Vanguard Managed Solutions

Vanguard Applications Ware
SNA Feature Protocols

AS/400 Communications Server

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575 West Street
Mansfield, Massachusetts 02048
(508) 261-4000

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To comment on this manual, please send e-mail to LGEN031@vanguardms.com

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Chapter 1
Introduction

Overview

Introduction

This manual describes the AS/400 5494 Communications Server feature as implemented for Vanguard products. This feature works with the OS/400 operating system, which is used primarily on AS/400 systems, and may also be found on System/36, System/38, and other systems.

About This Guide

The primary purpose of this document is to provide the information you need to configure the AS/400 5494 Communications Server feature for your network. Because networks are unique to each location, the information in this guide is generalized. You should study carefully the Configuration Application examples in Chapter 2, which present a variety of network architectures.

References in this guide to specific IBM equipment also includes compatible equipment from other vendors, unless otherwise specified. You should also remember that references to the AS/400 are also applicable to other systems using the OS/400 operating system.

Before You Begin

You should have a basic understanding of the OS/400 system and IBM or compatible remote controllers (particularly the 5394- and 5494-type controllers). You need to know how to configure the OS/400 using definition statements. You also need to know how to configure 5394-type controllers and their attached devices, such as displays and printers.

The AS/400 5494 Communications Server feature

The AS/400 5494 Communications Server feature makes a Vanguard function as a 5494 LAN communications server for OS/400 host systems with attached 5394-type (including 5394-, 5294- and compatible-type) remote controllers.

Figure 1-1 is a diagram illustrating how this feature would be used in a network. Vanguard products with this feature emulate 5494-type communication between an AS/400 Host system and the remote controller (using the “Emulation” module). This feature lets you connect 5394-type controller devices to host AS/400 computers using a LAN connection (Token Ring or Ethernet), rather than an SDLC link. You can mix 5494- and 5394-type controllers on the same LAN interface with the host computer. Alternatively, you can use Frame Relay connections directly from Vanguards with this feature to the AS/400. In addition, networks can be configured for WAN connections (X.25 or Frame Relay) between two Vanguard products. This feature is installed either in the node connected to the AS/400 or the node connected to the controller.

Note

When this feature is installed in the node connected to the remote controller, you need a separate license for each site.

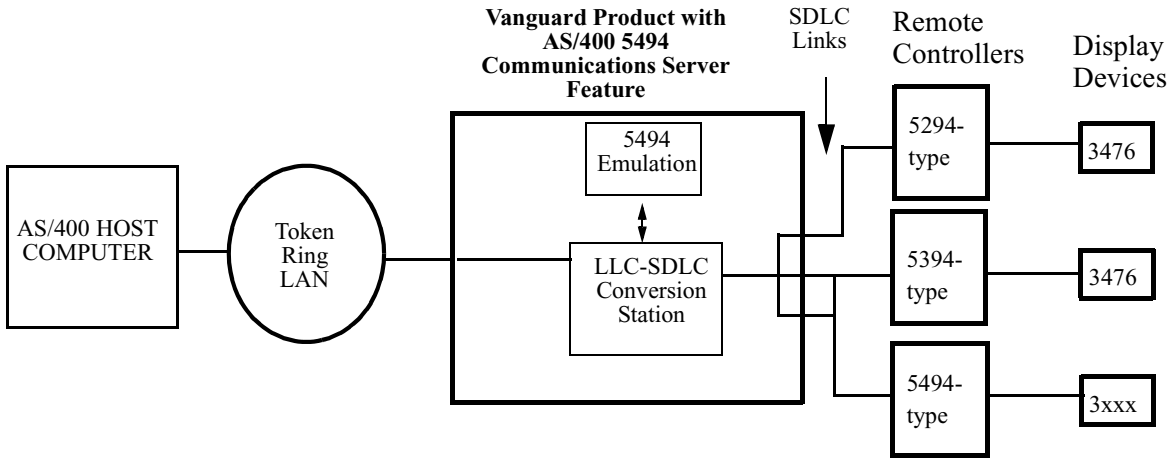

Figure 1-1. The AS/400 5494 Communications Server Feature

Note

You may require additional memory in Vanguard products, serial communications interfaces, LAN and WAN interfaces, or special cables for this feature.

IBM-Compatible Equipment

This feature operates with IBM-compatible equipment; IBM model numbers have been used to identify particular types or models of equipment. Not all manufacturers' units have been tested for interoperability. If you experience problems in interfacing non-IBM equipment, refer to your documentation or discuss the issue with your supplier.

Related Vanguard Documentation

Refer to these related Vanguard documents for additional information:

- *Vanguard Configuration Basics Manual* (Part No. T0113)
- *Vanguard Basic Protocols Manual* (Part No. T0106)
- *Vanguard SNA Feature Protocols Manual* (Part No. T0101)
- *Vanguard Applications Ware Alarms and Reports Guide* (Part No. T0005)
- Vanguide Documents on the Vanguard CD-ROM

Related Vendor Documentation

The documents listed below provide additional information about the SNA Architecture, the AS/400 Host system, and remote controller units.

IBM

- *APPN Architecture and Product Implementations Tutorial* (Part No. GG24-3669-00)
- *5494 Remote Control Unit Functions Reference* (Part No. SC30-3533-04)
- *The X.25 Interface for Attaching SNA Nodes to Packet Switched Data Networks General Information Manual*
- *AS/400 Communication Definitions Examples* (Part No. GG24-3449-00)

Perle

- *Perle 394 Hardware Setup Guide* (Part No. 95-1032-01)
- *Perle 394 IOPV-8-E Twinax Controller Card User's Guide* (Part No. 95-1053C0)

Internet/Web Addresses

The following Internet/Web (WWW) addresses have relevant information:

- **Vanguard Managed Solutions**

  http://www.vanguardms.com
- **IBM**

  AS/400 information:
  http://as400bks.rochester.IBM.com/bookmgr/v4r2frm.htm

  To reach AS/400 manuals:
  - Select category **Bookshelves for V4R2**.
  - Select **5 Host Communications**.
  - Select **Communications Configuration SC41-5401**.

  APPN Implementation Workshop:
  http://www.networking.ibm.com/app/aiwhome.htm
- **Perle**

  http://www.perle.com/

Other Information

Software Licensing for this Feature

This feature is licensed as an optional part of the Vanguard Applications Ware. This feature license is shown as the AS/400 block in Figure 1-2. You also need one of the base Vanguard Applications Ware licenses. The IP&SNA (Internet Protocol and SNA Features) license or the MS (Multi-Service) license can be used as the necessary base license with the AS/400 license. The AS/400 5494 Communications Server feature can also be used on Vanguard products that have Voice and Security features. However, the Voice and Security features do not provide the necessary base license.

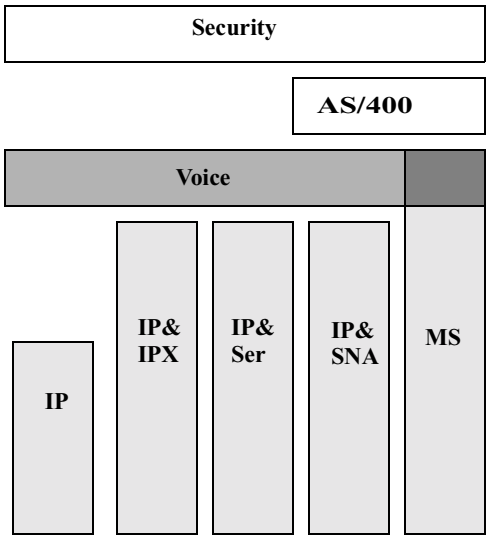

Figure 1-2. AS/400 5494 Communications Server Feature License with Base Feature Combinations

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- Perle is the trademark or registered trademark of Perle Corporation.

Alarms and Reports

Refer to the *Vanguard Applications Ware Alarms and Reports Manual* (Part Number T0005) for details on alarms and reports generated by this feature.

Hardware and Software Requirements

OS/400 Operating System and AS/400 Host Computer

This feature works with the OS/400 operating system, version V3R2 or later. The OS/400 runs on the IBM AS/400 (or compatible) Host computer system. Other computer systems (such as System/36 and System/38) may operate under OS/400, and can be configured to support this feature.

This feature is not used with IBM and IBM-compatible main-frame (such as the 30x0) host computer systems.

Maximum number of Controllers Supported with this feature

The recommended maximum number of remote controllers (5494-type, 5394-type, and 5294-type) are as follows:

- Vanguard 6560 (with 16 MB of memory) = 40 controllers
- Vanguard 6520 (with 8 MB of memory) = 10 controllers
- Vanguard 6400 Series (with 16 MB of memory) = 15 controllers

These recommended maximum controller numbers assume a maximum of four displays and printers per controller. Fewer controllers are supported if more than four display or printer units are attached to the controllers.

Note

You may have to add additional memory to your Vanguard products to support your intended network architecture and size.

