is used by a 3174. The LUGROUP macro on the VBUILD statement tells VTAM that this major node contains model LU definitions.

```
*--------------------------------------------------------------------*
*  AN LUGROUP MAJOR NODE CONTAINS MODEL LU DEFINITIONS               *
*--------------------------------------------------------------------*
         VBUILD TYPE=LUGROUP
GROUP1   LUGROUP
317@     LU DLOGMOD=M23278I,MODETAB=AMODETAB,USSTAB=US327X
3278002  LU DLOGMOD=M23278I,MODETAB=AMODETAB,USSTAB=US327X
3279SG3  LU DLOGMOD=D6327802,MODETAB=AMODETAB,USSTAB=AUSSTAB,         X
               LOGAPPL=CICS3
3471B10  LU DLOGMOD=M2SDLCQ,MODETAB=AMODETAB,USSTAB=US327X
3471@    LU DLOGMOD=M2SDLCNQ,MODETAB=AMODETAB,USSTAB=US327X
3472F00  LU DLOGMOD=M2SDLCQ,MODETAB=AMODETAB,USSTAB=US327X
3472@    LU DLOGMOD=M2SDLCNQ,MODETAB=AMODETAB,USSTAB=US327X
3192002  LU DLOGMOD=M2SDLCQ,MODETAB=AMODETAB,USSTAB=US327X
3270PC   LU DLOGMOD=M2SDLCQ,MODETAB=AMODETAB,USSTAB=US327X
4224@    LU DLOGMOD=SCS3262,MODETAB=MTJS328X
8560071  LU DLOGMOD=M2SDLCQ,MODETAB=AMODETAB,USSTAB=US327X
8560@    LU DLOGMOD=M2SDLCQ,MODETAB=AMODETAB,USSTAB=US327X
85@      LU DLOGMOD=M2SDLCQ,MODETAB=AMODETAB,USSTAB=US327X
@        LU DLOGMOD=M2SDLCQ,MODETAB=AMODETAB,USSTAB=US327X
GROUP2   LUGROUP
3471B10  LU DLOGMOD=M2SDLCQ,MODETAB=MODETAB2,USSTAB=US327X
:
@        LU DLOGMOD=M2SDLCQ,MODETAB=MODETAB2,USSTAB=US327X
```

Figure 158. Example LUGROUP Major Node

Model LU Definitions

In this example, there are two sets of model LU definitions:

- The group name (in this example, GROUP1 or GROUP2) identifies a set of model LU definitions. This name is specified in the LUGROUP operand of the 3174 PU macro.
- The LUGROUP macro to the right of the group name marks the beginning of the set of model LU definitions. Note that no operands are allowed for this macro.
- The maximum number of model LU definitions per set is 255.
- Multiple sets of model LU definitions can exist in the same major node (as shown in this example), or they can be separated into several major nodes for flexibility.
- Multiple sets of model LU definitions can be active at the same time.
- You can VARY ACT and VARY INACT an LUGROUP major node (like other major node types). However, you cannot VARY ACT and VARY INACT individual sets within the LUGROUP major node.

Model LU Name

The model LU name identifies the model LU definition that will be used for dynamically creating a device definition. The following rules apply to model LU names:

- The model LU name is required and must be unique within an LUGROUP. However, the same model LU name can be used in different LUGROUPs.
- A model LU name can be eight characters long. Note that the IBM-supplied SDDLU exit supports only seven-character model LU names.
- A model LU name can begin with:
  - An alphabetic character: A through Z
  - A numeric character: 0 through 9
  - A special character: @ # $
- The @ character has special meanings in a model LU name. It is used to substitute for characters in an LU acronym as follows:
  - Between other characters in a name, @ substitutes for a single unknown character.
  - If it is the last character in a name, @ substitutes for any number, up to seven, of unknown characters.
  - If it is the only character in a name, @ will substitute for any LU acronym.

Model LU Name Search Considerations

When defining the LUGROUP major node, you should be aware of the following considerations:

- When the SDDLU exit attempts to find a match for an LU acronym, it searches sequentially down the list of model LU names within the LUGROUP. This means that you should place the definitions that are likely to be used by the majority of the devices (displays and printers) in your network at the top of the list for better performance.
- The @ character in the model LU name, as we have described previously, is used to substitute any character in the LU acronym. You should, therefore, be careful about where you place model LU names with the @ character within an LUGROUP.

  For example, if you place the the model LU name 3472@ before the model LU name 3472F00, the first name will always be used for any LU acronym beginning with the four characters 3472. This may result in the incorrect LU parameters being used, with unintended consequences.

Valid Model LU Parameters

The following shows some of the parameters that can be used in a model LU definition statement. For descriptions of these parameters, see *VTAM Resource Definition Reference*.

Name	Definition Statements	Operands
name	LU	[,ASLENT=associated LU table entry name] [,ASLTAB=associated LU table name] [,DLOGMOD=default logmode entry name] [,ENCR=REQD|SEL|OPT|NONE] [,LOGAPPL=controlling primary LU] [,LOGTAB=interpret table name] [,MDLENT=model table entry name] [,MDLTAB=model table name] [,MODETAB=logon mode table name] [,PACING=n|0|1] [,SSCPFM=FSS|USSSCS|USS3270|USS3275] [,USSTAB=USS definition table name] [,VPACING=n|0|2]

11.9 SDDLU Exit Routine

To support the dynamic definition of dependent LUs, IBM supplies the Selection of Definitions for Dependent LUs (SDDLU) exit routine is supplied with the VTAM product tapes. There is no need for you to code your own exit to support DDDLU. By default, VTAM will call the SDDLU exit for processing during VTAM initialization.

There are, however, certain requirements when using this exit:

- Must be named **ISTEXCSD**
- Must reside in SYS1.VTAMLIB
- Must be link-edited with MODE=31,RMODE=24
- Runs under a VTAM subtask, allowing it to perform I/O
- Resides in pageable storage and receives control in supervisor state in VTAM′s storage key(6)

You should also note that the SDDLU exit uses a seven-character LU acronym (concatenation of the device machine type and model number) to select the model LU definition to be used.

The MODIFY command has been enhanced to allow you to activate, inactivate or replace the exit routine with a new copy without interrupting VTAM. The format of the enhanced MODIFY command is:

MODIFY|F *procname*,**EXIT,ID=ISTEXCSD,**
OPTION={**ACT**|**INACT**|**REPL**}

11.10 Operation

LUGROUP major nodes can be activated with the normal VARY ACT command, and deactivated with the VARY INACT command (like any other major node).

To support DDDLU, the LUGROUP major node must be active. When it is active, all the sets of model LU definitions within that node can be used for DDDLU. Each set or individual model LU definition, however, cannot be selectively activated or deactivated.

11.10.1 Display LUGROUP Major Node

Once activated, the DISPLAY command can be used to show the model LU names supported by the LUGROUP major node. Figure 159 shows an example display of an active LUGROUP major node.

```
==> DISPLAY NET,ID=LUGRP,SCOPE=ALL

 IST097I  DISPLAY  ACCEPTED

 LUGROUP MAJOR NODE = LUGRP
 NAME = GROUP1           , TYPE = MODEL LU GROUP
 LOGICAL UNITS:
 3192002             3471B10             3471@
 3472F00             3472@               3270PC
 4224@               8560071             8560@
 85@                 @
 END
```

Figure 159. Display LUGROUP Major Node

11.10.2 Display PU Major Node

The display of a PU with dynamically defined LUs is no different from the display of a PU with statically defined LUs. Figure 160 shows an example display of a PU with one LU which has been dynamically defined.

```
==> DISPLAY NET,ID=LOC11,SCOPE=ALL

  IST097I  DISPLAY  ACCEPTED

  NAME = LOC11      , TYPE = LCL SNA MAJ NODE
  STATUS= ACTIV     , DESIRED STATE= ACTIV
  NETWORK NODES:
  LOC11PU  TYPE = PHYSICAL UNIT    , ACTIV      ,CUA=E40
  LOC11002     TYPE = LOGICAL UNIT     , ACT/S
  END
```

Figure 160. Display PU with Dynamically Defined LU

11.10.3 Display Dynamically Defined LU

A dynamically defined LU can also be displayed, just like a statically defined LU. The difference is that the display shows the name of the model LU definition used (the MODEL NAME field) for the dynamically defined LU. Figure 161 shows an example of such a display.

```
==> DISPLAY NET,ID=LOC11002,SCOPE=ALL

 IST097I  DISPLAY  ACCEPTED

 NAME = LOC11002   , TYPE = LOGICAL UNIT
 STATUS= ACT/S     , DESIRED STATE= ACTIV
 MDLTAB=***NA*** ASLTAB=***NA***
 MODETAB=AMODETAB USSTAB=US327X   LOGTAB=***NA***
 DLOGMOD=M2SDLCQ  USS LANGTAB=***NA***
 MODEL NAME = 3472@
 CAPABILITY-PLU INHIBITED,SLU ENABLED  ,SESSION LIMIT 00000001
 LOCAL SNA MAJOR NODE = LOC11
 PHYSICAL UNIT = LOC11PU , CUA = E40
 DEVTYPE =           LU
 I/O TRACE = OFF, BUFFER TRACE = OFF
 ENCRYPTION = NONE
 ACTIVE SESSIONS = 0000000001, SESSION REQUESTS = 0000000000
 SESSIONS:
 NAME     STATUS         SID          SEND RECV VR TP NETID
 RAIAT05  ACTIV-P    F86FE164228484F0 0000 0002  0  0 USIBMRA
 END
```

Figure 161. Display Dynamically Defined Dependent LU

11.11 Performance

Tests have shown that, using the IBM-supplied SDDLU exit, there is negligible difference between the time required for the dynamic definition and activation of dependent LUs compared with the time required for the activation of statically defined dependent LUs.

11.12 3174 Customization

During 3174 customization, be aware that the local addresses you specify in question 117 will be used to replace the hash characters specified in the LUSEED name. Other than that, there are no other customizing questions you need to answer that are specific to DDDLU.

Chapter 12. Local Format Storage

Local Format Storage (LFS) is a function offered by the 3174 that allows applications running under CICS* to preload frequently used screen images (screen formats) into controller storage and recall these formats via the format name as they are required. Using this function, substantial reductions in communication line traffic and response time can be achieved.

LFS was available as an RPQ 8X0024 with Configuration Support-A and S. With Configuration Support-B Release 2 and later releases (including Configuration Support-C), LFS is integrated into the base microcode. To use LFS with all these 3174 microcode levels, the user must code a transaction program for format distribution (loading).

With Configuration Support-C Release 2 announcement, IBM also announced the UltraOpt/VTAM** product from BMC Software Inc., an IBM Business Partner (Application Specialist). UltraOpt/VTAM is a VTAM application that provides 3270 datastream optimization and fully exploits LFS functions for format creation, distribution and storage management for CICS as well as TSO, IMS and other VTAM applications. UltraOpt/VTAM will operate with Configuration Support-A, S, B and C. With the addition of UltraOpt/VTAM, the user no longer needs to code a transaction program for format distribution (loading).

Hence, LFS functions can be used as follows:

- Without UltraOpt/VTAM, for CICS only, using CICS Outboard Formatting facility and a user-coded screen format loading program
- With UltraOpt/VTAM, for CICS, IMS and TSO, with datastream optimization and without the need for a user-coded screen format loading program

This chapter describes both uses.

12.1 LFS without UltraOpt/VTAM

The Local Format Storage function provides for the host-controlled loading of presentation screen formats (maps), into the 3174 storage. These maps can be presented on any CUT terminal or emulated CUT device, including AEA attached terminals. DFT devices are not supported unless they have a CUT mode session available (like the 3472-G).

In environments where remote terminals, lines and communication controllers are heavily utilized and/or response times are unacceptably slow, the solution is usually to upgrade the line speed and/or install more lines and communication hardware. These solutions add significantly to the network cost. In such situations, LFS may potentially be used instead.

Using LFS, the amount of data sent down the line is reduced because the most commonly used screen formats are stored at the 3174. This traffic reduction not only improves line and communication controller utilization (thus overcoming the need to upgrade line speed and/or hardware) but also results in improved response times.

LFS uses new and existing 3270 datastream structured fields to control the loading and host-initiated presentation of stored maps. LFS supports the 3270 datastream architecture for format presentation as implemented by CICS, but a user can provide his own format presentation support using 3270 datastream architecture.

Map loading is controlled by a host-initiated utility session that is invoked when the host detects that a 3174 IML has occurred. Formats can be added, replaced, or deleted. Formats groups may be deleted, and format storage may be reset at any time under the control of the host utility session. The host utility can reside in the primary or secondary host.

Presentation of any stored format can be initiated by host command, and presentation of selected local formats can be initiated by a user without host intervention, provided that local formats have been defined in the Load Format structured field and local format selection has been enabled through 3174 customization.

12.1.1 Implementing LFS

There are three main phases of implementation in CICS:

1. Creating the formats to be downloaded
2. Distributing the formats to the 3174
3. Presenting the formats

This section discusses each of these stages.

12.1.2 Creating Formats

The customer is responsible for creating the formats to be downloaded. How the formats are created depends on the transaction management system and mapping service used. LFS requires that all stored formats contain the exact 3270 datastream to be sent to the display. LFS will not modify stored format to suit characteristics that are unique or specific to a display. If multiple versions of the same format exist, LFS will not attempt to decide which version of a format to present (except in the case of a secondary host that is customized to override formats loaded by the primary host).

To date, without UltraOpt/VTAM, CICS has the only existing 370 host support for LFS. CICS, with standard Basic Mapping Support (BMS) commands, allows the user to create the exact 3270 datastream version of BMS formats needed by LFS.

- The ROUTE command in BMS allows the user to generate a list of displays to which BMS directs format requests.
- The SEND MAP command with the SET operand builds the 3270 datastream for a format and then returns the data to the host instead of sending it to the display.

Using this method, the customer can generate the 3270 datastream needed for each different type of terminal that supports format storage. These formats can be stored on disk in the host and retrieved when it is necessary to distribute them to the 3174. Alternatively, the creation and distribution of the format datastreams can be performed each time the formats are to be sent to the 3174.

12.1.3 Distributing Formats

The user is responsible for distributing the formats to the 3174. This function is not automatically provided by any host support. With CICS, the user can code a CICS transaction (loader program) to the CICS interface for format distribution.

Because formats are stored only in the controller storage, the transaction must reload the formats each time the 3174 is re-IMLed.

LFS receives the formats on the SNA LU address 1 (LOCADDR=1). This is not a valid terminal address; it is used for Central Site Change Management and LFS. For LFS, this address supports a LU type 2 session and uses a subset of the 3270 datastream structured fields and commands required to support format distribution.

LOCADDR=1 Considerations

LOCADDR=1 is also used by 3174 Central Site Change Management (CSCM), in conjunction with NetView Distribution Manager (NetView DM). NetView DM will BIND the LU LOCADDR=1 when a CSCM session is initiated and UNBIND the LU when the CSCM session ends.

Because LFS supports a format distribution session on the same local address, CSCM functions cannot be performed if the format distribution session is active. It is, therefore, important that the user-written transaction issues an UNBIND after a format distribution session is completed so that CSCM activities can be initiated with that address.

Host Support

For format distribution, the transaction is responsible for initiating itself. CICS provides a facility for Automatic Transaction Initiation (ATI), which the transaction can use. The user must define the LU for format distribution (LOCADDR=1) as a display terminal to NCP, VTAM, and CICS.

With this approach, VTAM starts the LU when the 3174 powers on. CICS then simulates a logon from this LU address to the transaction.

Format Distribution Transaction

The transaction is responsible for starting the format distribution. The 3174 replies to each format load request.

Setup: Following is a typical setup to initiate the transaction:

- Customize the 3174 to support LFS
- Define to VTAM an LU with address 1
- Define to CICS an LU with address 1
- Define to CICS the transaction for ATI with LU address 1

Data Flow: The sequence expected during format loading is:

1. The host issues an ACTLU for LU address 1.

   If LFS or other LU address 1 service is present, the 3174 replies with a positive response. Otherwise, it rejects the ACTLU, preventing erroneous activation of the transaction.

2. The host sends a LU type 2 BIND request to LU address 1.

The 3174 accepts the BIND request if LFS or other LU address 1 service is present and not already bound. Otherwise, it rejects it.

3. The host sends Start Data Traffic (SDT) and the 3174 replies.

4. The transaction may send an optional query.

   If queried, LFS returns the following replies in addition to those currently applicable:

   - Auxiliary Device (for LU address 1 only)
   - Format Storage Auxiliary Device (for LU address 1 only)
   - Format Presentation (for all CUT mode terminal addresses)
   - Partition Characteristics

5. The transaction then begins distribution as follows:

   - The host sends formats with:

     – Destination/Origin structured field specifying the Format Storage Auxiliary Device

     – Load Format Storage structured field

   - LFS replies to each Load Format Storage structured field with:

     – Destination/Origin ID structured field identifying the Format Storage Auxiliary Device

     – Exception/Status structured field, with self-defining parameters set, to indicate the results of the operation

   This sequence is repeated until all the formats are distributed or the 3174 replies with an insufficient storage exception.

A Load Format Storage structured field must be sent for each format. After sending each format, the transaction must wait for a reply from the 3174. In SNA, this means that only one Load Format Storage structured field can be sent in a chain, and the chain must contain the Change Direction (CD) indicator. The transaction can cause this SNA sequence to be generated by issuing a “write-read” type of request rather than a “write” type of request.

The success or failure of the format load is reported as normal data to the transaction through the Exception/Status structured field rather than as an SNA positive or negative response. This is done to provide the user-written transaction with maximum control over error recovery.

The format distribution session must be terminated when downloading is completed so that other system activity directed to LU address 1 (for example, CSCM) can be performed.

12.1.4 Presenting Formats

CICS supports format presentation without any modification required. Because CICS is the only host application to support LFS, this section describes format presentation from a CICS standpoint. However, the structured fields and protocol sequences are standard 3270 datastream architecture and can be used by any product that supports 3270 devices.

Host Dependencies

The customer is responsible for defining:

- To CICS, the terminals supporting LFS
- To BMS, the formats that are outboarded

CICS support allows the user to define each terminal (not each 3174) that is to be supported by LFS. It also allows each format to be defined as outboarded or not. However, CICS does not support the grouping of formats so that different terminals can be defined as having different groups of formats outboarded. If a format is outboarded, CICS expects the format is outboarded in every terminal that is supporting LFS.

Invoking Format Presentation

Format presentation is automatically invoked by CICS when both a transaction calls a format that is outboarded and the terminal to which the transaction is attached is also defined as supporting LFS. If both of these requirements are not met, CICS goes through its normal format and terminal processing.

Each format is identified by its name. During format distribution, formats are loaded in 3174 storage in groups, with each group identified by its group name, using a directory structure. A group name, therefore, identifies a directory (group) containing all the formats stored under the same group name.

To select a format for presentation, the host must specify the the name of the format required and the group to be searched. The user must, therefore, ensure that formats are stored with the correct name in the correct directory. If a format name or group name requested is non-existent, LFS returns an exception status to the host.

LFS uses the following sequence for format presentation:

- Host sends Select Format Group structured field

  The Select Format Group is the first structured field sent by the host. It specifies a group name (directory) to be searched for required formats when subsequent Present Absolute Format or Present Relative Format structured fields are received.

  The host can select another directory to be searched by issuing the Select Format Group structured field specifying a different group name.

  If the group name specified does not exist, an exception indication is returned and no group is selected. With no group selected (no default group), format presentation is not possible until a valid group is re-selected.

- Host sends Present Absolute/Relative Format

  These two structured fields are used to select the name of the format to be presented. The difference between the two is that the Present Relative Format structured field contains an offset value that is added to each address-dependent order in the format datastream. This structured field is used predominantly by CICS to support BMS floating formats.

  Both the Present Absolute Format and Present Relative Format structured fields include a format presentation command which specifies either a Write, Erase/Write, or Erase/Write Alternate command. Both structured fields also contain a Write Control Character (WCC) byte. The presentation command and the WCC are used to display the format on the screen.

Because formats are processed as 3270 datastream outbound structured fields, screen size is not changed for the Erase/Write or Erase/Write Alternate commands that accompany the Present Absolute or Present Relative Format structured field. The host application can select an alternate screen size by sending an Erase/Write Alternate command prior to the Present Absolute or Present Relative Format structured field.

Using the format name specified, LFS searches the currently selected group (directory) for the requested format.

When LFS finds the requested format, the format presentation command (Write, Erase/Write, or Erase/Write Alternate) and WCC are extracted from the Present Format structured field and applied to the format. They are then passed to outbound datastream processing. The only modification LFS makes is to add the specified offset to each address-dependent order in the datastream for a Present Relative Format structured filed.

If this sequence is violated, or if a required format group or format is not found, LFS returns an exception status to the host.

12.1.5 Other LFS Functions

LFS supports functions other than storage and presentation of screen formats.

Dynamic Format Building

The 3270 datastream may contain multiple Present Format structured fields, and each one is processed in its turn. The resultant format is passed to outbound datastream processing for each iteration of the Present Format structured field in the datastream. By issuing Present Relative Format requests with different offset values, the user can cause recurring portions of a format to be presented in different locations on the screen.

Appending Application Variable Data

The host can send additional 3270 data to a terminal following the Present Absolute Format and Present Relative Format structured fields. This is supported by the host concatenating a 3270 datastream structured field to the Present Absolute Format or Present Relative Format structured field. When this occurs, the 3174 sends the data, unaltered, to normal outboard datastream processing after presenting the specified format.

12.1.6 Operator-Selected Formats

We have seen the host selection of screen formats using the Select Format Group and Present Absolute/Relative Format structured fields. LFS also supports the selection of screen formats by a display operator (or user).

By allowing the user to select formats stored in 3174 storage to be presented, performance can be significantly improved. This eliminates the transmission of format requests to the host and the transmission of the Present Absolute Format structured field from the host.

Host Application Support

Not all host applications, however, are capable of supporting operator-selected formats. The host application must ensure that the keyboard is restored following a Clear AID to allow the user to enter local format requests. The host application also must be able to detect and identify an operator-selected format, and accept input from that format, when it is read. The user must determine if operator-selected formats are supported by his host applications.

Enabling Operator-Selected Formats

Operator-selected formats can be enabled in one of two ways:

- Through the 3270 datastream

  The Set Partition Characteristics structured field enables the function and must be used for each host application or logical session. Once the operator-selected formats function has been enabled by the datastream, it remains enabled until one of the following occurs:

  – A Set Partition Characteristics structured field is received that resets it.

  – An Erase Write or Erase Write Alternate command is received with WCC=Reset.

  – A BIND command is received.

  – An Erase/Reset structured field is received.

- Through 3174 customizing question 179

  This option enables the function for all logical sessions on this host. Individual sessions cannot be selected using this option. Even though the function has been enabled through customizing, it can be disabled through the datastream and the Set Partition Characteristics structured field.

Invoking Operator-Selected Formats

Because each format is stored under a format name within a group name, and frequently contains an embedded suffix, the user does not necessarily know the stored format name. To allow users to select formats, the Load Format Storage structured field provides an optional field to specify a local name (up to eight characters) for each format.

When operator-selected formats is enabled, the local name is treated as one of the following:

- A pseudonym for a group name and format name (that is the default)
- A local format name qualified by the currently selected group name

To select a format, the user enters the local name on a clear unformatted screen, starting at the top left corner. If operator-selected formats have been enabled, the name is considered to be an operator request for a local format presentation. No validations or translations are performed on the name entered.

A search is then made for a format with the local name, or for a format with the local name that is within the currently selected format group (depending on the parameters of the Set Partition Characteristics structured field). If the format is found, it is sent to the display as though a Present Absolute Format structured field had been received from the host. (If the format requested is not found, the name is sent to the host in the normal fashion.)

While the local format is being searched and displayed, the SNA remains in the send state, causing normal outbound requests from the host to be rejected with sense code X′081B′ (Receiver in Transmit Mode).

The 3174 uses the default WCC (X′02′ – Keyboard Restore) with either the Erase/Write or the Erase/Write Alternate as its format presentation command; however, neither of the commands will alter the screen size. Which command is used is determined by the screen size flag in the Load Format Storage structured field that distributed the format to the 3174.

The user should be aware that LFS does not modify formats to suit specific device characteristics and, therefore, must ensure that the requested format can be displayed on the screen used.

After the format is displayed, the SNA and keyboard states are the same as before the local format request was entered.

12.1.7 Multi-Host Support

With Configuration Support-B Release 2 and later releases, LFS is supported in a multi-host environment. LFS functions can be enabled for the primary host 1A, and any secondary host, provided the host is SNA. Thus, LFS is supported on secondary hosts using Single Link Multi-Host support (host IDs 1B through 1H) or attached via Concurrent Communication Adapters (host IDs 2A through 2D, and 3A through 3D).

For LFS to be enabled on the secondary hosts, LFS must enabled on the primary host.

Depending on 3174 customization, secondary hosts may be allowed to present formats that are managed by the primary host, or they may be allowed to load and present formats of their own.

- If the 3174 is customized so the primary host manages all LFS formats, a format requested by a secondary host is fetched from the primary host LFS buffer. If the requested format is not present in the primary host LFS buffer, a 'format not found' condition is reported by the 3174.

  A reply to a Format Storage Auxiliary Device query sent from the secondary host indicates that formats are managed by another host and that no format storage space has been allocated to the secondary host.

- If the 3174 is customized so the secondary host can present formats managed by the primary host with an option to load overriding formats, buffer space is allocated for the secondary host formats separate from that of the primary host. A format requested by a secondary host is then fetched from the secondary host LFS buffer. If the requested format is not present in the secondary host LFS buffer, the format is then fetched from the primary host LFS buffer. If the format is not found in either buffer, a 'format not found' condition is reported by the 3174.

  A reply to a Format Storage Auxiliary Device query from the secondary host indicates the amount of storage space allocated for secondary host LFS formats.

12.1.8 3174 Customization

LFS is customized in question 179: Local Format Storage.

Question 179: Local Format Storage

The response consists of three digits:

Digit 1 - Enable/Disable LFS:

0 = LFS is disabled (default response).
1 = LFS is enabled. Formats can be loaded to an LFS storage buffer, which is reserved for this host.
2 = LFS is enabled for this secondary host. It can present formats managed by the 1A host.
3 = LFS is enabled for this secondary host. It can present formats *and* load them into its own storage buffer, or it can just present formats that are managed by host 1A.

Note: If LFS is enabled for a secondary host, then LFS must also be enabled on the 1A host.

Digit 2 - Enable/Disable Operator-Selected Formats:

0 = Operator-selected formats is disabled for this host (default response).
1 = Operator-selected formats is enabled for this host.

Note: If LFS is disabled, then operator-selected formats cannot be enabled.

Digit 3 - Amount of storage to be allocated for LFS on each host connection:

0 = No storage allocated (default response)
1 = 64KB
2 = 128KB
3 = 256KB
4 = 512KB
5 = 1024KB
6 = 1536KB

The response for this digit must:

- Be 0 if digit 1 is 0 or 2
- Not be 0 if digit 1 is 1 or 3

12.1.9 Storage Considerations

LFS formats are stored in the controller storage. When planning for controller storage, the user must add the the total amount required for LFS to that required for other features.

During customizing, the amount required for formats and format directories for each host connection is then allocated in question 179 digit 3. The maximum allowed for all host connections is 1535 KB.

See also Appendix E, “3174 Storage Requirements” on page 755 for further information.

Estimating Storage Requirements

Controller storage is required for loading format data as well as control blocks required to manage the formats and directories. To estimate storage requirements, use the following formula:

```
Total Storage Required (bytes) =
       (Number of Group Names  x 88)
       + (Number of Format Names x (50+Format Storage Space))
       + (Number of Local Names  x 32)
       + 86
```

The average size of each format is approximately 500 bytes (amount for Format Storage Space). Of course, each user must calculate the storage required for format data for his own unique environment.

The following details the storage requirements:

Group Directory Entry: 88 bytes

The 16-byte group name is included in this amount. A group directory entry is allocated each time a new group name is specified in a Load Format Storage structured field (bytes 15-30) requesting an add format operation. Whenever the last format in a given group directory is deleted, the group directory entry is also deleted.

Format Storage Block: 50 bytes + format storage space

The 16-byte format name is included in this amount. A format storage block is allocated each time a new format name is specified within a group in the Load Format Storage structured field (bytes 31-46) requesting an add format operation. In addition to the figure shown, space for the format data is allocated as part of this block.

Note: The format storage block is allocated in 4-byte increments.

Local Name Entry: 32 bytes

The 8-byte local name is included in this amount. A local name entry is allocated when both a local name is specified in the Load Format Storage structured field (bytes 7-14) requesting an add format operation, and the local format selection flag (byte 4, bit 2) is set. If the local format selection flag is not set, the data in the local name field is ignored and no local name entry is allocated. Whenever a format is deleted, its associated local name entry, if one exists, is also deleted.

General Directory Block: 86 bytes

Each host customized for format storage space requires 86 bytes of storage in addition to the space allocated for blocks and entries defined above. This space is allocated as control blocks and directories to be used in managing the storage reserved for this host.

12.1.10 Exception/Status Reporting

Exceptions are reported either as a sense code or an Exception/Status structured field, depending on where the error is detected. Errors caused by processing of format presentation structured field are reported by sense codes. Errors caused by processing of the Load Format Storage structured field:

- Checks at the datastream level are reported by sense codes.

- Checks past the datastream level are reported Exception/Status structured fields.

Exception/Status Codes

Codes used by the Exception/Status structured field to report exception conditions are:

X′0801′ - Invalid or unregconized destination/origin ID in the Destination/Origin structured field.

X′0805′ - Insufficient storage to complete load.

X′0806′ - Format/Group name not specified

X′0807′ - Data error

12.1.11 SNA Sense Codes

Some of the SNA sense codes used to report exception conditions are:

X′0868′ - No formats loaded

X′0869′ - Format not found

X′087**A**′ - Format processing error

X′1001′ - Data stream error

X′1003′ - Function not supported

X′1005′ - Parameter error

X′1009′ - Format group not selected

For more information on sense codes you should refer to the *VTAM Messages and Codes* manual.

12.1.12 Response Times

The Local Format Storage feature should improve the overall display response time as the most common screens can be kept down at the 3174 controller, and hence reduce the amount of transmitted data over a communications link.

Points to consider when evaluating the Local Format Storage feature might be listed as the example below:

- One 3174 IML per month
- 70 formats stored at a time
- Average format size is 500 to 800 bytes
- 30 terminals per controller
- One format per terminal, presented every 45 seconds (eight-hour shift)

If you assume the above transaction rates, and a screen size of 1920 bytes, you can start to make “pencil” calculations that will show a line utilization saving around the 20% range. This will obviously vary greatly from location to location, and be dependent on the installation′s application environment.

12.2 LFS with UltraOpt/VTAM

Local Format Storage (LFS) is a function offered by the 3174 that allows applications running under CICS to preload frequently used screen images (screen formats) into controller storage and recall these formats via the format name as they are required. Using this function, substantial reductions in communication line traffic and response time can be achieved.

With Configuration Support-C Release 2 announcement, IBM also announced the UltraOpt/VTAM product from BMC Software Inc., an IBM Business Partner (Application Specialist). UltraOpt/VTAM is a VTAM application that provides 3270 datastream optimization and exploits LFS functions for format creation, distribution and management for CICS as well as TSO, IMS and other VTAM applications.

UltraOpt/VTAM and LFS are recommended for environments where remote terminals, lines and communication controllers are heavily utilized and potential bottlenecks exist. This situation may result, for example, from implementation of new applications, terminal devices, or image products, especially where the applications make extensive use of screen formats. By using LFS together with UltraOpt/VTAM, you should be able to achieve even greater reduction of traffic on the host to controller transmission facilities than using either of them alone. The benefits you gain are not only dramatically improved response response times but also significantly reduced network costs at the same time.

This section uses material from the following BMC Software publications:

- *UltraOpt/VTAM Reference*
- *UltraOpt/VTAM Implementation Guide*

12.2.1 Performance Examples

Working in conjunction with LFS, UltraOpt/VTAM intercepts VTAM datastreams and uses a number of optimization techniques to reduce the amount of data transmitted between the host application and the 3174 end user. The result, as documented in customer tests, can be reductions in the length of outbound 3270 datastreams from 40 to as much as 90 percent, with 30 to 90 percent reductions in corresponding inbound data transmissions.

Figure 162 on page 419 and Figure 163 on page 420 show example differences in performance (response times and stress points) in environments with and without UltraOpt/VTAM and LFS. The performance charts and data are published in the generally available specification sheet, *3174 Establishment Controller With Local Format Storage*.

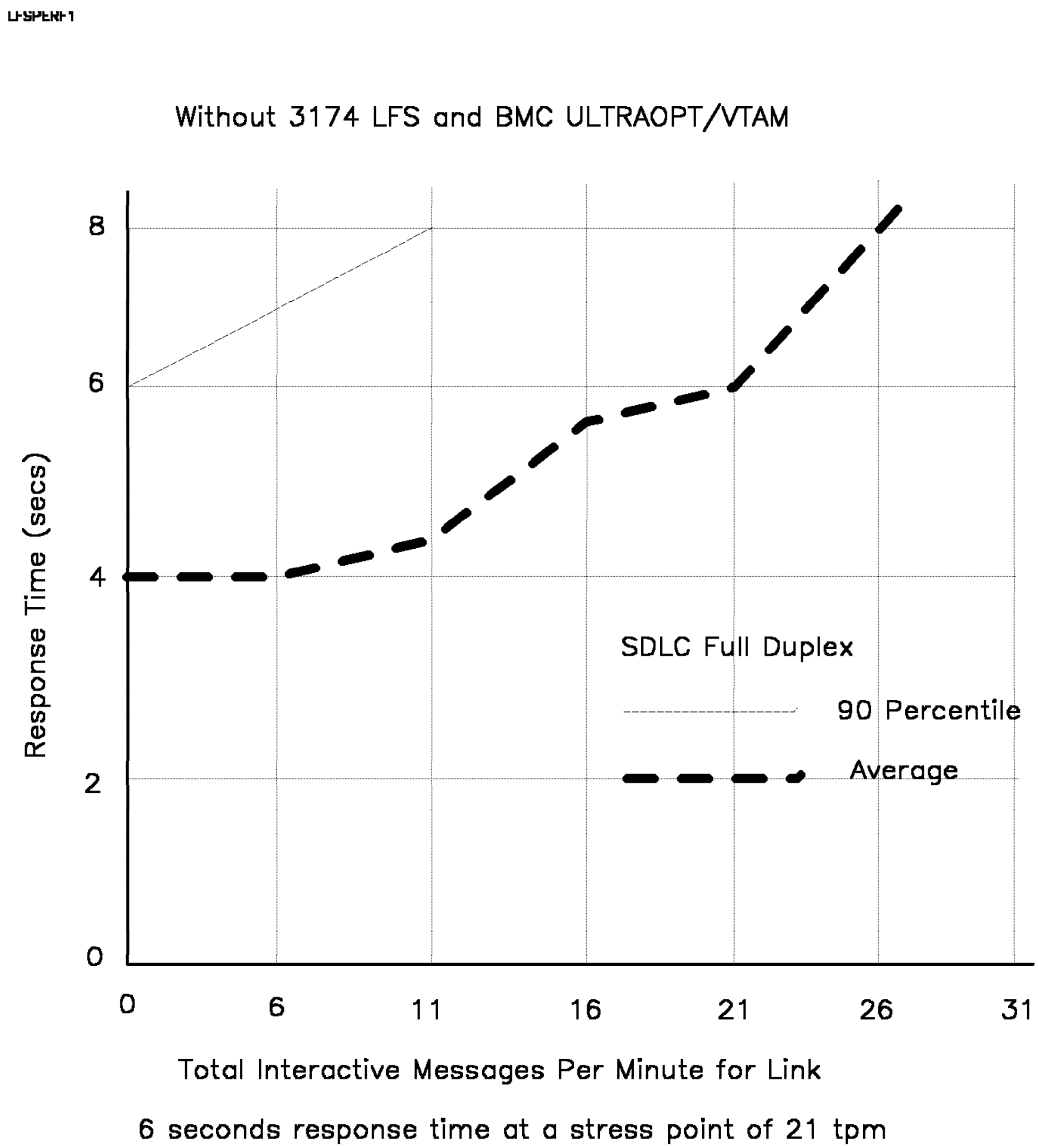


Figure 162. Performance without UltraOpt/VTAM and Local Format Storage

LFSPERF2

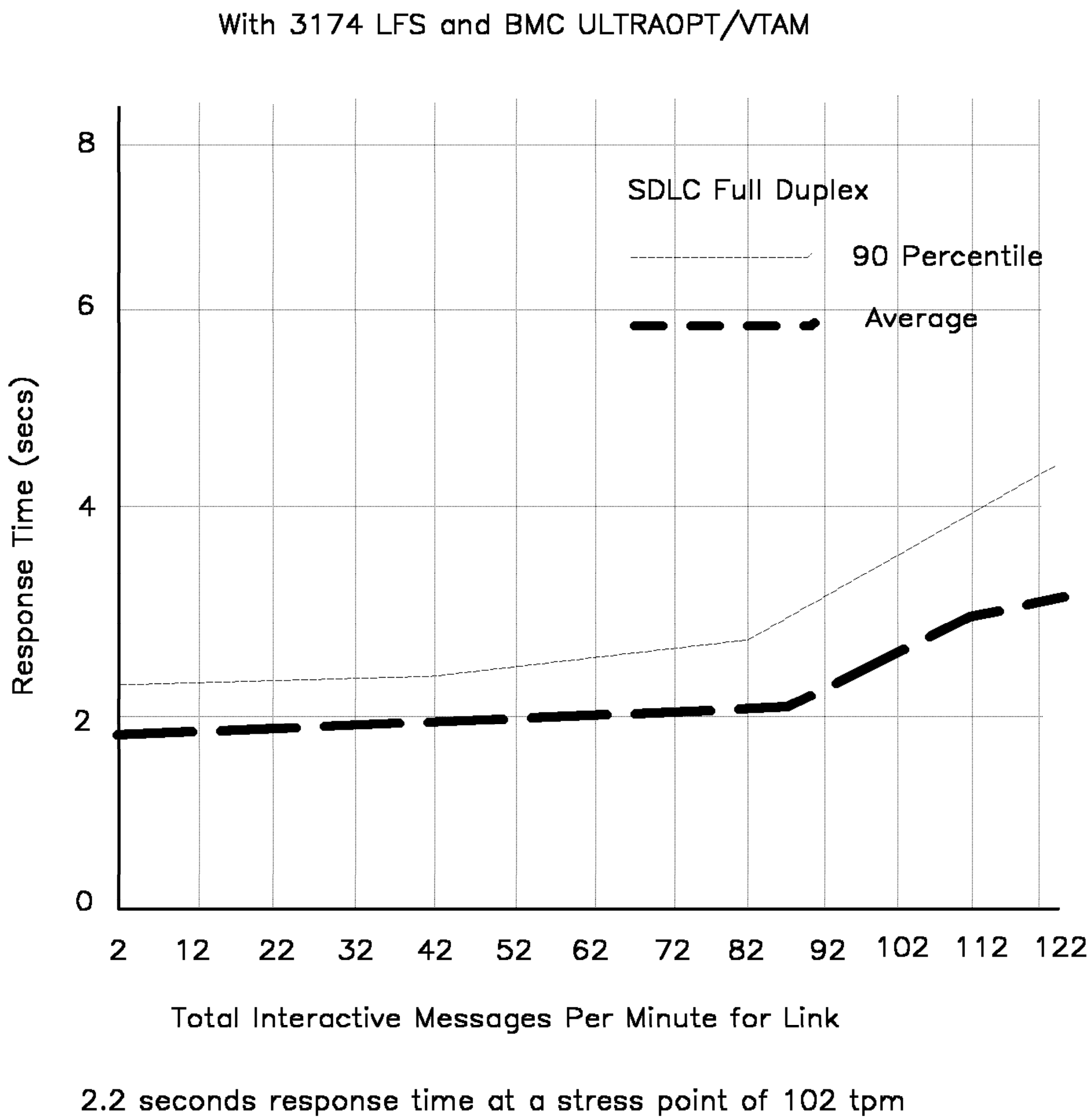


Figure 163. Performance with UltraOpt/VTAM and Local Format Storage

Both examples assume the following:

- A one-second host processing time
- Inbound message size of 1000 bytes, reduced to 200 bytes after optimization
- Outbound message size of 1920 bytes, reduced to 384 bytes after optimization
- A 9600 bps multi-drop line with six controllers

If rates were to remain constant at 21 transactions per minute (tpm), the “reclaimed” line capacity would allow you to re-design the network using lower speed lines with resulting savings in lower line costs.

By acting on the largest single component of network transit time for messages, the datastream optimization directly (and measurably) reduces response times. For example, optimizing a data steam 30 percent, on a line with 40 percent line utilization, can cut response times by 50 percent. On the same line, 80 percent data steam optimization will produce a response time improvement of 90 percent. Of course, actual measured results will vary in each customer environment but the combination or UltraOpt/VTAM and 3174 LFS can give virtually any user significantly better system performance.

CPU overhead for UltraOpt/VTAM is minimal. As an example, it takes approximately one to two milliseconds of *elapsed* time to optimize a datastream on an IBM 3090 Model 300J. The time it takes for optimization varies according to the original datastream length, the complexity, and the degree of optimization achieved. The larger the amount of reduction, the shorter the CPU time.

12.2.2 Benefits

Using LFS with UltraOpt/VTAM optimization can result in the following benefits:

- Improved response times, leading to user productivity gains and/or customer satisfaction
- Reduced network costs as a result of reducing line utilization, communication equipment costs, NCP and VTAM workloads.

  As a result, you can reduce/contain network costs in several ways:

  – Existing lines can accommodate new applications or growth in the number of transactions processed, without having to upgrade to higher-speed lines.

  – Existing lines can be re-designed to accommodate more locations or "drops," without having to install more lines.

  – Existing communication controllers and modems can accommodate application growth or more 3174s without being upgraded.

- Reduced operator fatigue

  Changing some information on a screen requires erasing and refreshing the entire screen. The resultant blinking effect causes operator fatigue.

  Using LFS and UltraOpt/VTAM optimization eliminates this blinking because the changed data is displayed within the full screen without the need for a screen erase and refresh.

The following sections show some quantifiable benefits.

Example 1: Improved Response Times

The benefits resulting from improved response times include:

- Increased customer satisfaction
- Faster processing of customer requests
- Improved terminal user productivity
- Increased amount of work processed

The following shows an example of translating these into quantifiable benefits:

```
25,000 trans/day x 2 secs saved/trans  = 50,000 secs saved per day
50,000 secs/day divide by 3,600 secs   = 13.9 hours saved per day
13.9 hours/day x $10 per operator hour = $139 saved per day
$139 saved/day x 21 days per month     = $2,919 saved per month
$2919 saved/month x 12 months          = $35,028 saved per year
```

Example 2: Delayed Hardware Upgrades/Purchases

Reduction in datastream lengths through optimization affects 3174 controllers, telecommunication lines, modems and 37xx communication controllers. The benefits resulting from this include:

- Increased reserve capacity for current needs or future growth, allowing you to add more terminals to existing telecommunication lines, and delay (or even cancel) upgrades and additions to lines, modems and 37xx controllers.
- Increased multi-dropping on existing lines to avoid adding new line(s).

The following shows an example of translating these into quantifiable benefits:

```
Assume the following:
Cost to upgrade from 4800 bps to 9600 bps line = $100 per month
Time required to manage line change            = 20 hours
Cost of managing line change at $25/hour       = $500
No personnel time required for second year
Modem and line installation charges not added to costs

    Number of          Cost for        Cost for       Total
  Lines Upgraded       First Year      Second Year     Costs
  --------------       ----------      -----------    -------
        1               $ 1,700          $ 1,200      $ 2,900
       10               $17,000          $12,000      $29,000
```

Example 3: Reduced Cost of Hardware

Reduction in datastream lengths through optimization results in:

- Reduced number of lines by multi-dropping
- Reduced speed of lines and modems
- Reduced size of 37xx communication controller

The following shows an example of translating these into quantifiable benefits:

```
Assume the following:
Saving from changing 9600 bps to 4800 bps line = $100 per month
Time required to manage line change           = 20 hours
Cost of managing line change at $25/hour      = $500
No personnel time required for second year
Modem and line installation charges not deducted from savings

  Number of          Savings for      Savings for     Total
Lines Changed         First Year      Second Year    Savings
-------------         ----------      -----------    -------
      1                $   700          $ 1,200      $ 1,900
     10                $ 7,000          $12,000      $19,000
```

12.2.3 Functional Description

LFS uses 3270 datastream structured fields to distribute, identify and present formats stored at the 3174. UltraOpt/VTAM supports the display of LFS formats on user terminals without requiring modifications to VTAM or other application programs.

During normal activities of an application, UltraOpt/VTAM intercepts user-selected VTAM SENDs. Outbound 3270 datastream images of each presentation screen generated by an application are constructed for display on user terminals connected to an LFS-enabled 3174.

UltraOpt/VTAM uses structured fields to convey instructions to the 3174, transparent to the terminal user. These instructions route the formats to the LFS function, control their storage at the 3174, and control their retrieval and presentation. UltraOpt/VTAM uses LFS to determine the number of formats loaded on a 3174, the number of format names used, and the amount of storage currently available (out of the total allocated to LFS).

Loading Formats

UltraOpt/VTAM creates and dynamically loads formats in tandem with the generation of datastreams by the host application. As datastreams are generated by the application, UltraOpt/VTAM generates structured fields to download format-specific data to the storage allocated to LFS on the 3174.

As host application activities increase and new formats are generated. UltraOpt/VTAM continues to load each new format into the 3174 until the storage allocated to LFS is depleted. When this happens, UltraOpt/VTAM analyzes the format usage and deletes the least-used formats. The freed storage is then used to load other formats needed but not found in LFS storage.

Allocating a greater amount of storage to LFS will allow a greater number of formats to be stored in the 3174. This will reduce the number of format reloads required.

Only new formats are loaded into LFS storage. If the terminal user requires a format that is already loaded in LFS storage, UltraOpt/VTAM retrieves the format, provides any variable data, and displays the format on the terminal.

Retrieving/Presenting Formats

Once LFS storage is loaded with one or more formats, they are immediately available for display on user terminals.

UltraOpt/VTAM analyzes outbound 3270 datastreams and compares their contents with formats already stored in LFS storage. If the format used by a datastream is not identical but closely matches a format already stored in LFS storage, UltraOpt/VTAM commands LFS to retrieve the similar format from the 3174. UltraOpt/VTAM then sends all the non-matching data from the original datastream to the 3174, together with a structured field referencing the format. LFS receives the structured field, updates the format where necessary, and sends the resulting screen to the terminal for display. Thus, UltraOpt/VTAM only sends the information necessary to transform an existing screen to a required new screen.

12.2.4 The Optimizer

UltraOpt/VTAM has two components: the Optimizer and the Monitor. This section describes the Optimizer; the next section describes the Monitor.

The UltraOpt/VTAM Optimizer performs the following:

- Reduces datastream lengths
- Analyzes datastreams for both application and hardware errors
- Traces VTAM datastreams according to user-specified criteria
- Saves statistics on the percentage of optimization achieved

The Optimizer itself consists of two components:

- BMC Primary Subsystem

  This subsystem is only used during startup. After startup is completed, it is no longer active and no CPU cycles are used. It can be cancelled and removed from the system.

- UltraOpt/VTAM Subsystem

  This subsystem contains the program modules that perform optimization

The actions of UltraOpt/VTAM are transparent so that no changes are required, either to VTAM or its applications. The Optimizer is designed to:

- Dynamically adjust to the VTAM release you are using
- Dynamically adjust to any changes to optimization options and features selected from the Monitor component.
- Execute its code above the 16MB line and acquire storage above the 16MB line (less than 8KB of storage is used below this line).
- Capture datastreams for user analysis.

When the Optimizer receives control of a datastream, it uses several optimization techniques, all of which are controlled from the Monitor.

- Conventional Optimization

  This optimization technique focuses on the:

  - Elimination of:
    - Repeating strings of characters

- Unnecessary or redundant user data
- Unnecessary 3270 control characters.

– Sorting of datastreams.

Conventional Optimization is used whenever UltraOpt/VTAM is installed but imaging techniques cannot be used or imaging is turned off (via the Monitor).

- SCS Printer Optimization

  The SCS Printer Optimization technique optimizes outbound datastreams for SCS printers. The effect is that the SCS printers print faster because they have less to print.

- SCS Horizontal Tabs Optimization

  This is another technique that reduces the length of SCS printer datastreams. SCS Horizontal Tabs Optimization uses the horizontal formatting codes: Set Horizontal Format and Horizontal Tab. If you have SCS printers that do not support these codes, this technique cannot be used.

- Imaging** Stage One Optimization

  This technology remembers what is displayed on each terminal screen. It transmits only the data necessary to make the appropriate changes to the screen.

  Imaging optimization supports partitioned terminals (for example, 3179, 3180, 3193, 3290, and 3775).

- Imaging Stage Two[4] Optimization

  This technique uses Imaging Stage One as a base and provides further optimization by as much as an additional eight to sixteen percent.

- Input Suppression** Optimization

  Using this technique, the Optimizer can reduce the length of inbound datastreams. Input Suppression Optimization:

  – Uses Imaging optimization technique to remove all unnecessary data and control characters from the datastream transmitted from a terminal to your host application. This is accomplished with the Optimizer software. No hardware changes are needed.

  – Allows additional adjustments to outbound datastreams to further reduce their lengths.

  – Reduces the number of characters transmitted and, therefore, the number of line-turnarounds.

  Note: The Input Suppression Optimization technique should not be used with the Erase Input key but can be used with the Erase EOF key.

- Erase Input Key Allowed Optimization

  This technique is a partial implementation of Input Suppression Optimization. It is provided for those installations with terminal operators using the Erase Input key.

- SNA Data Compression

  This technique compresses outbound datastreams but is not applicable to 3174 environments.

[4] U.S. Pat. No. 5,046,025

12.2.5 The Monitor

The Monitor is an online facility that allows you to control UltraOpt/VTAM operation. It can be accessed from any 3270 display Model 2 or above terminal under TSO and provides you with the ability to:

- Dynamically control optimization techniques and features
- Control, through the use of passwords, who can change options displayed by the Monitor
- Display summary statistics
- Display statistics by VTAM application or LU name
- Print Monitor panels and statistics
- An online help facility
- An online trace facility to capture, display and print any inbound or outbound VTAM datastream
- Analyze application and hardware datastream errors

Using the Monitor, you can turn LFS optimization on and off, create and edit a list of LUs for LFS optimization, and include or exclude individual LUs (or a list of LUs) from LFS optimization.

You can also display LFS statistics for an individual 3174 or a list of 3174s, including information such as:

- Whether a 3174 provides multi-host support
- Amount of controller storage allocated for LFS
- Amount of controller storage actually used for LFS
- Number of unique formats loaded in a 3174
- Number of times formats loaded in a 3174 were reset
- Number of terminals using LFS

Using this information, you can fine-tune, for example, the allocation of controller storage for LFS use.

12.2.6 Converting from CICS-based to UltraOpt/VTAM-based LFS

There are several reasons why a user would wish to convert from a CICS-based LFS environment to UltraOpt/VTAM:

- The person who wrote the CICS transaction for format distribution has left the organization and no one is available to maintain it. With UltraOpt/VTAM, you do not need such a transaction program.
- Many of the existing LFS programs have been written using CICS macro level programs. With CICS/ESA Version 3, macro level programs will no longer run. Some of the functions in existing loader programs cannot be duplicated in CICS command level language. UltraOpt/VTAM avoids this problem because it is a VTAM application.
- CICS-based LFS does not offer datastream optimization which greatly reduces the traffic between the host application and the 3174, resulting in faster response times and reduced network costs.

- CICS-based LFS does not support other applications. UltraOpt/VTAM supports CICS as well as IMS, TSO and other VTAM applications.
- CICS-based LFS does not provide dynamic format storage management, datastream analysis, statistics capture and reporting capabilities. UltraOpt/VTAM does, and through its online Monitor, allows you to maximize datastream optimization and fine-tune LFS storage allocation as required.

If you wish to convert from CICS-based LFS to UltraOpt/VTAM, or even if you will use UltraOpt/VTAM for the first time, you should be able to do so quite easily. For the CICS-based user, there are two changes that you need to make:

1. You no longer to create and download formats.
2. You need to turn off outboard formatting in CICS.

   One way to turn off outboard formatting is to modify your terminal definitions to specify OBFORMAT=NO. If you are using an autoinstall program, this should be simple. If a map (format) defined as OBFMT=YES is sent to a terminal with OBFORMAT=NO, BMS will ignore the OBFMT operand on the BMS map.

   Another way to turn off outboard formatting is to change the BMS mapset to specify OBFMT=NO. Depending on how many maps have been outboarded, this might be easier, especially if your TCT is maintained with Resource Definition Online.

UltraOpt/VTAM does not share LFS storage between the primary and secondary hosts. In customizing the 3174, your response to question 179 digit 1 must, therefore, be 1.

UltraOpt/VTAM also does not support Operator-Selected Formats. Operator-Selected Formats allows a user to clear the screen and enter the local name of a format stored in LFS storage that he wants displayed. With UltraOpt/VTAM′s format storage management techniques, formats are stored as required and least-used formats are deleted to regain LFS storage for other formats. In this dynamic environment, Operator-Selected Formats is neither possible because desired formats may not exist nor is it needed because of datastream optimization. In customizing the 3174, your response to question 179 digit 2 must, therefore, be 0.

12.2.7 Implementing UltraOpt/VTAM

Implementing UltraOpt/VTAM for LFS is very much easier that it was using CICS. You do not have to decide which screens to store in the 3174s. You do not have to write the format distribution (loader) program. You have much more flexibility. All that is required on the host end is to install and customize UltraOpt/VTAM and to add an LU to each 3174 definition in NCP or VTAM.

Host Environment Required

The operating system environment required for UltraOpt/VTAM is as follows:

- MVS/XA, ESA/370 or ESA/390
- VTAM Version 3.1 or later
- 12 KB CSA storage
- ECSA storage

To calculate the *minimum* amount of ECSA storage required by UltraOpt/VTAM, use the following formula:

```
Minimum ECSA Storage (KB) =
       982
       + (Number of terminals using extended attributes x 13)
       +(Number of terminals not using extended attributes x 7)
       +(Number of open ACBs x 14)
```

Note: In the above ECSA formula, you should multiply the result by a 1.25 factor to add an additional 25 percent to the amount required. This will ensure that UltraOpt/VTAM has enough ECSA to continue intercepting and optimizing datastreams.

- DASD storage

  To calculate the *minimum* number of cylinders required for the common page data set used by UltraOpt/VTAM, use the following formula:

```
Number of Cylinder = ECSA Storage/4 KB
                     -----------------------------
                     Number of frames per cylinder
```

- VSAM.

  If certain optional features are used, you will also need VSAM.

3174 Requirements

3174 requirements for LFS with UltraOpt/VTAM are as follows:

- Level of microcode:
  - Configuration Support-A with Local Format Storage RPQ 8X0024
  - Configuration Support-B Release 2 and later releases, including Configuration Support-C

    Note: Configuration Support-B Release 2 and later releases has the LFS function integrated in the base microcode. However, if you are using Configuration Support-B for LFS with UltraOpt/VTAM, you must have Configuration Support-B Release 4 with patch PTR A28B to ensure correct operation.
- Customization question 179 responses:
  - Digit 1=1 to enable LFS
  - Digit 2=0 to disable Operator-Selected Formats (not supported)
  - Digit 3=5 to allocate 1024 KB (amount recommended but you should allocate as required for your environment)
- Additional controller storage required for LFS.

12.2.8 3174 Storage Considerations

The total amount of storage you can allocate for LFS for all host connections is 1535 KB. You should ensure that the storage installed is sufficient for LFS and other features configured, such as MLT, AEA, token-ring support, etc.

When UltraOpt/VTAM uses up the amount of storage allocated, it analyzes the format usage and deletes the least used formats. This allows format storage to be dynamically managed and reduces the amount of format reloads. Allocating a greater amount of memory will produce a corresponding reduction in the

UltraOpt/VTAM analysis processing and format reloads. This process also occurs when the 3174 is IMLed or the host is IPLed.

The amount of storage allocated for LFS with UltraOpt/VTAM depends on the following factors:

- The number of unique formats the terminals connected to the 3174 will be displaying.
- The size and complexity of each format. UltraOpt/VTAM optimizes each format stored in LFS storage.

The average size for an optimized format requires approximately 800 bytes of storage. To estimate the amount of storage required for LFS storage, use the following formula:

```
Storage Required (bytes) = (Number of unique formats x 800)
```

You should be aware that the format used by a display model is unique, compared to the format used by a different display model, even though the screen may appear the same to the user. For example, the ISPF main menu format for a 43x80 screen is stored separately from the ISPF main menu format for a 24x80 screen.

You can use the Monitor to fine-tune your storage allocation.

Multi-Host Considerations

UltraOpt/VTAM can share a LFS 3174 controller with other UltraOpt/VTAM hosts. However, UltraOpt/VTAM does not support the sharing of LFS storage by multiple hosts. You must assign LFS storage for each host connection that will use LFS. The response to question 179 digit 1 must be 1.

Since the total storage that can be allocated per 3174 is 1535 KB, you must divide this amount amongst the various hosts. If you are 3174 storage constrained, you should consider limiting LFS to those applications that are more commonly used or that are more critical. You should also use the Monitor function to fine-tune your storage allocation.

12.2.9 Supported Devices

UltraOpt/VTAM supports the following devices:

- All 3270 models, including:
  - Color
  - SCS printers
  - Extended attributes
  - Program symbols
  - SNA data streams
  - Various screen sizes: 12x40, 12x80, 24x80, 32x80, 43x80, 27x132, and any other valid screen or partition size
- All 3600/4700 controllers and 3790 devices with decompression capability
- IBM 3174 with LFS (Configuration Support-A, B and C)

12.2.10 Implementation Steps

Detailed implementation steps are supplied with the UltraOpt/VTAM manuals. The following provides an overview of the steps required to implement UltraOpt/VTAM for LFS:

The following steps are required to implement UltraOpt/VTAM for LFS:

1. Unload the distribution tape and copy the modules to an APF authorized library.
2. Copy the BMC Primary Subsystem and the UltraOpt/VTAM Subsystem procedures to SYS1.PROCLIB.
3. Define one VTAM APPLID for UltraOpt/VTAM.
4. Define one VTAM APPLID for UltraOpt/VTAM LFS.
5. Define an LU with LOCADDR=01 to VTAM or NCP for each 3174 that will use LFS.
6. Add the PU name of each 3174 with LFS to the LFS User Exit. Assemble the LFS User Exit interface.
7. Create VSAM data sets.
8. Customize 3174s for LFS.
9. Start the BMC Primary Subsystem and UltraOpt/VTAM.

12.2.11 30-Day-Plus Free Trial Program

BMC Software offers a 30-day-plus free trial program for UltraOpt/VTAM. The following summarizes the key features of this program:

- No obligation
- Request product from BMC representative
- Receive installation package (product tape and documentation)
- Install in test environment to familiarize with operation
- Install in production environment to begin 30-day trial
- Receive license agreement for review during production trial
- At the end of the 30-day period, return signed license agreement if desired, otherwise return the product package
- Requires CPU ID authorization to operate after the trial period expires

Note: This program is subject to change at any time at the full and complete discretion of BMC Software.

US/Canada Offices

The following contacts are included for convenience. You should check with your local representative for further information.

Mailing Address
BMC Software, Inc.
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Sugar Land, Texas 77487-2002
U.S.A.

Shipping Address
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1-800-537-1813 Support (US and Canada)
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Chapter 13. Network Management

This chapter discusses the components of network management specific to the 3174. These are:

- Central Site Control Facility
- Network Asset Management and Vital Product Data

Central Site Change Management (CSCM) is also an important part of network management. This subject is covered in the ITSO documents *NetView Distribution Manager Release 2 and 3174 Central Site Change Management Implementation Guide*, GG24-3424 and, *NetView DM/2 V2.1 Remote Administrator and New functions*, GG-4419.

13.1 Central Site Control Facility

The 3174 has a number of online tests and diagnostics which can be accessed from any CUT terminal coax attached to the 3174. To perform the online tests, therefore, requires the user to be in relatively close proximity to the 3174. For Help Desk operators or central site support staff, this is not always possible.

Beginning with Configuration Support-B Release 2, the 3174 microcode is enhanced to provide Central Site Control Facility (CSCF). With CSCF, Help Desk operators and central site support staff can now perform certain online tests for any 3174 in the network from any NetView terminal at the central site. (This terminal is also known as the NetView CSCF console.)

With Configuration Support-B Release 3, an online test (Test 14) was added to allow a user to IML a 3174, and to select the drive from which the IML is to be performed. Test 14 also allows the user to select the level of microcode required for the IML in a CSCM environment: normal (production), back-level or trial. Using CSCF, this online test can also be invoked from a NetView terminal.

To prevent unauthorized 3174 IMLs, the user is prompted for the password customized in question 098: Online Test Password when Test 14 is invoked, either at the CUT terminal attached to the 3174 or through a NetView terminal using CSCF. In a network with thousands of 3174s, authorized Help Desk operators and central site support staff have to remember all the passwords required in the network. This is a formidable task.

To overcome this problem, Configuration Support-C Release 2 introduced an option via customizing question 008 to allow suppression of the IML password. With CSCF IML password suppression enabled, the user at a NetView CSCF console no longer needs to enter the password even if one is customized in question 098. For a Test 14 invoked at the CUT terminal local to the 3174, the password is still required.

Note: If no password is customized in question 098, Test 14 is not allowed. You will receive an status code 4712 which indicates that a password has not been customized for the test.

13.1.1 NetView Requirements

CSCF works in conjunction with NetView.

NetView V2

CSCF support is standard as a command processor in NetView V2. With NetView V1, Small Programming Enhancements (SPEs) shown in Table 19 need to be installed.

Table 19. NetView PTFs Required for CSCF

Operating System	Product Number	APAR	PTFs
MVS/XA	5665-362	OY26579	UY90507 UY90508 UY90509
MVS/ESA	5685-152	OY26617	UY90510 UY90511 UY90512
VM	5664-204	VM39206	UV90514 UV90515 UV90516

CSCF in the 3174 and NetView at the host communicates by exchanging datastreams formatted according to the Full Screen Transport Architecture (FSTA), an SNA datastream definition designed especially for this purpose. Because it is SNA, CSCF is supported only by 3174s customized for SNA operation, including those using X.25 connections. NetView sends an FSTA request to the 3174 to perform the online test desired. The 3174 sends to NetView FSTA replies containing test panel templates (constant data) and tokenized panel data (variable data). NetView stores the panel templates so that, with subsequent requests for these panels, the 3174 need only send the variable data for test replies. The completed test panel displayed at the NetView CSCF console is the result of combining the panel template, the tokenized data and panel parameters specified by NetView. NetView translates then translates the FSTA datastream into 3270 datastream for display on the terminal.

Once CSCF is invoked, the NetView operator will be in test mode on the 3174 almost as if he or she were actually using local test mode. Tests can, therefore, be performed by stepping through the menu, or by using the fast path method.

NetView DM/2 V2.1

NetView DM/2 2.1 supports the IBM 3174 Establishment Controller using Configuration Support C and Central Site Change Management (CSCM) as a remote destination for change management.

You will find a scenario and configuration documented in the ITSO book *NetView DM/2 V2.1 Remote Administrator and Functions,* GG24-4419.

13.1.2 Using CSCF

The following is an example of using CSCF from a NetView terminal to display the log for a specific port. You must start the NetView CSCF task DSIKREM by entering on the NetView command line:

START TASK=DSIKREM

Once the task is started, you will receive the following messages:

```
* RAIAN    START TASK=DSIKREM
- RAIAN    DSI166I DSIKREM  IS ACTIVATED BY PEPEBOO
Z RAIAN    DSI530I ′DSIKREM ′ : ′DST′ IS READY AND WAITING FOR WORK
C RAIAN    >CMMUPST 7 DSI530I ′DSIKREM ′ : ′DST′ IS READY AND WAITING FOR WORK
```

You can then initiate CSCF online tests for the 3174 (PU name=LOC1140), by entering on the NetView command line:

CSCF PU=*LOC1140*

The NetView terminal displays the screen shown in Figure 164.

```
                 _________ 3174 Test Menu (1TEST) _________

      Test      Description                                      (page 1 of 2)

        0       Terminal check
        1       Display event logs and response time log
        2       Display configuration panels
        3       3270 device status information
        4       Reset logs and cable errors
        5       Display vital data
        6       Display Control Areas
        7       Color convergence
        8       Extended functions and program symbols
        9       LAN tests
       10       Port wrap tests
       11,p     Trace control (p=password)
       12       Asynchronous emulation adapter tests
        A,n     Alert to Host ID n (n=1A-1H,2A-2D,3A-3D)
        D,n,m   Dump device on port n, HG m (n=0-31 m=26-27)


CMD===>
PF1= HELP             PF2= END              PF3= RETURN            PF6= ROLL
PF8= FORWARD                                                     PF12= RETRIEVE
```

Figure 164. NetView CSCF Display - 3174 Test Menu (Page 1)

Note that this is *page 1 of 2*. Pressing PF8 will send out a request for *page 2*, shown in Figure 165 on page 436.

```
                3174 Test Menu (1TEST)

    Test     Description                                    (page 2 of 2)

      13     Enterprise Systems CONnection (ESCON) Adapter Tests
      14     3174 Operator Functions
      15     Display 3270 Host Status Summary
      16     Integrated Services Digital Network (ISDN) Tests
      17     Advanced Peer to Peer Networking (APPN) Tests











CMD===>
PF1= HELP           PF2= END           PF3= RETURN           PF6= ROLL
PF7= BACKWARD                                              PF12= RETRIEVE
```

Figure 165. NetView CSCF Display - 3174 Test Menu (Page 2)

From this menu, online tests can be selected. If you know the test number required, you can use the fastpath to invoke the desired test. For example, to display logged events for port 1, enter:

```
/1,4,1,26
```

You can also invoke tests directly from the initial CSCF command by entering test options as parameters of the CSCF command. For example, to do the same test as above, type:

CSCF PU=*LOC1140*OP=(/1,4,1,26)

The resulting screen, using either method, is as shown in Figure 166 on page 437.

```
           ________ Log Records - PN 1 , HG 26 ______

 (Relative Day/Time since last POR: 014/05:35)
 Day Time  SC   QA PHG_PN CHG_PN ID HA  Extended data bytes (B1-B16)
                                        B1   B3   B5   B7   B9   B11  B13  B15
 014 04:15 0410 07  11     26_01 1A 003

 PHG_PN=PrimaryHG_PN     HG=Hardware Group  SC=Status Code  ID=Host ID
 CHG_PN=ConnectionHG_PN  PN=Port Number     QA=Qualifier    HA=Host Address

CMD===>
PF2= END                         PF3= RETURN                      PF6= ROLL
PF11= Test Menu                                                 PF12= RETRIEVE
```

Figure 166. NetView CSCF Display - Log Event Record

Figure 167 shows the request for a password when CSCF is used to IML a 3174, using Test 14.

```
           ________ 3174 Operator Functions _________

     Option     Description       (Relative Day/Time since last POR: 145/06:27)

      1,n,m     IML (n = drive: 1,2,3,4 or 8; 8 = search order 3,4,1,2)
                    (m = IML type: 41=Normal, 42=Back Level, 43=Trial)
      2,n,m     Set Time (n = hours : 24 hour clock; m = minutes)

     - Warning:  IML will disrupt all Host communications
                 and controller functions.

4713-Restricted Function.  Enter Online Test Password to continue.
CMD===>
PF2= END                         PF3= RETURN                      PF6= ROLL
PF11= Test Menu                                                 PF12= RETRIEVE
```

Figure 167. NetView CSCF Display - 3174 Remote IML

13.1.3 3174 Customization

With Configuration Support-B Release 2 and later releases, CSCF is automatically available once the 3174 IMLs. No customization is required to enable this function.

With Configuration Support-B Release 3 and later releases, you will need to enter a password in question 098: Online Test Password if you wish to use the

CSCF remote IML capability (Test 14). If no password is entered in question 098, the 3174 will not allow the remote IML to be initiated.

With Configuration Support-C Release 2 and later release, you may suppress the need to enter the password for Test 14 when invoked from a NetView CSCF terminal, even if a password exist in question 098. To enable CSCF IML password suppression, respond to question 008: CSCF IML Password Required with an N (No).

13.2 Network Asset Management

Network Asset Management is a function of the 3174 and NetView. It provides product information (both hardware and software/microcode) which helps to identify the controller and its attached devices.

The ability to retrieve controller-related information from the 3174, such as serial number and microcode level, has been available for some time. (The serial number is your seven-character response to customization question 108: Unique Machine Identifier.) This ability is supported in NetView by the NPDA CTRL command. NetView solicits the 3174 for the hardware and microcode release levels (in hexadecimal) when you enter the following on the NetView command line:

`NPDA CTRL` *LOC1140* `LVL`

Figure 168 shows the resulting output displayed.

```
 N E T V I E W          SESSION DOMAIN: RAIAN    PEPEBOO   10/12/94 12:30:57
 NPDA-21A          * RELEASE LEVEL FOR SNA CONTROLLER *         PAGE   1 OF   2

  RAIAN        ISTPUS18   CHOE       LOC1140
              +--------+            +--------+
  DOMAIN      |  CPU   |----CHAN----|  LCTL  |
              +--------+            +--------+
 DATE/TIME: 10/12 12:30      ID: 04800000(3174)


 0201C302 00921680 00000000 00200001 40004600 420A0002 00003174 00218011
 01000060 00000000 0101F2F3 F0F0D5F6 F2F3F304 00960100 01000000 00800000
                         1    2   3
 00000000 C3D7F1F1 D3404040 C3D5C5E3 40404040 0707F0F0 F0F0F0F0 F0F00000
 00000000 00100000 01000000 90000006 000901E0 00060000 00060000 00000000
 00000006 00060000 01060000 0000C9C2 D4D3C1D5 4040C9C2 D4C9E2C4 D5400000
 00000012 00000000 00000000 00000000 0000FFFF FFFFFFFF FFFFFFFF FFFFFFFF
 FFFF0000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
 00000000 00000000 00000000 00000000 0000

 ???
CMD==>
```

Figure 168. Using NPDA CTRL puname LVL Command

Question 108 is customized as 23N6233 (a seven-character field). Note how this response is used to provide the information retrieved:

1 The plant of manufacture is the first two characters of question 108.

2 The first two characters of the serial number are set to zeros.

3 The next five characters of the serial number are set to the last five characters of your response in question 108.

It is also desirable to be able to solicit information for devices attached to the 3174. The data collected can then be processed centrally and used for inventory control.

13.2.1 Vital Product Data

When an IBM 3270 device is powered on, control information is sent to the 3174 to establish the appropriate controller-terminal protocol. Thus, the 3174 knows what devices are attached to it at any time.

In order to support inventory control, both the 3174 and the attached devices must support Vital Product Data (VPD). The 3174 supports VPD beginning with Configuration Support-A and S Release 4. No customization is required to enable VPD support.

For devices which support VPD, the 3174 will send VPD information, which consists of the machine type, model number, serial number, plant of manufacture, and product class (whether IBM or non-IBM). The 3174 will also send, for all attached devices including those not supporting VPD, information which indicates the port address to which a device is attached, whether the device is currently powered on/off, and whether the device has been powered on/off since the last host request. All the information relating to the attached devices is maintained in the 3174 even when the devices are powered off.

Figure 169 on page 442 shows the information that is provided by a device that supports VPD. The device-supplied VPD is shown in the "Device-defined" column. If no value is supplied for a given field, that field is marked with an asterisk.

Devices which support VPD began with the 319x series of terminals. Full support for VPD were introduced for devices manufactured after January 1988.

Note that the machine type, model number and address information is used in the dynamic definition of dependent LUs (see Chapter 11, "Dynamic Definition of Dependent LUs (DDDLU)" on page 393).

13.2.2 User-Definable Data

For devices that do not provide Vital Product Data (for example, early 3270 displays and printers, and ASCII terminals), the 3174 was enhanced with Configuration Support-B Release 2 and later releases to support user-definable data. Again, no customization is required to enable 3174 support for user-definable data.

For these devices (whether attached to 3270 or AEA ports), the user is able to input the machine type, model number, serial number, and plant of manufacture in the "User-defined" column (see Figure 169 on page 442). For each device, the user can also enter up to 50 bytes of useful information in free format in the "Location:" field. For the 3174 itself, the user can enter useful information in the 50-byte free-format field. The contents of these fields are completely up to the user.

To enter user-definable data, the user can do it either locally at the terminal or via NetView CSCF, using the online Test 5 Option 2 for the 3174 and Test 5 Option 4 for the devices. The user-definable data is then stored in the 3174.

13.2.3 Extended VPD

Extended Vital Product Data provides a more comprehensive implementation of Network Asset Management. Extended VPD provides an additional 320 bytes of data, allowing the user to enter information, such as location, building number, department, or any other data that the user considers important for device management. The 320 data positions are divided into eight distinct areas. Each area contains a 15-byte label and a 25-byte description. The labels are entered during 3174 customization and the description are entered by the terminal user. The description for a terminal can only be entered from that terminal, using either the terminal setup facility or using online Test 5 Option 6. The description cannot be entered using CSCF. Once entered, the 3174 includes these label/description pairs in the Reply PSID sent to the host.

All models of the 3472, and 3471 Model B, support Extended VPD. Support in the 3174 is provided with Configuration Support-B Release 2 and later releases. To support Extended VPD, you must enabled this function in Question 802: Prompts for Extended Vital Product Data and enter the labels to be used for the description fields.

The following is an example use of Extended VPD: The network planner defines the labels using fields such as "Contact Name," "Department," "Location," "Telephone," etc. When a terminal is connected to the 3174, the user can invoke display setup mode or online Test 5 Option 6 and enter the description for each corresponding label.

The labels are stored on the Control disk. The labels and descriptions are stored in the terminal and remain there even when power is turned off. The descriptions are also stored in the controller storage but will be erased if the 3174 power is turned off or IMLed.

Moving Terminals

Because Extended VPD description data remains in a terminal, the descriptions will still match the corresponding labels if the terminal is moved to a different port on the *same* 3174.

If, however, the terminal is moved to a *different* 3174, the labels customized may be different and the descriptions may no longer be appropriate.

When a terminal is powered on, the 3174 compares the labels stored with those in the terminal. For matching labels, the 3174 copies the description for that label to its storage. For non-matching labels, the description is marked with an asterisk (when displayed) to indicate that the description may not be current. The user can then update the description via online Test 5 or the terminal setup facility.

Extended VPD Devices

The following table summarizes some of the products which provide VPD data to NetView and the level of detail for each.

Table 20. VPD Functions Supported on IBM Products					
Product	**Mach Type**	**Model**	**Serial**	**S/Ware Data**	**Ext. VPD**
3174 A R4	YES	YES	YES	NO	NO
3174 B R2	YES	YES	YES	NO	YES
3191 Mod D,E,L	YES	YES	YES	NO	NO
3192 NOT Mod G	YES	YES	YES	NO	NO
3194 Mod C,D,H	YES	YES	YES	NO	NO
3471	YES	YES	YES	NO	NO
3472	YES	YES	YES	NO	YES
OS/2 EE	NO	YES	YES	NO	NO
OS/2 EE 1.2	YES	YES	YES	YES	NO
3720/NCP 5.2	YES	YES	YES	YES	NO
3725/NCP 4.3	YES	YES	YES	YES	NO
3745/NCP 5.2	YES	YES	YES	YES	NO
5822 DSU	YES	YES	YES	NO	NO
586x modems	YES	YES	YES	NO	NO
786x modems	YES	YES	YES	NO	NO
3179 Mod 1	YES	NO	NO	NO	NO
3180 Mod 1	YES	YES	NO	NO	NO
3191 A,B	YES	NO	NO	NO	NO
3192 G	YES	YES	NO	NO	NO
3193 Mod 10,20	YES	YES	NO	NO	NO
3194 H50	YES	YES	NO	NO	NO
3290	YES	NO	NO	NO	NO
3720/NCP V4.2	NO	NO	NO	YES	NO
3725/NCP V4.2	NO	NO	NO	YES	NO

Collecting Vital Product Data

Whether you use basic VPD or extended VPD, the information can either be displayed locally or retrieved by NetView.

Using Online Test 5: An example display of VPD data using online Test 5 is shown in Figure 169 on page 442. This can also be retrieved and displayed on a NetView CSCF console.

```
              _____ Port Vital Data - PN 01, HG 26 _____

                    Device-defined          User-defined

 Device type:             3472                 ____
 Model number:            G00                  ___
 Plant of manufacture:    NO                   __
 Serial number:           NRN22CB              _______
 Release level:           000
 Engineering change data: 0220890720000

                                     B1 B2 B3 B4 B5 B6 B7 B8 B9 B10
 Device characteristics (hexadecimal): 05 11 81 04 40 00 10 00 1F 80

 * = data not supplied by device

 Location: ITSO Raleigh Center (up to 50 bytes of information)______



CMD===>
 PF: 3=Quit      7=Back    8=Fwd                            12=Test Menu
```

Figure 169. VPD Displayed Using 3174 Online Test 5

Using VPDCMD Command: To interrogate devices from NetView, you can use the VPDCMD command. The following is an example of using the VPDCMD command from a NetView terminal. You must start the NetView task VPDTASK by entering on the NetView command line:

START TASK=VPDTASK

Once the task is started, you will receive the following message:

```
* RAIAN    START TASK=VPDTASK
- RAIAN    DSI166I VPDTASK  IS ACTIVATED BY PEPEBOO
- RAIAN    DWO006I VPDTASK  IS READY FOR WORK (ACBNAME = RAIANVPD SNAPRQ = OFF
           VPDWAIT = 030 VPDREQ = 001 VPDSTOR = 02 )
```

The format of the VPDCMD command is:

VPDCMD ALL,*LOC1140*

where ALL will retrieve data for the 3174 and all devices attached to the PU named LOC1140. (Instead of ALL, you can use OWN to retrieve data for the 3174 only.) The resulting information sent to NetView is shown in Figure 170 on page 443 (comments marked with $$ are added for explanation).

```
VPDCMD ALL LOC1140
DWO009I REQUEST 'ALL' ACCEPTED FOR LOC1140   , REQID = 0005

$$ 3174 VPD
DWO100I REQID 0005 :  ORIG PU LOC1140   CNFG PU LOC1140   CH/LINK 0E40   PU ISTPUS25
DWO105I REQID 0005 :  PHY = 'ITSO Raleigh Center (up to 50 bytes of information)'
DWO102I REQID 0005 :  IBM-HW M/T = 3174 MDL = 11L MFG = 23 S/N = 00N6233

$$ 3179 on port 00 (serial number was entered manually)
DWO100I REQID 0005 :  ORIG PU LOC1140   CNFG LU L114002  PU LOC1140 CH/LINK 0E40   PU ISTPUS25
DWO101I REQID 0005 :  PORT = 000 PWROS = Y PWROL = Y
DWO105I REQID 0005 :  PHY = 'ITSO Raleigh Center (up to 50 bytes of information)'
DWO102I REQID 0005 :  IBM-HW M/T = 3179 MDL = *** MFG = ** S/N = 0086293

$$ 3472-G on port 01 (serial number retrieved from the device)
DWO100I REQID 0005 :  ORIG PU LOC1140   CNFG LU L114003  PU LOC1140 CH/LINK 0E40   PU ISTPUS25
DWO101I REQID 0005 :  PORT = 001 PWROS = N PWROL = Y
DWO105I REQID 0005 :  PHY = 'ITSO Raleigh Center (up to 50 bytes of information)'
DWO102I REQID 0005 :  IBM-HW M/T = 3472 MDL = G00 MFG = NO S/N = NRN22CB

$$ No terminal on port 02
DWO100I REQID 0005 :  ORIG PU LOC1140   CNFG LU L114004  PU LOC1140 CH/LINK 0E40   PU ISTPUS25
DWO101I REQID 0005 :  PORT = 002 PWROS = N PWROL = N
DWO102I REQID 0005 :  MIX-HW M/T = 0000 MDL = *** MFG = ** S/N = *******

$$ 3472-F on port 03 (serial number retrieved from the device)
DWO100I REQID 0005 :  ORIG PU LOC1140   CNFG LU L114005  PU LOC1140 CH/LINK 0E40   PU ISTPUS25
DWO101I REQID 0005 :  PORT = 003 PWROS = Y PWROL = Y
DWO105I REQID 0005 :  PHY = 'ITSO Raleigh Center (up to 50 bytes of information)'
DWO102I REQID 0005 :  IBM-HW M/T = 3472 MDL = F00 MFG = 23 S/N = 00F0678

$$ 3471 on port 04 (serial number entered manually)
DWO100I REQID 0005 :  ORIG PU LOC1140   CNFG LU L114006  PU LOC1140 CH/LINK 0E40   PU ISTPUS25
DWO101I REQID 0005 :  PORT = 004 PWROS = Y PWROL = Y
DWO105I REQID 0005 :  PHY = 'ITSO Raleigh Center (up to 50 bytes of information)'
DWO102I REQID 0005 :  IBM-HW M/T = 3471 MDL = *** MFG = ** S/N = 88Y8778
```

Figure 170. NetView Message Response for VPDCMD

Using NetView VPDCOLL CLIST: NetView provides sample CLISTs to retrieve the VPD data from the network and store it in SMF records. The formats of these records in NetView Version 1 Release 3 are documented in the *NetView Administration Reference*, SC31-6014.

Once you have the data stored as SMF records, you can use Service Level Reporter (SLR) or an equivalent product to generate the Network Asset Management reports.

Figure 171 on page 444 shows the output displayed using one of the NetView VPDCOLL CLIST provided and documented in *Automated Configuration Management Using The Information/System-NetView Bridge Adapter*, GG24-3871.

```
                   CONFIGURATION DATA COLLECTION
                        VITAL PRODUCT DATA          10/12/94 12:46:10
 Operator:PEPEB00                                   LU:MK1LA003
                           PRODUCT DATA

Device            : LOC1140        Hardware Type     : IBM-HW
Domain            : RAIAN          Machine Type      : 3174
Channel Address   : 0E40           Machine Model No. : 11L
Port              :                Plant             : 23
Power on status   :                Serial No.        : 00N6233
Power on activity :                H/W Common Name   :
CNFG Nodename 2   : LOC1140        Software Type     :
CNFG Nodetype 2   : PU             S/W Component ID  :
CNFG Nodename 3   :                S/W Product Ver   :
CNFG Nodetype 3   :                S/W Product Rel   :
ORIG Nodename     : LOC1140        S/W Product Mod   :
ORIG Nodetype     : PU             S/W Common Name   :
                                   S/W Customer Date :
                                   S/W Customer Time :
                                   Microcode EC Level:
Location : ITSO Raleigh Center (up to 50 bytes of information)

Command ===>
 PF1=HELP     PF2=END     PF3=RETURN     PF4=TRANSFER     PF6=ROLL
```

Figure 171. Using VPDCOLL CLIST

13.3 Using Network Asset Management Effectively

Network Asset Management (NAM) is greatly enhanced by the use of VPD and extended VPD, and can be very useful if implemented correctly. To use NAM effectively requires planning and procedure documentation by the network planners of the organization. It may save countless hours in tracking down terminals that have been moved when inventory time comes around. If implemented effectively, you can use NAM to:

- Dynamically build a configuration table and solicit product information from your network.
- Interactively determine the network location of a missing or moved network resource.
- Uniquely identify each supported resource in the network.
- Automatically build a list of (VPD supported) network resources, including their location and how they are attached to the system.
- Determine where a device with a specific serial number is located and show how it is connected to the system (LU name, PU name, line name and NCP name).
- Determine 3174 ports that have not had recent power-on activity, to assist in the identification of unused ports.

Chapter 14. Configuration Support-C Release 2

14.1 Introduction

In March 1992, IBM announced Configuration Support-C Release 2. With this announcement, the 3174 now provides a multi-protocol platform for dependent displays and intelligent workstations by building on and providing support for the following protocols:

- Advanced Peer-to-Peer Networking (APPN)
- Peer Communication
- Integrated Services Digital Network (ISDN)
- Transmission Control Protocol/Internet Protocol (TCP/IP) TELNET.

APPN is an enhancement to SNA and Type 2.1 node architecture, and allows the inter-connection of systems of widely differing sizes into networks, with the minimal system definition and maximum flexibility. 3174 support for APPN is provided by the Advanced Peer-to-Peer Networking Licensed Internal Code feature. Currently, this support allows the 3174 to operate as a network node only within an APPN network. For further information, see Chapter 18, “APPN” on page 501 and the ITSO document *3174 APPN Implementation Guide Update*, GG24-4171.

Peer Communication makes it possible for DOS and OS/2 intelligent workstations, attached to the 3174 by existing 3270 coax wiring and emulation adapters, to communicate with one another as if they were peer devices on a local area network (LAN). This capability provides a migration path for users evolving from an exclusively host-interactive computing environment to one that also includes local area networking. 3174 support for Peer Communication is provided by the Peer Communication Licensed Internal Code feature. For further information, see Chapter 19, “Peer Communication” on page 557 and the ITSO document *3174 APPN Implementation Guide Update*, GG24-4171.

3174 support for ISDN is provided in the base microcode, beginning with Configuration Support-C Release 1, and a Basic Rate Interface (BRI) adapter. Each BRI adapter is able to support up to eight downstream remote workstations, allowing them to communicate with hosts via the 3174 at 64 Kbps over high quality end-to-end digital networks. For further information, see Chapter 22, “ISDN” on page 661.

TELNET is a TCP/IP application protocol that provides a standardized interface through which one host (the TELNET client) may access the resources of another host (the TELNET server) as though the client were a local terminal attached to the server. With this capability, the 3174 (the TELNET client) allows attached CUT mode terminals and ASCII display stations to access other TCP/IP hosts (TELNET servers) using the TELNET protocol. 3174 support for TCP/IP TELNET is provided free of charge by RPQ 8Q0935 using Configuration Support-C Release 2 as the base microcode. For further information, see Chapter 21, “TCP/IP” on page 605.

In addition to supporting multi-protocol environments and providing functions supported by earlier releases, Configuration Support-C Release 2 also integrates a number of end-user productivity RPQs, some of which are available for Configuration Support-B at an additional charge:

- Split Screen
- Copy From Session To Session
- Local Print Buffering
- HAP Sharing for Local Copy
- Calculator function
- Token-ring T1 Timer/Retry Count
- 5250 Emulation
- 132-Column Support via AEA
- Entry Assist Support for ASCII
- CSCF IML Password Suppression

This chapter will describe the end-user productivity enhancements in greater detail.

Other enhancements announced with Configuration Support-C Release 2 were:

- Dynamic Definition of Dependent LU (DDDLU)

  Although DDDLU was first available with Configuration Support-B Release 4 and Configuration Support-C Release 1.1, Configuration Support-C Release 2 provided the first opportunity to announce this capability. For further information, see Chapter 11, “Dynamic Definition of Dependent LUs (DDDLU)” on page 393.

- Telephone Twisted-Pair Terminal Multiplexer Adapter (TTP TMA)

  Using only one card slot, each TTP TMA allows up to 32 3270 terminals to be attached to the 3174 using telephone twisted-pair wiring. This adapter, previously available as an RPQ 8Q0806, is now offered as a feature #3105. For further information, see 14.3, “Telephone Twisted-Pair Terminal Multiplexer Adapter” on page 477.

- Local Format Storage with UltraOpt/VTAM.

  Local Format Storage (LFS) is a 3174 capability that allows applications running under CICS to preload frequently used screen images (screen formats) into 3174 storage and recall these formats for presentation when required. This capability was available as an RPQ 8X0024 for Configuration Support-A and S, and subsequently integrated into the base microcode beginning with Configuration Support-B Release 2.

  The Configuration Support-C Release 2 announcement highlights the availability of UltraOpt/VTAM, a software product offered by BMC Software Inc., an IBM Business Partner application specialist.

  UltraOpt/VTAM is a VTAM application that provides 3270 datastream optimization and fully exploits the 3174 LFS capability for dynamic format creation, distribution and storage management It is available not only for CICS but also IMS, TSO, and other VTAM applications as well. For further information, see 12.2, “LFS with UltraOpt/VTAM” on page 418.

14.2 End-User Productivity Enhancements

To support the end-user productivity enhancements available with Configuration Support-C Release 2, a new customization panel and specific keyboard mappings are introduced. The new customization panel, shown in Figure 172, is displayed after the Port Assignment panels in the customizing sequence. The specific keyboard mappings are shown in Appendix I, "Keyboard Layouts" on page 803.

```
              _____ End User Productivity Functions _____
                                                                    00/TOKN

 Local Copy print queue buffer size    001 - 0000        (0000 - 1024K
                                                           use multiples of 2K)
 Calculator function                   002 - 0           (0 - 2)

 5250 emulation                        003 - 0           (0 - 2)

 Token Ring T1 timer                   004 - 5           (0 - 9)
  and retry count                      005 - 07          (01 - 99)

 Copy from session to session          006 - N           (Y,N)

 HAP sharing for local copy            007 - N           (Y,N)

 CSCF IML password required?           008 - Y           (Y,N)

 Non-standard feature options          009 - 00000000 00000000 00000000 00000000


 PF: 3=Quit    4=Default    7=Back    8=Fwd    9=RtnH
```

Figure 172. End User Productivity Functions Panel

Questions 001 and 006 affect 3174 controller storage requirements.

Question 009 is not used in Configuration Support-C Release 2; it is included for options not currently defined.

14.2.1 Split Screen

The Split Screen function builds on the Multiple Logical Terminal support. It allows the user of a CUT workstation to view up to five logical terminal (LT) sessions on the screen at one time. The user can decide how much of the screen (number of lines) is devoted to each LT, which LTs are displayed together as a workgroup, and the sequence that the LTs are displayed within that workgroup. The user can also determine the scroll factor or scroll increment; that is, the number of lines that will be moved up or down within an LT session when a scroll key is pressed. Each workstation can have up to five workgroups. Each workgroup can define up to five LT sessions.

Note: This does not mean you can have up to 25 sessions per workstation. The limit is still five sessions per workstation.

Screen Formats Supported

Split Screen supports the following screen formats:

- Format 2: 24 lines by 80 columns
- Format 3: 32 lines by 80 columns
- Format 4: 43 lines by 80 columns

When displaying two sessions on an equally divided screen in screen format 4, the user can view almost two complete 24-by-80 sessions.

Keyboards Supported

To support Split Screen operations, several new keystroke functions are added. These keystroke functions are supported on the following keyboards:

- Base keyboards
- Converged Typewriter keyboards
- Converged Data Entry keyboards
- Converged APL keyboards
- IBM Enhanced keyboards

The actual keystrokes required to invoke each function will vary, depending on the keyboard map.

Setup Mode Keys

The following describes the keys that are used during Split Screen setup mode. Note that all other keys are disabled in this mode.

Key — **Function**

New Line Moves the cursor to the LT select position.

Tab Moves the cursor to the LT select position and the scroll factor (increment) select position.

Back Tab Move the cursor like the Tab key but in a backward sequence.

Delete Eliminates the LT selection.

To eliminate an LT, use the New Line, Tab or Back Tab key to move the cursor to the LT select position and press the Delete key. This deletes the LT number in the LT select position, which deselects that LT.

Enter Validates your setup data (it does not save the data). Any errors detected will cause the line in error to be highlighted. Errors may be caused by an LT being specified more than once in the same workgroup, or by the scroll factor being greater than the number of lines specified for an LT. In this case, no setup data is saved.

If it is error-free, the setup data is saved in the 3174 storage (not in the terminal) and remains there even if the terminal is powered off. However, if the 3174 is powered off or IMLed, the setup data for all attached displays are lost.

PF1—PF5 Each PF key is associated with a workgroup, as follows:

- PF1 with workgroup 1
- PF2 with workgroup 2
- PF3 with workgroup 3
- PF4 with workgroup 4
- PF5 with workgroup 5

When a PF key is pressed, the setup data is validated. If it is error-free, the setup data is saved. If the PF key number is the same as the current workgroup number (that is, the workgroup being setup) the same setup screen is displayed. If the PF key number is different from the current workgroup number, the setup screen for the workgroup associated with that PF key is displayed.

If errors are detected when a PF key is pressed, the line in error is highlighted and the screen stays where it is to allow you to correct the error.

PF12 or PA2
Both keys perform the same function. Pressing either key validates the setup information and, if error-free, exits setup. Upon exit, the screen is in Zoom mode and displays the LT that was active when you entered setup mode.

If errors are detected, the line in error is highlighted and the screen stays where it is to allow you to correct the error.

Clear
Clears the setup data you have entered (without saving them) and restores the setup data for the current workgroup.

Keystroke Functions

The following describes the functions that support Split Screen operation.

Function	Description
Setup	Allows you to go into setup mode and define the LTs to be displayed as a workgroup, the size (number of lines) for each LT, the scroll factor for each LT, and the sequence in which the LTs are displayed within the workgroup.
Jump	Allows you to move sequentially (round-robin) between the LTs within a workgroup. The active LT header line is highlighted, with the cursor movement being confined within that LT. **Note:** This function is not supported in Text Entry Assist Change Format mode.
Jump Specific	Allows you to move directly to a specific LT within a workgroup. The active LT header line is highlighted, with the cursor movement being confined within that LT. **Note:** This function is not supported in Text Entry Assist Change Format mode.
Change Screen	Allows you to move sequentially (round-robin) between workgroups, in the same manner as moving sequentially between LTs in a MLT environment.
Scroll Forward	Allows you to move (scroll) forward a number of lines within an active LT with one keystroke sequence. You can specify the number of lines moved (scroll factor) during Split Screen setup. Only one scroll factor is specified; it is then effective for both scroll forward and scroll backward operations.
Scroll Backward	Allows you to scroll backward a number of lines within an active LT with one keystroke sequence. You can specify the scroll factor during Split Screen setup. Only one scroll factor is specified; it is then effective for both scroll forward and scroll backward operations.

Swap Allows you to temporarily bring (swap) in an LT that is not defined in the current workgroup. The LT swapped in takes on the display characteristics (LT size and scroll factor) of the active LT from which the swap was invoked. This swap is only temporary; the original LT will be displayed when you leave and then return to this workgroup through a Change Screen function.

Note: This function is not supported in Text Entry Assist Change Format mode.

Zoom Allows you to toggle between displaying an active LT as a full screen by itself (in Zoom mode) and displaying it as a part of a screen with other LTs in the workgroup (in Split Screen mode).

To invoke these functions, the keyboard must be placed in the Extension mode:

- For Converged and Enhanced keyboards, press the ExSel key.
- For Base keyboards, press the Alt and EraseEOF keys simultaneously.

Once in Extension mode, Table 21 shows the keystroke sequences required for each function.

Table 21. Keystroke Sequences for Split Screen Operation

Function	**Base Keyboard**	**Converged Keyboard**	**Enhanced Keyboard**
Setup	Alt EraseEOF I	ExSel I	ExSel I
Jump	Alt EraseEOF J	ExSel J	Alt PA1
Jump Specific to LT-1	Alt EraseEOF PF1	ExSel 1	ExSel 1
Jump Specific to LT-2	Alt EraseEOF PF2	ExSel 2	ExSel 2
Jump Specific to LT-3	Alt EraseEOF PF3	ExSel 3	ExSel 3
Jump Specific to LT-4	Alt EraseEOF PF4	ExSel 4	ExSel 4
Jump Specific to LT-5	Alt EraseEOF PF5	ExSel 5	ExSel 5
Zoom	Alt EraseEOF Z	ExSel Z	Alt Dup
Scroll Forward	Alt EraseEOF ↓	Alt ↓	Alt ↓
Scroll Backward	Alt EraseEOF ↑	Alt ↑	Alt ↑
Swap	Alt EraseEOF X	ExSel X	Alt Clear
Change Screen	Alt Insert	Alt ChgSc	Alt ChgSc

Setup Rules

Rules are enforced when setting up your display for Split Screen operation. When validation detects an error, the line in error is highlighted but you have no indication which of the two selection fields (the LT select position or the scroll factor select position) causes the error. You can determine the cause by adhering to the following rules:

- You cannot select an LT for display in a workgroup unless that LT has been activated by performing a Change Screen or Jump to Specific LT function.
- An LT can appear only once in a workgroup but it can appear in more than one workgroup.

- The scroll factor (or increment) must be less than or equal to the number of lines (or window size) selected for that LT.
- During setup, presentation space data for an active LT is not displayed.
- If all LTs are deleted from a workgroup, the LT that will be active upon setup exit is the LT associated with that workgroup:
  - LT-1 for workgroup 1
  - LT-2 for workgroup 2
  - LT-3 for workgroup 3
  - LT-4 for workgroup 4
  - LT-5 for workgroup 5
- The OIA indicator (next to the boxed stickman symbol) shows the workgroup number being setup.

Local Copy

When an LT is in Split Screen mode, host-initiated local copy will print the entire presentation space while operator-initiated local copy will only print the portion of the active LT currently displayed.

ASCII Session Support

The following list shows the Split Screen function differences for 3270 terminal emulation:

- The Jump to a Specific LT function is not supported.
- To Scroll:
  - You may enter the Pseudo-Alt state through Extension mode and then use the cursor-up or cursor-down keys for scrolling.
  - You may enter Extension mode and use the cursor-up or cursor-down keys for scrolling.
- The Split Screen function keys (Jump, Zoom, and Swap) must be used in Extension mode.

The following list shows the Split Screen function differences for ASCII terminal emulation sessions:

- The Scroll Forward and Scroll Backward keys are not supported.
- If you use the New Line key, cursor keys, or enter data beyond the viewport boundaries, the screen scrolls. You can use this method to scroll forward and backward without entering Zoom mode.
- The scroll increment is always one.
- You cannot enter setup mode while in an ASCII terminal emulation session. You can do one of the following to enter setup mode:
  - You can activate the Connection Menu through Extension mode and then enter setup mode.
  - You can setup a workgroup by jumping to 3270 (non-ASCII session) and entering setup mode. When you complete your setup, you can jump back to the ASCII terminal emulation session.

PC 3270 Emulation Program Entry Level V2.0

You setup a PS/2 running PC 3270 Emulation Program Entry Level V2.0 for Split Screen operation. However, you must select the standard keyboard layout during program installation. The Extension mode key sequence is Alt Esc.

Example Setup

This section provides an example of setting up and using the Split Screen function. A 3471 terminal is attached to a port customized for five host sessions. The 3174 is IMLed and ready for operation.

For the purpose of this example, we will assume you want to have the following:

- LT-1 by itself, without being setup for Split Screen
- LT-2, LT-3 and LT-4 in one workgroup (WG-2)
- LT-3 and LT-5 in another workgroup (WG-3)
- LT-4 by itself, without being setup for Split Screen
- LT-5 by itself, without being setup for Split Screen

You power on the terminal and the LT-1 displays the host logo. Before you can setup the 3471 for Split Screen operation, you must activate the LTs you want included in a workgroup by doing a Change Screen sequence to those LTs.

Step 1 Press Change Screen sequence from LT-1 through LT-5, and back to LT-1.

Step 2 Press ExSel I.

The host logo disappears and the screen stays blank. You are now in Split Screen setup mode. Notice the indicator at the right-hand corner of the OIA; it shows WG-1 next to the boxed stickman symbol.

We wish to leave LT-1 by itself, so we will proceed to setting up for LT-2.

Step 3 Press PF2.

The screen stays blank but the OIA indicator shows WG-2.

Step 4 Enter the number 2 in the LT select position.

This means that you have selected LT-2, and its header line will be where the cursor is currently located.

Note: The first LT header line must be row 1.

The cursor automatically tabs to the scroll factor select position.

Step 5 Enter the number 5.

This means that when you scroll forward or backward within LT-2 when it is active, five lines will be moved for each scroll keystroke sequence.

The cursor stays in the next character position.

Step 6 Press the New Line key six times.

This means you have five rows from the LT-2 header line to the next LT header line.

Step 7 Enter the number 3 in the LT select position.

Enter the number 5 in the scroll factor select position.

Press the New Line key eleven times.

Step 8 Enter the number 4 in the LT select position.

At this point, your setup screen is as shown in Figure 173 on page 453 (comments added in parentheses).

```
      2                                                     5
(LT select position)                         (scroll factor select position)


      3                                                     5




      4                                                     _




SB WG-2
```

Figure 173. Setup Screen after Steps 3-8 (WG-2)

Step 9 Press the Enter key to validate your setup data.

When you press Enter, your setup screen is as shown in Figure 174 (comments added in parentheses). Notice the scroll factor for LT-4 defaults to 01 and the number of rows (including the LT header lines) is 24.

```
    LT-2 ---------------------------------------------------- SCROLL = 5  ---


     (5 rows in between LT header lines)


    LT-3 ---------------------------------------------------- SCROLL = 5  ---


     (10 rows in between LT header lines)



    LT-4 ---------------------------------------------------- SCROLL = 01 ---

     (6 rows between LT header line and OIA)


SB WG-2
```

Figure 174. Setup Screen after Step 9 (WG-2)

Since the setup is error-free, none of the header lines are highlighted. At this point, if no further setup is required, you can press PF12 to exit and the screen will return to LT-1 display. However, we will continue with setting up for the next workgroup.

Step 10 Press PF3

The screen stays blank but the OIA indicator shows WG-3.

Step 11 Enter the number 3 in the LT select position.

Enter the number 11 in the scroll factor select position. When you enter a two-digit number for the scroll factor, the cursor automatically does a New Line.

Press the New Line key eleven times.

Step 12 Enter the number 5 in the LT select position.

Enter the number 11 in the scroll factor select position.

At this point, your setup screen is as shown in Figure 175.

```
     3                                                        11






     5                                                        11
     _





SB█WG-3
```

Figure 175. Setup Screen after Steps 10-12 (WG-3)

Step 13 Press the Enter key to validate your setup data.

When you press Enter, your setup screen is as shown in Figure 176 (comments added in parentheses).

```
    LT-3 ---------------------------------------------------- SCROLL = 11 ---



     (11 rows between LT header lines)



    LT-5 ---------------------------------------------------- SCROLL = 11 ---



     (11 rows between LT header line and OIA)



SB█WG-3
```

Figure 176. Setup Screen after Step 13 (WG-3)

Step 13 (alternative step)

Press PF12.

If this is your last setup, you may wish to press PF12 instead of the Enter key. Pressing the PF12 key will validate the setup data and, if no errors found, will exit to the LT from which setup was invoked. In our example, the screen will display LT-1 in full screen mode.

To display the split screens you have setup for LT-2, do a Change Screen to LT-2 and press ExSel Z. Figure 177 shows the LT-2 in Split Screen mode.

```
  - LT-2 ---------------------------------------- ROW = 20 ----- SCROLL = 05 -
                            ******

For HELP enter HELP and when NCCF LOGO appears,
use LOGON ID (HELP) and PASSWORD (HELP).

  - LT-3 ---------------------------------------- ROW = 15 ----- SCROLL = 05 -
                 * *        ******      11   888
                  *               **    11  8   8
                           *      **    11   888
                            ******

For HELP enter HELP and when NCCF LOGO appears,
use LOGON ID (HELP) and PASSWORD (HELP).

  - LT-4 ---------------------------------------- ROW = 19 ----- SCROLL = 01 -
                           *      **    11   888
                            ******

For HELP enter HELP and when NCCF LOGO appears,
use LOGON ID (HELP) and PASSWORD (HELP).
______________________________________________________________________________
SB WG-2
```

Figure 177. LT-2 Display in Split Screen Mode

14.2.2 Copy from Session to Session

Copy Session to Session allows the user of a CUT workstation to define and copy a block of data to a clipboard. Once the data is on the clipboard, the user can paste it to multiple locations in the same LT or to multiple locations in multiple LTs when using the MLT function. The multiple LTs can be on the same or different hosts, and can be in Split Screen or full screen modes. A 3174, when customized to allow this capability, maintains a 4 KB clipboard in the controller storage for each port. This storage amount must be added to the those required for all other features when planning for controller storage. The maximum size for a copy is 1920 bytes. You can also copy from any ASCII emulation session for a 3270 workstation.

Copy Session Rules

The following summarizes rules to be followed when doing a Copy Session to Session operation:

- You can copy data from any session on the same terminal, but not from the HAP or ASCII pass-through sessions.
- You can paste data to any session on the same terminal, but not to the HAP or any session on an ASCII host (ASCII pass-through or ASCII terminal emulation).

Note: The Transfer mode allows you to *copy data from* an ASCII terminal emulation session but you cannot *paste data to* any ASCII session.

- You can copy from and/or paste to all LTs, except those previously mentioned (HAP and ASCII pass-through sessions), including those on the Concurrent Communication Adapter.
- You can copy from and/or paste to on all 64 CUT and all 24 AEA display stations simultaneously (assuming you have sufficient storage).
- The maximum amount of data copied or pasted is a 24x80 screen area plus the Extended Attribute Buffer.
- You can paste data on the last row of the current screen (the active LT) in Split Screen mode, even if your block of data spans more than one row. The next and subsequent rows will be displayed when you Scroll Forward.
- You cannot paste data beyond the right or bottom boundaries of the screen. The paste operation will not be performed.

  For example, you have the following block of data to paste:

  ```
  1234567890
  ABCDEFGHIJ
  ```

  To do a successful paste operation, you should not attempt to paste the block beyond row 23 and column 71 of your current screen. (If you do, nothing happens.)

Attribute Processing

When you copy from and paste to fields that contain display attributes, the following results occur:

- An attribute that is in the data block copied to a clipboard is pasted as a space. The character attribute is set to X′00′ if an EAB is present.
- Any non-display data that is copied is pasted as spaces. The character attribute is set to X′00′ if an EAB is present.
- You cannot paste data blocks to protected fields. If you attempt to do so, nothing happens. You can only paste to unprotected fields.

  If the number of characters pasted is greater than the size of the unprotected field, the characters to the right are truncated.
- For EAB data, only copy the field if you are allowed to modify the attribute on the receiving presentation space (except APL and control codes, which are Program Symbol Set 1). Otherwise, EAB bytes are set to X′00′.

ASCII Terminal Emulation

The following describes the Copy Session to Session capabilities supported by ASCII terminal emulation:

- You can only copy data from an ASCII terminal emulation session.
  - To copy data, you must enter the Transfer mode (by entering Extension mode and pressing the Transfer key).
  - When in Transfer mode, you can then use the Begin Clip and End Clip keys to define and copy a block of data.
  - When you press the End Clip key to complete a copy, you will exit Transfer mode and the display will return to the original screen (as it was before entering Transfer mode).

- If you want to exit Transfer mode before completing a copy, press the Transfer key (without entering Extension mode again) and the display will return to the original screen.
- Transfer mode is supported only on ASCII terminal emulation sessions. You will not get into Transfer mode when you enter Extension mode and press the Transfer key from a non-ASCII session; the OIA will indicate a "last input not accepted" (X ? +) status.

- Precautions for Transfer mode data corruption:
  - When you enter Transfer mode, pacing is sent to the host to halt data transmission if the ASCII host session is customized for pacing (question 731).
  - To prevent data corruption, you should enter Transfer mode only when host communication has stabilized.
  - Screen data can be corrupted if host data is received unexpectedly.
  - Due to the precautions, data sent from the host could be lost if you remain in Transfer mode for an extended period of time.
- Cursor keys operate in the same way in Transfer mode as in 3270 mode, regardless of customization.
- The Transfer mode is supported in Split Screen and Zoom (full-screen) mode. For Converged and Enhanced keyboards, the Zoom function key is supported in Transfer mode.
- You cannot view the clipboard from within an ASCII terminal emulation session.

  To view the clipboard, switch to a non-ASCII session, enter Extension mode and press the View key.
- You cannot paste data to an ASCII terminal emulation session.

Functions

The following describes the functions that support Copy Session to Session operation.

Function	Description
Copy	To copy a block of data to the clipboard, move the cursor to the upper-left corner of the block, enter Extension mode, and press the Begin Clip key. Then, move the cursor to the lower-right corner of the block, enter extensions mode and press the End Clip key.
Paste	To paste the current clipboard contents to an area within an LT, move the cursor to the desired location, enter Extension mode, and press the Paste key. Once copied, you can paste the data from the clipboard multiple times. The data remains on the clipboard until new data is copied or the terminal is powered off. Pasted data will overwrite existing unprotected data (instead of being inserted). If you attempt to paste beyond the allowed boundaries, nothing will be pasted.

View To view the data that is currently stored on the clipboard, enter Extension mode and press the View key. The screen goes blank and then displays the clipboard data.

To get out of View mode, again enter Extension mode and press the View key. The screen will now return to the previous display before you enter View mode.

Transfer Is a mode that allows you to copy from an ASCII terminal emulation session. To enter Transfer mode, enter Extension mode and press the Transfer key. The OIA will display the XFER indicator.