Controllers and Attached Devices Supported

This feature works with controllers made by different manufacturers. These controllers and their associated display units and printers include:

- IBM 5394 Cluster Controller
  Display: 5291, 3476, 3180. Printer: 4224
- IBM 5294 Cluster Controller
  Display: 5291, 3476, 3180
- Perle 593 Cluster Controller
  Display: 5291, 3476, 3180. Printer: 4224

Technical Overview

Introduction

This section contains a brief technical overview of the AS/400 5494 Communications Server feature. You should remember that this feature makes non-5494-type controllers appear to be 5494-type controllers to the OS/400 system through emulation.

Major Features

The AS/400 549 Communications Server feature has these primary characteristics:

Characteristic	*Description or Benefit*
Eliminates native AS/400 Host system connection restrictions for 5294- and 5394-type controllers to a LAN.	The AS/400 treats the 5494 emulation by the Vanguard as a 5494-type connection, and allows non-5494-type controllers to be attached to the AS/400 through a LAN connection (Token Ring or Ethernet).
Supports both 5394-type and 5294-type controllers.	The AS/400 5494 Communications Server feature works with 5394- and 5294-type controllers that use a 5250-type of data stream.
Replaces multiple point-to-point SDLC or X.25 connections with a single LAN connection.	The AS/400 5494 Communications Server feature allows you to change your network design from point-to-point links to a single LAN connection between the AS/400 and the Vanguard.
Emulates LU6.2 connectivity for 5394-type devices attached to the AS/400.	The AS/400 can use LU6.2 connectivity to communicate with 5394-type controllers. The native LU4/7 packets from 5394-type controllers are encapsulated inside LU6.2 packets for upstream communication. In the downstream direction, the LU6.2 packets are stripped off, leaving LU4/7 packets for the 5394-type controller.
Operates with existing Vanguard Applications Ware that performs the LLC-SDLC conversion.	This feature is integrated into existing Vanguard Applications Ware so you can take advantage of the LLC-SDLC conversion choices, including HPAD/TPAD and TPAD/LLC-SDLC.
Supports WAN networks (X.25 or Frame Relay).	The AS/400 5494 Communications Server can be used in multiple Vanguard products to create large-scale WAN networks using X.25 or Frame Relay.

Eliminates Standard OS/400 Network Limitations

The OS/400 operating system is used on the AS/400, and requires that the controller type and model be identified in the OS/400. The OS/400 does not accept certain network configurations, such as LAN connections for 5294- and 5394-type controllers. The OS/400 only allows non-5494-type controllers to be attached through SDLC (or X.25) connections. If the remote control unit and model and type is not compatible with a LAN connection in its native mode, the OS/400 terminates the configuration effort. For example, certain equipment, such as the 5394-type controller, support SDLC connections, but cannot be appended to a Token Ring LAN resource on the AS/400.

With the AS/400 5494 Communications Server feature, you can a Token Ring or Ethernet LAN into your network.

Supports Multiple Controller Types

This feature works with 5294- and 5394-type controllers (5250-type data stream). You can have a mix of 5294-type, 5394-type, and 5494-type controllers in the same network, with all controllers appearing to be 5494-type units to the AS/400.

SDLC Conversion

The AS/400 5494 Communications Server feature supports conversion of the SDLC protocol typically used by 5294-type and 5394-type controllers to communicate with the AS/400, into QLLC (using the LLC-SDLC conversion in Vanguard Applications Ware). This QLLC can be routed through a Token Ring or Ethernet LAN connection to the AS/400. LAN connections typically offer higher speeds and greater throughput as compared to SDLC-type connections.

LU6.2/PU2.1 Connectivity

This feature emulates the LU6.2/PU2.1 connectivity used between the AS/400 and 5494-type controllers. The Vanguard software encapsulates LU4/LU7 data packets from the PU Type 2 controllers inside LU6.2 packets for the AS/400, and can separate out the LU4/LU7 data packets from LU6.2 packets for the downstream PU Type 2 controllers.

Integrated into Existing SNA Features

The AS/400 5494 Communications Server operates with the other Vanguard SNA features, including SDLC-to-LLC conversion, HPAD-TPAD functionality, and QLLC conversion. You need to have the necessary IP/SNA or Multi-Service licenses to utilize these existing features.

X.25 or Frame Relay WAN Support

The AS/400 5494 Communications Server feature can be used with Vanguard X.25 or Frame Relay WAN features to create large-scale networks. You can configure one central Vanguard unit to perform the 5494-conversion, and at the same time function as an X.25 node or as a Frame Relay Interface (FRI).

Other Vanguard SNA Features Supported

This table highlights other Vanguard features which can be used in with the AS/400 5494 Communications Server.

Feature	Description	Benefits
Access support for PU Type 2 and Type 2.1	Compatibility with existing SNA PU (Physical Unit) types. In a PU Type 2.1 environment, peer-to-peer nodes can communicate transparently across a Frame Relay SVC or across X.25.	• Full device support • Support of hierarchical and peer-to-peer SNA networks.
Local Polling (also called Spoofing)	Local polling means that polls from a host resource site receive a local response on one side of a call. Polls at the remote site of the call are generated in the end user device, and are automatically answered. This is supported in a serial environment (SDLC spoofing) and in an SNA LAN environment (LLC2 Local Termination).	• Bandwidth requirements are reduced. • Faster access to host resources.
SDLC-to-LLC Conversion: LAN (Token Ring and Ethernet)	Full conversion options are available for: • SDLC-to-LLC • LLC-to-SDLC A variety of media at central site and remote site locations are supported including STP, UTP, coax, and fiber.	• Flexibility • Reduced costs • Ease of operations
SDLC-to-LLC2 Conversion: RFC1490	RFC1490 is a standard that defines transporting multiple protocols, including LLC, over Frame Relay.	• Interoperability with other RFC1490-compliant vendors. • Standard interface method. • Consolidation of PUs over single DLCI/PVC for reduced bandwidth requirements.
Data Connection/ Protection (DCP)	This feature is compatible with the Data Connection/ Protection feature. Data connection maintains a virtual connection if the link fails. When the primary line drops, the internal SVC call is maintained while the connection is re-routed across a dial backup network. When the connection is reestablished, data traffic is resumed. Data protection maintains data integrity across the network using OSI transport layer 4 interfacing. **Note** You can apply Data/Connection Protection to any combination of SDLC or LLC2 circuits.	• Session protection • No loss of user data • Data integrity
Traffic Prioritization	Four levels of network traffic priorization are available: Expedite, High, Medium, and Low.	• Critical application support • Flexible traffic control

Feature	Description (continued)	Benefits
Dual Token Ring	Two Token Ring cards are used to increase LLC2/ SDLC conversion capacity.	• Offers backup capability • Flexible network management.
SNA Dial on Demand	PU and LU sessions are maintained between data transmissions; the network is used only when data is ready to send.	• Significant reduction in network costs

Theory of Operation

Introduction

The theory of operation presented below provides a basic description of how this feature has been implemented in Vanguard products. Reference is made to SNA terms as necessary.

SNA Overview

What Is SNA?

SNA (Systems Network Architecture) is an IBM-defined data communications architecture that is widely used in small-, medium-, and large-scale networks. SNA specifies how hardware and software entities are connected to each other, and how they communicate with each other. SNA supports both hierarchical (top-to-bottom) and peer-to-peer network topologies.

SNA contains seven different layers that specify the formats and protocols used for communication. These layers range from the highest application layer to the lowest physical layer:

- Transaction Services (applications such as data base access and document interchange)
- Presentation Services (network resource management, session presentation and application management)
- Data Flow Control (data flow synchronization and exchange)
- Transmission Control (data exchange pacing and encryption tasks)
- Path Control (data routing between source and destination and network data traffic control)
- Data Link Control (data transmission between adjacent nodes, using Channel Connect, SDLC, or Token Ring protocols).
- Physical Control (physical and electrical connections between adjacent nodes).

SNA has evolved into an Advanced Peer-to-Peer Networking (APPN) design, where multiple APPN nodes with attached peripheral nodes can interact with each other.

SNA Terminology

The key SNA terms are:

- End User
- Logical Unit (LU)
- Physical Unit (PU)
- System Services Control Point (SSCP)
- Network Addressable Unit
- Session
- SNA Data Formats

Each of these terms is briefly described in the following subsections.

End User

End Users typically interact with the SNA architecture through I/O devices such as printers and display stations. End users generally work with applications and application data, and are the final source and destination of such data. The AS/400 5494 Communications Server feature allows the AS/400 to communicate with end users who are connected to 5294- and 5394-type controller units.

Logical Unit (LU)

SNA defines a set of LU (logical unit) types, ranging from 1 through 7. Each LU type has certain characteristics and features, which are associated with the SNA stack. The common LU types are:

- LU4 = Printer
- LU7 = Display
- LU6.2 = LU-to-LU communication

LUs are “ports” through which end-users communicate with each other and the host computer. They are defined as network addressable software units. Data packet structures are associated with the LU types, which support the SNA communications protocols. The LU6.2 type supports the most advanced communications interface between two network nodes.

The AS/400 can only handle LU7 and LU4 communications for 5394-type controllers, but uses LU6.2 data packets with the 5494-type controllers. The AS/400 5494 Communications Server feature encapsulates the LU4 and LU7 packets inside LU6.2 packets, which can then be transferred through Token Ring, Ethernet, or Frame Relay (RFC1490) networks to the AS/400.

Physical Unit (PU)

SNA defines a set of PU (physical unit) types, which characterize attributes and network functionality of devices. PUs in the SNA world are defined as the software controlling the physical devices. PUs have the following features:

- Are network-addressable nodes
- Control the physical interface
- Support and control the Link Level Protocols (such as SDLC or LLC2)
- Provide network access for end users.

The primary PU types are:

- Host node (PU Type 5)
- Communications Controller node or Front End Processor (FEP) node (PU Type 4)
- Cluster Controller node (PU Type 2)
- Advanced Cluster Controller node (PU Type 2.1)
- Terminal node (PU Type 1)

The host computer system and the FEP functions are combined in the AS/400 environment, which is defined as a PU Type 2.1 unit. The AS/400 native environment supports 5494-type controller devices (PU Type 2.1) and 5394-type controller devices (PU Type 2), as well as certain PU Type 1 devices. These controllers in turn support devices such as display terminals and printers, which have defined LU types.

System Service Control Point (SSCP)

The SSCP is the central control point within an SNA network, which manages and allocates the various network resources. The SSCP "domain" defines all the components (network addressable units) controlled by that SSCP. Each host system has one or more SSCPs, each of which has its own domain.

LSCP (Local Service Control Points) control the resources within the local node only, and may be within the domain of an SSCP.

Network Addressable Unit (NAU)

Network Addressable Units are entities which are recognized and controlled by the network. These include:

- Logical Units (LUs)
- Physical Units (PUs)
- System Services Control Points (SSCPs)

Each NAU has a unique address, and are the source or destination of data through the Path Control Network (defined as the bottom three of the seven SNA levels). The Path Control Network includes the DLC and the physical layer.

Session

A session is the logical connection between two NAUs, which uses specified SNA protocols and allocates the resources required. These resources include the network paths, buffers, and protocols required for the session. Common session types are LU-to-LU, SSCP-to-PU, and SSCP-to-LU.

SNA Data Formats

SNA has a number of different data formats which are used by the NAUs, Path Control layer, and Data Link Control layer to exchange information. These data formats consist of one or more headers, with accompanying messages. Each layer sets bits in specific headers.

The LU4/7 and LU6.2 data formats are seen by the AS/400 as different data formats, and handled differently. With the AS/400 5494 Communications Server feature, the Vanguard emulates the LU6.2 format for data packets from non-5494 controllers in the upstream direction, and separates the LU4/7 format packets from the LU6.2 packets in the downstream direction. This emulation process is discussed in more detail in the next section.

How the AS/400 5494 Communications Server Feature Works

Data Formats in the Vanguard

The previous section ended with a brief description of how the AS/400 5494 Communications Server feature emulated the different LU data packets between the AS/400 and attached non-5494-type controllers. Now, let's look a little closer at the data formats within the Vanguard with the communication server feature.

Figure 1-1 shows a simplified network and the changes in the data format as the packets pass through the network. The network consists of these elements:

- AS/400 Host computer
- Token Ring LAN
- Vanguard node containing the AS/400 5494 Communications Server feature ("Emulator" in the LLC-SDLC Conversion Station box) which functions as an HPAD node
- Frame Relay WAN
- Remote Vanguard node which functions as a TPAD node
- 5394-type Controller, with attached 3476 Display

The different data formats generated by the network components (LAN, WAN, and SDLC stages) are shown by hollow arrows.

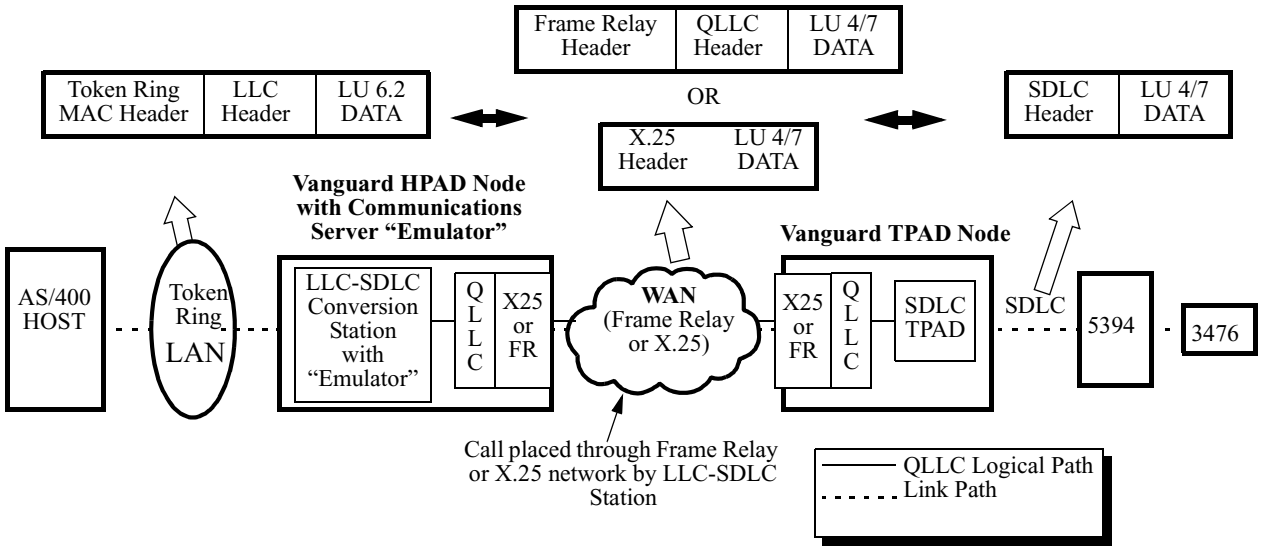


Figure 1-3. Data format changes through Vanguard nodes in the network.

When the AS/400 5494 Communications Server feature is installed in a Vanguard node (shown as "Emulator" in the figure), the LLC-SDLC Conversion Station can be configured to support the SDLC-to-LLC conversion for downstream SDLC 5394-type controllers. A key element in this SDLC-to-LCC conversion is the change in data format of the data frames.

As shown in Figure 1-3, this LLC-SDLC Conversion Station establishes a call to a downstream SDLC TPAD to which the 5394-type controller is attached. The Vanguard converts the PU Type 2 and LU4/LU7 commands and data frames received from the 5394-type controller into LU6.2 packets, and then sends these packets via LLC2 to the AS/400. In the downstream direction, LU6.2 frames from the AS/400 are converted by the Vanguard to LU4/LU7 frames before being sent to the 5394-type controller.

SNA Node Functionality

The AS/400 5494 Communications Server feature incorporates elements of the SNA node functionality into Vanguard products. SNA nodes have evolved to allow peer-to-peer networking and support PU2.1/LU6.2 functions. However, Vanguard nodes that have this Communications Server feature does not have the full set of SNA node features. What is provided is limited LU6.2/PU2.1 functionality to support non-5494-type controllers through 5494-type emulation.

When performing conversion from SDLC to LLC for a 5394-type controller, the LLC-SDLC Conversion Station appears to the AS/400 as a 5494-type Low Entry Networking node. The LLC-SDLC Conversion Station has a configurable Local Control Point Name. During LLC2 (Logical Link Control Type 2) Link Activation, the LLC-SDLC Conversion Station and the AS/400 go through an Exchange Identifier (XID) negotiation. In this negotiation, parameters like Local Control Point and ID Number/ID Block are passed in the XID Format 3 exchanges.

AS/400-to-Controller Session Start-Up Sequence

Figure 1-4 shows an example of the startup sequence of a typical LLC-SDLC Conversion Station for a "5494" Link Station Type. "5494" is used for both 5494-type controllers and 5494-emulated controllers (via the AS/400 5494 Communications Server feature). This start-up sequence establishes a session between the AS/400 and the controller through the Vanguard nodes.

Note

This example shows the call placed downstream from the Vanguard connected to the AS/400. The call could have been configured to come from the Vanguard connected to the controller. In that case, the sequence would be different.

Once the XID negotiation succeeds and LLC2 Link Activation is successfully established, the LLC-SDLC Conversion Station establishes the call to the SDLC TPAD port of the remote Vanguard unit. If the remote call is successfully established, then the LLC-SDLC Conversion Station BINDs an LU6.2 session with the AS/400. This is referred to as the Controller Conversation.

The TPAD starts sending NULL XIDs as soon as it is booted up. At some point, it receives the QLLC NULL XID from the LLC-SDLC Conversion Station. The AS/400 and LLC-SDLC Conversion Station BIND multiple LU6.2 sessions with each other. They use these sessions to ALLOCATE conversations. Within these conversations, the AS/400 and LLC-SDLC Station encapsulate the LU4/7 data using General Data Stream (GDS) headers (hex D822 and hex D824).

At this time, the LLC-SDLC Conversion Station sends QLLC XID polls through the Frame Relay (or X.25) network to the remote Vanguard TPAD node. Meanwhile, the SDLC TPAD is polling with XIDs to the 5394. The 5394 replies to the XID poll with a Format 1 XID. The Vanguard TPAD node sends the Format 1 XID back through the WAN network to the LLC-SDLC Conversion Station in the other Vanguard.