3174 Customization

To support Copy from Session to Session, you must customize the 3174 by specifying Y (Yes) to question 006 in the End User Productivity Functions panel.

Additional controller storage is also required and is calculated as follows:

4 KB x number of ports configured (hardware groups 26, 27, 21, 22 and 23)

Example Operation

A block of data on the LT display is marked for copying by defining the upper-left corner and the lower-right corner of the block. If the block is a single line of data, the upper-left corner is the first character and the lower-right corner is the last character of the line.

The following shows an example of a copy, view and paste operation, using a 3471 terminal.

```
  - LT-2 ---------------------------------------- ROW = 20 ----- SCROLL = 05 -
                           ******

For HELP enter HELP and when NCCF LOGO appears,
use LOGON ID (HELP) and PASSWORD (HELP).

  - LT-3 ---------------------------------------- ROW = 15 ----- SCROLL = 05 -
*       *      *     *    **      *     11   888
*       *       *   *     **            11  8   8
                 * *       ******       11   888
                  *              **     11  8   8
                           *     **     11   888
                            ******

For HELP enter HELP and when NCCF LOGO appears,
use LOGON ID (HELP) and PASSWORD (HELP).

  - LT-4 ---------------------------------------- ROW = 19 ----- SCROLL = 01 -
                           *     **     11   888
                            ******

For HELP enter HELP and when NCCF LOGO appears,
use LOGON ID (HELP) and PASSWORD (HELP).
______________________________________________________________________________
SB█WG-2
```

Figure 178. Copying and Pasting Data in Split Screen Mode

To copy a block of data, perform the following steps:

Step 1 Within the source LT, move the cursor to the upper-left corner, press ExSel U. The upper-left corner is now marked.

Step 2 Move the cursor to the lower-right corner, press ExSel L. The lower-right corner is now marked.

At this point, the block of data is copied to the clipboard.

Step 3 If copying within the same LT, move the cursor to the desired location, press ExSel P to paste the data.

If copying to a different LT in a Split Screen mode, jump to the desired LT by doing a sequential Jump or a Jump to Specific LT operation. When you are in the desired LT, move the cursor to the desired location, press ExSel P to paste the data.

If copying to a different LT on another MLT screen, Change Screen to the desired LT. When you are in the desired LT, move the cursor to the desired location, press ExSel P to paste the data.

The upper-left corner of the copied data appears at the current cursor position.

You can press ExSel V to view the data in the clipboard at anytime. When pressed, the current screen goes blank and the clipboard data is displayed, starting at the upper-left corner of the screen.

14.2.3 HAP Sharing for Local Copy

HAP Sharing for Local Copy allows a display attached HAP printer to be used for local copy by any display attached to the same 3174. This enhancement eliminates the need to attach a printer to each display for local copy.

HAP Sharing for Local Copy supports printers attached to 3270 CUT and ASCII displays; it does not supported printers attached to DFT devices. The display must be setup to use the attached printer as its printer (and not setup to use the subsystem printer). The printer ID in the OIA is 99 for the display with the attached printer. All other displays have the printer ID of the local copy printer.

3174 Customization

To enable HAP Sharing for Local Copy, respond to question 007 on the End User Productivity Functions panel with a Y (Yes) when customizing the 3174.

To allow a display attached HAP printer to be shared for local copy printing, the printer must be customized in the Printer Authorization Matrix (PAM) to allow shared mode operation when defining devices.

Example

This section describes an example of the customization required to support HAP Sharing for Local Copy. Figure 179 on page 460 shows a schematic diagram of the scenario.

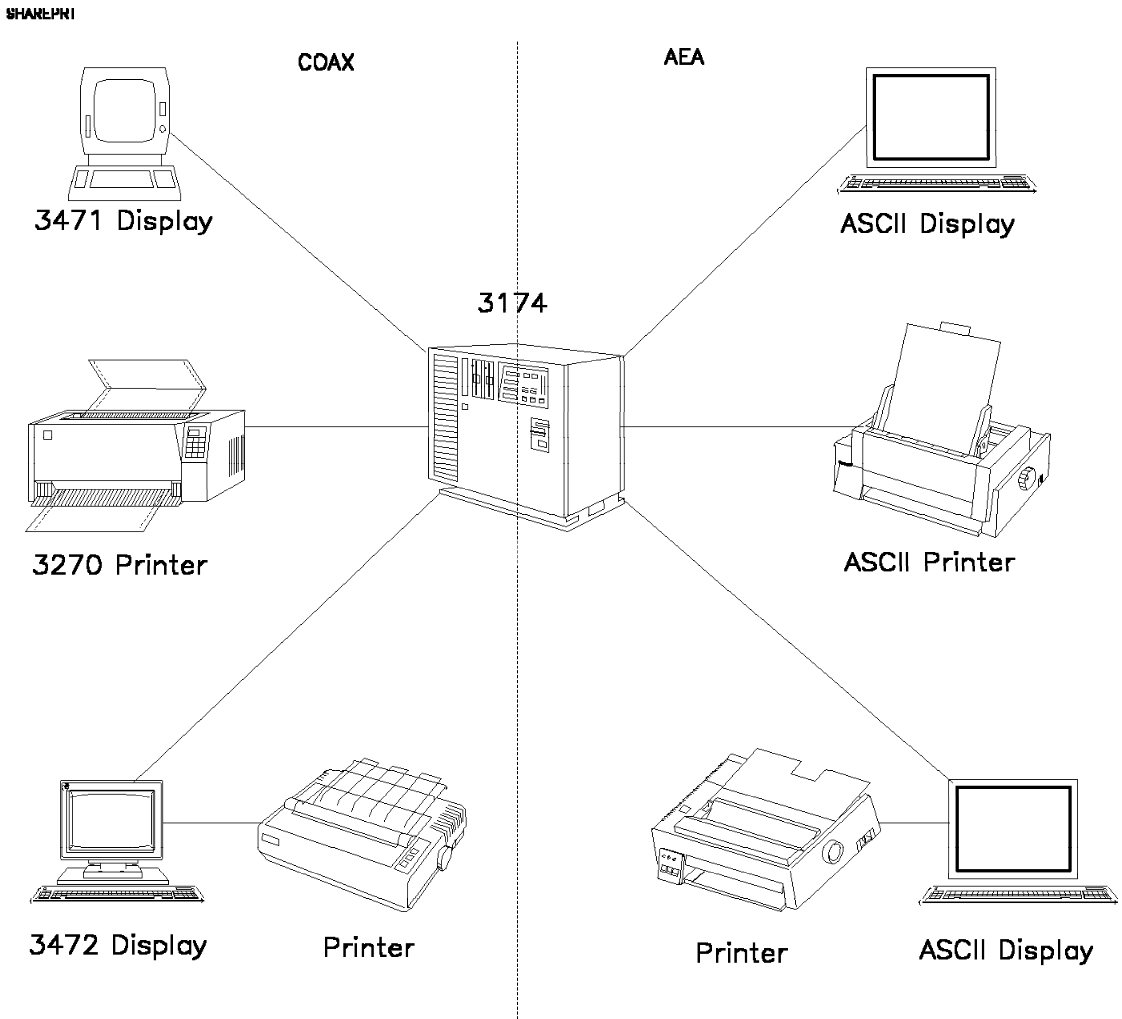


Figure 179. HAP Sharing for Local Copy Test Scenario

In this example, the 3174 is customized so that a user can initiate a local copy from a display attached to a 3174 port (3270 or AEA) to any printer. The user also has the option to local copy to a specific printer by changing the printer ID in the OIA.

Note: This example assumes you have already completed the port assignment for the various devices.

```
                   ___________ Device Definition ____________

  Select one or more Device Definitions. All selections
  will be processed without returning to this panel.


      800 Printer Authorization Matrix (PAM) - 1 0

      801 Logical Terminal Assignment        - 2

      802 Prompts for Extended VPD           - 0

      803 ISDN Definition                    - 0



  PF: 3=Quit                            8=Fwd
```

Figure 180. Device Definitions

Since we have devices attached only to hardware group 26, the response to question 800 is 10. With this response, the display user will specify either a number 1 through 55 which represents the hardware group 26 or AEA printer port, or a number 70 through 85 which represents the printer class.

When devices are attached to both hardware groups 26 and 27, the response to question 800 is 11. In this instance, the display user will specify either a number 1 through 47 which represents a PAM entry (instead of a port number), or a number 70 through 85 which represents the printer class.

```
                   ______________ PAM Definition ______________
   Entry     Printer        Mode          Class
              Port                  7           8
                                    01234 56789 012345
     1       26 - 01         2      .X... ..... ......

     2       26 - 02         2      .X... ..... ......

     3       21 - 01         2      .X... ..... ......

     4       21 - 02         2      .X... ..... ......

   Entry            3270 Display Ports               ASCII Display Ports
                        1           2           3    HG 21    HG 22    HG 23
        HG  01234 56789 01234 56789 01234 56789 01  01234567 01234567 01234567
     1  26  X.... ..... ..... ..... ..... ..... ..  X....... ........ ........
        27  ..... ..... ..... ..... ..... ..... ..
     2  26  X.... ..... ..... ..... ..... ..... ..  X....... ........ ........
        27  ..... ..... ..... ..... ..... ..... ..
     3  26  X.... ..... ..... ..... ..... ..... ..  X....... ........ ........
        27  ..... ..... ..... ..... ..... ..... ..

     4  26  X.... ..... ..... ..... ..... ..... ..  X....... ........ ........
        27  ..... ..... ..... ..... ..... ..... ..
      Select ===>

  PF: 3=Quit    4=Default    7=Back    8=Fwd    10=Page Back    11=Page Fwd
```

Figure 181. PAM Definition

In this example, we have defined four printers (at ports 26-01, 26-02, 21-01 and 21-02) to be used for shared host addressable printing and local copy (Mode=2). These printers are all defined as belonging to class 71, allowing the user to choose a specific printer, or printing to an available printer within that class.

The displays that can local copy to the four printers are the displays attached to ports 26-00 and 21-00.

3472 Setup

The following steps show the setting up of a 3472 display with an attached printer:

1. Press the SetUp key.
2. Select "Go to offline setup."
3. Select "Customize display station."
4. For Printer Model/Type, select "4201" or the appropriate model/type for your printer. Do not select "Subsystem."

Local Copy From 3471 Display

When the 3174 is IMLed, the 3471 display attached to port 26-00 indicates a printer ID 71 in the OIA. To local copy, press the Print key. The printer ID changes to 01, indicating the local copy will be printed on the printer attached to port 01. If this printer is not available, the printer ID changes to 02, indicating the local copy will be printed on the next printer in that class.

If you wish to local copy to a specific printer, press the Ident key and enter the port number of the printer desired.

Local Copy From 3472 Display

When the 3174 is IMLed, the 3472 display attached to port 26-02 indicates a printer ID 99 in the OIA. To local copy, press the Print key. The local copy can only be printed on the display-attached printer. You will not be able to change the printer ID.

Local Copy From 3163 Display

Ensure the 3163 display is setup correctly for the responses entered during AEA customization. To local copy, press Ctrl P. To change printer destination, press Esc Z and enter the port number in the OIA area.

See the *Terminal User's Reference for Expanded Functions* for other keyboard mappings.

14.2.4 Local Print Buffering

Local Print Buffering allows an operator to copy screen data to a local copy printer and continue typing while the printer prints. This local copy capability allows several local copy jobs to be queued to 3174 control storage. Print buffering is particularly beneficial when multiple users share a single printer for local copy operations. In this environment, users may perform a local copy operation to a shared printer and not have to wait until the printer has completed the previous print job before the keyboard is available for further input.

Local Print Buffering is supported only for CUT devices, not DFT devices.

Shared Prints

If a host attempts to print to a printer currently processing buffered local copy print requests, the host print is rejected just as it would be without Local Print Buffering. The difference is a longer period of time before the host is allowed to print again.

If a host is printing for along time, local copy is blocked from processing, which could cause a lot of local copy print requests to be queued. Eventually, the buffers could fill and lock the keyboard with a Printer Very Busy indicator.

If either of these situations become a problem, we recommend you define the printer in the PAM for local mode only operation instead of shared mode operation.

Processing Sequence

When printing to the same printer, buffers queued to a single LT are processed together before any print requests from other LTs are processed. However, it is possible that a queue may empty between instances of pressing the Print key, causing a local copy print request from another LT to be interspersed.

If you local copy to a printer class ID (and not to a specific printer ID), your local copy requests may not be printed on the same printer.

The Printer Printing indicator is not displayed when the local copy is queued; it is displayed when the local copy request is actually being printed.

Power Off

If a printer powers off with buffers queued, all the local copy requests for all LTs queued to that printer are lost. If a display powers off with buffers queued, only the local copy requests for that display are lost. There is no indication for either case.

Device Cancel

If local copy requests are queued to be printed and the Device Cancel key is pressed, the remainder of the queue for that display is purged. Hence, do not use the Device Cancel key unless you want to purge all local copy requests queued for that display.

Printer Ident

The Ident key is disabled when there are buffers queued to be printed on that LT. If the Ident key is pressed when it is disabled, an X-f indicator is displayed.

When the queue is empty, the Ident key is re-enabled.

Host Loadable PAM

The Host Loadable PAM function is disabled when there are buffers queued to be printed on that LT. There is no indication.

When the queue is empty, the functions is re-enabled.

3174 Customization

To support Local Print Buffering, you must customize the 3174 by allocating the amount of storage to hold local copy print requests (the queue buffer size) in question 001 in the End User Productivity Functions panel. The value specified must be a multiple of 2 KB, ranging from 0000 to 1024 KB. This is approximately 512 screens (24x80 bytes) that can be stored at the same time.

A response of 0000 (default) will disable the the Local Print Buffering function.

14.2.5 Calculator

The Calculator function gives CUT displays a 10-key calculator capability. It uses the OIA to display the input, result, memory store, error messages and modes of operation. The result displayed in the OIA may be used as input to a numeric field without rekeying.

The Calculator performs four basic arithmetic functions:

- Addition
- Subtraction
- Multiplication
- Division

Calculator Modes

The Calculator operates in one of two modes:

- Algebraic (in-fix notation)
- Reverse Polish (post-fix notation)

Algebraic Mode: The Algebraic mode operates like a hand-held in-fix calculator. The arithmetic operator is entered between the two numbers. The numbers are delimited by a + (plus) or - (minus) sign. In other words, the format is:

number*operator*number*delimiter*

For example, to subtract 2 from 4, you would enter:

```
4−2+
```

Reverse-Polish Mode: The Reverse Polish mode operates like a hand-held post-fix calculator. The arithmetic operator is entered after the two numbers. The numbers are delimited from each other by a + (plus) or - (minus) sign. In other words, the format is:

number*delimiter*number*operator*

For example, to subtract 2 from 4, you would enter:

```
4+2−
```

Note: To multiply two negative numbers, one of the numbers must be stored in memory. The other number is then entered as a negative number. The stored number is recalled and multiplied with the second negative number.

3174 Customization

To enable the Calculator function, you must customize the 3174 by specifying the mode of operation in question 002 in the End User Productivity Functions panel. You have three choices:

- 0=No Calculator function (default response)
- 1=Reverse Polish mode
- 2=Algebraic mode

In question 138: Standard Keypad Layouts, you specify the type of keypad to be used with the standard keyboard layouts selected in question 136. The valid responses are:

- 0=National Language Numeric Keypad (default response)
- 1=Data Entry Keypad
- 2=Program Function Keypad

To use the Calculator function, do not select response 2 for this question.

Calculator Fields

```
Calculator Active Indicator
 |
 |   Decimal Point Entry Mode
 |    |
 |    |    Memory Indicator
 |    |     |
 |    |     |    Memory Stored Value
 |    |     |      |
 |    |     |      |              Input     Result    Error Message
 |    |     |      |                |          |        |
 v    v     v      v                v          v        v
______________________________________________________________
CALC AUTO  MEM   150900.00        00.45     67905.00  DIVO
```

Figure 182. Calculator Fields in OIA

Calculator Active Indicator When the Calculator is active, CALC is displayed. When the Calculator is not active, this field and the rest of the Calculator fields are not displayed.

Decimal Point Entry Mode When in Auto mode, AUTO is displayed. When in Fixed mode, this field is blank.

Memory Indicator When the Calculator memory contains a non-zero value, MEM is displayed.

Memory Stored Value This field contains the last value stored in the Calculator memory.

Input This field contains the last number entered by the user.

Result This field contains the result of the last arithmetic operation. When Calculator mode is entered, this field is initialized to zeros.

Error Message This field may display one of the following error messages:

OVFL Indicates that the result of an arithmetic operation is larger than the Result field size, which is 13 characters including the decimal point. For example, OVFL will be displayed if you add 0.01 to 9999999999.99, or if you add 0.0000001 to 99999.9999999.

DIV0 Indicates that an attempt was made to divide a number by zero.

OVER Indicates that an attempt was made to select more decimal places than would fit in either the Memory or Result field. The Memory field, like the Result field, can contain 13 characters including the decimal point. For example, OVER will be displayed if you select seven decimal places for the number 123456.123456.

Calculator Keys

When the Calculator is invoked, the display is put into Calculator mode and the Calculator occupies the OIA. In this mode, only Calculator-related keys listed in this section are accepted; all other keys are ignored.

Calculator On key The Calculator On key allows you to enter Calculator mode. You cannot enter Calculator mode when:

- The keyboard is inhibited.
- The display is in Test mode.
- The display is in View mode.
- The display is in Change Format mode.
- The display is in Extension mode.
- The display is in Split Screen setup mode.

When in Calculator mode, this key performs as the Exit and Exit Paste keys.

Numeric keys The numeric keys located above the alphabetic keys and the numeric keys on the keypad are used to input numbers.

Fixed or Auto key The Fixed or Auto key is a toggle key that determines the decimal point entry mode:

- In Fixed mode, you must enter the decimal point where required.
- In Auto mode, the numbers entered have preset decimal positions. You can select the number of decimal positions for Auto mode using the PF2 through PF7 keys.

Upon 3174 IML, the default is Auto mode. The Decimal Point Entry Mode indicator in the OIA will show AUTO when in Auto mode; it will be blank when in Fixed mode.

PF2—PF7 keys
These PF keys allow you to select the number of decimal places that the Calculator displays when in Auto mode:

- PF2 selects two decimal places.
- PF3 selects three decimal places.
- PF4 selects four decimal places.
- PF5 selects five decimal places.
- PF6 selects six decimal places.
- PF7 selects seven decimal places (maximum).

The default is two decimal places.

Arithmetic keys
the following keys provide arithmetic operations:

- Addition key (on keypad)
- Subtraction key (on keypad and typewriter keys)
- Multiplication key (on keypad)
- Division key (on keypad and typewriter keys).

Memory Store key
The Memory Store key copies the Result field to the Memory field. The value in the Memory field remains unchanged until another Memory Store operation.

Memory Recall key
The Memory Recall key copies the value in the Memory field to the Input field.

Exit key
The Exit key allows you to exit Calculator mode.

Exit Paste key
The Exit Paste key is the alternate shift function of the Exit key. Exit Paste exits Calculator mode, pastes the result at the current cursor location (if in a numeric, unprotected field), and moves the cursor past the end of the pasted result.

If the cursor is in a non-numeric or protected field, or if the result is larger than the field size, nothing is pasted, a warning beep sounds and you remain in Calculator mode.

Exit Paste ErEOF key
The Exit Paste ErEOF key exits Calculator mode, pastes the result at the current cursor location (if in a numeric, unprotected field), moves the cursor past the pasted result, and erases to the end of the current field.

If the cursor is in a non-numeric or protected field, or if the result is larger than the field size, nothing is pasted, a warning beep sounds and you remain in Calculator mode.

Exit Paste ErEOF Tab key
The Exit Paste ErEOF Tab key is the alternate shift function of the Exit Paste ErEOF key. Exit Paste ErEOF Tab exits Calculator mode, pastes the result at the current cursor location (if in a numeric, unprotected field), moves the cursor past the pasted

result, erases to the end of the current field, and tabs to the next numeric, unprotected field.

If the cursor is in a non-numeric or protected field, or if the result is larger than the field size, nothing is pasted, a warning beep sounds and you remain in Calculator mode.

PF12 key
The PF12 key pastes the result at the current cursor location (if in a numeric, unprotected field), moves the cursor past the the pasted result, erases to the end of the current field, and tabs to the next numeric, unprotected field. It does not exit Calculator mode.

If the cursor is in a non-numeric or protected field, or if the result is larger than the field size, nothing is pasted and a warning beep sounds.

Clear Input and Result key
The Clear Input and Result key zeros the Input and Result fields and resets the Error Message field.

Clear Input key
The Clear Input key zeros the Input field but does not change the Result field.

Reset key
The Reset key unlocks the keyboard.

3270 Displays Supported

The Calculator function is supported by CUT terminals such as 3179, 3180, 3191, 3192, 3471 and 3472 displays. The following keyboards are supported:

- Converged Typewriter
- Converged Data Entry
- Converged APL
- Enhanced

Note: The Calculator function cannot be turned on for 3471 and 3472 displays setup for HAP.

14.2.6 Token-Ring T1 Timer/Retry Count

The Token-Ring T1 Timer/Retry Count enhancement allows the user to select the 3174 T1 timer and retry count values that are most optimal for the user′s network. The T1 timer specifies the amount of time the 3174 Token-Ring Adapter waits for an acknowledgement after transmitting a frame. The T1 timer retry number specifies the maximum number of retransmissions after the T1 timer expires.

Prior to Configuration Support-C Release 2, the T1 timer and retry count were fixed at 1.5 seconds and 7 retries, giving a total of 8 transmission attempts. Thus, if there were no response, it took approximately 12 seconds (8x1.5 seconds) for the transmission to fail.

With Configuration Support-C Release 2, default values still apply to the T1 timer and retry count. However, you can now select the values most suitable for your network configuration.

3174 Customization

You can select the value for the T1 timer in question 004 and the value for the retry count in question 005 in the End User Productivity Functions panel.

Valid values for the T1 timer that can be selected are shown in Table 22.

Table 22. Token-Ring T1 Timer Selections

Question 004 Response	T1 Timer Range (in seconds)
0	1 - 2
1	2 - 3
2	3 - 4
3	4 - 5
4	5 - 6
5 (default)	1.68 - 2.24
6	6.96 - 10.44
7	10.44 - 13.92
8	13.92 - 17.40
9	17.40 - 20.88

The retry count default response is 07. Valid retry counts range from 00 to 99.

Setting T1 Timer/Retry Count

The T1 timer value should always be greater than the total delay time that the frame might encounter through the network. Normal settings are in the range of 1 to 2 seconds. Too high a value will result in noticeable delays to those responses that must be retransmitted.

The maximum number of retry count together with the T1 timer should be great enough to allow for error detection and recovery on the network. The retry count also prevents continual retransmission of the same I-frame.

Care should be taken when specifying these values where bridges are used, particularly with remote bridge configurations.

14.2.7 5250 Keyboard Emulation

5250 Emulation support makes it possible for the 3174 to provide emulation of the Field Exit, Field Minus, and Field Plus keys used on 5250 keyboards. It also provides emulation of the 5250 Reset key.

AS/400 Requirements

The following products are required on the AS/400 for 5250 Emulation:

- OS/400 Version 1 Release 3 or later, with the following fixes applied:
  - Version 1 Release 3 requires PTF MF02929.
  - Version 2 Release 1 requires PTF MF02930.

  Later OS/400 versions and releases do not require any PTFs.
- 3270 Remote Attachment Feature.

Types Of Fields

The 5250 Emulation supports the following types of fields:

Numeric field
A field that can contain only numeric digits 0 through 9, or other characters that are allowed in the Numeric Lock state (the decimal point, the minus sign, and Dup).

The only way to leave this field is by means of a Field Exit, Field Minus, or Field Plus function; this keyboard state is known as Field Exit function pending.

Signed numeric field
A numeric field in which the first character location contains a + (plus) or a - (minus) sign.

Unsigned numeric field
A numeric field in which the first character location does not contain a + (plus) or a - (minus) sign.

Non-numeric field
A field that can contain alphanumeric characters.

Field Exit Functions

The Field Exit, Field Minus, and Field Plus functions perform differently, depending on the type of field in which they are used:

- In any protected field, they all do a Tab function to position the cursor in the next unprotected field.
- In an unprotected non-numeric field, or an unsigned numeric field, they all clear the field from the cursor to the end of the field and tab to the next unprotected field.
- In a signed numeric field, if the cursor is in the first character location in the field, the Field Exit and Field Plus functions set the character to a + (plus), and the Field Minus function sets the character to a - (minus).

  If the cursor is not in the first character location in the field, the field clears from the cursor to the end of the field, and the cursor tabs to the next unprotected field.

Field Function Keys

Unless otherwise noted below, all functions are unaffected by this feature. Any key function that attempts to move the cursor out of the field when a Field Exit function is pending will not be allowed and an X-f will be displayed in the OIA. The cursor skips (will not enter) the sign of a signed numeric field.

The sign is the first character position of a field. The first entry position of a signed numeric field is really the second character position in the field. In all other fields, the first entry position is the first character position.

Alphanumeric Keystrokes
Entering a character into a numeric field sets the Field Exit function pending state.

For a signed numeric field, if a character is entered into the last position of the field, the cursor is positioned on the sign character (the first character position in the field). If subsequent characters are entered, the X-f indicator is displayed in the OIA.

For an unsigned numeric field, if a character is entered in the last position of the field, a Tab function is performed to position the cursor in the next unprotected character location.

PF and PA keys
If there is a Field Exit function pending, the field is cleared (not the sign character if in a signed numeric field), the cursor is positioned in the first entry position of the field, and the PF or PA will be processed.

Enter
If there is a Field Exit function pending, no function will be provided and an X-f OIA indicator will be displayed.

Tab
Positions the cursor in the first entry position of the next field.

Back Tab
Positions the cursor in the first entry position of the field. If the cursor was in the first entry position of the field, positions the cursor in the first entry position of the previous field.

Cursor Move Right and Fast Cursor Move Right
If the result would be to position the cursor on the sign character of a signed numeric field, the cursor skips over the sign character to the first entry position of the field.

Cursor Move Left and Fast Cursor Move Left
If the result would be to position the cursor on the sign character of a signed numeric field, the cursor skips to the last position of the previous field.

Cursor Move Up and Cursor Move Down
If the result would be to position the cursor on the sign character of a signed numeric field, the cursor skips over the sign character to the second position of the field.

Reset
In an error condition, a Message Line appears, and the keyboard is locked with X SYSTEM displayed in the OIA. Use Reset to acknowledge the Message Line. The Reset function sends an Enter AID to the application, and the application unlocks the keyboard.

3174 Customization

You can customize the 3174 for 5250 Emulation support via question 003 in the End User Productivity Functions panel. Valid responses are:

- 0=No 5250 Emulation (default response)
- 1=Field Exit, Field Minus, Field Plus, and Reset
- 2=Field Minus, Field Plus, Reset, and New Line

Keyboard Mapping

Table 23 shows the keys required for the various 3270 keyboards when emulating 5250 functions.

Table 23. 5250 Emulation Keys

5250 Function	Base Keyboard	Converged Keyboard	Enhanced Keyboard
FIELD EXIT	New Line	New Line	New Line
FIELD MINUS	Not supported	- (minus)	- (minus)
FIELD PLUS	Not supported	Enter (keypad)	Enter (keypad)
RESET	Reset	Reset	Reset

14.2.8 132-Column Support via AEA

The 132-Column Support via AEA enhancement allows both ASCII terminal emulation (3270 device emulating an ASCII terminal) and 3270 terminal emulation (ASCII device emulating a 3270 terminal) to display up to 132 columns of data on a single line (for terminals that are able to display 132 columns). With this enhancement, a user can display extended print lines prior to, or in lieu of, printing.

3270 emulation provides 24 rows by 132 column support for the IBM 3151, 3161, 3162, and DEC VT220 displays. It also provides 27 row by 132 column support (Model 5) support for the IBM 3162 display. Additional support is provided for screen sizes of 43 rows by 80 columns for terminals emulating the DEC VT100 datastream.

3174 Customization

The 132-Column Support for ASCII function works automatically and requires no 3174 customization. However, you should note the following:

Question 722: Station Type: See Table 14 on page 295 for the list of station types supported, with new station types supported by Configuration Support-C Release 2 shown highlighted. You should choose the appropriate station type for the 132-Column Support for ASCII.

Question 751: Data Stream Supported by the ASCII Host: A response is required for ASCII hosts and specifies the datastream supported:

- 1=Host uses VT100 datastream
- 2=Host uses 3101 datastream
- 3=Host uses Data General D210 datastream (US English only)
- 4=Host uses VT220 7-bit datastream
- 5=Host uses VT220 8-bit datastream

There is no default response for this question. For 132-Column Support for ASCII host attachment, you must select response 1, 4 or 5 for this question.

User-Defined Terminal Table: The addition of the 132-Column Support for ASCII for the new station types has changed some of the User-Defined Terminal Table panels.

Figure 183 on page 473 highlights the new station types supported by Configuration Support-C Release 2.

```
                  __ User-Defined Terminal (UDT) Selection ___

  Type the new UDT number and name,
  then type the Model ID for the initial defaults

  UDT Number __               U1 - U6

  Name . . . ______________   14 Characters

  Model  . . __    --------------- Model Options ---------------

    U1. UDT-1                I1. IBM 3101              V1. DEC VT100
    U2. UDT-2                I3. IBM 3151/61/62/63     V2. DEC VT241
    U3. UDT-3                I4. IBM 3164              V5. DEC VT52
    U4. UDT-4                I6. IBM 3151 (132 cols)   V6. DEC VT220
    U5. UDT-5                I7. IBM 3162 (27x132)     H2. HP 2621B
    U6. UDT-6                FC. FTTERM Color          L3. LS ADM 3A
                             T1. Televideo 912         W1. WYSE 50/60
                             T7. Televideo 970         X4. Tektronix 4205



  PF: 3=Quit                              8=Fwd
```

Figure 183. Configuration Support-C Release 2 New Station Types

Figure 184 highlights the additions to Cursor Class and Cursor Sequence supported by Configuration Support-C Release 2.

```
                  ___ U1 User-Defined Terminal Attributes ____

  Tab to selection field and type option

                              Selection           Options
                             ------------      ----------------------
  Last Line Reserved for Status   N              Y=Yes        N=No
  Status Line Character Set....   0              0-2
  Status Line Clear Option.....   0              0-3
  Use Cursor Seq on Status Line   N              Y=Yes        N=No
  Scrolling On.................   N              Y=Yes        N=No
  Cursor Wraps at End of Line..   N              Y=Yes        N=No
  Color Supported..............   Y              Y=Yes        N=No
  Cursor Class.................   1              0-6
  Cursor Sequence..............   1B5B3B48__     ASCII hex codes
  Alternate Screen Size .......   3              0-5
  Graphics Query Reply.........   DEC340__       8 Characters
  Graphics Input Wait Time.....   2_             0-99 (100 milliseconds)
  Graphics Input Ending Seq....   5D0D______     ASCII hex codes
  Graphics Input Length........   128            1-128 Bytes



  PF: 3=Quit    4=Default             8=Fwd
```

Figure 184. Configuration Support-C Release 2 Cursor Class and Cursor Sequence

Cursor Class is a decimal number from 0 to 6 that indicates how the Set Cursor command is formatted.

Cursor Sequence is a sequence of hexadecimal digits, two to five pairs long, that directs the station to perform a Set Cursor function.

Classes 0 to 5 were previously supported. Configuration Support-C Release 2 supports a new Class 6, which is:

- Any two ASCII characters
- The line number, 2 bytes hexadecimal, using the following method:
  - byteh = (line/X′20′)+X′20′
  - bytel = (line MOD X′20′)+X′20′
- The column number, using the same method, with an additional X′20′ added to bytel.

This sequence has two pairs of introducers; for example, to position the cursor at line 25, column 101, the sequence might be:

```
ESC y SP 8 # D ...( the sequence)
1B 79 20 38 23 44 ... ( in hex)
```

For a station that supports this cursor class, the entry for this example would be 1B79.

Alternate Screen Size sets the size of the station screen. Previously, options 0, 1 and 2 were supported. Configuration Support-C Release 2 adds options 3, 4 and 5:

- 0=Screen size is 24 x 80 lines/column
- 1=Screen size is 30 x 80 lines/column
- 2=Screen size is 32 x 80 lines/column
- 3=Screen size is 24 x 132 lines/column
- 4=Screen size is 27 x 132 lines/column
- 5=Screen size is 43 x 80 lines/column

Figure 185 highlights the new Set Width options for ASCII devices supported by Configuration Support-C Release 2.

```
                   U1 Outbound Sequences - 3174 to ASCII Device
                                                       Entry 015 of 028
 Type the ASCII Sequence for each function

    Function       ASCII Sequence to the Terminal

  Status On        __________________________________
  Status Off       __________________________________
  Bell             __________________________________
  Dim Unprot       __________________________________
  Highlt Unprot    __________________________________
  Dim Protec       __________________________________
  Highlt Protec    __________________________________
  Transparency On  __________________________________
  Transparency Off __________________________________
  Alpha Clear      __________________________________
  Start Printer    __________________________________
  Stop Printer     __________________________________
  Set Width 132    __________________________________
  Set Width 80     __________________________________

 PF: 3=Quit    4=Default    7=Back    8=Fwd    10=Page Back   11=Page Fwd
```

Figure 185. Configuration Support-C Release 2 Set Width Options

Display Setup

A display must be setup to support the correct number of rows and columns.

Host Definitions

Figure 186 shows an example of the logmode entries required to support 24x132 and 27x132 screen sizes.

```
*-------------------------------------------------------------------*
*               LOGMODE ENTRY FOR 24 x 132 SCREEN                   *
*-------------------------------------------------------------------*
MXSDLCNQ MODEENT LOGMODE=MXSDLCNQ,FMPROF=X'03',TSPROF=X'03',         X
               PRIPROT=X'B1',SECPROT=X'90',COMPROT=X'3080',          X
               RUSIZES=X'87C7',PSERVIC=X'020000000000185018847F00'
*-------------------------------------------------------------------*
*               LOGMODE ENTRY FOR 27 x 132 SCREEN                   *
*-------------------------------------------------------------------*
M5SDLCNQ MODEENT LOGMODE=M5SDLCNQ,FMPROF=X'03',TSPROF=X'03',         X
               PRIPROT=X'B1',SECPROT=X'90',COMPROT=X'3080',          X
               RUSIZES=X'87C7',PSERVIC=X'02000000000018501B847F00'
```

Figure 186. 132-Column Logmode Entries Example

14.2.9 Entry Assist Support for ASCII

The Entry Assist Support for ASCII enhancement extends 3174 Entry Assist functions to ASCII devices.

The Entry Assist functions provide 24x80 screen displays with “wordprocessing” capabilities for limited local format, entry, and edit control when operating with one of the supported IBM host editors (XEDIT, PROFS Editor, ISPF/PDF, ICCF Editor, etc). Capabilities include:

- Display of a scale line, when required, for establishing margins, tab stops, and End-of-Line signal position.
- Screen margins, to automatically confine the body of the input material within the margins.
- Tabbing, to move the cursor to the next tab stop and replace null characters with space characters, allowing rapid entry of table data.
- Audible End-of-Line signal, to alert operator that a new line is required.
- Word wrap (automatic new line), to automatically move partially typed words to the next line.
- Word delete, to delete a word from the current cursor position to the end of the word.
- Typematic character delete.
- Cursor position display.
- Rapid cursor positioning.

Unlike the normal Entry Assist functions, error-correcting backspace function is not supported by this enhancement.

Document Mode

To use Entry Assist functions, press the Document On/Off (DOC ON OFF) key.

Change Format Mode

To enter Change Format mode, press the Change Format (CHG FMT) key. To exit, press the key a second time.

When the display is in Change Format mode, you can:

- Check the status of margins, tab stops, and audible End-of-Line signal positions.
- Set margins, tab stops, and audible End-of-Line positions.

3174 Customization

The Entry Assist function works automatically and requires no 3174 customization.

Operation Example

To invoke Entry Assist functions, the ASCII display must be placed into Extension mode, using the appropriate keystroke sequence. The following is an example of the keystrokes used on a 3151 ASCII display:

- To turn on the Entry Assist functions, enter:

  Ctrl L followed by D (DOC ON)

- To set margins, tabs and the audible End-of-Line signal, enter:

  Ctrl L followed by F (Change Format)

When invoking the above extended select mode functions you should see the > (greater than) sign displayed in the OIA.

14.2.10 CSCF IML Password Suppression

To allow a 3174 to be IMLed using an online test option (Test 14) via NetView CSCF, a password must be entered in 3174 customizing question 098. Prior to Configuration Support-C Release 2, this password must be entered when Test 14 is invoked.

With the IML Password Suppression enhancement, a NetView CSCF console operator can now IML a 3174 without requiring the entry of a password (even though one is customized). This enhancement can be significant in saving operator keystrokes and eliminating the need to maintain lists of passwords, especially in large networks of 3174s.

Note: A password is still required when you invoke Test 14 from a display locally attached to the 3174.

3174 Customization

To enable the CSCF IML Password Suppression, you must respond to question 008 with a Y (Yes) in the End User Productivity Functions panel.

14.3 Telephone Twisted-Pair Terminal Multiplexer Adapter

The Telephone Twisted-Pair Terminal Multiplexer Adapter (TTP TMA) is a high density adapter which allows the attachment of up to 32 3270 devices to a 3174 using telephone twisted-pair wiring. The attachment between the TTP TMA and the user′s patch panel is accomplished by use of two 25-pair bulk TTP cables fitted with standard 25-pair "telco" connectors.

The TTP TMA was previously available as RPQ 8Q0806. With Configuration Support-C Release 2, this adapter is now offered as feature #3105.

Using the TTP TMA greatly reduces the amount of wiring required between the 3174 and the terminals in the work locations. Other benefits include:

- Cable Management

  The TTP TMA can attach 32 3270 devices via two 25-pair bulk telephone cables (the TTP TMA only uses 16 pairs in each cable), instead of the 32 cables that are required when using standard 8-port TMAs (feature #3103).

- Improved Slot Utilization

  The TTP TMA requires only one card slot in the 3174, in contrast to using four slots when using the 8-port TMAs.

- Reduced Cost

  The connection between the TTP TMA and the user′s patch panel is accomplished with two 25-pair bulk telephone cables. This, in most environments, replaces a complex configuration of multiple TMAs, cables, baluns, and additional multiplexers or "octopus" cables. When connecting IBM InfoWindow displays to the wiring system at the terminal end, baluns are not required if the DPC-T3 Adapter (PN 83X9758) is used in conjunction with the Dual Purpose Connector which is standard on the InfoWindow displays.

- Improved Reliability

  By substantially reducing the number of connections or potential points of failure, the TTP TMA can enhance the quality and reliability of the network.

3174 Customization

There are no special 3174 customizing requirements.

Installation

Figure 187 on page 478 shows an example installation between the TTP TMA installed in a 3174 at one end and the terminals at the other, with patch panels in between.

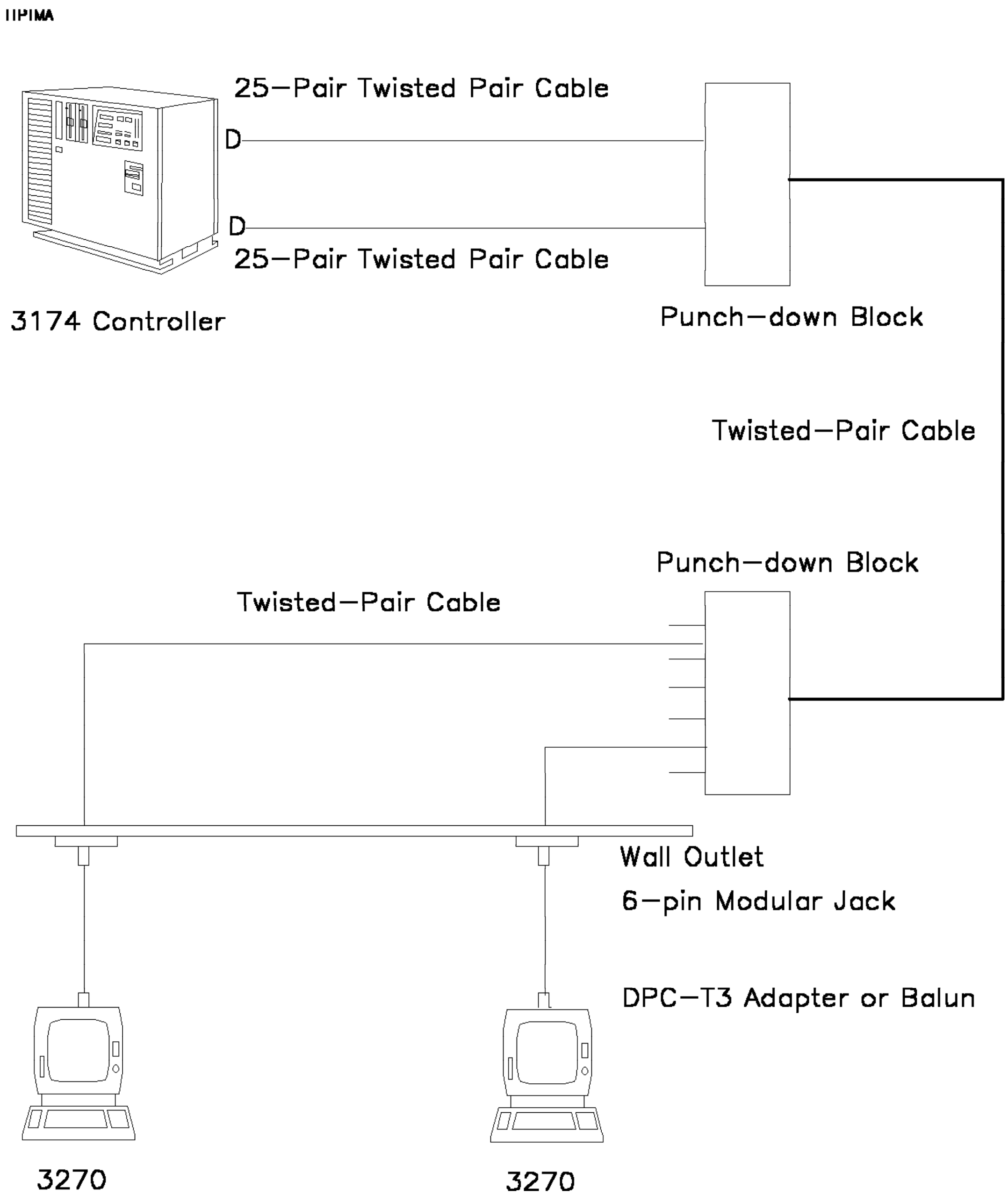
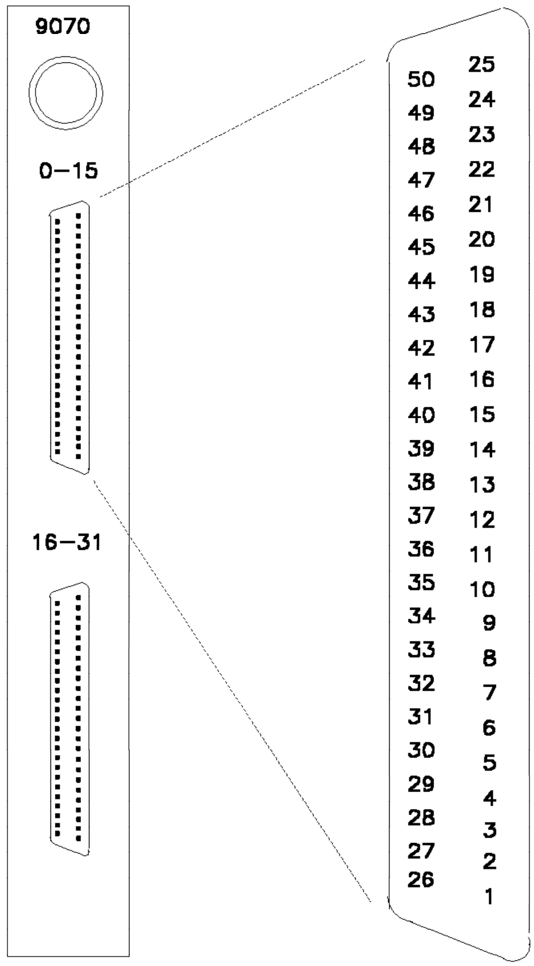


Figure 187. TTP TMA Attachment to Terminals

The TTP TMA can be installed in any feature slot that normally accepts a TMA (feature #3103). Figure 188 on page 479 shows a TTP TMA.

TTPCONN



Port Number		Pin Assignment	
Top Conn	Bottom Conn		
0	16	26	1
1	17	27	2
2	18	28	3
3	19	29	4
4	20	30	5
5	21	31	6
6	22	32	7
7	23	33	8
8	24	34	9
9	25	35	10
10	26	36	11
11	27	37	12
12	28	38	13
13	29	39	14
14	30	40	15
15	31	41	16
Not Used		42	17
		43	18
		44	19
		45	20
		46	21
		47	22
		48	23
		49	24
		50	25

Figure 188. TTP TMA Connectors and Pin Assignment

The TTP TMA has three connectors:

- One Dual Purpose Connector (DPC)
- Two 50-position female D-shell connectors

To support 32 devices, the DPC connector of the TTP TMA is attached to port 0 of the 3174 Terminal Adapter, using a short length of coax cable. The two 50-position D-shell female connectors are then connected to the TTP wiring facilities by two 25-pair TTP cables. Each cable transports the datastreams for 16 terminals, from the TTP TMA to the wiring distribution panels. (The D-shell connectors are the 50-position connectors used for normal telephone wiring connections.)

To support 64 devices, two TTP TMAs are needed: the DPC connector of the first TTP TMA is attached to port 0 of the 3174 Terminal Adapter, and the DPC connector of the second TTP TMA is attached to port 0 of the 3270 Port Expansion Feature, using two short lengths of coax cable.

Figure 188 also shows the pin assignment between the 3270 port numbers and the pins in the connectors. Note that only 16 pairs of the 50 pins available are used.

Considerations

- The TTP TMA is only available in certain countries.
- The telephone wiring must meet the specifications for IBM Cabling System Type 3 media.
- The maximum supported distance between the TTP TMA and the terminal is 900 feet (275 meters). There is no minimum distance required.
- Each TTP TMA supports a maximum of 32 3270 devices.
- A 3174 with a maximum capacity of 32 ports can support only one TTP TMA used in 32-port mode. In this configuration, the 3174 cannot support more than 32 devices by installing additional TMAs or 3299 Terminal Multiplexers, or directly attaching devices to the Terminal Adapter ports.
- To support more than 32 devices, you must install the 3270 Port Expansion Feature.

  A second TTP TMA can be connected to the 3270 Port Expansion Feature to provide attachment for another 32 3270 devices.
- The TTP TMA can coexist with TMAs or 3299 Terminal Multiplexers.
- The TTP TMA is supported by the same 3174 diagnostic and port wrap capabilities currently available for existing coax attachments.
- Support for the TTP TMA is provided for 32-port or 64-port 3174 models only.
- Support for TTP TMA is provided by the following microcode:
  - Configuration Support-C Release 2
  - Configuration Support-B Release 4 with RPQ 8Q0806
  - Configuration Support-A release 5.4 with RPQ 8Q0806

Chapter 15. Configuration Support-C Release 3

15.1 Introduction

In May 1993, IBM announced Configuration Support-C Release 3 which supports connections to SNA, APPN (TM), and TCP/IP environments. Release 3 builds on the Advanced Peer-to-Peer Networking (TM) (APPN) and Peer Communication (LAN over COAX) capabilities of Release 2. Configuration Support-C Release 3 Licensed Internal Code, (LIC) significantly expands 3174 connectivity through both APPN enhancements and the integration of TCP/IP Telnet support (formerly RPQ 8Q0935).

Configuration Support-C Release 3 also continues to support the functions provided in Configuration Support-C Release 2 including:

- Advanced Peer-to-Peer Networking
- Peer Communication (LAN on Coax)
- End-user productivity enhancements (for example, Split Screen and Copy Session-to-Session)
- Support for up to 64 3270 devices plus 24 ASCII devices
- ISDN Basic Rate Interface (BRI) support

This chapter briefly describes the enhancements announced with Configuration Support-C Release 3.

- APPN enhancements
- TCP/IP Telnet support
- Concurrent Communication Adapter (CCA) Support
- Host addressable Printer (HAP) assignment
- Calculator function enhancements
- 3174 Peer Communication improvements

15.2 APPN Enhancements

- 3174 Network Node (NN) compatibility in environments where the host is a LEN (Low Entry Networking) node, APPN Network Node (NN), Migration Data Host (MDH), or an Interchange Node (IN).
- Support for multiple links (that is, multi-tail) into an SNA subarea (LEN) from an APPN network comprised of 3174s and other APPN nodes. APPN multi-tail support enables customers to migrate their Token-Ring LAN environments to APPN ahead of the SNA subarea. This is made possible by providing support for multiple LEN connections between the APPN network and the subarea, and multiple subarea connections from a single 3174 Network Node via a Token-Ring LAN.
- Support for the transfer of 3270 and APPN datastreams across a single SDLC link between a 3174 and an AS/400. Both PU 2.0 and T2.1 datastreams can share a single 3174-to-AS/400 link.

15.3 TCP/IP Telnet Support

TCP/IP Telnet support (integration of TCP/IP Telnet support RPQ 8Q0935 provides Telnet client function for the IBM 3174 Establishment Controller. This support allows interactive access to remote TCP/IP hosts/servers from dependent 3174-attached terminals. Control Unit Terminal (CUT), ASCII, and Distributed Function Terminal-Extended (DFT-E) terminals can communicate directly with TCP/IP hosts/servers.

The 3174 communicates with a TCP/IP host via the 3174′s interface to a token-ring or Ethernet LAN. Thus, a dependent terminal attached to a 3174 can establish an interactive Telnet session with a TCP/IP server anywhere in the existing LAN/WAN network. The host/server may be attached directly to the token-ring/Ethernet LAN, or it may exist anywhere in the network reachable via that LAN and any bridges or routers.

See Chapter 21, “TCP/IP” on page 605 for more details on 3174 Telnet Support.

15.3.1 Supported TCP/IP Protocols

The following TCP/IP protocols are supported by Configuration Support-C Release 3 Telnet support:

- IP -- Internet Protocol
- ICMP -- Internet Control Message Protocol
- ARP -- Address Resolution Protocol (Resolver client only)
- TCP -- Transmission Control Protocol
- UDP -- User Datagram Protocol
- Telnet -- Teletypewriter Network (client only)
- PING -- Packet Internet Groper (ICMP)
- DNS -- Domain Name Server (stub resolver)
- SNMP -- Simple Network Management Protocol (MIB-1 Agent Only)

The SNMP agent responds to requests for MIB variable information from an SNMP client elsewhere in the network. The SNMP support requires additional storage, as shown in the Configuration Support-C storage configurator of the 3174 Sales Pages.

Using 3174 TCP/IP Telnet support, any dependent display that currently attaches to the 3174 controller (CUT, ASCII, DFT-E) can operate in Telnet mode. ASCII displays are supported via the AEA feature (Feature Code 3020). Coaxial-attached displays operating in CUT mode are supported as VT100 (3), VT220 (3), IBM 3101 or DG210 devices. These devices are supported as 24 X 80 full-screen devices. When accessing TCP/IP on an IBM host (TCP/IP for VM or MVS), only line-by-line mode is supported. (Note: TN3270 support -- RPQ 8Q1041 -- will provide full-screen 3270 datastream support.)

15.3.2 TCP/IP Telnet Terminal Support

The 3174-attached dependent terminals that can be used to access TCP/IP applications are:

- Coaxial-attached (CUT) dependent displays (up to five sessions via MLT)
- Intelligent displays operating in CUT mode (up to five sessions via MLT)
- DFT-E displays operating in ASCII host session mode (one session)
- ASCII displays (up to five sessions via AEA MLT)
- 3174 TCP/IP Telenet Support was previously made available via RPQ 8Q0935

15.3.3 Benefits of 3174 TCP/IP Telnet Support

In today′s world of multi-vendors and multi-protocols, SNA networks and TCP/IP networks are running side by side. Many users have a need to access applications in both networks, but do not want the inconvenience and expense of two separate display terminals -- one for each network.

Existing IBM products provide TCP/IP support for intelligent workstations attached to a 3174 with Peer Communication, and now the 3174 integrates RPQ 8Q0935, which provides similar Telnet function for dependent 3270 workstations. 3174 TCP/IP Telnet support allows 3270 CUT-mode terminals and ASCII display stations attached to a 3174 to communicate with TCP/IP Telnet servers. Dependent terminals (3270 CUT and ASCII) attached to a 3174 that has a token-ring or Ethernet LAN Adapter can establish a TCP/IP Telnet session with a TCP/IP host or server application anywhere in the existing LAN network. The host/server may be attached directly to the token-ring or Ethernet LAN, or it may be bridged to the token-ring or Ethernet LAN. The TCP/IP support provides the ability to send messages, share files, and access remote applications across the enterprise.

15.4 Concurrent communication Adapter (CCA) Support

Concurrent Communication Adapter support for the 3174 Port Expansion Feature Configuration Support-C Release 3 makes it possible for devices attached to the 3174 via the Port Expansion Feature (Feature Code 3100) to access a secondary host via the Concurrent Communication Adapter (CCA). In the past, devices attached to ports 32 to 63 could not access applications running on a secondary host link through the Concurrent Communication Adapter, while devices attached to ports 0 to 31 could access applications running on either the primary, secondary, or both host links. With Release 3, devices attached to ports 32 to 63 have the same host link access capabilities as devices attached to ports 0 to 31. A maximum of 160 sessions can be customized for each Concurrent Communication Adapter. This function was previously provided for Configuration Support-B only via RPQ 8Q0931.

15.5 Host Addressable Printer (HAP) Assignment

HAP Printer Assignment Configuration Support-C Release 3 also makes it possible to assign a HAP printer (Host Addressable Printer) to a host other than 1A in a Single Link Multi-Host (SLMH) environment. The HAP printer may be assigned to any host (1A through 1H) accessible via the 3174′s primary host link. This function was previously provided for Configuration Support-B only via RPQ 8Q1006.

15.6 Calculator Function Enhancements

The enhancements to the Calculate function (first provided in Configuration Support-C Release 2) now make it possible to calculate percentages, as well as perform hexadecimal calculations, in addition to the algebraic and Reverse Polish Notation (RPN) capabilities originally provided.

15.7 3174 Peer Communication Improvements

Configuration Support-C Release 3 provides improvements to the customization procedure for 3174 Peer Communication.

15.8 Benefits of Configuration Support-C Release 3 Enhancements

Network Routing Flexibility

Configuration Support-C Release 3 makes the 3174 more tolerant of network problems by providing multi-tail support. This support allows multiple links between APPN and SNA subarea networks. Communications can continue, even if one or more links should fail. Multi-tail′s dynamic shared link function increases 3174 tolerance to network conditions that differ from its configuration by allowing DSPUs to dynamically upgrade to APPN NN nodes with no customization changes at the 3174 Network Node server. Partial wild-card support provided with multi-tail allows more flexibility in routing from the APPN network to the LEN subarea, reducing the amount of VTAM host LU definition needed. In other words, the routing decisions can be made within the APPN network rather than having to be predefined in the subarea network. Multi-tail also increases network performance by eliminating the need to broadcast for route selection.

Reduced Customization Effort

Configuration Support-C Release 3′s improved APPN support reduces 3174 customization tasks for PU 2.0 intelligent workstations as they can be upgraded to become T2.1 ENs dynamically, with no customization or the need to IML the 3174. Also, since the 3174 APPN function now allows multiple connections to a LEN subarea and supports host APPN nodes as well, there are more links available for communications solutions should a link fail.

Enhanced Network Connectivity

With the 3174 APPN enhancements included in Configuration Support Release 3, customers can migrate the periphery of their SNA networks to APPN with flexible connections to a LEN subarea from either 3174s or other APPN nodes. In addition, customers can establish APPN networks including host APPN nodes and 3174s connected via SDLC links or a parallel channel, as well as token ring support. The 3174 provides enhanced APPN connectivity while preserving all pre-APPN functions, allowing customers the option to choose where to implement APPN, continue with existing networks, or to mix both 3270 SNA and APPN concurrently.

Asset Value Retention

Configuration Support-C Release 3 enables IBM customers to protect their valuable controller investment as they migrate their dependent 3270 terminals to intelligent workstations (for example, personal computers and PS/2s) and their SNA networks to APPN-based topologies. Using APPN support, the IBM 3174 performs the role of an SNA T2.1/LU6.2 NN server, allowing peer systems to interconnect and participate in a dynamic network. In addition, APPN offers the following benefits:

- Is easy to use.
- Allows decentralized network control and centralized network management.
- Allows dynamic network topology/definition.
- Allows connection flexibility.
- Provides reliable operation.
- Allows easier network growth and modification.
- Provides networking synergy for APPC applications.

With Configuration Support-C Release 3, the 3174 can concurrently support intelligent workstations communicating via peer-to-peer communications (T2.1/LU 6.2), traditional dependent 3270 terminals using LU 2.0 datastreams, and both dependent and intelligent workstations using TCP/IP. The 3174 Establishment Controller is truly a multi-protocol communications processor.

15.9 Configuration Support-C Release 3 Limitations

- Network Management traffic, such as Alerts, must flow over an SSCP-PU session which limits the 3174 to boundary attachment. When a System/370 (TM) or System/390 (R) SSCP-PU session does not exist, Alerts, RTM, and 3270 applications are not supported.

  Note: This limitation is addressed by the Statement of Direction announced for the 3174 on March 25, 1992.

- The APPN LIC feature requires a 3174 Token-Ring adapter in order to attach to the other nodes in an APPN network.
- The APPN LIC feature does not support communication over ESCON channels, X.21 switched or X.25 connections, and does not support communication through the Concurrent Communications Adapter (CCA), or ISDN BRI Adapter.

  Note: The ESCON limitation is addressed by the Statement of Direction announced for the 3174 on May 18, 1993 regarding 3174 APPN support for ESCON.

Chapter 16. Configuration Support-C Release 4

16.1 Introduction

In May 1993, the Configuration Support-C Release 4 was announced with three new 3174 Networking Server models that extend the 3174′s role as a multiprotocol terminal/communication server and provide Ethernet local area network (LAN) support. The Configuration Support-C Release 4 base LIC provides all the features available in Configuration Support-C Release 3.

The Configuration Support-C Release 4 announcement fulfills the September 15, 1992, Statement of Direction for 3174 Ethernet LAN support and TN3270 support for TCP/IP.

Specific 3174 product family multiprotocol terminal/communication enhancements include:

- Three new IBM 3174 Networking Server models - 14R, 24R and 64R
- An Ethernet Adapter (#3045) for existing IBM 3174 models
- Configuration Support-C Release 4.0 Licensed Internal Code (LIC)
- A 3174 Value Package (#4740) consisting of the Ethernet Adapter, Configuration Support-C Release 4.0, 4MB of control storage, and a 20MB fixed disk, at a significant cost savings
- RPQ 8Q1041 (TCP/IP Enhancements)
- PC-based application sharing solutions

These enhancements provide access from existing 3270 and ASCII terminals to Multivendor platforms and microprocessor-based network servers, using industry-accepted communication protocols such as TCP/IP, SNA, and APPN.

16.2 Configuration Support-C Release 4 Enhancements

- Three new Networking Server models expand the 3174′s role.
- Ethernet LAN support further expands the 3174′s capabilities as a multiprotocol terminal/communication server.
- TCP/IP enhancements such as TN3270 support, TCP/IP dependent host printer support, and SNMP MIB-II enhance the 3174′s capabilities in TCP/IP networks.
- Dependent 3270 terminals and ASCII displays can share personal computer applications.

16.2.1 Benefits of Configuration Support-C Release 4 Enhancements

Ethernet LAN Support - DSPU

The 3174 Models 14R, 24R and 64R and the Ethernet Adapter for current 3174 controllers now make it possible for attached dependent terminals (both CUT and ASCII) to access SNA and TCP/IP hosts via an Ethernet LAN.

Terminals attached to one of these Ethernet Models (3174-x4R models) can access upstream Ethernet LAN attached hosts in a manner analogous to token-ring DownStream Physical Unit (DSPU) configurations (for example, 3174-x3R models). The new models include an Ethernet Adapter (equivalent to feature code 3045) in the base machine.

Existing MLT support makes it possible for each dependent terminal to have up to five sessions. All five sessions may be with a single host, or may be distributed across multiple hosts. For example, a single terminal might have one session with a traditional SNA host, three TCP/IP Telnet sessions, each with a different TCP/IP host, plus one TN3270 sessions with a VM/MVS TCP/IP host.

Note: 3174 Ethernet support requires an Ethernet Adapter working in conjunction with Configuration Support-C Release 4 LIC. Configuration Support-C Release 4 is intended ONLY for 3174 controllers with Ethernet capability. TCP/IP enhancements such as TN3270, TCP/IP host printer support, and SNMP MIB-II are available for Configuration Support-C Release 4 and will be made available for Configuration Support-C Release 3 by RPQ 8Q1041. The RPQ 8Q1041 which is a control disk RPQ for Configuration Support-C Release 4, enables token-ring LAN support (the Configuration Support-C Release 4 base LIC does not allow token-ring LAN to be customized).

Ethernet LAN Support - Gateway

Using the new 3174 Ethernet Adapter feature (feature code #3045), the 3174 controller can be configured as an Ethernet gateway to a traditional SNA host. Devices attached downstream from the 3174 on an Ethernet LAN can access SNA hosts upstream from the 3174 Ethernet gateway. Ethernet LAN attached devices may include 3174s with attached terminals, or LAN attached PS/2 (R) intelligent workstations. Supported Ethernet gateway configurations are similar to those currently supported by 3174 Token Ring Gateway configurations.

Supported Ethernet gateway configurations are similar to those currently supported by 3174 Token Ring Gateway configurations. The 3174 Ethernet Adapter supports both Ethernet IEEE 802.3 and Ethernet DIX Version 2 interfaces. Physical attachment to the network may be via 10Base5, 10Base2, or 10BaseT wiring.

Connectivity Improvements

The new 3174 models and the Ethernet Adapter significantly expand the 3174′s connectivity alternatives. Ethernet support now makes it feasible to use 3270 and ASCII terminals to access both traditional hierarchical SNA environments and emerging/existing TCP/IP environments using a single network. By consolidating TCP/IP and SNA traffic over a single Ethernet network, customers can achieve cost savings and performance improvements.

Interoperability Improvements

The end user can now access TCP/IP hosts, as well as SNA hosts, that are accessible via Ethernet LAN using a single dependent terminal. Furthermore, Ethernet capability enables the 3174 to be attached to a wide area router network, making greater bandwidth available for 3270 transactions.

Access to Enterprise Data

The IBM 3174 Ethernet Adapter facilitates access to enterprise data by providing an SNA gateway for downstream device access to host data/applications. It provides the link necessary to connect an Ethernet LAN to a traditional mainframe host, allowing end users to access hierarchical host resources.

Strategic Architecture - Industry Standards

The 3174 Ethernet Adapter supports both IEEE 802.3 and Ethernet DIX Version 2 industry standards, which are open LAN networking architectures that are supported by a wide variety of independent vendors. This support for industry-standard architectures demonstrates the 3174′s unique ability to protect the customer′s installed investment while providing a migration path to the future.

Asset Protection

3174 dependent 3270 CUTs and ASCII terminals can access personal computer applications with Remote-OS. Existing terminals can be used to access new functions previously available only by using personal computer or PS/2 based workstations. As a result, the useful life of installed 3270 terminal equipment is extended. Dependent terminals can be used to access microprocessor applications without expensive upgrades to new personal computer or PS/2 based workstations.

16.3 TCP/IP Enhancements RPQ (8Q1041)

- TCP/IP enhancements, such as TN3270 support, TCP/IP dependent host printer support, and SNMP MIB-II support, are available via RPQ 8Q1041.
- TN3270 support makes it possible for client terminals to use TCP/IP protocol for mainframe access to 3270 applications in full-screen mode. While products such as the RISC System/6000 (R) do a good job of supporting ASCII terminals in full-screen mode over TCP/IP Telnet, using an ASCII terminal data stream, VM and MVS typically do not. Normal VM/MVS support for ASCII terminal communication is via line-by-line mode.
- TN3270 makes it possible to use full-screen 3270 data stream communication between VM/MVS and a client terminal, instead of the line-by-line ASCII terminal data stream. Thus, it is feasible for client terminals to access mainframe 3270 applications via TCP/IP, as well as traditional SNA. Customers who prefer to avoid routing SNA over a TCP/IP network can now use the 3174′s TN3270 support to build a pure TCP/IP network with IBM host access.
- TCP/IP printer support allows printers attached to a 3174 to accept and print jobs from TCP/IP hosts.
- SNMP MIB-II support enhances the level of network management support offered by the 3174. SNMP network managers can now access the network management parameters defined in RFC 1213 -- Managing Information Base for Network Management of TCP/IP-based Internets.

The 3174′s evolution of protocol support protects the customer′s investment while providing a direction for the future.

16.3.1 Benefits of TCP/IP Enhancement RPQ (8Q1041)

Improved Worker Productivity

TN3270 improves user productivity by providing better performance than normal ASCII data streams. The 3270 protocol used by TN3270 is a block mode exchange rather than the typical character mode used by ASCII data streams. Echoing of keystrokes is done by the 3174. When a function key or the Enter key is pressed, changes to the screen are sent to the host in a block. In normal ASCII character mode, the host must echo each terminal keystroke.

With MIB-II support, SNMP network managers can access the full complement of network management parameters to diagnose and resolve network problems.

Enabling New Applications

TCP/IP host printer support allows customers to use current 3174 attached printers to support new TCP/IP host applications. Multiple 3174 attached printers provide print distribution for multiple TCP/IP hosts.

Increased Capacity/Performance Improvement

For TCP/IP establishments, the addition of TCP/IP host printing services through the 3174 allows customers to offload some of the TCP/IP printing from the existing TCP/IP printing facilities. Multiple 3174 attached TCP/IP host printers will further offload TCP/IP host printing facilities. The end users will enjoy reduced print turnaround time. The I/S manager has increased printing capacity from the existing network.

16.4 Open Enterprise

The Ethernet Adapter complies with the following Ethernet LAN specifications:

- ISO/IEC 8802-3 ANSI/IEEE Standard 802.3, Third Edition, 1992-03-20
- ISO 8802-2 IEEE Standard 802.2, First Edition, 1989-12-31
- Ethernet: A Local Area Network Data Link Layer and Physical Layer Specification Version 2.0, DEC-Intel-Xerox (DIX) Ethernet Standard, Xerox Corporation, Stamford, Connecticut (1982)

The Ethernet Adapter conforms to the following SNA standards for SNA support:

- SNA LU6.2 Reference: Peer Protocols (SC31-6808)
- SNA APPN Architecture Reference (SC30-3422)
- SNA Formats (GA27-3136)

The Ethernet Adapter supports the following TCP/IP protocols:

- Telnet Client
- Transmission Control Protocol
- Internet Protocol
- Internet Control Messaging Protocol
- User Datagram Protocol

- Address Resolution Protocol
- Simple Network Management Protocol
- Domain Name System (resolver client only)

16.5 Configuration Support-C Release 4 Limitations

The Ethernet LAN Adapter has the following limitations:

- The Ethernet Adapter and the Type 3A Dual Speed (16/4) Token-Ring Adapter cannot be operational in the same 3174 at the same time.

  Note: Both adapters may be installed in the 3174 at IML time provided there are enough slots, but only one can be configured as the active host link or gateway.

- Only one Ethernet Adapter can be installed in a 3174 as in the case of Token-Ring Adapter
- With the Ethernet Adapter installed, coax attached intelligent workstations can communicate in a peer mode with other intelligent workstations coax attached to the same 3174 only. This is because of there is no bridging support provided between the 3174 attached intelligent workstations and the Ethernet LAN.

Chapter 17. Configuration Support-C Release 5

17.1 Introduction

In February 1994, IBM announced Configuration Support-C Release 5 to extend the functional capabilities of the 3174 Establishment Controller. Configuration Support-C Release 5 LIC enhances support for connections to SNA and APPN environments. In addition, a new Frame Relay Communications feature provides Frame Relay and Remote Bridging[5] communication support.

Configuration Support-C Release 5 includes all functions of CS-C Release 3 and the Ethernet support provided in Release 4.

This chapter briefly describes the enhancements announced with Configuration Support-C Release 5.

- Frame Relay Communications Feature
  - Remote Source Route Bridging support
  - Multiport bridging
- New Extensions to the APPN Feature
- Speed of WAN communications (Frame Relay, X.25 and SDLC) up to 256 Kps.
- ASCII Multiple Host Support
- Printer MLT
- Enhanced 5250 Emulation Support
- Multiple CECP language Support
- PS/55 -- 3174 Printer Sharing

17.2 3174 Frame Relay Communications (Feature 7020/7070)

The 3174 Frame Relay Communications Feature expands 3174 connectivity by providing Frame Relay and Remote Bridging communications support.

The existing 3174 multiprotocol communications such as SNA 3270, LAN Gateway, APPN, and TCP/IP are all supported over Frame Relay. In addition, Remote Bridging support enables Token-Ring or Peer Communications attached workstations to be bridged over Frame Relay to other 3174s or compatible remote bridges.

Frame Relay is supported over the primary communications link at up to 256Kb data rate in some configurations.

The 3174 Frame Relay support with RFC 1490 (updated RFC 1294) provides compatibility with many IBM products such as the 6611, 3745 (NCP), RouteXpander/2 and 3172, as well as with similar OEM products.

[5] The 3174 remote bridging function will be available on December 30,1994.

3174 Frame Relay support provides three types of LMI (Rev.1, Annex D, and CCITT), allows DTE to DTE and Frame Relay network connectivity, allows PVC connections, and provides a two-byte address field. 3174 Source Route Remote Bridging support provides LAN Network Management (LNM) interfaces.

In order to reduce network traffic and congestion, customers can selectively filter out traffic they do not want forwarded by the 3174 bridging function. These filters are defined on a port basis during customization and allow filtering of received or transmitted frames on the following conditions:

- MAC address
- Source SAP
- SNAP Ethertype value
- Route Designator (Segment and Bridge number)
- Hop Count
- Frame data and offset

These filters are combined into groups based on the direction of traffic flow selected for filtering.

With the 3174 Frame Relay Communications feature, the 3174 provides connectivity to workstations via Frame Relay for LAN client/server applications whether they need Remote Bridging or SNA communications. APPN and Remote Bridging are supported from one 3174 to another, and to other compatible IBM or OEM products.

Refer to Chapter 20, “Frame Relay Support” on page 589 and the ITSO document *3174 in Higher Speed and Multiprotocol Networks,* GG24-4376 for more details.

17.2.1 Benefits of Configuration Support-C Release 5 Frame Relay Feature

- With the 3174 Frame Relay Communications feature, customers have significantly increased connectivity flexibility as many remote addresses can be reached and many protocols can be supported over the 3174 Frame Relay connection. With Remote Bridging support, the 3174 can bridge from its attached token-ring or Peer LAN segments to other remote Peer or token-ring segments, allowing client/server and LAN-based applications to be accessed as customers need them. To allow efficient utilization of the WAN communications link, the primary communications link now supports up to 256Kbps for some configurations for both SDLC and Frame Relay communications.
- The 3174 Frame Relay Communications Feature supports existing 3174 Network Management functions and extends LAN Network Manager (LNM) support to include the new Remote Bridge functions. This enables customers to migrate their network to include LAN/WAN distributed networking in a graceful way, minimizing disruption to their network management. In addition, to support network isolation, 3174 Remote Bridging support includes a number of filters that can be selected.
- With Frame Relay and Remote Bridging support, customers can access more applications and utilize LAN/WAN communications to provide multiprotocol networking while continuing to use the SNA applications. In addition, dependent terminals can now access TCP/IP applications on remote hosts

via Frame Relay, as well as hosts on the LANs attached to the 3174, providing significant flexibility for customers. Customers can reach multiple Remote Bridges or 254 TCP/IP hosts or routers over the 3174 Frame Relay link. Support for up to 225 APPN links and for 250 LAN DSPUs (LAN Gateway) is also provided over the Frame Relay link.

- The Frame Relay Communications feature for the 3174 is provided to achieve maximum investment protection while also allowing customers to extend the connectivity of their 3174-based networks as they migrate to more distributed networks. This new function supports all of the existing 3174 protocols and communications allowing current applications and associated terminal equipment to continue to be used while allowing customers to implement client/server applications.

17.3 New Extensions to the APPN Feature

The APPN feature enhancements include the following:

- Dependent LU Requester
- APPN support of X.25
- APPN support of Frame Relay
- APPN Network Management communication to Focal Point
- Utilization of new APPN functions
- APPN Non-LAN customization

See Chapter 18, "APPN" on page 501 and the ITSO document *3174 APPN Implementation Guide Update,* GG24-4171 for details.

Dependent LU Requester (DLUR)

The DLUR function is used in conjunction with the Dependent LU Server (DLUS) function in ACF/VTAM Version 4 Release 2 to provide APPN support for 3270 applications. This support utilizes an LU6.2 session pipe for encapsulating the SSCP control data in order to provide equivalent functions of the subarea. The session data route is calculated directly between the LU session partners. The session data is natively routed, *not encapsulated,* through an APPN network. The route may or may not traverse the DLUS node. The DLUS node and the host applications can be located anywhere in an APPN network as long as the DLUR node has connectivity to the DLUS node and the DLUS node has connectivity to the host applications. This support enables the SSCP function and definition to remain in VTAM, yet allows an NN the ability to calculate the best route, thereby using the network more efficiently. The 3174 supports locally-attached dependent LUs only; this support has not been extended to downstream PU2.0 nodes.

APPN Support of X.25

APPN X.25 support is built on the existing X.25 Single Link Multi-host support and provides equivalent X.25 options. As a DTE, the 3174 NN may have multiple virtual circuits that communicate across an X.25 network to remote DTEs that may be VTAM/NCP LEN/APPN nodes, APPN NNs, APPN ENs, or LEN ENs. The 3174 uses the QLLC protocol layer and supports both types of virtual circuits: Permanent virtual Circuits (PVC) and Switched Virtual Circuits (SVC). However, the switched circuits are persistent and are not disconnected.

APPN Support of Frame Relay

APPN Frame Relay support is available in conjunction with the Frame Relay Communications feature. This support is compatible with the Frame Relay Boundary (BNN) function and the Frame Relay Frame Handler support in NCP Version 7 Release 1. This support utilizes the 802.2 logical link control and RFC 1490 for multiplexing protocols over a single PVC.

A 3174 NN can communicate directly with another 3174 NN (DTE to DTE) without a Frame Relay network (FRBS). The 3174 NN uses standard Frame Relay DTE communication to remote APPN network nodes and end nodes across a public or private Frame Relay network.

APPN Network Management Communication to Focal Point

Management Services of the 3174 NN are extended to communicate with an APPN Focal Point for alerts using an LU6.2 session and Multiple Domain Support for transport. This support allows the Focal Point NetView Version 2 Release 4 or AS/400 to be located anywhere in the APPN network and removes the restriction that the 3174 must be boundary attached in order to have Network Management support. The Focal Point can be explicitly defined at the 3174 or the 3174 can learn its Focal Point by means of the Sphere of Control at the Focal Point.

In addition, end nodes that the 3174 serves now have the option of choosing any Focal Point for any kind of Network Management application. The 3174 NN supports the routing of this Network Management data from the EN, eliminating the need for the EN to maintain separate sessions directly with an APPN Focal Point.

Utilization of New APPN Functions

Border nodes provided by AS/400 and VTAM allow sessions across the APPN sub-network with different network IDs. With this release, the 3174 NN supports attachment to these Border nodes. One benefit of sub-networks is that they decrease the size of topology databases and the number of network flows.

The 3174 can now take advantage of an APPN Central Directory. This function lessens the directory size requirements of the 3174 since the Central Directory automatically gets updates from other network nodes as they join the system.

APPN Non-LAN Customization

The Configuration Support-C Release 5 APPN feature removes the requirement for a LAN adapter for the APPN feature; that is, the 3174 can be customized as an APPN Network Node (NN) without a LAN adapter installed.

17.3.1 Benefits of APPN Enhancements

APPN extensions in Configuration Support-C Release 5 greatly increase the customer′s ability to build and interconnect networks that may be complex, vertical, and multi-vendor. APPN nodes in a network can be of different sizes and capabilities. The APPN protocol is able to route natively across any link type, learn of congested nodes or down links and route around them. With adaptive pacing, APPN regulates traffic to avoid overloading the capacity of a node or losing data.

- With Network Management extensions, the 3174 no longer needs to be boundary attached to a host for Network Management. In addition, the user has the flexibility to use an APPN alert Focal Point on multiple platforms that can be located anywhere in the APPN network.

- The Dependent LU Requester allows the customer the flexibility to locate the 3174 NN anywhere in the APPN network and still have the capability to have coax-attached, dependent terminals and 3174 Network Management functions such as Response Time Monitor.
- With the addition of APPN on Frame Relay, the customer has the potential cost saving benefits and improved bandwidth utilization provided by this fast packet network.
- With the addition of X.25 and Frame Relay, the customer can now interconnect LANs with the reliability of APPN routing. In addition, the customer can gain the efficiency of a single APPN link connection (PVC or DLCI) for multiple sessions.
- With the DLUR/DLUS functions, management and definition of the network is simplified. As the 3270 workstations and controllers are upgraded to APPN with DLUR, and subarea nodes migrate to VTAM Version 4 Release 2, PU2.0 gateways and Multi-host support are no longer required. This adds flexibility and eliminates the static definition of LAN addresses to station addresses and the definition of multiple PUs and LUs. In addition, dependent LU devices can move through the network without having to deal with VTAM definitions or concerns with problem management.
- For APPC applications and with DLUR for 3270 applications, the 3174 APPN NN provides seamless backup and recovery for links and nodes with no additional definition or requiring the user to change to another logical terminal. Since APPN has dynamic routing and directory information, the best route is chosen without static user definitions.
- The 3174 NN allows the customer to migrate applications to APPC while maintaining his 3270 application support. With the DLUR function, the 3174 NN can serve ENs with APPC applications and in conjunction with DLUS, obtain APPN routing for locally-attached terminals.
- Without APPN, SNA support of X.25 and Frame Relay is limited to eight host connections. With APPN, the customer can get increased connectivity to 225 links to remote APPN nodes.
- Customers have an enormous investment in 3270 applications. The Dependent LU Requester function gives customers the ability to maintain their investment and obtain the added value of APPN routing for these dependent LUs. With the 3174 NN, the coax-attached devices can benefit from the optimal routing of APPN and the 3174 continues to serve attached End Nodes for client/server applications and other LU 6.2 applications such as DCAF. In this way, the 3174 NN provides a pathway for customers to move to the new technologies of APPC, Frame Relay, etc., while still using the same hardware, lines, and wiring.

17.4 Other Configuration Support-C Release 5 Enhancements

17.4.1 Speed of WAN communications up to 256 Kbps

Higher speed WAN communications (up to 256 Kps) are supported for the primary communications link for X.21 and V.35 for both Frame Relay and SDLC communications for some configurations.

17.4.2 ASCII Multiple Host Support

This support allows terminals and printers attached to the 3174 via the Asynchronous Emulation Adapter (AEA) to access hosts that are attached via the 3174 single link multiple host support or via the Concurrent Communication Adapter (CCA). This function was previously provided for Configuration-C only via RPQ 8Q0933.

17.4.3 Printer MLT

Printer MLT extends the multiple host sessions capability supported for displays attached to the 3174 to printers as well. This support allows multiple 3270 sessions (up to a maximum of five) to print on a single printer. This support includes CCA-attached hosts as well as single link multi-host supported attached hosts. This function was previously provided for Configuration-C only via RPQ 8Q0934.

17.4.4 Enhanced 5250 Emulation Support

In addition to the 5250 support for Field Exit, Field Minus, Field Plus and Reset that is already supported, the 3174 now supports the following new functions:

- Mandatory Field Exit Fields
- Right Adjust Fields
- Help Key
- Record Backspace Key
- Roll Up Key
- Roll Down Key
- 5250 Clear
- 5250 Print
- Support for E-technology keyboards, PC3270 Emulation and ASCII devices. This function requires AS/400 Version 1 Release 3 or later. This function was previously provided for Configuration-B only via RPQ 8Q0892.

17.4.5 Multiple CECP Language Support

3174 multiple CECP language support allows the 3174 to concurrently support any combination of CECP languages. With this support, each attached CUT device can be customized to communicate with up to five hosts, with each host supporting a different CECP language. This function was previously provided for Configuration-B and C via RPQ 8Q1040.

17.4.6 PS/55 -- 3174 Printer Sharing

This support allows a PS/55 Multistation to communicate with another PS/55 Multistation that is attached to a common 3174 without host involvement. It permits one or more PS/55 Multistations, without an attached printer, to utilize the printer on another PS/55 Multistation without host intervention. This function was previously provided for Configuration-B and C via RPQ 8K1349 for Japan only.

17.4.7 Benefits of Configuration Support-C Release 5 Enhancements

- Until ASCII Multiple Host support, AEA-attached devices could only access the primary link or ASCII hosts. With this support, users attached to ASCII devices can now gain full utilization of the SNA network by being able to access applications on any host link (primary or secondary).
- Until now, printers attached to the 3174 could only accept print jobs from a single host; therefore several printers were required to provide printed output from more than one host application that a display station could be accessing. With the addition of Printer MLT support, the same printer can now be used to provide print output from up to five different hosts.
- 3174 printer sharing support allows a customer to better utilize existing PS/55 printers to provide local copy support without host involvement in the transaction and thereby reducing the amount of network traffic.
- Enhanced 5250 Emulation support includes usability functions that provide flexibility and efficiency to any user utilizing 5250 emulation support.
- With Multiple CECP Language support, end-user productivity is enhanced by allowing a user to communicate in his or her native language with an application that may reside in a location that does not use the user′s native language as well as communicate with applications that utilize the user′s native language.

17.5 Configuration Support-C Limitations

- The 3174 DLUR function does not support dependent LUs attached to downstream PU2.0 nodes.
- In order to receive dependent LU accounting provided by NCP/NPM, the session data must pass through an NCP.
- The APPN LIC feature does not support communication over ESCON channels and does not support communication through the Concurrent Communications Adapter (CCA) or ISDN BRI Adapter.

  Note: The ESCON limitation is addressed by the Statement of Direction announced May 18, 1993, regarding 3174 APPN support for ESCON.
- The 3174 SR Remote Bridge does not support automatic mode of the Spanning Tree algorithm. Manual mode is supported.

  Note: The Spanning Tree limitation is addressed by the Statement of Direction announced with the announcement of this release.
- Frame Relay is not supported via communication through the Concurrent Communications Adapter (CCA) or ISDN BRI Adapter.
- The 3174 SR Remote Bridge is not supported on the Ethernet models, for example (14R, 24R, 64R) or 3174s with the Ethernet adapter.

Chapter 18. APPN

This chapter briefly describes the 3174 Advanced Peer-to-Peer Networking (APPN) implementation in Configuration Support-C and it is only intended to provide a general description 3174 APPN functions available for those who need to customize the 3174 for APPN functions. For example customization scenarios, see the *3174 APPN Implementation Guide Update*, GG24-4171 for Configuration Support-C Release 3 and later, or *3174 APPN Implementation Guide*, GG24-3702 for earlier releases.

APPN is an enhancement to IBM′s Systems Network Architecture (SNA) and type 2.1 (T2.1) node architecture. It allows interconnection of systems of widely differing sizes into networks of dynamic topology. The resulting network is easier to use, more reliable, and provides more flexibility.

The T2.1 node allows peer-to-peer connection of distributed processors, and provides the physical and session level connectivity required for support of logical unit 6.2 (LU 6.2). Older LU types such as 0, 1, 2 and 3 continue to be supported as before. T2.1 nodes use protocols with reduced system customization requirements. For example, independent LUs can be dynamically defined to the system. Also, either end can initiate a session. Link station roles can be negotiated during session setup using XID3 exchanges instead of being pre-defined to the system.

APPN extends T2.1 node support to provide enhanced connectivity across an APPN network. If all the intermediate links are capable of routing APPN, communication can be established between any T2.1 nodes. Within an APPN network, automatic network topology and directory support are provided to simplify network definition and permit dynamic route selection. An APPN network is composed of a number of end nodes and network nodes connected by links. End nodes and network nodes contain session endpoints and applications. In addition, network nodes maintain the network, provide routing and directory services for end nodes, and route intermediate sessions.

18.1 Benefits

The 3174 APPN Licensed Internal Code feature, together with Configuration Support-C base microcode, allows a 3174 to be a network node and to use and enable APPC.

The benefits of using APPN include the following:

- Ease of Use

  APPN minimizes the requirement for coordinated system definition; network resources, such as LUs, links, etc., are defined only at the node where they are located. APPN distributes information about these resources through the network dynamically, as needed. For example, if the node does not have a directory entry of a node with which it wants to communicate, the distributed directory search will find it (assuming it is within the APPN network).

  Similarly, there is no need to pre-compute routes through an APPN network. Instead, routes are dynamically generated, as required, using information about the network′s topology and the desired class of service.

- Reliability

  In an APPN network, there is no single point of failure. The network′s topology is replicated throughout the network, as is the route computation function. APPN nodes have the capacity to compute both parallel and separate routes through the network, as well as distributing traffic load and minimizing the effects of link outages by computing routes around them.

- Self-Tuning

  APPN is able to adjust data flows and message sizes without system programmer intervention.

APPN allows interconnection of local area network (LAN) environments, flexible configuration of networks, better synergy with SNA subarea backbone networks, more complete end-to-end function such as routing services and directory services, and a sound base for total network management. APPN allows evolving customer needs to be supported within SNA by enhancing the level of service.

The APPN architecture has been designed to work very closely with IBM′s logical unit 6.2, also known as Advanced Program-to-Program Communications (APPC). APPN, like LEN before it, both uses and enables APPC. APPN′s system of network control and configuration uses LU 6.2 sessions to exchange messages and network information between nodes; APPN enables APPC because APPN protocols accommodate more fully the notion of *peerness* from which APPC derived, particularly in their application to distributed processing environments such as LAN networks.

18.2 An APPN Network

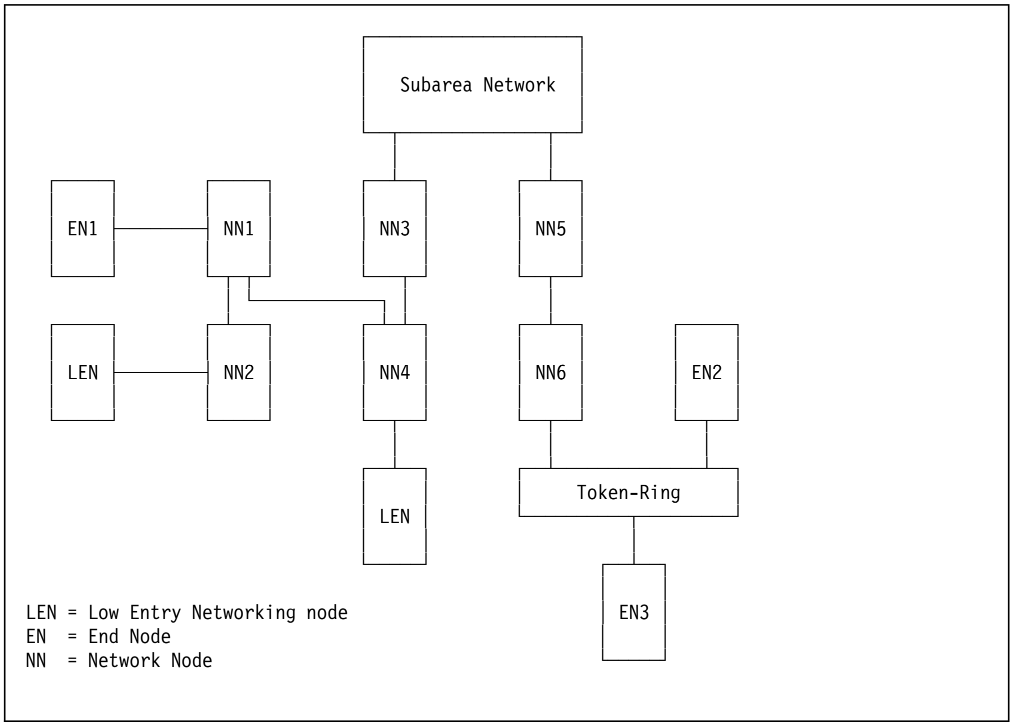


Figure 189. An APPN Network

As shown in Figure 189, an APPN network is composed of a number of *end nodes* (EN) and *network nodes* (NN) connected by *links*. APPN end nodes are enhanced Low Entry Networking (LEN) end nodes that actively participate in network flows. APPN network nodes have the additional ability to maintain and update databases containing information about the network topology and resources. Links between nodes can be connected using a variety of protocols, including LAN, X.25, Frame Relay, SDLC and S/370 channel. The types of links that are supported by a particular node are specific to that node; that is, a node may not support all of the link types mentioned.

18.3 LEN End Nodes

The Low Entry Networking (LEN) node architecture provides peer-to-peer connection to other directly attached LEN nodes but obtains full networking access through boundary node attachment into a subarea network. With APPN, the LEN node takes its place as an *end node* in networks where networking support is supplied using APPN protocols. APPN allows full inclusion of LEN nodes—transparently to the LEN nodes, except for positive effects such as reduced system definition requirements.

18.4 APPN End Nodes

The APPN end node extends the LEN node by implementing functions that allow the APPN end node to participate more fully in an APPN network. An APPN end node is able to:

- Select an APPN network node to be its network node server.
- Dynamically register its LUs with its network node server.
- Allow itself to be searched for LUs that it chooses not to register with the network. Generic or wildcard entries can also represent the end node′s resources at the server to reduce the directory load.
- Submit distributed directory search requests to its network node server, and obtain session-route calculations from its server when initiating LU-LU sessions.
- Support parallel links to other APPN nodes in an APPN network.

18.5 APPN Network Nodes

An APPN network node provides functions beyond that of the APPN end node. An APPN network node is able to:

- Receive resource registration messages from APPN end nodes for which the network node is a server.
- Participate in network-wide distributed directory searches for LUs, *cache* search results, and verify directly the continued availability of the LUs to the network.
- Broadcast a network topology database update to other APPN network nodes whenever its own load level or the state of one of its local links changes significantly. In this way, every APPN network node has a copy of the network topology database containing information on network nodes and links between them.
- Dynamically compute session routes through an APPN network, based on the current topology information, the locations of the session partners, and the requested classes of service.
- Provide necessary DLC signaling information to APPN end nodes connected to a shared-access transport facility, such as a Token-Ring network.
- Support intermediate session routing. This includes the activation/deactivation of session routes through an APPN network, as well as the hop-by-hop pacing and segmenting of session traffic.
- Provide management services support. This includes the ability to be defined as a management services focal point for network problem management.

18.6 APPN and Configuration Support-C

18.6.1 Configuration Support-C Release 1

The 3174 APPN LIC feature, together with Configuration Support-C Release 1 base microcode, allows the 3174 to behave as an APPN network node. This implementation does not allow the 3174 to be customized for any other APPN node type; that is, the 3174 can only be a network node. The 3174 Configuration Support-C Release 1 announcement consists of the following components:

- **Base microcode**

  The base microcode incorporates the base functions of previous releases of microcode, with enhancements to support the 3174 Integrated Services Digital Network Basic Rate Interface Adapter.

- **Peer Communication LIC feature**

  The Peer Communication LIC feature is a separately orderable no-charge feature, which integrates 3174 Peer Communication RPQ 8Q0718 for Configuration Support-B functions and enables workstations that are attached via 3270 wiring to the 3174 to participate as local area network workstations.

- **Advanced Peer-to-Peer Networking (APPN) LIC feature**

  The Advanced Peer-to-Peer Networking LIC feature is a separately orderable no-charge feature, which adds APPN network node and T2.1 capabilities to the 3174. Host links are limited to LEN (Low Entry Networking) node.

18.6.2 Configuration Support-C Release 2

In January 1991, Configuration Support-C Release 1 Licensed Internal Code for the 3174 was announced and in March 1992, Configuration Support-C Release 2 was announced. As far as APPN is concerned, there is no change in functions between these two releases.

18.6.3 Configuration Support-C Release 3

The following APPN enhancements are included the May 1993 announcement of Configuration Support-C Release 3:

- 3174 network node (NN) compatibility in environments where the host is a LEN node (supported in CS-C1), APPN network node (NN), Migration Data Host (MDH), or an interchange node (IN).
- Support for multiple links (that is, multi-tail) into an SNA subarea (LEN) from an APPN network comprised of 3174s and other APPN nodes. APPN multi-tail support enables customers to migrate their token-ring LAN environments to APPN ahead of the SNA subarea. This is made possible by providing support for multiple LEN connections between the APPN network and the subarea, and multiple subarea connections from a single 3174 network node via a token-ring LAN.
- Support for the transfer of 3270 and APPN datastreams across a single SDLC link between a 3174 and an AS/400. Both PU 2.0 and T2.1 datastreams can share a single 3174-to-AS/400 link.

18.6.4 Configuration Support-C Release 4

With the May announcement of Ethernet LAN support in Configuration Support-C Release 4, the 3174 APPN network node support extends links to other APPN network nodes, APPN end nodes and LEN nodes via Ethernet.

Note: Intelligent workstations that are coax attached to the 3174 using Peer Communications cannot participate as ENs in an APPN network and cannot communicate over the Ethernet network since there is no Peer Bridge support available with Configuration Support-C Release 4.

18.6.5 Configuration Support-C Release 5

The February 1994 announcement of Configuration Support-C Release 5 LIC significantly extends the APPN feature of the 3174. The APPN extensions include:

- Dependent LU Requester
- APPN support of X.25
- APPN support of Frame Relay
- APPN Network Management communication to Focal Point
- Utilization of new APPN functions
- APPN Non-LAN customization

Dependent LU Requester (DLUR)

The DLUR function is used in conjunction with the Dependent LU Server (DLUS) function in ACF/VTAM Version 4 Release 2 to provide APPN support for 3270 applications. This support utilizes an LU6.2 session pipe for encapsulating the SSCP control data in order to provide equivalent functions of the subarea. The session data route is calculated directly between the LU session partners. The session data is natively routed, *not encapsulated,* through an APPN network. The route may or may not traverse the DLUS node. The DLUS node and the host applications can be located anywhere in an APPN network as long as the DLUR node has connectivity to the DLUS node and the DLUS node has connectivity to the host applications. This support enables the SSCP function and definition to remain in VTAM, yet allows an NN the ability to calculate the best route, thereby using the network more efficiently. The 3174 supports locally-attached dependent LUs only; this support has not been extended to downstream PU2.0 nodes.

APPN Support of X.25

APPN X.25 support is built on the existing X.25 Single Link Multi-host support and provides equivalent X.25 options. As a DTE, the 3174 NN may have multiple virtual circuits that communicate across an X.25 network to remote DTEs that may be VTAM/NCP LEN/APPN nodes, APPN NNs, APPN ENs, or LEN ENs. The 3174 uses the QLLC protocol layer and supports both types of virtual circuits: Permanent virtual Circuits (PVC) and Switched Virtual Circuits (SVC). However, the switched circuits are persistent and are not disconnected.

APPN Support of Frame Relay

APPN Frame Relay support is available in conjunction with the Frame Relay Communications feature. This support is compatible with the Frame Relay Boundary (BNN) function and the Frame Relay Frame Handler support in NCP Version 7 Release 1. This support utilizes the 802.2 logical link control and RFC 1490 for multiplexing protocols over a single PVC. A 3174 NN can communicate directly with another 3174 NN (DTE to DTE) without a Frame Relay network (FRBS). The 3174 NN uses standard Frame Relay DTE communication to a public or private across an Frame Relay network to remote APPN network nodes and end nodes.

APPN Network Management Communication to Focal Point

Management Services of the 3174 NN are extended to communicate with an APPN Focal Point for alerts using an LU6.2 session and Multiple Domain Support for transport. This support allows the Focal point (NetView (R) Version 2 Release 4 or AS/400 (R)) to be located anywhere in the APPN network and removes the restriction that the 3174 must be boundary attached in order to have Network Management support. The Focal Point can be explicitly defined at the 3174 or the 3174 can learn its Focal Point by means of the Sphere of Control at the Focal Point.

In addition, End Nodes that the 3174 serves now have the option of choosing any Focal Point for any kind of Network Management application. The 3174 NN supports the routing of this Network Management data from the EN, eliminating the need for the EN to maintain separate sessions directly with an APPN Focal Point.

Utilization of new APPN Functions

Border Nodes provided by AS/400 and VTAM allow sessions across different APPN sub-networks with different network IDs. With this release, the 3174 NN supports attachment to these Border Nodes. One benefit of sub-networks is that they decrease the size of topology data bases and the number of network flows.

The 3174 can now take advantage of an APPN Central Directory. This function lessens the directory size requirements of the 3174 since the Central Directory automatically gets updates from other Network Nodes as they join the system.

APPN Non-LAN Customization

Configuration Support-C Release 5 APPN feature removes the requirement for a LAN adapter for the APPN feature; that is, the 3174 can be customized as an APPN network node (NN) without a LAN adapter installed. All adjacent nodes must be over Frame Relay, X.25 or SDLC links.

Benefits of Configuration Support-C Release 5 APPN Enhancements

APPN extensions in Configuration Support-C Release 5 greatly increase the customer's ability to build and interconnect networks that may be complex, vertical, and multi-vendor. See 17.3.1, "Benefits of APPN Enhancements" on page 496 for more information.

18.7 Functions and Level of Support in the 3174 NN

Table 24 lists the functions and the level of support in the Configuration Support-C 3174 APPN implementation. This table can be read by finding a function in the left-hand column and looking at the corresponding right-hand column to determine if or how that function is supported.

Table 24 (Page 1 of 2). Functions and Level of Support in the 3174 NN

Function	3174 APPN Network Node Implementation
3174 Functions	
Customizing	Yes
CSCM	Yes, dep. and indep. LU support
CSCU	Yes
Microcode Upgrade	Yes, prior configuration to C
Online Tests	Enhanced /17 APPN Tests
CSCF by PU-SSCP	Yes
DSL Merge	Yes for APPN; Yes for Peer Communications
De-configure	Yes
PU2.0	Required for Network Management and Dependent LUs
LU 1, 2, 3	Shared Link to Host (DLUR in CS-C5)
Peer Communication	Optional, required for 3174-Peer Nodes
LAN (token-ring or Ethernet) gateway	Optional, required for Shared Link to DSPUs
Other Configuration C Functions	No Change, Can Coexist.
T2.1 Links Supported	
Token ring to Host	Models 3R, 13R, 23R, 53R, 63R, 43R(WNM)
Ethernet to Host	Models 14R, 24R, 64R (CS-C4 and later)
TP-SDLC to Host	Models 1R, 2R, 11R, 12R, 21R, 51R, 61R, 62R, 41R(WNM)
S/370 Channel to Host	Models 1L, 11L, 21L, 21H
ESCON Channel to Host	Not Supported (SOD, available with CS-C6)
X.25 (PVC and SVC) to Host	Available in CS-C5
Frame Relay to Host	Available in CS-C5
X.21 Leased	Available in CS-C5
X.21 Switched	Not Supported
ISDN	Not Supported, T2.0 only, Can Coexist
Frame Relay or X.25 to other nodes and 3174	Available in CS-C5
SDLC to another 3174	Not Supported
SDLC to an AS/400	Supported
Token ring to APPN nodes	Supported
Ethernet to APPN nodes	Supported (CS-C4+)
3174-Peer APPN nodes	Requires Peer Communication feature and bridge (limited to Peer Communication nodes for CS-C4)

Table 24 (Page 2 of 2). Functions and Level of Support in the 3174 NN	
Function	**3174 APPN Network Node Implementation**
APPN Functions	
NN Base Functions	Yes
Control Point	Yes
Intermediate Session Routing	Yes
LU 6.2 Services	Yes
CPNAME = LUNAME	Yes
Connection Network	Yes
BIND Segment and Reassembly	Yes
BIND Pacing (Independent LUs)	Yes
Transmission Priority	Yes
Parallel TG	Yes
Multiple TG	Yes
Multi-link (Multitail)	Yes
LEN Subarea Routing	Yes, Full Wildcard, Generic and Specific Naming
Shared Link to LEN Host	Yes
Shared Link to Downstream Node on T2.1 Link	Yes
Safe Store of Directory Services cache	Yes, if Fixed Disk is Available
Network Operator Facility	Offline, by Customizing
Routing to Different APPN NETIDs	Yes, to Subarea and APPN EN To Border Node available in CS-C5
Border Node	
Node Function	No
Interoperability	Available in CS-C5
SSCP Takeover Participation	Yes
CP Name change	Yes
TG number change	Yes
Dependent LU Requester	Available in CS-C5
Dependent LU Server	No
Network Management	
Generic alerts	Yes
APPN NN Receives Alerts from APPN EN	Yes, by CP-CP Session
APPN NN Sends Alerts to NetView	Yes, by PU-SSCP Session (or CP-Focal Point session, available in CS-C5)
APPN NN Sends Alerts to focal point	Available in CS-C5
APPN NN Receives Alerts from LEN Node	None in APPN; LEN can use gateway function for PU-SSCP session
Pseudo Focal Point for APPN EN	Yes
CP-Focal Point Session	Available in CS-C5
Multiple Domain Support(MDS) Transport	Available in CS-C5

18.8 3174 APPN LIC Feature Connectivity

The 3174 APPN LIC feature, together with 3174 Configuration Support-C base microcode, allows the 3174 to behave as an APPN network node. This implementation does not allow the 3174 to be customized for any other APPN node type; that is, the 3174 can only be a network node. This means there is more that likely, other APPN nodes with end user (programs) interface, that require the services of the 3174 as a network node. The physical link or protocol that exist between the 3174 and adjacent nodes, has limitation based on the node and link type, as well as the release microcode running on the 3174. In this section, we will address which links and products are supported by the 3174 as a network node.

18.8.1 Supported Links

The 3174 network node supports links to other APPN network nodes, APPN end nodes and LEN nodes.

Configuration Support-C Release 5 fulfills the Statement of General Direction (May 16,1993) 193-121 for support of APPN over:

- X.25 connections
- X.21 leased
- Frame Relay

The links supported by Configuration Support-C Release 3 and later to the subarea are:

- Connection to a subarea network as a NN, EN or LEN node using SDLC, LAN (Token Ring and Ethernet) or parallel channel attachments.

For non-subarea nodes the supported links are:

- Connection to NN, EN and LEN nodes via LAN (Token Ring and Ethernet) or SDLC

  Note: SDLC connections are limited to the AS/400 and subarea

- Connection to NN, EN and LEN nodes via coax

  To support APPN nodes via coax attachment to the 3174 NN requires the Peer Communication LIC feature in the 3174 and the LAN-over-coax device drivers in DOS and OS/2 workstations.

  See 19.11, “Peer Workstation Requirements” on page 577. for workstation software requirements.

Because 3174 NNs allow LU 6.2 traffic to flow on a single link, multiple subchannel addresses or multi-drop links are not needed for T2.1 traffic.

18.8.2 Unsupported Links

The following physical links remain unsupported by 3174 network node running Configuration Support-C:

- Communication over ESCON* channels and X.21 switched connections
- Communication through the Concurrent Communication Adapter or ISDN Basic Rate Interface adapter

Statements of General Direction (SODs) and announcements have been made to include ESCON as an additional APPN link types for the 3174 NN.

Notes:

1. VM/SP does not support an SDLC T2.1 connection.
2. The ES/9370 with the Telecommunications Subsystem Controller and the multi-protocol two-line communication adapter (feature number 6031, VM/SP only), requires engineering change (EC) A48290 for direct connection of type 2.1 nodes through SDLC links.
3. Support for connectivity to other LEN/APPN products, other than those mentioned in Table 25 on page 511, will be considered on an RPQ basis.

18.8.3 3174 APPN Connectivity Summary

Table 25 summarizes the connectivity supported by the 3174 APPN LIC feature. The first column lists the various IBM products which are supported by the APPN LIC feature. The second column lists the type of connection that is supported for each product. The third column indicates the node type(s) that is supported for the connection type; an X indicates that a node type is supported.

Table 25. Supported Connectivity

Product Supported	Connection Type	Node Type		
		LEN	EN	NN
3174 Configuration Support-C 1,2,3,5	Token-ring	-	-	X
3174 Configuration Support-C 4 and 5	Ethernet	-	-	X
3174 Configuration Support-C 5	X.25 and Frame Relay	-	-	X
AS/400	LAN (Token Ring and Ethernet), X.25, SDLC and Frame Relay	X	X	X
DPPX/370 R3	Token-ring	X	X	X
Networking Services/2	LAN (Token Ring and Ethernet) and X.25	X	X	X
NS/Windows	LAN (Token Ring and Ethernet) and Coaxial	X	-	-
PC Support/400	LAN (Token Ring and Ethernet) and Coaxial	X	-	-
OS/2 EE V1.2, V1.3, or Japanese V1.2	LAN (Token Ring and Ethernet) and X.25	X	-	-
OS/2 2.0 with CM/2 1.0	LAN (Token Ring and Ethernet) and Coaxial	X	X	X
OS/2 2.0 with Extended Services	LAN (Token Ring and Ethernet) and Coaxial	X	X	X
DOS APPC/PC	Token-ring	X	-	-
DOS APPC/PC with 3174 Peer Communication device drivers	Coaxial	X	-	-
Networking Services/DOS 1.0	LAN (Token Ring and Ethernet) and Coaxial	X	-	-
AIX SNA Services V1R2	Token-ring	X	-	-
AIX SNA Services V2R1	LAN (Token Ring and Ethernet)	X	X	X
RXR/2	Token-ring and Frame Relay	X	X	X
6611 MPTN	Token-ring and Frame Relay	-	-	X
3172 ICP V2 with VTAM V3.4	Token-ring	X	-	-
3725 with NCP V4.3.1	SDLC and Token-ring	X	-	-
3720 with NCP V5.2.1 thru V5.4	SDLC and Token-ring	X	-	-
3745 with NCP V5.2.1 thru V6.1	SDLC and Token-ring	X	-	-
3745 with NCP V6.2 (VTAM V4.1)	SDLC, X.25 and token-ring	X	X	X
3745 with NPSI V3.5	X.25	-	-	X
3745 with NCP V7.1	Frame Relay and previous links	-	-	X
ES/9370 with VTAM V3.3	SDLC and Token-ring	X	-	-
4361 with VTAM V3.3	SDLC	X	-	-
VM with VTAM V3.3	Parallel Channel	X	-	-
MVS/ESA with VTAM V3.4	Parallel Channel	X	-	-
MVS/ESA with VTAM V4.1	Parallel Channel	X	X	X
Note: X = Supported				

18.8.4 3174 Network Node Services

As an APPN network node, the 3174 provides the following services:

- Control point services
- Topology and routing services
- Directory services
- Intermediate session routing
- Network node server

Control Point Services

The 3174 control point is responsible for managing itself as a T2.1 node and its attached resources. It activates links to adjacent T2.1 nodes, exchanges CP capabilities when establishing CP-CP sessions with adjacent nodes and provides services to those LEN nodes and end nodes which have specified it as their server. The services provided by the 3174 network node server will be described later.

Topology and Routing Services

The 3174 network node collects and exchanges information on links and network topology with other network nodes during topology database updates. It maintains this information in a topology database in controller storage.

The 3174 network node also performs route selection services. It receives requests for session endpoints and selects the best route to reach the session endpoints based upon the class of service (COS) desired.

To select the best route to a destination, the 3174 network node maintains a COS database which contains a table specifying the transmission group characteristics and node characteristics for each COS name.

IBM provides seven predefined COS tables for the 3174 network node, including SNASVCMG for LU-LU CNOS sessions and CPSVCMG for CP-CP sessions. The user can modify the IBM-supplied tables, except SNASVCMG and CPSVCMG, or create new tables through customization.

The 3174 network node also maintains a database correlating the COS names to mode names used for sessions. The IBM-supplied COS tables map to modes of the same name, except #CONNECT, which maps to a mode name containing eight blanks.

Directory Services

The 3174 network node maintains a directory of network resources and their locations, including the names of the LUs in the LEN nodes and end nodes that it serves.

For a LEN node to be served by a 3174 network node, its LU must be entered into the directory database either through customization or as a result of a previous sending of a BIND, if it is to be a BIND receiver. A LEN node that is a BIND sender does not need a prior entry in the database.

An end node, however, can register its LUs in the 3174 network node server directory database when required, without being customized in the 3174.

The directory database contains information from customization as well as information learned during network operation. The information that is learned is cached in controller storage.