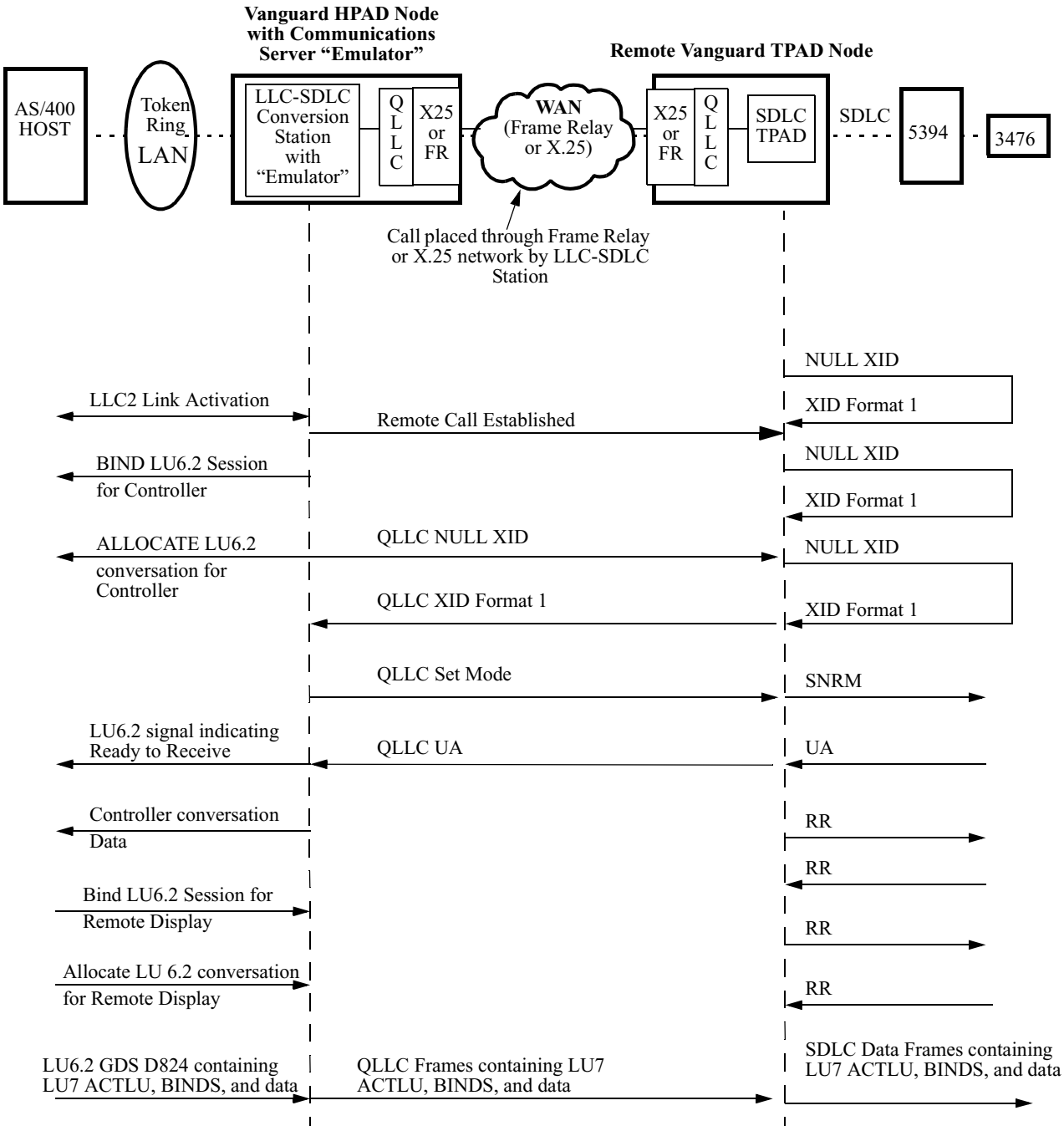


Figure 1-4. Summary of SDLC-LLC Station start-up sequence when Link Station Type is 5494.

When the LLC-SDLC Station receives this Format 1 XID, it responds with a QLLC Set Mode to the remote Vanguard. Upon receiving this QLLC Set Mode, the remote Vanguard sends an SDLC SNRM (Set Normal Response Mode) to the 5394 controller. The UA reply from the controller passes through both Vanguard units to the AS/400 as a LU6.2 Ready to Receive message. After the AS/400 and LLC-SDLC Conversion Station finish sending Controller Conversation data, the AS/400 BINDs a LU6.2 session for the controller display, then allocates the Display Conversation.

The AS/400 then sends to the LLC-SDLC Conversion Station the LU7 ACTLU and BIND encapsulated in the LU6.2 frames (via the GDS hex D824). Subsequent encapsulated LU6.2 frames with Display Conversation data are exchanged between the AS/400 and the LLC-SDLC Conversion Station. The session continues until the call is ended or the connection severed.

Chapter 2
Configuration

Introduction

This Chapter describes configuration procedures for the AS/400 5494 Communications Server feature.

Suggested Pre-Configuration Procedures

The following recommendations are designed to make the configuration process as simple and easy as possible:

- Plan your installation out on paper before you start. Study the network topology examples and the configuration applications for examples of how to design and configure your network.
- You should have the type and model numbers for all pieces of equipment in the network, as well as the names and unit numbers you will be using.
- Keep accurate records of all installation and configuration information. It is recommended that you print out a copy of the Vanguard configuration tables and also that you make a backup copy of the CMEM files. Store this information in a safe location.

Summary of Configuration Procedures

You will have to configure the Vanguard product containing the AS/400 5494 Communication Server feature. This configuration process requires that you set the parameters in the Vanguard Applications Ware to match your actual network configuration.

In addition, you will have to configure the other major elements in your network for this feature. These elements are:

- AS/400 Host system
- Other Vanguard products in the network (such as remote TPAD nodes)
- RWS controllers
- Attached devices such as display terminals and printers.

You may also have to configure auxiliary equipment such as modems, and routers.

Configuration information for other Vanguard product applications is contained in the documents listed in the first section of this manual.

Configuration Planning and Network Topologies

Introduction

This section contains information which you may find helpful in planning configuration process. You may want to re-design your network as part of the configuration process. For example you may convert from SDLC connections to a Token Ring LAN connection for Remote Work Station (RWS) controllers. RWS controllers include the IBM5394, the IBM 5294, and compatible units such as the Perle 394.

The examples presented in this section are generalized; you may have to modify them for your particular network requirements.

Network Topologies and Designs

The AS/400 5494 Communications Server feature can be used in a variety of network topologies. These networks can range from a single Vanguard product containing the feature for a few RWS controllers, to large-scale networks with multiple Vanguards organized into two levels (with one level containing the feature).

Some network designs include:

- A Vanguard node (with this feature) connected to the AS/400 via a Token Ring LAN, and linked to remote Vanguard nodes (without this feature).
- A Vanguard node (with this feature) connected to the AS/400 via an Ethernet LAN, and linked to remote Vanguard nodes (without this feature).
- Remote Vanguard nodes (with this feature) connected to the AS/400 through Frame Relay (RFC1490), in a point-to-point network topology.

Note

The number of controllers and devices supported in the network depends upon the controller type and connection method. For example, the maximum number of devices supported by Vanguard Managed Solutions per RWS controller is 16. Each SDLC station requires a separate Vanguard connection, which must also be configured in the AS/400.

Single Vanguard Node with Feature

For networks with a limited number of RWS controllers, the conversion process can be done in one Vanguard product equipped with the AS/400 5494 Communications Server feature. Typically, this Vanguard product will be located close to the AS/400 host system.

The standard Vanguard SNA Applications Ware handles the interfaces between the remote controllers and the remote Vanguard nodes, using SDLC. The remote Vanguard nodes are linked to the Vanguard node (which contains the feature), via X.25 or Frame Relay. This Vanguard node is then connected to the AS/400 through a LAN connection (Ethernet or Token Ring). Figure 2-1 illustrates this network design.

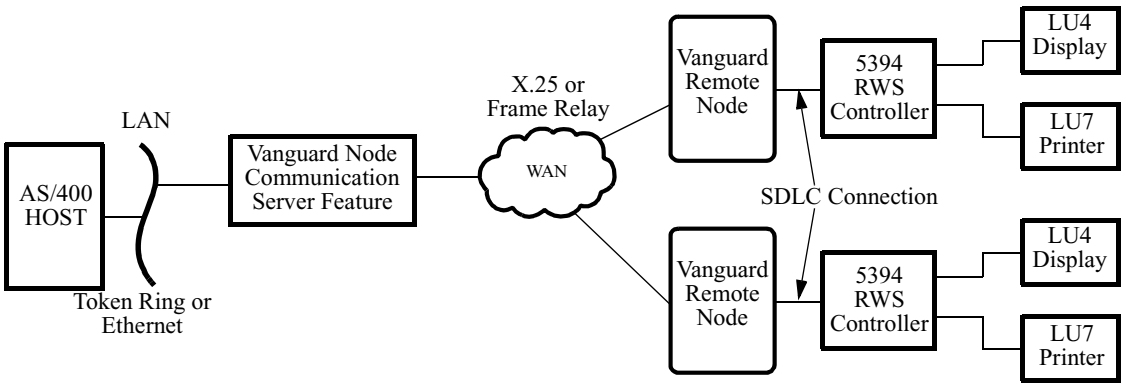


Figure 2-1. Single Vanguard Node with AS/400 5494 Communication Server Feature

Multiple Vanguard Nodes with Feature

For larger networks, the topology design can have multiple remote Vanguard nodes (with the feature), each of which handles a number of IBM or IBM-compatible Remote Work Station (RWS) controllers. These multiple Vanguards can be configured for Frame Relay connections to the AS/400. You can design a network with two stages of Vanguard products, to use Frame Relay (RFC1490) or X.25 WAN networks.