If a hard disk is available, the cached information is copied from controller storage to the hard disk periodically. The frequency of this checkpointing is based upon network activity and cannot be controlled by the user. When the 3174 is re-IMLed, the directory database containing the customized and cached information is reloaded into controller storage.

In addition to performing directory services for the LEN nodes and end nodes that it serves, the 3174 network node also performs directory services in response to search requests by other network nodes in the network.

Intermediate Session Routing

As a network node, the 3174 participates in setting up sessions when it is an intermediate node for those sessions and is involved in certain session protocols, such as session pacing, after the session is set up. As an intermediate node, it accepts traffic from one session stage and passes it to the other. Since each session stage may vary in RU sizes, flow control and required outage notification, the 3174 network node is responsible for such functions as segmenting and supporting adaptive session pacing.

Network Node Server

As a network node, the 3174 can provide APPN services for LEN nodes and end nodes that have specified it as the server. The types of services performed by the 3174 network node server differ, depending on the node type that it serves.

End Node Support: An end node is capable of CP-CP sessions with a 3174 network node (or other adjacent network nodes). A 3174 network node can be a server for an end node. The services performed by a 3174 network node for an end node that it serves are:

- T2.1 link connection

  A 3174 network node server can initiate a T2.1 link connection to an end node when it is IMLed if it knows the control point name, the node type, DLC type and address of the end node through customization in the Network Resources panel.

  Once this connection is established, the end node can use the link to transport multiple, parallel, LU 6.2 session traffic for independent LUs.

- CP-CP sessions

  A 3174 network node server will respond to a request for CP-CP session activation from an end node. When the CP-CP session is established between the end node and the 3174 network node, the end node can make its capabilities known to the 3174 network node server.

- Resource registration

  A 3174 network node server allows an end node to register its resources in the server′s directory database. Registration will enable the 3174 network node server to respond to search requests for the end node′s resources from other nodes.

- Directory services and preferred route selection

A 3174 network node server will perform directory searches to locate a remote LU name requested by an end node. The end node does not have to configure any remote LUs with which it may require a session.

- Network management

  A 3174 network node server will act as a “focal point” (referred to as a *pseudo focal point* in Table 24 on page 508) for alerts sent by an end node. The 3174 network node then converts the alerts to NMVTs and sends them to NetView via an SSCP-PU session.

At any one time, an end node must have only one network node server in an APPN network. If a 3174 network node is to be the server, the Token-Ring address of the 3174 network node needs to be defined in the end node.

LEN End Node Support: A LEN node (LEN EN) has more limited capabilities than an end node. The services performed by a 3174 network node for a LEN node that it serves are:

- T2.1 link connection

  A 3174 network node server can initiate a T2.1 link connection to a LEN node when it is IMLed if it knows the control point name, the node type, DLC type and address of the LEN node through customization in the Network Resources panel.

  Once this connection is established, the LEN node can use the link to transport multiple, parallel, LU 6.2 session traffic for independent LUs.

- A LEN node is not able to support CP-CP sessions and, therefore, cannot transfer certain APPN information to the 3174 network node server. For example, the LEN node cannot send its local LU names to the 3174 network node server. The 3174 network node server cannot automatically register LU names of the LEN node.

  The 3174 network node server, however, can be customized with the LU names of the LEN node so that it can respond to search requests for those LUs.

  The 3174 network node server also caches results of directory services. When a LEN node sends a BIND to the 3174 network node server, the 3174 caches the local LU name specified in the BIND as an entry in the directory database. Using this cached entry, the 3174 network node server can respond to subsequent search requests for that LU.

- When a LEN node wishes to communicate with another LU, it cannot send or receive a search request to locate the desired LU. Instead, the LEN node must send a BIND specifying the partner LU name to the 3174 network node server.

  When the 3174 network node server receives the BIND, it will perform directory services to locate the desired LU. When it has located the desired LU, it selects the preferred route, attaches the route selection control vector (RSCV) and forwards the BIND through the network to the desired LU without further involvement from the LEN node.

- There is no network management support provided by the 3174 network node server for LEN nodes.

A LEN node, like an end node, must have one and only one network node server in an APPN network. If a 3174 network node is to be the server, the LAN address of the 3174 network node needs to be defined in the LEN node. In addition, the address of the 3174 network node server will be the destination for all partner LUs as all BINDs are sent to the 3174 network node server.

18.8.5 Wildcard Routing

When an LU requests session setup with another LU, the request goes to a network node server. If the network node does not "know" where the partner LU is located, it will send out a broadcast to its adjacent network nodes. A broadcast will continue until the LU is found, or the search has been propagated through the network.

If the LU is not found within a network, the search can be directed into adjacent networks. This is done with explicit definition of nodes, utilizing a LEN connection, or with a "wildcard."

The 3174 network node implements a full wildcard, which is enabled when you respond with a 1 (Yes) to question 612 during customizing.

Prior to VTAM V4.1, a VTAM/NCP subarea network is supported only as a LEN node. As a LEN node, it does not support CP-CP sessions on its T2.1 link connections and cannot register LU names or process search requests like a network node. To allow access to the LUs located in the subarea network or beyond, the wildcard option in a 3174 network node that is boundary-attached to the subarea network must be used. (With VTAM V4.1 and later, this will no longer be necessary.)

When the 3174 network node receives a BIND for an LU it cannot find explicitly, it will first do a broadcast search to its adjacent network nodes. If it does not find the LU and the wildcard option is enabled, it will forward the BIND to the attached subarea network. The wildcard option does not guarantee that the LU will be found but, if the LU is located in the subarea network or defined to the subarea network as being located in another APPN network, then the subarea network can route the BIND. If the LU is not found, the BIND will fail.

There are some cautions to be observed when using wildcard routing:

- Only one node in an APPN network can have the wildcard option active. An APPN network ends at the subarea boundary. So even if all sites have the same NETID, if they are connected to each other only through the subarea network, they are in different APPN networks. Each set of APPN nodes, separated by a subarea network, can have one wildcard active.

  For example, the AS/400 refers to its wildcard option as *ANY routing. If an AS/400 is in the connected APPN network with the *ANY option, then there cannot be a 3174 in the same network with the wildcard option enabled.

  There are several ways around this problem with the AS/400:

  – You can change the full wildcard in the AS/400 to a partial wildcard.

  – You can give the AS/400 a different NETID, but then you cannot have an APPN connection from the 3174 network node to the AS/400.

- Since the network node server cannot verify the LU location, it is not stored in the directory. A broadcast search is always initiated for this resource.

- Since the route is calculated to the network node with the wildcard option, all traffic for these resources must be routed through that node.

Wildcard Routing to a Subarea Network

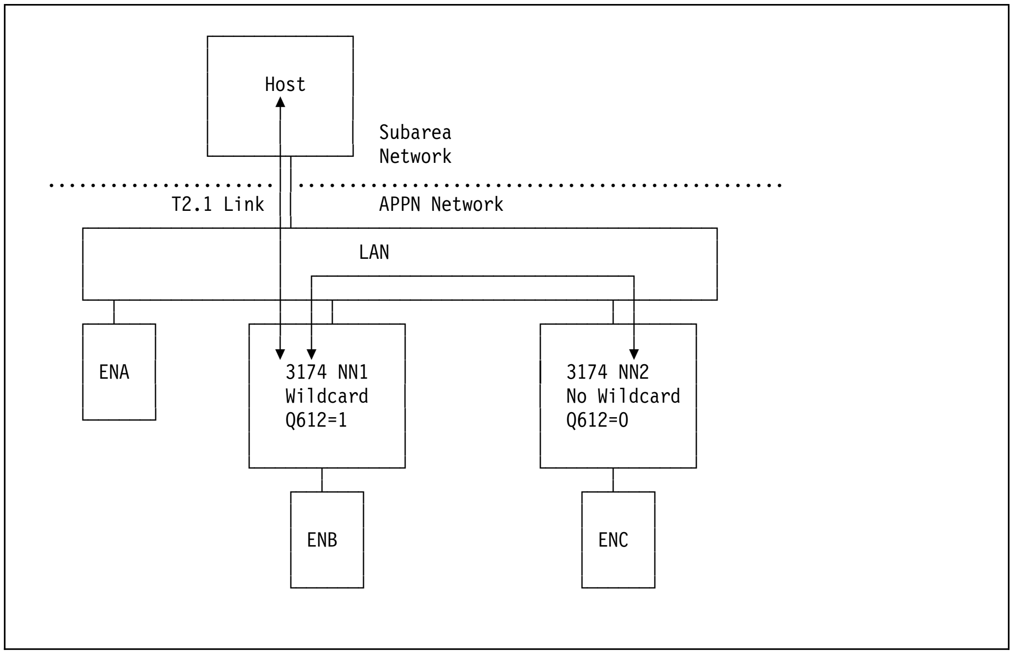


Figure 190. Example of a Wildcard Routing to a Subarea Network

Figure 190 shows an example of a wildcard configuration. If the subarea is running VTAM V3.4 with DYNLU=YES, the initiating LUs can be dynamically defined. If not, they have to be predefined to VTAM with LOCADDR=0 or as a cross domain resource.

For an independent initiating LU to access LUs in the subarea network, the following occurs:

1. ENC sends Locate/Find host LU to NN2 server
2. NN2 server does a broadcast search
3. NN2 server receives wildcard response from NN1
4. NN2 server calculates a route from ENC to NN1
5. NN2 server sends the calculated route to ENC
6. ENC sends a BIND to NN1, which then forwards the BIND to the host.

Note that NN2, although boundary-attached also, cannot respond because its wildcard option is not enabled. In addition, all APPN—subarea network traffic passes through NN1. In this example, ENC traffic is routed through NN2 to NN1 to the host.

A typical use of wildcard routing is shown in Figure 191 on page 517 where a 3174 network node/Token-Ring Gateway, with its wildcard option enabled, is attached to a subarea network.

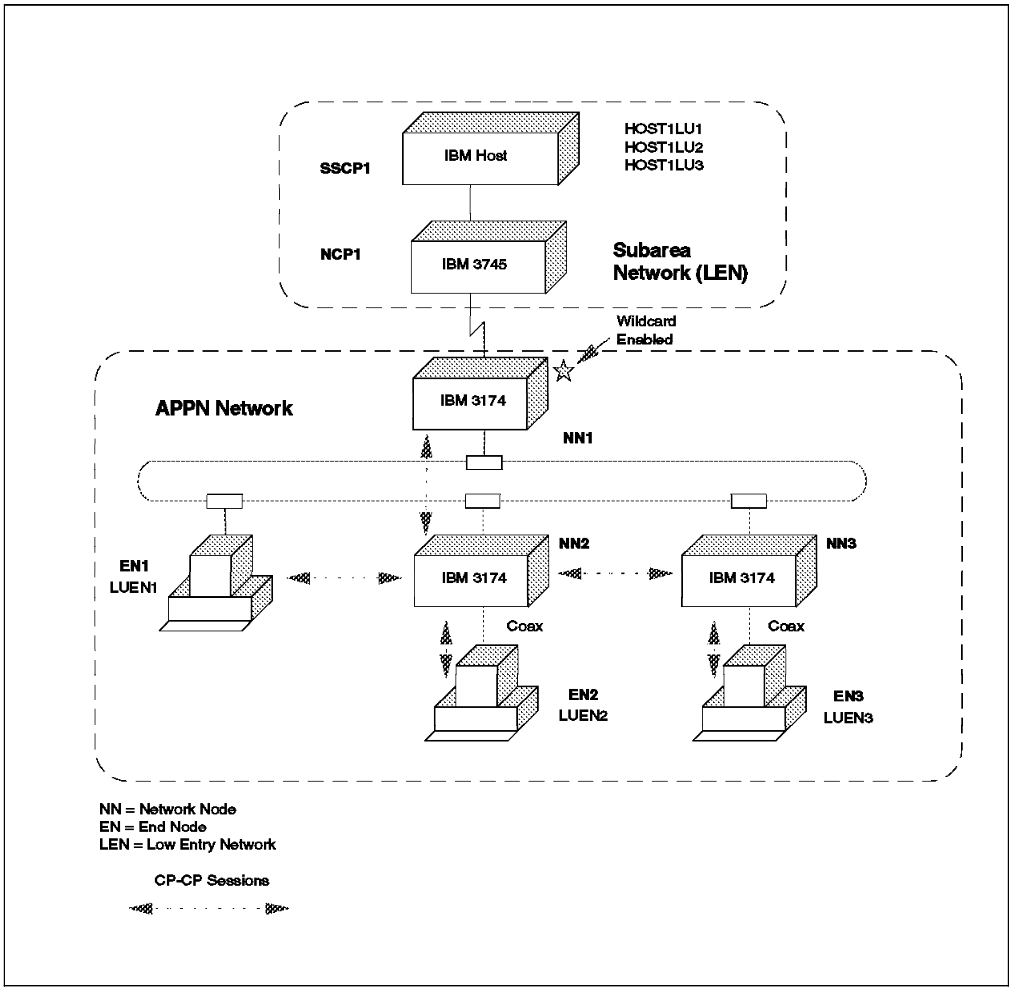


Figure 191. Another Example of a Wildcard Routing to a Subarea Network

18.8.6 Shared T2.0/2.1 Link Support

To support a T2.1 link connection between a subarea network and a 3174 network node, VTAM and NCP needs to support T2.1 peripheral nodes. The minimum levels of VTAM and NCP required are detailed in "Host Software" on page 536.

The T2.1 link connection is supported on the primary link only and is not supported by the Concurrent Communication Adapter. If the host connection fails, the route to the host is not available. The 3174, however, can continue to function as an APPN network node.

The T2.1 link can be an SDLC, X.25 or Frame Relay link and an S/370 channel attachment. For 3174 Model x3Rs, the T2.1 link can be via a 37xx NCP Token-Ring Interconnection (NTRI) gateway or a 3174 Token-Ring Gateway. Similarly for 3174 Model x4Rs, the T2.1 link can be via 3745 NCP gateway with an Ethernet type LAN Adapter (ELA) or a 3174 Ethernet Gateway

For T2.1 links to 37xx, the frame size needs to be set to 521 bytes. This is because LU 6.2 BINDs can exceed 256 bytes and NCP does not provide reassembly of BINDs. Therefore, your response to question 370: Maximum

Inbound I-Frame Size must be 1 (521 bytes maximum) when customizing the 3174.

For T2.1 links via the S/370 channel, the host Read Channel Program size (VTAM IOBUF) should at least be 1033 bytes. If the Read Channel Program size is less than 1033 bytes, the 3174 will not reassemble all data I-frames and may impact overall performance. Therefore, your host definition should reflect the recommended size.

The 3174 network node must also maintain a T2.0 link for dependent LUs that are attached. LU types 1, 2 and 3 are dependent upon SSCP and PU 2.0 functions. In addition, an SSCP-PU session is required to transport network management traffic for NetView alerts, network asset management and Central Site Control Facility when using Configuration Support-C Release 4 or earlier.

Note: With Configuration Support-C Release 5, Management Services (MS) function of the 3174 APPN NN has been extended to communicate with a Network Management Focal Point using an LU6.2 session and Multiple Domain Support for transport and, therefore, alerts are allowed to flow to the focal point on an LU6.2 session.

The link to the subarea host must, therefore, support both T2.0 and T2.1 traffic. The request for shared link support is indicated by coding XID=YES on the host PU definition for the 3174 network node. Shared link support allows dependent LU traffic for 3174-attached devices and independent LU 6.2 traffic from the APPN network to use the same link station address.

A 3174 network node may also act as a LAN gateway for downstream devices. The combined 3174 network node/LAN gateway provides shared link support to its downstream PUs. This shared link support allows a downstream PU (DSPU), which is also a LEN node, an end node or a network node, to use a single link connection to transport T2.0 traffic for SSCP-PU, SSCP-LU and dependent LU-LU sessions and T2.1 traffic for independent LU 6.2 sessions to the 3174 network node/LAN Gateway.

Figure 192 on page 519 shows an example of shared link support.

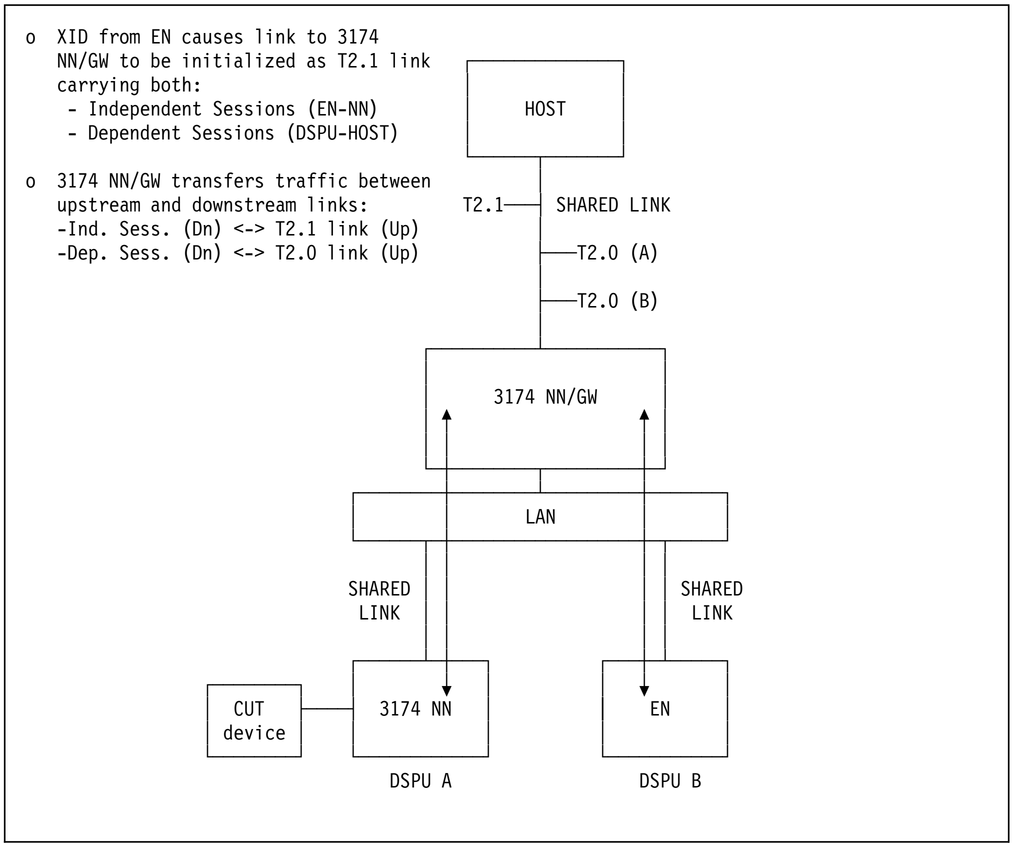


Figure 192. Shared T2.0/2.1 Link Support Example

18.8.7 Shared Link Customization Considerations

With Configuration Support-C the 3174 can support three types of SNA links:

- A link that carries only T2.0 traffic.
- A link that carries only T2.1 traffic.
- A link that carries both T2.0 and T2.1 traffic (the shared T2.0/2.1 link discussed previously).

If APPN is not enabled (question 510=0), all links with the 3174 are defined as T2.0 only.

If APPN is enabled (question 510=1), the responses to 3174 customization will determine the type of link the 3174 expects between itself and another node. The responses will also determine how the 3174 will attempt to activate the link. The following description assumes that APPN is enabled.

A link can be dynamically shared if you are running Configuration Support-C Release 3 or later and have customized the LAN address as a DSPU in question 941.

3174 Gateway Links

The type of link that a 3174 gateway will attempt to activate between itself and a LAN attached node is determined by how the attached node is defined to the 3174 gateway and the XID exchange:

Node Definition	Expected Link Type
The node LAN address/SAP is *not* customized in the 3174 gateway.	Type 2.1 Dynamically
The node LAN address/SAP is customized in the 3174 gateway in Question 940: LAN Address Assignment panel *only*.	Type 2.0 or Dynamically Shared based on XID3 exchange
The node LAN address/SAP is customized in the 3174 gateway in the Network Resources panel *only*.	Type 2.1 only
The node LAN address/SAP is customized in the 3174 gateway in Question 940: LAN Address Assignment panel *and* in the Network Resources panel.	Type 2.1 shared

3174 Model x3R/x4R Links

The type of link that a 3174 Model x3R/x4R will attempt to activate between itself and another LAN node (for example, a 3174/37xx gateway, or another 3174 Model x3R/x4R) will be determined by how the other node is defined to the 3174 Model x3R/x4R.

Node Definition	Expected Link Type
The node LAN address/SAP is *not* customized in the 3174 Model x3R/x4R.	Type 2.1 Dynamically
The node LAN address/SAP is customized in the 3174 Model x3R/x4R in Question 107: LAN Address and Service Access Point of the Gateway *only*.	Type 2.0 only
The node LAN address/SAP is customized in the 3174 Model x3R/x4R in the Network Resources panel *only*.	Type 2.1 only
The node LAN address/SAP is customized in the 3174 Model x3R/x4R in Question 107: LAN Address and Service Access Point of the Gateway *and* in the Network Resources panel.	Type 2.1 shared

3174 Channel Links to Host

The type of link that a channel-attached 3174 will attempt to activate between itself and the host is determined by the response to Question 242: Link Type.

Determining Parameters	Expected Link Type
Question 242 is set to 0 (T2.0 traffic only) and VTAM definition indicates PU T2.0 (no XID=YES on the PU definition; default is XID=NO).	Type 2.0 only
Question 242 is set to 1 (combined T2.0 and T2.1 traffic) and VTAM definition indicates PU T2.1 (XID=YES on the PU definition).	Type 2.1 (without DLUR is shared and with DLUR is T2.1 only)

3174 Remote Links to Host

The type of link that a remote (SDLC, X25, Frame Relay) link-attached 3174 will attempt to activate between itself and the host is determined by the response to Question 510: APPN Network Controller and the XID exchange.

Determining Parameters	Expected Link Type
Question 510 is set to 0 (APPN not enabled).	Type 2.0 only
Question 510 is set to 1 (APPN enabled) and the attached node is a VTAM host • VTAM definition indicates PU T2.1 (XID=YES on the PU definition)	Type 2.1 (without DLUR is shared and with DLUR is T2.1 only)
Question 510 is set to 1 (APPN enabled) and the attached node is an AS/400 with dependent LUs. • AS/400 has a APPC controller autocreated or explicitly defined for the 3174.	Type 2.1 shared
Question 510 is set to 1 (APPN enabled) and the attached node is non-subarea. • The node Local Area Network/SAP is customized in the 3174 Network Resources panel	Type 2.1 link

Note: For X.25 links, the Physical Unit ID (PUID) customized in Question 215 is not sent as a part of the XID, when the link is pure Type 2.1 or shared. This can cause the link to fail or an unexpected link type is the attached node checks this value.

Mismatched Link Types

In customizing a 3174 network node, it is important that the nodes at both ends of a link define the same link type. If the link types do not match, one of the following occurs:

- The link may not activate, as is the case with channel host links.
- The link may activate differently than one of the nodes expects, depending on the negotiation during XID exchange between the two nodes. This is the case with LAN links or SDLC links.

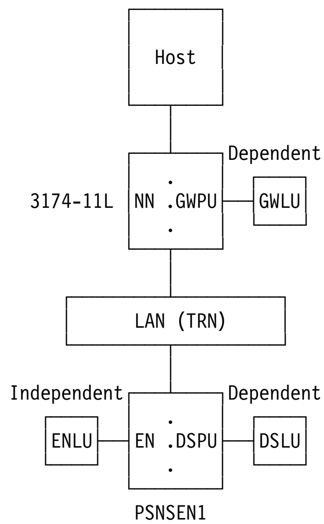
  Link type negotiation during XID exchange will result in the *lower* of the two link types expected. For example:

  – If node A expects the link to be T2.1 shared and node B expects the link to be T2.1 only, then the resultant link will be T2.1 only.

  – If node A expects the link to be T2.1 shared and node B expects the link to be T2.0 only, then the resultant link will be T2.0 only.

Figure 193 on page 523 shows an example of VTAM definitions and 3174 customization responses required to provide shared link support.

18.8.8 Shared Link Customization Example




```
VTAM Definitions:
 GWPU    PU CUADDR=E40,XID=YES
 ENLU    LU LOCADDR=0
 GWLU    LU LOCADDR=2
 DSPU    PU CUADDR=E41
 DSLU    LU LOCADDR=2

3174 Customization:
 Local (SNA)    Q242=1
 Common SNA     Q510=1   Q511=NN
 LAN  Addr Assg Q940= 40 400031740001 04
                     41 400030010001 04
 Network Resources
        NODE      DLC
 CPNAME TYPE  LUs TYPE  ADDRESS
 EN       2    -   1     400030010001 04
```

Figure 193. Shared T2.0/2.1 Link Example

In this example, a 3174-11L is both a network node and a LAN (Token Ring) gateway. We will assume that we require an APPN connection to the host. The 3174-11L will, therefore, require a shared link to the host to transport T2.0 and T2.1 traffic. We respond to question 242 (Link Type) with a 1 when customizing the 3174-11L. When question 242=1, it indicates that the link to the host is able to carry both T2.0 and T2.1 traffic.

For the host to support a T2.1 link from the 3174-11L, it must have the right levels of VTAM (and NCP if the 3174 is remote-attached). In addition, the host PU definition for the 3174-11L must specify XID=YES.

Similarly, PSNSEN1 is both an APPN end node and a downstream PU. PSNSEN1 will require a shared T2.0/2.1 link to the 3174-11L network node/LAN gateway. In order to have a shared link with the 3174-11L, PSNSEN1′s LAN address/SAP must be customized in Question 940: LAN Address Assignment as a downstream PU *and* it must also be customized in the Network Resources panel as an end node.

By having shared link support, T2.0 traffic from the 3174-11L LU (GWLU) and T2.1 traffic from the end node portion of PSNSEN1 (ENLU) will use the same link station address (CUADDR=E40) to reach the host. The T2.0 traffic from the downstream PU portion of PSNSEN1 will use the other link station address (CUADDR=E41) to reach the host. Thus, we can see that both the link from the 3174-11L to the host and the link from the 3174-11L to PSNSEN1 are shared T2.0/2.1 links.

The following points should be noted about the VTAM definitions:

- The independent LU (ENLU in this example) is defined under the PU definition for the 3174-11L. When a 3174 network node is attached to the host subarea, all independent LUs in the APPN network are associated (from the host′s perspective) with the boundary-attached 3174, regardless of the actual physical location of the independent LUs.

- The PU definition for the 3174 attached to the subarea (GWPU in this example) is always required.
- If a “downstream” node in the APPN network does not contain any dependent LUs, does not require SSCP-PU services and contains only independent LUs, then no PU definition is required for that node.

18.8.9 Connection Networks

When two nodes are physically attached to the same transport facility, such as a LAN, it is advantageous, for performance reasons, to establish *direct* connections between those two nodes when they wish to communicate rather than being routed via an APPN intermediate network node.

To achieve direct connectivity between two nodes, one node must be defined in the other node, and vice versa. In a large APPN network, direct any-to-any connectivity through definition may not be possible because of the enormous task of coordinating definitions, especially if the network topology changes frequently. This is where a connection network can be used.

The concept behind a connection network is that a shared-access transport facility (SATF), such as a LAN, can be considered a virtual node in an APPN network. This virtual node is also known as a connection network and is referred to by its name. Since it is a node in an APPN network, route selection services can calculate routes that go through this virtual node or connection network.

All nodes that are on the same SATF can be defined to attach to the same connection network. This is true even across bridges. Each attaching node defines DLC signalling (addressing) information about itself, such as its LAN address and SAP. In addition, it specifies the name of the connection network. All nodes attached to the same connection network must, therefore, specify the same connection network name.

When communication needs to be established between two nodes, route selection services will find out that both nodes are attached to the same connection network. The routing information that is returned to the initiator of the route request will contain the DLC signalling information of the destination. The initiator can then establish a direct outgoing connection to the destination. Thus, without massive pre-definition, any initiator can reach any destination on the same connection network.

A connection network may be used by network nodes and end nodes. A connection network cannot be used by LEN nodes because all data to or from a LEN node must always pass through its network node server.

A connection network reduces the number of entries in the topology database and the number of topology database updates (TDUs) that are sent about each network node—network node connection. By defining network nodes in the same connection network, the number of entries and TDUs are reduced from *n*• - *n* (*n squared* minus *n*) to *n*, where *n* is the number of network nodes in the APPN network. This is a very significant reduction when there is a large number of network nodes in the network.

With a 3174 network node, its attachment to a connection network is specified via question 512: APPN Virtual Node Name on the Common SNA panel. Figure 194 on page 525 shows an example of the relationship between definitions in the end nodes and the 3174 network node server required to implement a connection network.

Connection Network Definitions

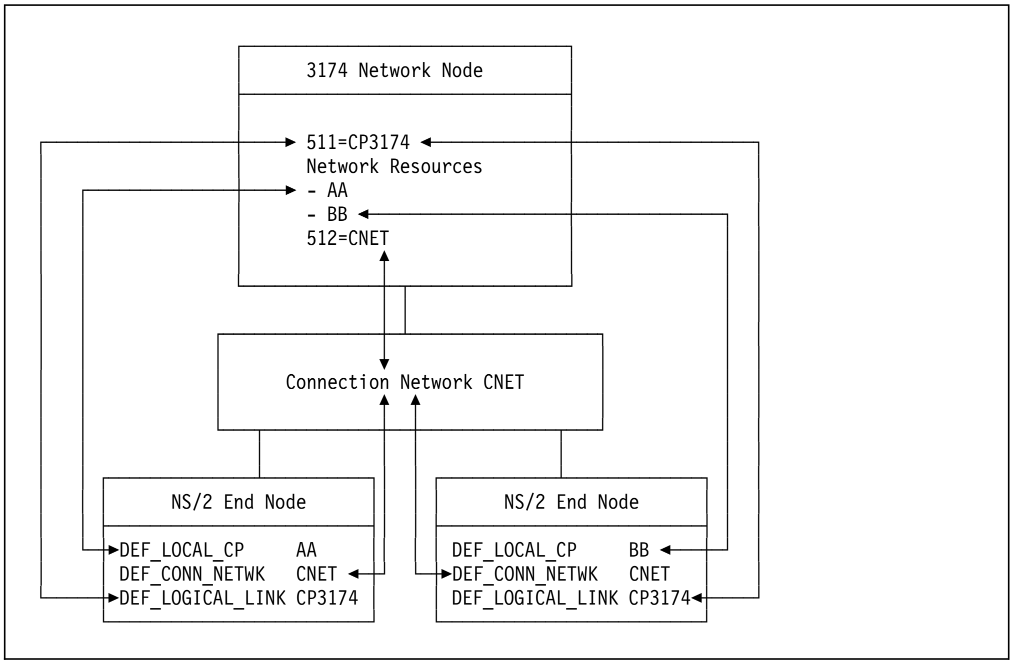


Figure 194. Relating Definitions Used in a Connection Network

In this example:

- All nodes attached to the same connection network specify the same virtual node or connection network name.
- All nodes define their own control point.
- Links are defined between each end node and its network node server.

If an LU in end node AA wants a connection to end node BB, AA asks the network node server (CP3174 in this example) for the shortest route to BB. This is the route through the connection network CNET. CP3174 gives AA the addressing information of BB. AA then establishes the session to BB directly, bypassing the network node server.

In this example, the end nodes AA and BB are defined as network resources in the 3174. To reduce customization further, AA and BB *need not* be defined as shown because they are end nodes and are, therefore, able to register themselves with the 3174 network node server via CP-CP sessions.

In the 3174 APPN feature customization, a connection network name is required (even if it is not used).

18.8.10 Mode and Class of Service

As in subarea networking, LUs in an APPN network have to agree on the rules used to communicate with one another. At session establishment, a specified set of rules is selected via a mode table entry, which is then used to build the BIND. If the LUs do not agree upon the BIND parameters initially selected, they may negotiate the parameters until they agree. If no agreement is reached, the BIND fails and the session is not established.

Figure 195 shows an example of the BIND parameters that may be specified.

```
DEFINE_MODE  MODE_NAME(QPCSUPP )
             COS_NAME(#CONNECT)
             DEFAULT_RU_SIZE(NO)
             MAX_RU_SIZE_UPPER_BOUND(1920)
             RECEIVE_PACING_WINDOW(7)
             MAX_NEGOTIABLE_SESSION_LIMIT(32767)
             PLU_MODE_SESSION_LIMIT(64)
             MIN_CONWINNERS_SOURCE(32);
```

Figure 195. NS/2 Example Mode (QPCSUPP) Used for 5250 Emulation

A mode with the same name must exist at both endpoints, that is, the local as well as the remote locations, of a session. The mode need not exist in an intermediate node through which the session may pass through. In the case of a LEN or EN node, the mode must exist in its network node server, the 3174.

The mode definition also specifies which class of service (COS) is to be used to determine the route and priority through the network. The NS/2 example shows the COS name specified via the COS_NAME parameter in the DEFINE_MODE statement.

IBM provides seven predefined COS table names for the 3174 network node including:

- CPSVCMG for LU-LU management services sessions between the CPs of two logically adjacent nodes. This is also called a CP-CP session.
- SNASVCMG for LU-LU management services sessions used when CPSVCMG cannot be used.

SNASVCMG and CPSVCMG are two tables that cannot be modified and, in fact, are not displayable. Unless you are looking at a trace you will not need to worry about these modes. The other default definitions are shown in 18.12.9, "COS Definition" on page 551. The user can modify these other IBM-supplied tables or create new tables using these tables as models when customizing the 3174 network node.

Each COS consists of two parts: TG (link) characteristics and node characteristics.

The TG characteristics that may be specified are:

- TG weighting
- Cost per connect
- Cost per byte
- Link speed
- Security level
- Propagation delay
- Three other characteristics to be defined by the user

The node characteristics that may be specified are:

- Node weighting
- Transmission priority
- Route addition resistance
- Congestion

The 3174 network node also maintains a database correlating the COS names to mode names used for sessions. The IBM-supplied COS tables map to modes of the same name, except #CONNECT, which maps to a mode name containing eight blanks.

18.8.11 APPN LIC Compared With T2.1 Passthru Gateway RPQ 8Q0800

Both of these features are currently available. The APPN LIC feature is based on Configuration Support-C, whereas the RPQ 8Q0800 is based on Configuration Support-B. If you are on Configuration Support-B and have not upgraded to Configuration Support-C, perhaps because you do not have enough 3174 slots for the memory required for Configuration Support-C, the RPQ remains an option.

The main difference between the two implementations is:

- The APPN LIC feature provides a full APPN network node capability to the 3174; in other words, it is a T2.1 device and can exchange XID3s.
- The RPQ only passes through the XID3s that it receives; the 3174 remains a PU 2.0 device.

APPN LIC feature for Configuration Support-C: Configuration Support-C APPN implements a full function network node in the 3174. Only the primary link (parallel channel, SDLC, X.25, Frame Relay, token ring or Ethernet) to the primary host is supported.***:*** With Configuration Support-C only the PU for the 3174 network node is defined in VTAM with XID=YES to allow representation of one boundary-attached T2.1 node.

T2.1 Passthru Gateway RPQ 8Q0800 for Configuration Support-B: The 3174, with Configuration Support-B Release 4 and the T2.1 Passthru Gateway RPQ, does not have any APPN functions at all. As its name indicates, the RPQ allows T2.1 datastreams (XID3s) to pass through the 3174 Token-Ring Gateway to the downstream PU. Each DSPU has a Token-Ring address which is mapped by the 3174 gateway to a device sub-channel address (if the 3174 gateway is channel attached) or to an SDLC poll address (if the 3174 gateway is SDLC link attached) during customization. The DSPUs appear as LEN nodes attached to the subarea network LEN node by a T2.1 link. Communication between the LEN nodes must be direct without involvement of an intermediate node.

When using the RPQ, each DSPU that is also a T2.1 device is defined to VTAM with XID=YES. Unlike the 3174 network node, the 3174 Passthru Gateway does not have its PU defined in VTAM with XID=YES.

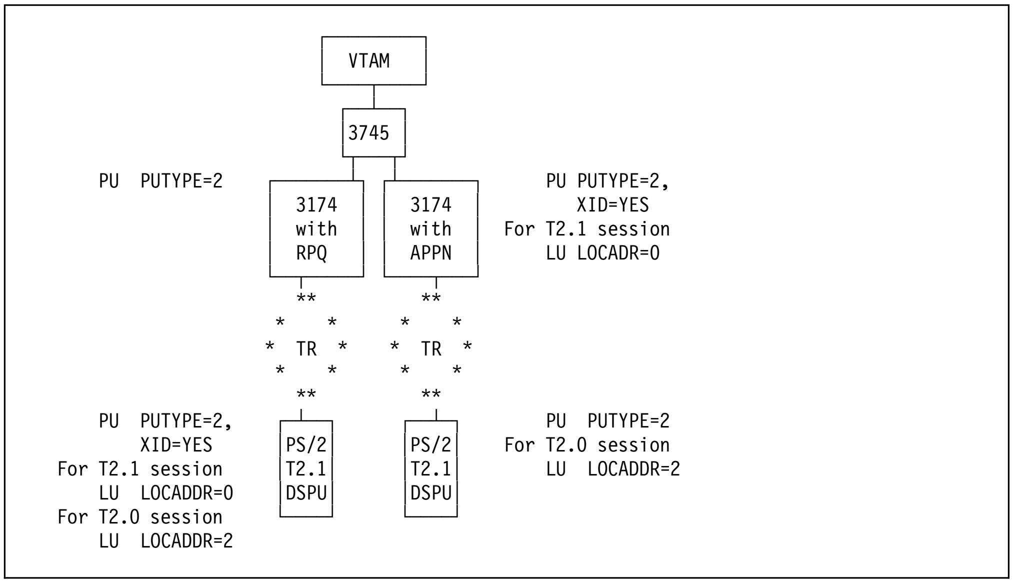


Figure 196. Example of T2.1 RPQ and Configuration Support-C with APPN

This figure shows two 3174s with Token-Rings. Each Token-Ring has a DSPU with two LUs, one for a T2.1 session and one for a T2.0 session. The left 3174 has the T2.1 RPQ. Note that the LU for the T2.1 node and the XID on the PU are specified in the DSPU PU definition. The right 3174 has Configuration Support-C with APPN. Note that the LU for the T2.1 node and the XID on the PU are specified in the 3174 PU definition.

18.8.12 Central Site Change Management

Each 3174 that is to participate in Central Site Change Management (CSCM) using NetView Distribution Manager (NetView DM) requires an LU to be defined to VTAM or NCP. The LU used for CSCM may be defined as a dependent or an independent LU when the 3174 APPN functions are active.

When defined as a dependent LU, CSCM supports a single session to NetView DM. Because of shared link support, the link to the host is able to carry the dependent LU traffic for CSCM and independent LU traffic for APPN. The LU for CSCM is a dependent LU if APPN is not enabled (question 510=0). It is also a dependent LU if APPN is enabled (question 510=1) but the LUNAME (question 502) and CPNAME (question 511) are not the same. In both cases, the host CSCM LU definition should specify LOCADDR=1.

When defined as an independent LU, CSCM uses the same LU 6.2 as that used for the 3174 network node since an independent LU 6.2 supports multiple parallel sessions. The LU for CSCM is an independent LU only if APPN is enabled and the LUNAME is the same as the CPNAME. In this case, the host CSCM LU definition should specify LOCADDR=0.

Note: 3174 can also participate in Central Site Change Management (CSCM) using NetView DM/2 V2.1. See the ITSO document *NetView DM/2 V2.1 Remote Administrator and New Functions*, GG24-4419, for further information.

18.8.13 Border Node Support

In subarea networking, subarea networks from different organizations may need to communicate with one another while maintaining their independent identities. SNA Network Interconnection (SNI) was provided to meet this requirement.

In APPN networking, the same requirement exists for independent APPN networks to communicate with one another while maintaining their independent identities. However, an APPN network node can have CP-CP sessions with other network nodes only if they all use the same network ID. The solution to the multi-network connectivity requirement is a *border node*.

A border node provides additional functions on top of the APPN network node. It can support CP-CP sessions with adjacent network nodes that do not use the same network ID as itself. It can be used to join two independent APPN networks and allow cross-network communications in a similar manner to SNI.

The AS/400 is the first APPN system to implement border node functions with OS/400 V2.1 (or V1.3 with PTFs). This capability is referred to as Multi-Network Connectivity.

Border Nodes provided by AS/400 and VTAM allow sessions across the APPN sub-network with different network IDs. With Configuration Support-C Release 5 the 3174 NN supports attachment to these Border Nodes. One benefit of sub-networks is that they decrease the size of topology data bases and the number of network flows.

18.9 3174 APPN and Peer Communication Combined

When the 3174 APPN feature is used in conjunction with the Peer Communication feature, end nodes and LEN nodes attached to a 3174 network node by coax can access the attached 3174 network node or any other APPN node on the external token ring.

Note:

This functions are not available when the LAN is Ethernet since Bridge Support (Q.651) is not available for Ethernet Adapter.

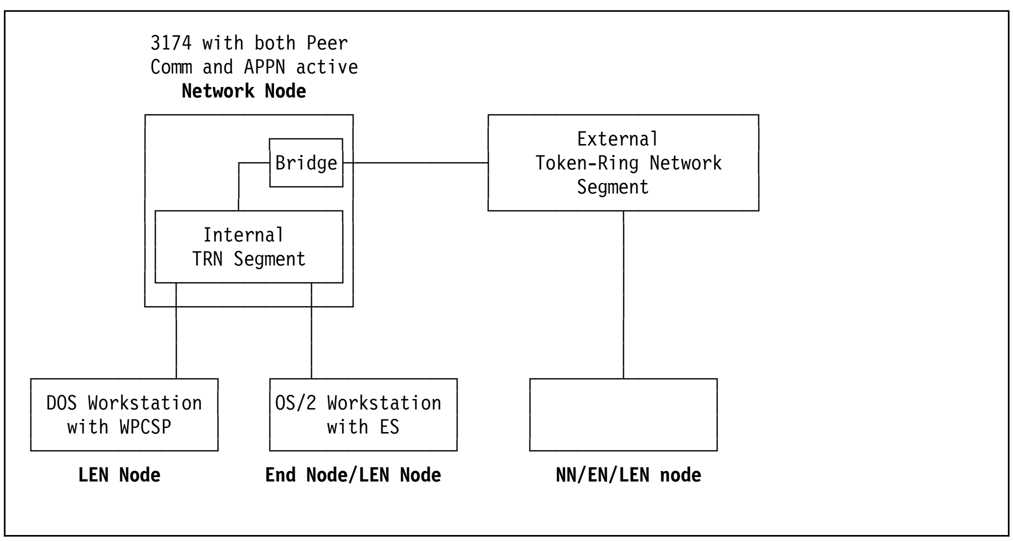


Figure 197. APPN and Peer Communication Combined: Logical View

18.10 Interface Flows between APPN Nodes

This section describes an overview of the session establishment between control points (CP-CP sessions) and between LUs (LU-LU session) in an APPN network. For a detailed description, see *3174 Functional Description*, GA23-0218. We have reproduced the charts that describe the interface flows between nodes at session establishment as a quick reference.

Figure 198 provides an example showing CP-CP sessions between APPN network nodes in a Token-Ring Network environment.

Figure 199 on page 531 provides an example showing CP-CP sessions between an APPN network node and an APPN end node in a Token-Ring network environment. An example of this can be found as Scenario 6 in the *3174 APPN Implementation Guide*, GG24-3702.

Figure 200 on page 532 provides an example showing an LU-LU 6.2 session between APPN end nodes and an APPN network node providing network node services in a Token-Ring Network. An example of this can be found in the *3174 APPN Implementation Guide Update* GG24-4171.

18.10.1 APPN NNs Establishing CP-CP Sessions

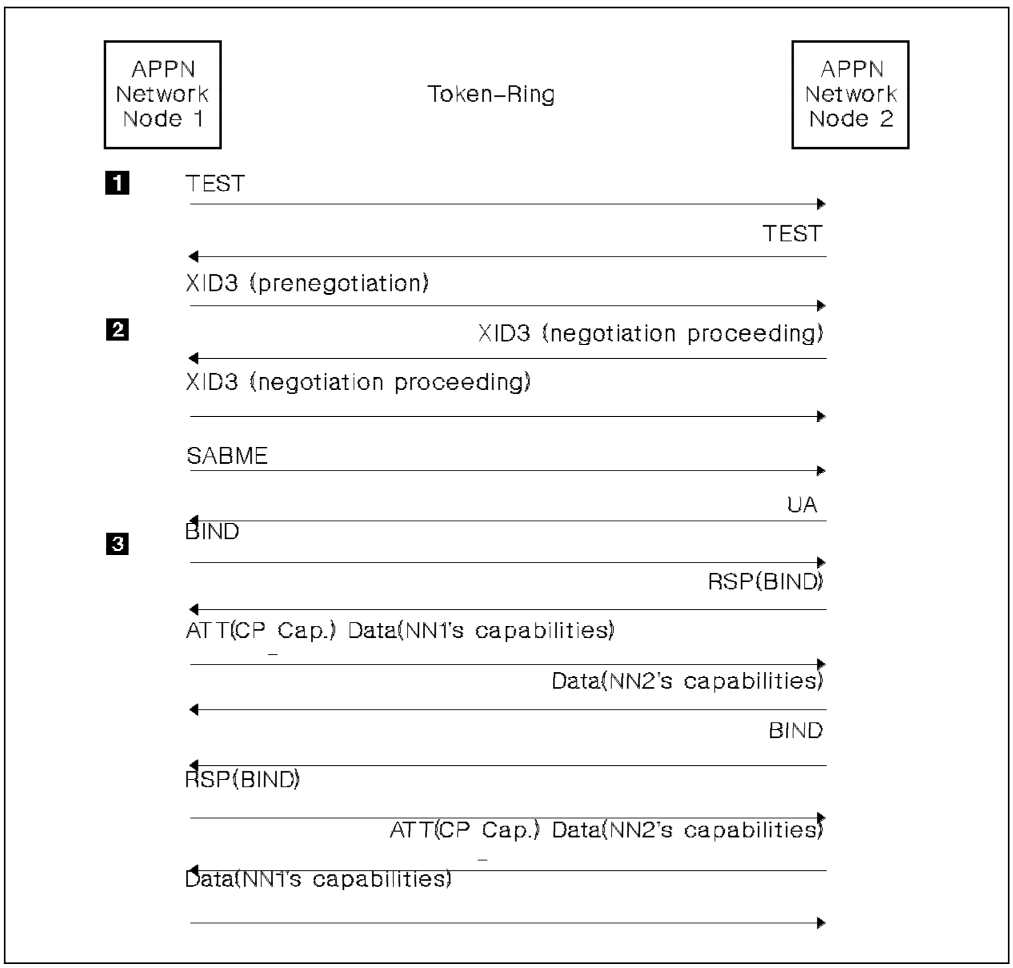


Figure 198. APPN NNs Establishing Parallel CP-CP Sessions

1 Connect Phase – Exchange of TEST commands allows initial establishment of communication between the Token-Ring nodes. The XID3 prenegotiation is used to poll the adjacent link station to ensure that it is active. The CP Status field indicates that CP-CP sessions are supported. The APPN network nodes also compute the shortest routes between the nodes during this phase.

2 Contact Phase – During this phase, XID3 negotiation is performed by the APPN nodes to identify themselves. The CP and adjacent link station names are learned, and node and transmission characteristics are conveyed to facilitate communication. Once the SABME and UA have been sent and RR has flowed on the link, the contact and link activation phase are complete and bind can be sent.

3 CP-CP session establishment – The sender of a CP-CP session BIND considers the CP-CP session to be enabled when it receives the other node's CP capabilities. CP capabilities are encoded in the CP Capabilities GDS variable and include such information as: CP supports Locate/Cdinit search requests, directory services are provided, resource registration is supported, topology updates are provided, and so on.

18.10.2 APPN NN And APPN EN Establishing CP-CP Sessions

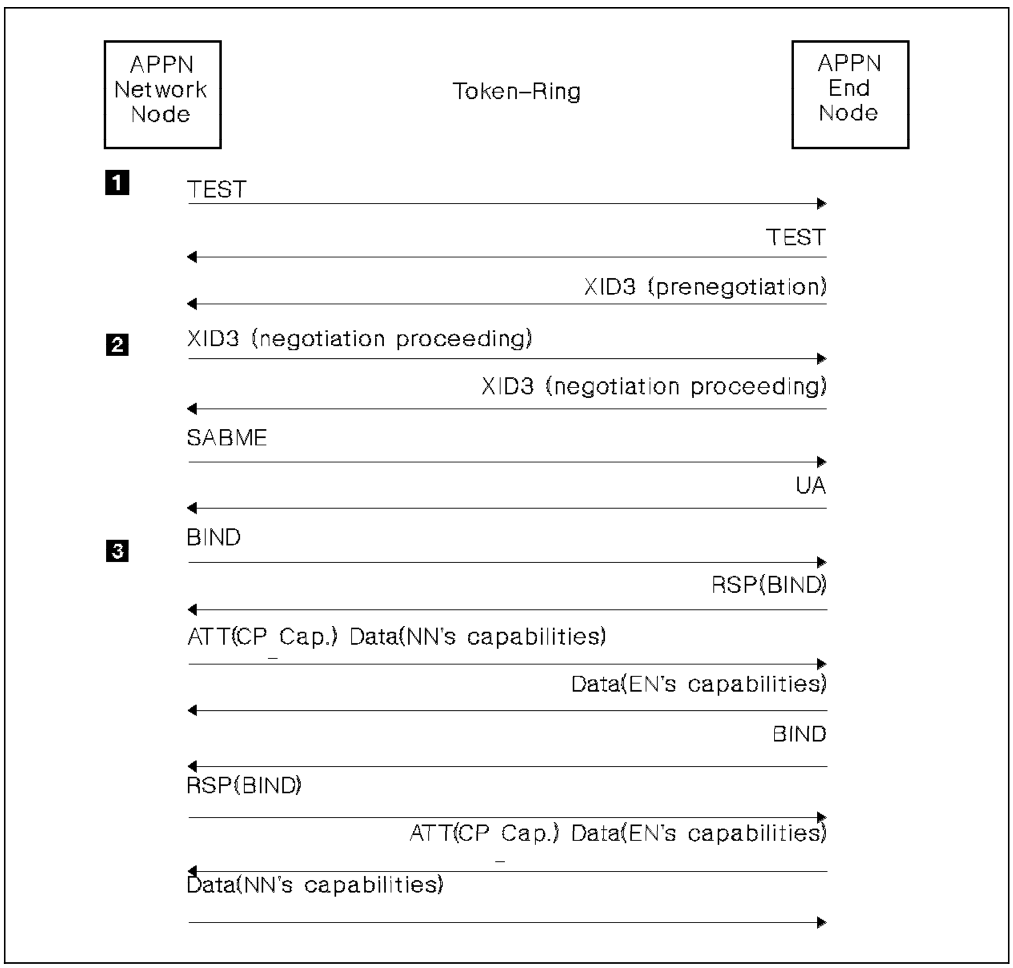


Figure 199. APPN NN and APPN EN Establishing Parallel CP-CP Sessions

1 Connect Phase – Exchange of TEST commands allows initial establishment of communication between the Token-Ring nodes The XID3 prenegotiation is used to poll the adjacent link station to ensure that it is active. The APPN end node indicates that it requires network services in the XID3 CP Status field. The APPN nodes also compute the shortest Token-Ring routes between the two link stations during this phase.

2 Contact Phase – During this phase, XID3 negotiation is performed by the APPN nodes to identify themselves. The CP and adjacent link station names are learned, and node and transmission characteristics are conveyed to facilitate communication. Once the SABME and UA have been sent and RR has flowed on the link, the contact and link activation phase are complete and Token-Ring I-frame data can be sent.

3 CP-CP session establishment – The sender of a CP-CP session BIND considers the CP-CP session to be enabled when it receives the other node's CP capabilities. CP capabilities are encoded in the CP Capabilities GDS variable and include such information as: CP supports Locate/Cdinit search requests, directory services are provided, resource registration is supported, topology updates are provided, and so on. CP-CP session establishment between an end node and a network node is the same as the CP-CP session establishment described above between two network nodes with the exception that end nodes have limited CP capabilities. Out of the list specified above for network nodes, the only CP capability an end node can specify is Locate/Cdinit search requests.

18.10.3 APPN Nodes Establishing an LU-LU Session

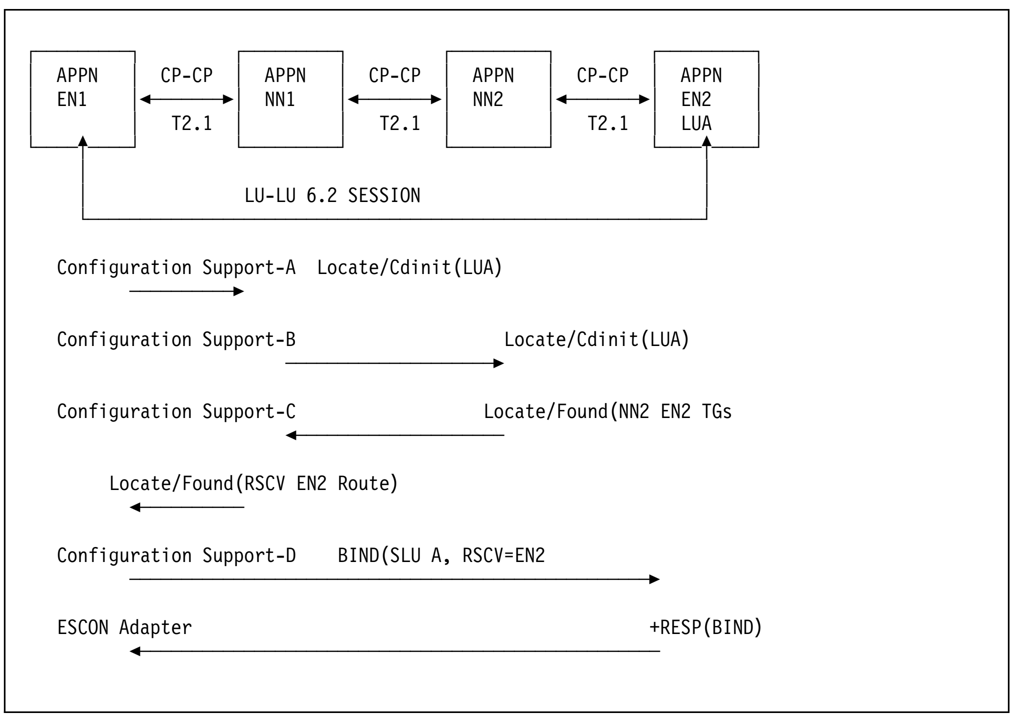


Figure 200. APPN Nodes Establishing an LU-LU Session in a Connection Network

1 This scenario does not show the link activations or CP-CP session establishments between the APPN nodes. The link activations and CP-CP session establishments would be similar to the two examples shown previously. APPN EN1 sends a Locate/Cdinit LUA to APPN NN1.

2 APPN NN1 determines that its local LU directory does not contain LUA as an entry. APPN NN1 builds a Locate/Cdinit that contains the FQPCID, the primary LU and secondary LU names, EN1's CP name, and NN1's CP name, and sends it to APPN NN2 with which it has a CP-CP session.

3 APPN NN2 knows about LUA and builds a Locate reply indicating that LUA is in APPN EN2 and its TG is EN2's Token-Ring MAC address and SSAP, and sends the reply to APPN NN1. APPN NN1 uses the TG vectors in conjunction with the topology database to compute the least weight route. In this case, since APPN EN2 is in the same connection network, the least weight route is the TG provided by APPN NN2. APPN NN1 sends the Locate/Found with the RSCV for APPN EN2 to APPN EN1.

4 APPN EN1 appends the RSCV to the BIND, after activating a link to EN2, and sends it to APPN EN2. The BIND contains the session parameters requested by the primary LU, as well as the secondary LU name and fully-qualified PCID. EN1 does not support the COS tower in this scenario.

5 LUA accepts the BIND and a +RSP BIND is routed back to APPN EN1. The LU-LU session is established at this point and session traffic can flow directly between EN1 and EN2. APPN NN1 provided network node services for EN1 but is not acting as an intermediate node.

18.11 Hardware/Software Requirements

3174 Models

To implement APPN functions, the following 3174 models are required:

- Older models: 1L, 1R, 2R, 3R, 51R and 53R
- Newer models: 11L, 11R, 12R, 13R ,14R, 61R, 62R, 63R and 64R
- Rack-mounted models: 21L, 21R, 22R, 23R and 24R
- 3174 Workstation Networking Modules (WNMs): 41R and 43R

Notes:

1. Models 12L and 22L (ESCON channel models) are supported by Configuration Support-C and the Peer Communication LIC feature; they are not supported by the APPN LIC feature.
2. Models 81R, 82R, 90R, 91R and 92R are not supported because they have only one diskette drive maximum. In addition, they do not support any fixed disk drive or storage expansion features. The maximum control storage on these models are as follows:
   - 81R and 82R: 1 MB
   - 90R, 91R and 92R: 2 MB.
3. Model 52R is not supported because its maximum control storage is 1.5 MB.

3174 Controller Storage

The amount of controller storage required to support Configuration Support-C is as follows:

- 2050 KB is the control storage required to support base microcode functions.
- 3 MB is the minimum control storage required to support APPN functions.

- Additional control storage is required other functions such as Peer, AEA, MLT, Multi-Host, SLMH, 3270 Port Expansion, CSCM and so on.

APPN Storage Requirements

When customizing the 3174 for APPN functions, the following will affect the amount of controller storage required:

- Question 610: APPN Sessions indicates the number of LU 6.2 intermediate sessions to be supported
- Question 611: APPN Nodes/Links indicates the number of T2.1 links to adjacent nodes to be supported.

The response can be from 1 to 4, corresponding to levels of APPN support. The default response for Question 610 is 1 (225 sessions) and for Question 611 is 1 (20 links). This default combination requires 968 KB of storage in addition to the 2050 KB base requirement.

Table 26 shows the additional amounts of storage required when APPN functions are desired.

Table 26. APPN Additional Storage Requirements (KB)

	Q611=1 (20)	**Q611=2 (75)**	**Q611=3 (150)**	**Q611=4 (225)**
Q610=1 (225)	968	1188	1666	1966
Q610=2 (500)	1408	1628	2106	2406
Q610=3 (750)	1808	2028	2506	2806
Q610=4 (1000)	2208	2428	2906	3206

Additional APPN suportwith Configuration Support-C Release 5:

- Frame Relay without Frame Relay host **90KB**
- Optional LAN adapter without gateway or TCP/IP over LAN **80KB**

Total Storage Requirements

To calculate the total storage required, see Appendix E, "3174 Storage Requirements" on page 755.

3174 Other Hardware

Other hardware required to run Configuration Support-C is as follows:

- Either one of the following:
  - Two 2.4 MB diskette drives
  - One 2.4 MB diskette drive and one hard disk.

    A hard disk is recommended for the following reasons:

    - The hard disk will result in speedier customization without frequent diskette swapping.
    - The hard disk can store more than one version of microcode and/or customization data objects to support Central Site Change Management (see *NetView Distribution Manager Release 2 and 3174 Central Site Change Management Implementation Guide* , GG24-3424 or *NetView DM/2 V2.1 Remote Administrator and New Functions*, GG24-4419).

- The directory database contains information from customization as well as information learned during network operation. The information that is learned is cached in control storage.

  If a hard disk is available, the cached information is copied from control storage to the hard disk periodically. When a re-IML is required, the cached information saved on the hard disk is reloaded into control storage. Thus, the 3174 network node does not have to re-learn the information contained in the cached entries.

- Configuration Support-C Release 5 APPN feature removes the requirement for a LAN adapter for the APPN feature. That is, the 3174 can be customized as an APPN network node (NN) without a LAN adapter installed.

Diskette Packaging

Configuration Support-C is packaged in three diskettes:

- One Control diskette
- One Control Extension diskette
- One Utility diskette

The Control and Control Extension diskettes contain the base microcode functions. The Control Extension diskette is also used to contain the microcode required to support the ISDN Basic Rate Interface Adapter and the Downstream Load (DSL) microcode required for other DSL functions such as AEA and graphics terminals.

Notes:

1. The Control Extension diskette is not delivered with any DSL microcode for AEA or graphics terminals that you may need in your current environment. You must merge all DSL microcode you need onto the Control Extension diskette.
   - Starting with Configuration Support-C Release 5, the APPN feature, Peer Communications feature, and the AEA feature code are pre-merged onto the Extension Diskette.
2. The APPN and Peer Communications features are merged into the Control Extension diskette when you order the 3174 base LIC for 3174 Workstation Networking Module (41R and 43R)

If you require APPN functions, you can order it by its LIC feature number shown in Table 27 on page 536.

The APPN LIC feature is delivered on a separate DSL diskette for Configuration Support-C Release 4 and earlier versions. This diskette is referred to as a ″DSL Extension″ diskette in the product announcement letter but is similar to other 1.2 MB DSL diskettes.

The APPN DSL code must be merged onto the 2.4 MB Control Extension diskette (or onto the hard disk if the Control Extension diskette has been copied to the hard disk) like other DSL microcode, using the Merge DSL option on the 3174 customization Master Menu. If other DSL functions such as AEA or graphics terminals are required, you must also merge them onto the Control Extension diskette.This is not necessary with Configuration Support-C Release 5 because APPN feature code is pre-merged onto Extension Diskette.

When you have merged the APPN DSL code and other DSL microcode needed for your environment, you should have two diskettes to IML the 3174:

- One Control diskette
- One Control Extension diskette

APPN LIC Feature Numbers

Table 27. APPN LIC Feature Numbers

Desired Feature	3174 Model	Feature Number
APPN LIC Feature	01L, 01R, 02R, 03R, 11L, 11R, 12R, 13R, 14R, 21H 21L, 21R, 23R, 24R	#7010
APPN LIC Feature	51R, 53R, 61R, 62R, 63R, 64R	#7060

3174 Licensed Internal Code

To install APPN functions on the 3174, you need the following:

- APPN Licensed Internal Code feature with Configuration Support-C

To install T2.1 Passthru Gateway functions on the 3174, you need the following:

- T2.1 Passthru Gateway RPQ 8Q0800 with Configuration Support-B.

Host Software

To support APPN, the subarea host systems must have the following or later levels of VTAM and NCP:

- VTAM V3.2 for SDLC
- VTAM V3.3 for 4361, ES/9370*, or VM S/370 channel
- VTAM V3.4 or above for MVS/ESA* S/370 channel
- NCP V4.3.1 for 3725
- NCP V5.2.1 or above for 3720 or 3745.

18.12 3174 Customization

Customization is the process of tailoring the 3174 Configuration Support-C Licensed Internal Code (LIC) to meet your unique requirements. This section provides guidance on customizing the 3174 for APPN functions.

Specific examples of customization for the 3174, VTAM, PS/2 and AS/400 for both APPN and Peer Communication can be found in the ITSO document *3174 APPN Implementation Guide Update*, GG24-4171. This document provides example scenarios on how to configure for APPN and Peer Communication using DOS, OS/2, AS/400, NCP, and VTAM.

Figure 201 shows the flow sequence of panels when customizing the 3174 for APPN and Peer Communications.

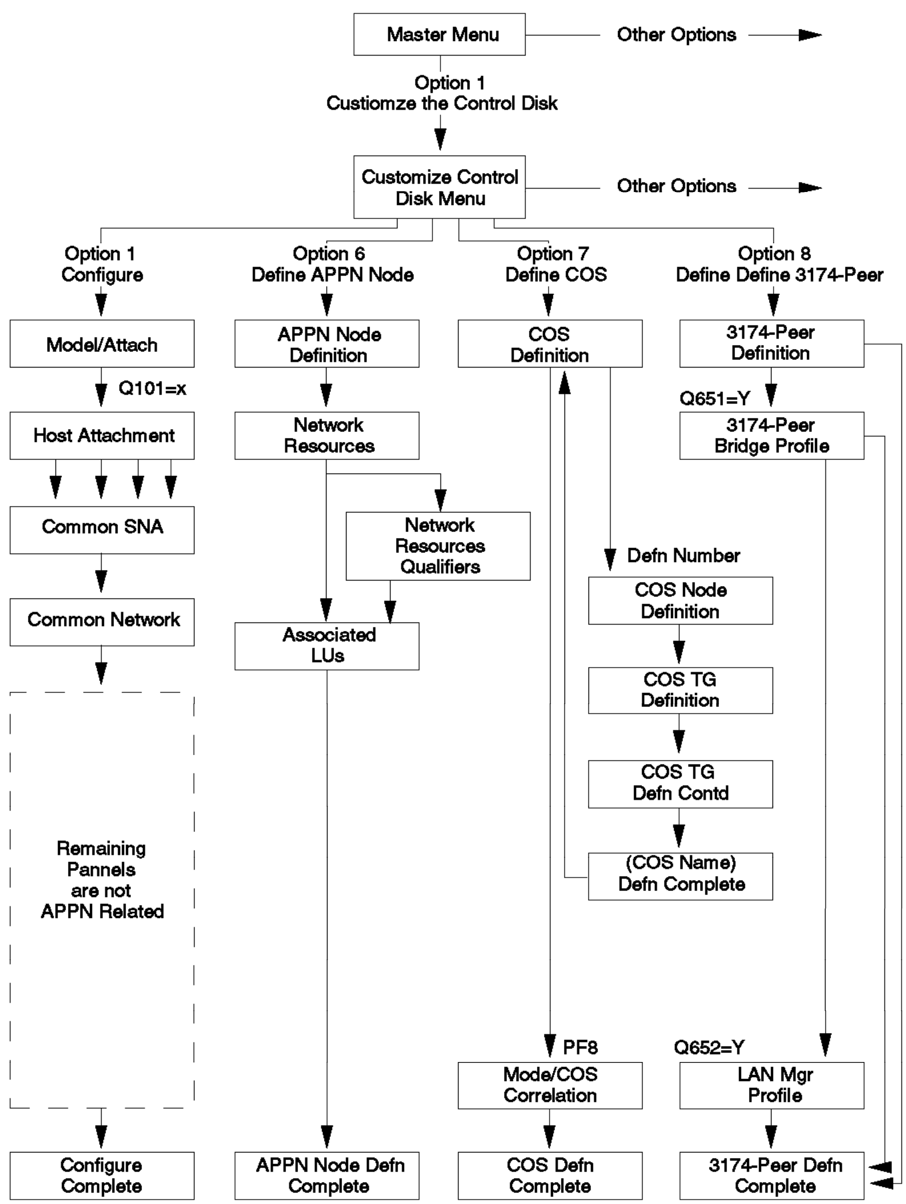


Figure 201. 3174 Customization Panel Flow Sequence

18.12.1 Master Menu

```
                   ______________ Master Menu _______________

             (C) COPYRIGHT IBM CORP 1986, 1991 - ALL RIGHTS RESERVED
                    Licensed Internal Code - Property of IBM

 Select Option; press ENTER

 Option     Description

    1   1   Customize the Control Disk
    2       Merge DSL
    3       Copy Files
    4       Diagnostics
    5       Microcode Upgrade
    6       Central Site Customizing
    7       Media Management
    K       Identify Customizing Keyboard




     Select ===> 1
```

Figure 202. 3174 Customizing Master Menu

1 To begin customizing the 3174, select option 1.

18.12.2 Customize Control Disk Menu

```
                   _______ Customize Control Disk Menu ________


 Select Option; press ENTER

 Option     Description

    1   1   Configure
    2       Define Devices
    3       Merge RPQs
    4       Modify Keyboards
    5       Define AEA
    6   2   Define APPN Node
    7   3   Define COS
    8   4   Define 3174-PEER
    9   5   Define WAN Profiles




     Select ===>
 Press PF12 to File, PF3 to Quit, or Select another Option
 PF: 3=Quit    4=Default    7=Back    8=Fwd    9=Check    12=File
```

Figure 203. Customizing Options

1 Option 1 is used to customize the 3174 physical connections and base functions.

2 Option 6 is used to customize the APPN functions.

3 Option 7 is used to define COS tables and mode/COS correlations.

4 Option 8 is used to define the Peer Communication functions. In subsequent panels, the Peer Communication function is referred to as the 3174-Peer support.

5 Option **9** became available in Configuration Support-C Release 5. It is used to define the WAN profiles for X.25 and frame relay links.

18.12.3 Model/Attach Panel

```
            ____________ Model / Attach ____________


  Online Test Password    098 -

  Product Assistance Data
  099 -

  3174 Model              100 - xxx

  Host Attachment         101 - x   (1-BSC              6-SDLC, X.21 Switched
                                     2-SDLC             7-Token-Ring
                                     3-X.25             8-Ethernet
                                     4-Non-SNA Channel  9-Frame Relay  6
                                     5-SNA Channel      M-Multi-host)

  LAN adapter type        102 - 0   (0-none
                                     1-Token Ring
                                     2-Ethernet)

  NSO selection           103 - 0000000000000000
  Select Test; press ENTER ===>


  PF:  3=Quit  8=Fwd  12=Test Menu
```

Figure 204. Model/Attach Panel

Question 101: Host Attachment

Question 101 has been expanded for Configuration Support-C Release 4 and later to include the selection of an Ethernet link to the host as either a single link single host or single link multiple host.

Q101=8   Ethernet to the host for models x4R

Q101=7   Token Ring to the host for models x3R

Q101=8   Ethernet to the host for models x4R

Q101=M   Single Link Multiple Host

Configuration Support-C Release 5 provides you with the ability to have a frame relay link to the host. Q101, has been expanded to allow the selection of a frame relay link.

Q101=9 **6**

Question 102: LAN Type

Question 102, allows you to select the type of LAN adapter you want configured. This question has only two valid answers for Configuration Support-C Release 4, **0** or **2** (none or Ethernet, respectively) because Token Ring support is disabled. RPQ 8Q1041 (TCP Enhancements), based on Configuration Support-C Release 4, enables you select Token Ring, Ethernet or None, as the LAN adapter type.

Configuration Support-C Release 5 is the first non-RPQ release to have full LAN (Token Ring and Ethernet) support.

Q102=1 Token Ring Configuration for models x3R

Q102=**2** Ethernet for models x4R

Q102=**0** No LAN adapter in the 3174

Question 103: NSO Selection

Question 103, Non-Standard Operation (NSO) selection appears on the Model/Attach panel for Configuration Support-C Release 4 and later. Usually you will let is default to 0000000000000000. Your customer support will advise you if you any of the NSO bits are applicable.

Q103=0000000000000000 NSO Selection

18.12.4 Local (SNA)

```
              _______________ Local (SNA) ________________
                                                             LOCL

 104 - 40         105 - 46         108 - 23N6233    110 - 1 0000     116 - 2_ __

 121 - 01         123 - 0          125 - 00000000   126 - 00000000   127 - 2 4

 132 - 0 0 0 0    136 - 1 0 0 1    137 - 0 0 0 0    138 - 0

 141 - A          150 - 1 0        165 - 0          166 - A          168 - 0

 173 - 00000000   175 - 000000     179 - 0 0 0      190 - 00

 213 - 1          215 - 00000      220 - 3

 222 - 1          223 - 10         224 - 2          225 - 4

 240 - 0          241 - 0          242 - 1



PF: 3=Quit    4=Default    7=Back    8=Fwd
```

Figure 205. Local (SNA) Panel

Question 242: Link Type

Question 242 applies only to a channel-attached 3174. The response indicates the type of traffic the channel link to the host is able to carry. Valid responses are:

0=Only T2.0 traffic (default response)

1=Combined T2.0 and T2.1 traffic. (or T2.1 only)

If you require an APPN connection to a subarea network host, you must respond to question 242 with a 1. This will then allow the link to the host to be shared by both the T2.0 and T2.1 traffic.

If you respond to question 242 with a 1, you must enable the 3174 APPN functions by responding to question 510 (APPN Network Controller) with a 1.

18.12.5 SDLC

```
                ________________ SDLC ________________

 104 - C0        105 - C3       108 - 0000000   110 -

 121 - 01        123 - 0        125 - 00000000  126 - 00000000  127 - 0 0

 132 - 0 0 0 0   136 - 1 0 0 1  137 - 0 0 0 0   138 - 0

 141 - A         150 - 1 0      165 - 1         166 - A         168 - 0

 173 - 00000000  175 -          179 - 0 0 0     190 - 00

 213 - 1         215 - 00000    220 - 0

 310 - 0         313 - 1        317 - 0         318 - 0         340 - 1

 365 - 0         370 - 1


Select Test; press ENTER ===>

PF:  3=Quit  7=Back  8=Fwd  12=Test Menu
```

Figure 206. SDLC Panel

Question 370: Maximum Inbound I-Frame Size

This question applies to an SDLC attached 3174. Valid responses are:

0=265-byte maximum I-frame (default response)

1=521-byte maximum I-frame

When APPN is enabled for connection to an NCP, the response must be 1. This is because LU 6.2 BINDs may exceed 256 bytes and NCP does not provide reassembly of BINDs.

18.12.6 Common SNA

The Common SNA panel is an important panel for APPN customization. The Common SNA panel allows you to:

- Give a name to identify the network for the 3174 you are customizing
- Give a name to the control point for the 3174
- Give a name to the connection network
- Enable the 3174 APPN functions

Other responses on this panel are:

- Question 500: CSCM Unique
- Question 502: Logical Unit Name

These questions are for Central Site Change Management (CSCM) functions. The LU named in question 502 can be a dependent or an independent LU but is not relevant to APPN functions.

The LU for CSCM is a dependent LU if APPN is not enabled (question 510=0). It is also a dependent LU if APPN is enabled (question 510=1) but the LUNAME (question 502) and CPNAME (question 511) are not the same. In both cases, the host CSCM LU definition should specify LOCADDR=1.

The LU for CSCM is an independent LU only if APPN is enabled and the LUNAME is the same as the CPNAME. In this case, the host CSCM LU definition should specify LOCADDR=0.

```
                ______________ Common SNA ______________

    500 - 0          501 - USIBMRA_    502 - _______

    APPN Support Fields:

    510 - 1          511 - CP3174__    512 - CNET____




 PF: 3=Quit   4=Default   7=Back   8=Fwd   9=RtnH
```

Figure 207. Common SNA Panel

Question 501: Network ID

The response is the name used to identify the network that the 3174 you are customizing is attached to. A network ID is required if you are using either of the following:

- CSCM (question 500=1 or 2)
- APPN (question 510=1)

The following rules apply to the network ID when APPN is enabled:

- It must not be the same as:
  - The control point name given in question 511
  - The virtual node name given in question 512
  - Any CPNAME on the Network Resources panel
  - Any CPNAME, LUNAME or SERVING NN name on the Associated LUs panel
- It may be up to eight alphanumeric characters long. The first character must be alphabetic with no blanks or spaces allowed between characters.

Question 510: APPN Network Controller

The response indicates whether APPN functions in the 3174 are enabled. Valid responses are:

0=APPN not enabled (default response)

1=APPN enabled

If you enabled the 3174 APPN functions (Question 510=1), then:

- The link type for a channel-attached 3174 must be able to carry both T2.0 and T2.1 traffic (question 242=1).
- The network ID (question 501), the control point name (question 511) and the virtual node name (question 512) must be unique.

If you enabled the 3174 APPN functions and perform no further APPN customization, you will get a minimum APPN configuration using the IBM-supplied class of service definitions.

Question 511: APPN Control Point Name (CPNAME)

The response is used as the control point name and identifies the 3174 network node to the network.

The following rules apply to the control point name:

- It is required when APPN is enabled.
- It must be unique.
- It may be up to eight alphanumeric characters long.

  The first character must be alphabetic with no blanks or spaces allowed between characters.

Question 512: APPN Virtual Node Name (VNODE)

A connection network is used to minimize definitions for nodes connected to a shared-access transport facility such as a Token-Ring Network. Physically, the connection network is the Token-Ring network to which the 3174 network node is attached.

Question 512 allows you to give a name to a connection network so that all nodes using the same connection network can point to the same name.

The connection network name is also referred to as:

- The virtual node name in the 3174
- The connection network control point name (CNNCPNAME) in the AS/400
- The connection network name in NS/2

  It is used fully qualified by the network ID.

The following rules apply to the connection network (or virtual node) name:

- It is required when question 510=1 (APPN enabled) even if a connection network is not used.
- It must be unique.
- It may be up to eight alphanumeric characters long.

  The first character must be alphabetic with no blanks or spaces allowed between characters.

18.12.7 APPN Node Definition

The APPN Node Definition panel allows you to specify the capabilities of the 3174 network node:

- Question 610: APPN Sessions
- Question 611: APPN Nodes/Links
- Question 612: APPN Wildcard Option.

Question 614 through 623 are options introduced in Configuration Support-C Release 5 to support LU6.2 Management Services and DLUR:

- Question 614: Alert Focal Point Name
- Question 615: Alert Focal Point NETID
- Question 616: Report to Alert Focal Point (Host Links)
- Question 620: Dependent LU Server (DLUS) Primary Host Name
- Question 621: Dependent LU Server (DLUS) Primary Host Name Network ID
- Question 622: Dependent LU Server (DLUS) Backup Host Name
- Question 623: Dependent LU Server (DLUS) Backup Host Name Network ID

```
                 __________ APPN Node Definition __________



             610 SESSIONS - 2          611 NODES/LINKS - 4

             612 WILDCARD - 0          613 HOST LINK - 1A

             Alert Focal Point 614-615
             614 FP NAME -     ____          615 FP NETID -

             Report to Alert Focal Point 616
             616 HOST LINKS - __ __ __ __ __ __ __ __

             DLUS Primary Host Name 620-621
             620 CPNAME -                  621 NETID -

             DLUS Backup Host Name 622-623
             622 CPNAME -                  623 NETID -



   PF: 3=Quit    4=Default           8=Fwd
```

Figure 208. APPN Node Definition Panel

Question 610: APPN Sessions

The response indicates the number of LU 6.2 *intermediate sessions* that may be activated through the 3174. Valid responses are:

1=up to 225 sessions (default response)

2=up to 500 sessions

3=up to 750 sessions

4=up to 1000 sessions

Your response is used to:

- Allocate control storage when the 3174 network node is initially loaded. Since APPN sessions are dynamically set up, dependent upon resources (buffers, control blocks, links) available at session initiation, this value may not always be achieved.
- Determine the total amount of storage required for the 3174.

  The number of APPN sessions customized affects the amount of control storage required, as shown in “APPN Storage Requirements” on page 534.

Every LU 6.2 session between a LEN or EN and another LEN or EN counts as one session. Every parallel session has a management session which also counts as a session.

Question 611: APPN Nodes/Links

The response indicates the number of T2.1 links to adjacent nodes that are supported by the 3174 network node. Valid responses are:

1=up to 20 nodes/links (default response)

2=up to 75 nodes/links

3=up to 150 nodes/links

4=up to 225 nodes/links.

Your response is used to:

- Allocate control storage when the 3174 network node is initially loaded. Since T2.1 links are dynamically activated as required, dependent upon resources (control blocks and ports) available at link establishment, this value may not always be achieved.
- Determine the total amount of storage required for the 3174.

  The number of nodes/links customized affects the amount of control storage required, as shown in “APPN Storage Requirements” on page 534.

Question 612: APPN Wildcard Option

The response indicates whether the 3174 network node you are customizing holds the wildcard connection to the host on behalf of the APPN network. Valid responses are:

0=No (default response)

1=Yes

The wildcard option allows LUs to be dynamically located in a subarea network. The wildcard option permits sessions to be established from LUs in the APPN network to LUs in or through a subarea network. Specifying YES does not guarantee that the desired destination LU is in the host. However, if the destination LU is in the host or if the host knows where the destination LU is located, the session will be established.

When using wildcards, the following should be noted:

- APPN cannot guarantee selection of the appropriate link when there are multiple links into a subarea network. Therefore, the APPN network must have only one link into the subarea network.
- Only one network node in an APPN network may have the full wildcard option active.

- The 3174 network node implements a full wildcard. It does not have a partial wildcard option.
- AS/400 refers to its full wildcard option as generic routing with *ANY as a location name.
- NS/2 allows you to specify a full wildcard option as a WILDCARD_ENTRY(FULL) parameter in the DEFINE_PARTNER_LU_LOCATION statement.

Question 613: APPN Wildcard Host Link

The response indicates which host link to this 3174 APPN Network Node will be used for wildcard routing. Valid responses are:

1A = Host link 1A is used for wildcard routing

1B = Host link 1B is used for wildcard routing

1C = Host link 1C is used for wildcard routing

1D = Host link 1D is used for wildcard routing

1E = Host link 1E is used for wildcard routing

1F = Host link 1F is used for wildcard routing

1G = Host link 1G is used for wildcard routing

1H = Host link 1H is used for wildcard routing

Question 614: Alert Focal Point

The response indicates the focal point to which the 3174 NN will report network management alert information for itself and any served ENs. Focal point name is the CPNAME if focal point is CM/2, AS/400 or NetView V2R4 using VTAM V4R1 or higher. For erlier releases of VTAM, the NetView LUNAME is used.

Question 615: Alert Focal Point Network ID

This question is optional and identifies the network ID for the APPN focal point for rhe 3174. If Q614 is left blank, this question is ignored. If this question is left blank and Q14 is answered, this question defaults to the network ID of the 3174 NN.

Question 616: Alert Focal Point (Host Links)

This question is optional and indicates the host links for dependent LUs whose alerts are sent to the APPN focal point. If left blank, the only alerts sent to the focal point are those from the served ENs and those that pertain to the 3174 PU. Valid responses are similar to Q613.

Question 620: Dependent LU Server (DLUS) Primary Host Name

This question indicates the CPNAME of the primary DLUS with which the 3174 DLUR will provide support for local dependent LUS. DLUS is available only VTAM V4.2.

Question 621: Dependent LU Server (DLUS) Primary Host Network ID

This question identifies the subnetwork in which the primary DLUS′s host resides. If Q620 is left blank, this question is ignored. This defaults to the network ID of the 3174 if left blank and Q620 is answered

Question 622: Dependent LU Server (DLUS) Backup Host Name

This question identifies the name of the backup DLUS with which the 3174 DLUR will provide support for dependent LUs if there is no response from the primary DLUS.

Question 623: Dependent LU Server (DLUS) Backup Host Network ID

This question identifies the subnetwork in which the backup DLUS′s host resides. If Q622 is left blank, this question is ignored. This defaults to the network ID of the 3174 if left blank and Q622 is answered.

18.12.8 Network Resources Definition

The Network Resources and Associated LUs panels allow you to define nodes in the APPN network to the 3174 network node you are customizing. You may use these panels to define:

- LEN nodes for which the 3174 is acting as a server.
- LUs that are located in the LEN nodes served by the 3174.
- Network nodes that are adjacent to the 3174.
- Nodes that share a link for both Type 2.0 and 2.1 traffic, such as a 3174-13R that is used for both 3270 DSPU and APPN functions.
- Addresses of nodes to which the 3174 network node will initiate a connection when it is IMLed.
- Resources that are to be preloaded in the 3174 directory cache to reduce the number of broadcasts in the network.

```
              ___________ Network Resources ____________
                                                             001 of 240
    CPNAME   NODE TYPE   LUs*  DLC TYPE      ADDRESS             DLCI
                1-4       X      1-5
      1          2        3       4            5         6     7
 1  PSNSNN1_     3        _       1     4000 3001 0031  04    ____ __
 2  PSNSEN1_     2        _       1     4000 3001 0047  04    ____ __
 3  PSLEN1__     1        X       1     4000 3001 0041  04    ____ __
 4  RALYASAB     3        _       1     4000 1002 0002  04    ____ __
 5  RALYAS4A     3        _       1     4000 1002 0001  04    ____ __
 6  PSCOAX1A     1        X       1     4000 3001 9119  04    ____ __
 7  PSCOAX1B     1        X       1     4000 3001 9117  04    ____ __
 8  PSCOAX1C     1        X       1     4000 3001 9118  04    ____ __
 9  RAI_____     3        _       5     ____ ____ ____  __    0500 04
10  CP31745_     3        _       5     ____ ____ ____  __    0505 04
11  RAK_____     3        _       5     ____ ____ ____  __    0501 04
12  ________     _        _       _     ____ ____ ____  __    ____ __

*  - Enter 'X' to define Associated LUs where required.



PF: 3=Quit   4=Default   7=Back   8=Fwd            11=PageFwd
```

Figure 209. Links to Adjacent Nodes

1 CPNAME is the name of the network node, end node or LEN node you are defining. Each CPNAME must be unique. The top right-hand corner of the screen shows the entries are numbered from 001 to 240. The maximum number of CPNAMEs you may define is limited by your response to Question 611: APPN Nodes/Links. For example, if question 611=4 (up to 225 nodes/links), then only 225 CPNAMEs can be defined.

2 NODE TYPE specifies the type of APPN node. Valid responses are:

1=LEN node

2=End node

3=Network node

4=Low Entry Networking (LEN) SSCP

The 3174 supports a maximum of eight adjacent network nodes. That is, you can have a maximum of eight entries with a NODE TYPE of 3.

3 If you wish to specify LUs associated with a network node, an end node or a LEN node, enter an X in the LUs field for that node. You may enter an X for a maximum of 120 nodes.

Whether or not to specify associated LUs for a node depends on the node type:

- A LEN node does not have CP-CP session capability with a network node server. Hence, there is CP-CP session for the LEN node to send its local LU names to the network node server. The network node server cannot automatically register LU names of the adjacent LEN node. Neither can the network node search the LEN node for requested LUs. You should, therefore, specify associated LUs for each LEN node so that the network node server can respond to search requests for these LUs.

  You may specify a maximum of four associated LU names in the Associated LUs panel for each node marked with an X. Therefore, a maximum total of 480 (4 x 120) associated LUs can be specified in a 3174 network node.

- You need not specify associated LUs for an end node using this 3174 network node as its server. The end node is able to register its LUs with the network node server.

4 DLC TYPE is the type of data link control protocol for the link to this adjacent node. Valid responses are:

- 1= LAN attached (Token Ring or Ethernet)
- 2= SDLC attached
- 3= S/370 channel attached
- 4= X.25 attached
- 5= Frame Realy attached

5 The ADDRESS field specifies the LAN address for establishing a link. If DLC TYPE=1 (LAN), this ADDRESS field is required. For SDLC (DLC TYPE=2), S/370 Channel (DLC TYPE=3), X.25 (DLC TYPE=4), and Frame Relay (DLC TYPE=5) attachments, leave this field blank.

6 The last two characters of the ADDRESS field are the SAP. The valid range is from X′04′ to X′E8′, in multiples of 4.

In the example shown in Figure 209 on page 548, the following have been defined:

- One PS/2 NS/2 network node: PSNSNN1
- One PS/2 NS/2 end node: PSNSEN1
- One PS/2 LEN node: PSLEN1
- Two AS/400 network nodes: RALYAS4A and RALYAS4B
- Three LEN nodes attached via 3174 Peer Communication: PSCOAX1A, PSCOAX1B and PSCOAX1C.

7 The DLCI field specifies the DLCI and SAP used to identify Frame Relay connections. If DLC TYPE= 5 (Frame Relay), this field is required. For other DLC TYPES leave this field blank.

In the example shown in Figure 209 on page 548, the following have been defined:

- Three NNs attached via 3174 Frame Relay Communication: RAI, CP31745 and RAK

See the ITSO document *3174 Networking Server in Higher Speed WAN and Multiprotocol Networks*, GG24-4376, for further information.

Network Resources Qualifiers

```
               ______ Network Resources Qualifiers ________
                                                            001 of 004
         CPNAME               NETID              PUNAME          NN

         ________            ________           ________         _
         ________            ________           ________         _
         ________            ________           ________         _
         ________            ________           ________         _
         ________            ________           ________         _
         ________            ________           ________         _
         ________            ________           ________         _




   PF: 3=Quit    4=Default    7=Back    8=Fwd   10=PageBk   11=PageFwd
```

Figure 210. Qualifying the Network Resources for LEN-SSCP Connections

The Network Resources Qualifiers panel is displayed only if one of the nodes on preceding Network Resources panel has been defined with a node type of 4, LEN-SSCP. This panel gives you an opportunity to add a certain degree of security to your network in the case of SSCP takeover.

Associated LUs

```
               ______________ Associated LUs ______________
                                                            001 of 004
         CPNAME        LUNAME     LUNAME     LUNAME     LUNAME     SERVING NN
            8             9                                           10
      1  PSLEN1        PSLEN1__   ________   ________   ________   CP3174__
      2  PSCOAX1A      PSCOAX1A   ________   ________   ________   CP3174__
      3  PSCOAX1B      PSCOAX1B   ________   ________   ________   CP3174__
      4  PSCOAX1C      PSCOAX1C   ________   ________   ________   CP3174__




   PF: 3=Quit    4=Default    7=Back    8=Fwd   10=PageBk   11=PageFwd
```

Figure 211. Defining LUs to the 3174 Directory

The Associated LUs panel is displayed if an X has been entered in the LUs field for a node on the Network Resources panel.

8 CPNAME is the name of the node with associated LUs indicated on the Network Resources panel. It is automatically filled in and cannot be modified.

9 LUNAME is the name of the logical unit associated with the node.

10 SERVING NN is the name of the network node server for the node. Note the following:

- If CPNAME is the name of a network node, then this field must either be left blank or be the same as CPNAME. If left blank, the default is the CPNAME of the NN. A network node must be its own server; this logic ensures that it will be its own server.

- If CPNAME is the name of an end node or LEN node, then this field may be left blank or filled in.

  If you want the 3174 you are customizing to be the server, then do either of the following:

  – Leave it blank. The default assumes the name given in question 511.

  – Enter the name given in Question 511.

  If you want another network node to be the server, then enter the name of that network node. It can be any network node in the APPN network but you have to ensure that it is a network node and not an end node or a LEN node. The 3174 you are customizing will not be able to ascertain this for you.

18.12.9 COS Definition

IBM-Supplied COS Tables

When you enable APPN functions in the 3174, seven IBM-supplied COS tables are automatically available. These tables have the following COS names and uses:

- #BATCH

  This COS name maps to a mode named #BATCH. It is a general, batch-oriented COS that uses low transmission priority. It is used when high capacity and low cost are more important considerations than rapid response.

- #BATCHSC

  This COS name maps to a mode named #BATCHSC. It has the same characteristics as #BATCH except that it provides one level of increased security for the line.

- #INTER

  This COS name maps to a mode named #INTER. It is a general, interactive-oriented COS that uses high transmission priority. It is used when rapid response is a more important consideration than high capacity and low cost.

- #INTERSC

  This COS name maps to a mode named #INTERSC. It has the same characteristics as #INTER except that it provides one level of increased security for the line.

- #CONNECT

  This COS name maps to a mode name containing eight blanks. This COS provides connectivity at medium transmission priority and is used for LU-LU sessions.

- SNASVCMG

  This COS is for LU-LU CNOS (session management) sessions and provides connectivity at network transmission priority. It is not displayed on the COS Definition panel and, therefore, cannot be modified.

- CPSVCMG

This COS is for CP-CP (session management) sessions and provides connectivity at network transmission priority. It is not displayed on the COS Definition panel and, therefore, cannot be modified.

- CPSVRMGR

  This COS is used to identify a session between a DLUS and a DLUR, two new components that reside in the CPs. The DLUS-DLUR pipe is very similar to the CP-CP sessions identified by the CPSVCMG mode.

Values provided for the node and link (TG) characteristics in these COS tables are shown in the appendix of *3174 APPN Implementation Guide Update*, GG24-4171.

Note that each of the IBM-supplied COS table names begins with a # character; this is a representation of X′7B′ used in the architecture.

COS Table Manipulation

The IBM-supplied COS definitions should be used for most networking requirements. If the IBM-supplied COS tables do not meet your requirements, you may:

- Modify an IBM-supplied COS table.

  Modifying an IBM-supplied COS table is not recommended. If they are modified, then every COS table in every network node in the network must be modified to contain the same values. If this is not done, then the same name is used for COS tables which contain really different values from one another and would not be consistent.

- Create a new COS table using an IBM-supplied table as a model.
- Create a completely new COS table without using a model.

You can also delete a COS table, except the IBM-supplied COS tables, by modeling it on a Clear Definition table which does not contain any values. A warning message that the existing values will be overwritten is displayed. You can either continue the deletion by pressing Enter and then erasing the COS name, or quit by pressing PF3.

Notes:

1. The IBM-supplied tables SNASVCMG, CPSVCMG and CPSVRMGR cannot be displayed and, therefore, cannot be modified, or used as models, or deleted.
2. The other five IBM-supplied tables can never be deleted.

Modifying or deleting an IBM-supplied COS table, or creating new COS tables, should only be undertaken with careful planning for unique environments.

```
                     ____________ COS Definition ____________

  Enter the number of the COS Definition and the number of the
  definition to be used as a model.

  COS Definition Number - __  1       Model Definition Number - __  2
  (1-14)                              (0-14)

                      ----------Definition Numbers----------

                   3    0. Clear Definition
                   4    1. #BATCH__          8. ________
                        2. #BATCHSC          9. ________
                        3. #INTER__         10. ________
                        4. #INTERSC         11. ________
                        5. #CONNECT         12. ________
                        6. ________         13. ________
                        7. ________         14. ________

 When using models 1-5, IBM-supplied defaults will always be invoked.



 PF: 3=Quit                     8=Fwd
```

Figure 212. COS Definition

1 The COS Definition Number is the COS table number you want to add or modify:

- If you enter a number from 1 to 5, you can modify one of the five IBM-supplied tables.
- If you enter a number from 6 to 14 and there is no name associated with that number, you can add a new COS table.
- If you enter a number from 6 to 14 and it is associated with a name, you can modify an existing user-defined COS table of that name.

2 You may choose to add a new COS table. To reduce the effort involved in creating a new table, the Model Definition Number allows you to select a table to be used as a model.

To add a new table using a model:

- Enter a COS Definition Number that is not associated with a name. This will be the COS Definition Number of the new table.
- Enter the Model Definition Number to be used as the model.

  If you enter 0 (Clear Definition) or leave it blank, then you will not be using a model; the definition screens that follow contain blank fields and you will have to enter all values required.

Notes:

1. If a COS Definition Number 1 to 5 is modeled on itself (that is, the COS Definition Number is the same as the Model Definition Number), a warning message that the existing values will be overwritten is displayed. This warning is provided to indicate that the IBM-supplied values will be presented and will replace all the values you have customized, if you continue by pressing Enter. If this is not desired, press PF3 to quit.

2. If a COS Definition Number 6 to 14 is modeled on itself, no warning message is displayed because the values you have customized will be presented.

3. If a COS Definition Number 1 to 14 is modeled on another COS Definition Number, a warning message that the existing values will be overwritten is displayed. This warning is provided to indicate that the values contained in the COS Definition Number table will be overwritten by values in the Model Definition Number table, if you continue by pressing Enter. If this is not desired, press PF3 to quit.

4. SNASVCMG and CPSVCMG are IBM reserved names and cannot be used as a COS table name or mode name.

5. If you modify an IBM-supplied COS table, you have actually modified *a copy* of the IBM-supplied table. This modified copy is then filed and used for routing calculations.

   When you select the same IBM-supplied table again, it will display the table with your customized values. To restore the IBM-supplied values, model the IBM-supplied table you have modified on itself.

3 Clear Definition presents you with definition screens that contain blank fields.

4 #BATCH is one of the five IBM-supplied COS tables. The IBM-supplied COS table names are the only names allowed to begin with a # character. You will not be able to enter this character in the COS name field; when you press the # key, nothing happens.

Mode/COS Correlation

The Mode/COS Correlation panel allows you to correlate a mode name with a particular COS table name. You can specify up to 14 mode/COS name correlations.

The first five mode names are automatically filled in and cannot be modified. The first four mode names are correlated to COS tables of the same name by default. The fifth mode name ″blank″ is correlated to #CONNECT. You may specify a maximum of nine other mode names.

The mode name points to a set of parameters for LU-LU sessions. Each mode name also points to the COS table to be used. The mode name must be unique.

If a mode name is specified, the COS table name must also be specified. Similarly, if a COS table name is specified, a mode name must also be specified. You may have different mode names pointing to the same COS table, as shown in Figure 213 on page 555. But the same mode name may not be used to point to the different COS tables.

Since mode names and COS table names are used throughout a network, they must be used consistently.

```
                ___________ Mode/COS Correlation ___________

           Mode Name    #  COS Name           Mode Name    #  COS Name

           #BATCH__     _  #BATCH__           ________     _  ________

           #BATCHSC     _  #BATCHSC           ________     _  ________

           #INTER__     _  #INTER__           ________     _  ________

           #INTERSC     _  #INTERSC           ________     _  ________

           blank        _  #CONNECT           ________     _  ________

      5    QPCSUPP_     _  #CONNECT           ________     _  ________

           ________     _  ________           ________     _  ________

      Define Mode/COS pairs.  To specify IBM-supplied COS names, place 1-5 in
      the #-column.  1=#BATCH  2=#BATCHSC  3=#INTER  4=#INTERSC 5=#CONNECT


   PF: 3=Quit    4=Default    7=Back    8=Fwd
```

Figure 213. Correlating Mode Names with COS Table Names

5 If you have APPC applications that use a mode name other than the IBM-supplied defaults, you must correlate that mode name to the COS table name it is to use. We have added QPCSUPP because 5250 emulation in OS/2 and AS/400 uses a mode named QPCSUPP by default. QPCSUPP is also mapped to the COS table #CONNECT in the AS/400 by default. Therefore, we have correlated QPCSUPP with the COS table named #CONNECT in the 3174, as shown in Figure 213. If this is not done, you will get an error message indicating session negotiation failure.

Chapter 19. Peer Communication

This chapter describes the 3174 Peer Communication Licensed Internal Code feature, which allows DOS and OS/2 intelligent workstations, attached to the 3174 by existing 3270 coax wiring and emulation adapters, to communicate with each other and with other token-ring attached workstations as if they (the coax attached workstations) were peer devices on a local area network (LAN).

This chapter is intended for those who need to customize the 3174 for Peer Communication. For further information, see Chapter 2, “3174 Peer Communications LIC with APPN” and Chapter 3, “3174 APPN and Peer Communication Customization” in the ITSO book *3174 APPN Implementation Guide Update*, GG24-4171.

19.1 Overview

The 3174 Peer Communication Licensed Internal Code feature, together with Configuration Support-C base microcode, allows DOS and OS/2 intelligent workstations, attached to the 3174 by existing 3270 coax wiring and emulation adapters, to communicate with each other and with other token-ring attached workstations as if they (the coax attached workstations) were peer devices on a local area network (LAN). This capability provides a migration path for users evolving from an exclusively host-interactive computing environment to one that also includes local area networking. This feature should not be confused with the 3174 Advanced Peer-to-Peer Networking (APPN) Licensed Internal Code feature. The Peer Communication feature does not provide any APPN functions. It does, however, provide a bridging function to allow coax attached nodes to be linked to an APPN network.

There are two ways to use the Peer Communication feature:

- In a 3174 with Configuration Support-C and the Peer Communication feature, but without a LAN adapter.

  This configuration allows workstations coax attached to the same 3174 to communicate with each other as peer devices, similar to the peer devices on a LAN. Because there is no LAN adapter, the peer workstations cannot access the host(s) attached to the 3174, unless they are reconfigured and restarted as CUT or DFT workstations.

  Because of this limitation, the Peer Communication feature is not likely to be used in this manner.

- In a 3174 with Configuration Support-C, the Peer Communication feature, and the 16/4 Mbps token-ring adapter.

  The significant difference with this configuration is the addition of the 16/4 Mbps token-ring adapter, which provides the bridge function in the 3174. When this bridge function is enabled via customization, the coax attached workstations can communicate with other workstations and hosts as if they (the coax attached workstations) were on the token-ring LAN attached to the 3174 via the 16/4 Mbps token-ring adapter. The result is that the coax attached workstations can now communicate, for example, with:

  – Other peer workstations attached to the same 3174

  – Other peer workstations on the token-ring LAN attached to the 3174

- Other peer workstations attached to other 3174s that are similarly configured and accessible via the 3174 Token-Ring LAN
- Hosts, such as S/370, S/390, and AS/400, on or accessible via the 3174 Token-Ring LAN
- Hosts accessible via the 3174 primary or secondary links (note that APPN functions via the CCA are not currently supported)

Note: A 3174 with Configuration Support-C Release 4 or later, the Peer Communication feature, and the Ethernet Adapter supports only 3174-Peer segment. This is also similar to *not* having a LAN adapter in the 3174, since Coax-to-Ethernet bridging (3174-Peer bridge) for Peer Communication is not supported. Therefore, intelligent workstations that are coax attached to the 3174 and using Peer Communication can not participate as ENs in an APPN network, as a DSPU to a gateway host, and can not communicate over the Ethernet Network.

The Peer Communication feature provides three significant functions:

- The 3174-Peer function, which allows the coax attached workstations to behave as if they were connected to an "internal ring" within the 3174. The internal ring differs from a real token ring in that no token flows. The workstations are referred to as *3174-Peer devices* and the internal ring as the *3174-Peer segment*.
- The bridge function, which allows the internal ring to be bridged to the real Token-Ring attached via the 3174 16/4 Mbps Token-Ring Adapter. This internal bridge is referred to as the *3174-Peer bridge*.
- The LAN Manager support, which allows the 3174-Peer devices, 3174-Peer segment and 3174-Peer bridge to be managed from a token-ring attached LAN Network Manager V1.1 or later station.[6]

19.2 3174-Peer Function

The Peer Communication feature works in conjunction with 3174-Peer device drivers (see "Workstation LAN-Over-Coax Drivers" on page 568) for DOS and OS/2 workstations. These device drivers, generically known as LAN-over-coax device drivers, perform functions similar to those provided by the LAN Support Program device drivers used in token-rings networks. For DOS workstations, the LAN-over-Coax device drivers are provided by the 3174 Peer Communications NDIS driver for DOS that replaces the 3174 Workstation Peer Communication Support Program (WPCSP) PRPQ P85114. See 19.12, "DOS Support" on page 578 for further information. For OS/2 workstations the LAN-over-Coax device drivers are provided by OS/2 Extended Services.

Together, the Peer Communication feature and the LAN-over-Coax device drivers allow coax attached workstations to behave as if they were connected to an "internal ring" within the 3174. The internal ring differs from a real token ring in that no token flows. The workstations are referred to as *3174-Peer devices* and the internal ring as the *3174-Peer segment*. The 3174-Peer devices can then communicate with other 3174-Peer devices attached to the same 3174, or to

[6] The term "LAN Manager" used in 3174 publications does not mean the IBM LAN Manager program products (Versions 1.0, 2.0 or Entry).

other workstations that are attached to the 3174 by an external token-ring Network.

Figure 214 shows an example of the physical components in a Peer Communication configuration.

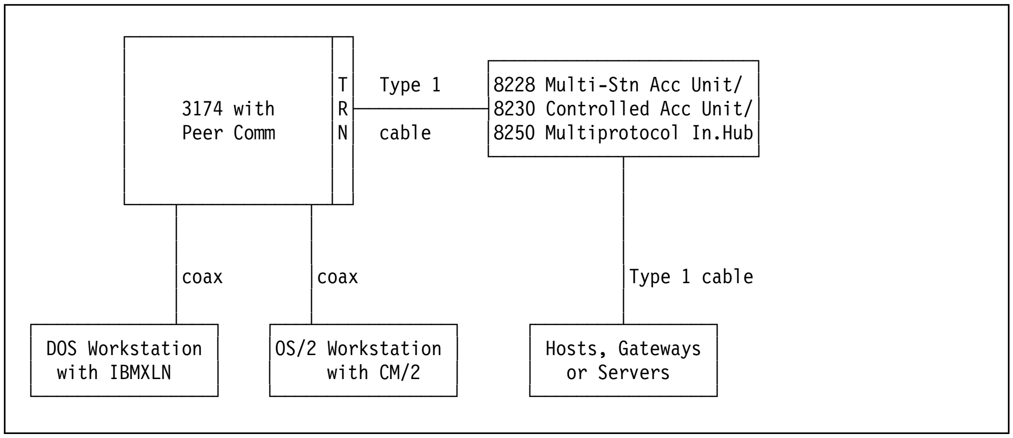


Figure 214. 3174 Peer Communication Function: Physical Configuration

Figure 215 shows the same configuration from a logical point of view. The Peer Communication feature simulates an internal ring segment bridged through the 3174 16/4 Mbps Token-Ring Adapter to a real external token-ring segment.

Note: For explanation purposes in this document, we have used the term *internal ring segment* or *internal ring* because it makes it easier to visualize how one coax attached workstation is connected to another coax attached workstation. No token actually flows on this internal ring. The official term used is *3174-Peer segment*.

We also used the term *external* or *real* token-ring segment to refer to the token-ring network attached to the 3174 using the 8228 Multi-Station Access Unit, the 8230 Controlled Access Unit, or the 8250 Multiprotocol Intelligent Hub.

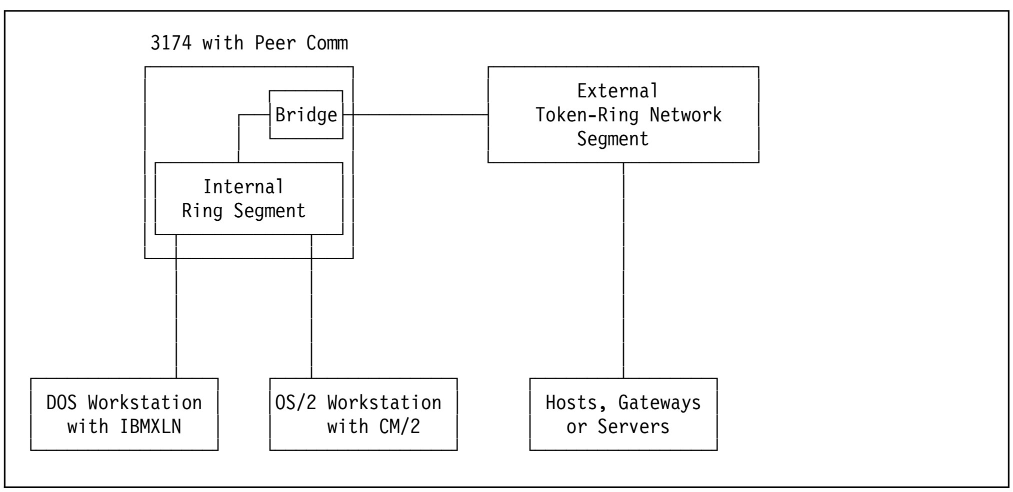


Figure 215. Peer Communication: Logical View

Figure 216 on page 560 shows a slightly different configuration. Here we have an OS/2 workstation with CM/2 communicating with a host connected to the 3174. The hashes show the path the data takes to and from the host. If there were no access unit or hub attached to the 3174 16/4 Mbps Token-Ring Adapter, the data would still travel through the adapter, the adapter cable, the data connector at the end of the cable, and wrap back into the 3174 (a patch is required – TR 824501 3174 Peer Communication Wrap Mode).

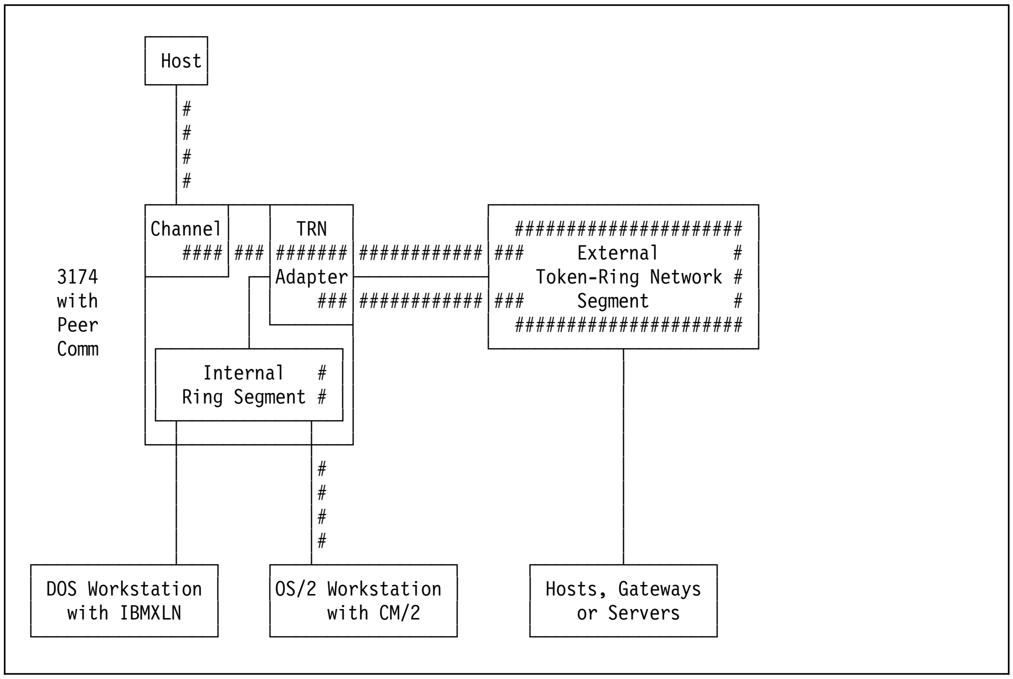


Figure 216. Peer Communication: Path for 3270 Host Communication

19.3 LAN Addressing

A MAC address can be specified during 3174 customization via question 660 (see "Question 660: 3174-Peer Port Address Range" on page 572). To form a standard 12-digit token-ring address, the first four digits are fixed as 4000. The 3174 automatically adds the last two digits using the port number. The MAC address is in the following format:

4000 XXXX XXPN

where X is the user-definable portion of the address and PN is the port number automatically assigned by the 3174. Since a 3174 can handle 64 coax ports, 64 addresses are assigned to the internal ring.

For example, if you enter 317491 in question 660, then the DOS workstation attached to port 0 will have an internal ring address of 400031749100 and the OS/2 workstation attached to port 63 will have an internal ring address of 400031749163. Notice that the last two digits relate to the port number.

You can override the address automatically assigned through 3174 customization by specifying an address via the LAN transport device driver you are using per operating system for each workstation. This is equivalent to assign a Locally Administered Address (LAA) in a real token-ring environment. To remove problems caused by duplicate addressing, the specified address (LAA) must not be within the address range entered in question 660. Using the example above, you should not assign an address within the range 400031749100 through 400031749163 inclusive. If the Locally Administered Address (LAA) is within the range entered in question 660, that workstation will not be able to join the internal ring when it is moved to another port.

Some applications used in the APPN network environment require you to specify the workstation address, thus tying the application to the address. If you use only 3174-assigned addressing (that is, not using a Locally Administered Address) and you move the workstation to a different port on the 3174, you will have to change the address specified in the application to match the new port number.

Continuing with the example above and using only 3174-assigned addressing, a workstation on port 00 is moved to port 63. If the workstation was defined as a LEN node in the Network Resources panel, you will have to change the address given for that workstation in the panel from 400031749100 to 400031749163. For an example of a Network Resources panel, see Figure 209 on page 548.

To avoid these changes and to provide port-independent addressing, we recommend that you use user-assigned workstation addresses for the appropriate LAN-Over-Coax device drivers. You should ensure that this user-assigned address is not within the range of addresses specified by question 660, and is not used elsewhere on the Token-Ring segments external to the 3174.

19.4 Bridge Function

Configuration Support-C also provides an internal bridge function **(source remote bridge)** which can be enabled to allow the internal ring to be bridged to a real external Token-Ring. Both the internal and external rings are given segment numbers and the bridge is given a bridge number during 3174 customization. The bridge is also automatically assigned an address as a result of your response to question 660 (see “Question 660: 3174-Peer Port Address Range” on page 572), with the bridge being assigned a port number of FF.

Note: The bridge function is not available for 3174 Configuration Support-C Ethernet environments.

19.5 LAN Manager Support

You can customize the 3174 to support LAN Network Manager functions. The LAN Network Manager must be V1.1 or higher.

The following screens show the use of LAN Network Manager V1.1 to monitor and control a 3174-13R Peer Communication environment. In these screens, the 3174-13R:

- Has its 3174-Peer segment 002 (question 672) connected to a Token-Ring segment BB3 (question 671) via an internal 3174-Peer bridge number 1 (question 670).
- Has an address 400031740002 (question 900); the address of the 3174-Peer bridge is 4000000022FF (question 660).
- Has a 3174-Peer device (PS/2 with LAN Station Manager) attached via coax; its address is 400031743992.

Figure 217 on page 562 shows the internal 3174-Peer bridge profile.

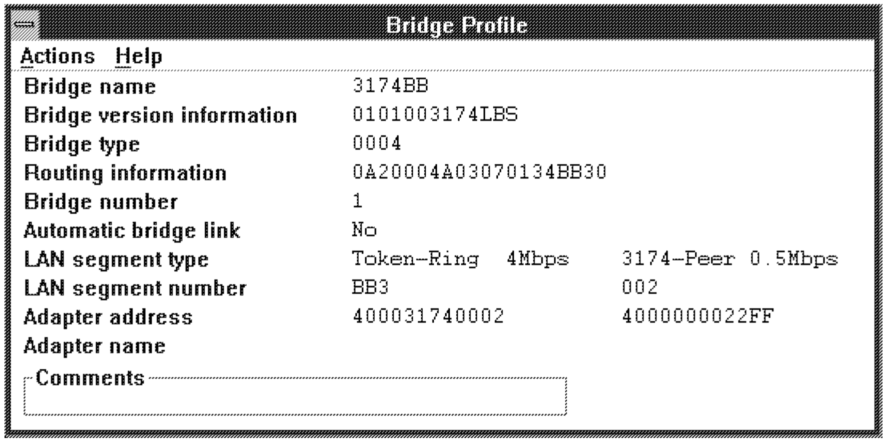


Figure 217. Bridge Profile

Figure 218 shows the bridge information and status.

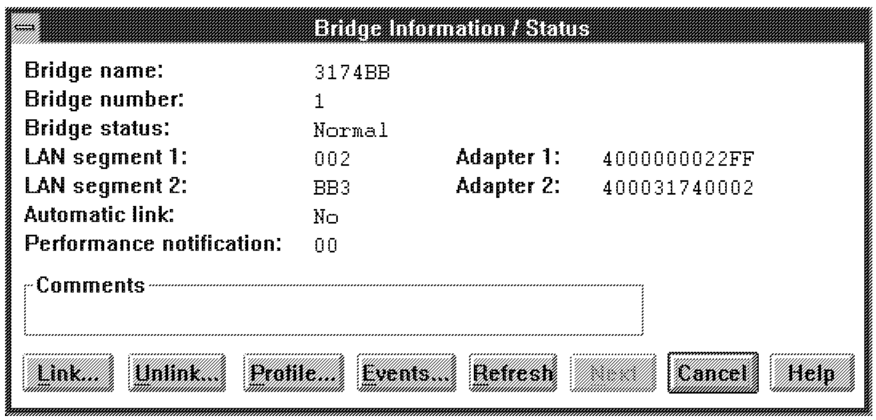


Figure 218. Bridge Information and Status

Figure 219 shows the information on the internal Peer-segment.

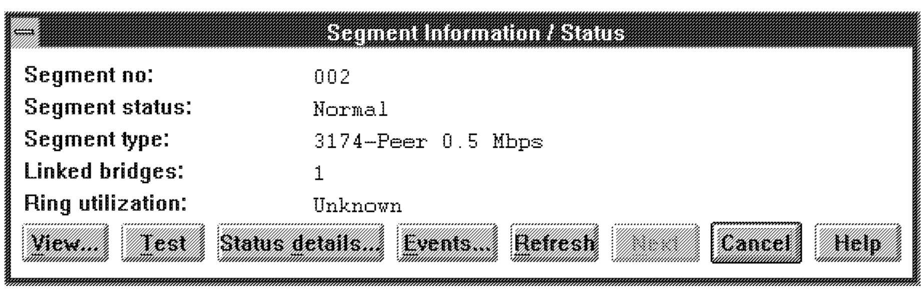


Figure 219. Segment Information and Status

Figure 220 on page 563 shows the devices attached to the internal 3174-Peer segment; in this example, the devices are the internal 3174-Peer bridge and the PS/2 with the LAN Station Manager.

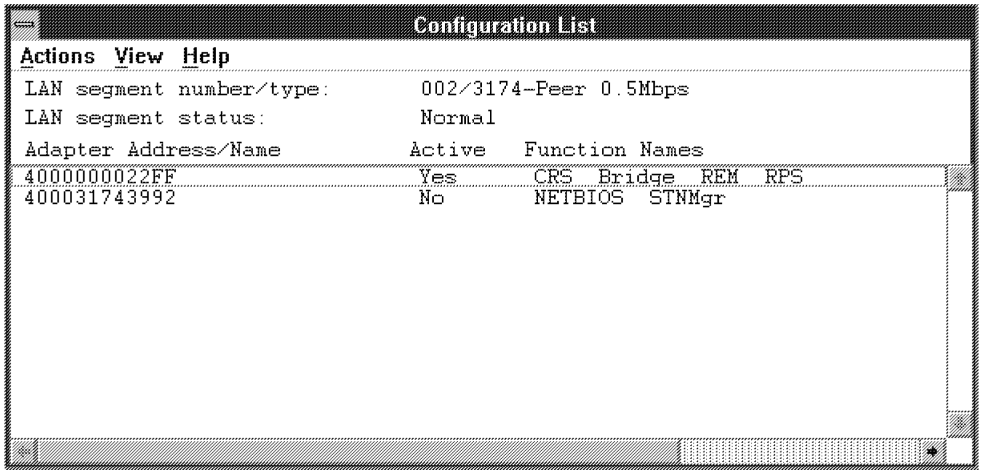


Figure 220. Configuration List

Certain LAN management functions can be performed via online tests (Test 9), if the Peer Communication feature is appropriately customized (see "Question 653: 3174-Peer Online Test Updates" on page 571).

19.6 Peer Communication Considerations

Communicating Outside the 3174: A 16/4 Mbps token-ring adapter must installed in the 3174 to allow the 3174-Peer devices to communicate with other hosts and workstations attached outside of the 3174. Without the 16/4 Mbps token-ring adapter, no bridging function is performed and no outside communication is possible.

Performance: The 3174-Peer segment within the 3174 has a speed of approximately 0.8 Mbps, regardless of the speed of the external Token-Ring LAN. We, therefore, recommended that servers, for example, should not be located at a coax attached workstation. In some situations, with a high volume of broadcast frames, it is possible that the 3174 may discard some of the frames, causing application time-outs to occur. Tuning of retry counts and time-out values may alleviate this condition.

Bridge function: The 3174-Peer bridge function counts as a real bridge when considering the number of hops a frame may have to travel. A frame may cross a maximum of seven bridges. For any remote LAN interconnect scenario, performance needs to be looked at carefully.

Application support: Peer Communication uses a unique Media Access Control (MAC) layer function. Applications written to the IEEE 802.2 or NetBIOS interfaces are unaffected. Those applications written to the token-ring MAC layer (IEEE 802.5) are not supported.

CM/2: Coax attached OS/2 CM/2 workstations may not be used as APPN network nodes, nor can they be used as bridges to a Token-Ring Network.

Printer access: A printer coax attached to the 3174 is not available to 3174-Peer devices for local copy; it is only available to CUT and DFT attached devices. If the printer is configured in the 3174 for host-directed printing, the 3174-Peer devices will be able to use it for host printing.

APPN/APPC: The Peer Communication feature supports but does not provide APPN functions and, therefore, cannot act as a network node server for the coax attached workstations. To provide APPN services, you need the APPN LIC feature installed as well.

Peer Communication, CUT, and DFT: Peer Communication, CUT and DFT are three distinct device protocols. When coax connected to a 3174, the connection between the 3174 and the device can only be in one of the three modes (Peer Communication, CUT or DFT). While the device can terminate one mode and start operating in another mode, it cannot be in two modes at the same time. With CUT and DFT modes, the device communicates with 3270 hosts as an LU (or several LUs) through the PU 2.0 in the 3174. With Peer Communication, the device communicates with 3270 hosts as a PU 2.0 in its own right, with its own LU(s), and able to access other hosts or gateways via the Token-Ring LAN attached to the 3174.

19.7 3174 APPN and Peer Communication Combined

When the 3174 APPN feature is used in conjunction with the Peer Communication feature, APPN nodes coax attached to a 3174 network node can access the attached 3174 network node or any other APPN node on the external Token-Ring. Figure 221 shows a configuration of a 3174 with both APPN and Peer Communication enabled, allowing coax attached workstations to participate as nodes in an APPN network.

Remember that this functions is not available when the LAN is Ethernet and the 3174 is running 3174 Configuration Support-C release 4 or later.

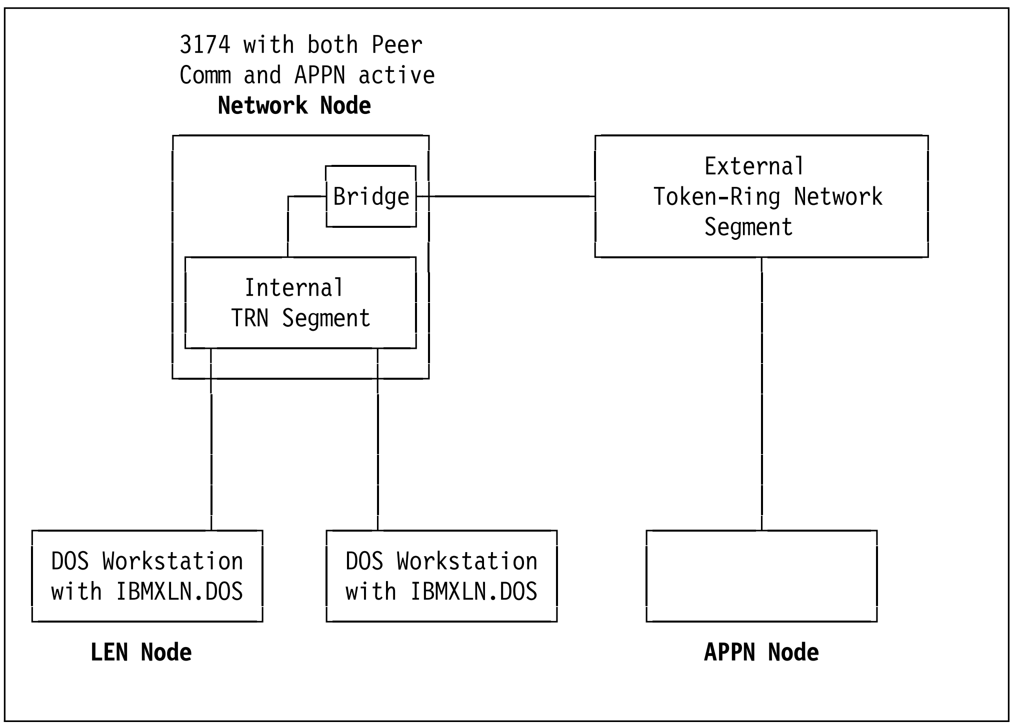


Figure 221. 3174 Combined APPN and Peer Communication Function: Logical View

19.8 Hardware

This section describes the hardware required to support Configuration Support-C Peer Communication Licensed Internal Code feature. It does not address the hardware required to support the 3174 Peer Communication RPQ 8Q0718.

3174 Models

The 3174 models required to support Peer Communication are those specified for Configuration Support-C (see B.2, "Old 3174 Feature Summary" on page 741 and B.3, "New 3174 Feature Summary" on page 742).

3174 Controller Storage

The amount of controller storage required to support Configuration Support-C is as follows:

- 2050 KB is the control storage required to support base microcode functions. This means that 3MB are required for Configuration Support-C.
- Additional control storage is required for Peer Communication functions, over and above those required for the base and other functions such as APPN, AEA, MLT, Multi-Host, SLMH, 3270 Port Expansion, CSCM and so on.

Peer Communication Storage Requirements

When customizing the 3174 for Peer Communication functions, the following will affect the amount of control storage required:

- Question 650: 3174-Peer Support indicates whether Peer Communication functions are to be enabled.
- Question 651: Bridge Support indicates whether the internal bridge function is to be enabled.
- Question 652: LAN Manager Support indicates whether support for a LAN Network Manager is to be enabled.

The response can be N if the function is not to be enabled or Y if the function is to be enabled. Each function enabled requires additional storage.

Table 28 shows the additional amounts of storage required when Peer Communication functions are desired. Note that the amounts are more if the 3270 Port Expansion is installed.

Table 28. Peer Communication Additional Storage Requirements (KB)

	Q650=Y	**Q650=Y + Q651=Y**	**Q650=Y + Q651=Y + Q652=Y**
Without 3270 Port Expansion	82	181	250
With 3270 Port Expansion	129	278	347

Total Storage Requirements

To calculate the total storage required, see Appendix E, "3174 Storage Requirements" on page 755.

3174 Other Hardware

Other hardware required to run Configuration Support-C is as follows:

- Either one of the following:
  - Two 2.4MB diskette drives
  - One 2.4MB diskette drive and one hard disk
- Token-ring adapter (optional)

  If Peer Communication is required only between devices attached to the same 3174, then a token-ring adapter is not required. This means that no host communication, no bridging to a Token-Ring network and no APPN functions are available.

  If host access, or bridging to a token-ring network, or APPN functions are required from 3174-Peer devices, then the 16/4 Mbps token-ring adapter is required. Each of these functions require the bridging code, which is available only in the 16/4 Mbps token-ring adapter. The token ring can be run at either 4 Mbps or 16 Mbps.

  Note: If the 16 Mbps token-ring adapter is to be used without an 8228 Multi-Station Access Unit, or an 8230 Controlled Access Unit, or an 8250 Multiprotocol Intelligent Hub, then a patch needs to be applied to the 3174 microcode. The patch, available for Configuration Support-B and C, is TR 824501 and is titled "3174 Peer Communications Wrap Mode." The token-ring adapter cable still needs to be attached.

  A 3174-x3R comes standard with a token-ring adapter. If it is a 16/4 Mbps token-ring adapter, it will provide the bridging for Peer Communication.

Diskette Packaging

Configuration Support-C is packaged in three diskettes:

- One Control diskette
- One Control Extension diskette
- One Utility diskette

The Control and Control Extension diskettes contain the base microcode functions. The Control Extension diskette also contains the microcode required to support the ISDN Basic Rate Interface Adapter and the Downstream Load (DSL) microcode required for other DSL functions such as APPN, AEA and graphics terminals.

Notes:

1. The Control Extension diskette is not delivered with any DSL microcode for AEA or graphics terminals that you may need in your current environment. You must merge all DSL microcode you need onto the Control Extension diskette.
   - Starting with Configuration Support-C release 5, the Peer Communication feature, APPN feature, and the AEA feature code are pre-merged onto the Extension Diskette.

2. The APPN and Peer Communications features are merged into the Control Extension diskette when you order the 3174 base LIC for 3174 Workstation Networking Module (41R and 43R).

The Peer Communication LIC feature is delivered on a separate DSL diskette for Configuration Support-C release 4 and earlier versions. This diskette is referred to as a ″DSL Extension″ diskette in the product announcement letter but it is similar to other 1.2MB DSL diskettes.

The Peer Communication DSL code must be merged onto the 2.4MB Control Extension diskette (or onto the hard disk if the Control Extension diskette has been copied to the hard disk) like other DSL microcode, using the Merge DSL option on the 3174 customization Master Menu. If other DSL functions such as AEA or graphics terminals are required, you must also merge them onto the Control Extension diskette. This is not necessary with Configuration Support-C release 5 because Peer Communication feature code is pre-merged onto Extension Diskette.

When you have merged the Peer Communication DSL code and other DSL microcode needed for your environment, you should have two diskettes to IML the 3174:

- One Control diskette
- One Control Extension diskette

Peer Communication LIC Feature Numbers

Table 29. Peer Communication LIC Feature Numbers

Desired Feature	**3174 Model**	**Feature Number**
Peer Communication LIC Feature	01L, 01R, 02R, 03R, 11L, 11R, 12L, 12R, 13R, 14R, 21H, 21L, 21R, 22H, 23R, 24R	#8010
Peer Communication LIC Feature	51R, 53R, 61R, 62R, 63R, 64R	#8060

3270 Coax Adapters

All IBM 3270 Connection adapters and IBM 3278/79 Emulation Adapters are supported.

19.9 Software

This section describes the software required to support Configuration Support-C Peer Communication Licensed Internal Code feature. It does not address the software required to support the 3174 Peer Communication RPQ 8Q0718.

3174 Licensed Internal Code

To support Peer Communication, you need one of the following in the 3174:

- 3174 Peer Communication RPQ 8Q0718 with Configuration Support-B
- 3174 Peer Communication Licensed Internal Code feature with Configuration Support-C

Workstation LAN-Over-Coax Drivers

Every workstation that wishes to use the 3174 Peer Communication capability must have the appropriate LAN-Over-Coax device drivers. These drivers are available in following ways:

- 3174 Peer Communication NDIS drivers that are NDIS V2.01 Compliant MAC drivers. IBM provides these 3174 NDIS MAC drivers for DOS and OS/2 workstations at no charge.
- Extended Services for OS/2 workstations.
- 3174 Workstation Peer Communication Support Program (PRPQ P85114), as a separately orderable offering, for DOS workstations.
- 3174 Workstation Peer Communication Support Program, included with the Networking Services/DOS package for convenience, for DOS workstations.

Other Workstation Software

The following IBM application programs are supported for Peer Communication:

- IBM Personal Communications/3270 Version 1.01 (Note 1)
- IBM PC LAN Program V1.32
- IBM DOS LAN Requester packaged with the IBM OS/2 LAN Server V1.2
- IBM Advanced Program to Program Communications/PC V1.11
- IBM 3270 Workstation Program V1.12
- IBM AS/400 PC Support V1.3 (Note 2)
- IBM PC/Host File Transfer and Terminal Emulator Program (FTTERM) V2.1 (Note 3)
- IBM LAN Network Manager V1.1
- IBM Networking Services/DOS V1.0
- IBM Communications Manager/2

Notes:

1. IBM Personal Communications/3270 supports 3174 Peer Communication only when run in a conventional memory environment. Running in Expanded Memory Specification (EMS) memory is not supported.
2. AS/400 PC Support is not supported with 3278/79 Emulator Adapter P/N 1602507.
3. FTTERM is supported when communicating with the IBM LAN Asynchronous Communications Server (LANACS).
4. IBM PC 3270 Emulation Program Entry Level is not compatible with 3174 Peer Communication and is not supported.

19.10 3174 Customization

To support Peer Communication, the Peer Communication feature must be installed and customized. This section provides guidance on customizing the feature. Only relevant screens are shown.

19.10.1 Customize Control Disk Menu

```
                 _______ Customize Control Disk Menu ________


 Select Option; press ENTER

 Option     Description

    1       Configure        1
    2       Define Devices
    3       Merge RPQs
    4       Modify Keyboards
    5       Define AEA
    6       Define APPN Node
    7       Define COS
    8       Define 3174-PEER 2






     Select ===>
 Press PF12 to File, PF3 to Quit, or Select another Option
 PF: 3=Quit    4=Default    7=Back    8=Fwd    9=Check    12=File
```

Figure 222. Customizing Options

1 Option 1 is used to customize 3174 general functions.

2 Option 8 is used to customize Peer Communication-specific functions. In subsequent panels, the Peer Communication function is referred to as the 3174-Peer support.

19.10.2 3174-Peer Definition

The 3174 Peer Communication, referred to in the customizing panels as the 3174-Peer Support, is separate and distinct from the APPN function. The 3174-Peer function can be used to allow coax attached nodes to connect to a Token-Ring APPN network.

As shown in Figure 215 on page 559, the 3174-Peer function provides a logical internal ring segment and a bridge to a real external Token-Ring segment. Each coax attached PS/2 workstation appears to be connected to the internal ring.

In the customizing panel descriptions, the following terms are used:

- *3174-Peer device* to refer to a coax attached PS/2 workstation
- *3174-Peer port* to refer to the coax port to which a PS/2 workstation is attached

- *3174-Peer bridge* to refer to the internal bridge
- *3174-Peer segment* to refer to the internal ring segment
- *Token-Ring segment* to refer to the external token-ring segment

Each 3174-Peer device can have a token-ring address:

- Specified as a DXML1MOD.SYS parameter in its CONFIG.SYS file.
- As a NETADDRESS parameter in the IBMXLN stanza of the PROTOCOL.INI file.
- Assigned by the 3174-Peer function according to its port number, with some portion of the address specified by the user through question 660.

The 3174-Peer Definition panels allow you to:

- Enable the internal ring segment
- Enable the internal bridge function
- Customize the internal bridge parameters
- Enable LAN Manager support
- Specify the middle six hexadecimal digits of the 3174-assigned ring address for the 3174-Peer devices

```
                   __________ 3174-Peer Definition __________


3174-Peer Support

     650 - Y        3174-Peer Support                    (Y,N)


  3174-Peer Options

     651 - Y        Bridge Support                       (Y,N)
     652 - N        LAN Manager Support                  (Y,N)
     653 - Y        3174-Peer Online Test Updates        (Y,N)


  3174-Peer Station Parameters

     660 - 4000 3174 91 PN  3174-Peer Port Address Range    (0000 00 - FFFF FF)
     661 - 05               Percentage of Discard Threshold (00 - 99)



 PF: 3=Quit    4=Default    8=Fwd
```

Figure 223. Enabling Peer Communication Functions

Question 650: 3174-Peer Support

The response indicates whether the internal ring segment is to be enabled. Valid responses are:

Y=Yes

N=No (default response)

If the response is Y, then the Peer Communication function will be included and operational when the 3174 is IMLed. A Y response increases the total controller storage required.

Question 651: Bridge Support

The response indicates whether the internal bridge function is to be enabled. This bridge function requires that the 16/4 Mbps Token-Ring Adapter be installed in the 3174. Valid responses are:

Y=Yes

N=No (default response)

You must respond with a Y if you want the 3174-Peer devices to communicate:

- With devices outside of the 3174, for example, to servers, or hosts and gateways, or APPN nodes on or accessible via the external token-ring segment.
- As LEN nodes and end nodes to the 3174 network node (the 3174 you are now customizing).

A Y response increases the total controller storage required.

Question 652: LAN Manager Support

The response indicates whether support for a LAN Network Manager is to be enabled. LAN Network Manager V1.1 or later is required. Valid responses are:

Y=Yes

N=No (default response)

If your response is Y, then LAN Network Manager will support the LAN Reporting Mechanism in the 3174-Peer bridge and provide functions such as:

- LAN Bridge Server (LBS)
- Ring Parameter Server (RPS)
- Configuration Report Server (CRS) (for the 3174-Peer segment only)
- Ring Error Monitor (REM) (for the 3174-Peer segment only)

If the LAN Manager support is enabled, the 3174-Peer bridge must also be enabled (question 651=Y). If the LAN Manager support disabled, you can update 3174-Peer status and bridge profile parameters via the online Test 9 (LAN tests).

A Y response increases the total controller storage required.

Question 653: 3174-Peer Online Test Updates

The response is used in conjunction with questions 651 and 652 to determine the update options you are allowed to perform via Test 9. Valid responses are:

Y=Yes (recommended)

N=No (default response)

Table 30. 3174-Peer Online Test Updates Allowed			
Q651: Bridge Support	**Q652: LAN Manager Support**	**Q653: 3174-Peer Online Test Updates**	**Updates Allowed Via**
Y	Y	Y	Test 9, option 12 LAN Manager profile
Y	N	Y	Test 9, option 9 3174-Peer status Test 9, option 10 3174-Peer bridge profile
N	N	Y	Test 9, option 9 3174-Peer status

Note:

You must enter a password in question 098: Online Test Password if you want to use the 3174-Peer Online Test Updates capability. If a password is not provided in question 098, this capability is deconfigured when the 3174 is IMLed.

See 19.10.4, " 3174-Peer Bridge Profile Online Test Update" on page 576 for more information.

Question 660: 3174-Peer Port Address Range

We have mentioned before that there are different ways to give a 3174-Peer device an address:

- As a DXML1MOD.SYS parameter in the CONFIG.SYS file if you are using WPCSP.
- As a NETADDRESS parameter in the IBMXLN stanza of the PROTOCOL.INI file, if you are using the NDIS compliant driver.
- Assigned by the 3174-Peer function according to its port number, with some portion of the address specified by the user.

Question 660 allows you to enter the user-specified portion of the address when it is automatically assigned by the 3174-Peer function.

The format of the address is as shown in Figure 224.

```
4000 XXXX XXPN
 1     2    3
```

Figure 224. Format of 3174-Peer Device Address Assigned Automatically

1 4000 is a protected field and cannot be modified.

2 XXXXXX is the user-specified portion of the address. The valid range is from hexadecimal '000000' to 'FFFFFF'.

3 PN is the port number to which the 3174-Peer device is attached. This value ranges from 00 (HG 26-00) to 63 (HG 27-31).

As shown in Figure 223 on page 570, we have entered 317491 as the user-specified portion of the address. This means that a 3174-Peer device attached to port HG 26-23 will have a 3174-assigned address of 400031749123. Another 3174-Peer device attached to port HG 27-23 will have a 3174-assigned address of 400031749155.

Note: The *3174 Planning Guide* description for question 660 gives an impression that the addresses in this example would be 400031749117 (port HG 26-23 decimal 23 converted to X′17′) and 400031749137 (port HG 27-23 decimal 55 converted to X′37′). Using online Test 9 Option 9, the addresses are displayed with the port numbers in decimal.

In addition, if LAN Manager support is enabled in question 652, then the 3174 has an address with a PN of FF on the internal ring. In our example, this address is 4000317491FF.

Note that if an address is user-assigned via the DXML1MOD.SYS driver in WPCSP or as the NETADDRESS in PROTOCOL.INI:

- It will override the 3174-assigned address.
- It must be outside the range of addresses available for assignment by the 3174 if you wish to have port-independent addressing. In our example, it should be outside the range 400031749100 to 400031749163.
- It must not be the address of the 3174 when the LAN Manager Support is enabled. In our example, it must not be 4000317491FF.

If the 3174-Peer function and the bridge support are both enabled, you should check that no other device uses any of the 3174-Peer addresses in questions 106, 107, 900 and 940.

Recommendation: We recommend that you use user-assigned addresses for the 3174-Peer devices. This will give you device addressing independent of the port numbers and allow 3174-Peer devices to be swapped from one port to another without problems.

Question 661: Percentage of Discard Threshold

As a 3174-Peer device becomes congested, it cannot receive as many frames and starts to discard those it cannot receive. The more frames it discards within a given time interval, the more congested the device has become.

Question 661 allows you to specify a threshold to use in deciding when a device has become congested. The valid range of response is 00 to 99. The default response is 05; this means that we consider a device to be congested if more than 5% of the frames are discarded in any one-minute interval. If you specify 00, it means that we consider a device to be congested if it discards any frame at all in any one-minute interval.

19.10.3 3174-Peer Bridge Profile

The 3174-Peer Bridge Profile panel allows you to specify parameters to be used by the internal bridge function. These parameters include:

- The internal bridge number
- The internal ring segment number
- The external token-ring segment number
- The number of hops over which a broadcast frame can cross
- Whether frames will be forwarded by the bridge
- Setting threshold for bridge congestion
- How long to wait before logging a bridge congestion

- How long to wait before sending an alert about a bridge congestion.

```
                  ________ 3174-Peer Bridge Profile ________


     670 - 1        Bridge Number                  (0-F)
     671 - BB3      Token-Ring Segment Number      (001-FFF)
     672 - 002      3174-Peer Segment Number       (001-FFF)
     673 - 7        Token-Ring Hop Count           (1-7)
     674 - Y        Frame Forwarding Active        (Y,N)
     675 - 0010     Bridge Performance Threshold   (0000-9999)
                     (Frames Discarded Per 10,000)
     676 - 02 00    Logging Interval               (00-99 Hours 00-59 Minutes)
     677 - 010      Alert Threshold                (000-255)









  PF: 3=Quit    4=Default    7=Back    8=Fwd
```

Figure 225. 3174-Peer Bridge Parameters

Question 670: Bridge Number

The response assigns a number to the internal 3174-Peer bridge. The valid range of response is a hexadecimal value from 0 to F, with 1 being the default. The bridge number is required for source routing.

If there is more than one 3174-Peer segment on the same token-ring, the 3174-Peer bridge number can be the same for all the 3174-Peer bridges.

Question 671: Token-Ring Segment Number

The response assigns a number to the external (real) token-ring segment. The valid range of response is a hexadecimal value from 001 to FFF, with no default. It is required for source routing.

If the 3174 is attached to an existing token ring, you should use the segment number already assigned to the token ring for Question 671.

If an IBM Token-Ring Network Bridge Program station is active on the Token-Ring, you must use the segment number assigned by the Bridge Program for Question 671. If the numbers do not match, the 3174-Peer bridge will not be able to communicate on the token ring.

If there are more than one 3174-Peer segments on the same token ring, the token-ring segment number must be the same for all the 3174-Peer segments (obviously, since they are attached to the same token ring).

The token-ring segment number, however, cannot be the same as the 3174-Peer segment number.

Question 672: 3174-Peer Segment Number

The response assigns a number to the internal ring segment (the 3174-Peer segment). The valid range of response is a hexadecimal value from 001 to FFF, with no default.

If there are more than one 3174-Peer segments on the same token ring, the 3174-Peer segment number must be different for all the 3174-Peer segments. It must also be different from the token-ring segment number. If the token ring is bridged to other token-rings, you must ensure that all 3174-Peer segment numbers are unique throughout the entire network.

Question 673: Token-Ring Hop Count

The response specifies the maximum number of bridges that a broadcast frame can cross. The valid range of response is from 1 to 7, with 7 as the default.

Note that the 3174-Peer bridge is counted as one hop when frames cross from the 3174-Peer segment to the external token ring or vice versa.

Question 674: Frame Forwarding Active

The response indicates whether the 3174-Peer bridge is to forward frames it receives. Valid responses are:

Y=Yes (default response)

N=No

If the response is Y, the 3174-Peer bridge will forward frames as well as process frames received from the token ring.

If the response is N, the 3174-Peer bridge will stop forwarding frames received from the token ring. In fact, it will discard any frames it receives and stop incrementing the discard frame counters.

Question 675: Bridge Performance Threshold

The response specifies the maximum percentage of information frames that may be discarded by the internal bridge within a one-minute interval before a count is incremented. The valid range is from 0000 to 9999; the number is in hundredths of a percent or the number of frames per 10,000. The default is 0010 and means that the discard counter will be incremented by one if 0.1% (10 hundredths of a percent) of the frames received within any one-minute interval are discarded. It is the same as saying the discard counter will be incremented by one if 10 out of every 10,000 frames received within any one-minute interval are discarded.

A separate count is maintained for frames received from the Token-Ring and frames received from the 3174-Peer segment.

Question 676: Logging Interval

When the internal bridge performance threshold is exceeded at the end of a one-minute interval, the bridge is congested. To measure how serious the congestion is, you can specify a time interval during which the congestion is monitored.

The monitoring begins at the end of the one-minute interval when the congestion occurred, counting that one-minute interval as the first minute of the monitoring interval. At the end of the monitoring interval, the Log Manager is invoked to record the number of minutes in that interval during which the bridge was congested. The number of minutes and a non-alertable status code are recorded in the event log. This information is time stamped.

Question 676 allows you to set the monitoring interval. The valid range of response is from 00 Hours 00 Minutes to 99 Hours 59 Minutes, with the default being 02 00 (every two hours). If 00 Hours 00 Minutes is specified, then no logging of the bridge congestion is invoked. If you specify any interval other than 0000, then logging begins only after bridge congestion has been detected.

Question 677: Alert Threshold

Within the monitoring interval set by Question 676, you can set another threshold to raise an alert if the congestion is serious. Question 677 allows you to set this alert threshold. The valid range of response is from 000 to 255, with the default being 010 minutes.

Using the default logging interval (0200) and default alert threshold (010) as an example, if bridge congestion is detected then monitoring begins. If bridge congestion total time is less than 10 minutes (the alert threshold), no alert is raised and logging is invoked at the end of two hours.

As soon as bridge congestion total time reaches 10 minutes (the alert threshold), an alert is raised, the Log Manager is immediately invoked to record a status code and the alert threshold in the event log and the logging interval is treated as if it has completed.

19.10.4 3174-Peer Bridge Profile Online Test Update

Once the 3174 is IMLed successfully, it is important to review Questions 670, 671, 672 and 674 in the 3174-Peer Bridge Profile and verify that they match with the responses specified during the customization.

You can review the 3174-Peer bridge profile by choosing option 9 (LAN Tests) from the 3174 Test Menu (1 TEST) and then by choosing option 10 (3174-Peer bridge profile).

If there is a mismatch, go back to the LAN Test Menu and choose option **10, u** (3174-Peer bridge profile). Then enter the online test password entered in Question 098 and the panel shwon in Figure 226 on page 577 is displayed.

Notes:

1. The parameter **u** is not displayed on the screen
2. You need to specify an online test password (Question 098) as well as a Y for the Question 653 (3174-Peer Online Test Updates) in the 3174-Peer Definition panel.

```
                    ________ 3174-Peer Bridge Profile ________


    * 670 - 1        Bridge Number                  (0-F)
    * 671 - BB3      Token-Ring Segment Number      (001-FFF)
    * 672 - 002      3174-Peer Segment Number       (001-FFF)
      673 - 7        Token-Ring Hop Count           (1-7)
    * 674 - Y        Frame Forwarding Active        (Y,N)
      675 - 0010     Bridge Performance Threshold   (0000-9999)
                      (Frames Discarded Per 10,000)
      676 - 02 00    Logging Interval               (00-99 Hours 00-59 Minutes)
      677 - 010      Alert Threshold                (000-255)


    * Override to customize data


    To go directly to other tests, enter /Test,Option
    Select Test, press ENTER ==> _

 PF: 3=Quit    4=Save    12=Test menu
```

Figure 226. 3174-Peer Bridge Parameters with Online Test Update

The responses of the Questions (670, 671, 672 and 764) can be changed. Press PF4 to save the data.

19.10.5 LAN Manager Profile

The LAN Manager Profile panel allows you to specify a password for each reporting link. The following rules apply to the reporting link passwords:

- The passwords need not be unique.
- Each password must be six to eight characters in length.
- Each character must be in the range 0-9 and A-Z.
- No blanks preceding or imbedded in the password are allowed.
- The default is all blanks (no password specified).

The following questions allow you to specify the passwords:

- Question 690: Reporting Link 0 Password
- Question 691: Reporting Link 1 Password
- Question 692: Reporting Link 2 Password
- Question 693: Reporting Link 3 Password

19.11 Peer Workstation Requirements

The 3174 Peer Communication LIC feature originally only worked in conjunction with the 3174 Workstation Peer Communication Support Program (WPCSP) PRPQ P85114 installed in the coax-attached DOS workstations. WPCSP provided a set of device drivers for the coax-attached workstations. These device drivers perform functions similar to those provided by the LAN Support Program device drivers used in token-ring networks.

Together, these two products allowed coax-attached workstations to form a LAN. These LAN workstations can then communicate with other workstations attached to the same 3174, or to other workstations that are attached to the 3174 by an external token-ring network.

IBM provides a 3174 NDIS MAC drivers at no charge for DOS and OS/2 workstations. These drivers allow customers to use their coax-connected intelligent workstations (with 3270 emulator cards) to access LAN applications that run on the NDIS interface. The 3174 Peer Communications NDIS Drivers are NDIS V2.01 Compliant MAC drivers.

19.12 DOS Support

In a DOS environment you are provided with device drivers for the non-NDIS and NDIS interface. We will focus on the NDIS device drivers, since the non-NDIS device drivers provided with the 3174 Workstation Peer Communications Support Program (3174-WPCSP) RPQ P85114 are covered under the heading 19.12.4, "3174 Workstation Peer Communication Support Program (WPCSP)" on page 580.

The 3174 Peer Communications NDIS Driver for DOS replaces the 3174 Workstation Peer Communication Support Program (3174-WPCSP) RPQ P85114. The NDIS driver may be used with applications such as TCP/IP for DOS V2.1, which requires NDIS compliant drivers.

The 3174 Peer Communications NDIS Driver may also be used in conjunction with LAN Support Program V1.33. When used with LSP V1.33, the 3174 Peer Communications NDIS Driver may be used with LAN applications which require an IEEE 802.2 LLC interface, or a NETBIOS interface. The following are examples of applications that will function with this driver and LSP V1.33:

- IBM′s DOS LAN Requester
- Novell Netware (using LANSUP.COM)
- Personal Communications/3270 v2.0 or later (PC/3270)
- TCP/IP fo DOS V1.2
- NS/DOS
- AS/400 PC Support

10.2KB of memory is required for the 3174 Peer Communications NDIS Driver. Additional memory is required for DOS, LAN Support Program, other device drivers and application programs.

IBM PC DOS V3.3 or later is the required level of operating system.

19.12.1 Configuring NDIS for DOS

When using the IBMXLN.DOS file with LAN Support Program, the DXMAID utility should be used for installation. The IBMXLN.NIF file is also required for this installation. The user should answer ′Yes′ for the adapter options diskette question, and supply the path to the IBMXLN.* files.

Also, if a Locally Administered Address (LAA) is assigned when using IBMXLN.DOS, the LAA should be on the device driver line and not on the 802.2 line in the PROTOCOL.INI file.

Note:

The IBMXLN.NIF file is an IBM format NIF file and is not readable by non-IBM applications.

In an DOS environment IBM LAN Support Program Version 1.33 level of support is required. In the example shown in Figure 227 and Figure 228 on page 580, we have used both the NDIS protocol drivers provided with IBM TCP/IP for DOS and Windows Version 2.1 and IBM LSP V1.33.

The 3174 Peer NDIS driver (**IBMXLN.DOS**) is not provided with IBM TCP/IP for DOS and Windows V2.1 or IBM LSP V1.33. It has been placed in the D:\TCPDOS21\BIN\IBMXLN.DOS subdirectory for this example.

```
REM*----------------------------------------*
REM* IBMXLN NDIS DEVICE DRIVER SUPPORT      *
REM*----------------------------------------*
DEVICE=C:\DOS52\SETVER.EXE
DEVICE=C:\WIN31\HIMEM.SYS
REM DOS=HIGH
FILES=30
BUFFERS=40
DEVICE=C:\WIN31\SMARTDRV.EXE /DOUBLE_BUFFER
STACKS=9,256
REM DEVICE = C:\DOS52\ANSI.SYS
DEVICE = D:\TCPDOS21\BIN\PROTMAN.DOS /I D:\TCPDOS21\ETC
DEVICE = D:\TCPDOS21\BIN\IBMXLN.DOS
DEVICE = D:\TCPDOS21\BIN\DOSTCP.SYS
DEVICE=\LSP133\DXMA0MOD.SYS 001
DEVICE=\LSP133\DXME0MOD.SYS
DEVICE=\LSP133\DXMT0MOD.SYS  O=N ES=2 EST=3
DEVICE = C:\DOS52\ANSI.SYS
```

Figure 227. Sample CONFIG.SYS

```
; ---------------------  Protocol Manager Definition  -----------------------
{PROTMAN_MOD}
             DriverName = PROTMAN$
; -------------------  Protocol Driver Definition ---------------------------
; IBM TCP/IP V2.1 for DOS
;
{TCPIP_V21}
             DriverName = DOSNDIS$
;
; ---- Bindings Statement ----
;
             Bindings = IBMXLN,,,
;
; ------------  IBM LAN Support Program V1.33  ----------------------
{DXME0_MOD}
             DriverName = DXME0$
             Bindings = IBMXLN
{DXMT0_MOD}
             DriverName = DXMT0$
             Bindings = IBMXLN
;
; ------------------ IBM 3174 Peer Support ------------------------
{IBMXLN}
; IBM 3174 PEER SUPPORT
; IBMXLN.DOS
             DriverName = IBMXLN$
             Maxtransmits = 6
             NETADDRESS = "400031744992"

;**** END OF FILE ****
```

Figure 228. Sample PROTOCOL.INI

19.12.2 Packaging

The 3174 Peer Communications NDIS device drivers for DOS consists of the following files:

- IBMXLN.DOS - the 3174 Peer Communications NDIS Driver
- IBMXLN.NIF - the Network Information File

19.12.3 Compatibility with Novell NetWare

The 3174 Peer Communications NDIS Driver for DOS is compatible with the NetWare Client Kit for DOS/Windows Version 1.01 (formerly known as NetWare Workstation Kit for DOS/Windows). The LANSUP.COM driver provided by NetWare Client Kit for DOS/Windows V1.01 allows the Novell client to communicate through the 802.2 interface provided by LAN Support Program V1.33. For best performance, it is also suggested that the burst mode support provided by the NetWare Client Kit for DOS/Windows Version 1.01 be used on both the Novell client and server.

All of this means that DOS APPC/APPN capable products can coexist on the same machine with a NetWare client.

19.12.4 3174 Workstation Peer Communication Support Program (WPCSP)

The 3174 Workstation Peer Communication Support Program (WPCSP) provides NetBIOS and IEEE 802.2 software interfaces for DOS workstations coax attached to a 3174, similar to the interfaces provided by the LAN Support Program for workstations attached to a token ring network. These interfaces enable coax attached workstations to communicate with one another as peers as if they were on a token-ring network. If a real token-ring network is attached to the 3174, these workstations can also communicate with the workstations on the real Token-Ring Network including the ability to access file/print servers.

WPCSP provides the LAN-over-Coax device drivers for the DOS environment and is available either as a PRPQ P85114, or as a diskette included with the Networking Services/DOS package. WPCSP works in conjunction with either of the following:

- 3174 Peer Communication RPQ 8Q0718 for Configuration Support-B
- Peer Communication LIC feature for Configuration Support-C

The workstations can be connected to the 3174 using IBM 3270 Connection Adapters or 3278/3279 Emulation Adapters.

WPCSP DXMINFO.DOC File

DXMINFO.DOC is a file included on the WPCSP diskette and provides information additional to the user′s guide. DXMINFO.DOC information can be used to set up and tailor WPCSP to meet the user′s unique environment. The information includes the following:

- IBM adapter information
- Coding of parameters for the supplied device drivers
- Setup/customization information for certain network applications
- Recommendations for heavy traffic and/or large numbers of sessions

The DXMINFO.DOC file also describes the WPCSP limitations and compatibility. Some important limitations are highlighted below:

- Only a single 3270 adapter is supported.
- The 3270 adapter cannot coexist (be active) with another LAN adapter.
- The IBM 3270 Emulation Program Entry Level V1.0 program is not compatible with Peer Communication and is not supported.
- Because the LAN segment created by Peer Communication is a different type of LAN than the Token-Ring LAN, the MAC layer function is different. Any LAN application that interfaces directly to the Token-Ring MAC layer (IEEE 802.5) will not work.
- For host file transfer to an SNA Host, the Session Control (SC) BIND Command must have the Read Partition-Query reply byte set to B′1′ at the host. Refer to the *3174 Functional Description* manual in the section on SNA Protocol for more information.

WPCSP Installation

WPCSP is provided on one PC diskette. It provides four device drivers which must be included in the CONFIG.SYS file. These are:

- DXMA0MOD.SYS, which is an interrupt arbitrator.
- DXMA1MOD.SYS, which is the software interface to the adapter hardware.
- DXML1MOD.SYS, which provides the IEEE 802.2 interface. An user-assigned address can be specified as a parameter of this device driver. This address then becomes the “ring address” of the 3270 Connection Adapter or 3278/3279 Emulation Adapter.

- DXMT0MOD.SYS, which provides NetBIOS interface. Extra SAPs may be specified for this device driver as required.

Once WPCSP is installed in the C:\WPCSP directory, we edit the CONFIG.SYS file to appear as shown in Figure 229.

```
DEVICE=C:\WPCSP\DXMA0MOD.SYS
DEVICE=C:\WPCSP\DXMA1MOD.SYS
DEVICE=C:\WPCSP\DXML1MOD.SYS 400030019119  1
DEVICE=C:\WPCSP\DXMT0MOD.SYS ES=3 EST=3    2
BREAK=ON
BUFFERS=20
FILES=40
DEVICE=C:\PCS\EIMPCS.SYS                   3
DEVICE=C:\PCS\ECYDDX.SYS                   3
```

Figure 229. Peer Communication: Example CONFIG.SYS File

1 This is the user-assigned address by which the 3270 Connection Adapter or 3278/79 Emulation Adapter will be recognized. The format of the address is the same as a Token-Ring network address and is treated as such. The DXML1MOD.SYS address will override the address specified in question 660 on the 3174-Peer Definition panel during 3174 customization (see “Question 660: 3174-Peer Port Address Range” on page 572).

Note: You should ensure that the DXML1MOD.SYS address does not fall within the range of the address given by question 660. For a detailed explanation, see 19.3, “LAN Addressing” on page 560.

2 Add ES= and EST= parameters to expand the number of SAPS and link stations to match the number of sessions required with the host. The NetBIOS interface will open the adapter at load time using these parameters:

- ES=3 indicates three extra SAPs requested by the NetBIOS driver.
- EST=3 indicates three extra link stations requested by the NetBIOS driver.

3 These are the two device drivers used by PC Support/400 for shared folders use. They are automatically added to the CONFIG.SYS file by the DOS installation procedure of PC Support/400. They will not be present if you are not using PC Support/400.

19.12.5 PC/3270 Configuration

This section shows an example configuration for a PS/2 with Personal Communications/3270 V2.0, coax attached to a 3174 with Peer Communication enabled. The PS/2 is configured as a 3174-Peer device (see its CONFIG.SYS file in Figure 229) to access an S/370 host using the 3174 as the gateway. Only relevant screens are shown.

```
                              Attachment Types

Fill in the fields.

  Total number of sessions for:

  Distributed Function Terminal (DFT) . . . . . . . . .   0

  LAN via 802.2 protocol  . . . . . . . . . . . . . . .   0

  LAN via NetBIOS . . . . . . . . . . . . . . . . . . .   0

  3174 Peer Communication . . . . . . . . . . . . . . .   3      1

  Synchronous Data Link Control (SDLC)  . . . . . . . .   0

  Asynchronous Data Link Control (ASYNCH) . . . . . . .   0
```

Figure 230. Peer Communication: PC/3270 Attachment Type

1 We want to establish three sessions with the S/370 host using 3174 Peer Communication.

```
                           3174 Peer Communication

Fill in the fields.

  Link name . . . . . . . .    lan1

  Destination address . . .   400031740001       2

  Physical Unit ID  . . . .   00000

  Block ID  . . . . . . . .   061

  PIU size  . . . . . . . .   0265
```

Figure 231. Peer Communication: Gateway Address

2 Is the Token-Ring address of the 3174-11L to which PS/2 is connected and which will be used as the gateway to the S/370 host.

With Peer Communication, the PS/2 is a PU 2.0 in its own right and is defined, in this example, to VTAM as a DSPU with three LUs in a local SNA major node.

19.13 OS/2 Support

The 3174 Peer Communications NDIS Driver for OS/2 is currently provided as part of most IBM OS/2 communications software products. The 3174 Peer Communications NDIS Driver for OS/2 is currently provided as part of the following OS/2 communications software packages:

- Extended Edition V1.3
- Extended Services V1.0
- Network Transport Services for OS/2
- TCP/IP for OS/2 V1.2.1

IBM OS/2 Version 1.3 or later is required.

19.13.1 Configuring NDIS for OS/2

For the OS/2, Peer Communications NDIS drivers were first made in the LAN Adapter and Protocol Support (LAPS) provided by IBM OS/2 Extended Edition Version 1.3. In the examples shown in Figure 232 and Figure 233 on page 585, we have elected to use the LAPS provided with IBM Network Transport Services for OS/2.

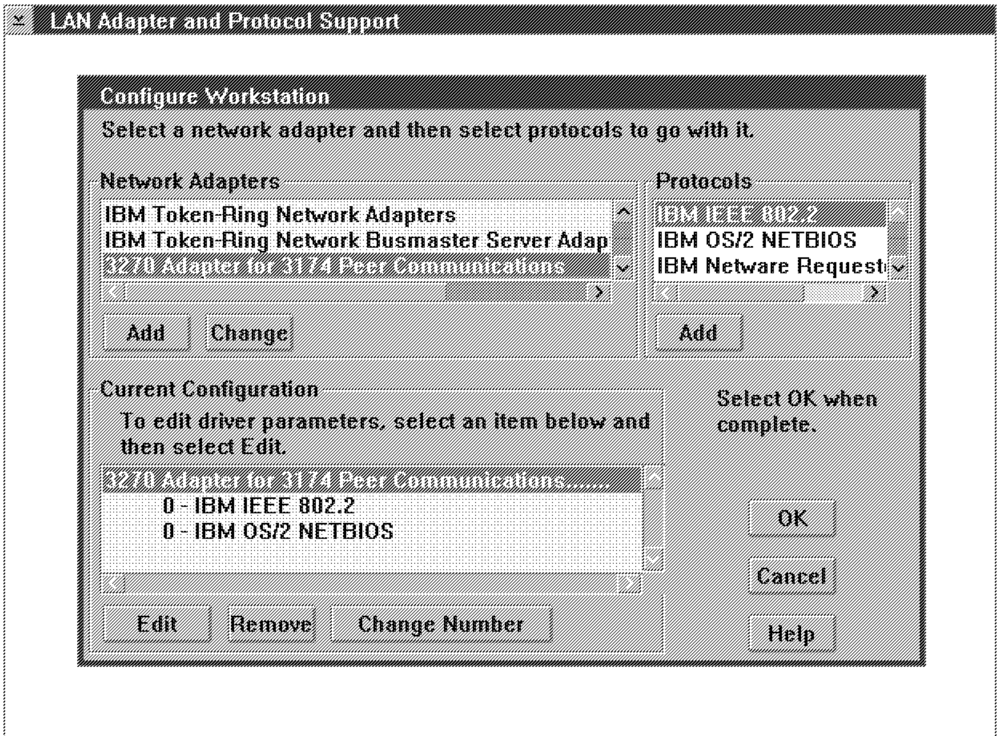


Figure 232. LAPS - Configure Workstation

On the Configure Workstation panel we are selected the Current Configuration of:

- Network Adapters
  - **3270 Adapter for 3174 Peer Communications**
- Protocols
  - **IBM IEEE 802.2**
  - **IBM OS/2. NETBIOS**

We then select **Edit**, that will present us with the panel shown in Figure 233 on page 585.

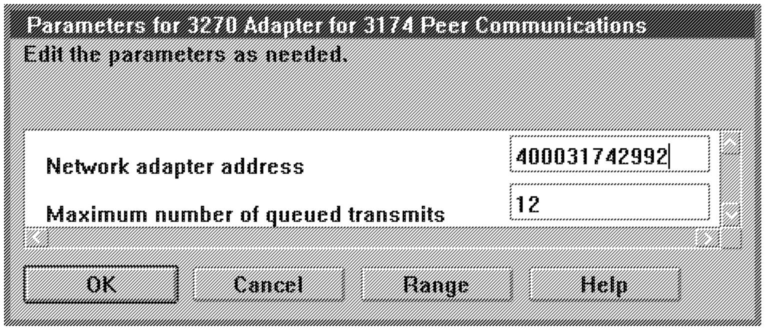


Figure 233. LAPS - Parameters for 3270 Adapter for 3174 Peer Communications

On the Parameters for 3270 Adapter for 3174 Peer Communications panel, we have entered a locally administered address (LAA) of **400031742992**. This will override the port assigned addressing defined in the 3174 customization.

19.13.2 Packaging

The 3174 Peer Communications NDIS device drivers for OS/2. consists of the following files:

- IBMXLN.OS2 - The 3174 Peer Communications NDIS Driver
- IBMXLN.NIF - the Network Information File

19.13.3 Compatibility with Novell′s NetWare

The 3174 Peer Communications NDIS Driver for OS/2. works with the NetWare Client for OS/2. v2.01 (formerly known as NetWare Workstation Kit for OS/2. v1.3). The NetWare compatibility driver (ODI2NDI.OS2) provided by Network Transport Services for OS/2., converts the ODI protocol stack created by NetWare into an NDIS stack which is support by 3174 Peer Communications NDIS Driver for OS/2..

This support does not have any APPN inference. It does provides the user with the ability to share a 3270 adapter between an NetWare client and an OS/2. APPC/APPN node, when using 3174 Peer Communications.

19.14 Prerequisites

Each participating IWS must be equipped with:

- An IBM 3270 Connection Card or an IBM 3278/3279 Emulation Adapter (8K versions only).

  Other 3270 emulation adapters that are *fully compatible* may work, but have not been tested. No support is offered nor warranty implied for such adapters.

- Only one (1) 3270 Adapter is supported in a workstation using the 3174 Peer Communications NDIS driver.
- The appropriate DOS or OS/2. Peer Communications device drivers.

3174 LIC Configuration Support-C up to, and including, version 4.

- Optional feature #8010 (Peer Communication) should be ordered for 3174 models 01L, 01R, 02R, 03R, 11L, 11R, 12L, 12R, 13R, 21L, 21R, 21H, 22L, 22R or 23R.

- Optional feature #8060 (Peer Communication) should be ordered for 3174 models 51R, 53R, 61R, 62R, or 63R.

3174 LIC Configuration Support-C5. (pre-merged)

For 3174 LIC Configuration Support B Release+4, RPQ 8Q0718 is required.

19.15 Extended Services (ES)

With the availability of Extended Services, OS/2 workstations are able to participate in the 3174 Peer Communication. Like WPCSP for the DOS environment, Extended Services provide the LAN-Over-Coax device drivers for the OS/2 workstations.

The two major components required for Peer Communication are:

- For the OS/2 workstation, the LAN-over-Coax MAC driver IBMXLN.OS2, which resides in the \IBMCOM\MACS sub-library. This driver is also referred to as the XLN driver.
- For the 3174, one of the following:
  - 3174 Peer Communication Licensed Internal Code feature for Configuration Support-C
  - 3174 Peer Communication RPQ 8Q0718 for Configuration Support-B

19.15.1 ES Limitations/Coexistence With 3270 DFT

The following limitations apply to the use and co-existence of 3270 adapter cards:

- The same 3270 adapter card cannot be used for DFT and Peer Communication simultaneously; it must be one OR the other.
- PCs with AT bus architecture (Family 1) are restricted to one 3270 adapter and, therefore, cannot simultaneously use a DFT and Peer Communication connection.
  - The 3270 DFT and Peer Communication device drivers both use the TCA (Terminal Control Area) adapter interrupt level 9; since Family 1 PCs do not allow interrupt sharing, the same interrupt level cannot be successfully used by two different device drivers at the same time. These two functions therefore will not be allowed to run at the same time, nor can multiple instances of either functions be allowed to run on Family 1 PCs.
- PS/2s with Micro Channel* architecture (Family 2) can have up to four 3270 adapter cards. However, only one of these adapter cards can be used for DFT (this is a prior OS/2 Extended Edition restriction which remains), but they can all be used for Peer Communication.
- Each adapter using Peer Communication must have a DEVICE=IBMXLN.OS2 statement in CONFIG.SYS. The adapters will be allocated starting from the highest numbered slot for Peer Communication, and the lowest numbered slot will be used for the DFT connection.

During LAN Adapter and Protocol Support (LAPS) configuration, when the user selects one or more instances of the Peer Communication (XLN) function, the LAPS configuration utility will build the DEVICE=IBMXLN.OS2 statement in CONFIG.SYS and the Driver Name statement in PROTOCOL.INI.

The first instance of Peer Communication will have a driver name of IBMXLN$, and will use the highest numbered adapter slot containing a TCA (3270) adapter. The second instance will have a driver name of IBMXLN2$, and will use the second highest numbered adapter slot containing a 3270 adapter, and so on.

The XLN driver will load and enter the device header name that corresponds to its next available device driver name, that is, IBMXLN$, IBMXLN2$, IBMXLN3$, or IBMXLN4$. It is this device header name that is known to the operating system.

19.15.2 ES Performance

No real performance tests were done yet in order to get exact performance figures. However, in order to get an idea or an order of magnitude of the difference in transfer speed between a coax attached workstation and a Token-Ring attached workstation, a simple wristwatch timing of a 1.5 MB file transfer was done. his simple test showed the transfer to the coax attached workstation to be about three times as slow as the transfer to a Token-Ring attached workstation, on a 4 Mbps token-ring LAN.

Given the difference in transfer speed of the media, and the presence of the 3174 polling, this figure appears about right, at least as a general rule of thumb.

Chapter 20. Frame Relay Support

The 3174 Frame Relay Communications feature, which is available with Configuration Support-C Release 5, significantly extends the connectivity and networking flexibility of the 3174 Establishment Controller by allowing APPN, SNA 3270 plus LAN Gateway, and TCP/IP multiprotocol connections to many locations over a single Frame Relay link. In addition, Source Route, Remote Bridging Support[7] is provided to allow bridging from the 3174 attached token ring and local peer segments to remote token rings over Frame Relay.

This chapter briefly discusses the 3174 Frame Relay support and the new ITSO document *3174 in Higher Speed WAN and Multiprotocol Networks*, GG24-4376, is recommended to assist the reader in understanding how 3174 Frame Relay Communications can be implemented in various scenarios.

20.1 Frame Relay Overview

20.1.1 Background of Frame Relay (FR)

Frame Relay is a layer 2 packet switching protocol that provides a more efficient end-to-end transmission mechanism than X.25 and other upper-layer protocols. It accomplishes this by eliminating almost all internodal routing processing such as congestion control and error correction mechanisms. As a result, this “lightweight” protocol is able to take advantage of the highly reliable, high-speed circuits available by enabling user devices to better realize their potential interface transmission speeds (up to T1/E1).

For the above reasons, Frame Relay (FR) is a new and increasingly popular network service that has the following characteristics:

1. Fast and Simple Packet Switching

   FR is based upon Fast Packet Switching (FPS) technology in which data is broken up into packets and transported in a packet switching network. FPS is different from traditional packet switching (such as X.25) in that the packet switches only perform low-level functions such as routing, congestion management, and CRC checking. Higher-level functions such as flow control, error correction, and acknowledgements are performed by the terminal equipment.

   Because of the lack of ″hop-by-hop″ error correction, FR is designed to carry data over good quality, high-speed lines.

2. Intended for high bandwidth and low network delay

   The reduced complexity of the packet switches results in low network delays and high data bandwidth. This is the benefit of FR and FPS in general over traditional packet switching.

3. Layer 2 multiplexing and single port access to network

   As the network is responsible for routing packets to multiple destinations, the FR user needs only a single physical port to connect to the network. A

[7] The 3174 remote bridging function will be available on December 30, 1994

layer 2 identifier is used to specify a unique logical connection over a port. Multiple logical connections carrying different data types to multiple destinations can be made over this single physical connection.

4. Bandwidth on demand

   As FR networks are based upon packet switching, they allocate only the required amount of bandwidth necessary for a transmission.

5. Protocol flexibility

   The packet switches (FRFHs) in an FR network operates below OSI level 3. As such, it can accommodate a variety of data with differing level 3 (and higher) protocols.

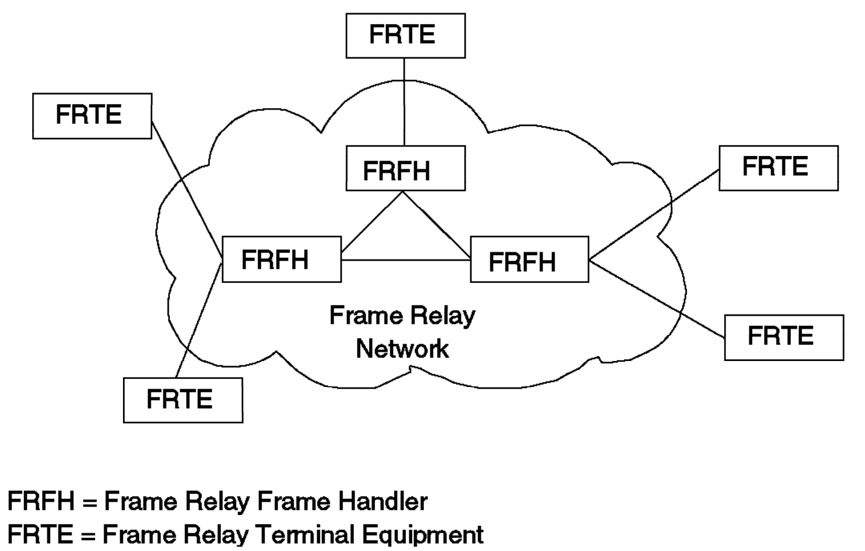


Figure 234. Frame Relay Network

20.1.2 Frame Relay Network Architecture

Considering the Frame Relay network as a layered architecture, FR has the following characteristics:

- FR standards defines FRTE-FRFH interface

  The FR standard is similar to the CCITT X.25 standard in that it defines only the FRTE (DTE) to FRFH (DCE) interface.

  It does not define how packets are routed between FRFHs within the FR network. Such details are left to individual implementations (for example, NCP).

- FRFH performs only CORE services

  As discussed in 20.1.1, "Background of Frame Relay (FR)" on page 589, the FRFH performs only OSI level 1 and 2 layer functions.

  At layer 2, it performs only the CORE services of multiplexing packets onto transmission links in accordance with their destination addresses, delimiting of frames, checking of DLC CRC and managing congestion between the FRFHs. If the packet is found bad, it is discarded. Frame Relay does not guarantee the delivery of packets, but it does guarantee that if the packet reaches its destination, it is correct.

The FRFH does not perform end-to-end functions and has a deliberately simple architecture that is similar to a MAC layer bridge. The simplicity of its architecture enables minimal transit delays for packets being processed by the FRFH. From the layered point of view, CORE services should be seen as Figure 235.

- FRTE performs Elements Of Procedure (EOP)

  The FRTE is the entry point for user applications into the FR network. It can perform the DLC Elements Of Procedure (EOP) as well as CORE services. EOP are end-to-end functions that include sequencing, frame acknowledgement, error detection/recovery and flow control.

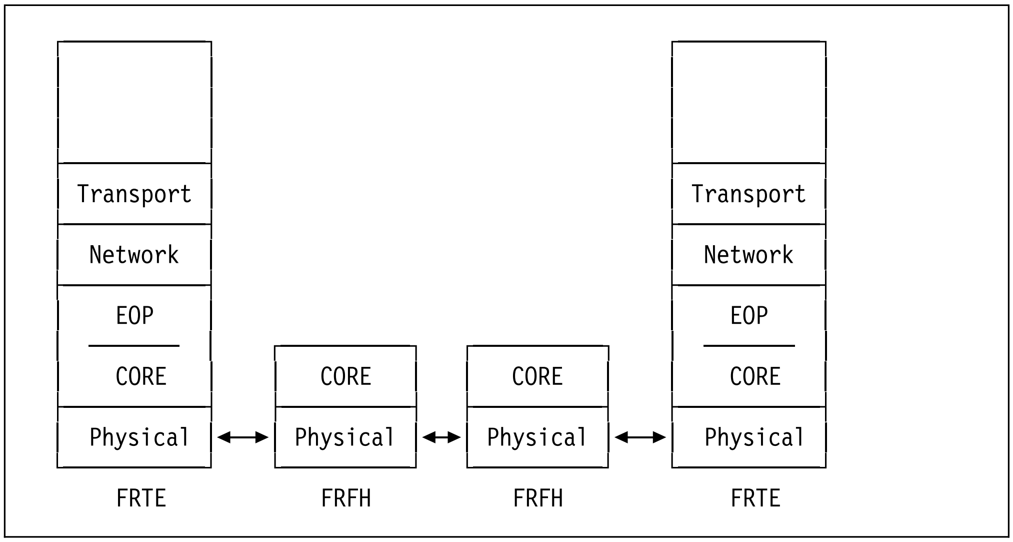


Figure 235. Frame Relay Network Architecture

20.1.3 Frame Relay Standards

The following is the list of relevant standards on which the implementation agreements (agreed to by the forum) are based:

1. ANSI T1.602 - Telecommunications - ISDN - Data Link Layer Signaling Specification for Application at the User-Network Interface, American National Standards Institute, Inc., 1990
2. ANSI T1.606 - Frame Relaying Bearer Service - Architectural Framework and Service Description, American National Standards Institute, Inc., 1990
3. ANSI T1S1/90-175 - Addendum to T1-606 - Frame Relaying Bearer Service - Architectural Framework and Service Description, American National Standards Institute, Inc., 1990
4. ANSI T1.617 - DSS1 - Core Aspects of Frame Protocol for Use with Frame Relay Bearer Service, American National Standards Institute, Inc., 1991
5. ANSI T1.618 - DSS1 - Signaling Specification for Frame Relay Bearer Service, American National Standards Institute, Inc., 1991
6. CCITT Recommendation I.122, Framework for Providing Additional Packet Mode Bearer Services, ITU, Geneva, 1988

7. CCITT Recommendation Q.922, ISDN Data Link Layer Specification for Frame Relay Mode Bearer Services, ITU, Geneva, (proposed 1991)
8. CCITT Recommendation Q.933, ISDN Signaling Specification for Frame Relay Mode Bearer Services, ITU, Geneva, (proposed 1991)

20.2 3174 Frame Relay Communications (Feature 7020/7070)

The 3174 Frame Relay Communications Feature expands 3174 connectivity by providing Frame Relay and Remote Bridging Support[8] communications support.

The existing 3174 multiprotocol communications such as SNA 3270, LAN Gateway, APPN, and TCP/IP are all supported over Frame Relay. In addition, Remote Bridging support enables token-ring or Peer Communications attached workstations to be bridged over Frame Relay to other 3174s or compatible remote bridges. Frame Relay is supported over the primary communications link at up to 256Kbs data rate.

The 3174 Frame Relay support with RFC 1490 (updated RFC 1294) provides compatibility with many IBM products such as the 6611, 3745 (NCP), RouteXpander/2 and 3172, as well as with like OEM products. 3174 Frame Relay support provides three types of LMI (Rev.1, Annex D, and CCITT Annex A), allows point-to-point and Frame Relay network connectivity, allows PVC connections, and provides a two-byte address field. 3174 Source Route Remote Bridging support provides LAN Network Management (LNM) interfaces.

In order to reduce network traffic and congestion, customers can selectively filter out traffic they do not want forwarded by the 3174 bridging function. These filters are defined on a port basis during customization and allow filtering of received or transmitted frames on the following conditions:

- MAC Address
- Source SAP
- SNAP Ethertype value
- Route Designator (Segment and Bridge number)
- Hop Count
- Frame data and offset

These filters are combined into groups based on the direction of traffic flow selected for filtering.

With the 3174 Frame Relay Communications feature, the 3174 provides connectivity to workstations via Frame Relay for LAN client/server applications whether they need Remote Bridging or SNA communications. APPN and Remote Bridging are supported from one 3174 to another, and to other compatible IBM or OEM products.

8 The 3174 remote bridging function will be available on December 30, 1994

20.3 3174 Implementation

Frame Relay defines only the DLC link level interface (layer 2) to exchange information between two partners in a Frame Relay network.

The DLC-layer support in IBM products, sometimes using the IEEE 802.2 logical Link Control (LLC) processing, allows the 3174 to communicate with other IBM Frame Relay products, such as 3174, 3745(NCP V7.1), 3172, AS/400, 6611, RouteXpander/2, etc. either over a Frame Relay network as shown in Figure 238 on page 595 and Figure 239 on page 596, or in a point-to-point configuration using Frame Relay (FR) protocol as shown in Figure 240 on page 596. In these figures, the machines labelled B and C are referred to as A′s remote partners.

20.3.1 Model Support

The Frame Relay Communication feature (#7020 or #7070) needs Configuration Support-C Release 5 and comes in a separate DSL diskette which has to be merged into the 3174 Control Extension Diskette. The Frame Relay Communications feature is supported on Models 11R, 12R, 21R, 41R, 61R, and 62R for all four protocols, that is, SNA PU 2.0, LAN Gateway, TCP/IP and APPN, and on Models 13R, 14R, 23R, 24R, and 43R for TCP/IP and APPN only.

Model	Protocol			
	SNA PU2.0	LAN Gateway	TCP/IP	APPN
11R, 12R, 21R 41R, 61R, 62R	Y	Y	Y	Y
13R, 14R, 23R 24R, 43R	N	N	Y	Y

Figure 236. 3174 Models vs. Protocols Supported over Frame Relay Communication Feature

20.3.2 Physical Connection (Physical Layer or Layer 1)

The Frame Relay physical connection is a point-to-point connection between one physical equipment and its adjacent physical equipment. Only *one* physical frame relay attachment is supported in the 3174. This is the Communication Adapter (CA) type 1 or type 2. Frame Relay Communication is not supported on Concurrent Communication Adapters (CCA) or on ISDN BRI adapters.

20.3.3 Adapter Type and Speed

The 3174 supports physical lines to Frame Relay networks as a nonswitched duplex line over the following adapter types:

- CCITT V.24 (Type 1 Communication Adapter) for speeds up to 19.2 Kbps.
- CCITT V.35 (Type 1 Communication Adapter) for speeds up to 256 Kbps.
- CCITT X.21 (V.11) (Type 2 Communication Adapter) for speeds up to 256 Kbps.

The Communication Adapter (CA) is the normal TP adapter found in remote 3174 models. The Type 1 Communication Adapter (CA), found in models x1R, has a V.24/V.35 physical attachment; and the Type 2 Communication Adapter (CA), found in models x2R, has an X.21 physical attachment. The 3174 supports FR over X.21 leased only, not over X.21 switched. Only a 4-wire mode of operation is supported; 2-wire is not supported.

Note: For 3174 models 13R, 14R, 23R, and 24R a Communication Adapter can be installed in lieu of a CCA. If this is the case, Frame Relay is available (Question 300= 1) with TCP/IP and APPN only, since the Token-ring is the ***primary*** SNA (PU2.0) link to the host. Please refer to Figure 236 on page 593 for more information.

20.3.4 Logical Connection (Data Link Layer or Layer 2)

The connection point between a physical line and a Frame Relay device is the Frame Relay port. The end-to-end logical connections, which are multiplexed over a physical line, are called Permanent Virtual Circuits (PVCs). Each PVC is uniquely identified to the Network by its Data Link Connection Identifier (DLCI).

Notes:

1. Only Permanent Virtual Circuits (PVCs) are supported over Frame Relay.
2. The 3174 supports up to 254 DLCIs on its physical link to the Frame Relay Network, provided there is enough memory available.

```
                FR network
                ..........
               .          .
 ┌────────┐    .   FRFH   .     ┌────────┐
 │ FRTE a │    .          .     │ FRTE b │
 │        │────.          .─────│        │
 └────────┘    . switch   .     └────────┘
               .          .
                ..........
        DLCI 62         DLCI 539
        ------->       <--------
            PVC between a and b
        <-------------------------->
```

Figure 237. A PVC Represented by a Pair of DLCIs

In the above picture **a** and **b** are Frame Relay Terminating Equipment (FRTEs), or FR DTEs, if you are used to X.25 terminology. FRTEs are not part of the FR network, they are attached to the network, which consists of Frame Relay Frame Handler (FRFH) switching equipment.

The connection between **a** and **b** is called a permanent virtual circuit. The PVC between **a** and **b** is represented by a pair of DLCIs: the DLCI **a** uses to talk to **b** (let′s say DLCI 62), and the DLCI **b** uses to talk to **a** (let′s say DLCI 539). The two are not necessarily the same number. The network understands the relationship between these 2 DLCIs and makes all the necessary ″translations″.

When **a** wants to talk to **b** it sends out a frame containing 62 as the DLCI. The network routes it to **b** by the time the frame arrives at **b** it contains DLCI 539.

When **b** wants to talk to **a**, it sends out a frame containing 539 as the DLCI. The network routes it to **a**; by the time the frame arrives at **a** the DLCI is 62.

Some networks may optionally implement global addressing, where DLCIs have global instead of local significance. In this case, a PVC is represented by the same DLCI number at both ends.

DLCI addresses are provided at subscription time by the network owner to the network user.

20.3.5 Local Management Interface

The 3174 supports Local Management Interface (LMI), allowing Status and Status Enquiry messages to flow between the Frame Relay terminal equipment (FRTE) and the Frame Relay network. Local Management Interface is an interface between a FRTE and the Frame Relay network. LMI is used for:

- Notification of the addition, deletion, and presence of PVC DLCIs
- Inquiry about the availability or unavailability of PVC DLCIs
- Verifying the integrity of the physical link between the 3174 and Frame Relay network, through the use of keep-alive sequence numbers exchange.

When an FRTE connected to a Frame Relay network becomes operational, it periodically polls the network to find all active PVCs. The 3174 supports following LMI formats:

- LMI Revision 1
- ANSI T1.617 Annex D
- CCITT Annex A

20.3.6 Sample Frame Relay Configurations

The following figures are sample configurations and do not represent the full extent of the 3174 support or the full extent of the other products capabilities, nor do they imply full connectivity regardless of the software configuration.

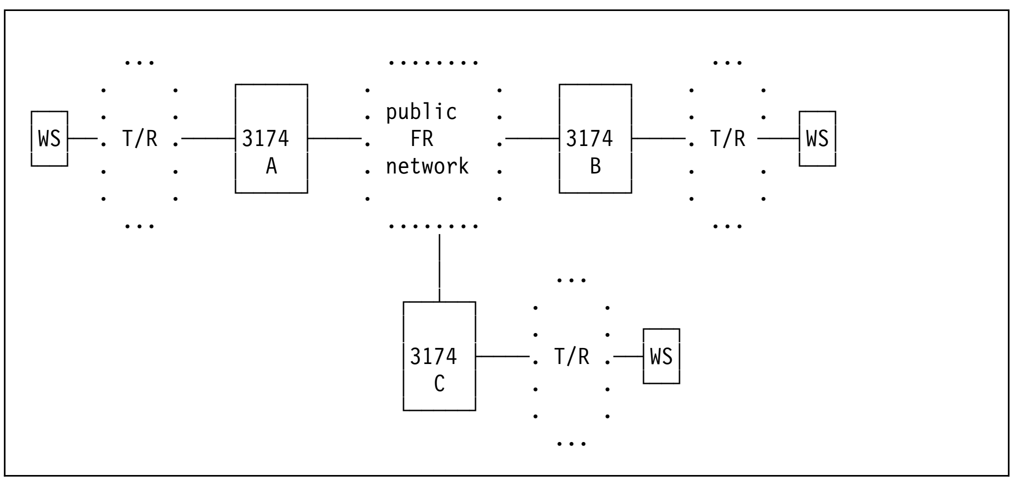


Figure 238. 3174 Talking to 3174s through a Public FR Network

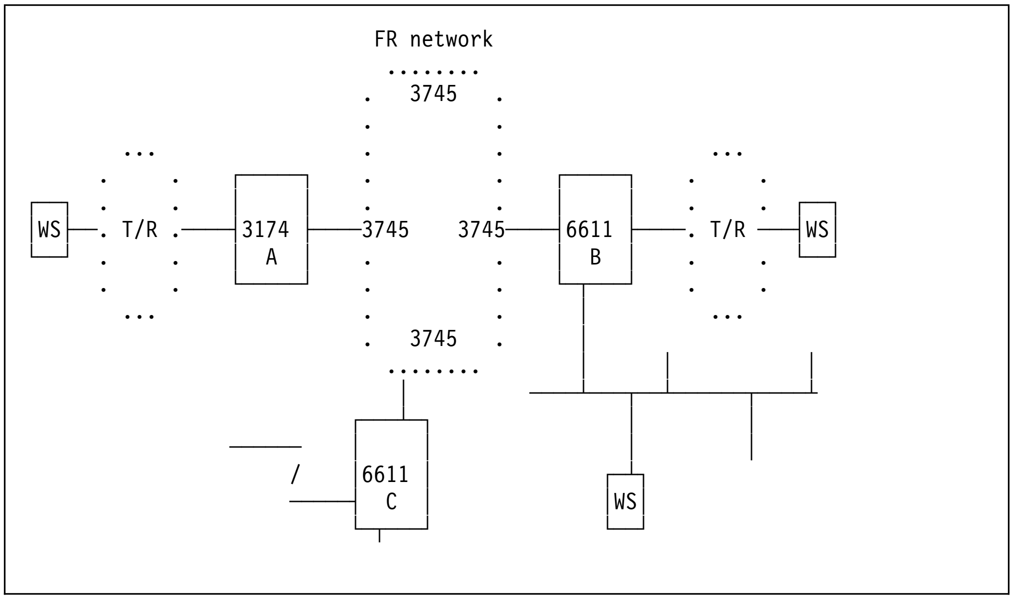


Figure 239. 3174 Talking to 6611s through a Private FR Network. In this case the private network is formed with 3745s.

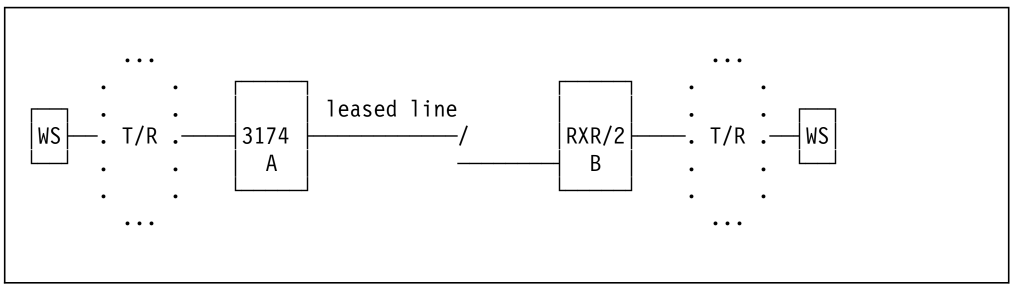


Figure 240. 3174 Talking to RXR/2 via a Leased Line, Using FR Protocol. Point-to-point configuration.

In the preceding figure, the partner in the point to point configuration could be an 3174, 3745, AS/400, 6611 or a 3172 in place of the RouteXpander/2 shown in the drawing.

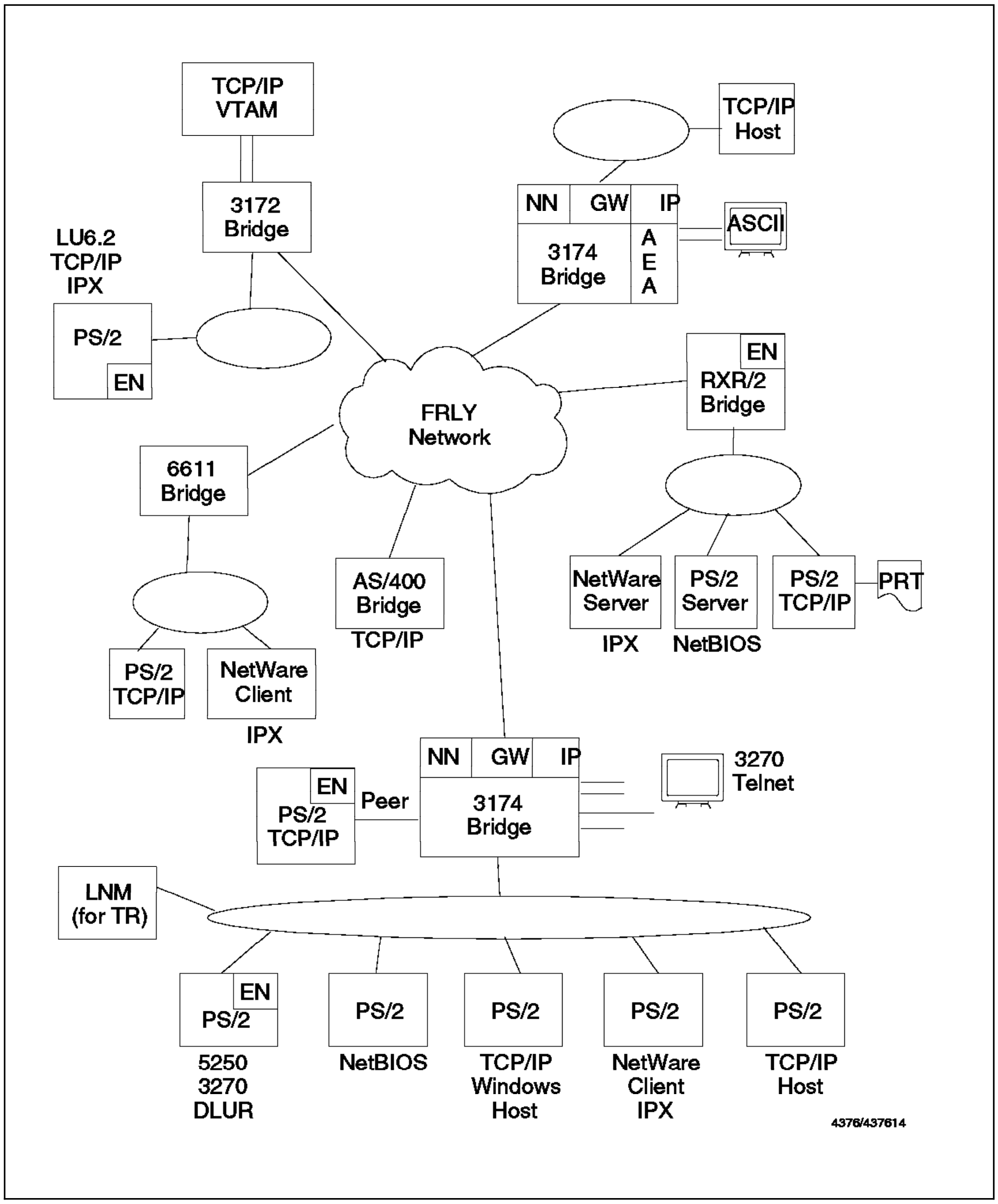


Figure 241. Using 3174 in Frame Relay Networks

For more configuration samples, see chapters related to Frame Relay in ITSO book *3174 Networking Server in Higher Speed WAN and Multiprotocol Networks*, GG24-4376.

20.4 3174 Customization

Customizing the 3174 for Frame Relay is very similar to customizing SDLC lines for remote 3174s, the only difference is, that specific questions to the Frame Relay protocol need to be answered. To do this, two new panels have been added to describe the new protocol and link definitions.

- The Frame Relay Description panel (Figure 242 on page 598)
- The Frame Relay Optional DLCI Specification panel (Figure 243 on page 599)

20.4.1 Definition for the Frame Relay Feature

Parameters to describe the Frame Relay physical interface, LMI and operational parameters are done in this panel. This is, in fact, all that is needed to connect to a Frame Relay network.

```
           ___________ Frame Relay Description ________________
        1A=Primary FR Host Link                                 00/FR

300 - _       Enable Frame Relay (0-No, 1-Yes)
313 - 0       NRZ (0-NRZ, 1-NRZI)
552 - 050     Maximum Number of DLCIs (001-254)
554 - _______ Committed Information Rate (002048-256000)
558 - 0       Congestion Control (0-No support/1-Support)
560 - 0       DE Bit Support (0-No support/1-Support)
562 - 3       LMI Type (1-None, 2-LMI Rev1, 3-Annex D, 5-CCITT)
  563 - 10      LMI Transmit Polling Interval (1-29)
566 - 0000    Additional Receive Buffer Space (0000-1024)
569 - N       Define DLCIs (N-No, Y-Yes)









PF: 3=Quit    4=Default    7=Back    8=Fwd  9=RtnH
```

Figure 242. Frame Relay Description Panel

20.4.2 Defining the Optional DLCI Addresses

If Question 569 in the Frame Relay Description Panel is answered with YES, then this panel is presented to allow manual definition of the DLCI addresses. The information entered here is only used when LMI Type (Question 562) is None.

```
              ______ Frame Relay Optional DLCI Specification _____
           1A=Primary FR Host Link                                  00/FR

 DLCI Range: 0016 - 1007 (Decimal)

0030 0032 0033 0034 0035 0036 0037 0038 0039 0040 0041 0042 0043 0044 0045 ____
0016 ____ ____ ____ ____ ____ ____ ____ ____ ____ ____ ____ ____ ____ ____ ____
0031 ____ ____ ____ ____ ____ ____ ____ ____ ____ ____ ____ ____ ____ ____ ____
0146 ____ ____ ____ ____ ____ ____ ____ ____ ____ ____ ____ ____ ____ ____ ____
0061 ____ ____ ____ ____ ____ ____ ____ ____ ____ ____ ____ ____ ____ ____ ____
0076 ____ ____ ____ ____ ____ ____ ____ ____ ____ ____ ____ ____ ____ ____ ____
0191 ____ ____ ____ 0095 0096 ____ 0098 0099 ____ ____ ____ ____ ____ ____ ____
0121 ____ ____ ____ ____ ____ ____ ____ ____ ____ ____ ____ ____ ____ ____ ____
0136 ____ ____ ____ ____ ____ ____ ____ ____ ____ ____ ____ ____ ____ ____ ____
0151 ____ ____ ____ ____ ____ 0166 ____ ____ ____ ____ ____ ____ ____ ____ ____
____ ____ ____ ____ ____ ____ ____ ____ ____ ____ ____ ____ ____ ____ ____ ____
0181 ____ ____ ____ ____ ____ ____ ____ ____ ____ ____ ____ ____ ____ ____ ____
____ ____ ____ 0196 ____ ____ ____ ____ ____ ____ ____ ____ ____ ____ ____ ____
0896 ____ ____ ____ ____ ____ ____ ____ ____ ____ ____ ____ ____ ____ ____ ____
1007 ____ ____ ____ ____ ____ ____ ____ ____ ____ ____ ____ ____ ____ ____ ____



PF: 3=Quit    4=Default    7=Back    8=Fwd  9=RtnH
```

Figure 243. Frame Relay Optional DLCI Specification Panel

20.4.3 Updated 3174 Customization Panels

Customizing Frame Relay for the 3174 has direct impact on other 3174 functions, such as:

- SNA 3270 PU2.0
- APPN
- LAN Gateway
- TCP/IP

The customization panels for those functions have been updated with various questions, which are required for the Frame Relay support. The updated panels are:

- The Frame Relay description for 1A=PRIMARY FR HOST LINK panel (Figure 244 on page 600)
- The Frame Relay description for 1B-1H=A FR SINGLE LINK panel (Figure 245 on page 600)
- The Frame Relay Index Assignment panel (Figure 246 on page 601)
- APPN Network Resources panel (Figure 247 on page 602)
- TCP/IP Options Menu (Figure 248 on page 603)

Frame Relay Description for the Primary Host 1A

The highlighted parameters have significance when customizing the 3174 primary host link 1A for Frame Relay.

```
                ____________ Frame Relay ____________
                1A=PRIMARY FR HOST LINK                      FR

  090 - XXXX XX     108 - 0000000  110 - 0 0000    116 - 0_ _

  121 - 01          123 - 0        125 - 00000000  126 - 00000000  127 - 0 0

  132 - 0 0 0 0     136 - 1 0 0 1  137 - 0 0 0 0   138 - 0

  141 - A           150 - 0        165 - 1         166 - A         168 - 0

  173 - 00000000    175 - 000000   179 - 0 0 0

  213 - 1           215 - 00000    220 - 0

  250 - 03          251 - 030      252 - 07        253 - 002

  260 - 1           261 - 1



 PF: 3=Quit   4=Default   7=Back   8=Fwd
```

Figure 244. Frame Relay Customization Host Panel (Host 1A)

20.4.4 Frame Relay Description for Host 1B - 1H

This is the panel displayed when Multi-Host Attachments has been selected. The information required for Frame Relay definition is identical to the primary host attachment.

```
                ____________ Frame Relay ____________
                1D = A FR SINGLE LINK                     FR

  090 - XXXX XX                                    116 - 0_ __

                                   125 - 00*****0                  127 - 0 0


                    150 - 0        165 - 1

                                   179 - 0 0 0

                    215 - 00000    220 - 0         221 - 0

  250 - 03          251 - 030      252 - 07        253 - 002

  260 - 1           261 - 1



 PF: 3=Quit   4=Default   7=Back   8=Fwd
```

Figure 245. Frame Relay Panel for Host 1B - 1H

20.4.5 Mapping DLCI to SAP Addresses for the Gateway

When the Gateway feature has been selected in the Frame Relay host link definition panel (Q150-1), then you are required to map the DLCI addresses to your downstream PUs (DSPUs).

```
                 _____ Frame Relay Index Assignment _____
                     1A = RAI                                         00
                                                           Entry 001 of 0
     S     DLCI    SAP                       S     DLCI    SAP
     00    0500     04
     01    0500     08                       02    0500     0C















  PF: 3=Quit   4=Default    7=Back   8=Fwd   9=RtnH
```

Figure 246. Frame Relay Index Assignment Panel

Note:

Depending on your gateway controller, you can assign a different DLCI for each DSPU or use the same DLCI and a different SAP for each DSPU (up to 48) to the same gateway controller. The DLCI and SAP combination must be unique. This allows the session traffic for up to 48 DSPUs to be multiplexed over a single DLCI to the gateway controller. For example, a 3745 with NCP 7.1 or higher as a gateway controller will allow you to use same DLCI and a different SAP for multiple DSPUs.

20.4.6 APPN Network Resources

```
            ___________ Network Resources ____________
                                                          001 of 240
       CPNAME   NODE TYPE   LUs*  DLC TYPE      ADDRESS          DLCI
                   1-4       X       1-5

   1   RAI_____     3        _        5       ____ ____ ____  __    0500 04
   2   CP31745_     3        _        5       ____ ____ ____  __    0505 04
   3   RAK_____     3        _        5       ____ ____ ____  __    0501 04
   4   ________     _        _        _       ____ ____ ____  __    ____ __
   5   ________     _        _        _       ____ ____ ____  __    ____ __
   6   ________     _        _        _       ____ ____ ____  __    ____ __
   7   ________     _        _        _       ____ ____ ____  __    ____ __
   8   ________     _        _        _       ____ ____ ____  __    ____ __
   9   ________     _        _        _       ____ ____ ____  __    ____ __
  10   ________     _        _        _       ____ ____ ____  __    ____ __
  11   ________     _        _        _       ____ ____ ____  __    ____ __
  12   ________     _        _        _       ____ ____ ____  __    ____ __

 *  - Enter 'X' to define Associated LUs where required.



 PF: 3=Quit    4=Default    7=Back    8=Fwd              11=PageFwd
```

Figure 247. Network Resources Panel

Depending on your configuration and node capabilities in the network, these definitions are optional.

A new DLC type and network addresses for Frame Relay has been added to this panel to define addresses of adjacent nodes for link establishment. By specifying the CPNAME, node type, DLC type, address or DLCI, this 3174 NN initiates a connection to the specified address or DLCI when the 3174 is IMLed. Also, if a link failure occurs, CP-CP sessions for NNs are re-initiated by this NN. If the DLC type and address or DLCI are not specified, the attaching node initiates the connection to the 3174 NN.

DLCI Type DLC TYPE is the type of data link control protocol for the link to this adjacent node.

1 = LAN attached (Token-Ring or Ethernet)
2 = SDLC attached
3 = S/370 channel attached
4 = X.25 attached
5 = Frame Relay attached

DLCI Column The DLCI field specifies the DLCI and SAP used to identify Frame Relay connections. If DLC TYPE = 5 (frame relay), this DLCI field is required. For DLC TYPE = 1, 2, 3 or, 4 leave this field blank.

Response: A decimal value between 0016 and 1007, and a 2-character hexadecimal SAP.

Note: Make sure that you have not customized for more DLCIs than you specified in question 552 in Figure 242 on page 598.

20.4.7 Frame Relay Address in TCP/IP Options Menu

```
                 _____ TCP/IP Options Menu _____


 LAN IP Address                052 - 000 . 000 . 000 . 000
 LAN Subnet Mask               054 - 000 . 000 . 000 . 000

 Maximum Telnet Connections    058 - XXX    (001 - 250)
 TCP/IP Buffer Space           060 - XXXX K (K = 1024 bytes)

 Routing Field Support         062 - Y      (Y,N)
 All Routes Broadcast          064 - Y      (Y,N)

 Frame Relay IP Address        066 - 000 . 000 . 000 . 000
 Frame Relay Subnet Mask       068 - 000 . 000 . 000 . 000







 PF: 3=Quit    4=Default    7=Back    8=Fwd
```

Figure 248. Frame Relay IP Address in TCP/IP Options Menu

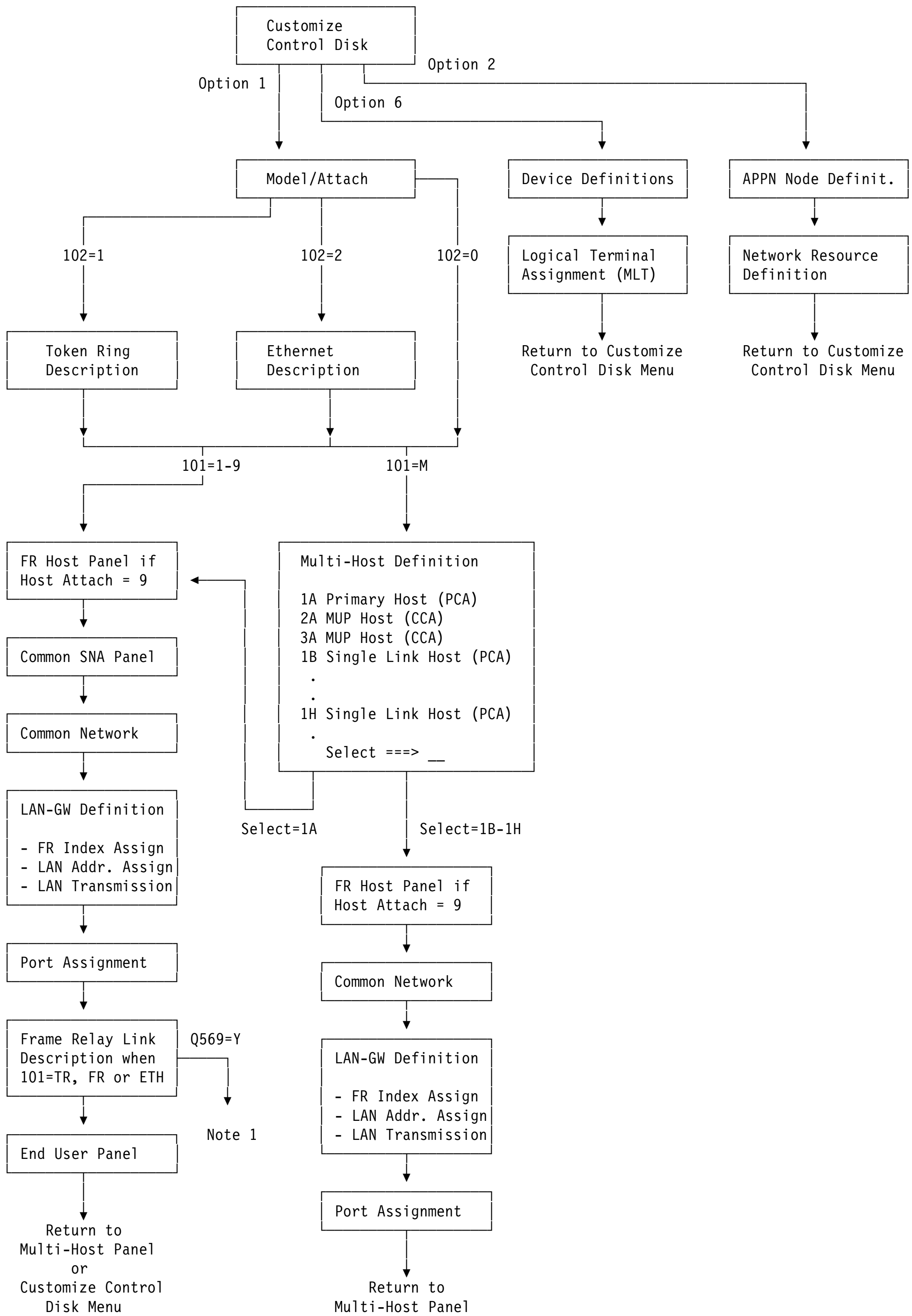
Note: An IP address of 000.000.000.000 means that the 3174′s LAN or FR connection is not being used for TCP/IP.

The following questions are not changed but they apply to a token-ring LAN interface only:

- ***Q062*** - Routing Field Support.
- ***Q064*** - All Routes Broadcast.

20.4.8 Customization Panel Flow

Figure 249 shows the panel flow when customizing the 3174 for Frame Relay and its associated features definitions.



Note 1: Optional DLCI Specification
Panel is presented

Figure 249. 3174 Frame Relay Customization Panel Flow

Chapter 21. TCP/IP

Transmission Control Protocol/Internet Protocol (TCP/IP) is a set of standards which has been widely accepted by the computer industry, both users and manufacturers, for communication between multi-vendor systems. The 3174, traditionally a cluster controller for 3270 host devices, is now enhanced with the TCP/IP Telnet client capability to allow 3270 displays operating in CUT mode, and ASCII displays attached to the AEA, to access TCP/IP Telnet servers in TCP/IP networks. This capability was initially offered as a no-charge 3174 TCP/IP Telnet RPQ. 8Q0935 that works in conjunction with Configuration Support-C Release 2. With Configuration Support-C Release 3 and later, it is integrated into the 3174 LIC. This chapter describes the 3174 TCP/IP Telnet Support, the models supported, the customization required, and the operational aspects of the Telnet support. See the ITSO document *Using 3174 TCP/IP Networks*, GG24-4172, for more details. This chapter uses material from the following documents:

- *TCP/IP Tutorial and Technical Overview*, GG24-3531
- *3174 TCP/IP TELNET RPQ Diskettes Installation Instruction* (provided with the RPQ package).

21.1 3174 TCP/IP Support

Existing IBM program products, TCP/IP for DOS and TCP/IP for OS/2, provide TCP/IP support for intelligent workstations. These workstations may be attached using a token ring, Ethernet, 3174 Peer (LAN-over-Coax), IBM PC Network, or Asynchronous Serial Line Internet Protocol (SLIP).

21.1.1 Support before RPQ 8Q0935

With the addition of the Peer Communication Licensed Internal Code or the Peer Communication RPQ 8Q0718 in a 3174 that is attached to a token-ring LAN, these workstations can be coax attached to the 3174 and participate in TCP/IP networking. For this configuration, the workstations require the appropriate LAN-over-Coax device drivers provided by the following:

- For DOS, Workstation Peer Communication Support Program
- For OS/2, Extended Services, OS/2 LAN Server

The 3174, in this instance, provides nothing more than an internal ring and an internal bridge to allow the coax attached workstations access to the token-ring LAN; it has no TCP/IP capability and 3270 CUT mode terminals and ASCII display stations attached to the 3174 cannot participate in TCP/IP networking.

The TCP/IP hosts to be accessed by the intelligent workstations may be attached directly to the same token-ring LAN, or they may be accessible through the token-ring LAN via bridges or routers.

21.1.2 Support with RPQ 8Q0935/3174 TCP/IP Telnet Support

With the announcement of RPQ 8Q0935 with Configuration Support-C Release 2 in March 1992, and the integration of TCP/IP Telnet Support (formerly RPQ 8Q0935) in subsequent releases of Configuration Support-C LIC, a new capability is added to a LAN attached 3174; the 3174 can now be customized to provide

TCP/IP Telnet client services to allow 3270 CUT mode terminals and ASCII display stations attached to the 3174 to communicate with TCP/IP Telnet servers.

Note: 3174 Configuration Support-C Releases 2 and 3 support only token-ring LANs, Configuration Support-C Release 4 supports only Ethernet LANs, and Configuration Support-C Release 5 supports both token-ring and Ethernet LANs which are mutually exclusive. See Chapter 4, "LAN Support" on page 69 for more details on 3174 LAN support.

With 3174 TCP/IP Telnet Support, a dependent terminal (3270 CUT and ASCII) attached to the 3174 can establish a TCP/IP Telnet connection with a TCP/IP host/server anywhere in the existing LAN/WAN network. The TCP/IP hosts to be accessed by the dependent terminals may be attached directly to the same LAN, or they may be accessible through the LAN via bridges or routers.

Each terminal user can have up to five logical terminals (LTs) if Multiple Logical Terminal (MLT) is customized. These five LTs can be used to access 3270 host, ASCII host or TCP/IP host sessions; that is, all five LTs may be used to access five 3270 host sessions, or five ASCII host sessions, or five TCP/IP host sessions, or some combination of 3270, ASCII and TCP/IP host sessions. The desired host connection can be selected by means of the Connection Menu, or established by default. Any LT can be used to access the TCP/IP "pipe," very much the same way that a dial-out AEA port is accessed. For each TCP/IP LT, a simple set of commands allows the user to request and operate a session with any TCP/IP host in the network.

As seen above, the 3174 TCP/IP Telnet Support works in conjunction with MLT and AEA functions. You can also use the 3174 TCP/IP Telnet Support concurrently with all other functions that a given 3174 is capable of, such as Peer Communication and APPN.

21.1.3 Support with 3174 TCP/IP Enhancement RPQ (8Q1041)

Included in the Configuration Support-C Release 4 announcement was also announced the 3174 TCP/IP Enhancement RPQ 8Q1041, which will provide:

- TN3270 support

  Enables terminals attached to the 3174 to access 3270 applications using TCP/IP as the transport mechanism. The 3270 datastream is passed over TCP/IP just as it is passed over a SNA transport network in our previous 3174 support. This allows terminals on the 3174 to access TCP/IP for VM or MVS full-screen applications, and CICS/6000 3270 applications.

- TCP/IP dependent host printer support

  Provides a print server function using the LPD (Line Printer Daemon) application. This allows TCP/IP hosts in the network to send ASCII print output to the 3174 for printing on either coax or AEA printers.

- SNMP MIB-II support

  Expands the 3174′s SNMP support to include MIB-II variables

See 16.3, "TCP/IP Enhancements RPQ (8Q1041)" on page 489 of this document and Chapter 9, ″3174 TCP/IP Enhancement RPQ 8Q1041″ in *Using 3174 in Networks*, GG21-4172, for further information.

21.1.4 Support with 3174 IP Forwarding RPQ (8Q1289)

RPQ 8Q1289 provides IP forwarding between a LAN interface (token-ring or Ethernet) and a Frame Relay interface. This is also called IP routing; however, RPQ 8Q1289 does not support routing protocols (RIP, for example) and only static (pre-customized) routes are used in the 3174.

IP forwarding allows devices on the LAN and the frame relay to send IP datagrams to the 3174 with a destination IP address other than the 3174′s IP address. If the 3174 has a route to the destination IP address, it will forward the datagram on its way.

Customization Considerations

On the TCP/IP options panel of the 3174 customization, specify IP addresses for both LAN and frame relay. These IP addresses must not be in the same subnet.

Route definitions are entered on the 3174′s Routing Information panel. This panel allows you to define up to 12 routes.

Depending on the amount of forwarded traffic, you may need to allow additional TCP/IP buffer space in the 3174 (Question 60 on the TCP/IP options panel). If the 3174 runs out of buffers, incoming IP datagrams are discarded until buffers become available. This causes retransmissions by the higher protocol layers and can result in poor performance.

Configuration for Frame Relay attachment must be done as described in the documentation for Configuration Support C, Release 5.

Prerequisites

- 3174 Licensed Internal Code, Configuration Support C, Release 5.
- 3174 Licensed Internal Code, Frame Relay Communications (feature 7020/7070)
- One of the following hardware combinations:
  1. 3174 Model 11R, 12R, 21R, 22R, 61R or 62R with 3174 Token-Ring adapter or 3174 Ethernet adapter
  2. 3174 Model 13R or 23R with 3174 Type 1 or Type 2 Communications adapter
  3. 3174 Model 14R or 24R with 3174 Type 1 or Type 2 Communications adapter

Note:

To install the RPQ 8Q1289 licensed internal code, you must follow the RPQ merge procedure described in the following document: *3174 Establishment Controller Utilities Guide (Configuration Support C, Release 5)*, GA27-3920

Limitations

1. RPQ 8Q1289 does not support RIP, or any other protocol used between routers to dynamically update routing tables.

Example: Figure 250 on page 608 shows 3174s being used for IP forwarding; the text that follows the picture describes the route information that would be customized in the 3174s for this example. 3174A has both Frame Relay and token-ring interfaces, and 3174B has Frame Relay and Ethernet interfaces. The subnet mask is common on all interfaces, and is 255.255.255.000. On the Frame

Relay interface, 3174A′s IP address is 9.67.200.1, and on the token-ring interface, it is 9.67.250.1. For 3174B, its IP address on the Frame Relay interface is 9.67.200.5, and its IP address on the Ethernet is 9.44.3.5. So the token ring is subnet 9.67.250, the Frame Relay is subnet 9.67.200, and the Ethernet is subnet 9.44.3.