Note

For complex network designs, it is recommended that you consult with Customer Service prior to implementation. Certain network designs may require additional bridging or conversion requirements beyond the scope of this manual.

Other Network Architectures

Other network architectures can be implemented using the Vanguard node with this feature, and other equipment. For example, you can connect multiple Vanguard conversion nodes to the AS/400 using Frame Relay (RFC1490). This design will require Frame Relay equipment for the AS/400. Another network design may utilize multiple LAN connections for both remote and local Vanguard stations.

Configuration Examples

Introduction

This section contains examples of configurations, with the accompanying configuration parameters that you will have to set or modify. In some instances, there will be no change to the parameters from a standard Vanguard configuration.

Configuration Examples

The three configuration examples show simple diagrams of possible network applications for the AS/400 5494 Communications Server feature. The configurations shown are for:

- AS/400 Host system
- Vanguard node (with the AS/400 5494 Communications Server feature)
- Vanguard nodes without the feature
- RWS Controllers and attached devices

Each example is designed to show different configuration factors and combinations. The Token Ring LAN, Ethernet LAN, and Frame Relay line definitions between the AS/400 and the Vanguard product (with the AS/400 5494 Communications Server feature) are presented as separate examples.

Configuration Example #1

Introduction

The first configuration example shows the AS/400 5494 Communications Server feature utilized in an Ethernet LAN configuration. Figure 2-2 and Figure 2-3 show the network diagram and the key configuration parameters.

Note

Figure 2-2 and Figure 2-3 should be read together. The parameters are shown below the figure, going from the AS/400 on the left side to the controllers and devices on the right side.

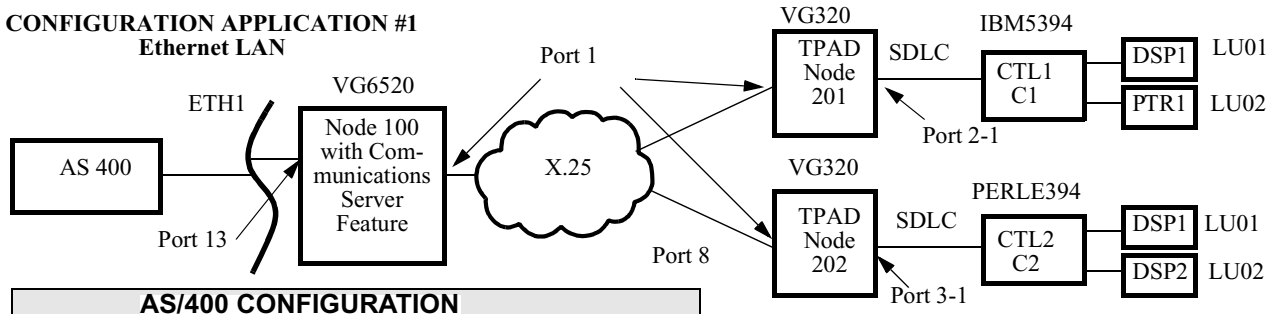
Description

The Communications Server feature is installed in a Vanguard 6520 node, designated as Node 100. The Vanguard product is attached to the AS/400 Host system through an Ethernet LAN in the upstream direction, and to other Vanguard products downstream through X.25 connections.

The downstream Vanguards (Node 201 and Node 202) are linked via SDLC to controllers C1/CTL1 and C2/CTL2, which in turn have attached devices.

Note

The Host AS/400 Network Attribute Definition contains the required Host Control Point Name. This name is necessary for Vanguard configuration. The AS/400 System Administrator can supply this information.



AS/400 CONFIGURATION

Ethernet Line Definition
Line Description: ETH1
Local Adapter Address: 10 00 51 9d 1e 04
Exchange Identifier: 05600003

APPC Controller Definition [1]
Controller Description: IBM5394
Category of Controller: APPC
Link Type: *LAN
Switched Line: ETH1
Remote Network Identifier: APPN
Remote Control Point MT13S001
LAN Remote Adapter Address:
40 00 00 00 00 01
Exchange Identifier: 07300003

APPC Controller Definition [2]
Controller Description: PERLE394
Category of Controller: APPC
Link Type: *LAN
Switched Line: ETH1
Remote Network Identifier: APPN
Remote Control Point MT13S002
LAN Remote Adapter Address:
40 00 00 00 00 02
Exchange Identifier: 07300004

APPC Device Definition
Device Description: IBM5394
Category of Device: APPC
Remote Location: MT13S001
Local Location: S10A5500
Remote Network ID: APPN
Attached Controller: IBM5394
Mode: QRMTWSC

APPC Device Definition
Device Description: PERLE394
Category of Device: APPC
Remote Location: MT13S002
Local Location: S10A5500
Remote Network ID: APPN
Attached Controller: PERLE394
Mode: QRMTWSC

RWS-type Controller Definition
Controller Description: CTL1
Controller Type: 5494
Controller Model: 2
Link type: NONE
Remote Location: MT13S001
Local Location: S10A5500
Remote Network ID: APPN
Switch Disconnect.: NO

RWS-type Controller Definition
Controller Description: CTL2
Controller Type: 5494
Controller Model: 2
Link type: NONE
Remote Location: MT13S002
Local Location: S10A5500
Remote Network ID: APPN
Switch Disconnect.: NO

DSP-type Device Definition
Device Description: DSP1A
Device Class: *RMT
Device Type: 3476
Device Model: EA
Local location address: 01
Attached controller: CTL1
Drop Line at Signoff: *NO

DSP-type Device Definition
Device Description: DSP1B
Device Class: *RMT
Device Type: 3476
Device Model: EA
Local location address: 01
Attached controller: CTL2
Drop Line at Signoff: *NO

PTR-type Device Definition
Device Description: PTR1
Device Class: *RMT
Device Type: 4224
Device Model: A
Local location address: 02
Attached controller: CTL1

DSP-type Device Definition
Device Description: DSP2
Device Class: *RMT
Device Type: 3476
Device Model: EA
Local location address: 02
Attached controller: CTL2
Drop Line at Signoff: *NO

VANGUARD 6520 COMMUNICATIONS SERVER NODE CONFIGURATION

Node Record
Node Name: LEN
Node Address: 100
Node Number: 100

APPN Tables
APPN Local Network Identifier: APPN

LAN Control Menu
MAC Address Display Format: Canonical

Port Record
Port Number: 1
Port Type: X25
Link Address: DCE
Port Number: 13
Port Type: ETH
LAN Cable Type: AUI
Port MAC Addr:
08-00-3e-00-12-34

Route Selection Table
Entry Number: 1
Address: 1001301
#1 Destination: LSC-ETH1
Entry Number: 2
Address: 1001302
#1 Destination: LSC-ETH2

LLC-SDLC Station Table
Entry #1
External MAC Address: 10-00-51-9d-1e-04
*Internal MAC Address: 40-00-00-00-00-01
Internal SAP: 04
External SAP: 04
Ethernet Frame Type: 802.3
*Link Station Type: 5494
External PU Type: 2.1
Remote Control Point Name: S10A5500
*Local Control Point Name: MT13S001
Number of Downstream Displays/Printers: 2
Downstream LU ID [1]: 01
Downstream Display/Printer Type [1]: 3476
Downstream LU ID [2]: 02
Downstream Display/Printer Type [2]: 4224
QLLC Sta.Addr: FF
XidValue: 000007300003

Entry #: 2
External MAC Address: 10:00-51-9d-1e-04
*Internal MAC Address: 40-00-00-00-00-02
*Link Station Type: 5494
External PU Type: 2.1
Remote Control Point Name: S10A5500
*Local Control Point Name: MT13S002
Number of Downstream Displays/Printers: 2
Downstream LU ID [1]: 01
Downstream Display/Printer Type [1]: 3476
Downstream LU ID [2]: 02
Downstream Display/Printer Type [2]: 3476
QLLC Station Address: FF
XID Value: 000007300004

Figure 2-2. Ethernet LAN Example (Page 1)