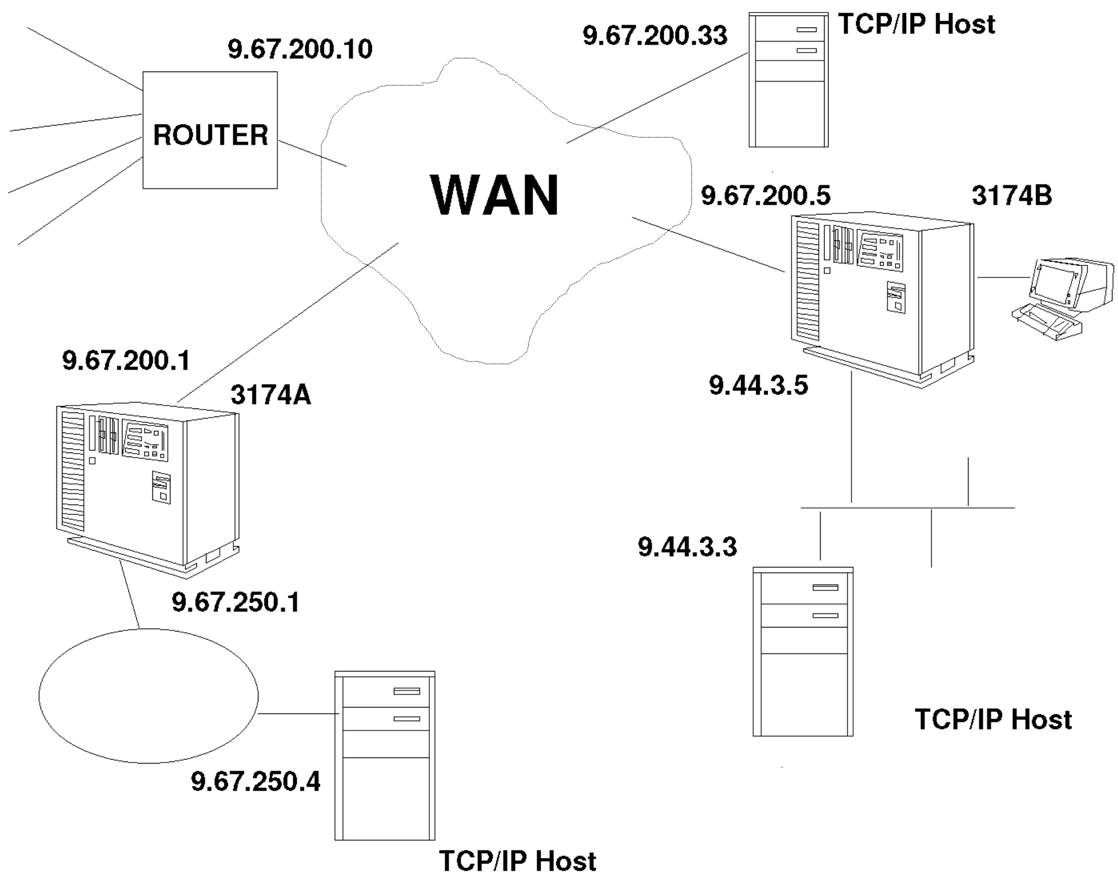


Figure 250. 3174 TCP/IP IP Forwarding Example Scenario

In 3174A′s customization, the Routing Information panel looks like this:

```
                _____ TCP/IP Routing Information _____

Destination IP Address      Type        Router IP Address
                          (N,S,H,D)

XXX . XXX . XXX . XXX        D        009 . 067 . 200 . 010
009 . 044 . 003 . 000        S        009 . 067 . 200 . 005
XXX . XXX . XXX . XXX        X        XXX . XXX . XXX . XXX
XXX . XXX . XXX . XXX        X        XXX . XXX . XXX . XXX
XXX . XXX . XXX . XXX        X        XXX . XXX . XXX . XXX
XXX . XXX . XXX . XXX        X        XXX . XXX . XXX . XXX
XXX . XXX . XXX . XXX        X        XXX . XXX . XXX . XXX
XXX . XXX . XXX . XXX        X        XXX . XXX . XXX . XXX
XXX . XXX . XXX . XXX        X        XXX . XXX . XXX . XXX
XXX . XXX . XXX . XXX        X        XXX . XXX . XXX . XXX
XXX . XXX . XXX . XXX        X        XXX . XXX . XXX . XXX
XXX . XXX . XXX . XXX        X        XXX . XXX . XXX . XXX




PF: 3=Quit    4=Default    7=Back    8=Fwd
```

Similarly, 3174B′s Routing Information panel is:

```
                _____ TCP/IP Routing Information _____

Destination IP Address      Type        Router IP Address
                          (N,S,H,D)

XXX . XXX . XXX . XXX        D        009 . 067 . 200 . 010
009 . 067 . 250 . 000        S        009 . 067 . 200 . 001
XXX . XXX . XXX . XXX        X        XXX . XXX . XXX . XXX
XXX . XXX . XXX . XXX        X        XXX . XXX . XXX . XXX
XXX . XXX . XXX . XXX        X        XXX . XXX . XXX . XXX
XXX . XXX . XXX . XXX        X        XXX . XXX . XXX . XXX
XXX . XXX . XXX . XXX        X        XXX . XXX . XXX . XXX
XXX . XXX . XXX . XXX        X        XXX . XXX . XXX . XXX
XXX . XXX . XXX . XXX        X        XXX . XXX . XXX . XXX
XXX . XXX . XXX . XXX        X        XXX . XXX . XXX . XXX
XXX . XXX . XXX . XXX        X        XXX . XXX . XXX . XXX
XXX . XXX . XXX . XXX        X        XXX . XXX . XXX . XXX




PF: 3=Quit    4=Default    7=Back    8=Fwd
```

A token-ring device on subnet 9.67.250 could configure 3174A as its default router. When the token-ring device wants to send IP traffic to an IP host whose address is 9.44.3.3, it builds the IP datagram with destination IP address of 9.44.3.3, and sends it to 3174A′s token-ring address. (It would have previously used ARP to determine the 3174′s token-ring address.) 3174A receives the frame, and discovers that the destination IP address is NOT its own IP address. 3174A checks its routing tables and sees that there is a route to subnet 9.44.3. So 3174A sends the datagram on the Frame Relay virtual circuit to host 9.67.200.5. If the token-ring device had sent 3174A IP traffic destined for any other network, 3174A would forward those frames to the router that is the default router, 9.67.200.10. This router (9.67.200.10) must be configured with appropriate route information to know that 3174A and 3174B provide access to subnets 9.67.250 and 9.44.3 respectively.

Also, in this example, the TCP/IP hosts on the LANs can access TCP/IP host 9.67.200.33, since it is part of the Frame Relay subnet. In addition, any terminals (CUT-mode or ASCII) attached to 3174A and 3174B can use the 3174′s Telnet client support to access any of the TCP/IP hosts in the diagram that are Telnet servers.

21.2 TCP/IP Protocols Supported

The 3174 TCP/IP Telnet Support supports IP, TCP and TELNET protocols over the LAN, using 802.2 connectionless service. It also supports ICMP, UDP, ARP and DNS (resolver client only). With the PING function, a user can query a destination before trying to connect, and SNMP agent support[9] provides network management information to a client in the network. The protocols supported are:

- TELNET client
- Transmission Control Protocol (TCP)
- Internet Protocol (IP)
- Internet Control Messaging Protocol (ICMP)
- User Datagram Protocol (UDP)
- Address Resolution Protocol (ARP)
- Simple Network Management Protocol(SNMP) (MIB-I agent only)
- Domain Name System (DNS) (resolver client only)
- Packet InterNet Groper (PING)

Figure 251 on page 611 shows the protocols, within the detailed TCP/IP architectural model, supported by the 3174 TCP/IP Telnet Support

[9] SNMP support was not included in the first release of the 3174 TCP/IP TELNET RPQ.

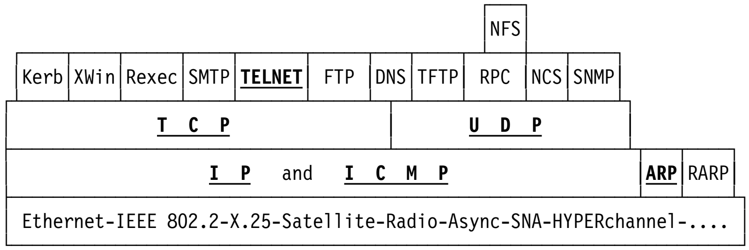


Figure 251. Protocols Supported by 3174 TCP/IP Telnet Support

Normally, Telnet operation is character mode, which gives the host application complete control of the screen format. A line-by-line mode of operation is also available, for host applications that do not explicitly support the ASCII terminal type being used.

TN3270 operation, in which the host application sends a 3270 datastream to the terminal, will be supported by the 3174 TCP/IP Enhancements RPQ 8Q1041.

21.3 3174 Models Supported

The 3174 TCP/IP Telnet Support allows display devices that are attached to a 3174 to communicate with any TCP/IP host that is accessible via the LAN. The TCP/IP host may be attached directly to the LAN, or it may be bridged or routed to the LAN from elsewhere in the network.

The 3174 with the TCP/IP Telnet support must be attached to a LAN, either as a gateway or as a DSPU. Once you have this attachment, the 3174 TCP/IP Telnet Support can be used on most models of the 3174.

21.3.1 Gateway 3174 Configuration

In a gateway configuration, the 3174 is attached to the SNA 3270 host either by a channel or a teleprocessing attachment. The 3174 gateway allows other devices on the LAN to access the 3270 host. The 3174 TCP/IP Telnet Support supports this configuration, allowing terminals that are attached to the 3174 gateway to access TCP/IP hosts via the LAN.

The following 3174 models, customized as gateways, can be used with the RPQ; each of these 3174s requires an IBM LAN Adapter (feature #3026, #3030, #3044 or #3045):

- Models 01L, 01R, 02R
- Models 11L, 11R, 12L, 12R
- Models 21L, 21R, 22L, 22R
- Model 41R (WNM)
- Models 51R, 61R and 62R

Note: If it is also installed a Type-1 or Type-2 Communication Adapter in the following 3174 models :

- With Token-Ring Adapter: 03R, 13R, 23R, 43R (WNM), 53R and 63R
- With Ethernet Adapter : 14R, 24R and 64R

then the 3174 can be customized as gateway. See Chapter 4, “LAN Support” on page 69 for more details.

Figure 252 shows a gateway configuration used with the 3174 TCP/IP Telnet support. In this configuration, the RS/6000 is using the 3174 gateway to access the 3270 host. The RS/6000, in turn, is being accessed as a TCP/IP host by the 3174 terminals.

The token-ring network in this figure can be replaced by an Ethernet Network.

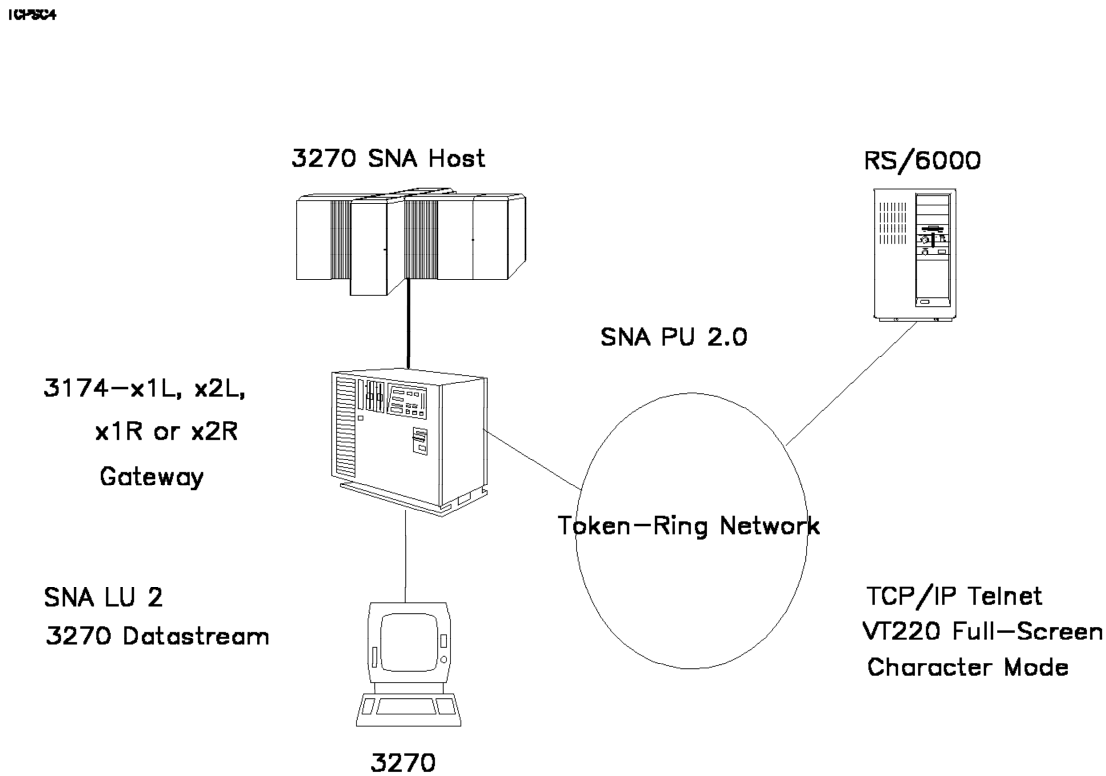


Figure 252. 3174 Gateway Configurations with 3174 TCP/IP Telnet Support

The 3174 provides the TCP/IP connection as an additional path for the user on a logical terminal (LT) basis. Without the 3174 TCP/IP Telnet support, each display may have up to five LTs which can be shared between 3270 host and AEA host sessions. With the 3174 TCP/IP Telnet Support, any LT can now be used to access the TCP/IP “pipe,” very much the same way that a dial-out AEA port is accessed.

21.3.2 DSPU 3174 Configuration

In a DSPU configuration, the 3174 uses the LAN to access SNA 3270 hosts. The 3174 TCP/IP Telnet Support allows dependent terminals that are attached to the 3174 DSPU to access TCP/IP hosts via the LAN.

The following 3174 models can be used with the 3174 TCP/IP Telnet Support:

- Token-Ring Adapter: Models 3R, 13R, 23R, 43R, 53R and 63R
- Ethernet Adapter: Models 14R, 24R and 64R

Each of these 3174s has an IBM LAN Adapter as a standard feature.

The 3174 TCP/IP Telnet Support may also be used on a 3174 with a LAN Adapter that is customized as a Model 3R, 13R, 14R, 53R, 63R or 64R using the Alternate IML capability.

Figure 253 shows a DSPU configuration used with the 3174 TCP/IP Telnet Support. The 3174 DSPU must be customized for at least one SNA host attachment.

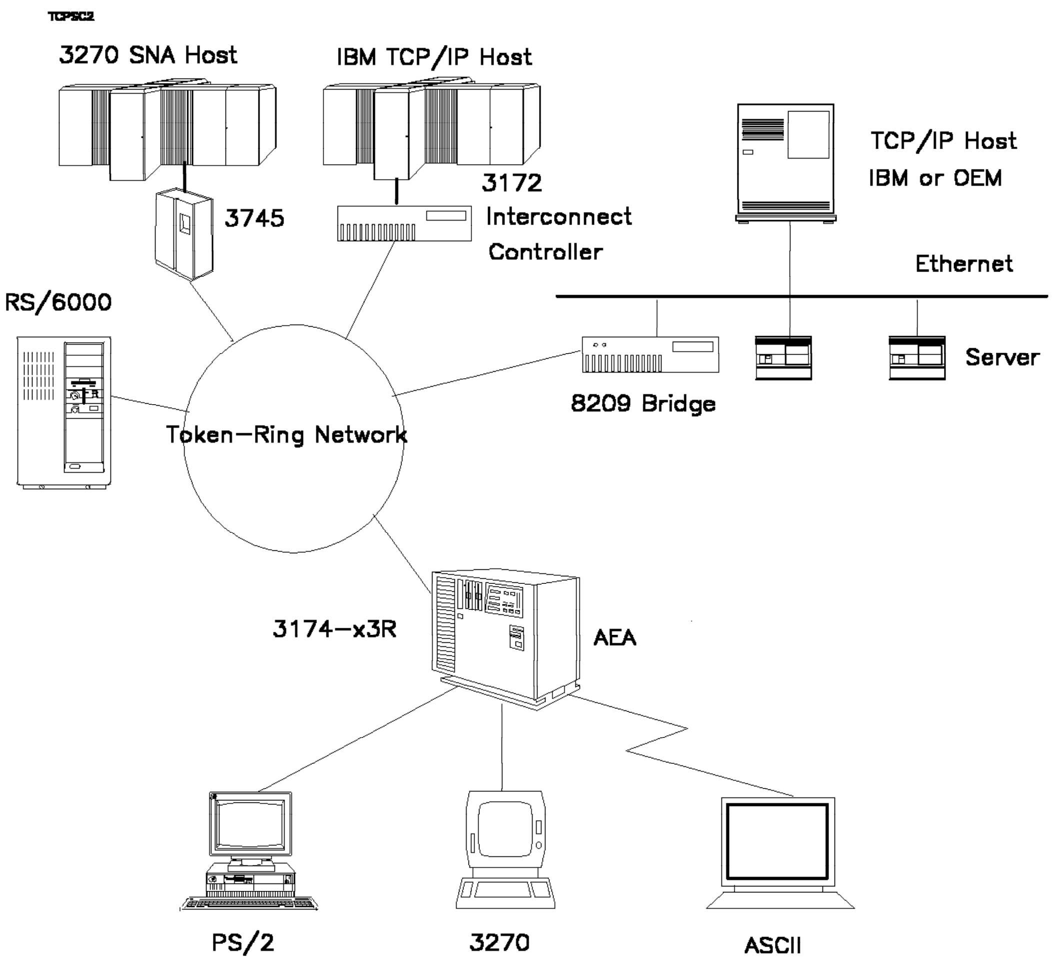


Figure 253. 3174 DSPU Configuration with 3174 TCP/IP Telnet Support

21.4 Devices Supported

The 3174 TCP/IP Telnet Support allows all displays that attach to the 3174, except DFTs, to operate in Telnet mode. The supported displays include the following:

- 3270 displays that are attached to the 3174 coax ports

  These 3270 displays must be operating in CUT mode (CUT displays, or the CUT side of a DFT-E display). They are supported as DEC VT100, DEC VT200, IBM 3101, or DG Dasher 210 devices, using the ASCII emulation microcode for the 3174 (an AEA adapter is not required). NLS support for these devices is the same as that provided by the AEA.

The 3174 TCP/IP Telnet Support supports these devices in 24x80 mode only; the 132-column support for DEC VT220 provided in Configuration Support-C Release 2 is not available for TCP/IP sessions.

- ASCII displays that are attached to the 3174 AEA ports

  The 3174 TCP/IP Telnet Support negotiates support for the specific terminal type when setting up the Telnet connection. If the specific terminal support is not available, simple line mode is used (ANSITERM).

21.5 Hosts Supported

The 3174 TCP/IP Telnet Support connects the supported devices to any host or device attached to the network that can communicate with TCP/IP and TELNET protocols, including IBM and non-IBM hosts. The TCP/IP hosts may be attached directly to the LAN, or they may be bridged or routed to the LAN from elsewhere in the network.

Access to IBM TCP/IP hosts (TCP/IP for VM or MVS), however, is limited to a line mode only when using Configuration Support-C Release 2 with RPQ 8Q0935 or using base Configuration Support-C Release 3 and later. This is because the 3174 TCP/IP Telnet Support available in the Configuration Support-C Release 2 with RPQ 8Q0953 and the base Configuration Support-C Release 3 and later does not support TN3270 protocols. However, support for TN3270 is available in 3174 TCP/IP Enhancement RPQ 8Q1041 which is based on Configuration Support-C Release 4 LIC, and it will be made available for Configuration Support-C Release 3 as well. See Chapter 9, ″3174 TCP/IP Enhancements RPQ 8Q1041″ in *Using 3174 in TCP/IP Networks*, GG24-4172, for further information.

21.6 Storage Requirements

Table 31 shows the additional storage your 3174 must have for the 3174 TCP/IP TELNET support. This additional requirements must be added to the amount that are needed by your 3174 without TCP/IP.

Table 31. 3174 TCP/IP TELNET Support Storage Requirements

	With AEA Customized	**Without AEA Customized**
Basic TCP/IP TELNET	231KB	362KB
Per session	7KB	
TCP/IP data buffers	See 21.6.2, “Data Buffers” on page 615.	
Split Screen	If you expect to use split screen functions while accessing Telnet sessions, add 2KB for each non-EAB Telnet LT and 4KB for each EAB Telnet LT to your base MLT calculation.	
SNMP	Figures will be provided with a later release of the 3174 TCP/IP Telnet support.	

21.6.1 Sessions

When you customize for the 3174 TCP/IP Telnet support, you must select the maximum number of concurrent TELNET connections you want to allow. This is given by your response to Question 058 on the TCP/IP Options menu. The 3174 creates a pool of session resources, available to terminal users on a first-come, first-served basis. They are not assigned to any particular 3174 terminal port or LT. Each session requires the amount of storage shown in the table.

21.6.2 Data Buffers

When you customize for the 3174 TCP/IP TELNET Support, storage is reserved for 40 TCP/IP data buffers. Using customization question 060 on the TCP/IP Options menu, you can include an additional amount of storage for TCP/IP data buffers. This additional amount should be included in your storage calculations.

A 3174 TCP/IP data buffer has roughly 100 bytes available for data. To determine how much storage your 3174 will need for these buffers, you should consider the types of host applications that your users will be accessing. For example, host applications that send only a line at a time to the user′s screen will use only one buffer at a time for a message. However, applications that send a full screen of information with screen formatting controls included may send much larger messages, requiring as many as 3174 buffers at a time. Your decision will also be affected by the number of concurrent sessions you select in Question 058.

When the 3174 runs out of buffers:

- The 3174 discards data from the TCP/IP network, causing retransmissions and adversely affecting response times.
- Requests to establish host connections will be rejected, and the users must retry.

21.7 Adding 3174 to a TCP/IP Network

Before you can customize your 3174 for the 3174 TCP/IP Telnet Support you must assign an IP address and a TCP/IP host name to the 3174. If you are adding the 3174 to an existing TCP/IP network, you should get the name and address from the administrator of the network. We will give just a brief overview here of IP addresses and network names; if you are unfamiliar with these TCP/IP concepts, see the *TCP/IP Tutorial and Technical Overview*.

21.7.1 IP Addresses

Each computer that attaches to the TCP/IP network is called a host, even though it may not provide functions you would normally attribute to a host. The 3174, for example, is a terminal server, but it is still called a TCP/IP “host.”

Each host has a unique IP address. These addresses are usually written as a series of four decimal numbers from 0 to 255, separated by periods. The four numbers, when converted to hexadecimal, create a 32-bit address. For example, decimal 9.67.7.218 is converted to hexadecimal 094307DA.

The address always has two logical parts, the network address and the host address. The bits at the beginning of the address determine how the address is split into its parts:

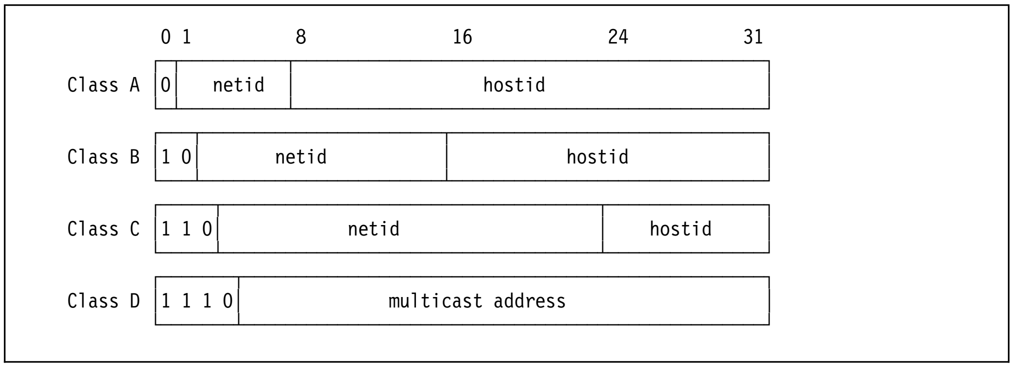


Figure 254. Classes of IP Addresses

If subnetting is used, the host address part is split into a subnet address and a host address. A subnet mask determines which bits represent the subnet part of the address. For example, a subnet mask of 255.255.255.0 (FFFFFF00) applied to 9.67.7.218 (094307DA) yields the following:

network = 9 (09)
subnet = 67.7 (4307)
host = 218 (DA)

If your TCP/IP network is split into subnets, you will have to know the subnet mask when you customize the 3174.

21.7.2 Customizing IP Addresses

Whenever you are asked to provide an IP address on the 3174 customization panels, you must give the full address, with leading zeros. The panels provide the "dots." For example, 9.67.7.218 is entered as:

009.067.007.218

When you enter a network or subnet address, you must provide all four parts of the address. For example, network 9 is entered as:

009.000.000.000

Subnet 9.67 is entered as:

009.067.000.000

21.7.3 Names

Since most people can remember names better than numeric addresses, TCP/IP allows you to assign names to each host. These names can be grouped into domains, so that they do not have to be unique across the entire network. For example, OURNET.OURDEPT.HOST1 is a different host from YOURNET.YOURDEPT.HOST1. When you customize the 3174 for the 3174 TCP/IP TELNET Support, you must give both a host name and a domain name. When appended, these give the fully-qualified name of your host in the network.

21.7.4 Name Servers

Unfortunately, most communication protocols including TCP/IP, do not work with character-string names very well and must instead use numeric addresses. To convert names to addresses, your network may have Domain Name Servers. These servers maintain tables of name-to-address correlations. A TCP/IP host can send a server a name, and the server returns the IP address assigned to that name. This means the hosts do not need to maintain extensive tables for name-to-address resolution, and only the server′s table is updated when hosts are added to or deleted from the network.

21.7.5 3174 Nicknames

3174 TCP/IP Telnet Support allows you to define a set of nicknames for your users. You provide an IP address to associate with each nickname.

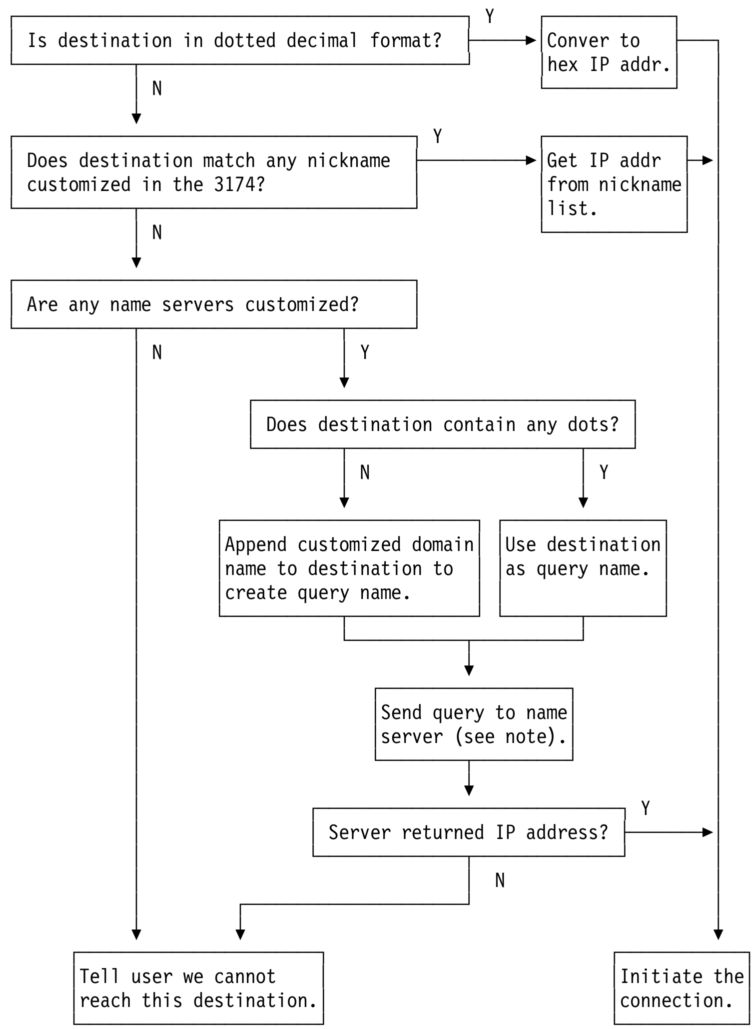
If your network does not have name servers, these nicknames can make life a little easier for your users, as they will not have to remember numeric IP addresses.

21.7.6 How the 3174 TCP/IP TELNET Support Looks at Names

A person sitting at a terminal attached to the 3174 may select the desired remote TCP/IP host by giving one of the following destinations:

- The host′s IP address, in dotted decimal form
- A nickname
- An unqualified host name, different from any nicknames, if the remote host is in the same domain as the 3174
- A fully qualified host name.

3174 TCP/IP Telnet Support uses the destination as follows:



Note: 3174 TCP/IP Telnet Support sends the query to the first server in the list and waits approximately two seconds for a response, before sending the query to the next server, if there is more than one.
If no server responds, the 3174 repeats the process with a four-second timeout, then six seconds, then eight seconds.

Figure 255. TCP/IP Resolving Name/Destination

21.7.7 Routes

If your users want to access remote hosts that are on other subnets or networks, at least one TCP/IP router must be on the same subnet as your 3174. You will need to know the router's IP address when you customize for the 3174 TCP/IP Telnet support, and this will be your default router. If there are other routers on your network, you can define these to the 3174, by giving their IP addresses and the destinations that they service.

The routes that you configure tell the 3174 the best way to get the TCP/IP traffic to the desired destinations. As an example, in Figure 256 on page 619, the 3174's IP address is 9.67.5.80, and the subnet mask being used is 255.255.255.000. That means the network is 9, and 67.5 identifies the subnet. Router 2 connects the 3174's network to Network 10, Router 1 connects the

3174's subnet to subnet 67.4, and Router 3 provides access to all other external networks.

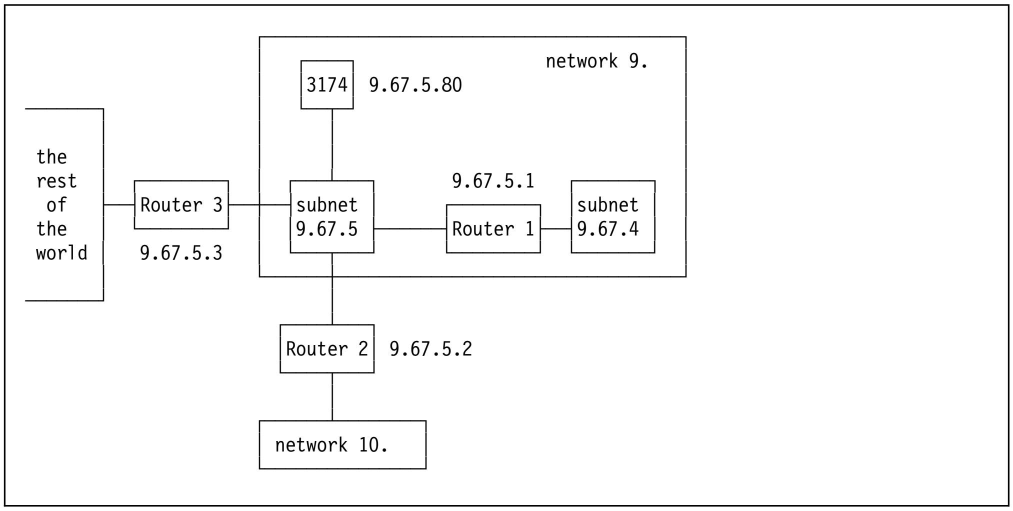


Figure 256. TCP/IP Router Example

In the 3174 customization, you would have three route entries for this configuration, telling the 3174 where to route traffic for destinations that are not part of the 3174's subnet:

1. For destinations on subnet 9.67.4 use Router 1, whose address on the local subnet is 9.67.5.1
2. For destinations on network 10., use Router 2, whose address on the local subnet is 9.67.5.2
3. For any other destinations that are not on the local subnet, use the default Router 3, with address on the local subnet of 9.67.5.3

```
                 _____ TCP/IP Routing Information _____

 Destination IP Address      Type       Router IP Address
                           (N,S,H,D)

 009 . 067 . 004 . 000         S       009 . 067 . 005 . 001

 010 . 001 . 000 . 000         N       009 . 067 . 005 . 002

 XXX . XXX . XXX . XXX         D       009 . 067 . 005 . 003

 XXX . XXX . XXX . XXX         X       XXX . XXX . XXX . XXX

 XXX . XXX . XXX . XXX         X       XXX . XXX . XXX . XXX

 XXX . XXX . XXX . XXX         X       XXX . XXX . XXX . XXX

 XXX . XXX . XXX . XXX         X       XXX . XXX . XXX . XXX

 XXX . XXX . XXX . XXX         X       XXX . XXX . XXX . XXX


 PF: 3=Quit    4=Default    7=Back    8=Fwd
```

Figure 257. TCP/IP Router Example Customization

21.8 Customizing 3174 TCP/IP Telnet Support

In many respects, the 3174 TCP/IP Telnet support function can be thought of as providing ASCII host access across a TCP/IP network. Because of this similarity, customizing for 3174 TCP/IP Telnet support uses many of the concepts that were introduced with the AEA. If you are familiar with customizing for AEA, adding 3174 TCP/IP Telnet support will be very simple.

If you are not familiar with the AEA, and you are not installing an AEA in your 3174, the following explanations include suggested responses for many of the customization questions. These suggestions will result in a very simple configuration where all coax ports are set up the same. After you have done this once, you will be able to see how to change it if you want a different setup for some ports. Your coax attached terminals will use the ASCII Emulation function when connected to a TCP/IP host; therefore, the customization questions that affect ASCII Emulation operation are the ones that you will have to answer.

For more information on AEA customization, refer to Chapter 7, "Asynchronous Emulation Adapter (AEA)" on page 263.

21.8.1 Example Scenario

In this example shown in Figure 258 on page 621, one important point must be emphasized regarding the 3174-11L channel-attached to MVS18. The 3174 does support TCP/IP access via the LAN (token-ring or Ethernet) on which it is resides (Configuration Support-C Release 5 adds Frame Relay as an additional transport). This means that the channel can be used for SNA traffic, but in order to access MVS18 as a TCP/IP Host, the traffic must flow over the token-ring. The 3172 will serve as a router to MVS18, making it possible for the 3174 to have a TELNET to MVS18.

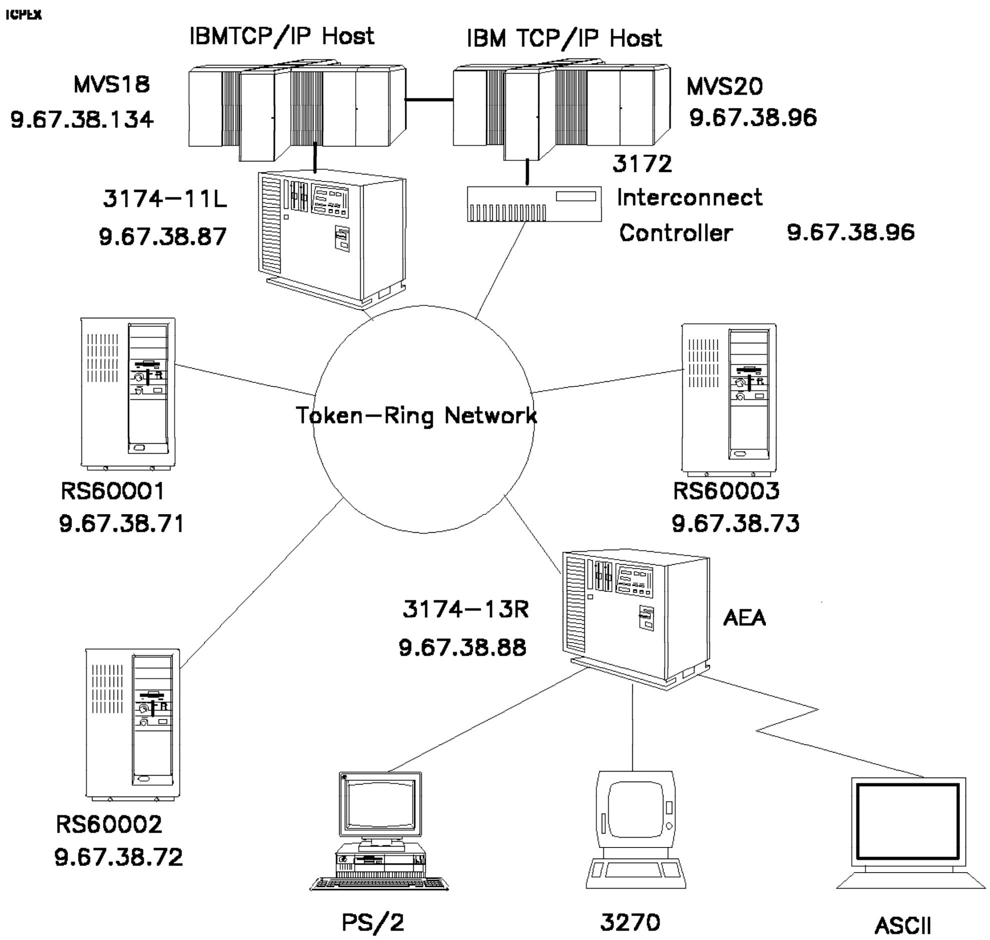


Figure 258. TCP/IP Example Scenario

In Figure 258 the token-ring network can be replaced by an Ethernet network and the 13R model by a 14R model without greatly affecting 3174 TCP/IP TELNET support customization.

21.8.2 Panel Flow

Figure 259 shows the panel flow sequence when customizing 3174 TCP/IP Telnet support.

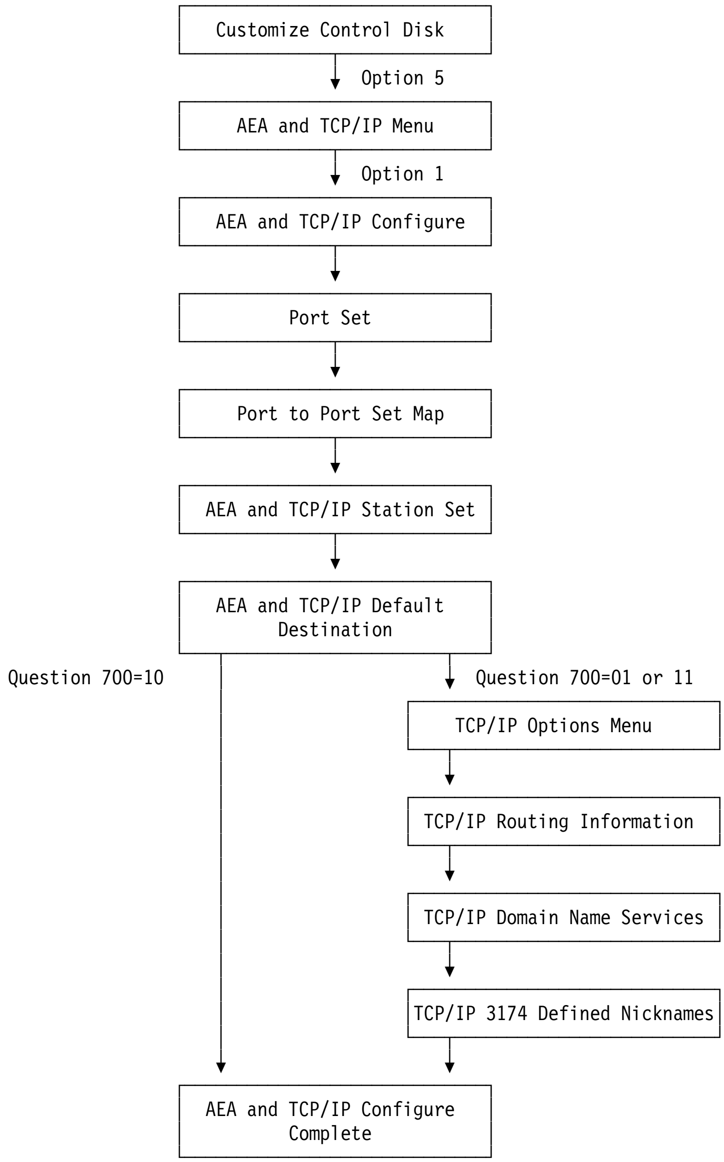


Figure 259. TCP/IP Customization Panel Flow

21.8.3 Configure AEA and TCP/IP

After you have IMLed your 3174 from a Utility diskette, select Customize the Control Disk from the Master Menu. The Customize Control Disk Menu is displayed (see Figure 260 on page 623).

```
                 Customize Control Disk Menu

 Select Option; press ENTER

 Option     Description

    1       Configure
    2       Define Devices
    3       Merge RPQs
    4       Modify Keyboards
    5       Define AEA and TCP/IP
    6       Define APPN Node
    7       Define COS
    8       Define 3174-PEER



     Select ===> 5

 PF: 3=Quit    4=Default    7=Back    8=Fwd    9=Check    12=File
```

Figure 260. Define AEA and TCP/IP Option

Select Option 5 to configure 3174 TCP/IP Telnet support. The AEA and TCP/IP Menu is displayed (see Figure 261).

```
                   AEA and TCP/IP Menu

 Select Option; press ENTER

 Option     Description

    1       Configure AEA and TCP/IP
    2       Define UDT
    3       Define UDX



     Select ===> 1

 PF: 3=Quit    4=Default    7=Back    8=Fwd    9=Check    12=Done
```

Figure 261. Configure AEA and TCP/IP Option

Select Option 1 to configure 3174 TCP/IP Telnet support. The AEA and TCP/IP Configure panel is displayed (see Figure 262 on page 624).

21.8.4 Enabling AEA and TCP/IP

```
                AEA and TCP/IP Configure

    700 - 1 1

    702 - 1

    703 - 1

    710 - 00000000    711 - 00000000    712 - 00000000    713 - 00000000








  PF: 3=Quit   4=Default   7=Back   8=Fwd
```

Figure 262. AEA and TCP/IP Configure Panel

For detailed description of each customizing question, see Chapter 7, "Asynchronous Emulation Adapter (AEA)" on page 263. This section will highlight information relevant to customizing 3174 TCP/IP Telnet support.

Question 700: Configure AEA and TCP/IP Feature

Question 700 has been changed from a one-digit response that allows the AEA feature to be customized, to a two-digit response that allows the AEA feature and the 3174 TCP/IP Telnet Support to be customized. The two digits are used as follows:

- **Digit 1 - AEA Feature**
  - 0=No AEA capability desired
  - 1=AEA capability desired
- **Digit 2 - TCP/IP Telnet Support**
  - 0=No TCP/IP capability desired
  - 1=TCP/IP capability desired without SNMP
  - 2=TCP/IP capability desired with SNMP

For our example, we have customized for both AEA and TCP/IP capabilities.

Question 702: Control Key Assignment

This question allows you to specify the control key when using ASCII emulation.

- 0=Use the Alt key
- 1=Use the Ctrl key (default response)

If you have never used the AEA feature before, use the default value.

Question 703: Request MLT for AEA

This question allows you to specify if you are using MLT on ASCII terminals. It is not affected by 3174 TCP/IP Telnet support.

- 0=No AEA MLT support (default response)
- 1=Request AEA MLT support

Questions 710 through 713: Miscellaneous ASCII Feature Options

Each of these four questions have an eight-digit response. Each digit determines whether certain modes of operation are enabled or not enabled. The only one that you need to consider for the 3174 TCP/IP Telnet Support is Question 710 digit 1: Reverse Video Blanks-to-Hyphens Option. For 3270 displays without EABs, specifying this digit as 1 causes reverse video blanks to be displayed as hyphens.

21.8.5 Defining Port Set

```
                  ______________ Port Set ______________

         Name            Session      Port        Modem          Password
                          Limit       Type        Type

   1 = 3270DISP            5           1            _            ________
   2 = 3163DISP            4           3            _            ________
   3 = ________            _           _            _            ________
   4 = ________            _           _            _            ________
   5 = ________            _           _            _            ________
   6 = ________            _           _            _            ________
   7 = ________            _           _            _            ________
   8 = ________            _           _            _            ________
   9 = ________            _           _            _            ________
  10 = ________            _           _            _            ________
  11 = ________            _           _            _            ________
  12 = ________            _           _            _            ________
  13 = ________            _           _            _            ________
  14 = ________            _           _            _            ________
  15 = ________            _           _            _            ________
  16 = ________            _           _            _            ________


  PF: 3=Quit    4=Default    7=Back    8=Fwd
```

Figure 263. Port Set Panel

If you have already customized for the AEA, you may not need to change this panel. If you want to allow 3270 displays to access TCP/IP destinations and the displays have not been included in a port set, then add them to this panel.

If you do not have an AEA, you should use this panel to define port set 1 for your 3270 displays to allow them to access TCP/IP destinations:

- Enter the name 3270DISP into the Name field.
- Select a session limit that matches the number of LTs you want the 3270 displays to have (the default is 1). This number may be larger than the number of addresses assigned by questions 117 and 118.
- Enter a 1 in the Port Type field for our 3270 displays. Where:
  - 1=3270 devices

– 2=Switched (for ASCII devices connected via modems and switched lines)

– 3=Direct (for ASCII devices connected via null modems)

– 4=Non-Switched (for ASCII devices connected via modems and non-switched lines)

- Leave the Modem Type and Password fields blank.

For our example, we have customized a port set for coax attached 3270 displays and another port set for 3163 displays that are attached to the AEA via null modems.

21.8.6 Mapping Port to Port Set

```
                 ________ Port to Port Set Map ________
                                                              Page 01 of 03
 Type the port set number to group the 3174 ports

   3270 Ports         0   1   2   3   4   5   6   7
  26-00 to 26-07      1_  1_  1_  1_  1_  1_  1_  __
  26-08 to 26-15      __  __  __  __  __  __  __  __
  26-16 to 26-23      __  __  __  __  __  __  __  __
  26-24 to 26-31      __  __  __  __  __  __  __  __




  Port Sets
  1 = 3270DISP        2 = 3163DISP        3 =                 4 =
  5 =                 6 =                 7 =                 8 =
  9 =                10 =                11 =                12 =
 13 =                14 =                15 =                16 =



PF: 3=Quit    4=Default    7=Back    8=Fwd    10=PageBack   11=PageFwd
```

Figure 264. Port to Port Set Map Panel (1 of 3)

If you have already customized for the AEA, you may not need to change this panel. If you have added a port set for 3270 displays in the Port Set panel, you will need to assign the 3270 ports to that new port set using this panel.

If you do not have an AEA, you should use this panel to assign coax ports to the port set, named 3270DISP, that you have defined in the Port Set panel:

- Enter the port set number for each port that you wish to use the 3174 TCP/IP Telnet support function. This assigns that port to the 3270 display port set.

There are three pages for mapping ports to the port sets you have defined. The first page shows ports in hardware group 26, the first 32 coax ports. The second page shows ports in hardware group 27, the next 32 coax ports (provided by the 3270 Port Expansion Feature). The third page shows ports in hardware groups 21, 22 and 23, ASCII ports (provided by the AEA).

For our example, we have:

- Mapped the first seven coax ports to the port set number 1 (1=3270DISP) in Figure 264

- No ports are mapped for the 3270 Port Expansion Feature in Figure 265 on page 627
- Mapped the first seven ASCII ports to the port set number 2 (2=3163DISP) in Figure 266.

```
                 ________ Port to Port Set Map ________
                                                            Page 02 of 03
 Type the port set number to group the 3174 ports

   3270 Ports        0   1   2   3   4   5   6   7
  27-00 to 27-07    __  __  __  __  __  __  __  __
  27-08 to 27-15    __  __  __  __  __  __  __  __
  27-16 to 27-23    __  __  __  __  __  __  __  __
  27-24 to 27-31    __  __  __  __  __  __  __  __







  Port Sets
  1 = 3270DISP        2 = 3163DISP        3 =                 4 =
  5 =                 6 =                 7 =                 8 =
  9 =                10 =                11 =                12 =
 13 =                14 =                15 =                16 =


All responses are correct
PF: 3=Quit    4=Default    7=Back    8=Fwd    10=PageBack   11=PageFwd
```

Figure 265. Port to Port Set Map Panel (2 of 3)

```
                 ________ Port to Port Set Map ________
                                                            Page 03 of 03
 Type the port set number to group the 3174 ports

   AEA Ports         0   1   2   3   4   5   6   7
  21-00 to 21-07    2_  2_  2_  2_  2_  2_  2_  __
  22-00 to 22-07    __  __  __  __  __  __  __  __
  23-00 to 23-07    __  __  __  __  __  __  __  __







  Port Sets
  1 = 3270DISP        2 = 3163DISP        3 =                 4 =
  5 =                 6 =                 7 =                 8 =
  9 =                10 =                11 =                12 =
 13 =                14 =                15 =                16 =


All responses are correct
PF: 3=Quit    4=Default    7=Back    8=Fwd    10=PageBack   11=PageFwd
```

Figure 266. Port to Port Set Map Panel (3 of 3)

21.8.7 Defining 3270 Host and Display Station Sets

```
                _______ AEA and TCP/IP Station Set _______


 1  721 - 3270 HOST______________     722 - 3H  723 - _______   725 - 1
     731 - 1    732 - 1    733 - 0    734 - _   735 - 0  736 - 1  737 - _
     741 - 000  742 - 015  743 - 1  744 - 0  745 - 0  746 - 0 0
     751 - _    752 - ________________________________________________
      761 - 1    762 - 1    763 - 1    764 - 1  765 - 0
      771 - 1    772 - 1    773 - 1    774 - 1   775 - 1  776 - 1
     781 - 0  782 - 0  783 - 066  784 - 1  785 - 11111000  786 - 132  787 - 0
     790 - 000 . 000 . 000 . 000

 2  721 - 3270 DISPLAY___________     722 - 3D  723 - 3270DISP  725 - 1
     731 - 1    732 - 1    733 - 0    734 - _   735 - 0  736 - 1  737 - _
     741 - 000  742 - 015  743 - 1  744 - 0  745 - 0  746 - 0 0
     751 - _    752 - ________________________________________________
      761 - 1    762 - 1    763 - 1    764 - 1  765 - 0
      771 - 1    772 - 1    773 - 1    774 - 1   775 - 1  776 - 1
     781 - 0  782 - 0  783 - 066  784 - 1  785 - 11111000  786 - 132  787 - 0
     790 - 000 . 000 . 000 . 000



 PF: 3=Quit    4=Default    7=Back    8=Fwd    10=Page Back    11=Page Fwd
```

Figure 267. AEA and TCP/IP Station Set Panel (1 of 4)

If you have already customized for AEA, you will have defined station sets for the 3270 host and the 3270 displays that are attached to your 3174. You will still need to define station sets for TCP/IP access, so do not skip this panel. You may, however, proceed to 21.8.8, "Defining TCP/IP Station Sets" on page 629.

If you do not have an AEA, you should define two station sets, one for the 3270 host and one for the 3270 displays we have added. You will also need to define station sets for TCP/IP access (see 21.8.8, "Defining TCP/IP Station Sets" on page 629). We will start with defining station set 1 for the 3270 host:

Q721 Enter a station set name for the 3270 host to be accessed. Whatever name you enter here will be displayed on the Connection Menu as a possible destination for the LT. If your 3270 host has a common name that the terminal users will recognize, enter that name.

In our example, we have used the name 3270 HOST.

Q722 Enter 3H as the station type for the 3270 host.

Leave all other questions at their default values.

Next, we will define station set 2 for the 3270 displays:

Q721 Enter a station set name for the 3270 displays we have added in the Port Set panel.

Q722 Enter 3D as the station type for the 3270 displays.

Q723 Enter 3270DISP as the port set name (the name we defined on the Port Set panel) to which the 3270 displays will be mapped.

Q725 Leave the response at its default value of 1.

This allows the terminal users to use the Connection Menu to select alternative host connections for an LT. After you are more familiar with Connection Menu operation, you may wish to change this to 0.

Leave all other responses at their default values.

21.8.8 Defining TCP/IP Station Sets

A station set for TCP/IP access defines a set of ASCII emulation characteristics and an optional host IP address. The 3174 TCP/IP Telnet Support supports the following ASCII terminal emulation:

- DEC VT100
- IBM 3101
- DG D210 (USA English only)
- DEC VT220, 7-bit control
- DEC VT220, 8-bit control.

Each TCP/IP station set you define will be displayed on the host Connection Menu for the terminal user to select as a connection.

For each station set definition, you may specify an IP host address, or use the default response (all zeros), in question 790. Your response is used as follows:

- If you specify an address, the 3174 *does not* automatically connect to that address when the station set is selected from the Connection Menu. The address is used if the user issues a PING or an OPEN command without specifying a destination.
- If you do not specify an address (default all zeros), then the user will need to specify the destination when issuing the PING or the OPEN command.

So, if your users at the 3270 coax terminals will use the 3174 TCP/IP Telnet support to access only one TCP/IP host and that host supports DEC VT100 devices, then you only need to define one TCP/IP station set (the DEC VT100 station set). You will specify that host′s IP address in question 790 so that the users do not have to remember it. To access that host, the user selects the DEC VT100 station set from the Connection Menu, which puts the display into local mode, and then issues the OPEN command without specifying a destination.

If your users will access more than one hosts, you probably should define five TCP/IP station sets, one for each type of ASCII Emulation supported. This allows the users to select the required station set from the Connection Menu. Again, if you specify an address in question 790, it will be used when the user issues a PING or OPEN command without a destination. If you do not specify an address in question 790 (default all zeros), then the user will need to specify the destination when issuing the PING or OPEN command.

For our example, we have defined five station sets (station set numbers 3 through 7 in the following panels) for TCP/IP access. Station set number 3 also has a “default destination” customized in question 790. Station set number 8 defines 3163 displays that are attached to the 3174 AEA; they can also select the TCP/IP connections from their Connection Menu.

```
                    _______ AEA and TCP/IP Station Set _______


 3  721 - TELNET VT100  _______       722 - TH  723 - _______  725 - 1
    731 - 1   732 - 1   733 - 0   734 - _   735 - 0  736 - 1  737 - _
    741 - 000  742 - 015  743 - 1  744 - 0  745 - 0  746 - 0 0
    751 - 1   752 - ________________________________________________
     761 - 1   762 - 1   763 - 0   764 - 1  765 - 0
     771 - 1   772 - 1   773 - 1   774 - 1   775 - 1  776 - 1
    781 - 0  782 - 0  783 - 066  784 - 1  785 - 11111000  786 - 132  787 - 0
    790 - 009 . 067 . 038 . 071

 4  721 - TELNET IBM3101             722 - TH  723 - _______  725 - 1
    731 - 1   732 - 1   733 - 0   734 - _   735 - 0  736 - 1  737 - _
    741 - 000  742 - 015  743 - 1  744 - 0  745 - 0  746 - 0 0
    751 - 2   752 - ________________________________________________
     761 - 1   762 - 1   763 - 1   764 - 1  765 - 0
     771 - 1   772 - 1   773 - 1   774 - 1   775 - 1  776 - 1
    781 - 0  782 - 0  783 - 066  784 - 1  785 - 11111000  786 - 132  787 - 0
    790 - 000 . 000 . 000 . 000


All responses are correct
PF: 3=Quit   4=Default   7=Back   8=Fwd   10=Page Back   11=Page Fwd
```

Figure 268. AEA and TCP/IP Station Set Panel (2 of 4)

To define each station set for TCP/IP access, respond to the following questions:

Q721 Enter a station set name that you wish displayed on the Connection Menu.

Q722 Enter TH as the station type for the TCP/IP host.

Q751 Specify the datastream supported by the TCP/IP host:

- 1=DEC VT100
- 2=IBM 3101
- 3=DG D210 (USA English only)
- 4=DEC VT220, 7-bit control
- 5=DEC VT220, 8-bit control

Your response to this question only affects the operation of 3270 displays. It determines the type of ASCII emulation that the 3174 provides for the 3270 display when the user selects this station set as the destination. When the user at an ASCII terminal selects a TCP/IP destination, the value of this field is ignored.

Q761 Respond only for VT100 or VT220 datastream; that is, if question 751=1, 4 or 5. The valid responses are:

- 0=Auto XON/XOFF disabled
- 1=Auto XON/XOFF enabled (default response).

Q762 Respond only for VT100 or VT220 datastream; that is, if question 751=1, 4 or 5. The valid responses are:

- 0=Wraparound option disabled
- 1=Wraparound option enabled (default response).

Q763 Respond only for VT100 or VT220 datastream; that is, if question 751=1, 4 or 5. The valid responses are:

- 0=New line option disabled
- 1=New line option enabled (default response).

Your response to this question depends on the host applications you will be using. If not answered correctly, characters may be placed in the wrong positions on the screen. When set to 1, the 3174 treats a line feed character from the host as a new line (line feed followed by carriage return).

Note: For connections to RS/6000 hosts, question 763 should be 0.

Q764 Respond only for VT100 or VT220 datastream; that is, if question 751=1, 4 or 5. The valid responses are:

- 0=Margin bell disabled
- 1=Margin bell enabled (default response).

Q765 Respond only for VT100 or VT220 datastream; that is, if question 751=1, 4 or 5. The valid responses are:

- 0=DEC host ASCII Character Set is NRC (default response)
- 1=DEC host ASCII Character Set is MCS.

Q771 Respond only for IBM 3101 datastream; that is, if question 751=2. The valid responses are:

- 0=Automatic line feed disabled
- 1=Automatic line feed enabled (default response).

  The receipt of a carriage return from the host will cause a carriage return and a line feed at the terminal.

Q772 Respond only for IBM 3101 datastream; that is, if question 751=2. The valid responses are:

- 0=Enter causes a carriage return only
- 1=Enter causes a carriage return and a line feed (default response).

Q773 Respond only for IBM 3101 datastream; that is, if question 751=2. The valid responses are:

- 0=Automatic new line at column 80 disabled
- 1=Cursor automatically moves to the first position of the next line after reaching column 80 (default response).

Q774 Respond only for IBM 3101 datastream; that is, if question 751=2. The valid responses are:

- 0=Scrolling disabled
- 1=Scrolling enabled (default response).

Q775 Respond only for IBM 3101 datastream; that is, if question 751=2. The valid responses for the line turnaround character to be used are:

- 0=Use EOT (end of transmission)
- 1=Use CR (carriage return) (default response)
- 2=Use XOFF (transmit off)

- 3=Use ETX (end of text).

Q790 Enter the default host IP address.

You may leave the response at its default value (all zeros). The user will need to specify the destination when issuing the PING or the OPEN command.

If you do specify an address, the 3174 *does not* automatically connect to that address when this station set is selected from the Connection Menu. In this case, if the user issues a PING or an OPEN command:

- Without specifying an address, the address in question 790 is used.
- Specifying an address, the address specified is used.

You can leave all other responses at their default values.

```
                 _______ AEA and TCP/IP Station Set _______


 5  721 - TELNET D210              722 - TH  723 - _______   725 - 1
     731 - 1    732 - 1    733 - 0   734 - _   735 - 0  736 - 1  737 - _
     741 - 000  742 - 015  743 - 1  744 - 0  745 - 0  746 - 0 0
     751 - 3    752 - ________________________________________________
      761 - 1   762 - 1    763 - 1   764 - 1  765 - 0
      771 - 1   772 - 1    773 - 1   774 - 1   775 - 1  776 - 1
     781 - 0  782 - 0  783 - 066  784 - 1  785 - 11111000  786 - 132  787 - 0
     790 - 000 . 000 . 000 . 000

 6  721 - TELNET VT220 7 BIT       722 - TH  723 - _______   725 - 1
     731 - 1    732 - 1    733 - 0   734 - _   735 - 0  736 - 1  737 - _
     741 - 000  742 - 015  743 - 1  744 - 0  745 - 0  746 - 0 0
     751 - 4    752 - ________________________________________________
      761 - 1   762 - 1    763 - 0   764 - 1  765 - 0
      771 - 1   772 - 1    773 - 1   774 - 1   775 - 1  776 - 1
     781 - 0  782 - 0  783 - 066  784 - 1  785 - 11111000  786 - 132  787 - 0
     790 - 000 . 000 . 000 . 000


 All responses are correct
 PF: 3=Quit    4=Default    7=Back    8=Fwd    10=Page Back    11=Page Fwd
```

Figure 269. AEA and TCP/IP Station Set Panel (3 of 4)

```
                ________ AEA and TCP/IP Station Set ________


  7  721 - TELNET VT220 8 BIT___      722 - TH  723 - ________  725 - 1
      731 - 1    732 - 1    733 - 0    734 - _   735 - 0  736 - 1  737 - _
      741 - 000  742 - 015  743 - 1  744 - 0  745 - 0  746 - 0 0
      751 - 5    752 - ________________________________________________
       761 - 1   762 - 1    763 - 0    764 - 1  765 - 0
       771 - 1   772 - 1    773 - 1    774 - 1   775 - 1  776 - 1
      781 - 0  782 - 0  783 - 066  784 - 1  785 - 11111000  786 - 132  787 - 0
      790 - 000 . 000 . 000 . 000

  8  721 - 3163 DISPLAY____________   722 - I3  723 - 3163DISP  725 - 1
      731 - 1    732 - 1    733 - 6    734 - _   735 - 1  736 - 1  737 - _
      741 - 000  742 - 015  743 - 0  744 - 0  745 - 2  746 - 0 0
      751 - _    752 - ________________________________________________
       761 - 1   762 - 1    763 - 1    764 - 1  765 - 0
       771 - 1   772 - 1    773 - 1    774 - 1   775 - 1  776 - 1
      781 - 0  782 - 0  783 - 066  784 - 1  785 - 11111000  786 - 132  787 - 0
      790 - 000 . 000 . 000 . 000


 All responses are correct
 PF: 3=Quit    4=Default    7=Back    8=Fwd    10=Page Back    11=Page Fwd
```

Figure 270. AEA and TCP/IP Station Set Panel (4 of 4)

21.8.9 Defining Default Destinations

```
                ____ AEA and TCP/IP Default Destination ____

  Station        Station Set         Session         Session
    Set             Name              Limit     LT1 LT2 LT3 LT4 LT5

     1    3270 HOST                     0       __  __  __  __  __
     2    3270 DISPLAY                  5       __  __  __  __  __
     3    TELNET VT100                  0       __  __  __  __  __
     4    TELNET IBM3101                0       __  __  __  __  __
     5    TELNET D210                   0       __  __  __  __  __
     6    TELNET VT220 7 BIT            0       __  __  __  __  __
     7    TELNET VT220 8 BIT            0       __  __  __  __  __
     8    3163 DISPLAY                  4       __  __  __  __  __
     9                                  0       __  __  __  __  __
    10                                  0       __  __  __  __  __
    11                                  0       __  __  __  __  __
    12                                  0       __  __  __  __  __
    13                                  0       __  __  __  __  __
    14                                  0       __  __  __  __  __
    15                                  0       __  __  __  __  __


 PF: 3=Quit    4=Default    7=Back    8=Fwd    10=Page Back    11=Page Fwd
```

Figure 271. AEA and TCP/IP Default Destination Panel

This panel determines what the terminal user will see on each LT when it is first accessed. You specify default destinations only for station sets that represent devices; you do not specify default destinations for host station sets. If you have already customized for the AEA, you should make changes here only if you want a TCP/IP session to be the default destination. If you are not not using the AEA, what you enter here will affect your end-users as follows:

- If you select the 3270 host station set as the default destination, the LT is initially assigned to the 3270 host. You should do this if you do not want things to look different to your users after you have installed the 3174 TCP/IP TELNET Support.
- If you select a TCP/IP host station set as the default destination, the LT is initially assigned to TCP/IP and the user will see the following prompt at the top of the screen:

  3174 TELNET>

  of the screen.
- If you select the Connection Menu as the default destination (leave the fields in the Session LTx columns blank), the Connection Menu will be displayed as the first screen and the user can choose the desired connection.

For each LT, enter either the 3270 host station set number, one of the TCP/IP station set numbers, or leave blank to request the Connection Menu, as the default destination.

Note: You cannot change the information in the Station Set Name and Session Limit columns. The Station Set Name is your response to question 721 and the Session Limit is your response to the Session Limit for that station set in the Port Set panel.

For our example, we have specified the Connection Menu as the default destination for all the attached displays (both 3270 and ASCII).

21.8.10 Defining TCP/IP Options

```
                    _____ TCP/IP Options Menu _____

 3174 IP Address               052 - 009 . 067 . 038 . 088
 Subnet Mask                   054 - 255 . 255 . 255 . 192
 Broadcast Address             056 - 000 . 000 . 000 . 000

 Maximum TELNET Connections    058 - 020    (001 - 250)
 TCP/IP Buffer Space           060 - 0256 K (K = 1024 bytes)

 Routing Field Support         062 - Y      (Y,N)
 All Routes Broadcast          064 - Y      (Y,N)

 Frame Relay IP Address        066 - 000 . 000 . 000 . 000
 Frame Relay Subnet Mask       068 - 000 . 000 . 000 . 000




 PF: 3=Quit    4=Default    7=Back    8=Fwd
```

Figure 272. TCP/IP Options Menu

Question 052: 3174 IP address

Enter the IP address assigned to your 3174. Each of the four fields of your response should contain a decimal number between 000 and 255. For example, the IP address of our 3174-13R is 9.67.38.88; it is entered as:

009.067.038.088

Question 054: Subnet Mask

Enter the subnet mask for your network. Each of the four fields of your response should contain a decimal number between 000 and 255. For example, the subnet mask of our network at ITSC Raleigh is 255.255.255.192; it is entered as:

255.255.255.192

The mask, when converted to hexadecimal, contains a 1 for each bit of the address that is part of the network or subnet identifier.

If you are not using subnets, this mask should represent the network portions of the address.

Question 056: Broadcast Address

Enter the address the 3174 should use when it needs to send TCP/IP broadcast frames. For example, a broadcast address that contains the subnet address of the local 3174, but with all bits of the hostid address set to 1, results in broadcast frames going to all hosts on the local subnet. Each of the four fields of your response should contain a decimal number between 000 and 255. For example, 9.67.38.255 is entered as

009.067.038.255

This response is optional (default all zeros). If you leave it as default, the 3174 uses a broadcast address that represents all the hosts in your subnet if a subnet mask is used, or in your network if no subnet mask is used.

Question 058: Maximum TELNET Connections

Enter the maximum number of connections you wish to have available for terminal users. This pool of connections is available on a first-come-first-served basis. Each connection requires additional storage, as described in 21.6, "Storage Requirements" on page 614.

Your response should be a decimal number between 001 and 250. For our example, we have specified 20 connections as the maximum.

Question 060: TCP/IP Buffer Space

Enter the amount of additional memory you wish to allocate for TCP/IP data buffers, as described in 21.6, "Storage Requirements" on page 614.

Your response should be a decimal number between 0000 and 1024, and specifies the number of 1024 byte (1 KB) increments.

Question 062: Routing Field Support

Your response should be as follows:

- Enter Y if you wish the TCP/IP frames to use LAN source routing. This allows communication through bridges.
- Enter N if you want to disable bridge access.

Question 064: All Routes Broadcast

Your response should be as follows:

- Enter Y for All Routes Broadcast.
- Enter N for Single Route Broadcast.

Note: The response to question 064 is meaningful only if question 062=Y.

Question 066: Frame Relay IP Address

This question determines the IP address assigned to your 3174′s Frame Relay interface. Obtain this address from the TCP/IP network administrator. If you do not want to use IP on your Frame Relay interface, use 000.000.000.000.

Question 068: Frame Relay Subnet Mask

This question determines the subnet mask that applies to the 3174′s Frame Relay interface. The Frame Relay subnet mask, when converted to hexadecimal characters, specifies 1 for each bit of the address that is part of the network or subnet identifier. The 3174 builds the subnet mask from the network identifier in the IP address. If you want to indicate that the 3174 is not on a subnet, use 000.000.000.000.

21.8.11 Defining TCP/IP Routing Information

```
                 _____ TCP/IP Routing Information _____

 Destination IP Address      Type       Router IP Address
                           (N,S,H,D)

 009 . 067 . 038 . 096         H       009 . 067 . 038 . 096

 009 . 067 . 038 . 134         H       009 . 067 . 038 . 096

 XXX . XXX . XXX . XXX         X       XXX . XXX . XXX . XXX

 XXX . XXX . XXX . XXX         X       XXX . XXX . XXX . XXX

 XXX . XXX . XXX . XXX         X       XXX . XXX . XXX . XXX

 XXX . XXX . XXX . XXX         X       XXX . XXX . XXX . XXX

 XXX . XXX . XXX . XXX         X       XXX . XXX . XXX . XXX

 XXX . XXX . XXX . XXX         X       XXX . XXX . XXX . XXX


 PF: 3=Quit    4=Default    7=Back    8=Fwd
```

Figure 273. TCP/IP Routing Information

This panel contains information about the routers that you want the 3174 to use. You can define four types of routes:

- Type=N - a route to a specific network
- Type=S - a route to a specific subnet
- Type=H - a route to a specific host IP address
- Type=D - a default router

For host, subnet and network entries, you must fill in all fields in the row:

- The Destination IP Address is the specific host, subnet or network address.
- The Type is H (host), S (subnet) or N (network).
- The Router IP Address is the network IP address of the router that should receive that destination′s traffic. This IP address must have the same network and subnet values as the 3174 you are customizing.

The default router (Type=D) is used for all other destinations that are not on the local network (or subnet). The Destination IP Address field for the default router must be left as:

XXX.XXX.XXX.XXX

Notes:

1. You should have only one default router entry.
2. If you define a route to a subnet, it must be on the same network as the 3174 you are customizing.
3. Do not add a route to the network or the subnet of the 3174 you are customizing.

For our example, we have define two destination hosts, 9.67.38.96 and 9.67.38.134, which are reachable through 9.67.38.96.

21.8.12 Defining Domain Name Services

```
                 _____ TCP/IP Domain Name Services _____

3174 Hostname
317413R___________________________________________________

3174 Domain Name
ITSO RALEIGH IBM COM______________________________________
__________________________________________________________
__________________________________________________________
_________________________________________________________

Domain Nameserver IP Addresses

009 . 067 . 038 . 096

009 . 067 . 038 . 134

XXX . XXX . XXX . XXX

XXX . XXX . XXX . XXX


PF: 3=Quit    4=Default    7=Back    8=Fwd
```

Figure 274. TCP/IP Domain Name Services

3174 Hostname

A response is required for this field. Enter the name assigned to your 3174. Observe the following rules when defining the 3174 Hostname:

- The name may be up to 63 characters long.
- Only alphabetic (A through Z), numeric (0 through 9) and the hyphen characters are allowed.
- Use the dollar sign ($) to represent a hyphen.
- No imbedded blanks are allowed.
- Although you enter the name in upper case characters, the 3174 converts it to lower case before using it.

3174 Domain Name

Enter the name of the domain that your 3174 is in. This name can be made up of several parts. Observe the following rules when defining the 3174 Domain Name:

- Each part of the name may be up to 63 characters long.
- Only alphabetic (A through Z), numeric (0 through 9) and the hyphen characters are valid.
- Use the dollar sign ($) to represent a hyphen.
- Use blanks to separate the parts of the name.

  For example, you would enter MYDEPT.MY-COMPANY.MYNET as MYDEPT MY$COMPANY MYNET.
- Although you enter the name in upper case characters, the 3174 converts it to lower case before using it.

A domain name is required if any Domain Nameserver IP Addresses is entered.

Domain Nameserver IP Addresses

Enter the IP addresses of the Nameservers that the 3174 should use to resolve names to IP addresses. Enter the primary Nameserver′s address first. These responses are optional.

21.8.13 Defining TCP/IP Nicknames

```
                 _____ TCP/IP 3174 Defined Nicknames _____

          Nickname                     IP Address

    RS60001_____________         009 . 067 . 038 . 071
    RS60002_____________         009 . 067 . 038 . 072
    RS60003_____________         009 . 067 . 038 . 073
    MVS20_______________         009 . 067 . 038 . 096
    MVS18_______________         009 . 067 . 038 . 134
    ____________________         XXX . XXX . XXX . XXX
    ____________________         XXX . XXX . XXX . XXX
    ____________________         XXX . XXX . XXX . XXX
    ____________________         XXX . XXX . XXX . XXX
    ____________________         XXX . XXX . XXX . XXX
    ____________________         XXX . XXX . XXX . XXX
    ____________________         XXX . XXX . XXX . XXX
    ____________________         XXX . XXX . XXX . XXX
    ____________________         XXX . XXX . XXX . XXX
    ____________________         XXX . XXX . XXX . XXX
    ____________________         XXX . XXX . XXX . XXX



 PF: 3=Quit    4=Default    7=Back    8=Fwd
```

Figure 275. TCP/IP 3174 Defined Nicknames

Since users remember names better than numeric IP addresses, this panel allows you to define up to 16 host nicknames and their associated IP addresses. Observe the following rules when defining nicknames:

- The nickname can be up to 20 characters long.
- Only alphabetic (A through Z) and numeric (0 through 9) characters are allowed.
- No imbedded blanks are allowed.
- Although you enter these names in upper case characters, the 3174 converts them to lower case before using them.

21.8.14 Configure Complete

```
                ____ AEA and TCP/IP Configure Complete _____

                      Press PF12 to save all responses
                         and return to the AEA Menu


 PF: 3=Quit    4=Default    7=Back    8=Fwd    12=Done
```

Figure 276. AEA and TCP/IP Configure Complete

You have now completed customization for the 3174 TCP/IP Telnet support.

21.8.15 LAN Considerations

Token-Ring Considerations

You may have noticed that we have not mentioned any token-ring customization questions. Since your 3174 must be either a x3R model customized for at least one 3270 host attachment, or a model customized as a LAN gateway, you have already set up the token-ring interface. No changes to your token-ring customization are required for the 3174 TCP/IP Telnet support.

Ethernet considerations

We are not using Ethernet in this example, but if we were, the 3174 could be a DSPU, Ethernet gateway, or a stand-alone TELNET terminal server. For DSPU or a Ethernet gateway, there are no changes to your LAN customization as a stand-alone Telnet terminal server, the 3270 Host is not and has not been defined, thus you must customize for the use of the Ethernet adapter.

See Chapter 4, "LAN Support" on page 69 for 3174 LAN customization details.

21.9 How to Use 3174 TCP/IP Telnet Support

```
                          __________  Connection Menu   __________
Enter a number (NUM) or a name on the Command Line, then press ENTER

NUM NAME                      STATUS    NUM NAME                      STATUS
  1 3270 HOST                 ?      1
  2 TELNET VT100              Down   2
  3 TELNET IBM3101            Down
  4 TELNET D210               Down
  5 TELNET VT220 7 BIT        Down
  6 TELNET VT220 8 BIT        Down









 PF: 3=End       6=Terminal Disconnect        12=Host Disconnect


 ============>To:
```

Figure 277. Connection Menu Immediately after 3174 IMLed

Re-IML the 3174 after you have completed your customizing procedures. Since we have specified the Connection Menu as the default destination for all our attached terminals, this screen appears immediately after the re-IML. Note the status displayed:

1 The 3270 host status is a question (?) mark.

2 The TCP/IP host status is Down.

```
                    Connection Menu
Enter a number (NUM) or a name on the Command Line, then press ENTER

NUM NAME                     STATUS     NUM NAME                     STATUS
  1 3270 HOST                Up     1
  2 TELNET VT100             Down   2
  3 TELNET IBM3101           Down
  4 TELNET D210              Down
  5 TELNET VT220 7 BIT       Down
  6 TELNET VT220 8 BIT       Down








 PF: 3=End       6=Terminal Disconnect       12=Host Disconnect


 ============>To:
```

Figure 278. Connection Menu after 3174 Becomes Active

When the 3270 host attachment becomes active, the status changes, without user intervention, to the following:

1 The 3270 host status is now Up and, if selected, the session will be established between the LT and the host.

2 The TCP/IP host status continues to be Down.

```
                    Connection Menu
Enter a number (NUM) or a name on the Command Line, then press ENTER

NUM NAME                     STATUS     NUM NAME                     STATUS
  1 3270 HOST                Up
  2 TELNET VT100             Up
  3 TELNET IBM3101           Up
  4 TELNET D210              Up
  5 TELNET VT220 7 BIT       Up
  6 TELNET VT220 8 BIT       Up








 PF: 3=End       6=Terminal Disconnect       12=Host Disconnect


 ============>To:
```

Figure 279. Connection Menu after 3174 Becomes Active and Enter Pressed

When you press the Enter key, the status shows all hosts active. You can now select any one of the hosts from the Connection Menu.

21.10 Terminal Operation with 3174 TCP/IP Telnet Support

When you select a TCP/IP option from the Connection Menu, your LT is placed into the local mode. You know you are in local mode when the following prompt is displayed:

3174 TELNET>

In the local mode, you are interacting with the 3174, just as if it were a "host computer." You ask the 3174 to perform functions on your behalf. The most important function is opening a connection with a remote TCP/IP host.

21.10.1 Opening a Connection

Once in the local mode, there are two ways to open a connection with a TCP/IP host:

- If you have specified an address in Question 790 and it is the desired destination, type the following at the TELNET prompt and press Enter:

  3174 TELNET> **open**

- If you have specified an address in Question 790 and it is not the desired destination, or if you have not specified an address in question 790, type the following at the TELNET prompt and press Enter:

  3174 TELNET> **open** *destination*
  where *destination* = {IPaddress|hostname}

Once your connection is opened, you leave the local mode and enter into session with the remote host.

When you are in session with the host, you can return to the local mode temporarily, without losing your connection to the host, by pressing the escape key.

21.10.2 Escaping to Local Mode

To escape to the local mode while you are in an active TELNET session, use the escape key sequence (this usually involves pressing more than one key and is not the key marked Esc or ESC on your keyboard). To find out what the escape key is, type the following at the TELNET prompt and press Enter:

3174 TELNET> **display**

Figure 293 on page 652 shows an example of the resulting display. Note the line that shows:

escape [^L]

This is the default setting; it means that:

- If you have a Ctrl key on your keyboard and your display is setup offline for native mode (Standard), press and hold the Ctrl key (a ← shows in the OIA) and then press the L key.
- If you do not have a Ctrl key, enter Extension mode (for example, press and hold Alt, and then press Erase EOF), then press and release the C key, which puts you into the Ctrl mode (a ← now shows in the OIA), then press the L key.

If you find this cumbersome, use the SET command to define your preferred escape key (for example, the $ key) before you open the connection:

3174 TELNET> **set escape $**

Note:

If you are using a Personal Computer as a CUT terminal attached the 3174 using PC3270 Emulation, you need to define some other key (for example, the Home key) as Extension mode key since the Ctrl key in emulated keyboard is not functional. The steps are as follows:

- Respond the Question 168 (additional Extension-Mode key definition) with a 1 to specify the Home key as the Extension-Mode key when you are customizing the 3174.
- At your emulated CUT terminal, press and hold the Home key and then press and release the C Key, which puts you into the Ctrl mode (a ← shows in the OIA). Then press the appropriate key (for example, the L key) to escape to the local mode.

Once you have escaped to the local mode, you can enter local commands (see 21.10.8, “Local Mode Commands” on page 646). If you enter the CLOSE or the QUIT command, the connection will end.

After the command is performed, you automatically return to your host session, unless the command was a request to end the connection. You may have to press Enter once to regain the host prompt.

If you did not issue any command when you have escaped to the local mode, just press Enter once and you be return to your host session.

When you return to your host session, you may need to request the host application to refresh the screen. For example, if you are working with SMIT (System Management Interface Tool) on the RS/6000, press the PF2 key to refresh. Otherwise, the commands and responses that were displayed during local mode remain on the screen until they are replaced by data from the host.

21.10.3 Returning to the Connection Menu

The procedure used to return to the Connection Menu from your Telnet session depends on the type of device you are using.

For 3270 devices:

- If a Telnet session is active, enter into Extension mode and then press the M key.
- If a Telnet session is not active, do either of the following:
  - Enter into Extension mode and then press the M key.
  - Type the following at the TELNET prompt and press Enter:

    3174 TELNET> **quit**

For ASCII devices, escape to the local mode first, and then escape to the Connection Menu; that is, press the escape key twice.

21.10.4 Returning to the Telnet Session

When you have returned to the Connection Menu:

- If you choose the same host connection as the host session you came from, you will be returned to that session.
- If you choose a different destination, the previous session is disconnected and you will be placed into the local mode to allow you to open a new connection.

21.10.5 Telnet Session Resources

When you first request a TCP/IP destination from the Connection Menu, one of the TELNET session resources reserved by question 058 must be available. If it is not, your request is rejected (see Figure 280).

```
                    __________  Connection Menu  __________
Enter a number (NUM) or a name on the Command Line, then press ENTER

NUM NAME                     STATUS     NUM NAME                     STATUS
  1 IBM HOST                 ?
  2 TELNET VT100             Busy
  3 TELNET IBM3101           Busy
  4 TELNET D210              Busy
  5 TELNET VT220 7 BIT       Busy
  6 TELNET VT220 8 BIT       Busy










 PF: 3=End       6=Terminal Disconnect        12=Host Disconnect
 802 03 No ′TELNET VT220 8 BIT      ′ ports are available

 ============>To:
```

Figure 280. TCP/IP Resources Not Available

Once your request is accepted, a session resource is allocated for you until you do either of the following:

- You enter a QUIT command from the local mode.
- You return to the Connection Menu and successfully select a different destination from the menu.

21.10.6 Operation: Telnet to RS/6000 Host

```
                    Connection Menu
Enter a number (NUM) or a name on the Command Line, then press ENTER

NUM NAME                     STATUS     NUM NAME                     STATUS
  1 3270 HOST                Up
  2 TELNET VT100             Up
  3 TELNET IBM3101           Up
  4 TELNET D210              Up
  5 TELNET VT220 7 BIT       Up
  6 TELNET VT220 8 BIT       Up









 PF: 3=End       6=Terminal Disconnect        12=Host Disconnect


 ============>To: 2
```

Figure 281. Selecting Connection to RS/6000 Host

```
3174 TELNET> open 9.67.38.73
```

Figure 282. TELNET Local Mode

```
IBM AIX Version 3 for RISC System/6000
(C) Copyrights by IBM and by others 1982, 1991.
login: root
root's Password:
******************************************************************************
*                                                                            *
*                                                                            *
*  Welcome to IBM AIX Version 3.2!                                           *
*                                                                            *
*                                                                            *
*  Please see the README file in /usr/lpp/bos for information pertinent to   *
*  this release of the AIX Operating System.                                 *
*                                                                            *
*                                                                            *
******************************************************************************

Last unsuccessful login: Fri Oct  7 11:07:03 CDT 1994 on hft/0
Last login: Tue Oct  4 12:21:51 CDT 1994 on pts/8 from rs60002
[YOU HAVE NEW MAIL]
swcons: console output redirected to: /log/12Oct94
<rs60003># smit
```

Figure 283. RS/6000 After Login

```
                                System Management

Move cursor to desired item and press Enter.

  Installation and Maintenance
  Devices
  Physical & Logical Storage
  Security & Users
  Diskless Workstation Management
  Communications Applications and Services
  Spooler (Print Jobs)
  Problem Determination
  Performance & Resource Scheduling
  System Environments
  Processes & Subsystems
  Applications
  Using SMIT (information only)




F1=Help             F2=Refresh          F3=Cancel           Esc+8=Image
Esc+9=Shell         Esc+0=Exit          Enter=Do
```

Figure 284. RS/6000 After Invoking SMIT

21.10.7 Operation: Telnet to MVS TCP/IP Host

```
3174 TELNET> open mvs20
Finding address of mvs20
Trying...
Connected to 9.67.38.96
Application Id required, no installation default
Enter Application Name:
tso
IKJ56700A ENTER USERID -
IKJ56714A ENTER CURRENT PASSWORD FOR PEPEBOO-
ICH70001I PEPEBOO  LAST ACCESS AT 13:51:50 ON TUESDAY, OCTOBER 12, 1994
IKJ56481I THE PROCEDURE NAME $ASNETDA IS A DEFAULT NAME - YOU MAY CHANGE IT
IKJ56455I PEPEBOO LOGON IN PROGRESS AT 12:52:22 ON OCTOBER 12, 1994
 SA20 was converted to ESA 4.2 on OCT 9
INVALID TERMINAL ACCESS METHOD, ISPF VERSION 3 REQUIRES ACF/VTAM.
READY
IKJ56470I PEPEBOO LOGGED OFF TSO AT 13:05:21 ON OCTOBER 12, 1994
******
 Connection closed by foreign host.

3174 TELNET>
```

Figure 285. Logging on to MVS TSO

21.10.8 Local Mode Commands

The 3174 converts all local mode commands and arguments into lower case before processing. Any numeric arguments that are required must be given in decimal. IP addresses must be entered in dotted decimal form, with no imbedded spaces, and leading zeros are not necessary.

In the following explanations of the commands, arguments must be given in the order shown. We have adopted the following convention:

- A command is shown in upper case.
- An argument, option or variable (for example, hostname) is shown in lower case.

Parentheses () denote optional arguments. If you wish to specify any optional argument, you must specify all the arguments that precede it. Abbreviations for commands and parameters are allowed. If the correct input cannot be determined, you will receive either an “invalid” or an “ambiguous” message.

You can use “?” after any command to get help.

NAMES Command

Purpose: The NAMES command will display any host nicknames that you have customized at your 3174 (see 21.8.13, “Defining TCP/IP Nicknames” on page 639) together with its associated IP address.

Command Format: NAMES

Example Display:

```
3174 TELNET> names
rs60001              9.67.38.71
rs60002              9.67.38.72
rs60003              9.67.38.73
mvs20                9.67.38.96
mvs18                9.67.38.134
```

Figure 286. TCP/IP Using NAMES Command

Figure 286 shows the display for the nicknames defined in 21.8.13, “Defining TCP/IP Nicknames” on page 639.

PING Command

Purpose: The PING command is used to query the availability of a remote host. Once issued, the PING operation will continue until the 3174 has sent a specified number of packets to the remote host (if it is available). You can stop the PING operation at any time by pressing any key.

Command Format: PING *(destination (count (size)))*

where:

destination Is the remote host being queried. The *destination* can be:

- A nickname
- An unqualified hostname, if the host is part of the same domain as the 3174 you are attached to
- A fully qualified hostname
- An IP address.

If no destination is given, the IP address if customized in question 790 for the selected station set is used.

count Is the number of packets the 3174 should send. If count=0, the 3174 will send packets until you stop the query. Possible values are 0 through 1000 (default 10).

size Is the number of bytes to send in each query. Possible values are 8 through 64 (default 64).

Example Display:

```
3174 TELNET> ping

 ...sending 00064 characters to 9.67.38.71
Received reply to packet 00000, delay (ms) = 00020
Received reply to packet 00001, delay (ms) = 00020
Received reply to packet 00002, delay (ms) = 00020
Received reply to packet 00003, delay (ms) = 00020
Received reply to packet 00004, delay (ms) = 00020
Received reply to packet 00005, delay (ms) = 00027
Received reply to packet 00006, delay (ms) = 00039
Received reply to packet 00007, delay (ms) = 00020
Received reply to packet 00008, delay (ms) = 00020
Received reply to packet 00009, delay (ms) = 00020

Summary for PING to 9.67.38.71

   Packets sent: 00010 Packets received: 00010
   Round-trip (ms) ( min avg max ) = 00020 00022 00039

3174 TELNET>
```

Figure 287. TCP/IP Using PING Command to Default Destination

In this display, the PING command was issued, without a destination, from an LT that selected the DEC VT100 station set number 3 (see Figure 268 on page 630). The default destination is, therefore, as customized in question 790.

```
3174 TELNET> ping mvs20 8 2

Finding address of mvs20
 ...sending 00008 characters to 9.67.38.96
Received reply to packet 00000, delay (ms) = 00047
Received reply to packet 00001, delay (ms) = 00021

Summary for PING to 9.67.38.96

   Packets sent: 00002 Packets received: 00002
   Round-trip (ms) ( min avg max ) = 00021 00034 00047

3174 TELNET>
```

Figure 288. TCP/IP Using PING Command with Parameters

In this display, the PING command is issued, specifying the destination host name as mvs20, data packet size 8 bytes, and two packets to be sent for the PING operation.

```
3174 TELNET> ping ?

Usage:  ping host size count
    host - destination host name or address
    size - size of data packet (8-64)
   count - number of packets (0-1000)
If unspecified, size=64 and count=10.

3174 TELNET>
```

Figure 289. TCP/IP Using PING Command - Help

In this display, the help information is provided to show the format and valid values that can be specified.

You can request help with any command by typing in the command followed by the question mark (or by the word help).

```
3174 TELNET> ping mvs30

Finding address of mvs30  1
Unknown host

3174 TELNET> ping mvs18

Finding address of mvs18  2
 ...sending 00064 characters to 9.67.38.134

Summary for PING to 9.67.38.134

   Packets sent: 00010 Packets received: 00000
   Percent packet loss:   100

3174 TELNET>
```

Figure 290. TCP/IP Using PING Command - Messages

1 Messages displayed for a destination that is not known.

2 Messages displayed for a destination that is not available.

OPEN Command

Purpose: The OPEN command is to open a connection to a remote host.

Command Format: OPEN *(destination (remote_port))*

where:

destination Is a remote host you wish to connect. The *destination* can be:

- A nickname
- An unqualified hostname, if the host is part of the same domain as the 3174 you are attached to
- A fully qualified hostname
- An IP address.

If no destination is given, the IP address if customized in question 790 for the selected station set is used.

remote_port Is the port number of the TELNET server at the remote host, if you want a port other than the standard TELNET port 23. Possible values are 0 through 65535.

Example Display: See Figure 282 on page 645 and Figure 285 on page 646.

CLOSE Command

Purpose: The CLOSE command will end the connection with the remote host; that is, it is used to disconnect from a remote host. Your LT will remain in TELNET local mode.

Command Format: CLOSE

Example Display:

```
login: root
root's Password:
*******************************************************************************
*                                                                             *
*                                                                             *
*  Welcome to IBM AIX Version 3.1!                                            *
*                                                                             *
*                                                                             *
*  Please see the README file in /usr/lpp/bos for information pertinent to    *
*  this release of the AIX Operating System.                                  *
*                                                                             *
*                                                                             *
*******************************************************************************

1 unsuccessful login attempt since last login
Last unsuccessful login: Fri Oct  7 08:20:20 1994 on pts/1 from 9.67.38.88
Last login: Fri Oct  9 08:10:50 1994 on pts/1 from 9.67.38.88
[YOU HAVE NEW MAIL]
<rs60001>#           1
3174 TELNET> close   2
Connection closed by user request

3174 TELNET>
```

Figure 291. TCP/IP Using CLOSE Command

1 At this point, you are in session with the RS/6000 host.

2 At this point, you have escaped to the local mode and issue the CLOSE command. The resulting message shows the connection was closed at your request and you are returned to the TELNET prompt.

QUIT

Purpose: The QUIT command will end any open connection and return the LT to the Connection Menu.

Command Format: QUIT

Example Display: No example display is provided.

STATUS Command

Purpose: The STATUS command is used to display the status of the current connection, showing the address of the remote host, and the mode of operation.

Command Format: STATUS

Example Display:

```
login: root
root's Password:
******************************************************************************
*                                                                            *
*                                                                            *
*  Welcome to IBM AIX Version 3.1!                                           *
*                                                                            *
*                                                                            *
*  Please see the README file in /usr/lpp/bos for information pertinent to   *
*  this release of the AIX Operating System.                                 *
*                                                                            *
*                                                                            *
******************************************************************************

1 unsuccessful login attempt since last login
Last unsuccessful login: Fri Oct  7 08:20.20 1994 on pts/1 from 9.67.38.88
Last login: Fri Oct  7 08:10:50 1994 on pts/1 from 9.67.38.88
[YOU HAVE NEW MAIL]
<rs60001>#              1
3174 TELNET> status     2
Connected to 9.67.38.71
Operating in character-at-a-time mode.
escape     [$]
                        3
<rs60001>#              4
```

Figure 292. TCP/IP Using STATUS Command

1 At this point, you are in session with the RS/6000 host.

2 At this point, you have escaped to the local mode and issue the STATUS command. The resulting three messages show the connection status, the operating mode, and the character that will allow you to escape to the local mode.

3 The display will stay at this point until you press Enter.

4 When you press Enter, you are again in session with the RS/6000.

DISPLAY Command

Purpose: The DISPLAY command, without any argument, will show the current operating parameters and their settings. The settings can be changed by the SET or TOGGLE command.

Command Format: DISPLAY **(option (option (option ...)))**

where:

option Is one of the options set by the SET or TOGGLE command.

Example Display:

```
3174 TELNET> display
 2          1
won't - map received carriage returns
won't - recognize local control characters
won't - wrap long output lines
will - translate backspace/delete

 3          4
escape     [^L]
terminal   DEC-VT100
erase      [^H]
interrupt  [^Z]
kill       [^U]
quit       [^X]

3174 TELNET>
```

Figure 293. TCP/IP Using DISPLAY Command

This display shows the current parameters and their settings:

1 Shows the parameters that can be changed by the TOGGLE command from "will" to "won't" and vice versa.

2 Shows the current TOGGLE values. For example, if you issue the following command:

TELNET> toggle crmod

the result will show the following change:

will - map received carriage returns

3 Shows the parameters that can be changed by the SET command.

4 Shows the current SET values. For example, if you issue the following command:

TELNET> set escape $

the result will show the following change:

escape [**$**]

SET Command

Purpose: The SET command allows you to assign a function to a specific keystroke. You can also set a terminal type string to send in response to a terminal type negotiation (for ASCII terminals).

Command Format: SET *option key*

where:

option Is one of the following:

- **escape** Is the character that will place you in local mode.
- **terminal** Is the string which will be used in terminal type negotiation.

The following need ′localchars′ to be toggled on:

- **erase** A character that will cause an Erase Character.
- **interrupt** A character that will cause a TELNET Interrupt.
- **kill** A character that will cause an Erase Line.
- **quit** A character that will cause a Break.

key Is one of the following:

- **¬ x** A control key (¬ e represents Ctrl-e or X′05′).
- **x** A non-alphanumeric character.
- **string** The terminal type for host negotiation.

TOGGLE Command

Purpose: The TOGGLE command allows you to switch the setting (from “will” to “won′t,” or vice versa) of certain local functions.

Command Format: TOGGLE *option (option (option ...))*

where:

option Is one of the following:

- **crmod** Mapping of received carriage returns.
- **localchars** Recognize local control characters.
- **wrap** Wrap long output lines.
- **bs** Backspace as a delete character function.

SEND Command

Purpose: The SEND command allows you to send special control sequences to the remote host. It also gives you the ability to pass the current escape character to the remote host, since the 3174 will intercept this character if it is typed on the keyboard.

Command Format: SEND *option (option (option ...))*

where:

option Is one of the following:

ayt	TELNET ″Are You There″ command.
brk	TELNET ″Break″ command.
break	TELNET ″Break″ command.
ec	Erase Character.
el	Erase Line.
escape	The current escape character.
ip	TELNET ″Interrupt″ command.
interrupt	TELNET ″Interrupt″ command.
intp	TELNET ″Interrupt″ command.
intr	TELNET ″Interrupt″ command.
nop	TELNET ″No Operation″ command.
synch	TELNET ″Synch Operation″ command.

HELP Command

Purpose: The 3174 displays help information for the requested commands, for example, if you need an explanation of a command and its options. It is the same as the ? (question mark) command.

Command Format: {HELP|?} *(command (command (command ...)))*

where:

command Is one of the other local mode commands.

21.10.9 Special Considerations for ASCII Terminals

When you are accessing a TELNET destination from an ASCII terminal, the data received from your terminal is sent to the remote host unchanged.

Terminal Types

If you are using a 3174 User Defined Terminal (UDT), use the SET command to enter the name of your terminal. Do this before you issue an OPEN command. The 3174 will send this character string to the host, in response to a terminal type negotiation request.

If you do not use the SET command, the 3174 uses pre-defined character strings as answers when the host asks for the terminal type. The character string is determined by the station type of the terminal, as follows:

Station Type	Character String Sent to Host
A2	ADDS-VIEWPOINT-A2
A7	ADDS-VIEWPOINT/78
E1	HAZELTINE-1500
E7	HAZELTINE-ESPRIT
H2	HP-2621
I1	IBM-3101
I2	IBM-3151

I5	IBM-3161
I7	IBM-3162
I4	IBM-3164
L1	LSI-ADM-11
L3	LSI-ADM-3A
L7	LSI-ADM-1178
T1	TELEVIDEO-912
T7	TELEVIDEO-970
V1	DEC-VT100
V6	DEC-VT220
V2	DEC-VT241
V5	DEC-VT52
M1	MINTEL-1B
W1	WYSE-50
X4	TEKTRONIX-4205
S1	ANSI
Others	UNKNOWN

Operation: ASCII Terminal

Some other things to note about using the 3174 TCP/IP Telnet Support from an ASCII terminal are:

- To request the Connection Menu, enter the escape key while in local mode.

  If you have an active Telnet session, enter the escape key twice - the first time, to enter local mode, and the second time to access the Connection Menu.

- If your terminal uses MLT to access more than one session, you must invoke the Connection Menu before using the Change Screen sequence.
- You cannot use Copy Session to Session functions while your LT is in TELNET mode.
- An LT in TELNET mode cannot be part of a Split Screen workgroup.

21.10.10 Special Considerations for 3270 Terminals

When you are accessing a Telnet destination from a 3270 terminal, the data received from your terminal is converted into an ASCII datastream that the remote host understands. Your terminal may operate differently from the way it does when you access a 3270 host. For example, there may be a delay after you press a key before the corresponding character appears on your screen. This is because the remote host usually provides the echoing of the keystroke. Also, the functions provided by some keys may be different from those you are used to. For a full description of how to use your 3270 terminal with ASCII hosts, refer to *Terminal User's Reference for Expanded Functions*.

Operation: 3270 Terminal

Some special things to note about using the 3174 TCP/IP TELNET Support from a 3270 terminal are:

- You can use Copy Session to Session function only to copy from a TELNET screen to a 3270 screen. You cannot copy to a TELNET screen.
- LTs in TELNET mode may be part of a Split Screen workgroup. However, you cannot do Split Screen setup functions from an LT in TELNET mode. You must access the Connection Menu on the LT before entering Split Screen setup.

21.11 If Things Go Wrong...

The 3174 TCP/IP Telnet Support adds the following online tests:

- Test 2 Option 4 - to display AEA and TCP/IP configuration panels.
- Test 3 Option 3 - to display 3270 device status, including TCP/IP connections and information.

Here are some actions you can take if you have trouble with your session:

1. If you are communicating with a TCP/IP host, escape to the local mode. Use the STATUS command to get the status of the session.
2. If your session appears hung, or you want to interrupt the host, escape to the local mode and use the SEND command to send an interrupt to the host.
3. Failure messages from OPEN and PING requests may contain error codes which can be found *Using 3174 in TCP/IP Networks*, GG24-4172. Use the error codes to help you diagnose the problem.
4. If you want to end the session, escape to the local mode and use the CLOSE command.
5. To see if a host is active, use the PING command. Since you cannot use the PING command from an active connection, you may need to use another LT, or CLOSE the active connection before issuing the PING command.
6. You can use the 3174 online tests /3 (for 3270 terminals) or /12 (for ASCII terminals) to display the connectivity of the LTs at any port. If an LT has selected a TCP/IP destination from the Connection Menu but has not used the OPEN command to start a session, these online tests will indicate the LT is in the local mode. If there is an active connection with a remote TCP/IP host, the host IP address is shown (see Figure 294 on page 657).

21.11.1 Online Test / 3,3,26 panel

```
                 ______ Connectivity for PN 03, HG 26 _______

  Adapter (HG) status:          Enabled
  Port (PN) status:             Powered on
  Device type:                  Video display (MLT)


  Current connectivity -
                      Host
         LT    Bound  Addr    IDn    HG_PN  Host/Station Name

  ACTIVE 1      Yes   002     1A1    16     3270 host          1
         2      n/a   n/a     n/a           009.067.038.071    2
         3      n/a   n/a     n/a           TELNET Local Mode  3
         4      No    014     1A4           LT not available   4
         5            n/a     1A5           LT not available   5



 To go directly to other tests, enter: /Test,Option
 Select Test; press ENTER ===>

 PF:  3=Quit  12=Test Menu
```

Figure 294. Online Test /3,3,26

1 LT-1 has a session with a 3270 host; the ACTIVE indicates this LT is currently being displayed on the screen.

2 LT-2 has an active connection to the TELNET host shown.

3 LT-3 is in TELNET local mode.

4 LT-4 is displaying the Connection Menu and has a local address customized in the PAST.

5 LT-5 is displaying the Connection Menu but does not have a local address customized in the PAST.

21.12 Data Flows

Figure 295 on page 659 shows an example flow of TCP/IP traffic to initiate a session for a LT. The flow shows these steps:

1. The user has already selected one of the TELNET options from the Connection Menu. He then types in `open MVS1.HOST1`.
2. 3174 TCP/IP Telnet Support uses the Domain Name Service function to determine the IP address associated with that host name. If the current routing table does not contain an entry for this host, a request would be sent into the network to the Domain Name Server to resolve the address. For this flow, assume that 3174 TCP/IP Telnet Support already has an entry for MVS1.HOST.
3. 3174 TCP/IP Telnet Support determines that the request should be forwarded to the router at 128.10.0.2.
4. It does not know the MAC address of the router, so it uses ARP to find out.
5. 3174 TCP/IP Telnet Support forwards the request to start a session (the first TCP message sent to do this is a SYN request).
6. The router discovers that the host is on a network that it can address directly and uses ARP to seek out the host′s MAC address. It forwards the request.
7. The host processes the request, builds a reply and consults its routing tables which point to the router.
8. On the return journey, neither the host nor the router needs to use ARP, because they have both seen recent ARP activity which identifies the MAC addresses they need. These combinations are kept in a sort of cache and are discarded at regular intervals so that any changes can be reflected. Thus, such discovery activity is not restricted to the login, but could happen at any point during the user′s host session.

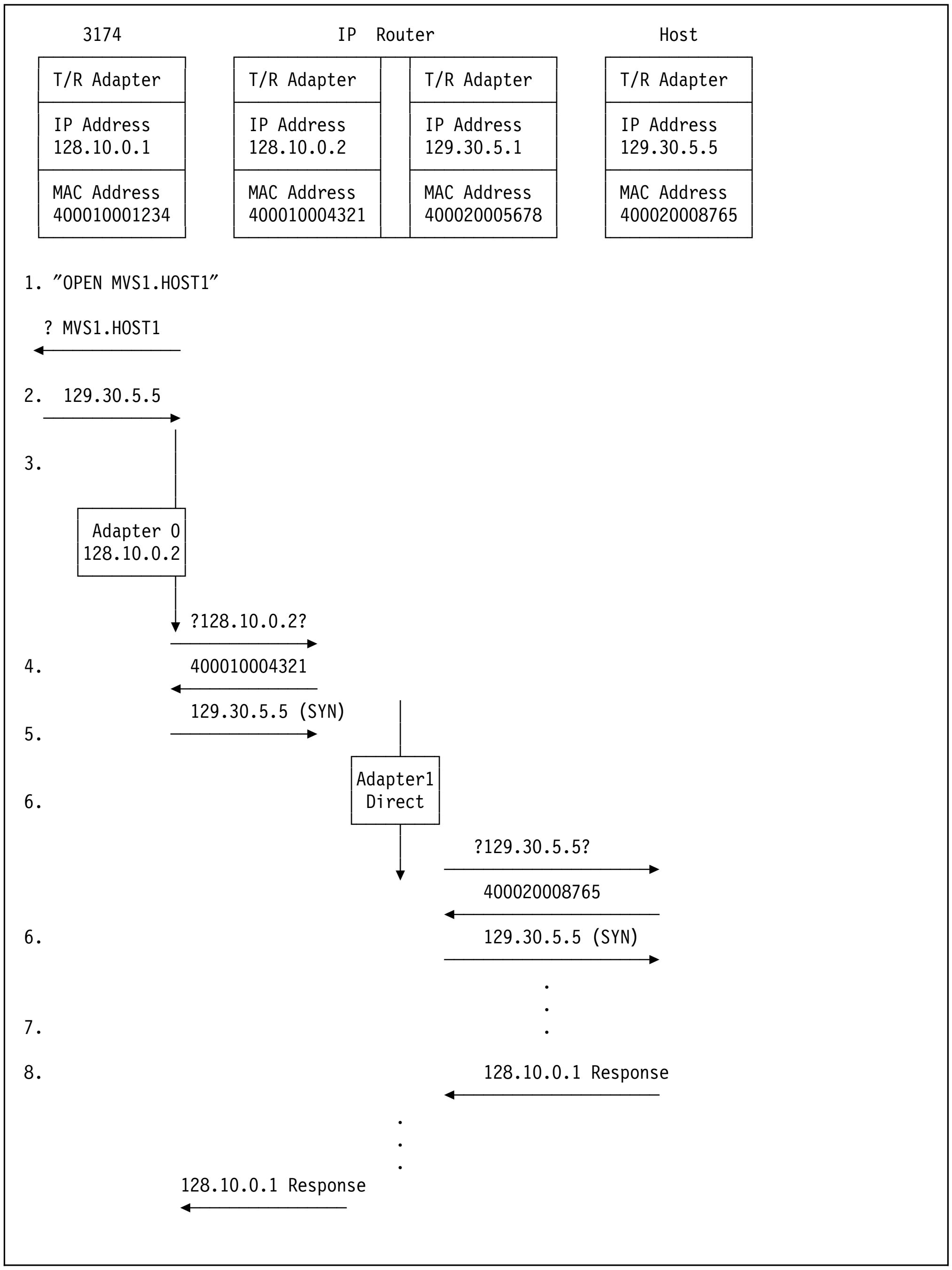


Figure 295. TCP/IP Connection Establishment

Chapter 22. ISDN

Integrated Services Digital Network (ISDN) is a network conforming to CCITT standards for digital end-to-end communication over high bandwidth transmission facilities. ISDN allows the many forms of communication (voice, data, facsimile, video, etc.) to be digitized and share a common data or telephone line. The main advantages over traditional voice and data networks is this ability to integrate services, and to carry the digitized communication at relatively high speeds and low error rates.

The 3174 supports ISDN communication in two ways:

- Using the 3174 ISDN Basic Rate Interface (BRI) Adapter, with supporting microcode in Configuration Support-C Release 1 and later releases, and ISDN Data Link Control (IDLC) protocols, for native attachment to the ISDN network.
- Using the 7820 ISDN Terminal Adapter, as a network interface adapter, and SDLC for attachment to the ISDN network.

This chapter will only address the first method; that is, using the 3174 ISDN BRI Adapter for native attachment. This chapter breifly discusses the following:

- ISDN concepts
- Hardware and software requirements
- 3174 requirements and customization
- An example scenario using the 3174 ISDN BRI Adapter

Further information can be found in the chapter dedicated to ISDN in the ITSO book *3174 in Higher Speed WAN and Multiprotocol Network,* GG24-4376.

ISDN should be considered in all cases where workstations are connected to switched public networks. The 64 Kbps bandwidth, high quality digital lines, and quick call set up capabilities can be very beneficial. ISDN is excellent in sites which need only limited connection to the host, but need quick response upon connection. Examples of these situations are:

- Infrequent file transfer
- Leased line backup
- Telemarketing applications
- Remote image transfer
- Geographically dispersed workstations
- Workstations requiring rapid access to various hosts
- Ability to integrate voice and data into one network

22.1 Overview

An Integrated Services Digital Network (ISDN) is a network designed to carry digital data end-to-end over high bandwidth (64 Kbps) channels. What makes ISDN so different from the traditional data and voice networks, however, is that ISDN channels can be used to carry voice and various forms of communication over the same physical interface. This means that the same line can transport, for example, voice and data simultaneously.

The ISDN services, protocols and interfaces are all defined in a series of CCITT (International Telegraph and Telephone Consultative Committee) Recommendations known as the *I-Series*. These standards provide for international network conformance and connectivity. What is important to understand is that although the CCITT Recommendations define the operational requirements between the user′s equipment and the ISDN network, it does not specify the internal workings of the network. The internal operation of the network is transparent to the user. Data carried end-to-end is likewise transparent to the network and not covered by the CCITT Recommendations. What data being transmitted between connected devices looks like depends entirely on the type of device and the software running it.

The ISDN standards also provide for additional network features such as semi-permanent connections, call tracing, closed user groups, and so forth. Provision of these services varies from network to network. Users can in most cases select from a range of additional features when subscribing to a network.

With ISDN, both users and network providers will begin changing from using separate networks for different services to an integrated network providing all services.

22.1.1 The ISDN Solution

The aim of ISDN is to provide universal connectivity using a single interface and a high speed digital network to transport all types of data.

Technological advances have led to the ability to send very high speed data over twisted pair wiring. It has been determined that the ordinary twisted pair connection to most homes and offices is able to carry around 200 Kbps, an enormous difference to the 3 Kbps it is presently being used for. In fact, the copper wire infrastructure already in place is able to provide the backbone for a modern communication network with the ability to carry not only voice but all other user data and, in many instances, to do it simultaneously. A basic ISDN interface can be provided using the original telephone twisted pair wiring and provide two 64 Kbps user channels and a 16 Kbps signalling channel. With this in mind, a user would be able for example to have his/her phone, computer and fax all use the same physical connection to the network and have the network switch the call to the appropriate remote site (see Figure 296 on page 663).

On a traditional switched network, signalling to the network was done on the same circuit as was used to carry the data. Once the connection was made the ability to “talk” to the network was lost until you made another call. Because ISDN uses a separate D-channel for signalling, the ability to “talk” to the network remains. This is irrespective of whether there is data traffic or not. The ISDN network is able to concurrently provide information on the call status such as which number the call originated from, what the ongoing cost of the call is and so forth. This is called out-band signalling.

A major point in favor of network providers implementing an ISDN was that the network could be put in place using the millions and millions of kilometers of wire already installed. Replacing that infrastructure would have been physically and financially impossible in many countries. The only equipment required is ISDN compliant user terminals and the network hardware.

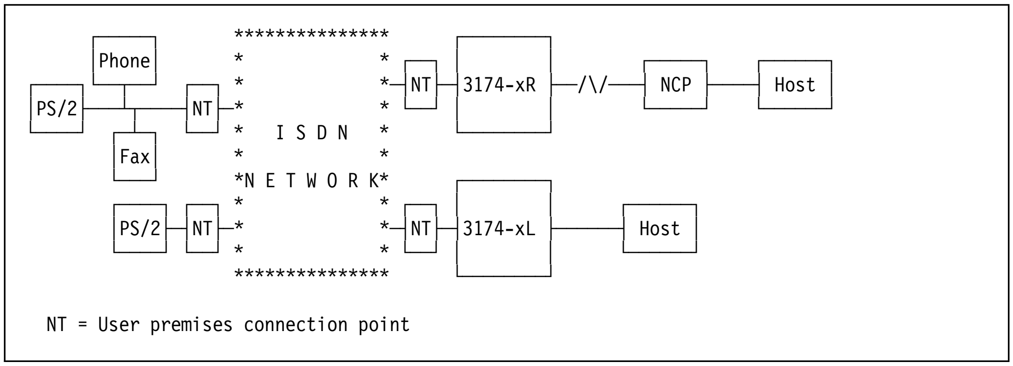


Figure 296. ISDN Network Connection

22.1.2 User Benefits Of ISDN

The demands on businesses today are changing dramatically due to an increasing need to compete in a wider market place, in many cases an international one. This brings additional demands in increased competition and the need to provide a competitive edge to survive.

In many cases, the services a business can provide will give it a competitive edge. To do this requires that companies have the ability to share more and more information both internally and with other companies. They also need the ability to put in place applications that take advantage of modern technology. Enhanced voice/data and image/data applications will not only change the way they do business but will ensure that they stay in business.

While making these changes, business management and the containment, if not the reduction, of costs are critical. One of the major requirements needed to put all these changes in place is the need for better communication. ISDN provides that ability. Not only does the customer now have access to a high performance network but his applications can now take advantage of information provided by the network and make decisions based upon it.

An example is a service organization using the calling party identification information provided by the network. When a call from a customer is answered, the caller can be automatically routed to a selected operator or perhaps to a database that will provide information based on the caller′s phone number.

Another example would be where a caller is displayed detailed information or a diagram on a display attached to the phone set he is using. An electronic notepad facility could also allow a caller to more clearly explain his requirements to the other party. Both the voice and data are being handled by a single terminal and being sent over the same communication line.

These types of applications cannot be handled using current analog solutions. While these are simple examples, more and more sophisticated applications will be developed using integrated voice/data/graphics and so forth. The ability of the customer to understand and to migrate to applications that exploit the ISDN capabilities will be key to them gaining the competitive edge.

22.1.3 Additional Advantages

Some other advantages of ISDN technology that should be considered when looking at communication needs are:

- High speed bandwidth on an as-required basis

  The cost of permanent high speed connections cannot always be justified and switched analog connections at this speed are not available.

- The cost of using ISDN

  Depending on the implementation and strategy of various carriers, the pricing structure of an ISDN service may offer significant cost benefits over other data and voice services.

- Ideal for high speed backup of a leased line network
- Can be used for LAN bridging
- Variety of network connections are not needed

  This means reduced cost to the business.

- Businesses can adopt a phased approach

  Communication requirements can be progressively migrated to ISDN as the appropriate services and equipment become available.

- Fast connect time, standard interface approach and digital end-to-end performance offer definite advantages and cost savings

As applications and services requiring high bandwidth transmission facilities become common place, ISDN may be the only way for many users to take advantage of these facilities at a cost they can afford.

22.1.4 Other Considerations

Unfortunately the original ideas behind ISDN have not eventuated quite the way they were planned. A number of factors have led to variations in the implementation of the standards by both equipment manufacturers and network providers. While the CCITT standards are well defined they define only the lower three layers of the OSI model. This has led to different implementations of the higher layers. The rush by manufacturers to take advantage of the move to ISDN has led to many "ISDN compatible" equipment arriving in the market place that does not offer connectivity with anything other than a similar piece of equipment.

The usual advice of "test it first" applies with ISDN as it does with everything else. Network compatibility with "ISDN compatible" equipment should be thoroughly tested to ensure that the equipment you are connecting conforms to the network specifications and will in fact work as you require it to.

You should also be aware that not all ISDN networks around the world have implemented all the services provided for under the CCITT Recommendations. Also, there may be further levels of incompatibility in implementation from network to network.

22.1.5 Where the 3174 Fits

The 3174 ISDN BRI Adapter provides two B-channels for data and one D-channel for signalling for each port, with four ports on each adapter.

There are two ways for the 3174 to connect to an ISDN: via the 3174 ISDN BRI Adapter or via a terminal adapter such as the IBM 7820 (see Figure 297). It should be noted that, because of different implementations, a 3174 using the native BRI adapter cannot communicate with equipment connected via an IBM 7820.

This chapter deals specifically with the 3174 ISDN BRI Adapter. Using this adapter, the 3174 can act as a ISDN gateway, allowing a PS/2 or an AS/400 with a native ISDN adapter to access 3270 hosts. The various connectivity options are covered later. The 3174, however, does not support the following:

- ISDN Primary Rate Interface
- The 3174 as a device on the downstream side of the ISDN network
- X.25 over either the B-channel or D-channel
- Voice

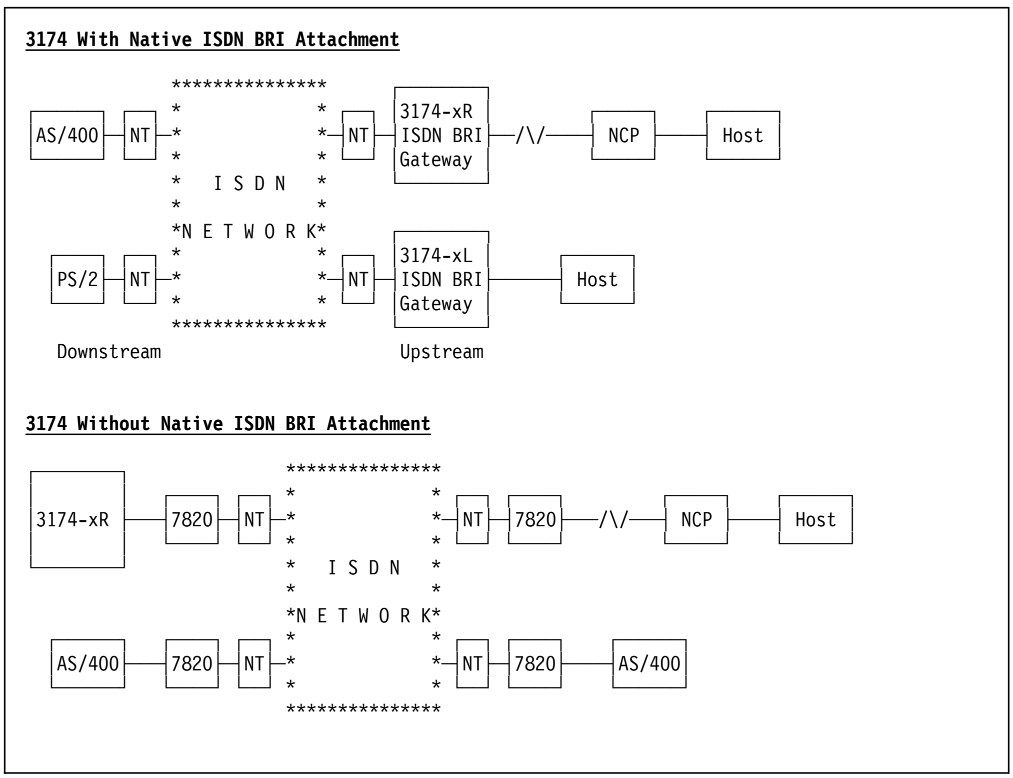


Figure 297. Possible 3174 ISDN Connections

22.2 Planning for ISDN

This section provides guidance for the attachment of intelligent workstations and AS/400s to the 3174 via ISDN.

The 3174 ISDN support is provided as a gateway function, similar to that provided by the Token-Ring Gateway. The workstations and AS/400s attached through the ISDN network are seen from the 3174 as DSPUs, in the same way as Token-Ring DSPUs. In fact, the Token-Ring and ISDN gateways share common functions. The ISDN gateway passes the data through a logical link between the upstream host connection and the downstream ISDN connection, and provides the function to establish and terminate the link between these connections.

Like the Token-Ring DSPUs, the host connection upstream of the 3174 is defined by the sub-channel or SDLC addresses. The common gateway support treats the host connections for Token-Ring and ISDN DSPUs identically.

The ISDN connection is defined by an ISDN B-channel, the ISDN Adapter port carrying the B-channel, and the ISDN Adapter containing the port. Unlike the Token-Ring connections, the ISDN connections are switched and exist only for the duration of an ISDN call from the DSPU to the 3174.

A DSPU is not restricted to a particular ISDN connection. The DSPU may call any port on any ISDN Adapter and obtain a B-channel, if available, from the port dialed.

22.2.1 Connecting to an ISDN Port

Each DSPU is identified by its PUID. When the DSPU dials in to the ISDN Adapter, the 3174 checks to see if the PUID is customized. If it is, the PUID is mapped to the host connection address (sub-channel or SDLC) provided during customization. The host connection is then established using the address mapped. Hence, PUIDs are not tied to any particular port.

If the PUID is in use, the 3174 will not allow another connection to be made. It is, therefore, possible for you to have more workstations attempting to access the 3174 through ISDN than there are available channels or ports. In this situation, the workstations contend for access and access is granted on a first-come first-served basis.

It would be useful to have your ISDN ports on the 3174 defined as a *hunt group*. This would allow the network to pass a call automatically on to the next free port if the port called was busy. This feature may be available from your network provider or your PABX, if your ISDN is going through your PABX.

22.3 ISDN DSPUs Supported

The following can be connected through ISDN to the 3174 ISDN BRI Adapter:

- An IBM PS/2 (AT bus) running DOS with the IBM ISDN Interface Coprocessor, the ISDN Coprocessor Support Program, and a 3270 emulation program, such as Personal Communications/3270 (PC/3270) V2.0.
- An IBM PS/2 Model 50 or above (Micro Channel architecture) running DOS with the ISDN Interface Coprocessor/2 Model 2, the ISDN Coprocessor Support Program, and a 3270 emulation program, such as PC/3270 V2.0.
- An AS/400 acting as a 3x74 with a native ISDN adapter.

The 3174 ISDN BRI Adapter connects to the ISDN network network at reference points S and T. This means that it can be connected to a PABX supporting ISDN or to the network provider's ISDN entry point.

The only protocol supported by the 3174 on the B-channel, which is used to transmit user data is ISDN Data Link Control (IDLC). This is an OSI data link layer protocol designed and optimized for ISDN applications. IDLC is a peer-to-peer full duplex protocol. IDLC conforms to the CCITT recommendation Q.922. IBM believes that IDLC provides a firm basis and direction for the development of ISDN services consistent with public network standards.

22.4 ISDN Networks Supported

With Configuration Support-C Release 1: The following networks are supported by the 3174 ISDN BRI Adapter:

- U.S. and Canada AT&T 5ESS/5E4
- U.S. and Canada AT&T 5ESS/5E5
- U.S. and Canada Northern Telecom DMS100/BSC29
- Japan NTT INSNET-64
- U.K. BTNR-191
- France VN2
- Germany 1TR6 SW1
- Germany 1TR6 SW2

With Configuration Support-C Release 2: The following networks are supported by the 3174 ISDN BRI Adapter, in addition to those supported by Configuration Support-C Release 1:

- Sweden
- Belgium
- Switzerland
- Australia
- Denmark
- Italy
- Norway

You can specify only one network identifier per adapter. Check with your IBM branch office and your network provider to make sure that network acceptance testing (homologation) has been done successfully and that the 3174 can connect to ISDN in your country.

22.5 3174 Models Supported

The maximum number of ISDN BRI Adapters that can be installed in a 3174 depends on the model. Table 32 on page 668 shows the maximum number supported by each model.

Table 32. 3174 ISDN Gateway Model Support	
Number of ISDN Adapters	**Models Supporting**
2	61R, 62R
3	01L, 01R, 02R
4	11L, 11R, 12L, 12R, 21L, 21R, 22L

Each 3174 ISDN BRI Adapter has four ports; each port supports two B-channels at 64 Kbps and one D-channel at 16 Kbps. Thus, each 3174 ISDN BRI Adapter may support up to eight (4 x 2) connections to DSPUs. Depending on the model, a 3174 may, therefore, support up to 32 DSPUs. The maximum number of ISDN DSPUs that may be customized is specified in question 190.

The 3174 ISDN BRI Adapter works with both telephone twisted pair (TTP) wiring or the Type 2 Voice Grade Media of the IBM Cabling system. TTP wiring usage should be avoided in a high electrical noise environment, such as next to an elevator.

You do not need to order the cables separately. You will receive one cable (5 meters) for each of the four ports on the adapter. The longer end plugs into the 3174 and the other end into the the ISDN adapter in the wall, patch panel, or PABX. The 3174 cable end is keyed to the 3174 with an extra bit of plastic. It cannot fit into a network connection socket. The network end could fit into either socket. The box in the middle is a fuse.

The 3174 ISDN BRI Adapter supports only incoming calls.

The 3174 ISDN BRI Adapter supports only PU T2.0. Although ISDN is in Configuration Support-C, the ISDN DSPUs will not be able to use the Peer Communication or APPN functions.

The ISDN DSPUs are defined to VTAM as multidrop PUs. Configuration Support-C includes the Group Poll feature, which should be used when you have multiple DSPUs on a 3174 (see 4.7.7, "Group Poll" on page 110 for further information).

The 3174 ISDN BRI Adapter communicates only to the primary host. An ISDN DSPU cannot communicate through the CCA. Also, it cannot communicate to a workstation or host on the Token-Ring.

Network management of the ISDN gateway and DSPUs is carried out normally. Alerts are generated and passed to NetView on an SSCP-PU session. New alerts exist to provide statistical data on ISDN adapter errors and performance.

22.6 PS/2 Hardware/Software Requirements

Each 3174 ISDN BRI Adapter can support eight PS/2s, each with its ISDN Coprocessor Support Program and either the ISDN Interface Coprocessor or ISDN Interface Coprocessor/2 Model 2. A 3270 emulator program, such as the PC/3270 V2.0, is also required to access the host.

IBM ISDN Interface Coprocessor/2 Model 2

The IBM ISDN Interface Coprocessor/2 Model 2, with supporting software, allows attachment of the IBM Micro Channel architecture PS/2 family (Models 50 and above) to the 3174 ISDN BRI Adapter. The ISDN Interface Coprocessor/2 Model 2 can be used with DOS and OS/2 workstations, although OS/2 does not currently support IDLC (see Statement Of Direction).

Statement Of Direction (Announcement Letter 391-050)

OS/2 EE ISDN BRI Support
April 22, 1991

Integrated Services Digital Network (ISDN) is an evolving all-digital public network based on international standards that allows integration of a wide range of applications within a single network connection.

IBM intends to provide ISDN basic rate communications support for Operating System/2* (OS/2) Extended Edition (EE) operating systems resident on IBM workstations with the IBM ISDN Interface Coprocessor/2 Model 2 installed.

Announcement of availability of ISDN for the OS/2 EE operating system will be dependent on IBM′s business and technical judgement.

The protocols supported by the Coprocessor/2 Model 2 are SDLC, LAP-B, LAP-D, HDLC, and IDLC. The protocol required for the 3174 is IDLC.

The ISDN Interface Coprocessor/2 Model 2 adapter handles:

- Processing associated with communication (relieving the PS/2 of this workload)
- Preparing and processing incoming and outgoing data
- Processing application tasks
- Controlling memory and peripheral chips

Programming Requirements:

- IBM DOS 3.3 or above
- ISDN Coprocessor Support Program V1.1
- Your local network support program, for example:
  - In Australia, Microlink** Network Support
  - In Japan, INSNET64** Network Support

Multiple ISDN Interface Coprocessor/2 Model 2 adapters may be installed in appropriately configured PS/2s, having the required number of available slots:

- Up to three adapters in a DOS environment
- Up to four adapters in an OS/2 environment

For a more detailed description of this adapter, see *IBM ISDN Interface Coprocessor/2 Model 2 Technical Reference*.

IBM ISDN Interface Coprocessor

The IBM ISDN Interface Coprocessor supports AT bus PS/2s, such as:

- PS/2 Model 30 (8530-E21, E31, E41)
- PS/2 Model 35 SX (8535-043)
- PS/2 Model 40 SX (8540-043, 045)

Programming Requirements:

- IBM DOS 3.3 or above
- ISDN Coprocessor Support Program V1.1.1
- Your local network support program, for example:
  - In Australia, Microlink Network Support
  - In Japan, INSNET64 Network Support

Up to three IBM ISDN Interface Coprocessor adapters may be installed in appropriately configured DOS PS/2s, having the required number of available slots.

IBM ISDN Coprocessor Support Program

IBM ISDN Coprocessor Support Program V1.1 and V1.1.1 supports the appropriate PS/2 ISDN adapter to allow PS/2s to communicate over ISDN using the Basic Rate Interface (BRI). The ISDN Coprocessor Support Program works in conjunction with the ISDN Interface Coprocessor and the ISDN Interface Coprocessor/2 Model 2.

The ISDN Coprocessor Support Program provides support for up to three ISDN adapters in a PS/2. It enables some of the following configurations:

- 3270 network station connection to a 3174
- ISDN LAN gateway to a 3174 (via PC/3270 only)

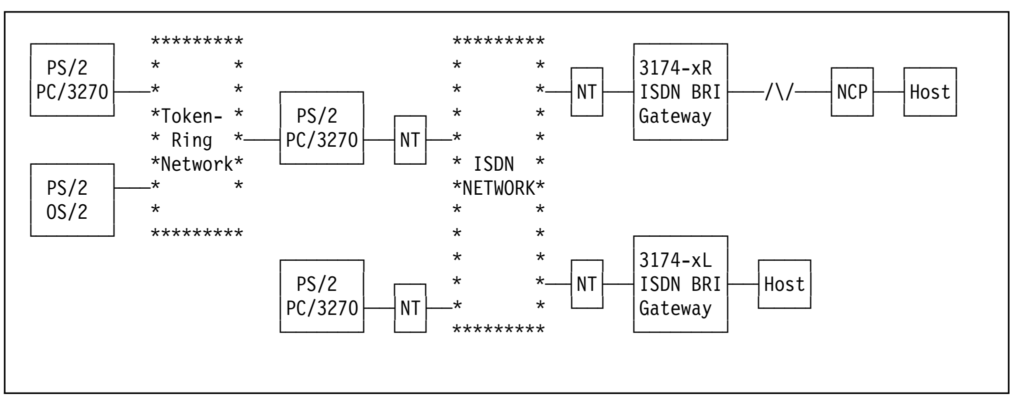


Figure 298. PS/2 and 3174 ISDN Connectivity

PC/3270 Limitations

Limitations when using ISDN with PC/3270 are as follows:

- For a network station configuration (one standalone PC), you can use:
  - One B-channel on each of one or two ISDN adapters
  - Two B-channels on one ISDN adapter

- For a gateway configuration, you can use:
  - One B-channel on one ISDN adapter
- You cannot use PC/3270 if applications using the DOS extended memory option are active in the same computer.
- The expanded or extended memory configuration option in PC/3270 is not supported.
- DOS must not be suspended when running PC/3270 over ISDN. DOS must run continuously, or the data transmission is interrupted. To suspend a DOS session you would press Alt S. For further information, see “Suspending DOS” in the *Personal Communications/3270 Users Guide*.

OS/2 Limitations

OS/2 cannot be used today to communicate via ISDN with IDLC protocol to the 3174. It is a statement of general direction for OS/2 Communications Manager to be able to support the ISDN adapter.

You can use the adapter and program to communicate between two network station OS/2s running SE 1.2 or above. Further discussion of this is not within the scope of this document.

ISDNBIOS

ISDN Basic Input/Output System (ISDNBIOS) is a software interface that enables computers to communicate over ISDN through the Basic Rate Interface. It is used by the ISDN Coprocessor Support Program to gain access to ISDN

22.7 AS/400 Hardware/Software Requirements

The AS/400 can communicate to a 3174 as a DSPU. OS/400 V2R1 and above provides the ISDN support for the new communication controller/IOP and the new communication adapter/IOA.

The following is required to implement ISDN on an AS/400:

- The Six-Line Communications Controller (feature #2623)

  This new communications controller is a prerequisite for the ISDN adapter and will support up to two ISDN adapters. It is available on all D and E models of the AS/400. When it is used for ISDN, unused lines are not available for other protocols.
- ISDN Adapter/IOA (feature #2605)

  This communications adapter consists of an adapter card and a six meter (20-foot) cable. It requires the new Six-Line Communications Controller (feature #2623). It is available on all D and E models of the AS/400.
- MFIOP Expansion (feature #3116)

  This feature adds storage and is required to use ISDN on an E02 model.

If you wish to connect an AS/400 to the 3174 via ISDN, you should refer to *IBM AS/400 ISDN Connectivity*. It discusses the implementation of ISDN on the AS/400 and the considerations related to ISDN connections. Also, contact your IBM representative for specific requirements and capabilities for your AS/400.

22.8 3174 Customization

This section discusses the questions related to ISDN when you customize the 3174.

22.8.1 Relationship between Questions 104, 105, And 190

Each ISDN DSPU workstation has a PUID assigned in its configuration. The PUID is mapped in the 3174 to a host address. In customizing the 3174, you are, therefore, required to specify the mapping of the PUIDs to the host addresses. Questions 104, 105 and 190 affect the number of host addresses and ISDN DSPUs that you can customize, as follows;

- Question 104 is the address of the 3174 with the ISDN Adapter.
- Question 105 is the upper limit of the range of addresses available to both the Token-Ring and ISDN gateway functions.
- Question 190 is the number of ISDN DSPUs that can be supported and which will need addresses from the range provided by questions 104 and 105.

Figure 299 shows how the address range is divided between the 3174 gateway, the Token-Ring DSPUs and the ISDN DSPUs.

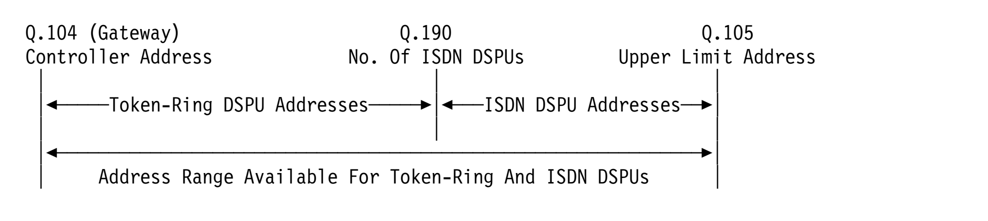


Figure 299. 3174 Address Assignment

The highest value that can be specified for question 190 is 32 (actually entered as a hexadecimal value 20 during customization). For example, assume you are customizing a 3174 for the following:

- 3174 gateway address at X′40′
- 16 Token-Ring DSPUs
- 10 ISDN DSPUs
- Upper limit address of X′5F′

Your customizing responses will be as follows:

- Question 104=40
- Question 105=5F
- Question 190=0A

The addresses are assigned as shown in Figure 300 on page 673, with unused addresses X′51′ through X′55′ available for Token-Ring DSPUs in the future.

```
Q.104 (Gateway)                      Q.190           Q.105
Controller Address                No. Of ISDN DSPUs   Upper Limit Address
 |                                      |                  |
 |                                      |                  |
 |     Token-Ring DSPU Addresses        ISDN DSPU Addresses
 |   ┌─┬─┬─┬─┬─┬─┬─┬─┬─┬─┬─┬─┬─┬─┬─┐    ├─┬─┬─┬─┬─┬─┬─┬─┬─┬─┤
 ▼   ▼ ▼ ▼ ▼ ▼ ▼ ▼ ▼ ▼ ▼ ▼ ▼ ▼ ▼ ▼ ▼    ▼ ▼ ▼ ▼ ▼ ▼ ▼ ▼ ▼ ▼ ▼
404142434445464748494A4B4C4D4E4F505152535455565758595A5B5C5D5E5F
 |                                 ▲ ▲ ▲ ▲ ▲                     |
 |                                 └─┴─┴─┴─┘                     |
 |                                   Unused                      |
 |◄──Address Range Available For Token-Ring And ISDN DSPUs──►|
 |                                                               |
```

Figure 300. 3174 Address Allocation

DSPUs can use up to 2 MB of controller storage depending on the number and the RU size. The storage is allocated based on the number of DSPUs customized and not on the number actually used.

22.8.2 Changes to Questions 104, 105, And 190

If a change is made to any one of questions 104, 105 or 190, the addresses available for the Token-Ring and ISDN DSPUs will change. For example:

- If questions 104 and 105 maintain the same values as before the change and question 190 is increased, then the number of Token-Ring DSPU addresses available will be decreased.
- If questions 104 and 190 maintain the same values as before the change and question 105 is decreased, then the number of ISDN DSPUs remain the same but the number of Token-Ring DSPU addresses available will be decreased.

Thus, when you change any of the three responses, you should modify your address definitions in VTAM (CUADDR) or NCP (ADDR), and your PUID mapping to those addresses, if necessary.

22.8.3 More ISDN DSPUs Than Available Ports/Addresses

You may have more workstations attempting to access the 3174 through ISDN than the number of 3174 ISDN BRI Adapter ports available. For example, you may have only two ISDN lines from your 3174-01R, with 40 PS/2s in the network contending for the two ports available. At any one time, only four PS/2s will be able to access through the four B-channels available.

Each PS/2 needs to be configured with a PUID, which must match the PUID customized in the 3174 and assigned to a host address. (Each PUID is assigned to one host address.) If you specify only four ISDN DSPUs (question 190=04), then you can only customize for four PUIDs and map them to four host addresses. In this situation, the four PUIDs must be used by all 40 PS/2s, for example, by dividing into four groups of ten PS/2s, with each group using one of the four PUIDs. However, only one PS/2 in each group is able to access through the 3174 at any one time.

A better approach is to configure as many unique PUIDs as possible for the 40 PS/2s, making it easier to identify the ISDN DSPU workstations.

The 3174 can be customized up to the maximum number of DSPUs its model can support, for example 16, 24, or 32, even if the required number of 3174 ISDN BRI Adapter are not installed. It will issue a warning message (status code 7045) during customization if the number of DSPUs is more than eight times the number of adapters installed. For example, with one adapter, the warning is given if you specify more than eight DSPUs, with two adapters, more than 16 DSPUs, with three adapters more than 24, and so forth.

Using the above example, you can specify a maximum of 32 ISDN DSPUs for the 3174-01R, allowing you to customize up to 32 PUIDs. The warning message mentioned above will be issued during customization, and a status code 399 xxx 7045 given each time the 3174 is IMLed. Although only four ISDN DSPUs can get through still, the advantage now is that you have unique PUIDs for 31 PS/2s and you only need to share one PUID for the other nine PS/2s. Remember, however, that DSPUs will be allocated controller storage once customized, even if they are not used.

Question 098: Online Test Password

You need to specify a password for question 098 if you wish to use:

- Online Test 16 Option 5 to change the error thresholds for a ISDN port
- Online Test 16 Option 6 to wrap a port on the 3174 ISDN BRI Adapter

Question 100: 3174 Model Designation

The model designation is one of the supported models shown in Table 33.

Table 33. ISDN Gateway Model Support

3174 Models Supported	No. of ISDN Adapters	No. of ISDN DSPUs	Q.190 Max. Value
61R, 62R	2	16	X′10′
01L, 01R, 02R	3	24	X′18′
11L, 11R, 12L, 12R, 21L, 21R, 22L	4	32	X′20′

Question 104: Controller Address

This is the address (in hexadecimal) of both the 3174 Token-Ring and ISDN gateway.

Question 105: Upper Limit Address

This is the upper limit address (in hexadecimal) of the range of addresses that can be assigned to Token-Ring and ISDN DSPUs.

Question 150: Gateway (Token-Ring and ISDN)

The response consists of two digits, used as follows:

- **Digit 1 - Token-Ring Gateway**
  - 0=This 3174 acts as a Token-Ring Gateway (default response).
  - 1=This 3174 does not act as a Token-Ring Gateway.
- **Digit 2 - ISDN Gateway**
  - 0=This 3174 acts as an ISDN gateway (default response).
  - 1=This 3174 does not act as an ISDN gateway.

Each digit response is independent of the other. Also, the ISDN gateway is not supported by the CCA. Hence, on the secondary SDLC panel, digit 2 does not appear.

Question 190: Number of ISDN DSPUs

Answer with the number of ISDN DSPUs in hexadecimal, by referring to Table 33 on page 674 for the appropriate 3174 model and number of ISDN Adapters.

Make sure you have enough controller storage for the number of DSPUs customized.

You can have more addresses than ISDN connections, up to the limit for your model. You will, however, get a warning during customization and on IMLing the 3174. Customizing more addresses is desirable when you have more DSPUs than channels (see 22.8.1, “Relationship between Questions 104, 105, And 190” on page 672).

ISDN PUID Assignment Panel

```
                 __________ ISDN PUID Assignment __________
                                                                40/LOCL
 Type in the ISDN PUID.  Each PUID must be unique and
 can not equal question 215.  Question 215 = 00000

    S   ISDN PUID       S   ISDN PUID       S   ISDN PUID       S   ISDN PUID
    51    _____         52    _____         53    _____         54    _____
    55    _____         56    _____         57    _____         58    _____
    59    _____         5A    _____         5B    _____         5C    _____
    5D    _____         5E    _____         5F    _____         60    _____
    61    _____         62    _____         63    _____         64    _____
    65    _____         66    _____         67    _____         68    _____
    69    _____         6A    _____         6B    _____         6C    _____
    6D    _____         6E    _____         6F    _____         70    _____









 PF: 3=Quit    4=Default    7=Back    8=Fwd    9=RtnH
```

Figure 301. ISDN PUID Assignment Panel

The ISDN PUID Assignment panel is used to map each PUID to a host address. The addresses are displayed automatically in the S column and cannot be modified. The number of addresses available for assignment is equal to your response in question 190. From the panel shown in Figure 301, we can deduce the following responses:

- Question 190=20 (that is, 32 ISDN DSPUs)
- Question 105=70 (that is, upper limit address is X′70′)

Each address in the S column should match the following:

- For a local gateway, the CUADDR parameter for the PU defined to VTAM
- For a remote gateway, the ADDR parameter for the PU defined to NCP

You specify the PUID in the ISDN PUID column. There should be as many PUIDs as there are addresses. The PUID matches with:

- On an AS/400, the last five hexadecimal numbers of the Exchange ID parameter in the IDLC line description (CRTLINIDLC)
- On PC/3270, the IDLC node ID

Question 803: ISDN Definition

Question 803 is displayed on the Device Definition panel. The valid responses are:

- 0=Do not define the ISDN (default response)
- 1=Define the ISDN

To define the 3174 ISDN adapters and channels, you have to respond to question 803 with a 1. With question 803=1, the ISDN Adapter Definition and the ISDN Channel Definition panels will be displayed.

ISDN Adapter Definition Panel

```
                 ________ ISDN Adapter Definition _________

  Type the Adapter Options for the ISDN Adapter(s).



    Adapter         Network            Inactivity
    Hardware                            Timeout
    Group No.                       (Y,N)      Range
    ---------       -------         ----------------

       36              2_             N         0030
       37              2_             N         0030
       38              2_             N         0030
       39              2_             N         0030




 All responses are correct
 PF: 3=Quit    4=Default    7=Back    8=Fwd
```

Figure 302. ISDN Adapter Definition Panel

Adapter Hardware Group No.: The first column is hard coded in the 3174 and shows the ISDN Adapter Hardware Group Numbers.

Network Type: The second column allows you to specify the network type. The valid network types are:

- 1=US and Canada AT&T 5ESS/5E4
- 2=US and Canada AT&T 5ESS/5E5
- 3=US and Canada Northern Telecom DMS100/BSC29
- 4=Japan NTT INSNET-64
- 5=UK BTNR-191
- 6=France VN2
- 7=Germany 1TR6 SW1

- 8=Germany 1TR6 SW2
- 9=Sweden
- 10=Belgium
- 11=Switzerland
- 12=Australia
- 13=Denmark
- 14=Italy
- 15=Norway
- 16 to 99=unassigned

Notes:

1. Network types 1 through 8 are available with Configuration Support-C Release 1.
2. Network types 9 through 15 are only available with Configuration Support-C Release 2. These are in addition to the network types supported by Configuration Support-C Release 1.
3. For any network type, you must provide an ISDN number for each data channel on the ISDN Channel Definition panel. This number will most likely be the same for each data channel associated with the same port, but will be unique between ports.
4. If you specify network type 3, you must provide a TEI value for each data channel on the ISDN Channel Definition panel.
5. If you specify network type 7 or 8, you must designate, on the ISDN Port Definition panel, which of the ports (if any) on the 3174 ISDN Adapter will be semi-permanent connections.
6. If you inadvertently enter an unassigned network type, the 3174 microcode defaults to network type 5. This default occurs in the 3174 microcode and will not be displayed on the ISDN Adapter Definition panel (that is, the unassigned value you specify on the panel will not be replaced by the value 5).

   With this default, which may not be suitable for your country network type, communication problems may occur on the ISDN channel during 3174 operation. If communication errors are encountered, check to ensure that the correct network type is entered on this panel.

Inactivity Timeout: If you wish the adapter to provide a disconnect on a B-channel with no data traffic flowing after a time period, specify Y and a timeout value in the Inactivity Timeout column. Valid timeout values are 0005 to 1440 (24 hours) minutes. The defaults are N and 0030 (30 minutes).

ISDN Port Definition Panel

```
                  __________ ISDN Port Definition __________

  Type in (Y,N) for Semi-Permanent Connection.
  Semi-Permanent Connection valid on Ports for
  Hardware Group number(s) 36, 37


  Port    Semi-Permanent                Port    Semi-Permanent
            Connection                            Connection
  36-00        N                        36-01        N
  36-02        N                        36-03        N
  37-00        N                        37-01        N
  37-02        N                        37-03        N



 PF: 3=Quit    4=Default    7=Back    8=Fwd
```

Figure 303. ISDN Port Definition Panel

Semi-permanent connection indicates to the ISDN the beginning or or the ending of the usage of a B-channel connection. The connected B-channel usage must be activated before end to end data transmission can take place.

The advantage of a semi-permanent connection is that the subscriber is not charged during the times the usage is deactivated. Usage is deactivated when no information frames have been transmitted or received after two minutes. Usage activation occurs when information frames are ready to be sent. Either end of the connection can initiate usage activation or deactivation.

Semi-permanent connection is subscribed to at the switch and customized in the 3174 on a port basis. The ISDN Port Definition panel, which is displayed only if you specify a network type 7 or 8 on the ISDN Adapter Definition panel, allows you to specify if a port will use a semi-permanent connection. Those ports not set up for semi-permanent connection are available for normal circuit switched connections.

Hardware Group Number(s): For each hardware group on the ISDN Adapter Definition panel specified with a network type 7 or 8, its hardware group number is automatically displayed. This panel indicates that you have specified a network type 7 or 8 for hardware groups 36 and 37 on the ISDN Adapter Definition panel.

Port For each hardware group specified with a network type 7 or 8, its port numbers are automatically displayed.

Semi-Permanent Connection: This field allows you to specify whether a not a port is to use a semi-permanent connection. The default response is N (No).

ISDN Channel Definition Panel

```
                _________ ISDN Channel Definition __________

   Type the Channel Options for the ISDN Channel(s).

   Port          B Channel                      B Channel
              TEI       ISDN Number          TEI       ISDN Number
   36-00      __          _______            __          _______
   36-01      __          _______            __          _______
   36-02      __          _______            __          _______
   36-03      __          _______            __          _______

   37-00      __          _______            __          _______
   37-01      __          _______            __          _______
   37-02      __          _______            __          _______
   37-03      __          _______            __          _______

   38-00      __          _______            __          _______
   38-01      __          _______            __          _______
   38-02      __          _______            __          _______
   38-03      __          _______            __          _______


  PF: 3=Quit    4=Default    7=Back    8=Fwd    10=Page Back    11=Page Fwd
```

Figure 304. ISDN Channel Definition Panel

Port: The hardware group and port number for the adapters that have been configured on the ISDN Adapter Definition panel is automatically displayed.

TEI (Terminal End-Point Identifier): For ports whose ISDN Adapter has been specified with a network type 3 on the ISDN Adapter Definition panel, you must supply a TEI value. The TEI value ranges from 00 to 63 and represents an ID for each terminal endpoint in the ISDN network. These values are supplied to you when the network is set up. The TEI values must be unique.

ISDN Number: The ISDN Number is required for all ports. Valid values are 0 through 9 and must be 4 to 7 digits long. The ISDN Number is used for reference only.

22.9 Example Scenario

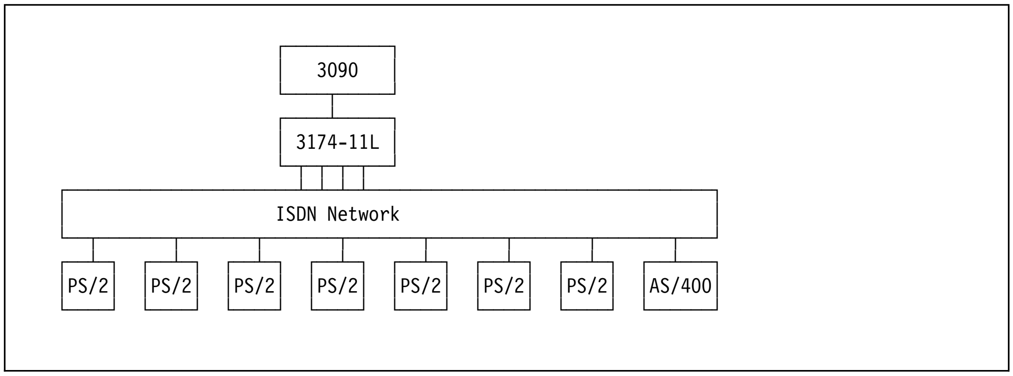
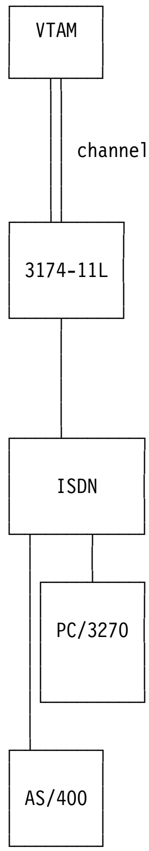


Figure 305. Example ISDN Scenario

22.9.1 Description

In this scenario we have a 3174-11L with one ISDN Adapter. There are four ISDN lines with eight possible downstream devices, which can all be at different locations. There may be more devices downstream but only eight simultaneous connections are possible with only one adapter.

22.9.2 Definitions Overview




```
VTAM Definitions
3174-11L: 1         AS/400: 2          PC/3270: 3
 PU CUADDR=30      PU CUADDR=31      PU CUADDR=38
 LU LOCADDR=01...  LU LOCADDR=01...  LU LOCADDR=01...
                   LU LOCADDR=02...

3174-11L Customization
Q104: 30 4     Q105: 38 5     Q150: 0 1     Q190: 8 6
ISDN PUID Assignment:
 S   PUID     S   PUID     S   PUID     S   PUID
 31  00031 7   32  00032    33  00033    34  00034
 35  00035    36  00036    37  00037    38  00038 8
Device Definition:
 Q803 ISDN Definition: 1
ISDN Adapter Definition:
 HG=36      Network=1     Inactivity=N   Range=0030
ISDN Port Definition: (if Network=7 or 8 Germany)
 Port=36-00  Semi-Permanent Connection=Y/N
ISDN Channel Definition:
 Port      Channel B1              Channel B2
           TEI     ISDN Number     TEI     ISDN Number
 36-00     ___     1234567890_     ___     1234567890_ 9
 36-01     ___     ___________     ___     ___________
 36-02     ___     ___________     ___     ___________
 36-03     ___     ___________     ___     ___________

PC/3270 Configuration
IDLC node ID: 00038                     10
ISDN Subscriber Number: 1234567899
Attachment Type: 5E4 AT&T/5ESS
Called Party Number: 1234567890         11

AS/400 Configuration
ADDCNNLE Remote Number: 1234567890      12
CRTLINIDLC Exchange ID: 05600031        13
CRTCTLHOST Initial Connection: *Dial
CRTDEVHOST Local Location address: 01
CRTDEVHOST Local Location address: 02
```

Figure 306. ISDN Example Scenario Definitions Overview

1 CUADDR=30 is the host sub-channel address for the 3174 ISDN gateway; it matches question 104 (**4**) in the 3174 customization.

2 CUADDR=31 is the host address that will be used by an ISDN DSPU whose PUID matches the PUID assigned to this host address (**7**) in the ISDN PUID Assignment panel.

In our example, it is the AS/400.

3 CUADDR=38 is the host address that will be used by an ISDN DSPU whose PUID matches the PUID assigned to this host address (**8**) in the ISDN PUID Assignment panel.

In our example, it is the PS/2 PC/3270 V2.0 workstation.

5 Is the upper limit address in the range of addresses available for Token-Ring and ISDN DSPUs.

In our example, we can have up to eight DSPUs in total. Since question 150=01 (Token-Ring Gateway not active), all the eight addresses can be used for ISDN DSPUs.

6 We have specified eight ISDN DSPUs in question 190.

9 Is the ISDN Number for port 36-00.

10 Is the PUID configured in the PS/2 workstation that will be checked by the 3174 for a matching PUID in the ISDN PUID Assignment panel.

11 Is configured in the PS/2 and relates to the ISDN Number of the 3174.

12 Is configured in the AS/400 and relates to the ISDN Number of the 3174.

13 Is the PUID configured in the AS/400 that will be checked by the 3174 for a matching PUID in the ISDN PUID Assignment panel.

22.9.3 3174 Customization

```
               ______ Customize Control Disk Menu _______

 Select Option; press ENTER

 Option     Description

    1       Configure
    2       Define Devices
    3       Merge RPQs
    4       Modify Keyboards
    5       Define AEA
    6       Define APPN Node
    7       Define COS
    8       Define 3174-PEER



     Select ===► 1

 PF: 3=Quit    4=Default    7=Back    8=Fwd    9=Check    12=File
```

Select option 1 to configure for 3174 base and ISDN functions.

```
               _____________ Model / Attach _____________


     098 - 070874__

     099 - 11L WITH ISDN GATEWAY

     100 - 11L

     101 - 5



 PF: 3=Quit    4=Default    7=Back    8=Fwd    9=RtnH    12=Done
```

- Q.098 is where you specify a password if you wish to use some of the online tests, specifically Test 16. Test 16 allows you to change the error thresholds for a ISDN port and to wrap a port on a ISDN adapter.
- Q.099 is a comment field.
- Q.100 is the 3174 model.
- Q.101=5 means that the 3174 is SNA channel attached.

```
               ______________ Local (SNA) _______________
                                                              LOCL
  104 - 30         105 - 38       108 - 0000000    110 - 2 0000     116 - 2_ __

  121 - 01         123 - 0        125 - 00000000   126 - 00000000   127 - 0 0

  132 - 0 0 0 0    136 - 1 0 0 1  137 - 0 0 0 0    138 - 0

  141 - A          150 - 0 1      165 - 0          166 - A          168 - 0

  173 - 00000000   175 - 000000   179 - 0 0 0      190 - 08

  213 - 1          215 - 00000    220 - 0

  222 - 0          223 - 10       224 - 2          225 - 4

  240 - 0          241 - 0        242 - 0


 PF: 3=Quit    4=Default    7=Back    8=Fwd
```

The relevant ISDN questions on this screen are:

- Q.104 is the host address of the 3174 gateway.
- Q.105 is the upper limit address of a range of host addresses that can be used for both Token-Ring and ISDN DSPUs.
- Q.150 digit 2=1 means that the 3174 will act as an ISDN gateway only. (Digit 1=0 means the Token-Ring Gateway function is not enabled.)
- Q.190=08 means eight ISDN DSPUs can be customized for this 3174.
- Q.215=00000 is the default PUID for this 3174 (not used in this example).

```
_______________ Common SNA _______________
                                                40/LOCL

    500 - 0          501 - _______    502 - _______

    APPN Support Fields:

    510 - 0          511 - _______    512 - _______


PF: 3=Quit    4=Default    7=Back    8=Fwd    9=RtnH
```

There are no ISDN specific questions on this screen. Remember, however, that ISDN DSPUs cannot use APPN or Peer Communication.

```
_____________ Common Network _____________
                                                40/LOCL

 900 - XXXX XXXX XXXX 04    905 - 1            908 - IBMLAN

 911 - 0                    912 - 00

 920 - IBMISDN




PF: 3=Quit    4=Default    7=Back    8=Fwd    9=RtnH
```

- Q.920 is the ISDN Link Subsystem Name. This defaults to IBMISDN.

```
___________ ISDN PUID Assignment ___________
                                                40/LOCL
Type in the ISDN PUID.  Each PUID must be unique and
can not equal question 215.  Question 215 = 00000

   S   ISDN PUID      S   ISDN PUID      S   ISDN PUID      S   ISDN PUID
   31    00031        32    00032        33    00033        34    00034
   35    00035        36    00036        37    00037        38    00038




PF: 3=Quit    4=Default    7=Back    8=Fwd    9=RtnH
```

This is where you assign PUIDs for the ISDN DSPUs. You should have as many PUIDs defined as you have specified in Q.190.

- The addresses in the S columns are provided automatically by the 3174 from your responses to Q.105 and Q.190. The last address (38) comes from Q.105. The number of addresses (eight in this example) is equal to your Q.190 response.
- The PUID you specify is used only to validate a call to the 3174 from a ISDN DSPU. The PUID must, therefore, match what you configure in the ISDN DSPU if access is to be granted. For example, the PUID must match:
  - In PC/3270 workstation, IDLC Node ID.
  - In the AS/400, Exchange ID response in the IDLC line description.

```
___________ Configure Complete ___________

              Press PF12 to save all responses
              and return to the selection Menu



PF: 3=Quit    4=Default    7=Back    8=Fwd    9=RtnH    12=Done
```

- Press PF12 to save your responses.
- This completes the Configure procedure.
- Next, you have to customize the ISDN adapter, channel and, for network type 7 or 8, port definitions via the Device Definition option.

```
             ______ Customize Control Disk Menu _______

Select Option; press ENTER

Option     Description

   1       Configure
   2       Define Devices
   3       Merge RPQs
   4       Modify Keyboards
   5       Define AEA
   6       Define APPN Node
   7       Define COS
   8       Define 3174-PEER



    Select ===► 2

PF: 3=Quit    4=Default    7=Back    8=Fwd    9=Check    12=File
```

- Select option 2 to continue with the ISDN customization.

```
             ___________ Device Definition ____________

Select one or more Device Definitions. All selections
will be processed without returning to this panel.


    800 Printer Authorization Matrix (PAM) - 0 0

    801 Logical Terminal Assignment        - 0

    802 Prompts for Extended VPD           - 0

    803 ISDN Definition                    - 1


PF: 3=Quit                        8=Fwd
```

- Respond with a 1 for Q.803 to define ISDN.

```
             ________ ISDN Adapter Definition _________

 Type the Adapter Options for the ISDN Adapter(s).


   Adapter         Network           Inactivity
   Hardware                           Timeout
   Group No.                       (Y,N)      Range
   ---------       -------         ----------------

      36              1              N        0030
      37              _              N        0030
      38              _              N        0030
      39              _              N        0030



PF: 3=Quit    4=Default    7=Back    8=Fwd
```

- We have one ISDN Adapter installed and connected to the ISDN network via an AT&T 5ESS/5E4 switch. So, respond with a 1 for the network type.
- In this example, we have chosen not to specify an inactivity timeout.

```
             ________ ISDN Channel Definition _________

 Type the Channel Options for the ISDN Channel(s).

 Port          Channel B1                      Channel B2
           TEI        ISDN Number          TEI        ISDN Number
 36-00     __           0000001            __           0000002
 36-01     __           0000003            __           0000004
 36-02     __           0000005            __           0000006
 36-03     __           0000007            __           0000008



All responses are correct
PF: 3=Quit    4=Default    7=Back    8=Fwd    10=Page Back   11=Page Fwd
```

- The TEI is only used with network type 3.
- The ISDN Number is only used to associate a port on the 3174 ISDN Adapter with the telephone number for that port. It does not really matter what number you use. We have just numbered them 0000001 through 0000008.

```
_______ Device Definition Complete _______

Press PF12 to save all responses
and return to the selection Menu


PF: 3=Quit                 7=Back                    12=Done
```

- Press PF12 to save your responses.
- This completes the customization of the 3174 ISDN BRI Adapter.

22.9.4 VTAM Definitions

```
*-------------------------------------------------------------------*
*              Definition for the 3174 ISDN Gateway                 *
*-------------------------------------------------------------------*
PUE30    PU    CUADDR=E30,DISCNT=NO,ISTATUS=ACTIVE,                  X
               PACING=0,PUTYPE=2,SSCPFM=FSS,VPACING=0
LU3002   LU    LOCADDR=02,ISTATUS=ACTIVE
LU3003   LU    LOCADDR=03,ISTATUS=ACTIVE
LU3004   LU    LOCADDR=04,ISTATUS=ACTIVE
         :
LU3032   LU    LOCADDR=32,ISTATUS=ACTIVE
LU3033   LU    LOCADDR=33,ISTATUS=ACTIVE
*-------------------------------------------------------------------*
*              Definition for the AS/400 ISDN DSPU                  *
*-------------------------------------------------------------------*
PUE31    PU    CUADDR=E31,DISCNT=NO,ISTATUS=ACTIVE,                  X
               PACING=0,PUTYPE=2,SSCPFM=FSS,VPACING=0
LU3102   LU    LOCADDR=02,ISTATUS=ACTIVE
LU3103   LU    LOCADDR=03,ISTATUS=ACTIVE
*-------------------------------------------------------------------*
*              Definition for the PS/2 ISDN DSPU                    *
*-------------------------------------------------------------------*
PUE38    PU    CUADDR=E38,DISCNT=NO,ISTATUS=ACTIVE,                  X
               PACING=0,PUTYPE=2,SSCPFM=FSS,VPACING=0
LU3802   LU    LOCADDR=02,ISTATUS=ACTIVE
LU3803   LU    LOCADDR=03,ISTATUS=ACTIVE
LU3804   LU    LOCADDR=04,ISTATUS=ACTIVE
LU3805   LU    LOCADDR=05,ISTATUS=ACTIVE
```

- There should be one host definition for each PUID customized in the ISDN PUID Assignment panel.
- For the AS/400, the PU matches the CRTCTLHOST Link type IDLC definition, and the LUs match the CRTCTLHOST Link type LU1 Link type LU2 definitions. The LOCADDR values match the local location addresses.
- For the PS/2, define as many LUs as the number of sessions required. If the PS/2 ISDN DSPU is acting as a token-ring gateway, there can be 256 LUs.

22.10 Configuring DOS PS/2 for ISDN

Configuring a DOS PS/2 for ISDN requires several steps. The following list provides an overview of these steps; later sections will describe some of the steps in detail:

1. Install the PS/2 ISDN adapter.

   Install either the ISDN Interface Coprocessor (AT bus) or the ISDN Interface Coprocessor/2 Model 2 (Micro Channel architecture). This must be done before the ISDN software is installed.

2. Install and tailor PC/3270 for an SDLC connection to the host.

   This can be done before the ISDN adapter is installed. Parameters configured for SDLC attachment, such as number of sessions, block ID, and so forth, will be overridden when you customize for ISDN. For details on installing PC/3270, refer to the product manuals and/or *IBM Personal Communications/3270 Version 2.0 Implementation Guide*.

3. Install the ISDN Coprocessor Support Program.

   Place a copy of the ISDN Coprocessor Support Program Network Support diskette in the diskette drive and type:

   INSTALL

   Follow the prompts provided by the install procedure. The files will be installed in the ISDN and ISDNBIOS sub-directories.

4. Install the PC/3270 ISDN Enabler program.

The PC/3270 ISDN Enabler program enables PC/3270 to be used through the ISDN connection. Place a copy of the ISDN Coprocessor Support Program Network Support diskette in the diskette drive and type:

PC3270IN A C:\PC3270B US

PC3270B is the sub-directory where your PC/3270 is installed, and US is the language used.

5. Configure the PC/3270 ISDN Enabler program.

   Change to the PC/3270 sub-directory and type:

   CONF3270

   This procedure updates the PC/3270 configuration file (previously configured for an SDLC attachment).

6. Run the ISDN configurator:

   ISDNCONF

   to define ISDN adapters, directories and protocol profiles.

7. Start the ISDN Coprocessor Support Program:

   ISDNBIOS

8. Start PC/3270, using the updated configuration file.

22.10.1 Configuring PC/3270 ISDN Enabler Program

When you have installed the ISDN adapter and the ISDN Coprocessor Support Program, and have also configured PC/3270 for an SDLC host attachment, you are ready to configure the PC/3270 ISDN Enabler program.

To start the PC/3270 ISDN Enabler program, enter at the DOS prompt:

CONF3270

Figure 307 is displayed.

```
Enter path\filename of your PC/3270 configuration: pc3270.bat        1

Are you using this machine as a PC/3270 gateway ? Y/N : n            2

Are you connecting to the host via a 3174 controller ? Y/N : y       3

How many 3270 sessions ? 1 - 8 : 4                                   4

Enter Segment size, 256 - 2057 : 1033                                5

Enter SDLC/IDLC window size, 1 - 7 : 4                               6

Enter the ISDN adapter address, 128 - 130 : 128                      7

Enter Local Name (upper case, 16 characters only): IDLCPS2TO3174L    8

Enter Remote Name (upper case, 16 characters only): IDLCPS2TO3174R   9

Do you want to change anything? Y/N or ESC to exit: n

PC/3270 Emulation configuration for ISDN complete.                   10
Enter "pc3270" to start your PC/3270 ISDN configuration.
```

Figure 307. Configuring PC/3270 ISDN Enabler Program

1 Is the name of the PC/3270 configuration file created previously for an SDLC attachment. This procedure will modify the PC/3270 configuration file with the information you supply on this screen. If you leave out the file extension, it will assume a .BAT file. It can handle a Windows mode .CNF file or a DOS mode .BAT file.

2 Specifies whether the PS/2 will be used a gateway.

3 Specifies whether the PS/2 will connect through the ISDN network to the 3174 ISDN gateway.

4 Specifies the number of sessions to the 3270 host.

5 Specifies the buffer size for the ISDN adapter.

Always use 1033 for the segment size. for the ISDN adapter.

6 Specifies the the number of frames that can be sent before an acknowledgement is received.

We have chosen a window size of four. You can choose any number from one to seven.

7 Is the address of the ISDN adapter in the PS/2. 128 is the first, 129 is the second, and 130 is the third ISDN adapter installed.

8 Is the directory name for the local ISDN device (the PS/2).

9 Is the directory name for the remote ISDN device (the 3174).

10 You have now completed the PC/3270 ISDN Enabler program.

22.10.2 Running ISDN Configurator

You need to run the ISDN configurator to define the ISDN adapter, local and remote directory entries and the protocol profile used.

- Change to the sub-directory where your ISDN Coprocessor Support Program is installed; that is, the ISDNBIOS sub-directory.
- To start the ISDN configurator, enter at the DOS prompt:

  ISDNCONF

- Select *File* from the action bar, and then select *New* in the window. "A new configuration file has been opened." message is displayed. Press Enter to continue.

Configuring ISDN Adapter

```
┌ISDN─CONFIGURATOR──────────────────────────────────────┐
│ File    Options◄── Exit    Help                        │
│          ┌─────────────────────┐                       │
│          │  Adapters...◄──     │                       │
│          │  Directories...     │                       │
│          │  Adapter Models...  │rt Program v1.1        │
│          │  Protocol Profiles..│lity                   │
│          └─────────────────────┘                       │
│                                                        │
└────────────────────────────────────────────────────────┘
```

- Select *Options* from the action bar, and then select *Adapters...* from the window.

```
┌ISDN-CONFIGURATOR──────────────────────────────────────┐
│┌Adapter-to-network-Connections────────────────────────┴┐
││ Edit◄── Exit    Help                                  │
││ ┌─────────────────┐                                   │
││ │  Display...     │                                   │
││ │  Change...      │                                   │
││ │  Create...◄──   │                                   │
││ │  Delete...      │                                   │
└┤ └─────────────────┘                                   │
 │                                                       │
 │                                                       │
 └───────────────────────────────────────────────────────┘
```

- Next select *Edit* from the action bar, and then select *Create...* from the window.

```
┌ISDN-CONFIGURATOR────────────────────┐
│┌Adapter-to-network-Connections──────┴┐
││┌Select-an-item.─────────────────────┴┐
│││Adapter slot configuration status    │
│││Esc=Cancel ENTER=Select F1=Help.     │
│││                                     │
│││ ┌───────────────────────┐           │
│││ │Slot 1 not configured  │           │
│││ │Slot 2 not configured  │           │
└┤│ │Slot 3 not configured◄─┤           │
 └┤ │Slot 4 not configured  │           │
  │ │Slot 5 not configured  │           │
  │ │Slot 6 not configured  │           │
  │ │Slot 7 not configured  │           │
  │ └───────────────────────┘           │
  └─────────────────────────────────────┘
```

- Use the down arrow key to move to the slot number that your ISDN adapter is installed and press Enter. Our ISDN adapter is in slot 3.

```
┌ISDN-CONFIGURATOR─────────────────────────────────────┐
│┌Adapter-to-network-Connections───────────────────────┴┐
││┌Create-slot-1-adapter-configuration──────────────────┴┐
│││Esc=Cancel  f1=Help  F2=Enter  F3=D-Channel           │
│││F4=Advanced  F5=Change field                          │
│││                                                      │
│││ ISDN subscriber number         1234567890            │
│││                                                      │
└┤│                                                      │
 └┤ Passive bus unit address                             │
  │                                                      │
  │ Country                        United States         │
  └──────────────────────────────────────────────────────┘
```

- For the subscriber number, give the ISDN number for this adapter.
- Leave the passive bus unit address blank, as we are not using a passive bus.
- For the country selection, press F5 to get a list of countries supported. Use the down arrow key to move to the country desired and press Enter.
- Press F4 to get to the advanced options screen.

```
┌ISDN-CONFIGURATOR──────────────────────────────────────────────────────┐
│┌Adapter-to-network-Connections────────────────────────────────────────┴┐
││┌Create-slot-1-adapter-configuration───────────────────────────────────┴┐
│││┌Adapter-configuration--advanced-options───────────────────────────────┴┐
││││Esc=Cancel  f1=Help  F2=Enter                                          │
││││F4=Get predefined values  F5=Change field                              │
││││ (Use PageUp and PageDown to scroll)                                   │
││││                                                                       │
││││ ISDN numbering type                    Unknown type                   │
││││                                                                       │
││││ ISDN numbering plan                    Unknown plan                   │
││││                                                                       │
└┤││ Passive bus unit address type          No passive bus unit address    │
 └┤│                                                                       │
  └┤                                                                       │
   │ Passive bus unit address position      Not Used                       │
   │                                                                       │
   │ Application program ID type       No application program selection ID│
   └───────────────────────────────────────────────────────────────────────┘
```

- The fields are filled in with predefined (default) values. You can also press F4 to get the predefined (default) values.
- The advanced options takes up two screens. Use the page down and page up keys to scroll between the two pages. Use the New Line or Tab key to move between fields.
- Page down to the next screen.

```
┌ISDN─CONFIGURATOR──────────────────────────────────────────────────────────┐
│┌Adapter-to-network─Connections────────────────────────────────────────────┐┐
││┌Create─slot─1─adapter─configuration─────────────────────────────────────┐┐
│││┌Adapter─configuration──advanced─options─────────────────────────────────┐
││││Get predefined adapter model values                                    │
││││ Esc=Cancel  f1=Help  F2=Copy values  F6=List Models                    │
││││  (Use PageUp and PageDown to scroll)                                   │
││││                                                                       │
││││  Passive bus unit address position                           Not Used │
││││                                                                       │
││││                                                                       │
││││  Application program ID type         No application program selection ID │
││││                                                                       │
││││                                                                       │
││││  Application program ID position                             Not Used │
││││                                                                       │
││││                                                                       │
└│││  Application program ID length                               Not Used │
 └││                                                                       │
  └│                                                                       │
   │  Attachment type                                        5E4 AT&T/5ESS │
   │                                                                       │
   │                                                                       │
   │  Permanent connection feature      No B channel permanently connected. │
   └───────────────────────────────────────────────────────────────────────┘
```

- Some of the fields are repeated from the previous screen.
- We have used predefined values. You can use the F5 key to change the value of any field.
- Press F2 to return to the adapter configuration screen.

```
┌ISDN─CONFIGURATOR───────────────────────────────┐
│┌Adapter-to-network─Connections──────────────────┐┐
││┌Create─slot─1─adapter─configuration────────────┐┐
│││Esc=Cancel  f1=Help  F2=Enter  F3=D-Channel     │
│││F4=Advanced  F5=Change field                    │
│││                                                │
│││                                                │
│││                                                │
│││ ISDN subscriber number         9987654321      │
│││                                                │
└││                                                │
 └│ Passive bus unit address                       │
  │                                                │
  │                                                │
  │ Country                        United States   │
  └────────────────────────────────────────────────┘
```

- You will now be back to this screen after the previous step (that is, after pressing F2).
- Press F2 again.

```
┌ISDN─CONFIGURATOR──────────────────────────────────┐
│┌Adapter-to-network─Connections─────────────────────┐┐
││ Edit    Exit◄── Help                              │
││                                                   │
││                                                   │
││                                                   │
││                                                   │
││                                                   │
└│                                                   │
 │                                                   │
 │                                                   │
 │                                                   │
 │                                                   │
 │                                                   │
 │                                                   │
 │                                                   │
 └───────────────────────────────────────────────────┘
```

- Select *Exit* from the action bar, and then select *Exit now* from the window.

  You will return to the configuration utility main screen.

Configuring Directory Entries

```
┌ISDN-CONFIGURATOR──────────────────────────────────────────────┐
│ File    Options◄── Exit    Help                               │
│          ┌────────────────────────────┐                       │
│          │  Adapters...               │                       │
│          │  Directories...◄──         │                       │
│          │  Adapter Models...         │rt Program v1.1        │
│          │  Protocol Profiles...      │lity                   │
│          └────────────────────────────┘                       │
│                                                               │
└───────────────────────────────────────────────────────────────┘
```

- Select *Options* from the action bar, and then select *Directories...* in the window.

```
┌ISDN-CONFIGURATOR──────────────────────────────────────────────┐
│┌Directories─────────────────────────────────────────────────────┐
││ Edit◄── Exit    Help                                            │
││                                                                 │
││ Currently selected directory: Default directory                 │
││                                                                 │
└┤                                                                 │
 │ Directory comment: Used if adapter has no directory defined     │
 │                                                                 │
 └─────────────────────────────────────────────────────────────────┘
```

- Select *Edit* in the action bar.

```
┌ISDN-CONFIGURATOR──────────────────────────────────────────────┐
│┌Directories─────────────────────────────────────────────────────┐
││ Edit    Exit    Help                                            │
││ ┌──────────────────────────────────┐                            │
││ │  Display entry...                │                            │
││ │  Change entry...                 │t directory                 │
││ │  Create entry...◄──              │                            │
││ │  Delete entry...                 │                            │
││ │  Select directory...             │as no directory defined     │
││ │  Change directory comment...     │                            │
││ └──────────────────────────────────┘                            │
└┤                                                                 │
 │                                                                 │
 └─────────────────────────────────────────────────────────────────┘
```

- Select *Create entry...* in the window.

  We will first create the local directory.

```
┌ISDN-CONFIGURATOR──────────────────────────────────────────────┐
│┌Directories─────────────────────────────────────────────────────┐
││┌Select-an-item.──────────────────────────────────┐             │
│││Select the type of directory entry to be created │             │
│││Esc=Cancel ENTER=Select f1=Help.                 │             │
│││                                                 │             │
│││ ┌────────────────────────────────────┐          │             │
│││ │ISDN Support Program Version 1.1◄── │          │efined       │
│││ │ISDN Support Program Version 1.0    │          │             │
│││ │PC LAN Program                      │          │             │
│││ └────────────────────────────────────┘          ├─────────────┘
└┤│                                                 │
 └┤                                                 │
  │                                                 │
  └─────────────────────────────────────────────────┘
```

- Select *ISDN Support Program Version 1.1* in the window.

```
┌ISDN-CONFIGURATOR──────────────────────────────────────────────┐
│┌Directories──────────────────────────────────────────────────────┐
││┌Select-an-item.──────────────────┐                              │
│││Select a basis directory         │                              │
│││Esc=Cancel ENTER=Select f1=Help. │                              │
│││                                 │ directory                    │
│││                                 │                              │
│││ ┌────────────────────┐          │                              │
│││ │Predefined models   │          │s no directory defined        │
│││ └────────────────────┘          │                              │
│││                                 │                              │
│││                                 │                              │
│││                                 │                              │
└││                                 │                              │
 └│                                 ├──────────────────────────────┘
  │                                 │
  │                                 │
  │                                 │
  │                                 │
  └─────────────────────────────────┘
```

- Press Enter to get the list of predefined model directory entries.

```
┌ISDN-CONFIGURATOR──────────────────────────────────────────────┐
│┌Directories──────────────────────────────────────────────────────┐
││┌Select-an-item.─────────────────────────────┐                   │
│││Select a directory entry                    │                   │
│││Esc=Cancel ENTER=Select f1=Help.            │                   │
│││                                            │                   │
│││                                            │                   │
│││                                            │                   │
│││   ┌────────────────────┐                   │ry defined         │
│││   │Local :IDLCPS2TO3174L│◄──               │                   │
│││   │Remote:IDLCPS2TO3174R│                  │                   │
│││   │Local :LAPBPS2toPS2L │                  │                   │
│││   │Remote:LAPBPS2toPS2R │                  │                   │
└││   │Local :SDLC2toPS2L   │                  │                   │
 └│   │Local :SDLC7820V35L  │                  ├───────────────────┘
  │   │Remote:SDLC7820V35R  │                  │
  │   │Local :SDLC7820X21L  │                  │
  │   │Remote:SDLC7820X21R  │                  │
  │   │Remote:SDLCPS2toPS2R │                  │
  │   └─────────────────────┘                  │
  │                                            │
  └────────────────────────────────────────────┘
```

- At this point you can select IDLCPS2TO3174L or IDLCPS2TO3174R. These are the only two valid for the 3174. We will go through the panels first for the local directory (IDLCPS2TO3174L) and then for the remote directory (IDLCPS2TO3174R). These names must match the Local Name and Remote Name specified in the PC/3270 ISDN Enabler configuration.
- Since the cursor is at the first selection, press Enter.

```
┌ISDN-CONFIGURATOR──────────────────────────────────────────────┐
│┌Directories──────────────────────────────────────────────────────┐
││┌Create-local-directory-entry─────────────────────────────────────┐
│││Esc=Cancel f1=Help F2=Enter F4=Advanced options                  │
│││ (Use PageUp and PageDown to scroll)                             │
│││                                                                 │
│││                                                                 │
│││                                                                 │
│││ Directory:                                    Default directory │
│││                                                                 │
│││                                                                 │
│││ Directory entry type:           ISDN Support Program Version 1.1 │
│││                                                                 │
└││                                                                 │
 └│ Directory entry name:                             IDLCPS2TO3174L  │
  │                                                                 │
  │                                                                 │
  │ Directory entry comment:    PS2 to 3174 Host using IDLC (Local) │
  │                                                                 │
  │                                                                 │
  │ Application ID:                                            FFFF │
  │                                                                 │
  └─────────────────────────────────────────────────────────────────┘
```

- On this screen, we can take all the defaults.
- You need to go to the advanced options to set the B-channel protocol profile. It is on the second page of the advanced options screen.

  To go to the advanced options screen, Press F4.

```
┌ISDN─CONFIGURATOR──────────────────────────────────────────────────────┐
│┌Directories──────────────────────────────────────────────────────────┴┐
││┌Create─local─directory─entry────────────────────────────────────────┴┐
│││┌Create─advanced─local─directory─entry──────────────────────────────┴┐
││││ Esc=Cancel f1=Help F2=Enter F5=Change field                        │
││││ (Use PageUp and PageDown to scroll)                                │
││││                                                                    │
││││                                                                    │
││││ D channel protocol:   TE-1 (ISDN Coprocessor support program Q931 subset) │
││││                                                                    │
││││                                                                    │
││││ Auto hang-up feature:                                 used         │
└┤││                                                                    │
 └┤│                                                                    │
  ││ Connection feature:                                Neither         │
  ││                                                                    │
  ││                                                                    │
  ││ Auto Activate B channel:                               Automatic   │
  ││                                                                    │
  ││                                                                    │
  ││ Rate specification:                      64 kbps without RDI       │
  └┤                                                                    │
   └────────────────────────────────────────────────────────────────────┘
```

- Again, you can take the default values. You can use the default for the D-channel protocol.
- Page down to the next screen.

```
┌ISDN─CONFIGURATOR──────────────────────────────────────────────────────┐
│┌Directories──────────────────────────────────────────────────────────┴┐
││┌Create─local─directory─entry────────────────────────────────────────┴┐
│││┌Create─advanced─local─directory─entry──────────────────────────────┴┐
││││ Esc=Cancel f1=Help F2=Enter F5=Change field                        │
││││ (Use PageUp and PageDown to scroll)                                │
││││                                                                    │
││││                                                                    │
││││ Rate specification:                      64 kbps without RDI       │
││││                                                                    │
││││                                                                    │
││││ B channel protocol type:                                  IDLC     │
││││                                                                    │
└┤││                                                                    │
 └┤│ B channel protocol profile:                      PS2to3174 ◄──     │
  ││                                                                    │
  └┤                                                                    │
   └────────────────────────────────────────────────────────────────────┘
```

- On this screen, you need to enter the B-channel protocol type IDLC and the name of the B-channel protocol profile. You will create the B-channel protocol profile later.
- Press F2 twice.

  Note that the next few screens resulting from your actions are not shown here. You are now going to define the remote directory.
- Select *Exit* from the action bar, and then select *Exit now* from the window.
- Select *Options* from the action bar, and then select *Directories...* from the window.
- Select *Edit* from the action bar, then select *Create entry...* from the window.
- Select *ISDN Support Program Version 1.1*. This will now take you to the screen shown next.

```
┌ISDN─CONFIGURATOR─────────────────────────────────────────────────────┐
│┌Directories─────────────────────────────────────────────────────────┴┐
││┌Select─an─item.───────────────────┐                                 │
│││Select a basis directory          │                                 │
│││Esc=Cancel ENTER=Select f1=Help.  │                                 │
│││                                  │ directory                       │
│││                                  │                                 │
│││ ┌────────────────────┐           │                                 │
│││ │Default directory   │           │s no directory defined           │
│││ │Predefined models   │ ◄──       │                                 │
│││ └────────────────────┘           │                                 │
│││                                  │                                 │
│││                                  │                                 │
└┤│                                  │                                 │
 └┤                                  ├─────────────────────────────────┘
  │                                  │
  │                                  │
  │                                  │
  └──────────────────────────────────┘
```

- You now have an additional entry (*Default directory*) in the window.

  Select *Predefined models* again to obtain the selection list.

```
┌ISDN-CONFIGURATOR──────────────────────────────────────────────────┐
│┌Directories──────────────────────────────────────────────────────┐┐
││┌Select-an-item.────────────────────────────┐                    │
│││Select a directory entry                    │                    │
│││Esc=Cancel ENTER=Select f1=Help.            │                    │
│││                                            │                    │
│││                                            │                    │
│││   ┌──────────────────┐                     │ry defined          │
│││   │Local :IDLCPS2TO3174L│                  │                    │
│││   │Remote:IDLCPS2TO3174R│◄──               │                    │
│││   │Local :LAPBPS2toPS2L │                  │                    │
│││   │Remote:LAPBPS2toPS2R │                  │                    │
└┤│   │Local :SDLC2toPS2L   │                  │                    │
 └┤   │Local :SDLC7820V35L  │                  ├────────────────────┘
  │   │Remote:SDLC7820V35R  │                  │
  │   │Local :SDLC7820X21L  │                  │
  │   │Remote:SDLC7820X21R  │                  │
  │   │Remote:SDLCPS2toPS2R │                  │
  │   └──────────────────┘                     │
  │                                            │
  └────────────────────────────────────────────┘
```

- This time select *IDLCPS2TO3174R* to configure the remote directory. This name will match that given to the PC/3270 ISDN Enabler program as the Remote Name.

```
┌ISDN-CONFIGURATOR──────────────────────────────────────────────────┐
│┌Directories──────────────────────────────────────────────────────┐┐
││┌Create-remote-directory-entry──────────────────────────────────────┐
│││Esc=Cancel f1=Help F2=Enter F4=Advanced options                    │
│││ (Use PageUp and PageDown to scroll)                               │
│││                                                                   │
│││                                                                   │
│││ Directory entry type:                ISDN Support Program Version 1.1 │
│││                                                                   │
│││                                                                   │
│││ Directory entry name:                             IDLCPS2TO3174R  │
│││                                                                   │
│││                                                                   │
│││ Directory entry comment:      PS2 to 3174 Host using IDLC (Remote) │
└┤│                                                                   │
 └┤                                                                   │
  │ Called party number:          1234567890 ◄──                      │
  │                                                                   │
  │                                                                   │
  │ Called party subaddress value:                               FFFF │
  │                                                                   │
  └───────────────────────────────────────────────────────────────────┘
```

- Enter the ISDN number for the 3174.
- Press F4 to go to the the advanced options screen.

```
┌ISDN-CONFIGURATOR──────────────────────────────────────────────────┐
│┌Directories──────────────────────────────────────────────────────┐┐
││┌Create-remote-directory-entry──────────────────────────────────────┐┐
│││┌Create-advanced-remote-directory-entry──────────────────────────────┐
││││ Esc=Cancel f1=Help F2=Enter F5=Change field                        │
││││ (Use PageUp and PageDown to scroll)                                │
││││                                                                    │
││││                                                                    │
││││ D channel protocol:   TE-1 (ISDN Coprocessor support program Q931 subset) │
││││                                                                    │
││││                                                                    │
└┤││ Called party numbering plan:           Unknown plan                │
 └┤│                                                                    │
  └┤                                                                    │
   │ Called party numbering type:                   Unknown type        │
   │                                                                    │
   │                                                                    │
   │ Auto hang-up feature:                                     used     │
   │                                                                    │
   │                                                                    │
   │ Connection feature:                                   Neither      │
   └────────────────────────────────────────────────────────────────────┘
```

- The default values are acceptable. Page down to the next screen.

```
ISDN-CONFIGURATOR
Directories
Create-remote-directory-entry
Create-advanced-remote-directory-entry
 Esc=Cancel f1=Help F2=Enter F5=Change field
 (Use PageUp and PageDown to scroll)

 User to user data code sets:                         Code Set 0


 Called party subaddress supplied by application and/or ISDNBIOS: not used


 Calling party number supplied by ISDNBIOS:                       not used


 Calling party subaddress supplied by application and ISDNBIOS:   not used


 Disconnection cause supplied by application or ISDNBIOS:         not used


 Keypad facility:                                                 not used
```

- The default values are acceptable. Page down to the next screen.

```
ISDN-CONFIGURATOR
Directories
Create-remote-directory-entry
Create-advanced-remote-directory-entry
 Esc=Cancel f1=Help F2=Enter F5=Change field
 (Use PageUp and PageDown to scroll)

 Keypad facility:                                                 not used


 Higher layer compatibility information supplied by application:  not used


 Auto Activate B channel:                                        Automatic


 Rate specification:                          64 kbps without RDI


 B channel protocol type:                                             IDLC


 B channel protocol profile:                            PS2to3174
```

- On this panel, you need to enter the B-channel protocol type IDLC and the name of the B-channel protocol profile. You will create the B-channel protocol profile later.
- Press F2 twice.

```
ISDN-CONFIGURATOR
Directories
 Edit    Exit◄— Help


 Currently selected directory: Default directory


 Directory comment: Used if adapter has no directory defined
```

- Select *Exit*, and then select *Exit now* from the window.

Configuring Protocol Profiles

Lastly, you need to define the protocol profile. This profile must match that defined to the local directory as the B-channel protocol profile.

```
┌ISDN─CONFIGURATOR──────────────────────────────────────────────────┐
│ File    Options    Exit    Help                                    │
│          ┌──────────────────────────┐                              │
│          │  Adapters...             │                              │
│          │  Directories...          │                              │
│          │  Adapter Models...       │rt Program v1.1               │
│          │  Protocol Profiles... ◄─ │lity                          │
│          └──────────────────────────┘                              │
│                                                                    │
└────────────────────────────────────────────────────────────────────┘
```

- Select *Options* from the action bar, and then select *Protocol Profiles...* from the window to define the B-channel protocol profile.

```
┌ISDN─CONFIGURATOR──────────────────────────────────────────────────┐
│┌Protocol─Profiles─User─Interface───────────────────────────────────┐
││ Edit◄─ Exit    Help                                               │
││ ┌────────────────┐                                                │
││ │  Display...    │                                                │
││ │  Change...     │                                                │
││ │  Create...◄─   │                                                │
││ │  Delete...     │                                                │
││ └────────────────┘                                                │
└┤                                                                   │
 └───────────────────────────────────────────────────────────────────┘
```

- Select *Edit* from the action bar, and then select *Create...* from the window.

```
┌ISDN─CONFIGURATOR──────────────────────────────────────────────────┐
│┌Protocol─Profiles─User─Interface───────────────────────────────────┐
││┌Select─an─item.─────────────────┐                                 │
│││Create protocol profile         │                                 │
│││Esc=Cancel ENTER=Select f1=Help.│                                 │
│││                                │                                 │
│││ ┌────────────┐                 │                                 │
│││ │SDLC        │                 │                                 │
│││ │LAPB        │                 │                                 │
│││ │IDLC◄─      │                 │                                 │
│││ └────────────┘                 │                                 │
└┤│                                │                                 │
 └┤                                ├─────────────────────────────────┘
  │                                │
  └────────────────────────────────┘
```

- The 3174 ISDN BRI Adapter only supports IDLC protocol.

  Select *IDLC* from the window.

```
┌ISDN─CONFIGURATOR──────────────────────────────────────────────────┐
│┌Protocol─Profiles─User─Interface───────────────────────────────────┐
││┌Create─protocol─profile──────────────────────────────────────────┐│
│││                                                                 ││
│││Enter a name for your new protocol profile                       ││
│││                                                                 ││
│││ Protocol profile name PS2to3174 ◄─                              ││
│││                                                                 ││
│││ Esc=Cancel Enter=Accept value  f1=Help.                         ││
││└─────────────────────────────────────────────────────────────────┘│
└┤                                                                   │
 └───────────────────────────────────────────────────────────────────┘
```

- Enter the name of the B-channel protocol profile (PS2to3174) specified in the local directory (IDLCPS2TO3174L).

```
┌ISDN─CONFIGURATOR─────────────────────────────────────────────────────┐
│┌Protocol─Profiles─User─Interface──────────────────────────────────────┴┐
││┌Select─an─item.────────────────────┐                                  │
│││Create protocol profile            │                                  │
│││Esc=Cancel ENTER=Select f1=Help.   │                                  │
│││                                   │                                  │
│││                                   │                                  │
│││ ┌────────────────┐                │                                  │
│││ │PS2to3174       │                │                                  │
│││ └────────────────┘                │                                  │
│││                                   │                                  │
│││                                   │                                  │
│││                                   │                                  │
│││                                   │                                  │
└┤│                                   │                                  │
 └┤                                   ├──────────────────────────────────┘
  │                                   │
  └───────────────────────────────────┘
```

- Press Enter to confirm.

```
┌ISDN─CONFIGURATOR─────────────────────────────────────────────────────┐
│┌Protocol─Profiles─User─Interface──────────────────────────────────────┴┐
││┌Create─IDLC─profile───────────────────────────────────────────────────┴┐
│││ Esc=Cancel  f1=Help  F2=Enter                                         │
│││ (Use PageUp and PageDown to scroll)                                   │
│││                                                                       │
│││                                                                       │
│││ IDLC node ID: Block number                                       53   │
│││                                                                       │
│││                                                                       │
│││ IDLC node ID: Identifier number                               00031   │
│││                                                                       │
│││                                                                       │
└┤│ Response timeout                                              50      │
 └┤                                                                       │
  │                                                                       │
  │ Maximum unacknowledged I-frames                                  4    │
  │                                                                       │
  │                                                                       │
  │ Maximum received frame length                                  1033   │
  │                                                                       │
  └───────────────────────────────────────────────────────────────────────┘
```

- Block number is the first three digits of an eight-digit node ID.
- Identifier number must match one of the PUIDs customized in the 3174 ISDN PUID Assignment panel. Leading zeros are not required.
- The response timeout is a 50-millisecond units.

  We have specified a timeout of 2500 (50x50) milliseconds or 2.5 seconds. This value is distance-dependent.
- Maximum unacknowledged I-frames should match the window size set in the PC/3270 ISDN Enabler configuration.
- Maximum received frame length must not be less than the segment size set in the PC/3270 ISDN Enabler configuration. The segment size should be set to 1033.
- Page down to the next screen.

```
┌ISDN─CONFIGURATOR─────────────────────────────────────────────────────┐
│┌Protocol─Profiles─User─Interface──────────────────────────────────────┴┐
││┌Create─IDLC─profile───────────────────────────────────────────────────┴┐
│││ Esc=Cancel  f1=Help  F2=Enter                                         │
│││ (Use PageUp and PageDown to scroll)                                   │
│││                                                                       │
│││ Maximum sent frame length                                      1033   │
│││                                                                       │
│││ HDLC frame address                                             256    │
│││                                                                       │
│││                                                                       │
│││ Maximum retransmissions                                          3    │
└┤│                                                                       │
 └┤                                                                       │
  │ Inactivity timeout                                            600     │
  │                                                                       │
  │                                                                       │
  │ Link initialize timeout                                       65535   │
  │                                                                       │
  └───────────────────────────────────────────────────────────────────────┘
```

- Maximum sent frame length must not be less than the segment size set in the PC/3270 ISDN Enabler configuration. The segment size should be set to 1033.
- You can leave all other values at their default.
- Press F2 to return to the action bar.

Note that the next few screens resulting from your actions are not shown here. We will verify and save the configuration data created, and then use the configuration data to create ASCII files required by the ISDN Coprocessor Support Program.

- Select *Exit* from the action bar, and then *Exit now* from the window.
- Select *File* from the action bar, and then select *Verify* from the window. If the configuration data is valid, a "No errors found during verification." message is displayed after the verify is complete.
- Press Enter to return to the action bar.
- Select *File* from the action bar, and then select *Save* from the window.
- Enter the path and file name in which the configuration data will be stored.
- Press Enter to return to the action bar.
- Select *File* from the action bar, and then select *Use* from the window to create the ASCII files needed by the ISDN Coprocessor Support Program. The files created will be copied to the ISDNBIOS sub-directory.

22.11 ISDN Configurator Parameters

The sections that follow provide a detailed description of each of the fields appearing in the ISDN Configurator panels.

22.11.1 Configuring ISDN Adapter

Figure 308 shows the panel flow when configuring ISDN adapters. The references to F3 and F4 indicate the shortcut keys used to obtain certain panels.

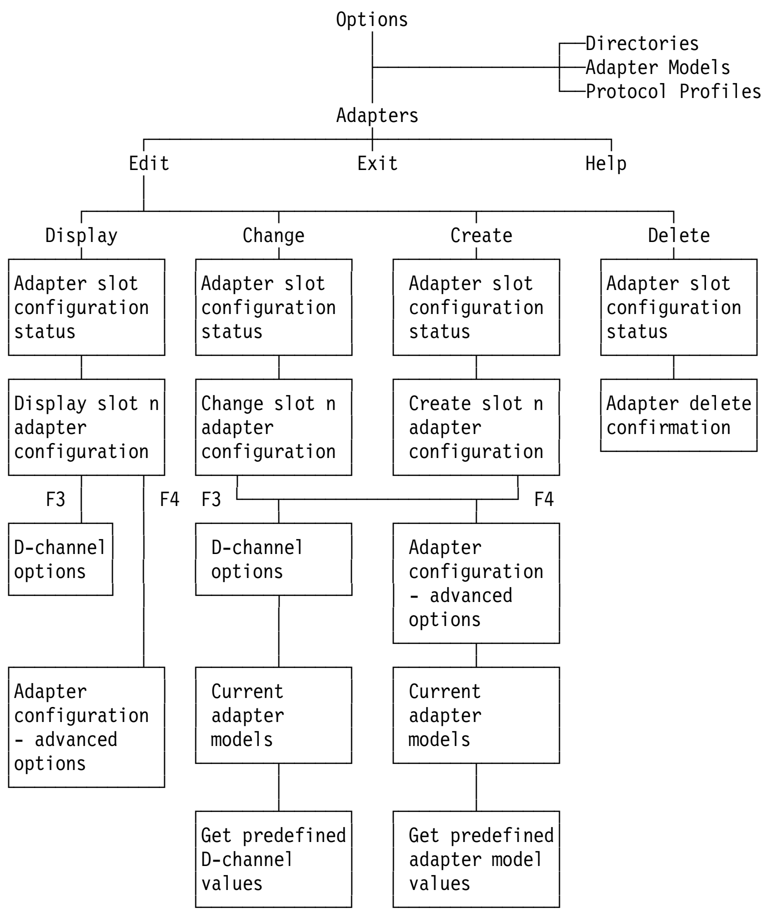


Figure 308. Adapter Configuration Edit Panels

Creating Adapter Configuration

```
┌ISDN─CONFIGURATOR──────────────────────────────┐
│┌Adapter-to-network─Connections──────────────────┐
││┌Create─slot─1─adapter─configuration─────────────┐
│││Esc=Cancel  f1=Help  F2=Enter  F3=D-Channel     │
│││F4=Advanced  F5=Change field                    │
│││                                                │
│││                                                │
│││                                                │
│││ ISDN subscriber number         1234567890      │
└││                                                │
 └┤                                                │
  │ Passive bus unit address                       │
  │                                                │
  │                                                │
  │ Country                        United States   │
  └────────────────────────────────────────────────┘
```

Figure 309. Create Adapter Configuration Panel

See 22.12.1, “Create Slot n Adapter Configuration Checklist” on page 720 for the related checklist.

The fields have the following meanings:

ISDN subscriber number: This is the ISDN “phone” number for the adapter in slot *n*. It must be specified by a remote location to establish a connection with this ISDN adapter. The format of the number is network dependent. This field is not used when contacting the 3174.

Passive bus unit address: The passive bus unit address is used by the computer to route data packets to this adapter. If this field is empty, no passive bus unit address is used. In this case, if the ISDN adapter is attached to a passive bus, it works in a *pool-addressing* mode (the fastest device on the bus gets more incoming calls).***:*** This field must be empty if *passive bus unit address type* (specified on the *Adapter configuration – advanced options* panel) is *No passive bus unit address*.

Country: The name of the country in which you are using the network. Press F5 for a list of choices.

Adapter Configuration Advanced Options

```
ISDN-CONFIGURATOR
 Adapter-to-network-Connections
  Create-slot-1-adapter-configuration
   Adapter-configuration--advanced-options
   Esc=Cancel  f1=Help  F2=Enter
   F4=Get predefined values  F5=Change field
    (Use PageUp and PageDown to scroll)


    ISDN numbering type                    Unknown type


    ISDN numbering plan                    Unknown plan


    Passive bus unit address type          No passive bus unit address


    Passive bus unit address position      Not Used


    Application program ID type       No application program selection ID


    Application program ID position        Not Used


    Application program ID length          Not Used


    Attachment type                        5E4 AT&T/5ESS


    Permanent connection feature      No B channel permanently connected.
```

Figure 310. Adapter Configuration Advanced Options Panel

See 22.12.2, "Adapter Configuration – Advanced Options Checklist" on page 721 for the related checklist.

The fields have the following meanings:

ISDN numbering type: The subscriber numbering type used by the adapter. For example, national number, network-specific number, or abbreviated number.

Select *Unknown type* if you do not know the numbering type.

ISDN numbering plan: The ISDN numbering plan used by the adapter. For example, ISDN, X121 data numbering plan, or telex numbering plan.

Select *Unknown plan* if you do not know the numbering plan.

Passive bus unit address type: The type of addressing used by the adapter to receive incoming calls on the ISDN passive bus. It indicates how the value in the passive bus unit address position field is used.

If you select *No passive bus unit address*, then *Passive bus unit address position* must be specified as *Not used*, and the *Passive bus unit address* field (specified on the *Create slot n adapter configuration* panel) must be blank.

Passive bus unit address position: This number, used with *Passive bus unit address type*, indicates the position of the unit address in data supplied by the network on an incoming call:

- When the passive bus unit address type is *Called-party subaddress*, the value specified here is used as the offset value of the leftmost digit of the unit address relative to the *first* digit of the called-party subaddress data supplied by the network.
- When the passive bus unit address type is *Direct dialing in* or *Multiple directory numbering*, the value specified here is used as the offset value of the leftmost digit of the unit address relative to the last digit of the called-party number supplied by the network.

For example, if the passive bus unit address type is *Called-party subaddress*, a value of 8 in this field specifies that the unit address begins at the ninth digit of the called-party subaddress (numbering starts at 0). If the passive bus unit address type is *Direct dialing in* or *Multiple directory numbering*, a value of 8 specifies that the unit address begins at the ninth digit from the end of the called-party number (numbering starts at 0).

Not used indicates that passive bus unit addressing is not used for selecting an ISDN adapter on an incoming call, whatever the passive bus unit address type. In this case, if several ISDN adapters are attached to the ISDN passive bus, the fastest one gets the call.

If the passive bus unit address type is *No passive bus unit address*, or the passive bus unit address (specified on the *Create slot n adapter configuration* panel) is blank, then *Not used* must be selected here.

This is used in conjunction with the application program ID (APID) position to indicate the location and value of the addressed APID in the data supplied by ISDN on an incoming call.

If *No application program selection* is selected here, then applications should specify the string FFFF as APID in their local directory entries. This ensures that they accept any incoming calls that specify an APID not associated with any other local directory entry that has issued a LISTEN command (that is, they disregard the APID requested by the incoming call).

Application program ID position: This number, used with the APID type, indicates the position of the APID in data received by the network on an incoming call:

- When the APID type is *Called-party subaddress*, the value specified here is used as the offset value for the leftmost digit of the APID relative to the first digit of the received called-party subaddress.
- When the APID type is *Direct dialing in* or *Multiple directory numbering*, the value specified here is used as the offset value of the leftmost APID digit relative to the last digit of the received called-party number.

For example, if the APID type is *Called-party subaddress*, a value of 8 in this field specifies that the APID begins at the ninth digit of the called-party subaddress (numbering starts at 0). If the passive bus unit address type is *Direct dialing in* or *Multiple directory numbering*, a value of 8 specifies that the APID begins at the ninth digit *from the end* of the called-party number (numbering starts at 0).

A position value of *Not used* here indicates that no digit is used as APID, whatever the APID type.

If the passive bus unit address type is *No application program selection ID*, the APID position must be *Not used*.

Application program ID length: This indicates the length of the APID.

If the APID cannot be entirely contained in data received from the network, the incoming call is rejected as if no APID is specified.

If the APID type is *No application program selection ID*, then *Not used* must be selected here.

If you are using passive bus addressing to access more than one application on a PS/2 computer, it is recommended that the value you use in this field is the same for all these applications.

Attachment type: This specifies the ISDN exchange equipment to which the adapter is connected.

Permanent connection feature: This specifies which ISDN B-channels, if any, are permanently connected. This feature is network dependent.

Adapter Configuration D-Channel Options Panel

```
┌ISDN—CONFIGURATOR─────────────────────────────────────────────┐
│┌Adapter-to-network—Connections────────────────────────────────┐
││┌Create—slot—1—adapter—configuration───────────────────────────┐
│││┌Adapter—configuration—-—D-Channel options──────────────────────┐
││││Esc=Cancel  f1=Help  F2=Enter                                  │
││││F4=Get predefined values  F5=Change field                      │
││││                                                               │
││││                                                               │
││││ Auto-polling Support                            No            │
││││                                                               │
││││                                                               │
││││ Connect/Disconnect Indication Support           No            │
││││                                                               │
└│││                                                               │
 └││ Power-on TEI Request Support                    No            │
  └│                                                               │
   │                                                               │
   │ TEI Identity Verify Procedure Support           No            │
   │                                                               │
   │                                                               │
   └───────────────────────────────────────────────────────────────┘
```

Figure 311. Adapter Configuration D-Channel Options Panel

See 22.12.3, “D-Channel Options Checklist” on page 722 for the related checklist.

The fields have the following meanings:

Auto-polling support: Specifies whether or not auto-polling is supported.

Use it if your network exchange requires periodic polling.

Connect/disconnect indication support: Specifies whether or not connect/disconnect indication is supported.

Use it if you want the adapter to release any assigned terminal endpoint identifiers (TEIs) when it detects loss of power from the ISDN link, or if the link is disconnected.

Power-on TEI request support: Specifies whether or not power-on TEI request is used.

Use it if you want the TEI assignment procedure to be followed when the adapter is initialized (this is usually when the power is turned on).

TEI identity verify procedure support: Specifies whether or not TEI identity verify procedure is supported.

Use it if your network requires support of the TEI identity verify procedure.

22.11.2 Configuring Local/Remote Directory Entries

Figure 312 shows the panel flow when configuring local and remote directory entries. The references to F4 indicate the shortcut key used to obtain certain panels.

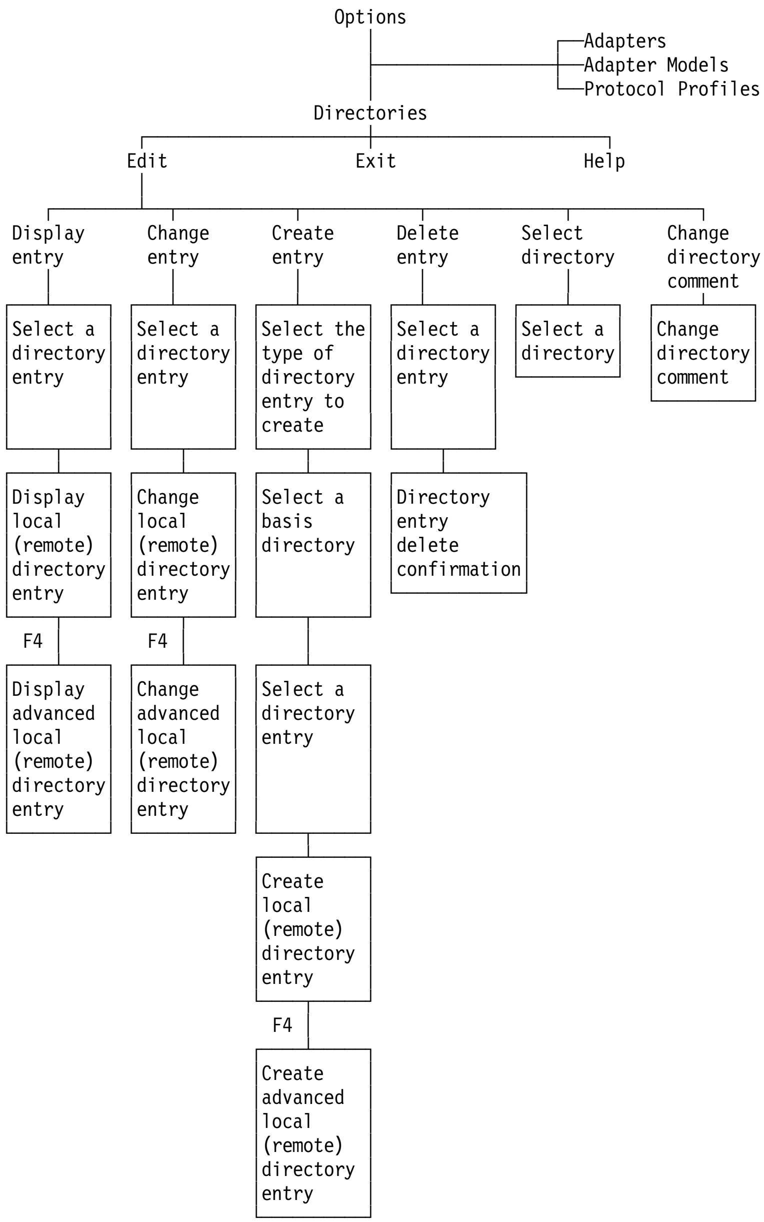


Figure 312. Directory Configuration Edit Panels

Create Local Directory Entry Panel

```
┌ISDN─CONFIGURATOR──────────────────────────────────────────────────────────┐
│┌Directories─────────────────────────────────────────────────────────────────┐
││┌Create─local─directory─entry──────────────────────────────────────────────────┐
│││Esc=Cancel f1=Help F2=Enter F4=Advanced options                              │
│││ (Use PageUp and PageDown to scroll)                                         │
│││                                                                             │
│││                                                                             │
│││ Directory:                                               Default directory │
│││                                                                             │
│││                                                                             │
│││ Directory entry type:                   ISDN Support Program Version 1.1 │
│││                                                                             │
└││                                                                             │
 └│ Directory entry name:                                      IDLCPS2TO3174L   │
  │                                                                             │
  │                                                                             │
  │ Directory entry comment:        PS2 to 3174 Host using IDLC (Local)         │
  │                                                                             │
  │                                                                             │
  │ Application ID:                                                        FFFF │
  │                                                                             │
  └─────────────────────────────────────────────────────────────────────────────┘
```

Figure 313. Create Local Directory Entry Panel

See 22.12.4, "Create Local Directory Entry Checklist" on page 722 for the related checklist.

The fields have the following meanings:

Directory: This identifies the directory to which this local entry applies.

Each adapter has its own directory, which contains local and remote entries. There is also a default directory that is used for any adapter that has no entries in its directory.

You select the directory to create an entry for by using the *Select directory* option on the *Edit* menu on the *Directories* panel.

If you are only communicating to a 3174 this can be the default directory.

Directory entry type: You can run applications written for the IBM ISDN Coprocessor Support Program (Version 1.0), the IBM ISDN Coprocessor Support Program Version 1.1, or for the IBM PC LAN Program. This field value ensures that the directory entry name is set up correctly for your application.

You select the directory entry type on the Select the type of directory entry to create panel that is displayed when you use the *Create* option on the *Edit* menu on the *Directories* panel.

Your directory entry type will probably be *ISDN Coprocessor Support Program Version 1.1*.

Directory entry name: A name by which you can refer to the directory entry.

If you are using this directory entry for either of:

- IDLC B-channel protocol

• Connection to a host through an IBM 7820 Terminal Adapter using SDLC B-channel protocol

then this name must be in uppercase characters.

When communicating with the 3174, the Local Directory entry name must be IDLCPS2TO3174.

Directory entry comment: You can use this comment to provide useful information about this directory entry.

Application ID: This value is supplied to ISDNBIOS when a LISTEN command is issued to identify this local application.

String FFFF specifies that the application associated with this directory entry is to receive calls that specify an APID not associated with any other local directory name that has issued a LISTEN command.

Create Advanced Local Directory Entry Panel

```
ISDN-CONFIGURATOR
Directories
Create-local-directory-entry
Create-advanced-local-directory-entry
 Esc=Cancel f1=Help F2=Enter F5=Change field
 (Use PageUp and PageDown to scroll)

 D channel protocol:   TE-1 (ISDN Coprocessor support program Q931 subset)

 Auto hang-up feature:                                          used

 Connection feature:                                      Neither

 Auto Activate B channel:                                      Automatic

 Rate specification:                      64 kbps without RDI

 B channel protocol type:                                            IDLC

 B channel protocol profile:                              PS2to3174
```

Figure 314. Create Advanced Local Directory Entry Panel

See 22.12.5, "Create Advanced Local Directory Entry Checklist" on page 723 for the related checklist.

The fields have the following meanings:

D-channel protocol: The Q.931 signaling protocol subset used on the ISDN D-channel, depending on the type of called ISDN equipment.

Auto hangup feature: This parameter specifies whether the D-channel is to be hung up automatically when a disconnect protocol sequence is detected on a B-channel.

Connection feature: Specifies whether or not the semi-permanent connection or permanent connection facility is used.

Auto-activate B-channel: Part of the data link control specification for the B-channel. This parameter specifies the action performed by the ISDNBIOS following a CALL or LISTEN command.

Rate specification: This parameter specifies the data transfer rate on the B-channel.

B-channel protocol type: Part of the data link control specification for the B-channels, specifying the protocol to be used. For the 3174 this should be IDLC.

B-channel protocol profile: The protocol profile defined for the B-channel protocol selection in *B-channel protocol type*. It supplies all the transmission parameters to be used for this session. You will create this later. (To create a protocol profile, select *Profiles* from the *Options* menu on the main panel.)

Create Remote Directory Entry Panel

```
┌ISDN—CONFIGURATOR──────────────────────────────────────────────┐
│┌Directories────────────────────────────────────────────────────┐
││┌Create—remote—directory—entry──────────────────────────────────┐
│││Esc=Cancel f1=Help F2=Enter F4=Advanced options                │
│││ (Use PageUp and PageDown to scroll)                           │
│││                                                               │
│││ Directory:                                  Default directory │
│││                                                               │
│││                                                               │
│││ Directory entry type:           ISDN Support Program Version 1.1│
│││                                                               │
│││                                                               │
│││ Directory entry name:                          IDLCPS2TO3174R │
│││                                                               │
│││                                                               │
│││ Directory entry comment:      PS2 to 3174 Host using IDLC (Remote)│
└││                                                               │
 └│                                                               │
  │ Called party number:          1234567890 ◄──                  │
  │                                                               │
  │                                                               │
  │ Called party subaddress value:                           FFFF │
  │                                                               │
  └───────────────────────────────────────────────────────────────┘
```

Figure 315. Create Remote Directory Entry Panel

See 22.12.6, "Create Remote Directory Entry Checklist" on page 724 for the related checklist.

The fields have the following meanings:

Directory: This identifies the directory to which this directory entry applies.

Each adapter has its own directory; there is also a default directory that is used for any adapter that has no entries in its directory.

You select the directory to create an entry for by using the *Select directory* option on the *Edit* menu on the Directories panel.

Directory entry type: You can run applications written for the IBM ISDN Coprocessor Support Program (Version 1.0), the IBM ISDN Coprocessor Support Program Version 1.1, or for the IBM PC LAN Program. For the 3174, it will be the IBM ISDN Coprocessor Support Program. This entry ensures that the directory entry name is set up correctly for your application.

You select the directory entry type on the Select the type of directory entry to create panel that is displayed when you use the *Create* option on the *Edit* menu on the *Directories* panel.

Directory entry name: A name used for this directory entry. For the 3174 this will be IDLCPS2TO3174R.

Directory entry comment: You can use this comment to provide useful information about this directory entry.

Called-party number: This specifies the ISDN subscriber number to be specified by the local session to establish a connection with the remote ISDN adapter. The format of the number is network dependent. This is the ISDN subscribers number of the 3174.

Called-party subaddress value: Used by the ISDNBIOS CALL command processor on outgoing SETUP sequences:

- If the called-party passive bus unit address type is *Called party subaddress*, specify the unit address on the ISDN passive bus.
- If the called-party APID type is *Called-party subaddress*, specify the APID.
- If the remote application identifier value is part of the data supplied by the application and need not be processed by the ISDNBIOS, specify string FFFF.

The ISDNBIOS inserts this value before the called-party subaddress data supplied by the application on CALL commands.

Create Advanced Remote Directory Entry Panel

```
┌ISDN─CONFIGURATOR──────────────────────────────────────────────────────────┐
│┌Directories─────────────────────────────────────────────────────────────────┐
││┌Create─remote─directory─entry─────────────────────────────────────────────────┐
│││┌Create─advanced─remote─directory─entry──────────────────────────────────────────┐
││││ Esc=Cancel f1=Help F2=Enter F5=Change field                                   │
││││ (Use PageUp and PageDown to scroll)                                           │
││││                                                                               │
││││                                                                               │
││││ D channel protocol:   TE-1 (ISDN Coprocessor support program Q931 subset)     │
││││                                                                               │
││││                                                                               │
└│││ Called party numbering plan:            Unknown plan                          │
 └││                                                                               │
  └│                                                                               │
   │ Called party numbering type:                     Unknown type                 │
   │                                                                               │
   │                                                                               │
   │ Auto hang-up feature:                                           used          │
   │                                                                               │
   │                                                                               │
   │ Connection feature:                                       Neither             │
   │                                                                               │
   │                                                                               │
   │ User to user data code sets:                       Code Set 0                 │
   │                                                                               │
   │                                                                               │
   │ Called party subaddress supplied by application and/or ISDNBIOS: not used     │
   │                                                                               │
   │                                                                               │
   │ Calling party number supplied by ISDNBIOS:                       not used     │
   │                                                                               │
   │                                                                               │
   │ Calling party subaddress supplied by application and ISDNBIOS:   not used     │
   │                                                                               │
   │                                                                               │
   │ Disconnection cause supplied by application or ISDNBIOS:         not used     │
   │                                                                               │
   │                                                                               │
   │ Keypad facility:                                                 not used     │
   │                                                                               │
   │                                                                               │
   │ Higher layer compatibility information supplied by application:  not used     │
   │                                                                               │
   │                                                                               │
   │ Auto Activate B channel:                                        Automatic     │
   │                                                                               │
   │                                                                               │
   │ Rate specification:                        64 kbps without RDI                │
   │                                                                               │
   │                                                                               │
   │ B channel protocol type:                                             IDLC     │
   │                                                                               │
   │                                                                               │
   │ B channel protocol profile:                               PS2to3174           │
   └───────────────────────────────────────────────────────────────────────────────┘
```

Figure 316. Create Advanced Remote Directory Entry Panel

See 22.12.7, "Create Advanced Remote Directory Entry Checklist" on page 724 for the related checklist.

The fields have the following meanings

D-channel protocol: This identifies the Q.931 signaling protocol subset used on the ISDN D-channel.

Called-party numbering plan: This specifies the ISDN numbering plan used by the called party.

Called-party numbering type: This specifies the type of the called-party subscriber number.

Auto hangup feature: If this feature is used, the D-channel is hung-up automatically when a disconnect protocol sequence is detected on a B-channel.

Connection feature: This field is used to specify which of the ISDN service facilities are used.

User-to-user data code sets: Specifies which user-to-user data code sets are supplied by the application.

Called-party subaddress supplied by application and/or ISDNBIOS: Specifies whether or not this ISDN service facility is used.

Calling-party number supplied by ISDNBIOS: Specifies whether or not this ISDN service facility is used.

Calling-party subaddress supplied by application or ISDNBIOS: Specifies whether or not this ISDN service facility is used.

Disconnection cause supplied by application or ISDNBIOS: Specifies whether or not this ISDN service facility is used.

Keypad facility: Specifies whether or not this ISDN service facility is used.

Higher-layer compatibility information supplied by application: Specifies whether or not higher-layer compatibility information is supplied by the application.

Auto activate B-channel: This parameter specifies the action performed by the ISDNBIOS following a CALL or LISTEN command.

Rate specification: This is the throughput rate of the B-channels in Kbps; it is network dependent.

B-channel protocol type: Part of the data link control specification for the B-channels, specifying the protocol to be used.

Note: For a 3174 directory entry, you must use the IDLC protocol.

B-channel protocol profile: The protocol profile defined for the B-channel protocol selection in *B-channel protocol type*. It supplies all the transmission parameters to be used for this session. This can be the same protocol profile defined for the local directory. (To create a protocol profile, select *Protocol profiles* from the *Options* menu on the main panel.)

22.11.3 Configuring Adapter Models

Figure 317 shows the panels that you use to edit adapter models. The boxes show the names of the panels you can display from the *Edit* menu on the *Adapter models* main panel. The references to F3 and F4 indicate the shortcut keys used to obtain certain panels.