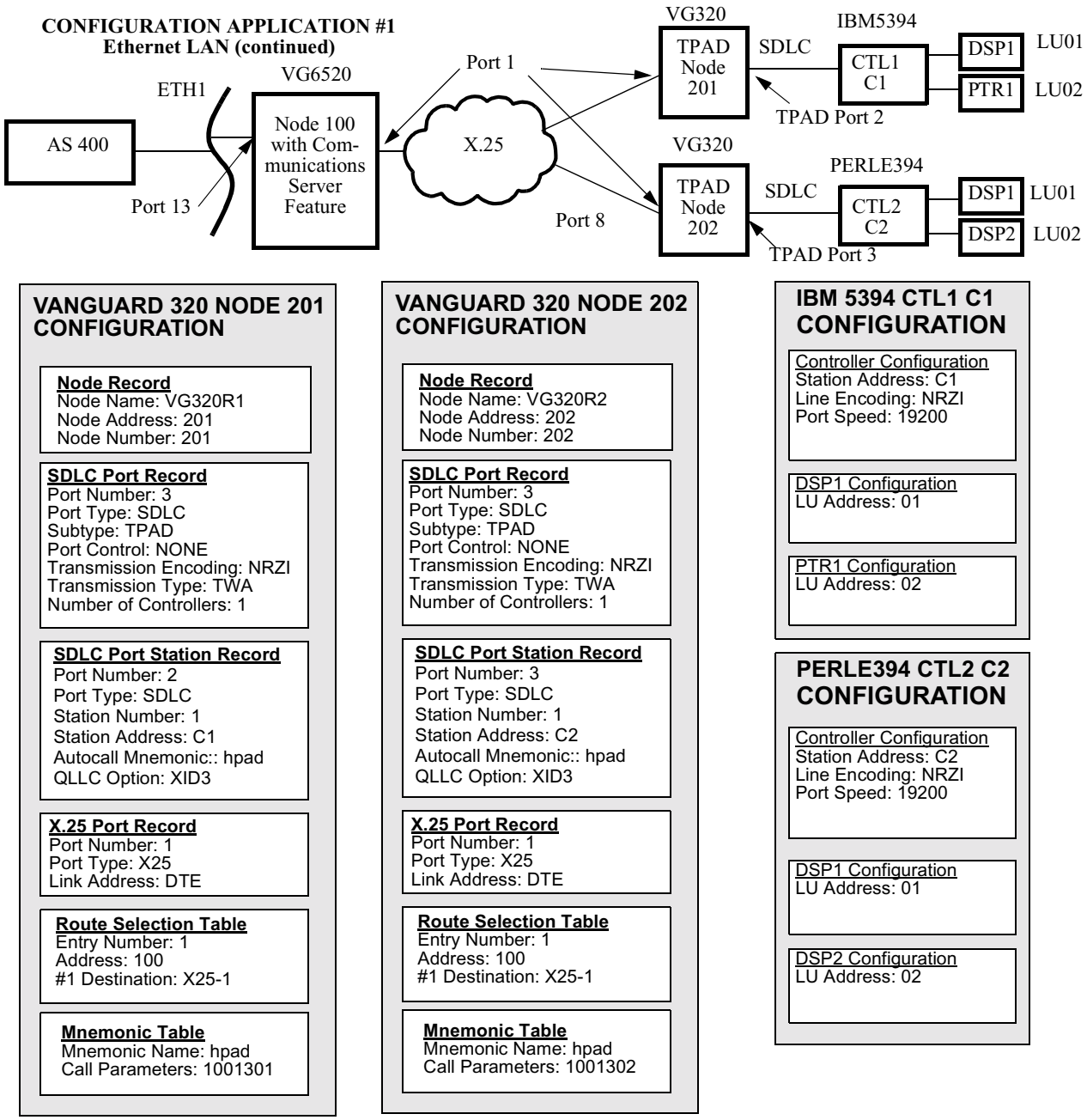


Figure 2-3. Ethernet LAN Example (Page 2)

Configuration Example #2

Introduction

The second configuration example shows the AS/400 5494 Communications Server feature utilized in a Token Ring LAN configuration. Figure 2-4 and Figure 2-5 show the network diagram and the key configuration parameters.

Note

Figure 2-4 and Figure 2-5 should be read together. The parameters are shown below the figure, going from the AS/400 on the left side to the controllers and devices on the right side.

Description

This example shows the AS/400 5494 Communications Server software installed in a Vanguard 6520 Node, designated as Node 300. The Vanguard product is attached to the AS/400 Host system through a Token Ring LAN in the upstream direction, and to a Vanguard product downstream through Frame Relay (Annex G) connections. The downstream Vanguard (Node 401) is linked via SDLC to the controllers (CTL1 and CTL2), which in turn have attached devices (for CTL1 these devices are DSP1 and PTR1, and for CTL2 the attached devices are DSP1, DSP2, and DSP3).

You should notice that the Token Ring LAN requires a different AS/400 configuration, as well a different configuration for the Vanguard product with the Communications Server feature, compared to the first configuration application example. In addition, the Frame Relay WAN requires that both Vanguard nodes (Node 300 and Node 401) be configured with Frame Relay ports and stations. You should also notice that the three display devices attached to CTL 2 will each require a definition in the AS/400 configuration.

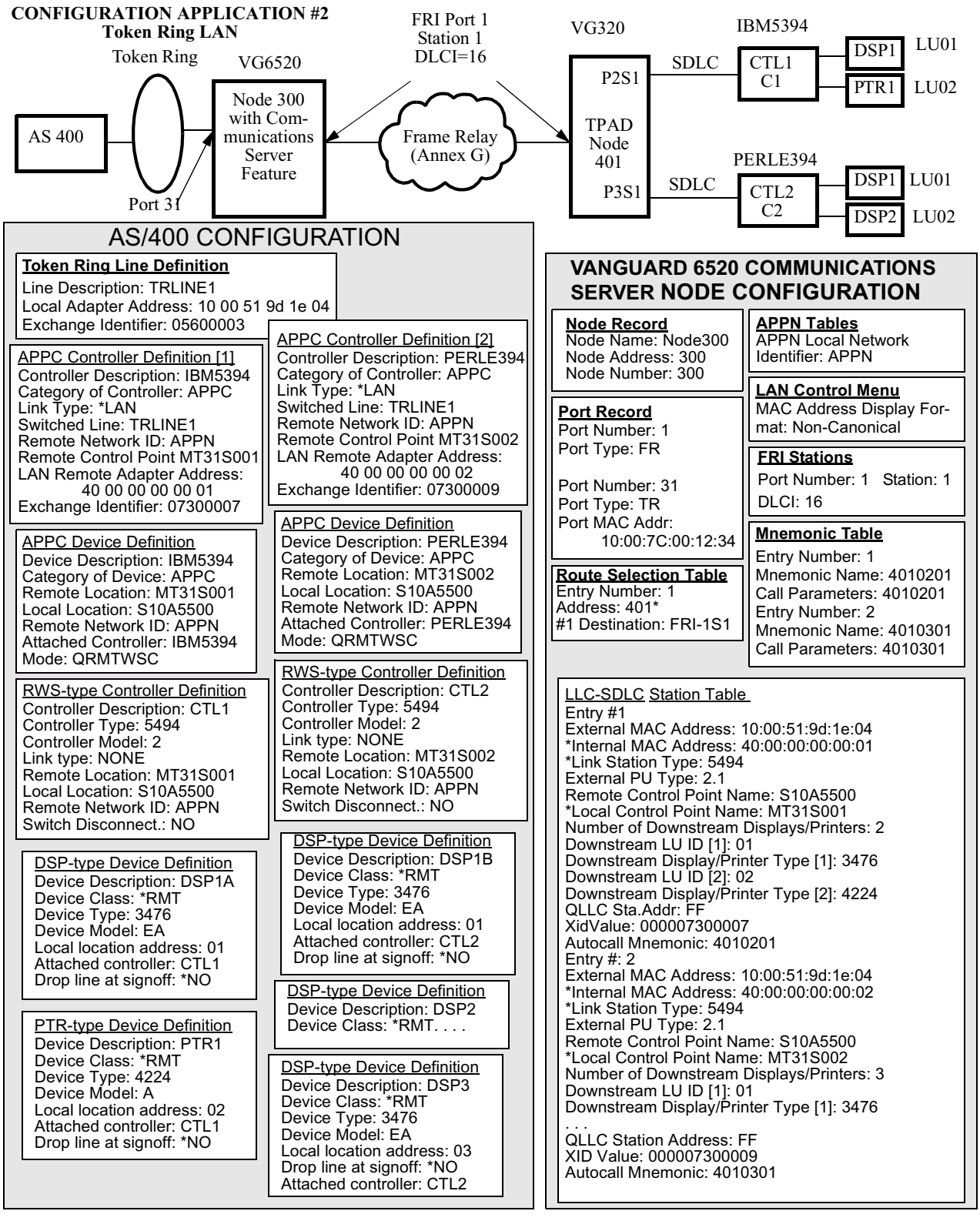


Figure 2-4. Token Ring LAN Example (Page 1)