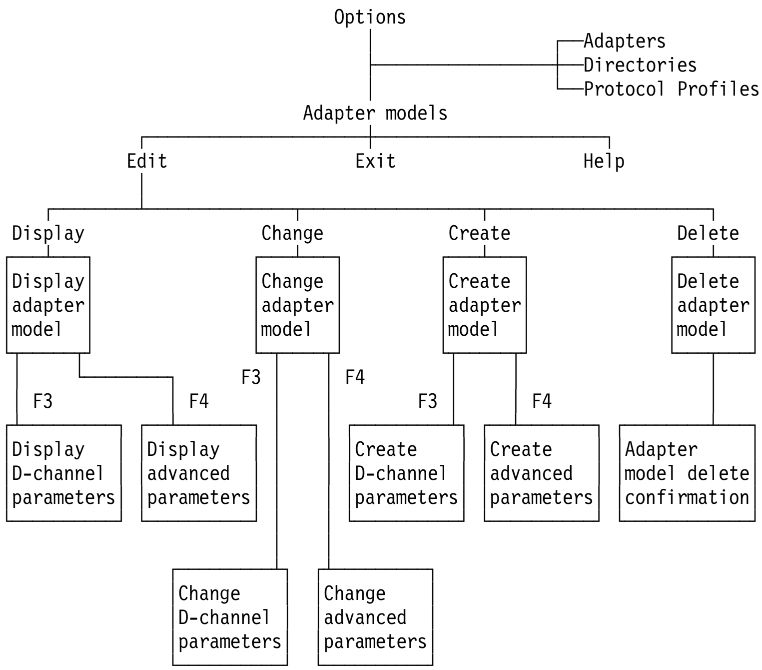


Figure 317. Adapter Models Configuration Edit Panels

Create Adapter Model Panel

```
┌ISDN─CONFIGURATOR──────────────────────────────────────────────┐
│┌Adapter─Models─User─Interface──────────────────────────────────┐
││┌Create─adapter─model───────────────────────────────────────────┐
│││ Esc=Cancel  F1=Help  F2=Enter  F3=D-Channel F4=Advanced        │
│││                                                                │
│││                                                                │
│││                                                                │
│││ Model name:                                                    │
│││                                                                │
│││                                                                │
│││ Comment:                                                       │
│││                                                                │
└││                                                                │
 └│                                                                │
  └────────────────────────────────────────────────────────────────┘
```

Figure 318. Create Adapter Model Panel

See 22.12.8, "Create Adapter Model Checklist" on page 725 for the related checklist.

The fields have the following meanings:

Model name: A name by which you can refer to this adapter model when you use it to configure an adapter, or when you display, change, or delete it.

Comment: A comment associated with this adapter model. You can use it for information about the use of the model.

Create Advanced Parameters Panel

```
┌ISDN-CONFIGURATOR──────────────────────────────────────────────────────┐
│┌Adapter-Models-User-Interface──────────────────────────────────────────┐
││┌Create-adapter-model────────────────────────────────────────────────────┐
│││┌Create-advanced-parameters──────────────────────────────────────────────┐
││││ Esc=Cancel  F1=Help  F2=Enter  F5=Change field                          │
││││ (Use PageUp and PageDown to scroll)                                     │
││││                                                                         │
││││                                                                         │
││││ ISDN numbering type                              Unknown type           │
││││                                                                         │
││││                                                                         │
││││ ISDN numbering plan                     Unknown plan                    │
└│││                                                                         │
 └││                                                                         │
  └│ Passive bus unit address type               No passive bus unit address │
   │                                                                         │
   │                                                                         │
   │ Passive bus unit address position                              Not Used │
   │                                                                         │
   │                                                                         │
   │ Application program ID type         No application program selection ID │
   │                                                                         │
   │                                                                         │
   │ Application program ID position                                Not Used │
   │                                                                         │
   │                                                                         │
   │ Application program ID length                                  Not Used │
   │                                                                         │
   │                                                                         │
   │ Attachment type                                            5E4 AT&T/5ESS │
   │                                                                         │
   │                                                                         │
   │ Permanent connection feature      No B channel permanently connected.   │
   │                                                                         │
   └─────────────────────────────────────────────────────────────────────────┘
```

Figure 319. Create Advanced Parameters Panel

See 22.12.9, "Create Advanced Parameters Checklist" on page 726 for the related checklist.

The fields have the following meanings:

ISDN numbering type: The subscriber numbering type used by the adapter.

For example, national number, network-specific number, or abbreviated number.

Select *Unknown type* if you do not know the numbering type.

ISDN numbering plan: The ISDN numbering plan used by the adapter.

For example, ISDN, X121 data numbering plan, or telex numbering plan.

Select *Unknown plan* if you do not know the numbering plan.

Passive bus unit address type: The type of addressing used by the adapter to receive incoming calls on the ISDN passive bus. It indicates how the value in the passive bus unit address position field is used.

No passive bus unit address can be specified. If so, *Passive bus unit address position* must be specified as *Not used*.

Passive bus unit address position: This number, used with the passive bus unit address type, indicates the position of the unit address in data supplied by the network on an incoming call:

- When the passive bus unit address type is *Called-party subaddress*, the value specified here is used as the offset value of the leftmost digit of the unit address relative to the first digit of the called-party subaddress data supplied by the network.
- When the passive bus unit address type is *Direct dialing in* or *Multiple directory numbering*, the value specified here is used as the offset value of the leftmost digit of the unit address relative to the last digit of the called-party number supplied by the network.

For example, if the passive bus unit address type is *Called-party subaddress*, a value of 8 in this field specifies that the unit address begins at the ninth digit of the called-party subaddress (numbering starts at 0). If the passive bus unit address type is *Direct dialing in* or *Multiple directory numbering*, a value of 8 specifies that the unit address begins at the ninth digit from the end of the called-party number (numbering starts at 0).

Not used indicates that passive bus unit addressing is not used for selecting an ISDN adapter on an incoming call, whatever the passive bus unit address type. In this case, if several ISDN adapters are attached to the ISDN passive bus, the fastest one gets the call.

If the passive bus unit address type is *No passive bus unit address*, *Not used* must be selected here.

Application program ID type: This is used in conjunction with the application program ID (APID) position to indicate the location and value of the addressed APID in the data supplied by ISDN on an incoming call.

If *No application program selection* is selected here, then applications should specify the string FFFF as APID in their local directory entries. This ensures that they accept any incoming calls that specify an APID not associated with any other local directory entry that has issued a LISTEN command (that is, they disregard the APID requested by the incoming call).

Application program ID position: This number, used with the APID type, indicates the position of the APID in data received by the network on an incoming call:

- When the APID type is *Called-party subaddress*, the value specified here is used as the offset value for the leftmost digit of the APID relative to the first digit of the received called-party subaddress.
- When the APID type is *Direct dialing in* or *Multiple directory numbering*, the value specified here is used as the offset value of the leftmost APID digit relative to the *last* digit of the received called-party number.

For example, if the APID type is *Called-party subaddress*, a value of 8 in this field specifies that the APID begins at the ninth digit of the called-party subaddress (numbering starts at 0). If the passive bus unit address type is *Direct dialing in* or *Multiple directory numbering*, a value of 8 specifies that the APID begins at the ninth digit from the end of the called-party number (numbering starts at 0).

A position value of *Not used* here indicates that no digit is used as APID, whatever the APID type.

If the passive bus unit address type is *No application program selection ID*, the APID position must be *Not used*.

Application program ID length: This indicates the length of the APID.

If the APID cannot be entirely contained in data received from the network, the incoming call is rejected as if no APID is specified.

If the APID type is *No application program selection ID*, *Not used* must be selected here.

If you are using passive bus addressing to access more than one application on a PS/2 computer, it is recommended that the value you use in this field is the same for all these applications.

Attachment type: The ISDN exchange equipment to which the adapter is connected.

Permanent connection feature: This specifies which ISDN B-channels are permanently connected.

Create D-Channel Parameters Panel

```
┌ISDN─CONFIGURATOR──────────────────────────────────────────────────┐
│┌Adapter─Models─User─Interface────────────────────────────────────┐│
││┌Create─adapter─model──────────────────────────────────────────┐│
│││┌Create─D─Channel─parameters──────────────────────────────────┐
││││ Esc=Cancel  F1=Help  F2=Enter  F5=Change field              │
││││                                                             │
││││                                                             │
││││ Auto-polling Support                                  No    │
││││                                                             │
││││                                                             │
││││ Connect/Disconnect Indication Support                 No    │
└│││                                                             │
 └││                                                             │
  └│ Power-on TEI Request Support                          No    │
   │                                                             │
   │                                                             │
   │ TEI Identity Verify Procedure Support                 No    │
   └─────────────────────────────────────────────────────────────┘
```

Figure 320. Create D-channel Parameters Panel

See 22.12.10, “Create D-channel Parameters Checklist” on page 727 for the related checklist.

The fields have the following meanings:

Auto-polling support: Specifies whether or not auto-polling is supported.

Use it if your network exchange requires periodic polling.

Connect/disconnect indication support: Specifies whether or not connect/disconnect indication is supported.

Use it if you want the adapter to release any assigned terminal endpoint identifiers (TEIs) when it detects loss of power from the ISDN link, or if the link is disconnected.

Power-on TEI request support: Specifies whether or not power-on TEI request is used.

Use it if you want the TEI assignment procedure to be followed when the adapter is initialized (this is usually when the power is turned on).

TEI identity verify procedure support: Specifies whether or not TEI identity verify procedure is supported.

Use it if your network requires support of the TEI identity verify procedure.

22.11.4 Configuring B-Channel Protocol Profiles

Figure 321 shows the panel flow when editing the protocol profiles. We will only discuss the IDLC panels as they are required for 3174 connectivity. The boxes show the names of the panels you can display from the *Edit* menu on the *Protocol profiles* main panel.

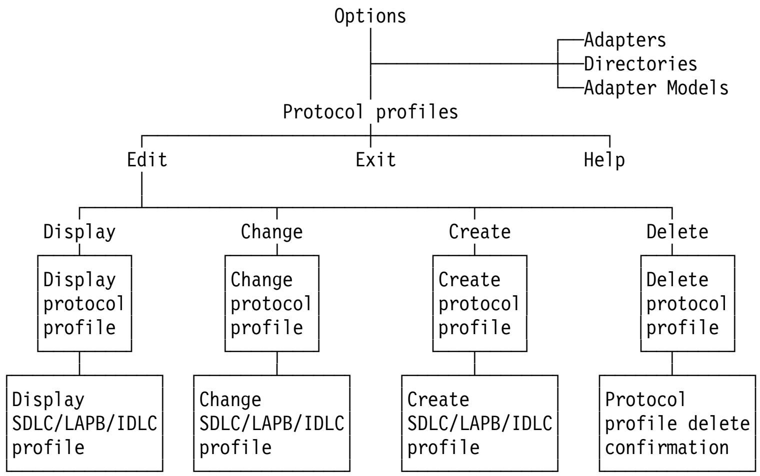


Figure 321. Protocol Profiles Configuration Edit Panels

Create IDLC Profile Panel

```
┌ISDN─CONFIGURATOR──────────────────────────────────────────┐
│┌Protocol─Profiles─User─Interface──────────────────────────┐
││┌Create─IDLC─profile───────────────────────────────────────┐
│││ Esc=Cancel  f1=Help  F2=Enter                             │
│││ (Use PageUp and PageDown to scroll)                       │
│││                                                           │
│││ IDLC node ID: Block number                         53     │
│││                                                           │
│││                                                           │
│││ IDLC node ID: Identifier number                  00031    │
│││                                                           │
│││                                                           │
└││ Response timeout                                 50       │
 └│                                                           │
  │                                                           │
  │ Maximum unacknowledged I-frames                     4     │
  │                                                           │
  │                                                           │
  │ Maximum received frame length                     1033    │
  │                                                           │
  │                                                           │
  │ HDLC frame address                                256     │
  │                                                           │
  │                                                           │
  │ Maximum retransmissions                             3     │
  │                                                           │
  │                                                           │
  │ Inactivity timeout                               600      │
  │                                                           │
  │                                                           │
  │ Link initialize timeout                          65535    │
  └───────────────────────────────────────────────────────────┘
```

Figure 322. Create IDLC Profile Panel

See 22.12.11, "Create IDLC Profile Checklist" on page 728 for the related checklist.

Note: You specify the name for this protocol profile on the *Create protocol profile* panel.

The fields have the following meanings:

IDLC node ID: block number: A three-digit number that is used as the first three digits of the eight-digit node identifier.

IDLC node ID: identifier number: A five-digit number that is used as the final five digits of the eight-digit node identifier. This must match one of the DSPU PUIDs configured on the 3174.

Ask the system administrator of the remote station to provide the identifier number.

Response time-out: This is timer T200 specified in 50 millisecond units. For example, a value of 50 gives a T200 value of 2.5 seconds.

T200 is the time allowed for a response to a transmitted frame. If no response is received when T200 expires, the frame is retransmitted.

Maximum unacknowledged I frames: This is the maximum number of information (I) frames that can be sent without acknowledgment. It represents the link window size. For 3174 communication, this should match the PC/3270 ISDN Enabler configured window size.

Maximum received frame length: This is the maximum number of bytes in a received information (I) frame.

This value must be not less than the I-frame size specified for the PC/3270 emulator (this is the I value in the PC/3270 batch file generated when the terminal emulator is installed, for example, I=1033).

Maximum sent frame length: This is the maximum number of bytes in a transmitted information (I) frame.

This value must be not less than the I-frame size specified for the PC/3270 emulator (this is the I value in the PC/3270 batch file generated when the terminal emulator is installed, for example, I=1033).

HDLC frame address: This is the frame address used for communication between the PS/2 computer and the host control.

The value hex 0100 is equivalent to an IDLC address of hex 20.

Maximum retransmissions: This is N200.

It specifies the number of times a frame can be retransmitted before the link is considered broken.

Inactivity time-out: This is T203 specified in 50-millisecond units. For example, a value of 600 gives a T200 value of 30 seconds.

This timer can be used to check for link inactivity. If it is enabled and the link becomes inactive, the link is disconnected when timer T203 times out.

A value of 0 indicates that the timer is turned off.

Link initialize time-out: This is timer TConn. The way in which it is interpreted depends on its value:

A value of 0 indicates that Set Asynchronous Balanced Mode Extended (SABME) is transmitted immediately in an attempt to establish the link.

A value of 1 through 65 534 specifies a time-out value in 50-millisecond units (for example, a value of 600 gives a time-out value of 30 seconds). When this timer times out, an attempt is made to establish the link. If a SET MODE command is received from the remote station before the timer has timed out, the link is established immediately.

A value of 65 535 specifies that no active attempt to establish the link is made by the local station. The link is established when a SET MODE command is received from the remote station.

Note: The ISDN Coprocessor Support Program allocates a record number to each protocol profile; you have to specify the record number corresponding to the profile you want to use when you use ISDNBIOS commands to add directory entries dynamically. The record number is displayed with the other profile parameters when you display or change a protocol profile.

22.12 Parameter Checklists

This section is taken from the appendix of the ISDN Coprocessor Support Program &V11. DOS System Administrators Guide. It is included as a convenience reference to help you:

- Plan the configuration of a system
- Carry out the actual configuration
- Document any changes to the configuration of the system.

Make a copy of the pages in this appendix, and complete the "Your value" fields by placing a checkmark in the box against the appropriate choice, or by filling in the required information for your network.

22.12.1 Create Slot n Adapter Configuration Checklist

Table 34. Create Slot n Adapter Configuration Checklist

Field name	Parameter range	Your value
ISDN subscriber number	Up to 40 printable characters	
Passive bus unit address	1–8 digits, or leave blank	
Country	Australia Belgium Canada Denmark Finland France Germany Japan Norway Sweden Switzerland United Kingdom United States	• • • • • • • • • • • • •

See "Creating Adapter Configuration" on page 699 for the configuration utility panel and field descriptions corresponding to this checklist.

22.12.2 Adapter Configuration – Advanced Options Checklist

Table 35 (Page 1 of 2). Adapter Configuration – Advanced Options Checklist

Field name	**Parameter range**	**Your value**
ISDN numbering type	Unknown type International number National number Network specific number Subscriber number Abbreviated number	• • • • • •
ISDN numbering plan	Unknown plan ISDN X121 data numbering plan Telex numbering plan National standard numbering plan Private numbering plan	• • • • • •
Passive bus unit address type	No passive bus unit address Called party subaddress Direct dialing (French SDA) Multiple directory numbering	• • • •
Passive bus unit address position	Not Used 0 1 2 3 4 5 6 7 8 9	• • • • • • • • • • •
Application program ID type	No application program selection ID Called party subaddress Direct dialing (French SDA) Multiple directory numbering	• • • •
Application program ID position	Not Used 0 1 2 3 4 5 6 7 8 9	• • • • • • • • • • •
Application program ID length	Not Used 1 2 3 4	• • • • •

Table 35 (Page 2 of 2). Adapter Configuration – Advanced Options Checklist		
Field name	**Parameter range**	**Your value**
Attachment type	5E4 AT&T/5ESS 5E5 AT&T/5ESS 5E6 AT&T/5ESS BCS29 NTI/DMS100 BCS30 NTI/DMS100 BCS31 NTI/DMS100 VN2 1TR6 NTT89 NTT90 ISDN2 Microlink ALINE Swissnet 2	• • • • • • • • • • • • • •
Permanent connection feature	No B-channel permanently connected B-channel 1 permanently connected B-channel 2 permanently connected Both B-channels permanently connected	• • • •

See “Adapter Configuration Advanced Options” on page 700 for the configuration utility panel and field descriptions corresponding to this checklist.

22.12.3 D-Channel Options Checklist

Table 36. D-Channel Options Checklist		
Field name	**Parameter range**	**Your value**
Auto-polling support	Yes No	• •
Connect/disconnect indication support	Yes No	• •
Power-on TEI request support	Yes No	• •
TEI identity verify procedure support	Yes No	• •

See “Adapter Configuration D-Channel Options Panel” on page 703 for the configuration utility panel and field descriptions corresponding to this checklist.

22.12.4 Create Local Directory Entry Checklist

Table 37 (Page 1 of 2). Create Local Directory Entry Checklist		
Field name	**Parameter range**	**Your value**
Directory	Directory for the slot number of an installed directory, or default directory. **Note:** This is selected on the *Select a directory* panel.	
Directory entry type	ISDN Coprocessor Support Program (Version 1.1) ISDN Coprocessor Support Program (Version 1.0) PC LAN Program **Note:** This is selected on the *Select a directory* panel.	• • •
Directory entry name	Up to 16 alphanumeric characters	

Table 37 (Page 2 of 2). Create Local Directory Entry Checklist		
Field name	**Parameter range**	**Your value**
Directory entry comment	Up to 40 alphanumeric characters	
Application ID	Up to 4 digits, or string FFFF	

See "Create Local Directory Entry Panel" on page 705 for the configuration utility panel and field descriptions corresponding to this checklist.

22.12.5 Create Advanced Local Directory Entry Checklist

Table 38. Create Advanced Local Directory Entry Checklist		
Field name	**Parameter range**	**Your value**
D-channel protocol	TE–1 (IBM ISDN Coprocessor Support Program Q931 subset) TA–1 (IBM 7820 Q931 subset V35) TA–1 (IBM 7820 Q931 subset X21)	• • •
Auto hang-up feature	Not used Used	• •
Connection feature	Neither Semi-permanent Permanent	• • •
Auto Activate B-channel	Automatic Manual	• •
Rate specification	64 kbps without RDI 56 kbps Restricted (USA only)	• •
B-channel protocol type	SDLC LAPB IDLC	• • •
B-channel protocol profile	SDLC: PS2to7820secV35 PS2to7820secX21 PS2toPS2pri PS2toPS2sec LAPB: PS2toPS2dce PS2toPS2dte IDLC: PS2toHOST	 • • • • • • •

See "Create Advanced Local Directory Entry Panel" on page 706 for the configuration utility panel and field descriptions corresponding to this checklist.

22.12.6 Create Remote Directory Entry Checklist

Table 39. Create Remote Directory Entry Checklist

Field name	Parameter range	Your value
Directory	Directory for the slot number of an installed directory, or default directory. **Note:** This is selected on the *Select a directory* panel.	
Directory entry type	ISDN Coprocessor Support Program (Version 1.1) ISDN Coprocessor Support Program (Version 1.0) PC LAN Program **Note:** This is selected on the *Select a directory* panel.	• • •
Directory entry name	Up to 16 alphanumeric characters	
Directory entry comment	Up to 40 alphanumeric characters	
Called party number	Up to 40 printable characters	
Called party subaddress value	A number in the range 1–9999, or string FFFF	

See "Create Remote Directory Entry Panel" on page 707 for the configuration utility panel and field descriptions corresponding to this checklist.

22.12.7 Create Advanced Remote Directory Entry Checklist

Table 40 (Page 1 of 2). Create Advanced Remote Directory Entry Checklist

Field name	Parameter range	Your value
D-channel protocol	TE–1 (IBM ISDN Coprocessor Support Program Q931 subset) TA–1 (IBM 7820 Q931 subset V35) TA–1 (IBM 7820 Q931 subset X21)	• • •
Called party numbering plan	Unknown plan ISDN X121 data numbering plan Telex numbering plan National standard numbering plan Private numbering plan	• • • • • •
Called party numbering type	Unknown type International number National number Network specific number Subscriber number Abbreviated number	• • • • • •
Auto hang-up feature	Not used Used	• •
Connection feature	Neither Semi-permanent Permanent	• •
User to data code sets	Code Set 0 Code Sets 0 and 6 Code Sets 0, 6, and 7	• • •
Called party subaddress supplied by application and/or ISDNBIOS	Not used Used	• •

Table 40 (Page 2 of 2). Create Advanced Remote Directory Entry Checklist		
Field name	**Parameter range**	**Your value**
Calling party number supplied by ISDNBIOS	Not used Used	• •
Calling party subaddress supplied by application and ISDNBIOS	Not used Used	• •
Disconnection cause supplied by application or ISDNBIOS	Not used Used	• •
Keypad facility	Not used Used	• •
Higher layer compatibility information supplied by application	Not used Used	• •
Auto Activate B-channel	Automatic Manual	• •
Rate specification	64 Kbps without RDI 56 Kbps Restricted (USA only)	• •
B-channel protocol type	SDLC LAPB IDLC	• • •
B-channel protocol profile	SDLC: PS2to7820secV35 PS2to7820secX21 PS2toPS2pri PS2toPS2sec LAPB: PS2toPS2dce PS2toPS2dte IDLC: PS2toHOST	 • • • • • • •

See "Create Advanced Remote Directory Entry Panel" on page 709 for the configuration utility panel and field descriptions corresponding to this checklist.

22.12.8 Create Adapter Model Checklist

Table 41. Create Adapter Model Checklist		
Field name	**Parameter range**	**Your value**
Model name	Up to 16 characters	
Comment	Up to 40 alphanumeric characters	

See "Create Adapter Model Panel" on page 712 for the configuration utility panel and field descriptions corresponding to this checklist.

22.12.9 Create Advanced Parameters Checklist

Table 42 (Page 1 of 2). Create Advanced Parameters Checklist

Field name	Parameter range	Your value
ISDN numbering type	Unknown type International number National number Network specific number Subscriber number Abbreviated number	• • • • • •
ISDN numbering plan	Unknown plan ISDN X121 data numbering plan Telex numbering plan National standard numbering plan Private numbering plan	• • • • • •
Passive bus unit address type	No passive bus unit address Called party subaddress Direct dialing (French SDA) Multiple directory numbering	• • • •
Passive bus unit address position	Not Used 0 1 2 3 4 5 6 7 8 9	• • • • • • • • • • •
Application program ID type	No application program selection ID Called party subaddress Direct dialing (French SDA) Multiple directory numbering	• • • •
Application program ID position	Not Used 0 1 2 3 4 5 6 7 8 9	• • • • • • • • • • •
Application program ID length	Not Used 1 2 3 4	• • • • •

Table 42 (Page 2 of 2). Create Advanced Parameters Checklist		
Field name	**Parameter range**	**Your value**
Attachment type	5E4 AT&T/5ESS 5E5 AT&T/5ESS 5E6 AT&T/5ESS BCS29 NTI/DMS100 BCS30 NTI/DMS100 BCS31 NTI/DMS100 VN2 1TR6 NTT89 NTT90 ISDN2 Microlink ALINE Swissnet 2	• • • • • • • • • • • • • •
Permanent connection feature	No B-channel permanently connected B-channel 1 permanently connected B-channel 2 permanently connected Both B-channels permanently connected	• • • •

See “Create Advanced Parameters Panel” on page 713 for the configuration utility panel and field descriptions corresponding to this checklist.

22.12.10 Create D-channel Parameters Checklist

Table 43. Create D-Channel Parameters Checklist		
Field name	**Parameter range**	**Your value**
Auto-polling support	Yes No	• •
Connect/disconnect indication support	Yes No	• •
Power-on TEI request support	Yes No	• •
TEI identity verify procedure support	Yes No	• •

See “Create D-Channel Parameters Panel” on page 716 for the configuration utility panel and field descriptions corresponding to this checklist.

22.12.11 Create IDLC Profile Checklist

Table 44. Create IDLC Profile Checklist

Field name	Parameter range	Your value
Protocol profile name	1–16 alphanumeric characters, different from any existing IDLC profile name. **Note:** This field is case sensitive (for example, "IDLCPR1" is a different IDLC profile name from "idlcpr1"). You specify this field on the *Create protocol profile* panel.	
IDLC node ID: block number	Hex 000 – hex FFF **Note:** 053 required for 3174.	
IDLC node ID: identifier number	Hex 00000 – hex FFFFF	
Response time-out	A number in the range 1–65535	
Maximum unacknowledged I frames	1–127	
Maximum received-frame length	A number in the range 16–4096	
Maximum sent-frame length	A number in the range 16–4096	
HDLC frame address	A number in the range 0–8191	
Maximum retransmissions	1–255	
Inactivity time-out	A number in the range 0–65535	
Link initialize time-out	A number in the range 0–65535	

See "Create IDLC Profile Panel" on page 718 for the configuration utility panel and field descriptions corresponding to this checklist.

Appendix A. 3174 Adapters

A.1 IBM 3174 Large Controller Card and Adapter Functions

The following is a description of the adapters that may be installed in various models of the IBM 3174. It is useful to know the hardware group and recommended position of each card and adapter for problem determination purposes, so this information is also included.

Each card has a position in the 3174 logic board recommended by IBM. Apart from certain adapters such as the Channel Adapter they can be thought of as conventional positions rather than mandatory. However conventions are always helpful if problems arise. The number of the position that a particular card should be fitted to is included in the installation instructions with each card.

Each of these cards is a Field Replaceable Unit (FRU) and as such each has a FRU type number.

A.1.1 Processor Card

- Use .... Base - All Models
- Type Number .... 9500 or 9501
- Position 18
- Hardware Group 87

This card contains the 3174 microprocessor, a timer, a pluggable 16K x 18 ROS module, and other timing and control logic. It also contains logic for single-bit per halfword memory error correction and double-bit memory error detection. A red light emitting diode (LED) on the card blinks during diagnostic testing to indicate that the card logic is operational.

A.1.2 512K Storage Card

- Use .... Optional - Models 1L, 1R, 2R, 3R - Not for models 11L, 11R, 12R, 13R, 14R
- Type Number 9051
- Position .... 17 or 20
- Hardware Group 87

This card contains 23 modules of 256K x 1 memory and switching logic to provide 512K of usable storage, six-bit error correction code, single-bit error correction, and double-bit error detection.

A.1.3 1MB Storage Card

- Use .... Base - Models 1L, 1R, 2R, 3R; Optional - Models 1L, 1R, 2R, 3R, 11L, 11R, 12R, 13R, 14R
- Type Number 9052
- Position .... 17 or 20
- Hardware Group 87

This card contains 46 modules of 256K x 1 memory and switching logic to provide 1MB of usable storage, six-bit error correction code, single-bit error correction, and double-bit error detection.

A.1.4 2MB Storage Card

- Use .... Base - Models 11L, 1xR; Optional - Models 1L/11L, 1R/11R, 2R/12R, 3R/13R, 14R
- Type Number 9053
- Position .... 17, 19, or 20 or planar board
- Hardware Group 87

This card contains 92 modules of 256K x 1 memory and switching logic to provide 2 MB of usable storage, six-bit error correction code, single-bit error correction, and double-bit error detection.

This card provides an additional 2,048KB of control storage. When this feature is ordered for an 11L, 11R, 12L, 12R, 13R, 14R an adapter card is shipped, when it is ordered for Models 21H, 21L, 21R, 22L, 23R, 61R, 62R, 63R or 64R a Plug-in Module (PIM) is shipped. The 4MB storage Expansion feature should be considered in lieu of this feature to accommodate future functional growth and for the most efficient use of the available card slots.

A.1.5 4MB Storage Card

- Use .... Base - Models 11L, 1xR; Optional - Models 1L/11L, 1R/11R, 2R/12R, 3R/13R, 14R
- Type Number .... 905?
- Position .... planar board
- Hardware Group 87

This card provides an additional 4,096KB of control storage. This feature is a Plug-in Module (PIM). You can only use one 4MB PIM in a 3174. Configuration Support-B or Configuration Support-C is required.

A.1.6 Disk Adapter (File Adapter)

- Use .... Base - All Models
- Type Number .... 9120 or 9154
- Position 21
- Hardware Group 01/26

The 9120 adapter provides read/write control for the two diskette or fixed disk drives that can be installed in the 3174. In addition, the 9154 adapter provides for 3270 Terminal Attachment.

A.1.7 Terminal Adapter

- Use .... Base - All Models
- Type Number .... 9150 or 9154
- Position .... 22, 23 or 24
- Hardware Group .... 26 or 27

This adapter provides buffering and control for attachment of up to 32 category-A displays, printers, and workstations. Each of the four BNC top-card connectors provides a path to one terminal, or to one IBM 3299 Terminal Multiplexer, or to one Terminal Multiplexer Adapter. Signals from each port contains addressing for up to eight terminals. Attachments can be up to 4920 feet (1.5 km) from the 3174 when coaxial cable is used to attach them, or up to 3280 feet (1 km) when IBM Cabling System Data Grade Media is used. A balun is needed at the terminal end of the connection, but none is needed at the 3174 end when Cabling System media is used. Diagnostic wrap capability, under microcode program control, is provided at the driver/receiver output. Logic for Driver/receiver wrapping, timeout delay selection, and addressed cable protocol are also included on the card.

Note: When a 3299 model 32 is attached to port 0, 32 terminals can be attached to the 3299. The remaining ports of the Terminal Adapter cannot be used.

A.1.8 Port Expansion Feature

- Use .... Models 11L, 11R, 12R, 13R, 14R
- Type Number 9155
- Position .... 22 or 23
- Hardware Group .... 26 or 27

This adapter provides the connection for an additional 32 ports for attachment of category-A displays, printers, and workstations. Each of the four BNC top-card connectors provides a path to one terminal, or to one IBM 3299 Terminal Multiplexer, or to one Terminal Multiplexer Adapter. Signals from each port contains addressing for up to eight terminals. Attachments can be up to 4920 feet (1.5 km) from the 3174 when coaxial cable is used to attach them, or up to 3280 feet (1 km) when IBM Cabling System Data Grade Media is used. A balun is needed at the terminal end of the connection, but none is needed at the 3174 end when Cabling System media is used. Diagnostic wrap capability, under microcode program control, is provided at the driver/receiver output. Logic for Driver/receiver wrapping, timeout delay selection, and addressed cable protocol are also included on the card.

Note: When a 3299 model 32 is attached to port 0, 32 terminals can be attached to the 3299. The remaining ports of the Terminal Adapter cannot be used.

A.1.9 Terminal Multiplexer Adapter

- Use .... Optional - All Models
- Type Number 917X
- Position .... Variable
- Hardware Group .... 26 or 27

This adapter performs the same functions as an external IBM 3299 Model 2 Terminal Multiplexer. Input to the card is via a short length of RG-62A/U cable between a Terminal Adapter port and the top BNC connector on this card. The input signals contain addressing to select one of the eight possible BNC output driver/receiver ports. Terminals can be up to 4920 feet (1.5 km) from the 3174 unit when coaxial cable is used to attach them, or up to 3280 feet (1 km) when IBM Cabling System Data Grade Media is used. A balun is needed at the terminal end of the connection, but none is needed at the control unit end when Cabling System media is used. Diagnostic wrap capability, under microcode program control, is provided at the driver/receiver output.

Note: With the Port Expansion feature, up to eight TMAs can be installed depending on the number of other optional features already installed.

A.1.10 Telephone Twisted-Pair Terminal Multiplexer Adapter

- Use 1L, 1R, 2R, 3R, 11L, 11R, 12L, 12R, 13R, 14R, 21L, 21R, 22L, 23R, 24R
- Type Number 9070
- Position .... 1L, 1R, 2R, 3R - 15, 16, 11, 23, 22, 12, 17, 24, 13, 14
- Position .... 11L, 11R, 12L, 12R, 13R, 14R - 11, 13, 15, 17, 22, 2, 12, 14, 16, 24
- Position .... 21L, 21R, 22L, 23R, 24R- any
- Hardware Group .... 26 or 27

This adapter performs the same functions as an external IBM 3299 Model 2 Terminal Multiplexer. Input to the card is via two 25-pair Telephone Twisted Pair cables. Each cable transports the data streams for up to 16 devices to the TTP TMA. A balun is usually required at the device to terminate the circuit.

This adapter is only available in certain countries. Please contact IBM to find out if it is available in your country.

A.1.11 ISDN Gateway Adapter

- Use 1L, 1R, 2R, 3R, 11L, 11R, 12L, 12R, 13R, 14R
- Type Number 9341
- Position .... 1L, 1R, 2R, - 11, 12, 13, 14
- Position .... 11L, 11R, 12L, 12R, 13R, 14R - any slot 11-17
- Hardware Group .... 36, 37, 38, or 39

This adapter provides data passage between a 3174 and Down stream devices only. Each adapter contains four ports. One connector containing two sets of

Telephone Twisted Pair wiring plugs into each port. The ISDN adapter connects to a Network Terminator (NT1) that provides a connection to the ISDN Network line switching equipment. Depending on the model of controller and the number of ISDN Adapter installed, you can have up to 32 active connections or DSPUs. The 1L, 1R, and 2R 3174s can have three ISDN adapters, the rest can have four ISDN adapters.

This adapter is only available in certain countries. Please contact IBM to find out if it is available in your country.

A.1.12 Channel Adapter

- Use .... Base - Model 1L/11L
- Type Number 9210
- Position 11
- Hardware Group 16

This adapter provides S/370-type channel host communications. Attachment to selector, byte multiplexer, and block multiplexer channels is supported. SNA or non-SNA operational mode is selectable via microcode. When in SNA mode the 3174 operates as a single-address controller. When in non-SNA mode the 3174 unit operates as a shared multiple address unit, using one of two address ranges - one for up to 16 devices, and one for up to 32 devices. The channel address is selectable via microcode in both modes. The mode of data transfer two and from the channel, which is also microcode-selectable, may be either Data-Chain Interlocked or High-Speed Transfer.

A.1.13 ESCON Channel Adapter

- Use .... Base - Model 12L
- Type Number 9810
- Position 11
- Hardware Group 17

This adapter provides ESCON-type channel host communications. Provides for SNA and non-SNA local host attachment via an ESCON Adapter fiber optic link.

The ESCON Channel gives you access to up to eight hosts via an ESCON director.

A.1.14 Channel Interface Driver/Receiver Card

- Use .... Base - Model 1L/11L
- Type Number 9230
- Position 10
- Hardware Group 16

This card is used in conjunction with the Channel Adapter. It provides driver/receiver signal conversion for the S/370-type bus and tag lines between the host channel and the Channel Adapter. The card also contains solid state Select Out bypass relays.

A.1.15 Type-1 Communications Adapter (V.24/V.35)

- Use .... Base - Model 1R/11R; Optional Model 1L/11L, 3R/13R, 14R
- Type Number 9253
- Position 22
- Hardware Group 11

This adapter provides CCITT V.24/V.28 (EIA RS-232D) and CCITT V.35 electrical interfaces to connect the 3174 to a modem or other signal converter. A 25-pin D-shell connector is provided on the card to connect the communications cable. Adapter logic works in byte-PIO mode when BSC protocols are used, and in byte-CHIO mode for other protocols. The desired interface (V.24/V.28 or V.35) and the operational speed are selected under microcode program control. External clocking is required.

A.1.16 Type-1 Concurrent Communication Adapter (V.24/V.35)

- Use .... Optional - Model 1L/11L, 1R/11R, 2R/12R, 3R/13R, 14R
- Type Number 9263
- Position .... 11 - 17
- Hardware Group 51

This adapter provides CCITT V.24/V.28 (EIA RS-232D) and CCITT V.35 electrical interfaces to connect the 3174 to a modem or other signal converter. A 25-pin D-shell connector is provided on the card to connect the communications cable.

Each Concurrent Communication Adapter provides an additional 3174 controller appearance in a single 3174. This is accomplished by having a separate microprocessor, control storage and TP interface. External clocking is required.

A.1.17 Type-2 Communications Adapter (X.21)

- Use .... Base - Model 2R/12R; Optional Model 1L/11L, 3R/13R, 14R
- Type Number 9273
- Position 22
- Hardware Group 11

This adapter provides CCITT V.11 (X.21) electrical interface to connect the 3174 to an X.21 network or other signal converter providing a compatible interface. A 25-pin D-shell connector is provided on the card to connect the communications cable. Adapter logic works in byte-CHIO mode supporting SNA/SDLC protocols. The operational speed is selected under microcode program control. External clocking is required.

A.1.18 Type-2 Concurrent Communication Adapter (X.21)

- Use .... Optional - Model 1L/11L, 1R/11R, 2R/12R, 3R/13R, 14R
- Type Number 9267
- Position .... 11 - 17
- Hardware Group 52

This adapter provides CCITT V.11 (X.21) electrical interface to connect the 3174 to an X.21 network or other signal converter providing a compatible interface. A 25-pin D-shell connector is provided on the card to connect the communications cable.

Each Concurrent Communication Adapter provides an additional 3174 controller appearance in a single 3174. This is accomplished by having a separate microprocessor, control storage and TP interface. External clocking is required.

A.1.19 Type-3 Communications Adapter (IBM Token Ring)

- Use .... Base - Model 3R; Optional Model 1L, 1R, 2R
- Type Number 9350
- Position .... 11 - 17
- Hardware Group 31

This adapter provides an IEEE 802.5 (ECMA 89) standard interface to an IBM Token-Ring Network. Baseband communications at 4 Mbps is supported. The adapter contains a microprocessor, memory, ROS, and other logic to provide the physical interface, link clocking, serialization/deserialization, link address recognition, frame structuring/stripping, and error checking. A nine-pin connector is provided to attach the communication cable.

A.1.20 Type-3A Dual Speed Communications Adapter (IBM Token Ring)

- Use .... Base - Model 13R; Optional Model 1L, 1R, 2R, 3R, 11L, 11R, 12R
- Type Number 9351
- Position .... any slot
- Hardware Group 31

This adapter provides an IEEE 802.5 (ECMA 89) standard interface to an IBM Token-Ring Network. Baseband communications at 4 or 16 Mbps is supported. The speed is a customization option as well as the ″Early Token Release″ function. The adapter contains a microprocessor, memory, ROS, and other logic to provide the physical interface, link clocking, serialization/deserialization, link address recognition, frame structuring/stripping, and error checking. A nine-pin connector is provided to attach the communication cable.

A.1.21 Ethernet Adapter

- Use 11L, 11R, 12L, 14R
- Type Number 9344
- Position .... 12 - 17
- Hardware Group 41

3174 Configuration Support-C Release 4 or Release 5 allows the 3174 to attach to Ethernet LANs in configurations similar to token-ring configurations supported by the same models of the 3174. This adapter provides IEEE 802.3 and Ethernet DIX Version 2 frame format network support. The adapter contains a microprocessor, memory, ROS, and other logic to provide the physical interface, link clocking, serialization/deserialization, link address recognition, frame structuring/stripping, and error checking. It provides the interface to attach to 10Base5, 10Base2, and 10BaseT networks using one of the following three connectors on the adapter:

- 1OBase5 15-pin D-SUB
- 10Base2 BNC
- 10BaseT RJ-45

A.1.22 Asynchronous Emulation Adapter

- Use .... Optional - All Models
- Type Number 9331
- Position 14,13,12
- Hardware Group 21,22,23

This adapter provides eight ASCII start/stop ports. The adapter contains a microprocessor and memory, which is loaded from a feature DASD. A short cable between the 3174 logic board and a panel containing eight 25-pin D-shell connectors carries signals to and from the adapter. The adapter performs protocol conversion to allow certain ASCII devices to communicate with IBM hosts, and certain IBM terminals to communicate with ASCII hosts. The EIA RS-232D interface is selected under microcode program control.

A.1.23 Fiber-Optic Terminal Adapter

- Use .... Optional - Models 11L, 11R, 12L, 12R, 13R, 14R, 21L, 21R, 22L
- Type Number 9750
- Position .... 11 - 17
- Hardware Group .... 26 or 27

This adapter provides the ability to attach an 3299 Terminal Multiplexer Model 032 to large cluster 3174 models via 62.5/125 micron fiber-optic media at a distance of up to 1,500 meters (4,920 ft). It can also be used with 100/140 micron and 50/125 micron fiber-optic cable. This adapter does not extend the 3174 controller's ability to support more ports (thirty-two without 3270 Port Expansion Feature, sixty-four with 3270 Port Expansion Feature). Support for multiple Fiber Optic Terminal Adapter features allows multiple groups of up to eight devices to be connected to a 3174 via fiber-optic cable. When connected this way, only the first eight ports (0-7) on the attached 3299 Terminal Multiplexer Model 032(s) are active.

A.1.24 Encrypt/Decrypt Adapter

- Use .... Optional - Models 1R, 2R, 3R
- Type Number 9030
- Position 24
- Hardware Group 46

This adapter provides the logic to encrypt and decrypt data traffic between SNA nodes according to the United States National Bureau of Standards Data Encryption (DES) algorithm. (Encryption is not available to terminals operating in DFT mode.) The card contains a 4.14V mercury battery, oscillator, control logic, storage for the cryptographic master key, and a security keyhole to prevent unauthorized access to the adapter.

A.2 IBM 3174 Medium Controller Feature Slots

Two feature slots are available in Models 51R, 52R, 61R and 62R.

Slot 4 can contain:	Asynchronous Emulation Adapter
	Type 3A Dual Speed (16/4 Mbps Token-Ring) Communication Adapter
	Ethernet Adapter
	Type 1 Concurrent Communication Adapter
	Type 2 Concurrent Communication Adapter.
Slot 5 can contain:	Type 3A Dual Speed (16/4 Mbps Token-Ring) Communication Adapter
	Ethernet Adapter
	Type 1 Concurrent Communication Adapter
	Type 2 Concurrent Communication Adapter.

Note: Configuration Support-B is not supported on model 52R; therefore, the Concurrent Communication Adapter is not supported.

One feature slot is available in Models 53R, 63R and 64R

Slot 2 can contain:	Asynchronous Emulation Adapter
	Type 1 Concurrent Communication Adapter
	Type 2 Concurrent Communication Adapter
	Type 1 Alternate IML Communication Adapter
	Type 2 Alternate IML Communication Adapter.

3174 Model 61R, 62R, 63R and 64R use ″Plug in Module″ (PIM) storage expansion. Hence no slot is needed for storage expansion in these controllers.

A.3 IBM 3174 Rack Mounted Controller Feature Slots

Five feature card slots are provided on Models 21L and 21R. Four feature card slots are provided on Models 22L, 32R and 24R. The following feature adapters can be inserted into any of the available feature slots:

- Asynchronous Emulation Adapter
- Type 3A Dual Speed (16/4 Token-Ring) Communication Adapter
- Ethernet Adapter
- Type-1 Concurrent Communication Adapter
- Type-2 Concurrent Communication Adapter
- Terminal Multiplexer Adapter
- Fiber-Optic Terminal Adapter
- Telephone Twisted Pair Adapter
- ISDN Adapter

Appendix B. 3174 Features

B.1 3174 Model Comparison Summary

FEATURES	MODELS								
	NA 01L 01R 02R 03R	11L 11R 12L 12R 13R 14R	$ 21H 21L 21R 22L 22R 23R 24R	41R 43R	NA* 51R 52R 53R	61R 62R 63R 64R	NA 81R 82R	90R	91R 92R
BASE STORAGE.............................	1	2	2	6	1*	2	1	2	2
STORAGE EXPANSION SLOTS **..............	2	2	1	0	1*	1	0	0	0
Maximum STORAGE(MB)......................	4	6@@	6@@	6	3*	6@@	1	2	2
STORAGE-512KB (#1011)...................	Y	N	N	N	Y	N	N	N	N
STORAGE-1MB (#1012)......................	Y	Y	Y	N	Y	Y	N	N	N
STORAGE-2MB (#1014)......................	Y	Y	Y	N	Y	Y	N	N	N
STORAGE-4MB (#1016)......................	N	N	Y	N	N	Y	N	N	N
BASE DASD, DISKETTE DRIVE (MB) ***........	1.2	2.4	2.4	2.8	1.2	2.4	1.2	2.4	2.4
DASD, ADDITIONAL ATTACHMENTS.............	3	3	1	#	1	1	0	0	0
2ND DISKETTE DRIVE (1.2MB) (#1046).......	Y	N	N	0	Y	N	N	N	N
2ND DISKETTE DRIVE (#1048) ***...........	Y	Y	Y	0	Y	Y	N	N	N
20MB FIXED DISK DRIVE (#1056)...........	2	2	1	0	1	1	0	0	0
BASE 3270 TERMINAL ATTACHMENT PORTS.......	4	4	4	4	9	9	4	1	4
3270 TERMINAL ATTACHMENT PORTS (MAX)	32	64@	64@	32	16	16	8	8	8
TMA, 8 PORTS EACH (#3103), %	1-4	1-8	1-4	N	0	0	0	0	0
3299, 8 PORTS EACH, %	1-4	1-8	1-4	1-4	1-2	1-2	1	1	1
3299, 32 PORTS EACH, %%	1	1-2	1-2	1	0	0	0	0	0
BASE HOST ATTACHMENT:									
S/370 CHANNEL (SNA/NON-SNA).............	01L	11L	21L	N	N	N	N	N	N
ESCON S/390 CHANNEL (SNA/NON-SNA)........	N	12L	22L	N	N	N	N	N	N
EIA-232D /V.24/V.28/V.35................	01R	11R	21R	41R	51R	61R	81R	90R	91R
X.21..................................	02R	12R	22R	41R	52R	62R	82R	N	92R
TOKEN-RING 4M Bps.......................	03R	N	N	N	53R	N	N	N	N
TOKEN-RING 16M Bps (#3030/#3031).........	03R	N	N	N	53R	N	N	N	N
TOKEN-RING (16/4M Bps)..................	N	13R	23R	43R	N	63R	N	N	N
ETHERNET LAN ATTACHMENT.................	N	14R	24R	N	N	64R	N	N	N
4-WIRE SNBU.............................	01R	11R	21R	41R	51R	61R	81R	90R	91R
2-WIRE SNBU.............................	01R	N	N	N	51R	N	81R	N	N

```
NOTE:  22R is available only in EMEA.
NA  =  No Longer Available
$   =  21H is a marketing administrative model to facilitate ordering
       and distribution of a model 21L with ES/9000 Model 120, 130, 150
       and 170 processors. It provides a Model 21L with Internal Channel
       Connector (#9003) and 9309 Rack Group (#9030).
*   =  Not applicable to some early 51Rs and all 52Rs.
**  =  21L, 21R, 22L, 22R, 23R, 24R, 61R, 62R, 63R and 64R use plug-in-module
       technology, therefore not requiring a feature expansion slot.
*** =  See Diskette Capacities description under Special Feature #1048.
#   =  41R and 43R have an additional 2 MB of non-volatile storage
       (RAM Disk).
@   =  With 3270 Port Expansion Feature installed on the 3174
@@  =  Only when using Configuration Support-B or C, 4MB otherwise.
%   =  Max. of eight only with Port Expansion Feature (#3100) installed.
%%  =  Up to six 3299-032s may be attached in 8 port mode on the 1xx and
       2xx models.
```

B.2 Old 3174 Feature Summary

FEATURES	MODELS								
	01L	01R	02R	03R	51R	52R	53R	81R	82R
ALTERNATE HOST ATTACHMENT:									
EIA-232D/V.24/V.28 (#3040)........	Y	N	N	Y	N	N	N	N	N
V.35 (#3041)......................	Y	N	N	Y	N	N	N	N	N
V.35 (#3042) France only..........	Y	N	N	Y	N	N	N	N	N
X.21 (#3043)......................	Y	N	N	Y	N	N	N	N	N
TOKEN-RING 16/4 Mbps (#3044)......	Y	Y	Y	N	Y	Y	N	N	N
MULTI-HOST SUPPORT (CS-B/C REQ'D):									
Maximum NUMBER OF CCA FEATURES....	2	2	2	2	1	0	0	0	0
EIA-232D/V.24/V.28 (#3050)........	Y	Y	Y	Y	Y	N	N	N	N
V.35 (#3051)......................	Y	Y	Y	Y	Y	N	N	N	N
V.35 (#3052) France only..........	Y	Y	Y	Y	Y	N	N	N	N
X.21 (#3053)......................	Y	Y	Y	Y	Y	N	N	N	N
ASCII:									
Maximum ASCII PORTS	24	24	24	24	8	8	0	0	0
ASYNC EMUL ADAPTER 8 PORT (#3020).	1-3	1-3	1-3	1-3	1	1	0	0	0
TOKEN-RING:									
TOKEN-RING GWY 4 Mbps (#3025/3026)	Y	Y	Y	N	Y	Y	N	N	N
TOKEN-RING GWY 16 Mbps (#3026)....	Y	Y	Y	N	Y	Y	N	N	N
TOKEN-RING GWY (CS-B/#3044).......	Y	Y	Y	N	Y	N	N	N	N
ISDN BRI ADAPTER (#3055)...........	Y	Y	Y	N	N	N	N	N	N
ENCRYPT/DECRYPT ADAPTER (#3680)....	N	Y	Y	N	N	N	N	N	N
LICENSED INTERNAL CODE:									
CONFIGURATION SUPPORT-A5 (#9010)..	Y	Y	Y	Y	Y	Y	Y	Y	Y
CONFIGURATION SUPPORT-S5 (#3026)..	Y	Y	Y	N	Y	Y	N	N	N
CONFIGURATION SUPPORT-B (#5010)..	Y	Y	Y	Y	N	N	N	N	N
CONFIGURATION SUPPORT-B (#5060)..	N	N	N	N	Y	N	Y	N	N
CONFIGURATION SUPPORT-B (#5090)..	N	N	N	N	N	N	N	N	N
CONFIGURATION SUPPORT-C (#6010)..	Y	Y	Y	Y	N	N	N	N	N
CONFIGURATION SUPPORT-C (#6015)..	Y	Y	Y	Y	N	N	N	N	N
CONFIGURATION SUPPORT-C (#6060)..	N	N	N	N	Y	N	Y	N	N
CONFIGURATION SUPPORT-C (#6065)..	N	N	N	N	Y	N	Y	N	N
APPN (#7010)..	Y	Y	Y	Y	N	N	N	N	N
APPN (#7060)..	N	N	N	N	Y	N	Y	N	N
PEER COMMUNICATION (#8010)..	Y	Y	Y	Y	N	N	N	N	N
PEER COMMUNICATION (#8060)..	N	N	N	N	Y	N	Y	N	N

NOTE: These old 3174 models are no longer available

B.3 New 3174 Feature Summary

FEATURES	MODELS											
	11L	11R 12R	12L	13R 14R	21H 21L 22L	21R 22R	23R 24R	41R 43R	61R 62R	63R 64R	90R	91R 92R
ALTERNATE HOST ATTACHMENT:												
EIA-232D/V.24/V.28 (#3040)	Y	N	Y	Y	22L	N	Y	43R	N	N	N	N
V.35 (#3041).............	Y	N	Y	Y	22L	N	Y	43R	N	N	N	N
V.35 (#3042) France Only..	Y	N	Y	Y	22L	N	Y	43R	N	N	N	N
X.21 (#3043).............	Y	N	Y	Y	N	N	N	N	N	N	N	N
TOKEN-RING 16/4MBps(#3044)	Y	Y	Y	14R	Y	Y	24R	41R	Y	64R	N	N
ETHERNET LAN (#3045)......	Y	Y	Y	13R	Y	Y	23R	N	Y	63R	N	N
MULTIHOST SUPPORT (CS-B OR CS-C REQ'D):												
MAX NUMBER OF CCA FEATURES	2	2	2	2	2	2	2	0	2	1	0	0
EIA-232D/V.24/V.28 (#3050)	Y	Y	Y	Y	Y	Y	Y	N	Y	Y	N	N
V.35(#3051)..............	Y	Y	Y	Y	Y	Y	Y	N	Y	Y	N	N
V.35 (#3052) France only..	Y	Y	Y	Y	Y	Y	Y	N	Y	Y	N	N
X.21 (#3053).............	Y	Y	Y	Y	Y	Y	Y	N	Y	Y	N	N
ASCII:												
Maximum ASCII PORTS.......	24	24	24	24	24	24	24	0	8	8	0	0
AEA-8 PORT (#3020)........	1-3	1-3	1-3	1-3	1-3	1-3	1-3	0	1	1	0	0
TOKEN-RING:												
TOKEN-RING GWY (#3026)...	Y	Y	N	N	N	N	N	N	Y	N	N	N
TOKEN-RING GWY(CS-B/#3044)	Y	Y	Y	N	Y	Y	N	N	Y	N	Y#	N
ETHERNET:												
ETHERNET SUPPORT (#3045)..	Y	Y	Y	13R	Y	Y	23R	N	Y	63R	N	N
ISDN BRI ADAPTER (#3055)...	Y	Y	Y	N	Y	Y	N	N	Y	N	N	N
ENCRYPT/DECRYPT ADAPTER....	N	N	N	N	N	N	N	N	N	N	N	N
LICENSED INTERNAL CODE:												
CONFIG SUPPORT-A5 (#9010).	Y	Y	N	13R	N	N	N	N	Y	63R	N	Y
CONFIG SUPPORT-S5 (#3026).	Y	Y	N	N	N	N	N	N	Y	N	N	N
CONFIG SUPPORT-B (#5010).	Y	Y	Y	13R	Y	Y	23R	N	N	N	N	N
CONFIG SUPPORT-B (#5060).	N	N	N	N	N	N	N	N	Y	63R	N	N
CONFIG SUPPORT-B (#5090).	N	N	N	N	N	N	N	N	N	N	Y	Y
CONFIG SUPPORT-C (#6010).	Y	Y	Y	Y	Y	Y	Y	Y	N	N	N	N
CONFIG SUPPORT-C (#6015).	Y	Y	Y	Y	Y	Y	Y	N	N	N	N	N
CONFIG SUPPORT-C (#6060).	N	N	N	N	N	N	N	N	Y	Y	N	N
CONFIG SUPPORT-C (#6065).	N	N	N	N	N	N	N	N	Y	Y	N	N
APPN (#7010).	Y	Y	N	Y	**	Y	Y	Y	N	N	N	N
APPN (#7060).	N	Y	N	N	N	N	N	N	Y	Y	N	N
PEER COMMUNICATION(#8010).	Y	Y	Y	Y	Y	Y	Y	Y	N	N	N	N
PEER COMMUNICATION(#8060).	N	N	N	N	N	N	N	N	Y	Y	N	N
FRAME RELAY COMM. (#7020).	N	Y	N	Y	N	Y	Y	Y	N	N	N	N
FRAME RELAY COMM. (#7070).	N	N	N	N	N	N	N	N	Y	N	N	N

Token-Ring Gateway is standard on the Model 90R
** Available on Models 21H and 21L only
Note: 22R is available in EMEA only

B.4 Licensed Internal Code Functions - Configuration Support A, S, and B

	LIC LEVEL									
Configuration Support-A Functions Configuration Support-S Functions Configuration Support-B Functions	AR4	SR4	AR5	SR5	BBS	BR1	BR2	BR3	BR4	BR4*1
3174 MODEL SUPPORT:										
Model 11L,11R,12R,13R,61R,62R,63R..............			Y	Y	Y	Y	Y	Y	Y	Y
Model 91R,92R.................................			Y		Y	Y	Y	Y	Y	Y
Model 21L,21R	Y	Y	Y	Y	Y	Y				
Model 90R.....................................							Y	Y	Y	Y
Model 12L,22L (ESCON).........................							Y	Y	Y	Y
Model 22R (EMEA only).........................								Y	Y	Y
Model 23R.....................................										Y
Model 14R,24R,64R.............................										
Model 41R,43R.................................										
FUNCTIONS:										
3274 CS-D LEVEL 65 COMPATIBILITY................	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
ENTRY ASSIST SUPPORT...........................	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
INTELLIGENT PRINTER DATA STREAM (IPDS)..........	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
LOCAL FORMAT STORAGE...........................							Y	Y	Y	Y
TYPE AHEAD.....................................							Y	Y	Y	Y
NULL/SPACE PROCESSING..........................							Y	Y	Y	Y
INTEGRATION OF RPQs 7L0665 AND 8K1387...........							Y	Y	Y	Y
MULTIPLE LOGICAL TERMINALS										
LEVEL 1 to 4	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
LEVEL 5			Y	Y	Y	Y	Y	Y	Y	Y
LEVEL 6							Y	Y	Y	Y
LEVEL 7 and 8									Y	Y
TERMINAL SWITCHING VIA 7232 MULTIPLEXER.........	Y	Y	Y	Y	Y					
3270 PORT EXPANSION FEATURE SUPPORT									Y	Y
3299-032 TERMINAL MULTIPLEXER SUPPORT...........			Y					Y	Y	Y
3299-32T TERMINAL MULTIPLEXER SUPPORT...........			Y					Y	Y	Y
S/370,S/9000 DATA STREAMING CHANNEL							Y	Y	Y	Y
20MB FIXED DISK DRIVE SUPPORT...................	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
SPLIT SCREEN...................................										
COPY FROM SESSION TO SESSION....................										
LOCAL PRINT BUFFERING..........................										
HAP SHARING FOR LOCAL COPY......................										
CALCULATOR FUNCTION............................										
5250 Emulation.................................										
132 COLUMN VIA AEA.............................										
CSCF IML PASSWORD SUPPRESSION...................										
NETWORK MANAGEMENT FUNCTIONS:										
RESPONSE TIME MONITOR SUPPORT (RTM).............	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
NETVIEW ALERT..................................	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
BASIC NETWORK ASSET MGMT (VPD)..................	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
ENHANCED NETWORK ASSET MANAGEMENT(VPD)..........							Y	Y	Y	Y
EXTENDED TRACE FACILITY........................							Y	Y	Y	Y
CENTRAL SITE CONFIGURATION UTILITIES (CSCU).....	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
CENTRAL SITE CHANGE MANAGEMENT (CSCM)...........	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
CENTRAL SITE CONTROL FACILITY (CSCF)............							Y	Y	Y	Y
REMOTE IML VIA CSCF............................								Y	Y	Y
COMMON MANAGEMENT INTERFACE PROTOCOL EVENT										

(Y = included in this LIC level)

Licensed Internal Code Functions - Configuration Support A, S and B (continued)

Configuration Support-A Functions (continued) Configuration Support-S Functions (continued) Configuration Support-B Functions (continued)	LIC LEVEL AR4	SR4	AR5	SR5	BBS	BR1	BR2	BR3	BR4	BR4*1
CONNECTIVITY:										
ASCII ENVIRONMENT:										
BASE AEA FUNCTIONS:										
3270 Emulation/ASCII Emulation/Pass-thru......	Y		Y	Y	Y	Y	Y	Y	Y	Y
GDDM-PCLK/FTTERM Compatibility................			Y		Y	Y	Y	Y	Y	Y
ENHANCED AEA FUNCTIONS:										
Additional ASCII device types.................							Y	Y	Y	Y
Multiple Session (MLT) access to primary host. link and ASCII Pass Through Only.............							Y	Y	Y	Y
User Defined Xlate/Terminal Tables............							Y	Y	Y	Y
GDDM/ASCII Graphics for Specific ASCII Device.							Y	Y	Y	Y
Entry Assist Support for ASCII................										
X.25 ENVIRONMENT:										
X.25 at 64 Kbps................................			Y		Y	Y	Y	Y	Y	Y
Enhanced X.25 Support..........................								Y	Y	Y
X.21/X.25 SWITCHED AUTOCONNECT/DISCONNECT.......								Y	Y	Y
TOKEN RING:										
4M bps Token-Ring Support.....................	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
16M bps Token-Ring Support.....................			Y	Y	Y	Y	Y	Y	Y	Y
Token Ring T1 Timer/Retry Count................										
GATEWAY FUNCTION:										
TRN Gateway (basic)............................		Y		Y	Y	Y	Y	Y	Y	Y
TRN Gateway w/AEA Co-Residency (New Models)....				Y	Y	Y	Y	Y	Y	Y
TRN Gateway Support/250 DSPUs (New Models).....						Y	Y	Y	Y	Y
TRN Gateway-Multiple Upstream Hosts								Y	Y	Y
TRN Remote Gateway Group Poll						Y	Y	Y	Y	Y
TRN Remote Gateway Duplex Multipoint...........								Y	Y	Y
ISDN:										
ISDN Gateway for 32 DSPU T2.0										
ISDN Gateway-Multiple Upstream Host via ES.....										
ISDN Remote Gateway Group Poll										
ISDN Remote Gateway Duplex Multipoint..........										
MULTIPLE HOST ENVIRONMENT:										
SINGLE-LINK MULTIHOST										
via X.25								Y	Y	Y
via TRN						Y	Y	Y	Y	Y
via ESCON (w/ DIRECTOR)								Y	Y	Y
MULTILINK MULTIHOST via CCA						Y	Y	Y	Y	Y
ENHANCED DEVICE CONNECTIVITY:										
APPN (Network Node)............................										
PEER COMMUNICATION SUPPORT (Integrated)........										

(Y = included in this LIC level)

B.5 Licensed Internal Code Functions - Configuration Support C

Configuration Support-C Functions	LIC LEVEL					
	CR1	CR1*1	CR2*0	CR3*0	CR4*0	CR5*0
3174 MODEL SUPPORT:						
Model 11L,11R,12R,13R,61R,62R,63R..............	Y	Y	Y	Y	Y	Y
Note: CS-C4.0 does not support 13R and 63R						
Model 91R,92R.................................						
Model 21L,21R	Y	Y	Y	Y	Y	Y
Model 90R.....................................						
Model 12L,22L (ESCON).........................	Y	Y	Y	Y	Y	Y
Model 22R (EMEA only).........................		Y	Y	Y	Y	Y
Model 23R.....................................	Y	Y	Y	Y		Y
Model 14R,24R,64R.............................					Y	Y
Model 41R,43R.................................				Y		Y
FUNCTIONS:						
3274 CS-D LEVEL 65 COMPATIBILITY...............	Y	Y	Y	Y	Y	Y
ENTRY ASSIST SUPPORT...........................	Y	Y	Y	Y	Y	Y
INTELLIGENT PRINTER DATA STREAM (IPDS)..........	Y	Y	Y	Y	Y	Y
SERIAL OEM INTERFACE (SOEMI) for 3174 01L, 11L, 21L (NON-SNA ONLY).............	Y	Y	Y	Y	Y	Y
LOCAL FORMAT STORAGE...........................	Y	Y	Y	Y	Y	Y
TYPE AHEAD.....................................	Y	Y	Y	Y	Y	Y
NULL/SPACE PROCESSING..........................	Y	Y	Y	Y	Y	Y
INTEGRATION OF RPQs 7L0665 AND 8K1387...........	Y	Y	Y	Y	Y	Y
MULTIPLE LOGICAL TERMINALS						
LEVEL 1 to 4	Y	Y	Y	Y	Y	Y
LEVEL 5	Y	Y	Y	Y	Y	Y
LEVEL 6	Y	Y	Y	Y	Y	Y
LEVEL 7 and 8	Y	Y	Y	Y	Y	Y
TERMINAL SWITCHING VIA 7232 MULTIPLEXER.........						
3270 PORT EXPANSION FEATURE SUPPORT	Y	Y	Y	Y	Y	Y
3270 PORT EXPANSION SUPPORT FOR CCA............				Y	Y	Y
3299-032 TERMINAL MULTIPLEXER SUPPORT...........	Y	Y	Y	Y	Y	Y
3299-32T TERMINAL MULTIPLEXER SUPPORT...........	Y	Y	Y	Y	Y	Y
S/370,S/9000 DATA STREAMING CHANNEL	Y	Y	Y	Y	Y	Y
20MB FIXED DISK DRIVE SUPPORT..................	Y	Y	Y	Y	Y	Y
SPLIT SCREEN...................................			Y	Y	Y	Y
COPY FROM SESSION TO SESSION...................			Y	Y	Y	Y
LOCAL PRINT BUFFERING..........................			Y	Y	Y	Y
HAP SHARING FOR LOCAL COPY.....................			Y	Y	Y	Y
HAP OTHER THAN 1A2.............................				Y	Y	Y
CALCULATOR FUNCTION............................			Y	Y	Y	Y
5250 Emulation.................................			Y	Y	Y	Y
132 COLUMN VIA AEA.............................			Y	Y	Y	Y
CSCF IML PASSWORD SUPPRESSION..................			Y	Y	Y	Y
EASTERN EUROPEAN LANG. - 3270..................				Y	Y	Y

(Y = included in this LIC level)

Licensed Internal Code Functions - Configuration Support C (continued)

	LIC LEVEL					
Configuration Support-C Functions (continued)	CR1	CR1*1	CR2*0	CR3*0	CR4*0	CR5*0
NETWORK MANAGEMENT FUNCTIONS:						
RESPONSE TIME MONITOR SUPPORT (RTM)............	Y	Y	Y	Y	Y	Y
NETVIEW ALERT..................................	Y	Y	Y	Y	Y	Y
BASIC NETWORK ASSET MGMT (VPD).................	Y	Y	Y	Y	Y	Y
ENHANCED NETWORK ASSET MANAGEMENT(VPD)..........	Y	Y	Y	Y	Y	Y
EXTENDED TRACE FACILITY........................	Y	Y	Y	Y	Y	Y
CENTRAL SITE CONFIGURATION UTILITIES (CSCU).....	Y	Y	Y	Y	Y	Y
CENTRAL SITE CHANGE MANAGEMENT (CSCM)...........	Y	Y	Y	Y	Y	Y
CENTRAL SITE CONTROL FACILITY (CSCF)............	Y	Y	Y	Y	Y	Y
REMOTE IML VIA CSCF............................	Y	Y	Y	Y	Y	Y
COMMON MANAGEMENT INTERFACE PROTOCOL EVENT......	Y	Y	Y	Y	Y	Y
DYNAMIC DEFINITION OF DEPENDENT LU		Y	Y	Y	Y	Y
SIMPLE NETWORK MANAGEMENT PROTOCOL..............				Y	Y	Y
CONNECTIVITY:						
ASCII ENVIRONMENT:						
BASE AEA FUNCTIONS:						
3270 Emulation/ASCII Emulation/Pass-thru......	Y	Y	Y	Y	Y	Y
GDDM-PCLK/FTTERM Compatibility................	Y	Y	Y	Y	Y	Y
ENHANCED AEA FUNCTIONS:						
Additional ASCII device types.................	Y	Y	Y	Y	Y	Y
Multiple Session (MLT) access to primary host.						
link and ASCII Pass Through Only............	Y	Y	Y	Y	Y	Y
User Defined Xlate/Terminal Tables...........	Y	Y	Y	Y	Y	Y
GDDM/ASCII Graphics for Specific ASCII Device.	Y	Y	Y	Y	Y	Y
Entry Assist Support for ASCII...............			Y	Y	Y	Y
X.25 ENVIRONMENT:						
X.25 at 64 Kbps...............................	Y	Y	Y	Y	Y	Y
Enhanced X.25 Support.........................	Y	Y	Y	Y	Y	Y
APPN T2.1						Y
X.21/X.25 SWITCHED AUTOCONNECT/DISCONNECT.......	Y	Y	Y	Y	Y	Y
FRAME RELAY COMMUNICATIONS:						
SNA PU2.0.....................................						Y
Gateway Support...............................						Y
APPN T2.1						Y
TCP/IP Telnet.................................						Y
TOKEN RING:						
4M bps Token-Ring Support.....................	Y	Y	Y	Y		Y
16M bps Token-Ring Support.....................	Y	Y	Y	Y		Y
Token Ring T1 Timer/Retry Count................			Y	Y		Y
GATEWAY FUNCTION:						
TRN Gateway (basic)...........................	Y	Y	Y	Y		Y
TRN Gateway w/AEA Co-Residency (New Models)....	Y	Y	Y	Y		Y
TRN Gateway Support/250 DSPUs (New Models).....	Y	Y	Y	Y		Y
TRN Gateway-Multiple Upstream Hosts............	Y	Y	Y	Y		Y
TRN Remote Gateway Group Poll..................	Y	Y	Y	Y		Y
TRN Remote Gateway Duplex Multipoint...........	Y	Y	Y	Y		Y

(Y = included in this LIC level)

Licensed Internal Code Functions - Configuration Support C (continued)

Configuration Support-C Functions (continued)	LIC LEVEL CR1	CR1*1	CR2*0	CR3*0	CR4*0	CR5*0
ETHERNET:						
DSPU Support					Y	Y
Gateway Support					Y	Y
APPN T2.1					Y	Y
ISDN:						
ISDN Gateway for 32 DSPU T2.0	Y	Y	Y	Y	Y	Y
ISDN Gateway-Multiple Upstream Host via ES	Y	Y	Y	Y	Y	Y
ISDN Remote Gateway Group Poll	Y	Y	Y	Y	Y	Y
ISDN Remote Gateway Duplex Multipoint	Y	Y	Y	Y	Y	Y
MULTIPLE HOST ENVIRONMENT:						
SINGLE-LINK MULTIHOST:						
via X.25	Y	Y	Y	Y	Y	Y
via TRN	Y	Y	Y	Y		Y
via ETHERNET					Y	Y
via Frame Relay						Y
via ESCON (w/ DIRECTOR)	Y	Y	Y	Y	Y	Y
MULTILINK MULTIHOST via CCA	Y	Y	Y	Y	Y	Y
ENHANCED DEVICE CONNECTIVITY:						
APPN (Network Node)	Y	Y	Y	Y	Y	Y
VTAM APPN COMPATIBILITY (V4R1)				Y	Y	Y
MULTITAIL				Y	Y	Y
SHARED AS/400 LINK (PU2.0 & T2.1)				Y	Y	Y
Dependent LU Requester						Y
APPN Network Management						Y
PEER COMMUNICATION SUPPORT (Integrated)	Y	Y	Y	Y	Y	Y
TCP/IP SUPPORT:						
Telnet				Y	Y	Y

(Y = included in this LIC level)

AR4=CONFIGURATION SUPPORT-A RELEASE 4
SR4=CONFIGURATION SUPPORT-S RELEASE 4
AR5=CONFIGURATION SUPPORT-A RELEASE 5
SR5=CONFIGURATION SUPPORT-S RELEASE 5
BBS=CONFIGURATION SUPPORT-B BASE
BR1=CONFIGURATION SUPPORT-B RELEASE 1
BR2=CONFIGURATION SUPPORT-B RELEASE 2
BR3=CONFIGURATION SUPPORT-B RELEASE 3
BR4=CONFIGURATION SUPPORT-B RELEASE 4
BR4*1=CONFIGURATION SUPPORT-B RELEASE 4.1
CR1=CONFIGURATION SUPPORT-C RELEASE 1
CR1*1=CONFIGURATION SUPPORT-C RELEASE 1.1
CR2*0=CONFIGURATION SUPPORT-C RELEASE 2
CR3*0=CONFIGURATION SUPPORT-C RELEASE 3
CR4*0=CONFIGURATION SUPPORT-C RELEASE 4
CR5*0=CONFIGURATION SUPPORT-C RELEASE 5

Appendix C. 3174 Physical Specifications

C.1 3174 Large Cluster Models 11L, 12L, 11R, 12R, 13R, 14R, and 0xx

- Width: 700 mm (27.5 in.)
- Depth: 460 mm (18 in.)
- Height: 636 mm (25 in.)
- Weight: 50 kg (110 lbs.)
- Heat output: 375 watts (1280 BTU/hr)

  Airflow: 2.8 m(3)/min (100 cfm) forced air
- Power Consumption: 0.54 kVA
- Power Supply: Specific to country of installation

C.2 3174 Rack Mounted Models 21L, 22L, 21R, 23R, and 24R

- Width: 445 mm (17.5 in.)
- Depth: 527 mm (20.7 in.)
- Height: 254 mm (10 in.)
- Weight: 29.5 kg (65 lbs.)
- Heat output: 210 watts (720 BTU/hr)

  Airflow: 2.0 m(3)/min (70 cfm) forced air
- Power Consumption: 0.54 kVA
- Power Supply: Specific to country of installation

C.3 3174 Medium Cluster Models 61R, 62R, 63R, 64R, and 5xR

- Width: 445 mm (17.5 in.)
- Depth: 608 mm (20 in.)
- Height: 191 mm (7.5 in.)
- Weight: 22.7 kg (50 lbs.)
- Heat output: 185 watts (631 BTU/hr)

  Airflow: 1.4 m(3)/min (50 cfm) forced air
- Power Consumption: 0.32 kVA
- Power Supply: Specific to country of installation

C.4 3174 Small Cluster Models 90R, 91R, ,92R, and 8xR

- Width: 406 mm (16. in.)
- Depth: 425 mm (16.75 in.)
- Height: 120 mm (4.75 in.)
- Weight: 8.0 kg (18 lbs.)
- Heat output: 78 watts (265 BTU/hr)

  Airflow: 0.14 m(3)/min (5 cfm) forced air
- Power Consumption: 0.12 kVA @ 60 Hz, 0.14 kVA @ 50 Hz
- Power Supply: Specific to country of installation

Appendix D. 3174 Feature Slot Usage

D.1 Slot Usage for Models 11L, 11R, 12L, 12R, 13R, and 14R

Certain 3174 adapters can plug only into card slots 11 through 17, while others can only plug into card slots 22, 23, and 24. Some adapters must plug into specific card slots. These requirements will result in certain 3174 configurations that cannot be accommodated. Where conflicts for card slots occur, you must analyze your requirements and make the appropriate trade-offs.

The chart below lists all the adapters that can plug only into the feature slots, identifies the adapters that have specific slot requirements, and gives plugging recommendations for all other adapters in this category.

The column ″Adapter Type″ refers to the four-digit number used to identify adapter cards by the specific function they provide. The type number provides for easy identification during CSU, problem determination, and repair.

ADAPTER NAME	FEATURE CODE	ADAPTER TYPE	REQD SLOT	COMMENT/PLUGGING RULES
Channel Adapter	N/A	9210	11	Provided in Mdl 11L base; N/A to other models.
ESCON Channel Adapter	N/A	9810	11	Provided in Mdl 12L base; N/A to other models.
Type-3A Comm. Adapter	3026, 3044 See Comment	9351	Any slot 11-17	Provided in Mdl 13R; optional feature in all other models. Only 1 Type 3A adapter supported
Ethernet Adapter	3045 See Comment	9344	Any slot 11-17	Provided in Mdl 14R; optional feature in all other models. Only 1 Ethernet adapt. supported
3270 PEF Adapter	3100	9155	22,23	Installed in first available location 22-23
TMA Adapter	3103	9174	11-17 22-24	1st available location in this sequence 11,13,15,17,22,23,12, 14,16,24. See note below.
TTP TMA Adapter	3105	9070	11-17 22-24	Same as 3103; F/C 3105 is available only in certain countries.
FTA Adapter	3110	9750	11-17 22-24	Same as 3103
AEA	3020	9331	14	Installed starting with location 14, then 13, then 12.
AEA			13	
AEA			12	
CCA-1	3050 or 3051 or 3052 or	9263 9263 9263	Any slot 11-17	These features are plugged in sequence, left-to-right, beginning at first available slot, skipping slots already plugged.
CCA-2	3053	9267		
Optional Storage-1	1012 1014	9053 9053	20	Base storage plugged in slot 19; optional storage cards must be plugged in sequence of slots 20 and 17 without gaps.
Optional Storage-2			17	
Type 1 or 2 Comm Adapter	3040 3041 3042 3043	9253 9277/3	22	
ISDN Adapter	3055	9341	11-17	1st available location 11-17

Note: Terminal Multiplexer Adapter features (#3103) can plug into any vacant slot (11-17, 22-24). If slots are not available to accommodate the required number of these features, then use of an external 3299 Terminal Multiplexer is recommended.

D.2 Slot Usage For Models 21H, 21L, 21R, 22L, 23R, and 24R

Five feature card slots (11 through 15) are provided on Models 21H, 21L, and 21R.

Four feature card slots are provided on Models 22L (12 through 15), 23R and 24R (11 through 14).

One Plug-In Module (PIM) connector is provided to plug in either the 1MB Storage Expansion PIM feature (#1012), the 2MB Storage Expansion PIM feature (#1014), or the 4MB Storage Expansion PIM feature (#1016); therefore, using these PIM features do not require a card slot for memory expansion.

The following feature adapters can be inserted into any of the five card slots on the Models 21H, 21L, and 21R, or the four feature slots on the Models 22L, 23R and 24R:

- Asynchronous Emulation Adapter (#3020)
- Ethernet Adapter (#3045) (except 24R)
- Type 3A Dual Speed (16/4) Communication Adapter (#3044) (except 23R)
- Type 1 Concurrent Communication Adapter (#3050, #3051, or (#3052 France only))
- Type 2 Concurrent Communication Adapter (#3053)
- ISDN Basic Rate Interface Adapter (#3055)
- Terminal Multiplexer Adapter (#3103)
- Telephone Twisted Pair Terminal Multiplexer Adapter (#3105)
- Fiber Optic Terminal Adapter (#3110)

Note: Only one of either Type 3A Communication Adapter or Ethernet Adapter is functionally supported at a time.

D.3 Slot Usage For Models 61R, 62R, 63R, and 64R

Two feature card slots are provided on Models 61R and 62R (slot numbers 4 and 5) and one slot (slot number 4) is provided on the Models 63R and 64R.

On Models 61R, 62R, 63R and 64R one Plug-In Module (PIM) connector is provided to plug in either the 1MB Storage Expansion PIM feature (#1012), the 2MB Storage Expansion PIM feature (#1014), or the 4MB Storage Expansion PIM feature (#1016); therefore, using these PIM features do not require a card slot for memory expansion.

On Models 61R and 62R the respective slots can accept the cards/adapters listed; Models 63R and 64R only have one available slot (that is, slot number 4).

Slot number 4 will accept any one of the following:

- Asynchronous Emulation Adapter (#3020)

- Ethernet Adapter (#3045) (except 64R)
- Type 3A Dual Speed (16/4) Communication Adapter (#3026 or #3044) (except 63R)
- Type 1 Concurrent Communication Adapter (#3050, #3051, (#3052 France only))
- Type 2 Concurrent Communication Adapter (#3053)
- ISDN Basic Rate Interface Adapter (#3055) (not supported on 63R and 64R)

Slot number 5 will accept any one of the following:

- Ethernet Adapter (#3045) (except 64R)
- Type 3A Dual Speed (16/4) Communication Adapter (#3026 or #3044) (except 63R).
- Type 1 Concurrent Communication Adapter (#3050, #3051, (#3052 France only))
- Type 2 Concurrent Communication Adapter (#3053)
- ISDN Basic Rate Interface Adapter (#3055) (not supported on 63R and 64R)

Appendix E. 3174 Storage Requirements

E.1 For Configuration Support-A

Some combinations of the 3174 features and functions may require additional controller storage. Before you decide on the total amount of storage required, you should determine the level of MLT support needed.

E.1.1 MLT Weighting Factors

Each IBM CUT display supported for MLT sessions requires a certain amount of storage depending on:

- The number of sessions desired
- The screen size
- The screen characteristics

This storage requirement is called a “weighting factor.” The sum of the weighting factors for each terminal on a given 3174 determines the required level of MLT (level 0, 1, 2, 3, 4, or 5) to support the required MLT sessions. The chart below should be used to determine the level of MLT support required.

Display Characteristics		Number of Sessions Per Terminal					
Row x Column	Total Characters	1	2	3	4	5	
24x80	(1920), no EAB	0	3	6	9	12	Weighting
24x80	(1920), with EAB	0	5	10	15	20	
32x80	(2560), no EAB	0	5	10	15	20	Factors
32x80	(2560), with EAB	0	9	18	27	36	
43x80	(3440), no EAB	0	5	10	15	20	Per
43x80	(3440), with EAB	0	9	18	27	36	
27x132	(3564), no EAB	0	5	10	15	20	Terminal
27x132	(3564), with EAB	0	9	18	27	36	

Figure 323. Configuration Support-A MLT Weighting Factors

Notes:

1. EAB (Extended Attribute Buffer) refers to the ability of some displays to highlight or display in 7-color mode, individual display character positions.
2. Some CUT displays support a number of screen sizes and allow the user to select a screen size as part of display setup mode. If these displays support the Extended Function feature, then the largest screen size supported by the device must be used to determine its weighting factor. If the display does not support this feature, then the screen size chosen during setup mode should be used.

E.1.2 MLT Levels

For MLT level 0, the sum of weighting factors is 0.

For MLT level 1, the sum of weighting factors must not exceed 64.

For MLT level 2, the sum of weighting factors must not exceed 128.

For MLT level 3, the sum of weighting factors must not exceed 416.

For MLT level 4, the sum of weighting factors must not exceed 864.

For MLT level 5, the sum of weighting factors must not exceed 1408.

E.1.3 Determining Storage Requirements

	Hardware and Change Management Configuration			
Feature/ Function	BASE	CSCM RSC or CSCM(DSK)	CSCM CSC (FD1)	CSCM CSC (FD2)
BASE	1MB	1MB	1.5MB	1.5MB
AEA	1MB	1.5MB	1.5MB	1.5MB
MLT1	1MB	1MB	1.5MB	2MB
MLT1, AEA	1MB	1.5MB	1.5MB	2MB
MLT2	1MB	1.5MB	1.5MB	2MB
MLT2, AEA	1.5MB	1.5MB	1.5MB	2MB
MLT3	1.5MB	1.5MB	2MB	2MB
MLT3, AEA	1.5MB	2MB	2MB	2MB
MLT4	2MB	2MB	2.5MB	2.5MB
MLT4, AEA	2MB	2.5MB	2.5MB	3MB
MLT5	2.5MB	2.5MB	3MB	3MB
MLT5, AEA	2.5MB	3MB	3MB	3.5MB

Legend:
CSCM CSC = Central Site Change Management at a "Central Site Control Unit"
CSCM RSC = Central Site Change Management at a "Remote Site Control Unit"
DSK = Second Diskette Drive
FD1 = One 20MB Fixed Disk Drive
FD2 = Two 20MB Fixed Disk (11L, 11R, 12R, 13R)
MLTn = Multiple Logical Terminal Level 1, 2, 3, 4, or 5

Figure 324. Configuration Support-A Storage Requirements

Any one of the feature/function combinations listed in Figure 324 is operable within its listed storage requirement. (Features/ functions not shown in the table, do not increase storage requirements above that listed in the table.)

To determine the amount of storage required, identify the feature/functions desired on the appropriate hardware and change management configuration. The intersection of the selected column and row determines the storage requirement for that feature/function combination.

Note: The maximum storage available when using Configuration Support-A Release 5 is 4MB. If you customize for items requiring more than the total amount of storage installed, a deconfiguration of some of these items will occur during IML.

E.2 For Configuration Support-S

Some combination of the 3174 features and functions may require additional controller storage. Before you decide on the total amount of storage required, you should determine the level of MLT support needed.

E.2.1 MLT Weighting Factors

Each IBM CUT display supported for MLT sessions requires a certain amount of storage depending on:

- The number of sessions desired
- The screen size
- The screen characteristics.

This storage requirement is called a "weighting factor." The sum of the weighting factors for each terminal each on a given 3174 determines the required level of MLT (level 0, 1, 2, 3, 4,or 5) to support the required MLT sessions.

The chart below should be used to determine the level of MLT support required.

Display Characteristics		Number of Sessions Per Terminal					
Row x Column	Total Characters	1	2	3	4	5	
24x80	(1920), no EAB	0	3	6	9	12	Weighting
24x80	(1920), with EAB	0	5	10	15	20	
32x80	(2560), no EAB	0	5	10	15	20	Factors
32x80	(2560), with EAB	0	9	18	27	36	
43x80	(3440), no EAB	0	5	10	15	20	Per
43x80	(3440), with EAB	0	9	18	27	36	
27x132	(3564), no EAB	0	5	10	15	20	Terminal
27x132	(3564), with EAB	0	9	18	27	36	

Figure 325. Configuration Support-S MLT Weighting Factors

Notes:

1. EAB (Extended Attribute Buffer) refers to the ability of some displays to highlight or display in 7 color mode, individual display character positions.
2. Some CUT displays support a number of screen sizes and allow the user to select a screen size as part of display setup mode. If these displays support the Extended Function feature, then the largest screen size supported by the

device must be used to determine its weighting factor. If the display does not support this feature, then the screen size chosen during setup mode should be used.

E.2.2 MLT Levels

For MLT level 0, the sum of weighting factors is 0.

For MLT level 1, the sum of weighting factors must not exceed 64.

For MLT level 2, the sum of weighting factors must not exceed 128.

For MLT level 3, the sum of weighting factors must not exceed 416.

For MLT level 4, the sum of weighting factors must not exceed 864.

For MLT level 5, the sum of weighting factors must not exceed 1408.

E.2.3 Determining Storage Requirements

Any one of the feature/function combinations listed in the tables below is operable within its listed storage requirement. (Features/ functions not shown in the table, do not increase storage requirements above that listed in the table.)

To determine the amount of storage required, identify the feature/functions desired on the appropriate hardware and change management configuration. The intersection of the selected column and row determines the storage requirement for that feature/function combination. This storage requirement should be recorded.

From the Token-Ring Gateway - DSPU table, select the desired number of DSPUs. Add the two values of storage requirements. The final result is the storage requirement for your configuration.

Note: The maximum storage available when using Configuration Support-S Release 5 is 4MB. If you customize for items requiring more than the total amount of storage installed, a deconfiguration of some of these items will occur during IML.

	Hardware and Change Management Configuration			
Feature/ Function	BASE	CSCM RSC or CSCM(DSK)	CSCM CSC (FD1)	CSCM CSC (FD2)
BASE	1MB	1MB	1.5MB	1.5MB
AEA	1MB	1.5MB	1.5MB	1.5MB
MLT1	1MB	1MB	1.5MB	2MB
MLT1, AEA	1MB	1.5MB	1.5MB	2MB
MLT2	1MB	1.5MB	1.5MB	2MB
MLT2, AEA	1.5MB	1.5MB	1.5MB	2MB
MLT3	1.5MB	1.5MB	2MB	2MB
MLT3, AEA	1.5MB	2MB	2MB	2MB
MLT4	2MB	2MB	2.5MB	2.5MB
MLT4, AEA	2MB	2.5MB	2.5MB	3MB
MLT5	2.5MB	2.5MB	3MB	3MB
MLT5, AEA	2.5MB	3MB	3MB	3.5MB

	DSPUs			
Machine Type	28	72	116	140
Local Gateway T/R	.5MB	1MB	1.5MB	2MB
Remote Gateway T/R	.5MB	.5MB	1MB	1MB

Legend:
CSCM CSC = Central Site Change Management at a "Central Site Control Unit"
CSCM RSC = Central Site Change Management at a "Remote Site Control Unit"
DSK = Second Diskette Drive
FD1 = One 20MB Fixed Disk Drive
FD2 = Two 20MB Fixed Disk (11L, 11R, 12R, 13R)
MLTn = Multiple Logical Terminal Level 1, 2, 3, 4, or 5
DSPU = Down Stream Physical Units
LG = Local Gateway
RG = Remote Gateway

Note: A 3174 operating as a gateway is not supported as a central site controller (CSC).

Figure 326. Configuration Support-S Storage Requirements

E.3 For Configuration Support-B

Some combinations of the features and functions may require additional controller storage. Before you decide on the total amount of storage required, you should determine the level of MLT support needed.

E.3.1 MLT Weighting Factors

Each IBM CUT display supported for MLT sessions requires a certain amount of storage depending on:

- The number of sessions desired
- The screen size
- The screen characteristics

This storage requirement is called a "weighting factor." The sum of the weighting factor for each terminal on a given 3174 and the physical host link determine the required level of MLT (level 0, 1, 2, 3, 4, 5, 6, 7, 8) to support the required MLT sessions.

MLT sessions on the primary host link are supported by the 3174 controller storage. MLT sessions via secondary physical host links (that is, CCA), are supported by internal CCA feature storage. CCA feature storage is not expandable. Each CCA feature supports a maximum of MLT level 2. The tables below should be used to determine the MLT requirements for the primary host link when multi-host support is NOT selected and for the primary host link when multi-host support IS selected.

Notes:

1. Use Table A if *no* multi-host support (Concurrent Communication Adapter and/or Single Link Multi-Host Support) is being customized.
2. Use Table B if multi-host support (Concurrent Communication Adapter and/or Single Link Multi-Host Support) *is* being customized. Be sure to sum the weighting factors for the primary and any secondary physical host links (that is, CCA), when present, separately. The primary host link MLT level is used when determining 3174 controller storage requirements. Secondary host link MLT level requirements must be reviewed to ensure they are not greater than MLT Level 2.

Primary Host Link Only

Display Characteristics		Number of Sessions Per Terminal					
Row x Column	Total Characters	1	2	3	4	5	
24x80	(1920), no EAB	0	0	2	4	6	Weighting
24x80	(1920), with EAB	0	4	8	12	16	
24x80	(1920), ASCII	0	0	2	4	6	
30x80	(2400), ASCII	0	4	8	12	16	Factors
32x80	(2560), ASCII	0	4	8	12	16	
32x80	(2560), no EAB	0	4	8	12	16	
32x80	(2560), with EAB	0	12	20	28	36	per
43x80	(3440), no EAB	0	4	8	12	16	
43x80	(3440), with EAB	0	12	20	28	36	
27x132	(3564), no EAB	0	4	8	12	16	Terminal
27x132	(3564), with EAB	0	12	20	28	36	

Figure 327. Table A: No Multi-Host Support (No SLMH or CCA)

Primary Host Link And Any Secondary Host Links

Display Characteristics		Number of Sessions Per terminal					
Row x Column	Total Characters	1	2	3	4	5	
24x80	(1920), no EAB	0	0	0	0	2	Weighting
24x80	(1920), with EAB	0	0	4	8	12	
32x80	(2560), no EAB	0	0	4	8	12	
24x80	(1920), ASCII	0	0	2	4	6	Factors
30x80	(2400), ASCII	0	4	8	12	16	
32x80	(2560), ASCII	0	4	8	12	16	
32x80	(2560), with EAB	0	8	16	24	32	per
43x80	(3440), no EAB	0	0	4	8	12	
43x80	(3440), with EAB	0	8	16	24	32	
27x132	(3564), no EAB	0	0	4	8	12	Terminal
27x132	(3564), with EAB	0	8	16	24	32	

Figure 328. Table B: Multi-Host Is Supported (SLMH and/or CCA)

Notes:

1. EAB (Extended Attribute Buffer) refers to the ability of some displays to allow extended highlighting (reverse video, blinking and underscore), extended color (seven colors), Programmed Symbols, etc.
2. If you are planning storage for ASCII Tektronix 4205s or UDT tables for which transparency is being defined, you must add additional storage. Base the additional storage amounts on screen size. If the display is 24x80, add 2 KB more storage; if the display is 30x80, add 4 KB more storage. If you are

planning for only one session on an ASCII display, no additional storage is required

3. Some CUT displays support a number of screen sizes and allow the user to select a screen size as part of display setup mode. If these displays support the Extended Function feature, then the largest screen size supported by the device must be used to determine its weighting factor. If the display does not support this feature, then the screen size chosen during setup mode should be used.

For Configuration Support-B Release 4, some changes were made for the Extended Function feature support. For devices which support this feature, the largest screen size should only be used to determine the weighting factor for the session that can communicate with a SNA host. Also, a customization option was added that disables the ability of the 3270 host to BIND the display for a screen size larger than the size selected at display setup time. In other words, when this option is used, the screen size chosen at display setup mode should be used to determine the display's weighting factor. For a list of the displays that support the Extended Function feature, refer to Chapter 6 of the *3174 Planning Guide*, (GA27-3862 for Configuration Support-B and GA27-3918 for Configuration Support-C).

Note: If CCAs are installed, do not count MLT sessions assigned to the secondary physical host links (that is, CCA) when determining the weighting factors for 3174 control storage. Be sure, however, to confirm that each secondary host link (that is, CCA) requirement does not exceed MLT Level 2.

Based upon the sum of the weighting factors selected using Table A or B, either use that sum or the appropriate weighting number (Configuration Support-B, Release 4 or Configuration Support-C) to determine the appropriate MLT Level required.

E.3.2 MLT Levels

For MLT level 0, the sum of weighting factors is 0.

For MLT level 1, the sum of weighting factors must not exceed 64.

For MLT level 2, the sum of weighting factors must not exceed 128.

For MLT level 3, the sum of weighting factors must not exceed 512.

For MLT level 4, the sum of weighting factors must not exceed 896.

For MLT level 5, the sum of weighting factors must not exceed 1152.

For MLT level 6, the sum of weighting factors must not exceed 1536.

For MLT level 7, the sum of weighting factors must not exceed 2048.

For MLT level 8, the sum of weighting factors must not exceed 2688.

E.3.3 Determining Storage Requirements

Any one of the feature/function combinations listed in Tables 1 and 2 is operable within its listed storage requirement. Features and functions not shown in the tables, do not increase storage requirements above that listed.

The following tables can be used to determine the amount of storage required for the combination of features and functions desired. For 3174 Models 11L, 11R, 12L, 12R, 13R, 21H, 21L, 21R, 22L, 23R, 61R, 62R, and 63R:

1. Using Table 1, add the storage weighting factors for all desired functions to the base control storage weight (1661).
2. If Gateway or Gateway/CCA support is required, used Table 2 to determine the additional storage requirement for the Gateway or Gateway/CCA combination.
3. Using the above total, refer to Table 3 determine the total 3174 control storage required.

FUNCTION	WEIGHTING FACTOR	NOTES
Base	1661	
3270 Port Expansion Feature Support	377	Without multi-host support
3270 Port Expansion Feature Support	505	With multi-host support
AEA	309	Asynchronous Emulation adapter. Add this factor for the first AEA adapter
AEA Large Screen Support	48	Add this additional factor when attaching any ASCII terminals with large screens
AEA MLT	216	Add this additional factor and some MLT level when multiple logical terminals are desired on ASCII devices in 3270 CUT emulation mode. NOTE: AEA MLT cannot be configured on CCA's.
Multi-Host Support (Concurrent Communication Adapter/Single Link Multi-Host)	159	Add 159 if either CCA's or Single Link Multi-Host Support is used.

Figure 329 (Part 1 of 3). Configuration Support-B Storage Requirements

For Single Link Multi-Host Support, select one of the seven following choices for the desired number of additional hosts.		
Single Link Multi-Host Support	54	With 1 additional host
Single Link Multi-Host support	108	With 2 additional hosts
Single Link Multi-Host Support	162	With 3 additional hosts
Single Link Multi-Host Support	216	With 4 additional hosts
Single Link Multi-Host Support	270	With 5 additional hosts
Single Link Multi-Host Support	324	With 6 additional hosts
Single Link Multi-Host Support	378	With 7 additional hosts
Some level of MLT must be selected (MLT 1 is the minimum allowed) if Multi-Host Support is being implemented using Single Link or CCA.		
For MLT, select one of the following MLT levels determined using Table A or B above, or the appropriate sum of the weighting factors.		
MLT Level 1	64	See MLT Level determined above
MLT Level 2	128	
MLT Level 3	512	
MLT Level 4	896	
MLT Level 5	1152	
MLT Level 6	1536	
MLT Level 7	2048	
MLT Level 8	2688	
MLT Level X	X	Where X = Sum of the weighting Factors. (Configuration Support-B Release 4

Figure 329 (Part 2 of 3). Configuration Support-B Storage Requirements

For Central Site Change Management (CSCM), select one of the three following options.		
CSCM	186	A controller that receives configuration from a central site controller, or a central site controller that uses a diskette drive only.
CSCM FD1	267	A central site controller using one 20MB Fixed Disk optional feature (#1056).
CSCM FD2	347	A central site controller using two 20MB Fixed Disk optional feature (#1056). Only for Models 11L, 11R, 12R, 13R.
For Local Format Store, select one of the following six choices of storage for local formats. Note: the format storage selected is the TOTAL format storage selected for all hosts.		
Local Format Storage Level 1	77	Allows up to 64KB of format storage.
Local Format Storage Level 2	141	Allows up to 128KB of format storage.
Local Format Storage Level 3	269	Allows up to 256KB of format storage.
Local Format Storage Level 4	525	Allows up to 512KB of format storage.
Local Format Storage Level 5	1037	Allows up to 1024KB of format storage. See Note.
Local Format Storage Level 6	1548	Allows up to 1536KB of format storage.
For channel or remotely attached T/R Gateway, see Table 2		

Figure 329 (Part 3 of 3). Configuration Support-B Storage Requirements

Notes:

1. If the 3174 contains a total of 3MB of storage, then 984KB of format storage are allowed.
2. The Concurrent Communication Adapter (CCA) has sufficient internal storage to allow selection of MLT Level 1 or MLT Level 2 for those sessions that communicate through the CCA, up to four X.25 Single-Link Multi-Host host connections, and Local Format Storage. Do not include CCA MLT, Single-Link Multi-Host, or Local Format Storage requirements in the 3174 control storage requirements calculated above.

DSPUs				Storage Required
Primary DSPUs ONLY	CCAs DSPUs ONLY	Primary and CCA DSPUs		
		Primary	CCAs	
LOCALLY ATTACHED MODELS (with 4KB RUs)				
1 - 28	1 - 100	1 - 20	1 - 32	512
29 - 72		1 - 60	1 - 72	1024
73 - 116		1 - 95	1 - 100	1536
117 - 140		1 - 130	1 - 100	2048
141 - 200		1 - 180	1 - 100	2560
201 - 250		1 - 230	1 - 100	3072
REMOTELY ATTACHED MODELS (with 4KB RUs)				
1 - 71	1 - 100	1 - 40	1 - 50	512
73 - 140		1 - 116	1 - 100	1024
141 - 250		1 - 200	1 - 100	1536
LOCALLY ATTACHED MODELS (with 8KB RUs)				
1 - 20	1 - 100	1 - 12	1 - 32	512
21 - 50		1 - 38	1 - 72	1024
51 - 80		1 - 59	1 - 100	1536
81 - 100		1 - 90	1 - 100	2048

Figure 330. 3174 Gateway Storage Considerations

To use Table 2, proceed as follows:

1. Select whether the primary interface is channel or remote attached. If channel attached, determine if the maximum RU size is 4KB or 8KB. Use the appropriate section of the table based on the maximum RU size. (8KB RUs are only available on Models 12L and 22L.)

2. Determine the number of DSPUs that will be connected through the primary host link, if any.

3. Determine the number of Downstream Physical Units that will be connected through the CCA links, if any. Note: There is a maximum of 50 DSPUs per CCA link.

4. Using these two numbers, locate the specific storage increment that will support this configuration. This is the additional storage needed.

   Note: The maximum number of DSPUs connected through the 3174 Gateway with the Type 3 adapter is 140. The maximum DSPUs for the Type 3A adapter is 250 for 4KB RUs. 8KB RUs support a maximum of 100 DSPUs.

As examples:

1. Assume: Local gateway, 4KB RUs, with 64 primary PUs, and 30 CCA PUs, then the additional amount of storage required for this gateway function is 1536KB.

2. Assume: Local gateway, 8KB RUs, with 64 primary PUs, and 30 CCA PUs, then the additional amount of storage required for this gateway function is 2048KB.

Total Weighting Factor	Total Storage Required
2048 or less	2MB total storage required (standard with 3174 Models 11L, 11R, 12L, 12R, 13R, 21H, 21L, 21R, 22L, 22R,** 23R, 61R, 62R, 63R, 91R and 92R.
greater than 2048 and less than 3032	3.0MB total storage required.
greater than 3032 and less than 4056	4MB total storage required
greater than 4056 and less than 5080	5MB total storage required.
greater than 5080 and less than 6104	6MB total storage required.

** 22R available in EMEA only

Figure 331. Configuration Support-B Total Storage Requirements

Notes:

1. The maximum storage available when using Configuration Support-B is 6MB for 3174 Models 11L, 11R, 12L, 12R, 13R, 21H, 21L, 21R, 22L, 23R, 61R, 62R, and 63R.

   If you customize for items requiring more than 6MB of storage, a deconfiguration of some features/functions will occur during IML.

2. The maximum storage available when using Configuration Support-B is 2MB for 3174 Models 90R, 91R and 92R. If you customize for items requiring more than 2MB of storage, a deconfiguration of some features/functions will occur during IML.

3. A minimum of 4MB of control storage is recommended when using the off line Central Site Customization Utility (CSCU), Generate Control Diskette procedure, to generate control diskettes. This will reduce the time and manual intervention required for control diskette generation.

E.4 For Configuration Support-C

Some combinations of the features and functions described in the ″Optional Features″, the Configuration Support-B, and the Configuration Support-C sections may require additional storage. Before you decide on the total amount of storage required, the level of MLT support should be determined.

E.4.1 MLT Weighting Factors

Each IBM CUT display that is to be supported for MLT sessions requires a certain amount of storage based on the number of sessions desired, the display screen size and screen characteristics. This storage requirement is defined as a "weighting factor." The sum of the weighting factor for each terminal on a given 3174 and the physical host link determine the required level of MLT (level 0, 1, 2, 3, 4, 5, 6, 7, 8) to support the required MLT sessions.

MLT sessions on the primary host link are supported via 3174 control storage. MLT sessions via secondary physical host links (that is, CCA), are supported by internal CCA feature storage. CCA feature storage is not expandable. Each CCA feature supports a maximum of MLT level 2.

The tables below should be used to determine the MLT requirements for the primary host link when multi-host support is NOT selected and for the primary host link when multi-host support IS selected.

Notes:

1. Use Table A if NO multi-host support (Concurrent Communication Adapter and/or Single Link Multi-Host Support) is being customized.
2. Use Table B if multi-host support (Concurrent Communication Adapter and/or Single Link Multi-Host Support) IS being customized. Be sure to sum the weighting factors for the primary and any secondary physical host links (that is, CCA), when present, separately. The primary host link MLT level is used when determining 3174 control storage requirements. Secondary host link MLT level requirements must be reviewed to ensure they are not greater than MLT Level 2.

Primary Host Link Only

Display Characteristics		Number of Sessions Per Terminal					
Row x Column	Total Characters	1	2	3	4	5	
24x80	(1920), no EAB	0	0	2	4	6	Weighting
24x80	(1920), with EAB	0	4	8	12	16	
32x80	(2560), no EAB	0	4	8	12	16	
32x80	(2560), with EAB	0	12	20	28	36	Factors
43x80	(3440), no EAB	0	4	8	12	16	
43x80	(3440), with EAB	0	12	20	28	36	
27x132	(3564), no EAB	0	4	8	12	16	
27x132	(3564), with EAB	0	12	20	28	36	per
24x80	(1920), ASCII	0	0	2	4	6	
30x80	(2400), ASCII	0	4	8	12	16	
32x80	(2560), ASCII	0	4	8	12	16	
43x80	(2560), ASCII	0	4	8	12	16	Terminal
24x132	(2560), ASCII	0	4	8	12	16	
27x132	(2560), ASCII	0	4	8	12	16	

Figure 332. Table A: No Multi-Host Support (No SLMH or CCA)

Primary Host Link And Any Secondary Host Links

Display Characteristics		Number of Sessions Per Terminal					
Row x Column	Total Characters	1	2	3	4	5	
24x80	(1920), no EAB	0	0	0	0	2	Weighting
24x80	(1920), with EAB	0	0	4	8	12	
32x80	(2560), no EAB	0	0	4	8	12	
32x80	(2560), with EAB	0	8	16	24	32	Factors
43x80	(3440), no EAB	0	0	4	8	12	
43x80	(3440), with EAB	0	8	16	24	32	per
27x132	(3564), no EAB	0	0	4	8	12	
27x132	(3564), with EAB	0	8	16	24	32	
24x80	(1920), ASCII	0	0	2	4	6	Terminal
30x80	(2400), ASCII	0	4	8	12	16	
32x80	(2560), ASCII	0	4	8	12	16	
43x80	(2560), ASCII	0	4	8	12	16	
24x132	(2560), ASCII	0	4	8	12	16	
27x132	(2560), ASCII	0	4	8	12	16	

Figure 333. Table B: Multi-Host Is Supported (SLMH and/or CCA)

Notes:

1. EAB (Extended Attribute Buffer) refers to the ability of some displays to allow extended highlighting (reverse video, blinking and underscore), extended color (seven colors), Programmed Symbols, etc.
2. If you are planning storage for ASCII Tektronix 4205s or UDT tables for which transparency is being defined, you must add additional storage. Base the additional storage amounts on screen size. If the display is 24x80, add 2 KB more storage; if the display is 30x80, add 4 KB more storage. If you are planning for only one session on an ASCII display, no additional storage is required
3. Some CUT displays support a number of screen sizes and allow the user to select a screen size as part of display setup mode. If these displays support the Extended Function feature, then the largest screen size supported by the device must be used to determine its weighting factor. If the display does not support this feature, then the screen size chosen during setup mode should be used.

For Configuration Support-B, Release 4 or Configuration Support-C, some changes were made for the Extended Function feature support. For devices which support this feature, the largest screen size should only be used to determine the weighting factor for the session that can communicate with a SNA host. Also, a customization option was added that disables the ability of the 3270 host to BIND the display for a screen size larger than the size selected at display setup time. In other words, when this option is used, the screen size chosen at display setup mode should be used to determine the display's weighting factor. For a list of the displays that support the Extended Function feature, refer to Chapter 6 of the *3174 Planning Guide*, GA27-3862.

Note: If CCAs are installed, do not count MLT sessions assigned to the secondary physical host links (that is, CCA) when determining the weighting factors for 3174 control storage. Be sure, however, to confirm that each secondary host link (that is, CCA) requirement does not exceed MLT Level 2.

E.4.2 Buffered Local Copy Print Weighting Factor

To calculate the weighting factor for the Buffered Local Copy Print function, determine the average number of copies you want on the printer queue. Then multiply by the buffer size in the following table:

CUT or ASCII Device Screen Size	Buffer Size (K)
CUT/24x80	2
CUT/24x80 with EAB	4
ASCII/24x80	2
ASCII/30x80	4
ASCII/32x80	4
ASCII/43x80	4
ASCII/24x132	4
ASCII/27x132	4
CUT/32x80	4
CUT/43x80	4
CUT/27x132	4
CUT/32x80 with EAB	8
CUT/43x80 with EAB	8
CUT/27x132 with EAB	8

For example, if you want the potential to have three copies on the printer queue and use a CUT/43X80 with EAB, you would need 24K (3 x 8K).

E.4.3 Copy Session To Session Weighting Factor

To calculate the weighting factor for Copy Session to Session, multiply the number of configured ports by 4K. For example, a controller with 16 configured ports requires 64K of storage (16 x 4K).

E.4.4 MLT Levels

Based upon the sum of the weighting factors selected in table A or B, the Buffered Local Copy Print weighting factor, and the Copy Session to Session weighting factor, determine the appropriate MLT Level required:

For MLT level 0, the sum of weighting factors is 0.

For MLT level 1, the sum of weighting factors must not exceed 64.

For MLT level 2, the sum of weighting factors must not exceed 128.

For MLT level 3, the sum of weighting factors must not exceed 512.

For MLT level 4, the sum of weighting factors must not exceed 896.

For MLT level 5, the sum of weighting factors must not exceed 1152.

For MLT level 6, the sum of weighting factors must not exceed 1536.

For MLT level 7, the sum of weighting factors must not exceed 2048.

For MLT level 8, the sum of weighting factors must not exceed 2688.

E.4.5 Determining Storage requirements

Any one of the feature/function combinations listed in Tables 1, 2 and 3 is operable within its listed storage requirement. (Feature/functions not shown in the tables, do not increase storage requirements above that listed.)

The following tables can be used to determine the amount of storage required for the combination of features and functions desired. For 3174 Models 11L, 11R, 12L, 12R, 13R, 14R, 21L, 21R, 22L, 23R, 24R, 61R, 62R, 63R and 64R as well as Models 01L, 01R, 02R, 03R, 51R, and 53R:

1. Using TABLE 1, add the storage weighting factors for all desired functions to the base control storage weight (2050).
2. If Gateway and/or CCA support is required, used Table 2 to determine the additional storage requirement for the Gateway/CCA combination.
3. If APPN support is required, see TABLE 3 to determine the additional storage for the level of APPN support required.
4. Using the above total, refer to TABLE 4 determine the total 3174 control storage required.

FUNCTION	STORAGE WEIGHTING FACTOR	NOTES
Base	2050	
Calculator function	25	
3270 Port Expansion Feature Support	377	Without multi-host support
3270 Port Expansion Feature Support	505	With multi-host support
AEA	309	Asynchronous Emulation adapter. Add this factor for the first AEA adapter
AEA Large Screen Support	48	Add this additional factor when attaching ASCII terminals with large screens
AEA MLT	216	Add this additional factor and some MLT level when multiple logical terminals are desired on ASCII devices in 3270 CUT emulation mode. NOTE: AEA MLT cannot be configured on CCA's.
Multi-Host Support (Concurrent Communication Adapter or Single Link Multi-Host)	159	Add 159 if either CCA's or Single Link Multi-Host Support is used.
For Single Link Multi-Host Support, select one of the seven following choices for the desired number of additional hosts.		
Single Link Multi-Host Support	54	With 1 additional host
Single Link Multi-Host support	108	With 2 additional hosts
Single Link Multi-Host Support	162	With 3 additional hosts
Single Link Multi-Host Support	216	With 4 additional hosts
Single Link Multi-Host Support	270	With 5 additional hosts

Figure 334 (Part 1 of 4). Table 1: Configuration Support-C Storage Requirements

Single Link Multi-Host Support	324	With 6 additional hosts
Single Link Multi-Host Support	378	With 7 additional hosts
Some level of MLT must be selected (MLT 1 is the minimum allowed) if Multi-Host Support is being implemented using Single Link or CCA. For MLT, select one of the following eight MLT levels determined using Table A or B above or the appropriate sum of the weighting factors.		
MLT Level 1	64	See MLT Level determined above
MLT Level 2	128	
MLT Level 3	512	
MLT Level 4	896	
MLT Level 5	1152	
MLT Level 6	1536	
MLT Level 7	2048	
MLT Level 8	2688	
MLT Level X	X	Where X = sum of the weighting factors. (Configuration Support-B, Release 4 or Configuration Support-C
For Central Site Change Management (CSCM), select one of the six following options.		
CSCM without APPN	248	A controller that receives configuration from a central site controller, or a central site controller that uses a diskette drive only.
CSCM with APPN	155	
CSCM FD1 without APPN	331	A central site controller using one 20MB Fixed Disk optional feature (#1056).
CSCM FD1 with APPN	238	
CSCM FD2 without APPN	414	A central site controller using two 20MB Fixed Disk optional feature (#1056). Only for Models 11L, 11R, 12R, 13R and 14R
CSCM FD2 with APPN	321	

Figure 334 (Part 2 of 4). Table 1: Configuration Support-C Storage Requirements

For Local Format Store, select one of the following six choices of storage for local formats. Note: the format storage selected is the TOTAL format storage selected for all hosts.		
Local Format Storage Level 1	77	Allows up to 64KB of format storage.
Local Format Storage Level 2	141	Allows up to 128KB of format storage.
Local Format Storage Level 3	269	Allows up to 256KB of format storage.
Local Format Storage Level 4	525	Allows up to 512KB of format storage.
Local Format Storage Level 5	1037	Allows up to 1024KB of format storage. See NOTE.
Local Format Storage Level 6	1548	Allows up to 1536KB of format storage.
For 3174 Peer Communication support, select on the following six options.		
3174 Peer	82	Peer Communication support without the Port Expansion Adapter
3174 Peer and Bridge Support	181	
3174 Peer, Bridge and LAN Manager	250	
3174 Peer	129	Peer Communication support with the Port Expansion Adapter.
3174 Peer and Bridge Support	278	
3174 Peer, Bridge and LAN Manager	347	
ISDN Gateway Support	58	Add this factor only when configured as an ISDN and Token-Ring Network Gateway.

Figure 334 (Part 3 of 4). Table 1: Configuration Support-C Storage Requirements

For Frame Relay Communications add the following options.		
Additional Frame Relay Buffers configured	X	X is the additional Frame Relay buffers configured
Additional Frame Relay DLCIs configured	.2(N) Note 1	.2 times the number of DLCIs over 50 (0 - 200)
Frame Relay for TCP/IP	25 Note 1	Add for Frame Relay communications only.
Frame Relay for SNA, Gateway and APPN	60 Note 1	Add this factor only when configured as SNA, APPN or Gateway with Frame Relay.
Additional communication adapter with Frame Relay. Not applicable for CCA.	205 Note 1	Add this for Token-Ring or Ethernet models with a communication adapter. This is not applicable when Gateway is configured.
Additional Ethernet, Token-Ring, or link adapter without Frame Relay.	135 Note 1	Add this for a second communications adapter. This is not applicable when Gateway is configured.

For channel or remotely attached Gateway support, see Table 2 for additional storage requirements.
For APPN support, see Table 3 for additional storage required to support the number of sessions and nodes desired.

Figure 334 (Part 4 of 4). Table 1: Configuration Support-C Storage Requirements

Notes:

1. If the 3174 contains a total of 3 MB of storage, then 984KB of format storage are allowed.
2. The Concurrent Communication Adapter (CCA) has sufficient internal storage to allow selection of MLT Level 1 or MLT Level 2 for those sessions that communicate through the CCA, up to four X.25 Single-Link Multi-Host host connections, and Local Format Storage. Do not include CCA MLT, Single-Link Multi-Host, or Local Format Storage requirements in the 3174 control storage requirements calculated above.

DSPUs				Storage Required
Primary DSPUs ONLY	CCAs ** DSPUs ONLY	Primary AND CCA DSPUs Primary	CCAs	
LOCALLY ATTACHED MODELS (with 4KB RUs)				
1 - 28 *	1 - 100	1 - 20	1 - 32	512
29 - 72		1 - 60	1 - 72	1016
73 - 116		1 - 95	1 - 100	1528
117 - 140		1 - 130	1 - 100	2040
141 - 200		1 - 180	1 - 100	2552
201 - 250		1 - 230	1 - 100	3064
REMOTELY ATTACHED MODELS (with 4KB RUs)				
1 - 72	1 - 100	1 - 40	1 - 50	512
73 - 140		1 - 116	1 - 100	1016
141 - 250		1 - 200	1 - 100	1528
FRAME RELAY ATTACHED MODELS				
1 - 28	1 - 100	1 - 20	1 - 32	512
29 - 72		1 - 60	1 - 72	1016
73 - 116		1 - 95	1 - 100	1528
117 - 140		1 - 130	1 - 100	2040
141 - 200		1 - 180	1 - 100	2552
201 - 250		1 - 230	1 - 100	3064
LOCALLY ATTACHED MODELS (with 8KB RUs)				
1 - 20	1 - 100	1 - 12	1 - 32	512
21 - 50		1 - 38	1 - 72	1016
51 - 80		1 - 59	1 - 100	1528
81 - 100		1 - 90	1 - 100	2040

* For an ISDN only Gateway, the 28 DSPU limit in 512KB storage on the Primary Only is increased to a 32 DSPU limit.
** Token-Ring Network Gateway only.

Figure 335. Table 2: 3174 Gateway/CCA Storage Considerations

To use Table 2, proceed as follows:

1. Select whether the primary interface is channel or remote attached. If channel attached, determine if the maximum RU size is 4KB or 8KB. Select the appropriate section of the table based on the maximum RU size supported. (8KB RUs are only available on Models 12L and 22L.)
2. Determine the number of Downstream Physical Units that will be connected through the primary host link, if any.

3. Determine the number of Downstream Physical Units that will be connected through the CCA links, if any. NOTE: There is a maximum of 50 DSPUs per CCA link.

4. Using these two numbers, locate the specific storage increment that will support this configuration. This is the additional storage needed.

   Note: The maximum number of DSPUs connected through the 3174 Gateway with the Type 3 adapter is 140. The maximum DSPUs for the Type 3A adapter is 250 for 4KB RUs. 8KB RUs support a maximum of 100 DSPUs.

As examples:

1. Assume: Local gateway, 4KB RUs, with 64 primary PUs, and 30 CCA PUs, then the additional amount of storage required for this gateway function is 1536KB.
2. Assume: Local gateway, 8KB RUs, with 64 primary PUs, and 30 CCA PUs, then the additional amount of storage required for this gateway function is 2048KB.

	Nodes or Link connections				
Sessions	1-20	21-75	76-150	151-225	
1-225	968	1188	1666	1966	Additional
226-500	1408	1628	2106	2406	Storage
501-750	1808	2028	2506	2806	Required
751-1000	2208	2428	2906	3206	

Figure 336. Table 3a: APPN Storage Requirements without X.25

	Nodes or Link connections				
Sessions	1-20	21-75	76-150	151-225	
1-225	975	1215	1720	2047	Additional
226-500	1415	1655	2160	2487	Storage
501-750	1815	2055	2560	2887	Required
751-1000	2215	2455	2960	3287	

Figure 337. Table 3b: APPN Storage Requirements with X.25

To use Table 3a or Table 3b, select the number of intermediate LU 6.2 sessions and the number of nodes or link connections supporting the T2.1 sessions. The intersection of these values determine the additional storage required.

Total Weighting Factor	Total Storage Required
greater than 2048 and less than 3072	3.0MB total storage required.
greater than 3072 and less than 4096	4.0MB total storage required
greater than 4096 and less than 5120	5.0MB total storage required.
greater than 5120 and less than 6144	6.0MB total storage required.

Figure 338. Table 4: Configuration Support-C Total Storage Requirements

Notes:

1. The maximum storage available when using Configuration Support-C is 6.0MB for 3174 Models 11L, 11R, 12L, 12R, 13R, 14R, 21H, 21L, 21R, 22L, 23R, 24R, 61R, 62R, 63R and 64R. If you customize for items requiring more than 6.0MB of storage, a deconfiguration to a minimum will occur during IML.
2. A minimum of 4.0MB of control storage is recommended when using the off line Central Site Customization Utility (CSCU), Generate Control Diskette procedure, to generate control diskettes. This will reduce the time and manual intervention required for control diskette generation.

Appendix F. APARs

APARs

In this section, APAR numbers are provided for convenience only. Since APARs may be superseded and new APARs may become available, you should contact your Software Support Center for the latest levels of APARs, PTFs, and other relevant material that you need to apply to your unique environment.

F.1 VTAM APARs for Improved Channel Interface

VTAM APARs are required to support the improved channel interface between VTAM and a channel-attached 3174 token-ring gateway to provide the most reliable device bring-up. This improvement requires that both the VTAM APAR (or newer VTAM version that includes the APAR) and Configuration Support-C Release 1 be installed. You must apply the appropriate VTAM APAR *before you IML* the 3174 channel gateway with Configuration Support-C Release 1.

Any of the following APARs can be installed with earlier releases of the 3174 channel gateway microcode. These APARs must be applied even if you are not using the APPN or Peer Communication LIC features.

Table 45. VTAM APARs for Improved Channel Interface

Operating System	**VTAM Version**	**VTAM APAR**
VM	V3.2	VM33635
VM	V3.3	VM42445
MVS/370	V3.2	OY19979
MVS/XA*	V3.2	OY18496
VSE	V3.1, V3.1.2, V3.2	DY37950
VSE	V3.3	DY40118

Newer VTAM versions than those listed should not require a separate APAR. If your system is not listed above, please contact your Software Support Center.

F.2 CICS and VM/SP APARs

If you are using an OEM ASCII graphics terminal (for example, a DEC VT240/241 or Tektronix 4205) and one of the following environments, you will need to apply an APAR fix.

Table 46. CICS and VM/SP APARs		
Environment	**Product Version**	**Product APAR**
CICS	V1.7	PL20997 PL36820
	V2.1	PL22650 PL37826 PL52779
VM/SP	R6	VM37424
VM/SP HPO	R6	VM37424

F.3 NetView R3 APARs

To use 3174 functions Central Site Control Facility, Extended Vital Product Data under enhanced Network Asset Management, or enhanced TRACE facility, install the appropriate NetView R3 feature and associated APARs.

Table 47. NetView R3 APARs				
Environment	**NetView R3 Product #**	**NetView R3 Feature #**	**APAR #**	**PTF #**
MVS/ESA	5685-152	5850 5851 5852	OY26617	UY90510 UY90511
MVS/XA	5665-362	5860 5861 5862	OY26579	UY90507 UY90508
VM	5664-204	5890 5891 5892	VM39206	UY90514 UY90515

F.4 NetView DM PTF Required for CSCM

In order to operate with the CSCM changes included in Configuration Support-C Release 1, NetView DM V1.2 must have the PTF related to PL63689 installed. If this is not done, then certain operations may result in an exception condition and sense code ′100B0004′ being reported to the operator. This exception is detected by NetView DM and results from the expanded canonical name reporting for CSCM in Configuration Support-C Release 1. The final state of the phase will be ″Pending″ even when the 3174 will have completed its operation(s). Therefore, the pending state should be deleted and any subsequent phases/plans should be allowed to run.

F.5 APPN APARs

This section lists the known problems in other products when using a 3174 in an APPN network. The associated APAR number(s) which identify the problem are also listed. Contact your Software Support Center to obtain the appropriate PTFs.

Table 48. VTAM/NCP APARs for 3174 APPN			
Problem/Symptom	**Users Affected**	**VTAM**	**NCP**
		Version # **APAR #**	**Version #** **APAR #**
Cannot activate multiple independent sessions with VTAM application.	All users requiring multiple T2.1 sessions and using adaptive BIND pacing.	V3.3 for VM VM45562	N/A
Messages IST683I and IST684I from VTAM when activating T2.1 link.	All users with T2.1 links with 3174.	V3.3 for VM VM45886	N/A
		V3.3 for VM/ESA* VM46470	N/A
Independent session with VTAM is terminated with sense code of ′20110000′.	VTAM users with T2.1 links using adaptive pacing for data.	V3.3 for VM VM45911	N/A
Unable to start independent session with VTAM application.	All VTAM users who issue CV′0E′ control vectors.	V3.2 for MVS/XA OY18594	V4.3 or V5.2.1 IR85929
		V3.3 for VM VM40904	V5.2 or V5.2.1 IR85952

Table 49. OS/400 APARs for 3174 APPN			
Problem/Symptom	**Users Affected**	**OS/400**	
		Release # **APAR #**	**Source Fixed in Release #**
Unable to start independent session with AS/400 application.	Users with a shared (combined 2.0/2.1) link between AS/400 and 3174.	V1.2, V1.3, V2.1 MA03632, MA03636	V2.1.1
OS/400 message CPI5906 received. APPN CP-CP session terminating with reason code ′0E′.	All users starting CP-CP sessions with OS/400.	V1.2, V1.3 MA02267, MA03302	V2.1
OS/400 message CPI5906 received. APPN CP-CP session terminating with reason code ′0E′.	All users starting CP-CP sessions with OS/400 and issuing directory searches and topology updates.	V1.3 MA03718	V2.1

F.6 AS/400 APARs

When a AS/400 is connected as a Network Node in **between** the DLUR and the DLUS, PTF 07043 for VRM2.20 or MF07044 for VRM2.30 should be applied.

Appendix G. VTAM/NCP Definition Examples

This appendix contains VTAM and NCP definition examples for local channel attached SNA and non-SNA 3270 devices as well as for devices attached to a SDLC link, to an X.25 connection and to the token-ring Network.

G.1 Local 3174 Definitions (SNA)

PU Definition

```
**********************************************************************
*        LOCAL 3174 DEFINITIONS                                      *
**********************************************************************
LOCCOLOR VBUILD   TYPE=LOCAL
LOCAPU   PU    CUADDR=05E,ISTATUS=ACTIVE,PUTYPE=2,MAXBFRU=10,          X
               MODETAB=MT327X
```

LU Definitions

```
LOC791   LU    LOCADDR=2,VPACING=4,DLOGMOD=T3279M3,USSTAB=US327X
LOC32872 LU    LOCADDR=3,VPACING=4,DLOGMOD=T3287M2C
LOC793   LU    LOCADDR=4,VPACING=4,DLOGMOD=T3279M2,USSTAB=US327X
LOC794   LU    LOCADDR=5,VPACING=4,DLOGMOD=T3279M2,USSTAB=US327X
LOC795   LU    LOCADDR=6,VPACING=4,DLOGMOD=T3279M4E,USSTAB=US327X
LOC32876 LU    LOCADDR=7,VPACING=4,DLOGMOD=T3287M2C,USSTAB=US327X
LOC32877 LU    LOCADDR=8,VPACING=4,DLOGMOD=T3287M2C
LOC798   LU    LOCADDR=9,VPACING=4,DLOGMOD=T3279M4,USSTAB=US327X
```

Note: The ACF/VTAM Installation manual describes the definition of Local SNA major nodes.

G.2 Local 3174 Terminal Definition (Non-SNA)

```
*********************************************************************
*  LOCAL 3270 TERMINAL DEFINITION                                   *
*********************************************************************
         LBUILD
H11L420  LOCAL CUADDR=420,TERM=3277,                                 X
               MODETAB=AMODETAB,LOGAPPL=SAMON11,USSTAB=US3270,       X
               ISTATUS=ACTIVE,SPAN=(SPH11L),DLOGMOD=M2BSCNQ
*              STATOPT=('3277 420 -SYS3')
H11L421  LOCAL CUADDR=421,TERM=3277,                                 X
               MODETAB=AMODETAB,LOGAPPL=SAMON11,USSTAB=US3270,       X
               ISTATUS=ACTIVE,SPAN=(SPH11L),DLOGMOD=M2BSCNQ
*              STATOPT=('3277 421 -SYS3')

⋮
H11L42F  LOCAL CUADDR=42F,TERM=3286,FEATUR2=(MODEL2),                X
               MODETAB=AMODETAB,ISTATUS=INACTIVE,                    X
               SPAN=(SPH11L)
*              STATOPT=('3286 42F -SYS3')
H11L430  LOCAL CUADDR=430,TERM=3277,                                 X
               MODETAB=AMODETAB,USSTAB=US3270,LOGAPPL=SAMON11,       X
               ISTATUS=ACTIVE,SPAN=(SPH11L),DLOGMOD=M3BSCQ
*              STATOPT=('3277 430 -SYS3')
H11L431  LOCAL CUADDR=431,TERM=3277,                                 X
               MODETAB=AMODETAB,USSTAB=US3270,LOGAPPL=SAMON11,       X
               ISTATUS=ACTIVE,SPAN=(SPH11L),DLOGMOD=M3BSCQ
*              STATOPT=('3277 431 -SYS3')
H11L436  LOCAL CUADDR=436,TERM=3277,                                 X
               MODETAB=AMODETAB,USSTAB=US3270,DLOGMOD=M3BSCNQ,       X
               ISTATUS=ACTIVE,SPAN=(SPH11L)
*              STATOPT=('3277 436 -SYS3')
H11L437  LOCAL CUADDR=437,TERM=3277,                                 X
               MODETAB=AMODETAB,USSTAB=US3270,DLOGMOD=M3BSCNQ,       X
               ISTATUS=ACTIVE,SPAN=(SPH11L)
*              STATOPT=('3277 437 -SYS3')

⋮
```

Note: The ACF/VTAM Installation manual describes the definition and filing of local terminals.

G.3 SDLC 3174 Definitions

G.3.1 SDLC Group Specification for 3174

GDSL (definition model)

```
*********************************************************************
*       GROUP MACRO SPECIFICATIONS FOR SDLC LINES                   *
*********************************************************************
G13S1    GROUP LNCTL=SDLC,        SYNCHRONOUS DATA LINK              X
               DUPLEX=FULL,       REQUEST TO SEND ALWAYS UP          X
               NRZI=YES,                                             X
               REPLYTO=1,         1 SECOND FOR SDLC                  X
               RETRIES=(7,4,5),   7 RETRIES PER SECOND FOR 5 TIMES   X
               TYPE=NCP           NCP ONLY
*********************************************************************
```

G.3.2 Line Macro for SDLC 3174

LSD3174 (definition model)

```
*********************************************************************
*            SDLC 3174                                              *
*********************************************************************
*       LINE MACRO SPECIFICATION     SDLC LINK 000  MODEM           *
*********************************************************************
L13000   LINE  ADDRESS=(000,FULL),  FULL DUPLEX                      X
               ATTACH=MODEM,      MODEM  ATTACH                      X
               OWNER=M11,                                            X
               ANS=CONTINUE,      DON'T BREAK CROSS DOMAIN SESSIONS  X
               CLOCKNG=EXT,       MODEM ATTACHED                     X
               NRZI=YES,                                             X
               ISTATUS=ACTIVE,                                       X
               DUPLEX=(FULL),     REQUEST TO SEND ALWAYS UP          X
               ETRATIO=30,        DEFAULT                            X
               MAXPU=1,           ALLOW NO MORE THAN 1 PU  ON LINE   X
               SERVLIM=10,                                           X
               SRT=(,64),                                            X
               SPEED=9600
*              STATOPT='3174 LINE'
```

G.3.3 SDLC Service Macro Specifications Remote 3174

SERVICE (definition model)

```
*********************************************************************
*       SERVICE MACRO SPECIFICATION FOR SDLC (LINE 000)             *
*********************************************************************
         SERVICE ORDER=(P13000A),                                    X
               MAXLIST=1
```

G.3.4 3174 PU/LU Specifications for PU3174

CBS3174 (definition model)

```
***********************************************************************
*       PU/LU SPECIFICATIONS FOR PU3174                               *
***********************************************************************
P13000A  PU    ADDR=C1,            CLUSTER ADDRESS = C1                 X
               MAXDATA=265,        MAXIMUM AMOUNT OF DATA               X
               MAXLU=64,           MAXIMUM LUS ON THIS PU               X
               MAXOUT=7,           MAX SDLC FRAMES BEFORE RESPONSE      X
               PACING=0,           PACING SET BY BIND IMAGE             X
               PASSLIM=8,                                               X
               PUDR=YES,                                                X
               PUTYPE=2,                                                X
               RETRIES=(,4,5),     7 RETRIES PER SECOND FOR 5 TIMES     X
               DISCNT=(NO),        (V) VTAM                             X
               ISTATUS=ACTIVE,     (V) VTAM                             X
               VPACING=0           (V) VTAM
T1300002 LU    LOCADDR=02,         3278                                 X
               MODETAB=AMODETAB,                                        X
               DLOGMOD=M2SDLCNQ,                                        X
               ISTATUS=ACTIVE      (V) VTAM
*
T1300003 LU    LOCADDR=03,         3278                                 X
               MODETAB=AMODETAB,                                        X
               DLOGMOD=M2SDLCNQ,                                        X
               ISTATUS=ACTIVE      (V) VTAM
*
T1300004 LU    LOCADDR=04,         3287                                 X
               MODETAB=AMODETAB,                                        X
               DLOGMOD=M3287SCS,                                        X
               ISTATUS=ACTIVE      (V) VTAM
*
T1300005 LU    LOCADDR=05,         3179G                                X
               MODETAB=AMODETAB,                                        X
               DLOGMOD=M2SDLCNQ,                                        X
               ISTATUS=ACTIVE      (V) VTAM
*
T1300006 LU    LOCADDR=06,         3270PC                               X
               MODETAB=MTPSPC,                                          X
               DLOGMOD=PCMODE,                                          X
               ISTATUS=ACTIVE      (V) VTAM
*
T1300007 LU    LOCADDR=07,         3270PC                               X
               MODETAB=MTPSPC,                                          X
               DLOGMOD=PCMODE,                                          X
               ISTATUS=ACTIVE      (V) VTAM
*
T1300008 LU    LOCADDR=08,         3270PC                               X
               MODETAB=MTPSPC,                                          X
               DLOGMOD=PCMODE,                                          X
               ISTATUS=ACTIVE      (V) VTAM
*
```

G.4 X.25 Definitions

This section includes VTAM and the NCP NPSI definitions used for testing the X.25 functions referenced in this manual.

G.4.1 Single-Host Testing

The single-host testing was performed using NPSI V1.4.2.

```
***********************************************************************
* X25 NPSI R4.2 STAGE1 INPUT                                          *
*                                                                     *
* THIS GENERATION IS FOR 1 MCH LINK.                                  *
* FOR:                                                                *
* CPU TO 3174 PVC AND SVC; WITH QLLC CONTROL FOR BOTH.                *
* X25BUILD - THIS MACRO DESCRIBES THE GENERATION PROCESS.             *
***********************************************************************
X25R41  X25BUILD IDNUMH=01,      ID FOR NON-SNA SWITCHED SUPPORT       X
               MAXPIU=4K,        MAXIMUM PIU LENGTH                    X
               MCHCNT=1,         1 MCH LINK DEFINED                    X
               MODEL=3725,       3725                                  X
               SNAP=NO,          SNAP FACILITY OFF                     X
               SRCHI=X25BLK1,    STAGE 2 OUTPUT MEMBER NAME (1 = GENNO)X
               SRCLO=X25TBL1,    STAGE 2 OUTPUT MEMBER NAME (1 = GENNO)X
               SRCPRFX=X25,      STAGE 2 OUTPUT TABLES & BLOCKS PREFIX X
               VERSION=V4,       NPSI RELEASE 4.2 ONLY                 X
               TYPSYS=OS         MVS 3.8 WITH ACF/VTAM V3
***********************************************************************
*      X25 NET - DESCRIBES THE PPSN.                                  *
***********************************************************************
NETX25 X25NET  DM=YES,           LAPB DM COMMAND                       X
               NETTYPE=1,        TYPE 1 TYMNET NETWORK                 X
               CPHINDX=2,        2 ENTRIES IN VIRTUAL CIRCUIT TABLE    X
               OUHINDX=1         1 ENTRY IN THE OPTIONAL FACILITY TABLE
***********************************************************************
*     X25VCCPT - VIRTUAL CIRCUIT CONNECTION PARAMETERS TABLE.         *
***********************************************************************
      X25VCCPT INDEX=1,          TABLE ENTRY NUMBER                    X
               MAXPKTL=128,      MAXIMUM PACKET LENGTH EXCL PACKET HDR X
               INSLOW=(25,0),    FREE BUFFER PERCENTAGE                X
               VWINDOW=2         PACKET TRANSMIT/RECEIVE WINDOW SIZE
***********************************************************************
*     X25OUFTT - SVC USER FACILITIES AND CALL USER DATA TABLE.        *
***********************************************************************
       X25OUFT INDEX=1           TABLE ENTRY NUMBER                    *
***********************************************************************
*       X25MCH - DESCRIBE THE PHYSICAL MULTICHANNEL LINK.             *
*               DTE END 15                                            *
***********************************************************************
        X25MCH ADDRESS=15,       3725  FDX LINE ADDRESS                X
               FRMLGTH=259,      MAXIMUM FRAME LENGTH (+3 BYTE PKT HDR)X
               LCGDEF=0(20),     LOGICAL CHAN GRP 0, UP TO CHAN 12     X
               MWINDOW=7,        LINK ACCESS FRAME WINDOW SIZE (HDLC)  X
               ANS=STOP,         AUTO NETWORK SHUTDOWN DECISION        X
               ENABLTO=3,        ENABLE TO 3 SECONDS                   X
               DSABLTO=3,        DISABLE TO 3 SECONDS                  X
               DBIT=NO,          DELIVERY CONFIRMATION BIT SUPPORTED   X
               GATE=NO,          GATE OR DATE FUNCTION SUPPORTED       X
               SUBADDR=NO,       SUBADDRESING                          X
```

```
              LCNO=NOTUSED,      LOGICAL CHANNEL 0 NOT USED            X
              LLCLIST=(LLC3),         SVC'S TYPES SUPPORTED            X
              NDRETRY=2,         NP/TP SEQUENCE EXECUTED               X
              NPRETRY=10,        I OR U FRAME TIMOUT RECOVERY          X
              PAD=INTEG,         PAD FUNCTION     SUPPORTED            X
              TRAN=ODD,          NO TRANSLATION IF NO PAD FUNCTION     X
              PKTMODL=8,         MODULO 8 PACKET NUMBERING             X
              STATION=DTE,       NETWORK CONNECTION                    X
              SPEED=9600,        PHYSICAL LINK SPEED                   X
              TDTIMER=2,         TIME (SECS) BETWEEN ND RETRANSMISSIONSX
              TPTIMER=3.0        X25 T1 TIMER IN SECS
***********************************************************************
*       X25LCG - DESCRIBE THE LOGICAL CHANNEL GROUP.                  *
***********************************************************************
        X25LCG LCGN=0            LOGICAL CHANNEL GROUP NUMBER
***********************************************************************
*     PU/LU MACRO SPECIFICATION FOR 3174 LOGICAL CHANNEL 4 (PVC)      *
***********************************************************************
XL15004  X25LINE LCN=1,                                                X
              DSTNODE=BNN,                                             X
              LLC=LLC3,                                                X
              TYPE=P,                                                  X
              VCCINDX=1
*
XP15004 X25PU  PUTYPE=2,         ATTACH TO AN X.25/SNA 3174            X
              ADDR=C1,           STATION ADDRESS                       X
              MAXDATA=265,       DEPENDANT ON PU CONSTRAINTS           X
              PASSLIM=7,         MAXIMUM PIU SEGMENTS IN TRANSMISSION  X
              MAXOUT=7,          MAXIMUM SDLC FRAMES BEFORE LINK RESP  X
              ISTATUS=ACTIVE,    ACTIVATE AT INITIALIZATION            X
              SSCPFM=USSSCS,     LOGON FORMAT                          X
              MODETAB=MT3274C2,  MODE TABLE REFERENCE FOR VTAM         X
              DLOGMOD=T3278M2,   MODE TABLE REFERENCE FOR VTAM         X
              USSTAB=US327X      USS TABLE REFERENCE FOR VTAM
*
XT1541   X25LU LOCADDR=2,        ADDRESS OF LU                         X
              ISTATUS=ACTIVE     ACTIVATE WITH PU
XT1542   X25LU LOCADDR=3,        ADDRESS OF LU                         X
              ISTATUS=INACTIVE   ACTIVATE WITH PU
***********************************************************************
*       X25VC - DESCRIBE RESERVE PVCS                                 *
***********************************************************************
        X25VC  LCN=(2,10),       LOGICAL CHANNELS WITHIN A GROUP       X
              TYPE=P,            V C TYPE - P=PERMANENT, S=SWITCHED    X
              VCCINDX=1,         INDEX IN CONNECTION PARAMETER TABLE   X
              LLC=LLC0           LOGICAL LINK CONTROL
***********************************************************************
*       X25VC - DESCRIBE THE SWITCHED VIRTUAL CIRCUITS                *
***********************************************************************
        X25VC  LCN=(11,20),      LOGICAL CHANNELS WITHIN A GROUP       X
              NCPGRP=X25S01B,    TO ASSOCIATE WITH VTAM PATH STMT      X
              TYPE=S,            V C TYPE - P=PERMANENT, S=SWITCHED    X
              VCCINDX=1,         INDEX IN CONNECTION PARAMETER TABLE   X
              CALL=INOUT,        INCOMING AND OUTGOING CALLS ACCEPTED  X
              OUFINDX=1          INDEX IN USER TABLE
***********************************************************************
*       X25END - NPSI GENERATION END, NAME MEMBERS FOR STAGE 2 OUTPUT.*
***********************************************************************
        X25END INCPRFX=X25,      STAGE 2 OUTPUT MEMBERS PREFIX         X
```

```
               LSTUACB=YES,      NPSI SUPPLY LASTUACB MACRO           X
               NCPSTG1=X25NCP1,  STAGE 2 OUTPUT MEMBER NAME (1 = GENNO)X
               X25VTAM=YES,      VTAM ACCEPT ADDRESS=NONE & AUTO=YES   X
               INCHI=X25HJI1,    STAGE 2 OUTPUT MEMBER NAME (1 = GENNO)X
               INCL2HI=X25HII1,  STAGE 2 OUTPUT MEMBER NAME (1 = GENNO)X
               INCINIT=X25INI1,  STAGE 2 OUTPUT MEMBER NAME (1 = GENNO)X
               INCL2LO=X25LOI1,  STAGE 2 OUTPUT MEMBER NAME (1 = GENNO)X
               ORDINIT=X25INO1,  STAGE 2 OUTPUT MEMBER NAME (1 = GENNO)X
               ORDHI=X25HJO1,    STAGE 2 OUTPUT MEMBER NAME (1 = GENNO)X
               ORDL2HI=X25HIO1,  STAGE 2 OUTPUT MEMBER NAME (1 = GENNO)X
               ORDL2LO=X25L1     STAGE 2 OUTPUT MEMBER NAME (1 = GENNO)
           END
***********************************************************************
```

VTAM Switched Major Node

```
X3174   VBUILD MAXGRP=5,               REQUIRED                        X
               MAXNO=12,               REQUIRED                        X
               TYPE=SWNET              REQUIRED
*
XP3174   PU    ADDR=C1,                                                X
               IDBLK=017,             Same as 3274                     X
               IDNUM=A0076,           user defined                     X
               DISCNT=YES,                                             X
               MAXDATA=265,                                            X
               MAXOUT=7,                                               X
               PASSLIM=7,                                              X
               MODETAB=MT3274C2,                                       X
               MAXPATH=6,                                              X
               VPACING=0,                                              X
               PUTYPE=2,                                               X
               SSCPFM=USSSCS,                                          X
               DLOGMOD=T3278M2,                                        X
               USSTAB=US327X
*
PAT3174 PATH  DIALNO=31060019833,      Host DTE address, LLC type 3    X
               GRPNM=X25S01B,          association to NCP/NPSI group   X
               GID=2,                                                  X
               PID=21
*
XT3174   LU    LOCADDR=2
XT3174A  LU    LOCADDR=3
```

G.4.2 Multi-Host Testing

The multi-host testing was performed using NPSI V2.1 and ESA VTAM V3.3.

```
************************************************************************
*      NCP/NPSI DEFINITIONS FOR X.25 MULTI-HOST TESTING               *
************************************************************************
NCPBUILD BUILD ..add the following statements:                          X

               X25.PREFIX=X,       ALL NAMES START WITH X               X
               X25.IDNUMH=02,      MUST MATCH WITH SWITCH MAJOR NODE IDX
               X25.SNAP=YES,       SNAP TRACE INCLUDED                  X
               X25.MCHCNT=1,       NUMBER OF PHYSICAL LINKS             X
               X25.MAXPIU=5K       LESS THAN MAXBFRU TIMES UNITSZ
*
************************************************************************
*      X.25 NETWORK                                                   *
************************************************************************
X3174    X25.NET CPHINDX=1,                                             X
               NETTYPE=1,                                               X
               OUHINDX=1,                                               X
               DM=YES
*
         X25.VCCPT INDEX=1,                                             X
               MAXPKTL=128,                                             X
               VWINDOW=3,           PACKET LEVEL WINDOW 3               X
               INSLOW=(100,50)
************************************************************************
*      FIRST MCH                                                      *
************************************************************************
MCH01    X25.MCH   ADDRESS=08,      CONTROLLER LINE ADDRESS             X
               ANS=STOP,                                                X
               LCGDEF=(0,4),        4 PVC                               X
               FRMLGTH=259,         256 + 3 (PACKET HEADER)             X
               MWINDOW=7,           FRAME WINDOW SIZE                   X
               STATION=DCE,         USED TO SIMULATE X.25 NETWORK       X
               ENABLTO=3,                                               X
               DSABLTO=3,                                               X
               TDTIMER=1,                                               X
               TPTIMER=3,                                               X
               NPRETRY=10,                                              X
               NDRETRY=1,           CODED TO MATCH  STATION=DCE         X
               SUBADDR=NO,                                              X
               LLCLIST=(LLC3),                                          X
               LCNO=NOTUSED,                                            X
               DBIT=NO,                                                 X
               PAD=NO,                                                  X
               PKTMODL=8,                                               X
               GATE=NO,                                                 X
               ITRACE=YES,                                              X
               SPEED=9600,          DEFAULT                             X
               T1TIMER=1
************************************************************************
*
         X25.LCG LCGN=0             LOGICAL CHANNEL GROUP ZERO
*
************************************************************************
*      X.25 LINE / PU / LU MACROS                        (LINE 008)
*      EACH LINE DEFINES A PVC
```

```
***********************************************************************
XL13008A X25.LINE LCN=1,            FIRST PVC                          X
               DSTNODE=BNN,                                            X
               LLC=LLC3,                                               X
               TYPE=P,                                                 X
               VCCINDX=1
***********************************************************************
XP13008A X25.PU PUTYPE=2,                                              X
               ISTATUS=ACTIVE,                                         X
               ADDR=C1,                                                X
               MAXDATA=265,                                            X
               MAXOUT=7,                                               X
               SSCPFM=USSSCS,                                          X
               MODETAB=AMODETAB,                                       X
               USSTAB=US327X
***********************************************************************
T13008A1 X25.LU LOCADDR=2,DLOGMOD=M2SDLCQ
T13008A2 X25.LU LOCADDR=3,DLOGMOD=M2SDLCQ
T13008A3 X25.LU LOCADDR=4,DLOGMOD=M2SDLCQ
T13008A4 X25.LU LOCADDR=5,DLOGMOD=M2SDLCQ
T13008A5 X25.LU LOCADDR=6,DLOGMOD=M2SDLCQ
T13008A6 X25.LU LOCADDR=7,DLOGMOD=M2SDLCQ
T13008A7 X25.LU LOCADDR=8,DLOGMOD=M2SDLCQ
T13008A8 X25.LU LOCADDR=9,DLOGMOD=M2SDLCQ
T13008A9 X25.LU LOCADDR=10,DLOGMOD=M2SDLCQ
***********************************************************************
XL13008B X25.LINE LCN=2,            SECOND PVC                         X
               DSTNODE=BNN,                                            X
               LLC=LLC3,                                               X
               TYPE=P,                                                 X
               VCCINDX=1
***********************************************************************
XP13008B X25.PU PUTYPE=2,                                              X
               ISTATUS=ACTIVE,                                         X
               ADDR=C1,                                                X
               MAXDATA=265,                                            X
               MAXOUT=7,                                               X
               SSCPFM=USSSCS,                                          X
               MODETAB=AMODETAB,                                       X
               USSTAB=US327X
***********************************************************************
T13008B1 X25.LU LOCADDR=34,DLOGMOD=M2SDLCQ
T13008B2 X25.LU LOCADDR=38,DLOGMOD=M2SDLCQ
T13008B3 X25.LU LOCADDR=42,DLOGMOD=M2SDLCQ
T13008B4 X25.LU LOCADDR=46,DLOGMOD=M2SDLCQ
T13008B5 X25.LU LOCADDR=50,DLOGMOD=M2SDLCQ
T13008B6 X25.LU LOCADDR=54,DLOGMOD=M2SDLCQ
T13008B7 X25.LU LOCADDR=58,DLOGMOD=M2SDLCQ
T13008B8 X25.LU LOCADDR=62,DLOGMOD=M2SDLCQ
T13008B9 X25.LU LOCADDR=66,DLOGMOD=M2SDLCQ
***********************************************************************
XL13008C X25.LINE LCN=3,            THIRD PVC                          X
               DSTNODE=BNN,                                            X
               LLC=LLC3,                                               X
               TYPE=P,                                                 X
               VCCINDX=1
***********************************************************************
XP13008C X25.PU PUTYPE=2,                                              X
               ISTATUS=ACTIVE,                                         X
```

```
               ADDR=C1,                                                 X
               MAXDATA=265,                                             X
               MAXOUT=7,                                                X
               SSCPFM=USSSCS,                                           X
               MODETAB=AMODETAB,                                        X
               USSTAB=US327X
***********************************************************************
T13008C1 X25.LU LOCADDR=35,DLOGMOD=M2SDLCQ
T13008C2 X25.LU LOCADDR=39,DLOGMOD=M2SDLCQ
T13008C3 X25.LU LOCADDR=43,DLOGMOD=M2SDLCQ
T13008C4 X25.LU LOCADDR=47,DLOGMOD=M2SDLCQ
T13008C5 X25.LU LOCADDR=51,DLOGMOD=M2SDLCQ
T13008C6 X25.LU LOCADDR=55,DLOGMOD=M2SDLCQ
T13008C7 X25.LU LOCADDR=59,DLOGMOD=M2SDLCQ
T13008C8 X25.LU LOCADDR=63,DLOGMOD=M2SDLCQ
T13008C9 X25.LU LOCADDR=67,DLOGMOD=M2SDLCQ
***********************************************************************
XL13008D X25.LINE LCN=4,           FOURTH PVC                           X
               DSTNODE=BNN,                                             X
               LLC=LLC3,                                                X
               TYPE=P,                                                  X
               VCCINDX=1
***********************************************************************
XP13008D X25.PU PUTYPE=2,                                               X
               ISTATUS=ACTIVE,                                          X
               ADDR=C1,                                                 X
               MAXDATA=265,                                             X
               MAXOUT=7,                                                X
               SSCPFM=USSSCS,                                           X
               MODETAB=AMODETAB,                                        X
               USSTAB=US327X
***********************************************************************
T13008D1 X25.LU LOCADDR=36,DLOGMOD=M2SDLCQ
T13008D2 X25.LU LOCADDR=40,DLOGMOD=M2SDLCQ
T13008D3 X25.LU LOCADDR=44,DLOGMOD=M2SDLCQ
T13008D4 X25.LU LOCADDR=48,DLOGMOD=M2SDLCQ
T13008D5 X25.LU LOCADDR=52,DLOGMOD=M2SDLCQ
T13008D6 X25.LU LOCADDR=56,DLOGMOD=M2SDLCQ
T13008D7 X25.LU LOCADDR=60,DLOGMOD=M2SDLCQ
T13008D8 X25.LU LOCADDR=64,DLOGMOD=M2SDLCQ
T13008D9 X25.LU LOCADDR=68,DLOGMOD=M2SDLCQ
***********************************************************************
*
        X25.END
*
***********************************************************************
```

G.5 Definitions for 3174 LAN Models

This section includes sample VTAM and NCP definitions for:

- Local LAN (Token-Ring) gateways
- Remote LAN gateways
- DSPU devices.

G.5.1 VTAM Definitions for 3174 DSPU Attached via NTRI

VTAM definitions used for a switched major node for a downstream 3174-x3R via an NCP/NTRI gateway.

```
**********************************************************************
*         VTAM SWITCHED MAJOR NODE FOR NTRI WITH 3174                *
**********************************************************************
E13SW9  VBUILD MAXGRP=5,               REQUIRED                      X
               MAXNO=12,               REQUIRED                      X
               TYPE=SWNET              REQUIRED
**
E13PS09  PU    ADDR=13,                COULD BE ANYTHING (NOT USED)  X
               IDBLK=017,              3274/3174 BURNED IN           X
               IDNUM=A0001,            SEE CUSTOMIZATION # 215       X
               DISCNT=NO,                                            X
               MAXOUT=1,                                             X
               MODETAB=AMODETAB,                                     X
               MAXPATH=2,                                            X
               VPACING=0,                                            X
               PUTYPE=2,                                             X
               SSCPFM=USSSCS,                                        X
               DLOGMOD=M2SDLCQ,                                      X
               USSTAB=US327X
**
E13D0901 PATH  DIALNO=0004400043301002,  TO 3174 MODEL 03R           X
               GRPNM=EG22L01,            LOGICAL GROUP OF TIC 1      X
               GID=1,                                                X
               PID=1
**
E13D0902 PATH  DIALNO=0004400033301004, TO PC WITH 3270 EMULATION    X
               GRPNM=EG22L02,            LOGICAL GROUP OF TIC 2      X
               GID=1,                                                X
               PID=2,                                                X
               USE=NO                    INITIALLY INACTIVE
**
E13L0902 LU    LOCADDR=2                 FOR A DISPLAY
E13L0903 LU    LOCADDR=3                 FOR A DISPLAY/PRINTER
E13L0904 LU    LOCADDR=4                 FOR A DISPLAY/PRINTER
         _
         _
         _
**********************************************************************
```

G.5.2 NCP Definitions for 3174 DSPU

NCP definitions for a 3720 gateway to a 3174 DSPU.

```
**********************************************************************
G22XLLL  GROUP LNCTL=SDLC,REPLYTO=1
**********************************************************************
L22000   LINE  ADDRESS=(00,FULL),  LINE ADDRESS                      X
               ATTACH=DIR3725,     INN LINK                          X
               CLOCKNG=EXT,        REQUIRED FOR DIRECT               X
               DUPLEX=FULL,        MODEM STRAPPING IS FULL           X
               MONLINK=YES,        MONITOR LINK FOR ACTPU            X
               NRZI=YES,                                             X
               PAUSE=0.1,                                            X
               SDLCST=(SDL22PRI,SDL22SEC),                           X
               RETRIES=(7,3,5),                                      X
               SERVLIM=254,                                          X
               ISTATUS=ACTIVE      INITIAL STATUS
**********************************************************************
*       PU MACRO SPECIFICATION FOR THE ADJACENT 3720  SA12           *
**********************************************************************
P22000   PU    MAXOUT=7,           MAX PIU'S SENT BEFORE RESP REQ    X
               PUTYPE=4,           PHYSICAL UNIT TYPE LOCAL 3720     X
               ISTATUS=ACTIVE,     INITIAL STATUS                    X
               TGN=8,              TRANSMISSION GROUP 8              X
               ANS=CONTINUE        DON'T BREAK THE X-DOMAIN SESSIONS
**********************************************************************
*       PHYSICAL GROUP FOR TIC 1                                     *
**********************************************************************
EG22P01  GROUP ECLTYPE=PHYSICAL,   TIC DEFINITION                    X
               PUDR=NO,                                              X
               STATOPT='NTRI TIC1'
EL22017  LINE  ADDRESS=(17,FULL),  TIC ADDRESS                       X
               PORTADD=0,          FIRST  TIC                        X
               LOCADD=400012201001, LOCAL ADMIN. ADDRESS OF TIC      X
               RCVBUFC=4095,        NTRI RECEIVE BUFFER              X
               MAXTSL=1108          NTRI TRANSMIT DATA CAPACITY
EP22017  PU    ADDR=01
EU22017  LU    ISTATUS=INACTIVE,                                     X
               LOCADDR=0
**********************************************************************
*       LOGICAL  GROUP FOR TIC 1                                     *
**********************************************************************
EG22L01  GROUP ECLTYPE=LOGICAL,    DEFINE TERMINALS IN THE RING      X
               AUTOGEN=20,         LOGICAL CONNECTIONS               X
               MAXLU=20,           NUMBER OF LOGICAL UNITS           X
               PHYPORT=0,          FIRST  TIC                        X
               CALL=INOUT,         DIAL IN / DIAL OUT POSSIBILITY    X
               DIAL=YES,                                             X
               LINEADD=YES,                                          X
               LINEAUT=YES,                                          X
               MAXPU=1,                                              X
               PUTYPE=2
**********************************************************************
```

G.5.3 VTAM Definitions for 3174 Local Gateway and DSPUs

MVS Environment

```
**********************************************************************
*       LOCAL 3174 DEFINITIONS                                       *
*       RAPP40    = 3174 LOCAL GATEWAY PU                            *
*       RAPP41-46 = DOWNSTREAM PU                                    *
**********************************************************************
HSNA040 VBUILD TYPE=LOCAL
RAPP40   PU     CUADDR=E40,ISTATUS=ACTIVE,PUTYPE=2,MAXBFRU=10,        X
               MODETAB=AMODETAB,DLOGMOD=M2SDLCQ,USSTAB=US327X,        X
               VPACING=0
*
RAPT400 LU     LOCADDR=2
RAPT401 LU     LOCADDR=3,MODETAB=MTJS328X,DLOGMOD=SCS3262
RAPT401 LU     LOCADDR=3,MODETAB=MT4224,DLOGMOD=M4224
RAPT402 LU     LOCADDR=4
RAPT403 LU     LOCADDR=5
RAPT404 LU     LOCADDR=6
RAPT405 LU     LOCADDR=7
RAPT406 LU     LOCADDR=8
RAPT407 LU     LOCADDR=9
RAPT408 LU     LOCADDR=10
RAPT409 LU     LOCADDR=11
**********************************************************************
RAPP41   PU     CUADDR=E41,ISTATUS=ACTIVE,PUTYPE=2,MAXBFRU=10,        X
               MODETAB=AMODETAB,DLOGMOD=M2SDLCQ,USSTAB=US327X,        X
               VPACING=0,SECNET=YES
*
RAPT410 LU     LOCADDR=2
RAPT411 LU     LOCADDR=3,MODETAB=MTJS328X,DLOGMOD=SCS3262
RAPT412 LU     LOCADDR=4
RAPT413 LU     LOCADDR=5
RAPT414 LU     LOCADDR=6
RAPT415 LU     LOCADDR=7
RAPT416 LU     LOCADDR=8
RAPT417 LU     LOCADDR=9
RAPT418 LU     LOCADDR=10
RAPT419 LU     LOCADDR=11
**********************************************************************
RAPQ42   PU     CUADDR=E42,ISTATUS=ACTIVE,PUTYPE=2,MAXBFRU=10,        X
               MODETAB=AMODETAB,DLOGMOD=M2SDLCQ,USSTAB=US327X,        X
               VPACING=0,SECNET=YES
*
RAPT420  LU    LOCADDR=2
RAPT421  LU    LOCADDR=3
RAPT422  LU    LOCADDR=4
RAPT423  LU    LOCADDR=5
RAPT424  LU    LOCADDR=6
RAPT425  LU    LOCADDR=7
RAPT426  LU    LOCADDR=8
RAPT427  LU    LOCADDR=9
RAPT428  LU    LOCADDR=10
RAPT429  LU    LOCADDR=11
**********************************************************************
RAPP43   PU     CUADDR=E43,ISTATUS=ACTIVE,PUTYPE=2,MAXBFRU=10,        X
               MODETAB=AMODETAB,DLOGMOD=M2SDLCQ,USSTAB=US327X,        X
```

```
               VPACING=0,SECNET=YES
*
RAPT430  LU    LOCADDR=2
RAPT431  LU    LOCADDR=3
RAPT432  LU    LOCADDR=4
RAPT433  LU    LOCADDR=5
***********************************************************************
RAPP44   PU     CUADDR=E44,ISTATUS=ACTIVE,PUTYPE=2,MAXBFRU=10,          X
               MODETAB=AMODETAB,DLOGMOD=M2SDLCQ,USSTAB=US327X,          X
               VPACING=0,SECNET=YES
*
RAPT440  LU    LOCADDR=2
RAPT441  LU    LOCADDR=3
RAPT442  LU    LOCADDR=4
RAPT443  LU    LOCADDR=5
***********************************************************************
RAPP45   PU     CUADDR=E45,ISTATUS=ACTIVE,PUTYPE=2,MAXBFRU=10,          X
               MODETAB=AMODETAB,DLOGMOD=M2SDLCQ,USSTAB=US327X,          X
               VPACING=0,SECNET=YES
*
RAPT450  LU    LOCADDR=2
RAPT451  LU    LOCADDR=3
RAPT452  LU    LOCADDR=4
RAPT453  LU    LOCADDR=5
***********************************************************************
RAPP46   PU     CUADDR=E46,ISTATUS=ACTIVE,PUTYPE=2,MAXBFRU=10,          X
               MODETAB=AMODETAB,DLOGMOD=M2SDLCQ,USSTAB=US327X,          X
               VPACING=0,SECNET=YES
*
RAPT460  LU    LOCADDR=2
RAPT461  LU    LOCADDR=3
RAPT462  LU    LOCADDR=4
RAPT463  LU    LOCADDR=5
***********************************************************************
```

VSE Environment

The following is an example of a typical VSE/VTAM B-book for a local SNA major node containing a gateway and two DSPUs.

```
CATALOG SNA3174.B
SNA3174  VBUILD TYPE=LOCAL
***********************************************************************
SNAE40   PU     CUADDR=E40,MODETAB=MODE3290,           GATEWAY         X
                PUTYPE=2,ISTATUS=ACTIVE,MAXBFRU=1
VSE3L000 LU     LOCADDR=2,                                             X
                SSCPFM=USSSCS,USSTAB=USSTAB,PACING=1,VPACING=2,        X
                ISTATUS=ACTIVE,LOGAPPL=MWTC,DLOGMOD=GMOD3E
VSE3L001 LU     LOCADDR=3,                                             X
                SSCPFM=USSSCS,USSTAB=USSTAB,PACING=1,VPACING=2,        X
                ISTATUS=ACTIVE,LOGAPPL=MWTC,DLOGMOD=GMOD3E
         LU     ...
***********************************************************************
SNAE41   PU     CUADDR=E41,MODETAB=MODE3290,           DSPU 1          X
                PUTYPE=2,ISTATUS=ACTIVE,MAXBFRU=1
VSE3L100 LU     LOCADDR=2,                                             X
                SSCPFM=USSSCS,USSTAB=USSTAB,PACING=1,VPACING=2,        X
                ISTATUS=ACTIVE,LOGAPPL=MWTC,DLOGMOD=GMOD3E
VSE3L101 LU     LOCADDR=3,                                             X
                SSCPFM=USSSCS,USSTAB=USSTAB,PACING=1,VPACING=2,        X
                ISTATUS=ACTIVE,LOGAPPL=MWTC,DLOGMOD=GMOD3E
         LU     ...
***********************************************************************
SNAE42   PU     CUADDR=E42,MODETAB=MODE3290,           DSPU 2          X
                PUTYPE=2,ISTATUS=ACTIVE,MAXBFRU=1
VSE3L200 LU     LOCADDR=2,                                             X
                SSCPFM=USSSCS,USSTAB=USSTAB,PACING=1,VPACING=2,        X
                ISTATUS=ACTIVE,LOGAPPL=MWTC,DLOGMOD=GMOD3E
VSE3L201 LU     LOCADDR=3,                                             X
                SSCPFM=USSSCS,USSTAB=USSTAB,PACING=1,VPACING=2,        X
                ISTATUS=ACTIVE,LOGAPPL=MWTC,DLOGMOD=GMOD3E
         LU     ...
***********************************************************************
```

G.6 AS/400

G.6.1 AS/400 Definitions for 3174-X3R DSPU

```
⋮
            CRTLINTRN  LIND(TRNLINE) RSRCNAME(LIN041) ONLINE(*NO) +
                         ADAPTADR(400010020001) EXCHID(05615078) +
                         TEXT('TRN-Line AS/400 B50 ITSC')
⋮
```

G.6.2 AS/400 Controller and Device Descriptions

The next CL commands will create the AS/400 objects for the line, the remote IBM 3174 controller, and connected devices.

```
⋮
            CRTCTLRWS  CTLD(TRN3174) TYPE(3174) MODEL(0) +
                         LINKTYPE(*TRLAN) SWLINLST(TRNLINE) +
                         EXCHID(017FFFFF) ADPTADR(400000003174) +
                         TEXT('3174-13R on Token Ring)

            CRTDEVDSP  DEVD(TRN3179A) DEVCLS(*RMT) TYPE(3278) +
                         MODEL(0) LOCADR(02) CTL(TRN3174) +
                         TEXT('S1 of IBM 3179 at 3174-13R')

            CRTDEVDSP  DEVD(TRN3179B) DEVCLS(*RMT) TYPE(3278) +
                         MODEL(0) LOCADR(03) CTL(TRN3174) +
                         TEXT('S2 of IBM 3179 at 3174-13R')

            CRTDEVDSP  DEVD(TRN3191A) DEVCLS(*RMT) TYPE(3278) +
                         MODEL(0) LOCADR(04) CTL(TRN3174) +
                         TEXT('S1 of IBM 3191 at 3174-13R')

            CRTDEVDSP  DEVD(TRN3191B) DEVCLS(*RMT) TYPE(3278) +
                         MODEL(0) LOCADR(05) CTL(TRN3174) +
                         TEXT('S2 of IBM 3191 at 3174-13R')

            CRTDEVDSP  DEVD(TRN4224) DEVCLS(*RMT) TYPE(3287) +
                         MODEL(0) LOCADR(0A) CTL(TRN3174) +
                         TEXT('IBM 4224 at 3174 on TRLAN')
⋮
```

Appendix H. 3174 Workstation Networking Module

The 3174 Workstation Networking Module, which is also known as the 8250 Workstation Networking Module, extends the 3174 Establishment Controller family. It exploits the benefits of intelligent hubs and provides an integrated/enhanced 3270 solutions to customers who wish to take the advantage of the media concentration, LAN management, and space savings benefits of the IBM 8250 Multiprotocol Intelligent Hub, while preserving their investments in 3270 terminal hardware, wiring and 3270 applications.

H.1 Introduction to 8250 HUB

The 8250 is a multiprotocol intelligent hub with modular hardware composed of a rack-mountable chassis plus a set of feature modules that provide primarily the functions of:

- LAN concentration

  The 8250 supports concentration for Ethernet, token-ring, and FDDI networks, with multiple cable types (shielded twisted pair (STP), unshielded twisted pair (UTP), fiber, coaxial) and multiple choices of cable connectors. Multiple LAN types as well as multiple segments for a single type can coexist in the same chassis.

- Hub management

  Extensive hub management functions are provided either from a terminal connected to an RS-232 port or from an SNMP management station such as AIX* NetView*/6000.

- LAN and media management

  The 8250 provides functions for managing the media of LAN segments (Ethernet, token-ring, FDDI), by collecting management information (performance, statistics, configuration, problems) and reporting it to a network management station via SNMP or TELNET protocols.

- Interconnect

  The 8250 offers integrated bridging functions for Ethernet segments and network as well as token-ring segments and network.

- SNMP management

The 8250 contains an SNMP agent which includes enterprise-specific extensions designed to take advantage of the advanced features of the 8250.

The backplane architecture of the 8250 allows the ″hot-pluggability″ of any 8250 module, which means a module can be installed or removed without powering down the concentrator or taking the network out of service. Moreover, the special architecture of the backplane makes any module ″full-floating,″ which means that no fixed position in the chassis is required according to the type of the module.

This 8250 backplane is also used as the bussing system for connecting the various modules. It supports any combinations of Ethernet, token-ring, and FDDI segments, with up to three Ethernet segments, up to seven token-ring segments, and up to four FDDI rings. Modules for a given LAN type can be assigned without restriction to any of the corresponding segments, with no fixed positions of blades for given LAN segments. Modules with a ″port switching″ feature offer additional flexibility with the ability to assign individual ports on a module to the various segments of same LAN type, hence the terminology of ″port switching″ and ″module switching″ features.

Fault tolerance is offered as an option, and can be achieved through redundancy of critical components, such as the Hub Controller Module, which monitors the concentrator conditions, including temperature and power supply status. Redundant links with automatic switchover at the backbone and, for the Ethernet case, at the lobe level, ensure fault tolerance to the end station.

H.2 Workstation Networking Module Feature (#3174)

The Workstation Networking Module feature (#3174) is an optional module for the IBM 8250 Multiprotocol Intelligent Hub that provides key 3174 Establishment Controller token-ring LAN based functions and synchronous communication link, X.25 and Frame Relay functions, such as APPN and TCP/IP, as well as traditional 3270 terminal attachment. It allows customers to consolidate their LAN network infrastructure while preserving investments in 3270 terminal hardware, wiring and related applications.

The Workstation Networking Module is an integral member of the 3174 product family and is a derivative of the existing 3174-23R. It is a 3270 solution for the IBM 8250 Multiprotocol Intelligent Hub that uses 3174 Configuration Support-C Release 3 or Release 5 and can be configured as Model 41R, if the host attachment is via the teleprocessing link or 43R, if the host attachment is via the Token Ring LAN.

The 3174 Workstation Networking Module feature (# 3174) includes the following:

- One two-slot Workstation Networking Module
- 3174 Configuration Support-C LIC on 3 1/2″, 2.88 2ED diskettes (APPN, Peer Communication, and Downstream Load support for 3179-G, 3192-G ,3472-G, 3193 and 3290 are included.)
- Appropriate Workstation Networking Module publications

The 3174 Workstation Networking Module support many key functions provided by the IBM 3174 Establishment Controller.

:Supported functions include:

- 3270 Terminal Attachment for up to thirty-two 3270 Category A device
- SDLC, X.25 and Frame Relay host protocols
- Token-Ring DSPU
- Token-Ring Gateway
- Peer Communications (LAN Over Coax)
- APPN
- TCP/IP
- Single Link Multi-Host - Token-Ring
- Central Site Change Management

- Central Site Control Facility
- 3174 RAS functions (for example, ′slash′ tests)
- 3174 End-User Interface

The Workstation Networking Module supports up to thirty-two 3270 Category A devices. It provides function similar to a thirty-two port 313174-23R. Terminal attachment is accomplished by use of the existing IBM 3299 Terminal Multiplexer family. Supported 3270 terminal types are the same as those supported by the IBM 3174 Establishment Controller. The Workstation Networking Module may be installed in any model of the 8250 family or 8260 family. Refer to the following documents for a detailed description of 3174 Establishment Controller functions.

- *IBM 3174 Establishment Controller Functional Description,* GA23-0218
- *IBM 3174 Establishment Controller Planning Guide - Configuration Support C,* GA27-3918
- *IBM 3174 Establishment Controller Utilities Guide - Configuration Support C,* GA27-3920

H.3 Hardware Features

The Workstation Networking Module is a two-slot 8250 module. The maximum number of Workstation Networking Modules that can be installed in an 8250 is dependent on the number of available 8250 slots (example: the 8250 Model 6PS has six slots, and can therefore support up to three Workstation Networking Modules, if no other 8250 feature modules are installed).

The Workstation Networking Module includes:

- Processor
- 6MB control storage
- 3 1/2″ 2.88MB diskette drive (formatted capacity)
- 2MB Non-volatile storage
- Operator panel
- Type 1 communications port (EIA232/V.24/V.28 or V.35)
- Four Dual Purpose Connectors (DPC) which support attachment of up to thirty-two 3270 Category A devices through the use of IBM 3299 Terminal Multiplexers (3299-001, 002, 003, 032 or 32T)

The Workstation Networking Module does not support certain 3174 functions that typically require hardware configurations that make Workstation Networking Module support of these functions infeasible (for example, ASCII,OEM-parallel channel, ESCON channel, Concurrent Communications Adapter, etc.). While the Workstation Networking Module supports most 3174 functions, the following are not supported:

- Binary Synchronous Communications (BSC)
- CCITT X.21
- ISDN
- Multiple physical host links (for example, Concurrent Communication Adapter - CCA)

- Ethernet
- Port Expansion (that is, more than 32-ports)
- Internal multiplexers (for example, terminal multiplexer adapters)
- ASCII Device Support
  - Forward Protocol Conversion
  - ASCII PassThru

    Note: Reverse Protocol Conversion using TCP/IP Telnet (for example, 3270 CUT device access to an ASCII host via TCP/IP Telnet across the token ring) LAN is supported.
- Fixed disk/hardfile
- 3174 Configuration Support-A, B or S

  Note: Only Configuration Support-C Release 3 and Release 5 support WNM

To install, customize, and service the Workstation Networking Module the following documents are needed:

- *8250 Workstation Networking Module Installation and Customization Guide,* GA27-4022
- *3174 Establishment Controller Planning Guide - Configuration Support C,* GA27-3918
- *3174 Establishment Controller Utilities Guide - Configuration Support C,* GA27-3920
- *8250 Workstation Networking Module Problem Determination and Service Guide,* SY27-0342

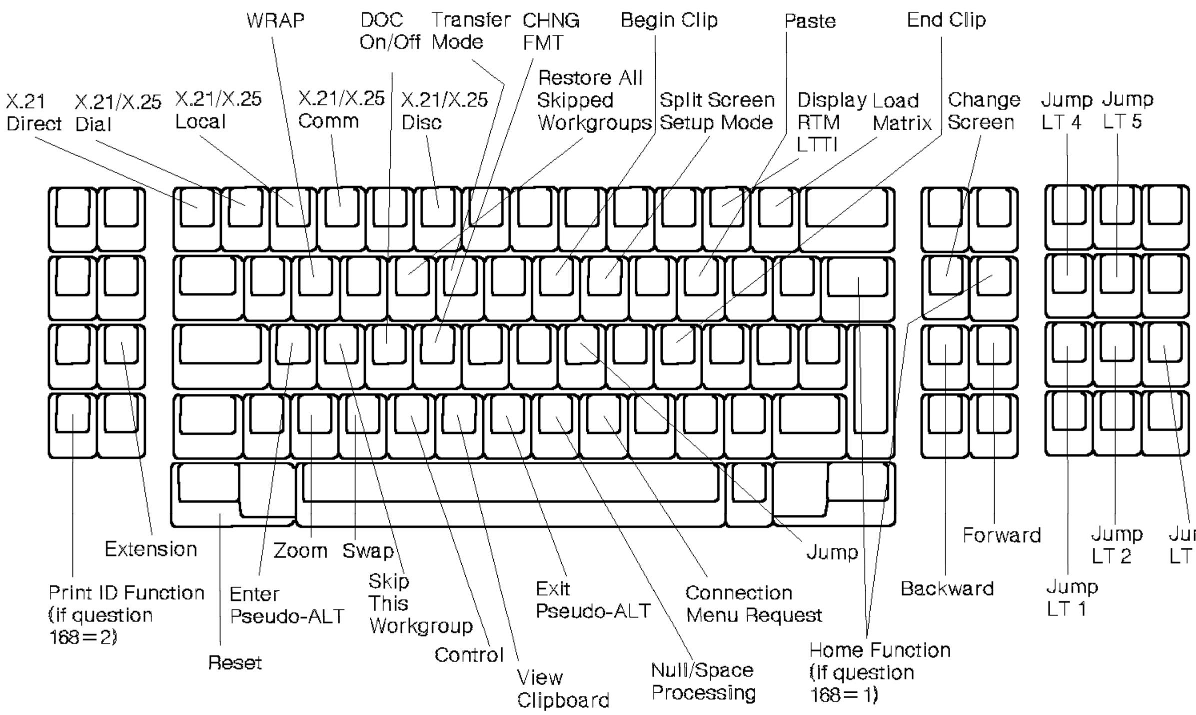
Note: IBM AIX NetView Hub Management Program/6000, IBM AIX NetView Hub Management Program/6000 Entry, IBM Hub Management Program/DOS, or IBM Hub Management Program/DOS Entry is recommended for management of the Workstation Networking Module, as well as other 8250 modules, but is not specifically required.

Appendix I. Keyboard Layouts

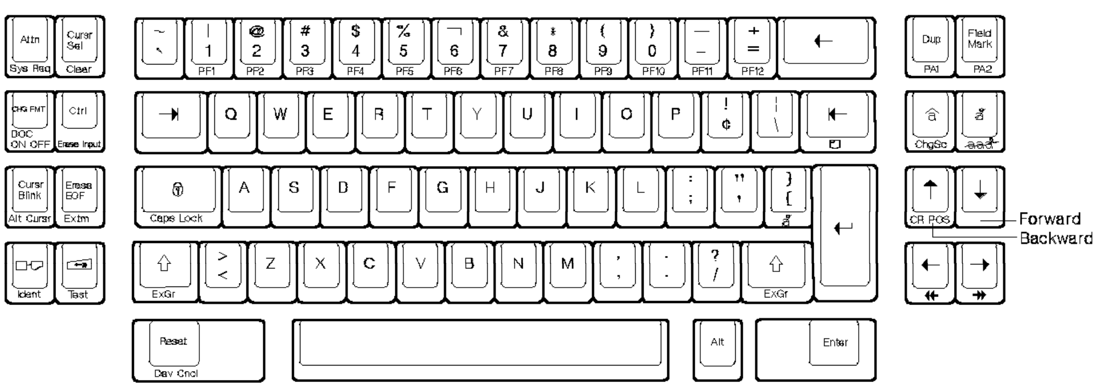
The keyboard layouts shown are used for the Configuration Support-C Release 2 end-user productivity enhancements.

I.1 Base Keyboard Layouts

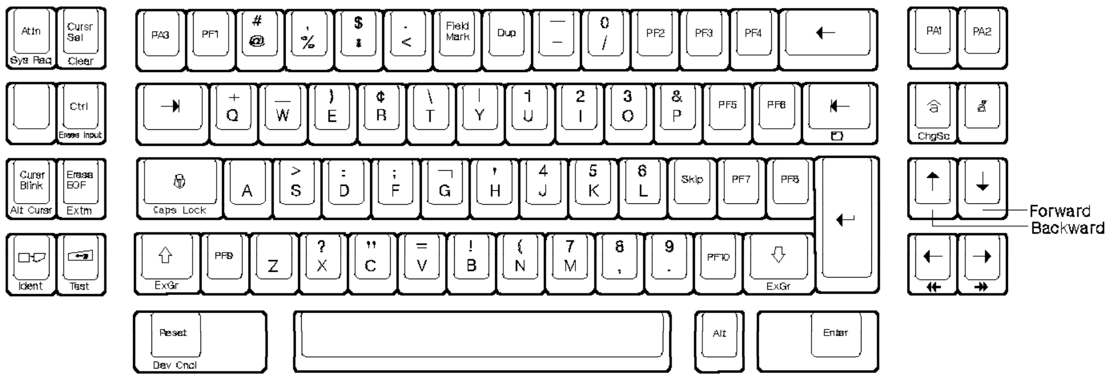
Extension Functions (Base)



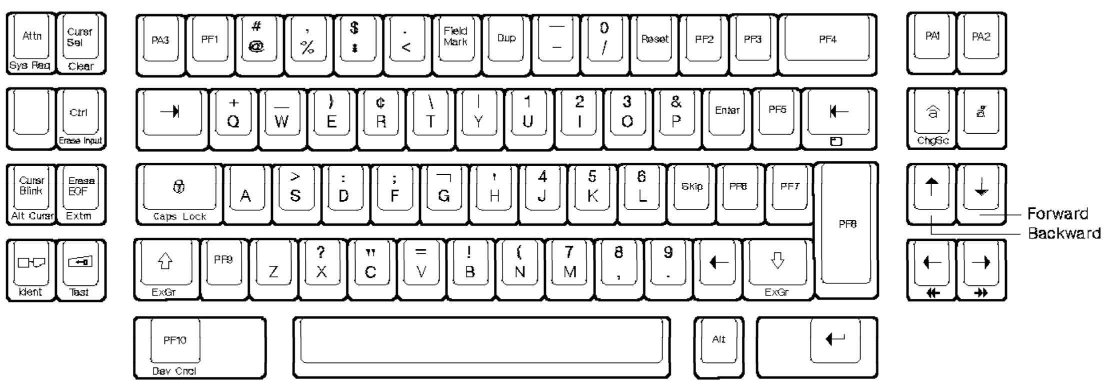
Base Typewriter



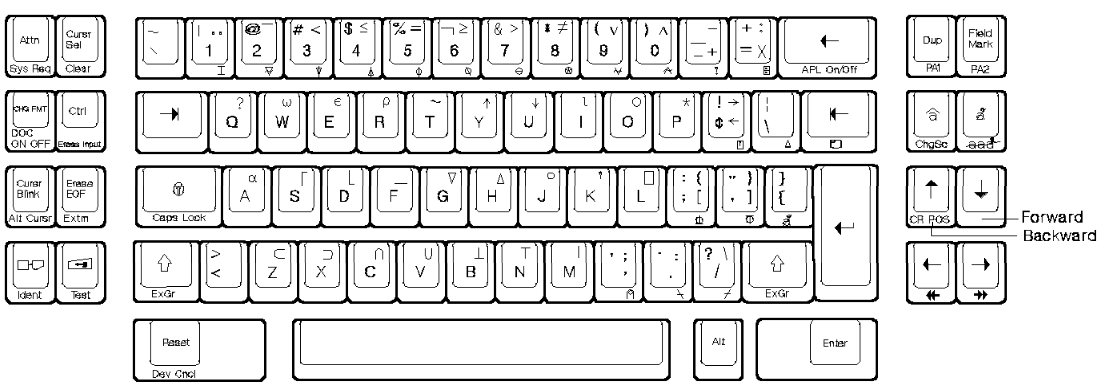
Base Data Entry



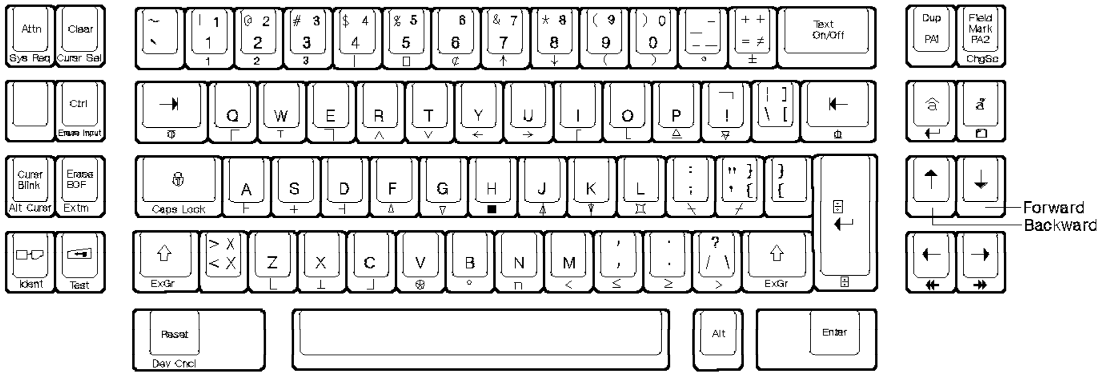
Base Data Entry Keypunch



Base APL

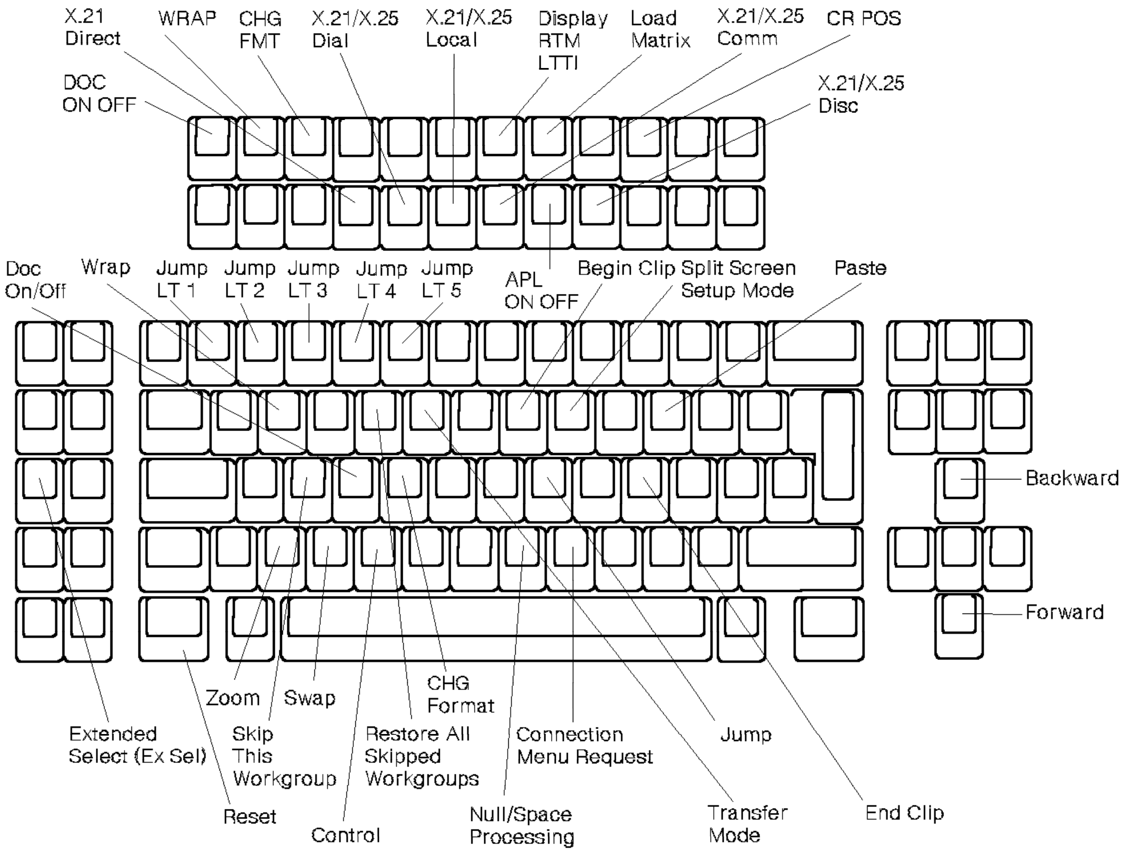


Base Text

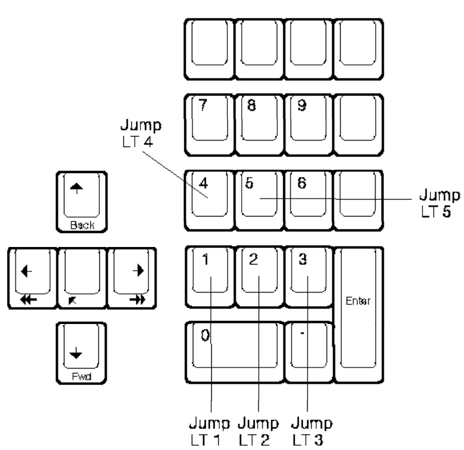

Attn
Sys Req
Clear
Cursr Sel
Ctrl
Erase Input
Cursr Blink
Alt Cursr
Erase EOF
Extnd
Ident
Test
Text On/Off
Caps Lock
ExGr
ExGr
Reset
Dev Cncl
Alt
Enter
Dup
PA1
Field Mark
PA2
ChgSc
Forward
Backward

I.2 Converged Keyboard Layouts

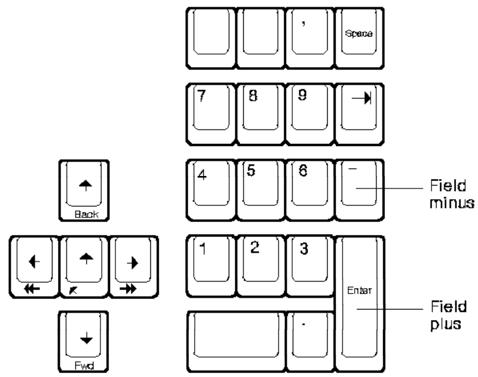
Extended Select Functions (Converged)



Numeric Keypad ExSel Functions



Numeric Keypad 5250 Field Exit Functions



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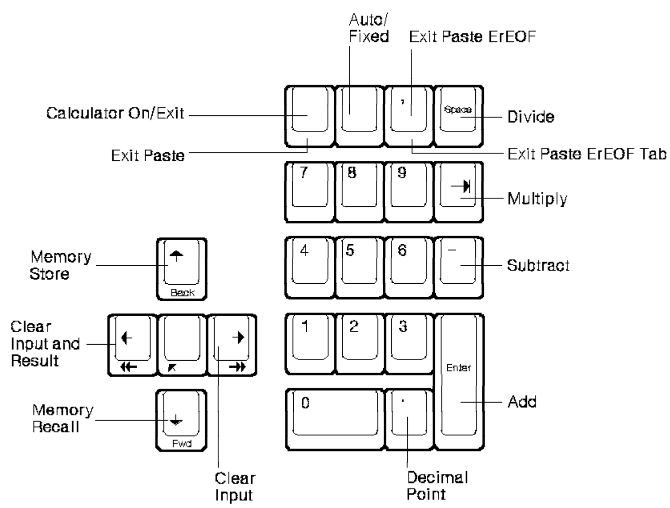
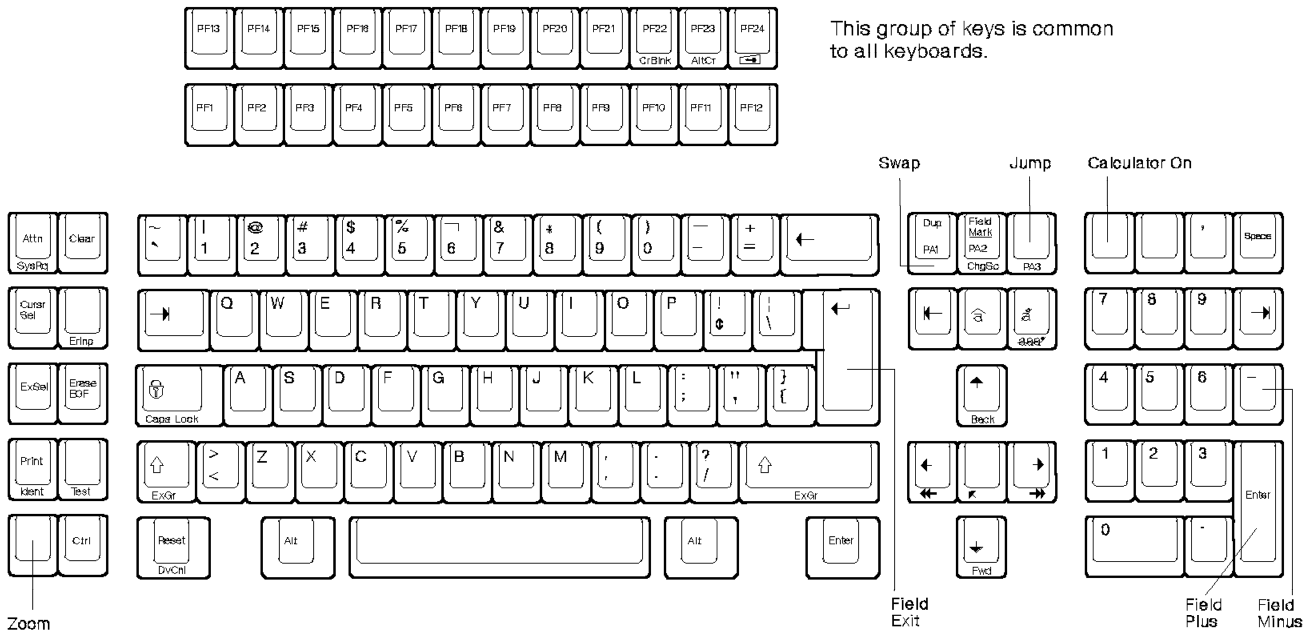


Converged Typewriter



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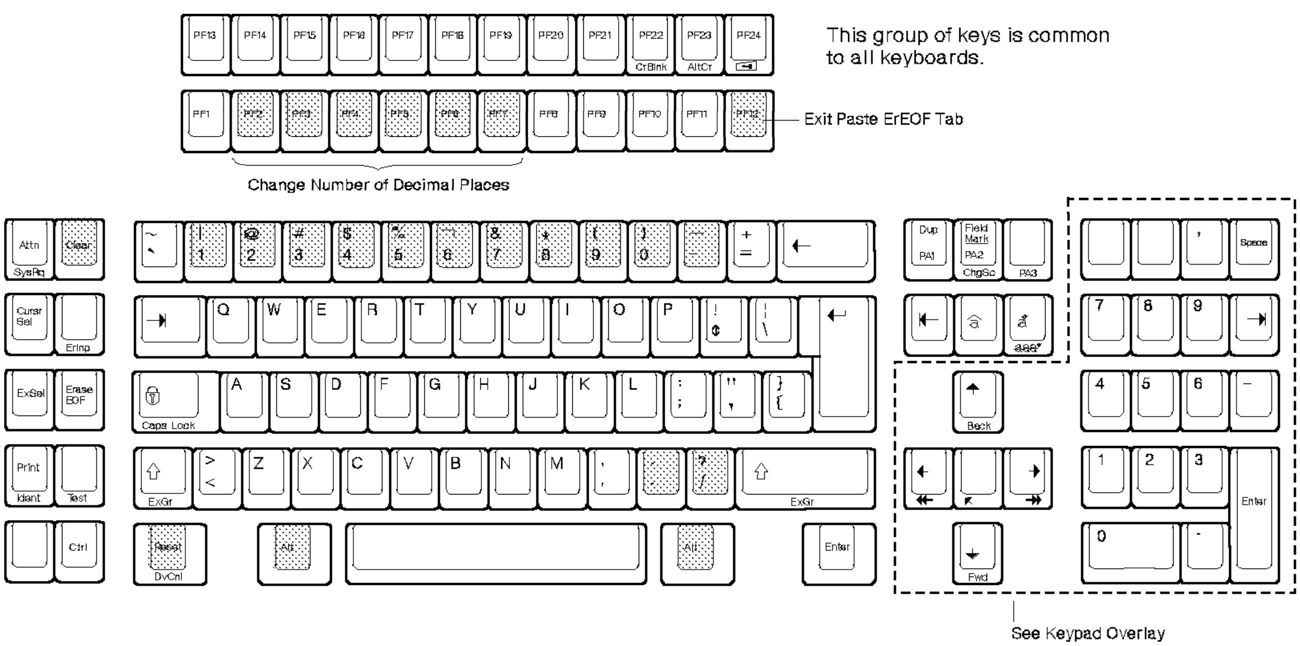

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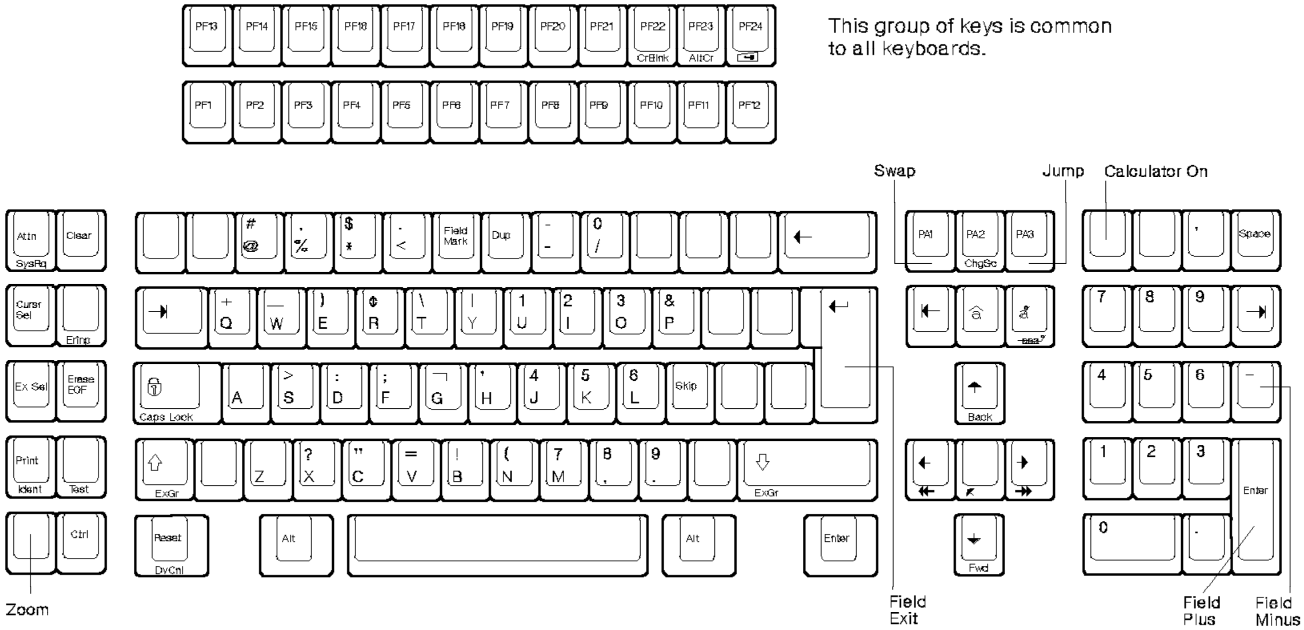

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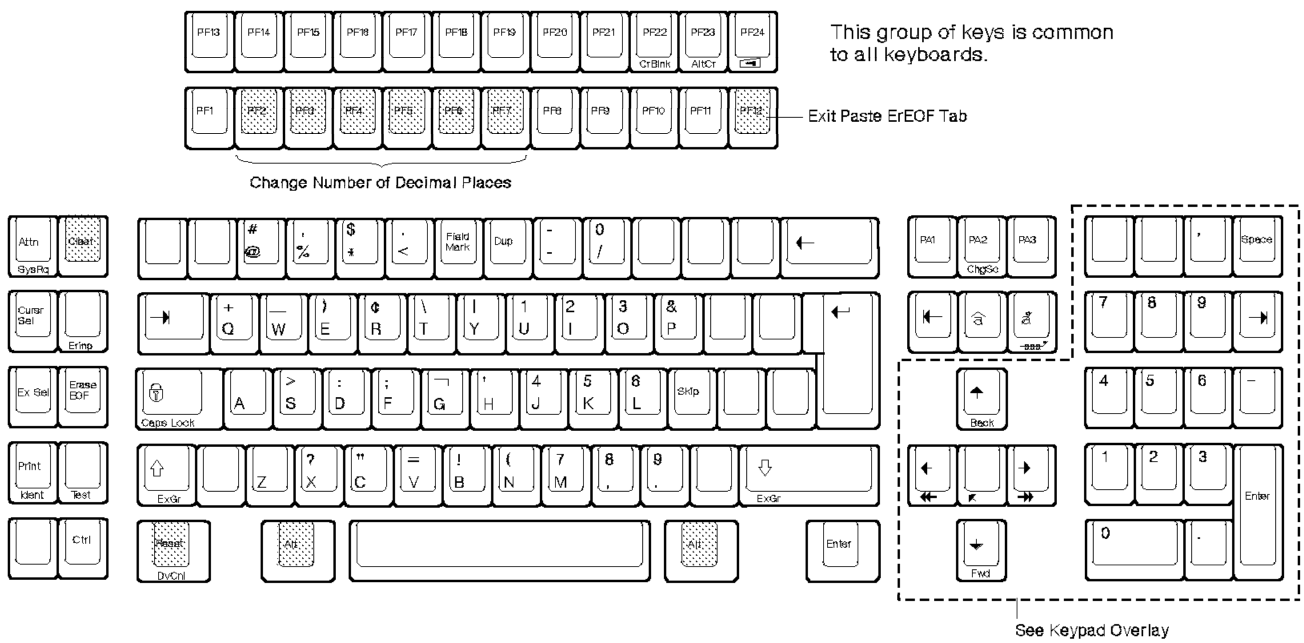

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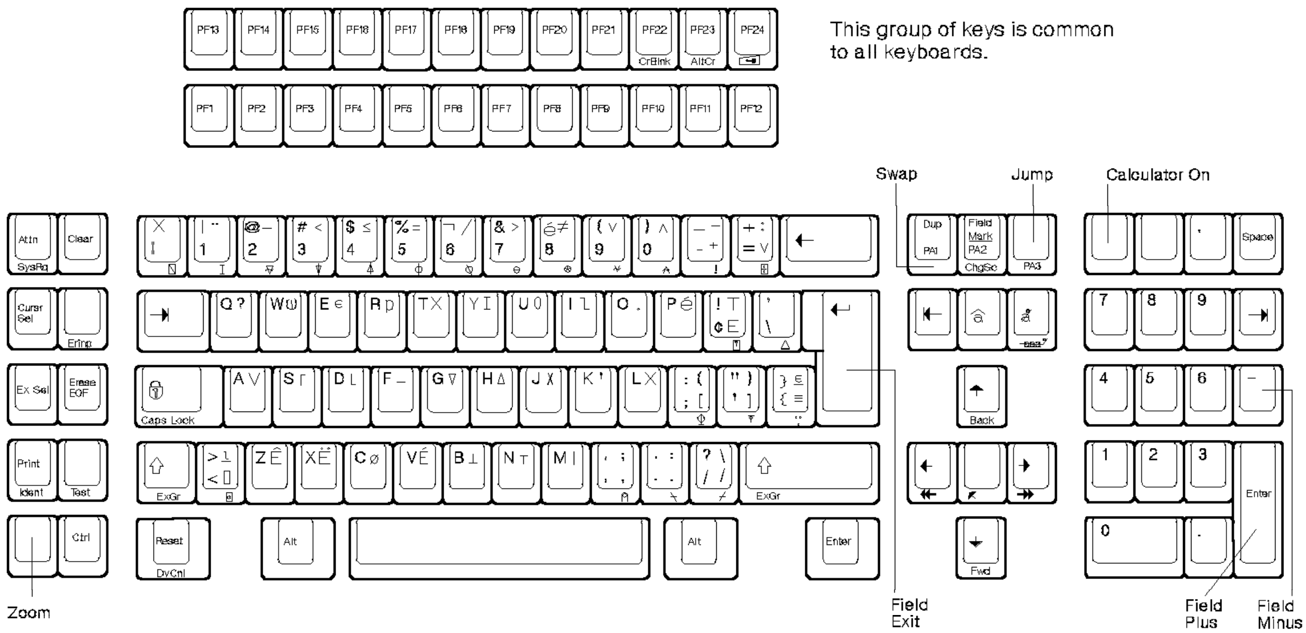

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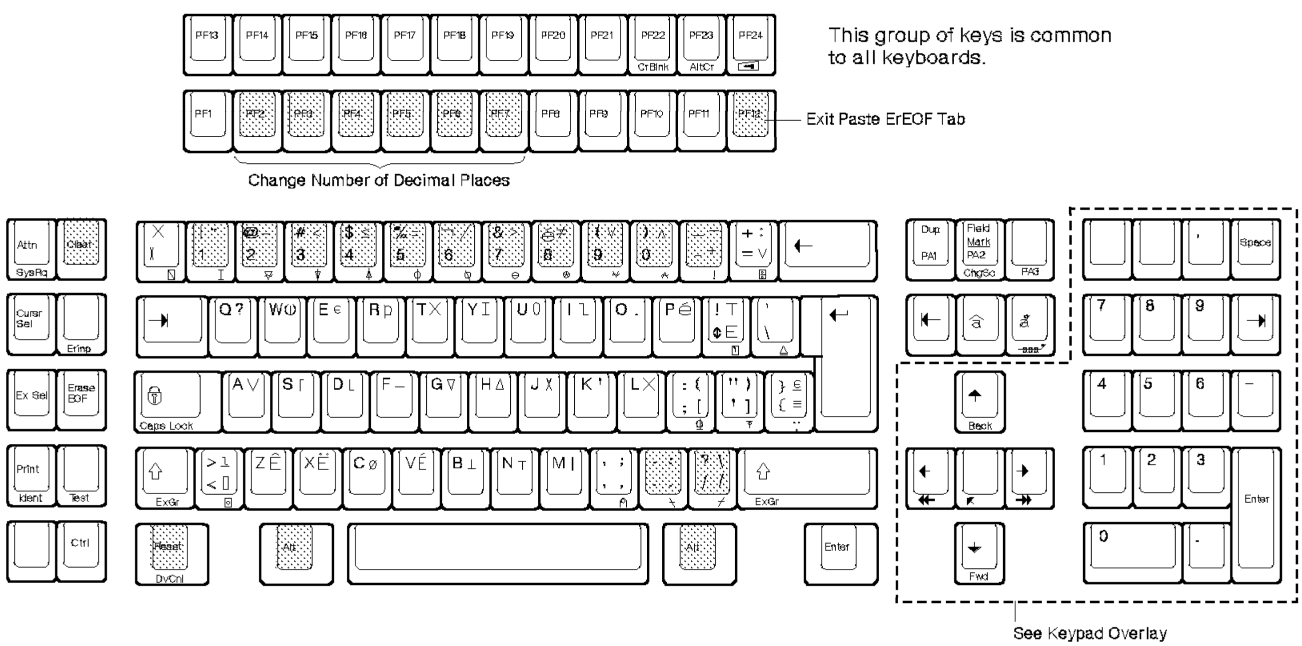
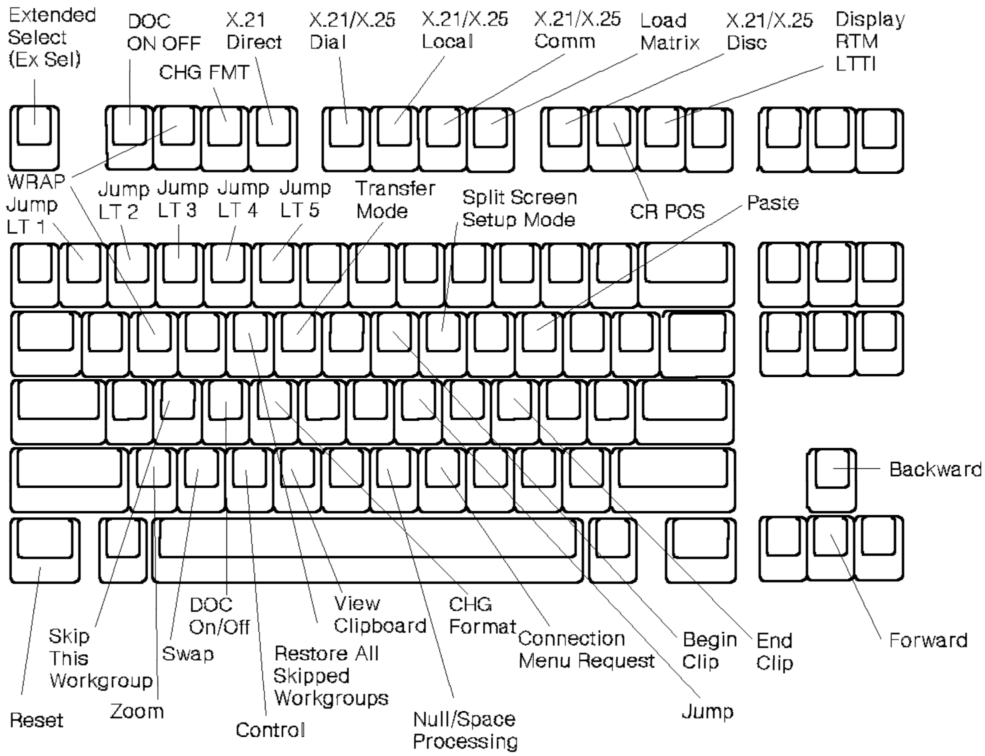
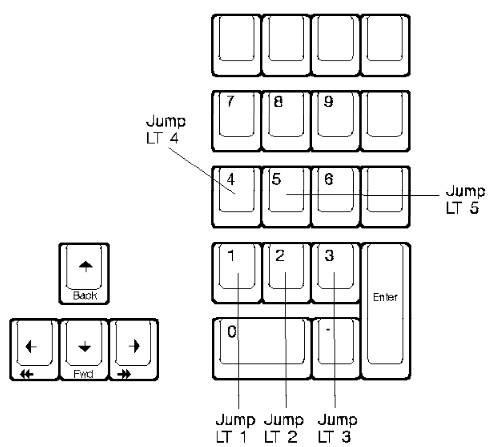


I.3 Enhanced Keyboard Layouts

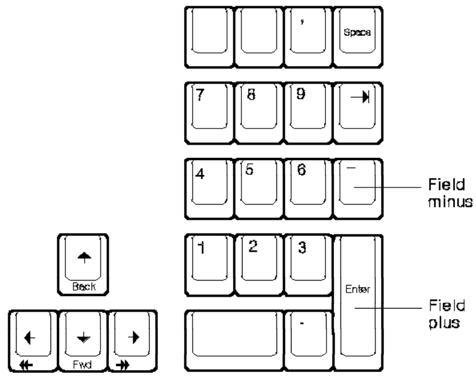
Extended Select Functions (Enhanced)



Numeric Keypad ExSel Functions



Numeric Keypad 5250 Field Exit Functions



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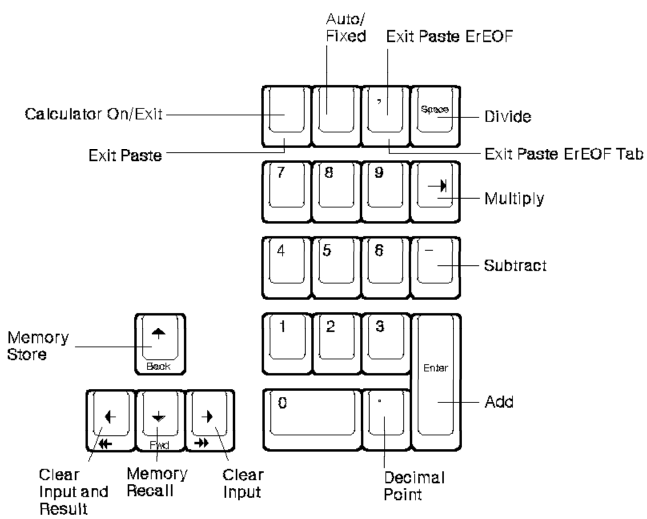
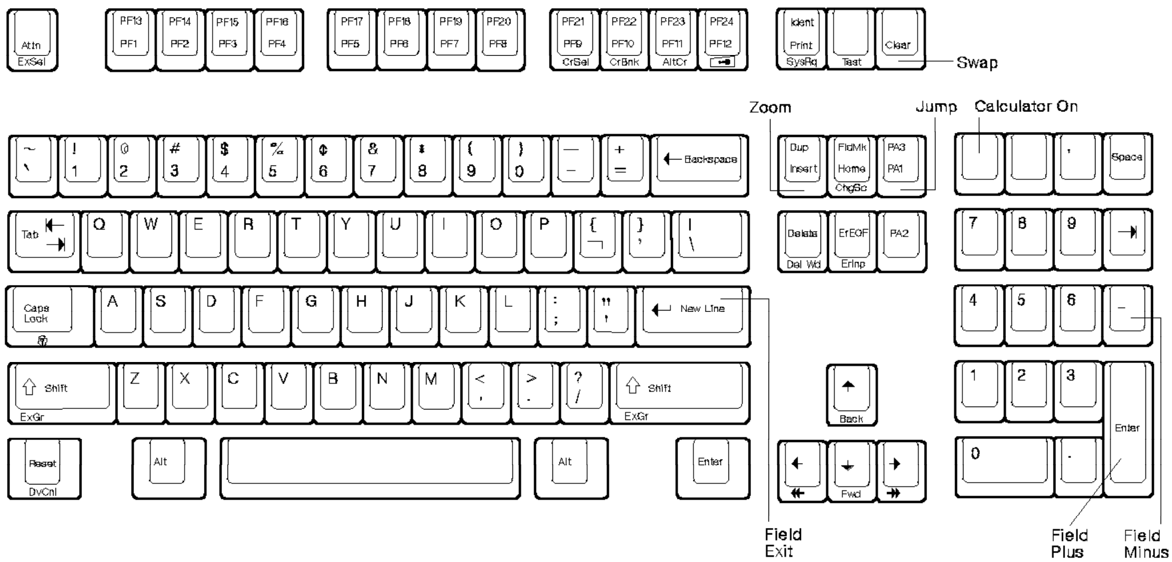
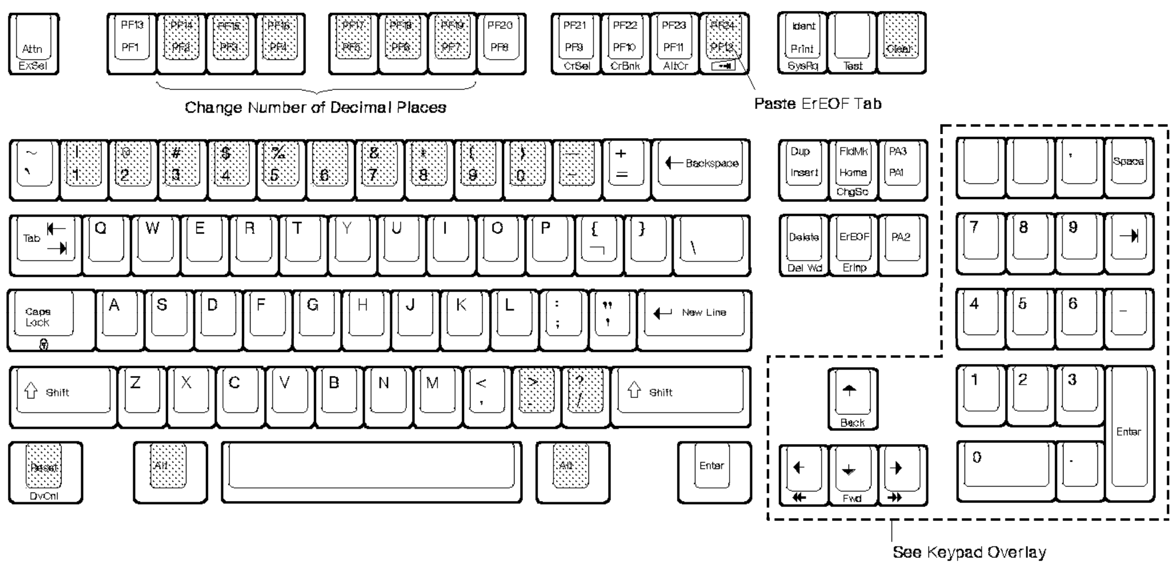


IBM Enhanced Typewriter



IBM Enhanced Typewriter (Calculator Function)



Appendix J. Abbreviations

ABBREVIATION	MEANING
ACF/VTAM	Advanced Communications Function/Virtual Telecommunications Access Method
AEA	Asynchronous Emulation Adapter
APAR	Authorized Program Analysis Report
APPN	Advanced Peer-to-Peer Networking
ARP	Address Resolution Protocol
ASCII	American National Standard Code for Information Interchange
BRI	Basic Rate Interface
CCA	Concurrent Communication Adapter
CECP	Country Extended Code Page
CICS	Customer Information Control System
CID	Connection Identifier
CMEP	Change Management Entry Point
CMFP	Change Management Focal Point
COPT	Connection Options
COS	Class Of Service
CP	Control Point
CSCF	Central Site Control Facility
CSCM	Central Site Change Management
CSCU	Central Site Control Unit
CSU	Customer Setup
CUG	Closed User Group
CUT	Control Unit Terminal
DATE	Dedicated Access to X.25 Transport Extension
DDDLU	Dynamic Definition of Dependent LU
DFT	Distributed Function Terminal
DNS	Domain Name System
DPC	Dual Purpose Connector
DRD	Distributed Resource Directory
DSL	Downstream Load
DSPU	Downstream Physical Unit
EAB	Extended Attribute Buffer
EN	End Node (APPN)
ES	Extended Services
ESCON	Enterprise Systems Connection
ET	Exchange Termination
FTA	Fiber Optic Terminal Adapter
FTTERM	File Transfer and Terminal Emulation program
GIX	Generalized Interactive Executive
GW	Gateway
HNAD	Host Network (DTE) Address
ICA	Integrated Communication Adapter
ICMP	Internet Control Message Protocol
IDLC	ISDN Data Link Control
IML	Initial Microprogram Load
IOF	Interactive Operator Facility
IOPT	Incoming Call Options
IP	Internet Protocol
IPDS	Intelligent Printer Data Stream

ISDN	Integrated Services Digital Network
JCL	Job Control Language
KDU	Keyboard Definition Utility
LAP	Link Access Protocol
LEN	Low Entry Networking
LFS	Local Format Storage
LFU	Limited Function Utility
LIC	Licensed Internal Code
LT	Line Termination
MLT	Multiple Logical Terminal
MVS	Multiple Virtual Storage
MVS/ESA	Multiple Virtual Storage/Enterprise System Architecture
MVS/XA	Multiple Virtual Storage/Extended Architecture
NAM	Network Asset Management
NCP	Network Control Program
NDIS	Network Device Interface Specification
NIA	Network Interface Adapter
NLDM	Network Logical Data Manager
NMVT	Network Management Vector Transport
NN	Network Node (APPN)
NPDA	Network Problem Determination Application
NPKT	Negotiated Packet Size
NPSI	NCP Packet Switching Interface
NSCU	Network Site Control Unit
NTRI	NCP Token-Ring Interconnection
NT1	Network Termination 1
NT2	Network Termination 2
NVDM	NetView Distribution Manager
OEM	Other Equipment Manufacturer
OOPT	Outgoing Call Options
OSI	Open Systems Interconnection
PABX	Private Automated Branch Exchange
PAM	Printer Authorization Matrix
PIM	Plug In Module
PING	Packet Internet Groper
PRI	Primary Rate Interface
PS	Programmed Symbols
PSDN	Packet Switched Data Network
PSH	Physical Services Header
PUID	Physical Unit ID
PVC	Permanent Virtual Circuit
QLLC	Qualified Logical Link Control
RARP	Reverse Address Resolution Protocol
RPOA	Recognized Private Operating Authority
RPQ	Request for Price Quotation
RR	Resource Repository
RTM	Response Time Monitor
SAP	Service Access Point
SDDLU	Selection of Definitions for Dependent LU
SDLC	Synchronous Data Link Control
SHM	Short Hold Mode
SID	Short Identifier
SLMH	Single Link Multi-Host
SNA	Systems Network Architecture
SNA/DS	Systems Network Architecture/Distribution Services

SNA/FS	Systems Network Architecture/File Services
SNA/MS	Systems Network Architecture/Management Services
SNMP	Simple Network Management Protocol
SOEMI	Serial Original Equipment Manufacturer Interface
SVC	Switched Virtual Circuit
TA	Terminal Adapter
TCF	Transmission Control File
TCLS	Throughput Class Negotiation
TCP	Transmission Control Program
TCP/IP	Transmission Control Protocol/Internet Protocol
TEI	Terminal Endpoint Identifier
TE1	Terminal Equipment with ISDN Interface
TE2	Terminal Equipment with non-ISDN Interface
TG	Transmission Group
TMA	Terminal Multiplexer Adapter
TTP	Telephone Twisted-Pair
T2.0	Type 2.0
T2.1	Type 2.1
UDP	User Datagram Protocol
UDT	User-Defined Terminal Table
UDX	User-Defined Translate Table
VPD	Vital Product Data
VTAM	Virtual Telecommunications Access Method
WCC	Write Control Character
WNM	Workstation Networking Module

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