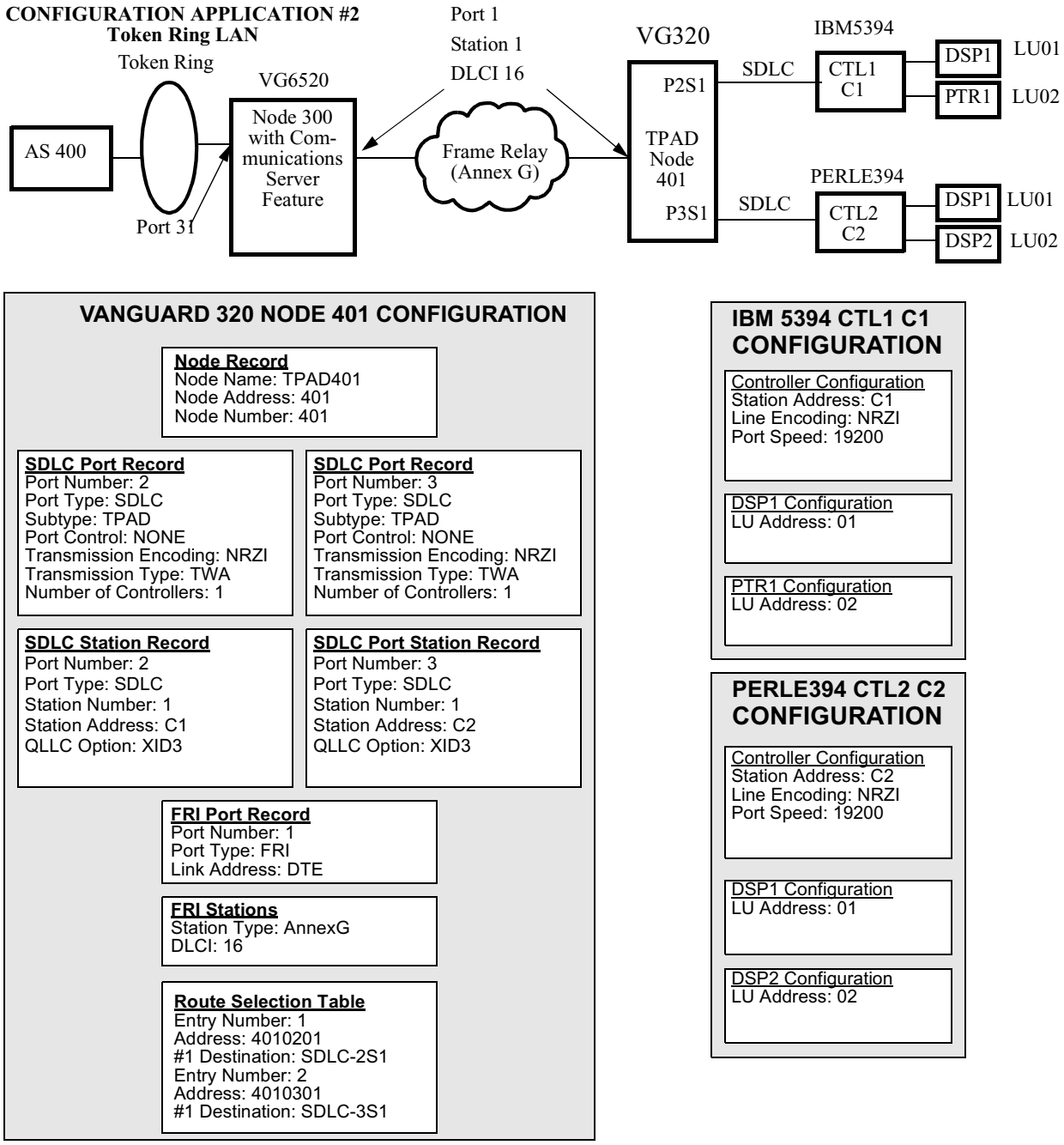


Figure 2-5. Token Ring LAN Example (Page 2)

Configuration Example #3

Introduction

The third configuration example shows the AS/400 5494 Communications Server feature utilized in a Frame Relay configuration. Figure 2-6 and Figure 2-7 show the network diagram and the key configuration parameters.

Note

Figure 2-6 and Figure 2-7 should be read together. The parameters are shown below the figure, going from the AS/400 on the left side to the controllers and devices on the right side.

Description

This example shows the AS/400 5494 Communications Server software installed in a Vanguard 6520 Node, designated as Node 900. The Vanguard product is attached to the AS/400 Host system through a RFC1490 Frame Relay WAN in the upstream direction, and to the controllers (C1/CTL1 and C2/CTL2) in the downstream direction. The Frame Relay WAN requires that the Vanguard node be configured with Frame Relay ports and stations.

The controllers have multiple attached devices: for CTL1, these devices are DSP1 and PTR1; and for CTL2, the attached devices are DSP1, DSP2, and DSP3. Each controller and its attached devices must be defined in the AS/400.

The AS/400 5494 Communications Server Feature in this example allows the connection of remote controllers to the AS/400 through a Frame Relay network, rather than direct lines or modem connections.

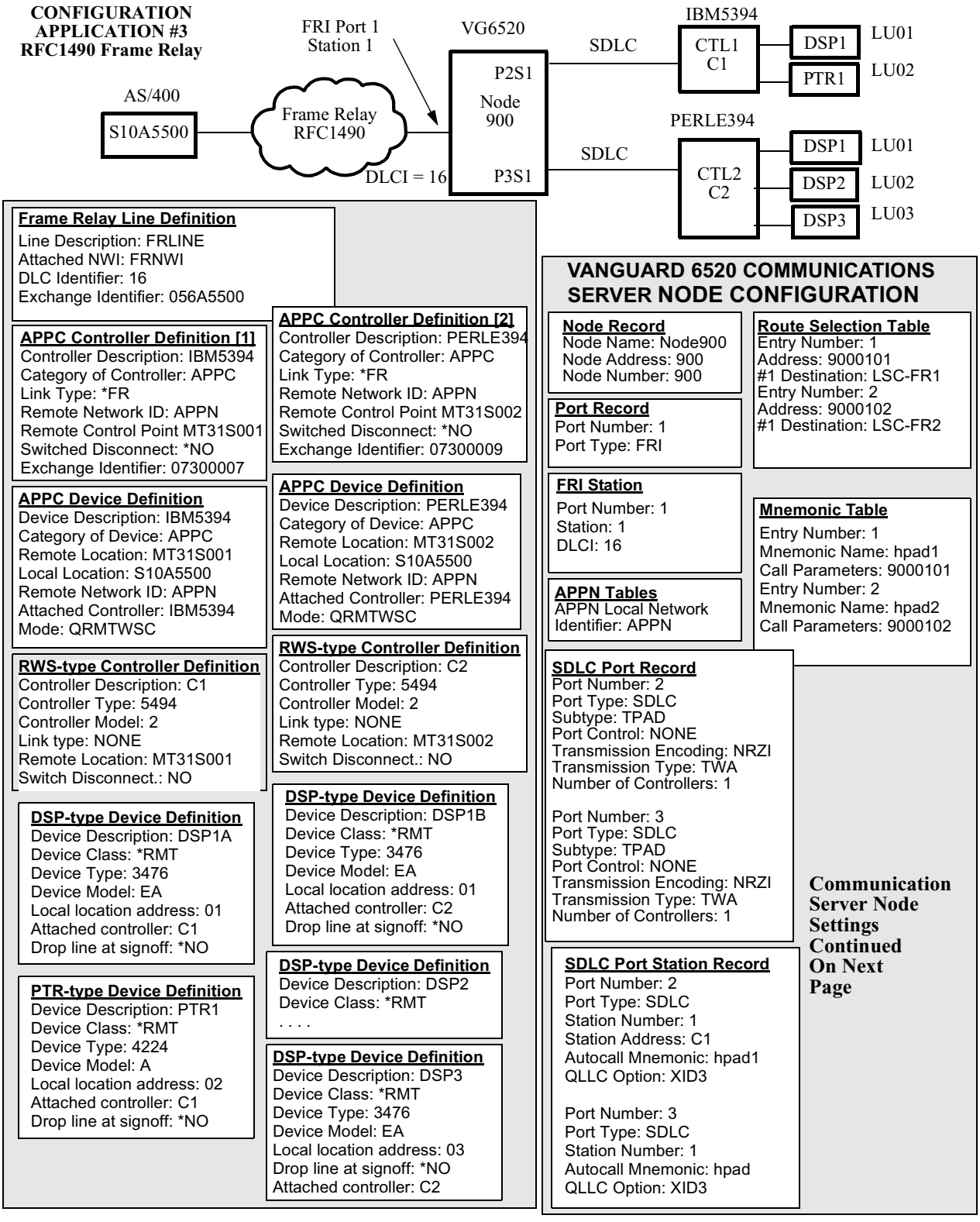
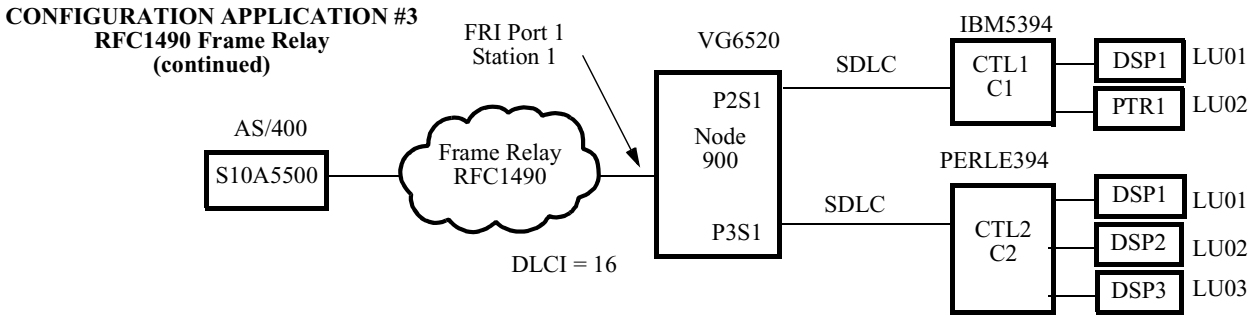


Figure 2-6. Frame Relay Example (Page 1)



VANGUARD 6520 COMMUNICATIONS SERVER NODE CONFIGURATION (continued)

LLC-SDLC Station Table
Entry #1
*Frame Relay Port Number: 1
*Frame Relay Station Number: 1
1490 Encapsulation: LLC
Internal SAP: 04
External SAP: 04
*Link Station Type: 5494
External PU Type: 2.1
Initiate TEST Frame: ON
Remote Control Point Name: S10A5500
*Local Control Point Name: MF00S001
Number of Downstream Displays/Printers: 2
Downstream LU ID [1]: 01
Downstream Display/Printer Type [1]: 3476
Downstream LU ID [2]: 02
Downstream Display/Printer Type [2]: 4224
LLC Profile Name: DEFAULT
QLLC Station Address: 01
QLLC Options: NONE
XID Value: 000007300007

LLC-SDLC Station Table
Entry #2
*Frame Relay Port Number: 1
*Frame Relay Station Number: 1
1490 Encapsulation: LLC
Internal SAP: 04
External SAP: 04
*Link Station Type: 5494
External PU Type: 2.1
Initiate TEST Frame: ON
Remote Control Point Name: S10A5500
*Local Control Point Name: MF00S002
Number of Downstream Displays/Printers: 3
Downstream LU ID [1]: 01
Downstream Display/Printer Type [1]: 3476
Downstream LU ID [2]: 02
Downstream Display/Printer Type [2]: 3476
Downstream LU ID [3]: 03
Downstream Display/Printer Type [3]: 3476
LLC Profile Name: DEFAULT
QLLC Station Address: 02
QLLC Options: NONE
XID Value: 000007300009

IBM 5394 CTL1 C1 CONFIGURATION

Controller Configuration
Station Address: C1
Line Encoding: NRZI
Port Speed: 19200

DSP1 Configuration
LU Address: 01

PTR1 Configuration
LU Address: 02

PERLE394 CTL2 C2 CONFIGURATION

Controller Configuration
Station Address: C2
Line Encoding: NRZI
Port Speed: 19200

DSP1 Configuration
LU Address: 01

DSP2 Configuration
LU Address: 02

DSP3 Configuration
LU Address: 03

Figure 2-7. Frame Relay Example (Page 2)

Configuring the AS/400 Host System

Introduction

This section contains configuration information for the AS/400 and describes the configuration status display.

AS/400 Host System Configuration Requirements

General Configuration Requirements

The AS/400 Host system must be configured correctly to support this feature in the Vanguard. You must set the AS/400 definition fields to match or complement the other network configuration parameters. The key elements in the AS/400 which must be matched are:

- Line Definition – one per LAN and/or Frame Relay connection
- APPC Controller Definition – one per downstream controller
- APPC Device Definition – one per downstream controller
- Mode Definition – QRMTWSC is supplied by IBM. It is specified in the APPC Device Definition
- RWS (Remote Work Station Controller) Definition – one per attached downstream controller (workstation)
- Display Device Definition – one per attached display device
- Printer Device Definition – one per attached printer device

Refer to your Host system and controller documentation for specific system information.

Note

The configuration values you use in the Host system must match your network logical and physical configuration. In particular, description names and identifiers must be identical.

Accessing AS/400 Definition Menus

You can access the AS/400 definition menus and screens through two different methods:

- Command Line Interface (using the specific menu or screen name)
- Menu selections

Command Line Interface

The AS/400 allows you to enter commands and access screens through the command line interface. Refer to your AS/400 documentation for details of how this interface operates, and for command definitions and examples.

AS/400 Main Menu

The AS/400 Host System definition (configuration) menus and screens can be accessed through the AS/400 Main menu. The Communications option has sub-menus for the key definitions you will need to access.

AS/400 Line Definition Options

The AS/400 Line Definition menu defines the parameters for the interface lines from the Host system to the controllers. There are three types of line definitions which can be used with the AS/400 5494 Communications Server feature:

- Token Ring LAN
- Ethernet LAN
- Frame Relay (RFC1490)

Each of these line definitions has a different set of parameters. You can configure separate line definitions for different networks. Each separate line definition must match the other definitions for that network.

AS/400 Token Ring LAN Line Definition

The key AS/400 Token Ring LAN Line Definition parameters you will need to configure for the Vanguard Communications Server feature are listed here. You must provide the remaining definition parameters as necessary to configure the AS/400. These other parameters should use the default or standard setting for your equipment.

The key parameters for the AS/400 Communications Server feature are:

- Line description
- Line speed
- Maximum frame size
- Local adapter address
- Exchange identifier
- Autocreate controller

AS/400 Token Ring LAN Definition Key Parameters

These key parameters you will have to set or check for the AS/400 5494 Communication Server feature are described here.

Line Description

Range:	[Name]
Suggested Values:	Use a name to identify the Token Ring LAN that is attached to the Vanguard. Example: TRLINE
Description:	Identifies the name applied to the LAN connection to the Vanguard (and the attached controllers). This is the type of line used by the AS/400 to connect with the network to reach the attached controllers.

Line speed

Range:	4M, 16M
Suggested Value:	4M or 16M Matches the Ring Speed parameter for the Vanguard Token Ring Port.
Description:	Defines the nominal Token Ring LAN data rate. The Vanguard Communications Server feature will only support a line speed of 4 or 16 Mbps.

Maximum frame size

Range:	N/A
Suggested Value:	1500 (recommended)
Description:	Defines the packet size used to transfer data through the network. If you select a smaller frame size, the throughput of the network will decrease. Larger frame sizes may not be processed properly through the Vanguard.

Local adapter address

Range:	Valid six hex-byte MAC address
Suggested Value:	Set the External MAC Address parameter in the Vanguard LLC-SDLC Station Table to match the AS/400 local adapter address.
Description:	Shows the MAC address for the AS/400 local adapter connecting to the Token Ring LAN.

Exchange identifier

Range:	Valid XID Format 3 identifier
Suggested Value:	Use the XID that uniquely identifies the AS/400.
Description:	Shows the AS/400 XID 3 value exchanged with the Vanguard during the initial start-up sequence.

Autocreate controller

Range:	*YES, *NO
Suggested Value:	*NO
AS/400 Match Value:	RWS Controller Definition parameter for Autocreate device is set to *NO.
Description:	Turns the auto-creation of controller parameters by the AS/400 ON or OFF.

AS/400 Ethernet LAN Line Definition

The key AS/400 Ethernet LAN Line Definition parameters you will need to configure for the Vanguard Communications Server feature are listed here. You must also configure the remaining AS/400 line definition parameters as required.These other parameters should use the default or standard setting for your equipment.

The key parameters you will have to set or check for the AS/400 5494 Communications Server feature are described in the following tables:

Line Description

Range:	[Name]
Suggested Value:	Use a name to identify the LAN that attaches to the Vanguard. Example: ETHLINE
Description:	Identifies the name for the line that the Vanguard uses to attach to the Ethernet LAN.

Local adapter address

Range:	Valid six hex-byte MAC address
Suggested Value:	Set the External MAC Address parameter in the Vanguard LLC-SDLC Station Table to match the AS/400 local adapter address.
Description:	Shows the MAC address for the AS/400 local adapter connecting to the Ethernet LAN.

Exchange identifier

Range:	Valid XID Format 3 identifier.
Suggested Value:	Use the XID that uniquely identifies the AS/400.
Description:	Identifies the AS/400 XID 3 value exchanged with the Vanguard during the initial start-up sequence.

Link speed

Range:	10M, 100M
Suggested Value:	10M This matches the parameter in the Vanguard Ethernet Port Record.
Description:	Defines the Ethernet LAN speed. 10M is the standard Ethernet rate; 100M is the high-speed Ethernet rate.

AS/400 Frame Relay (RFC1490) Line Definition Parameters

The key AS/400 RFC1490 Frame Relay Line Definition parameters you will need to configure for the Vanguard Communications Server feature are listed below. You must also configure the remaining AS/400 line definition parameters as required.

The key parameters you will have to set or check for the AS/400 5494 Communications Server feature are described in the following tables:

Line Description

Range:	[Name]
Suggested Value:	Use a name to identify the Frame Relay line that attaches to the Vanguard. Example: FRLINE
Description:	Identifies the line used by the Vanguard to attach to the AS/400 via Frame Relay.

Attached nonswitched NWI

Range:	[Name]
Suggested Value:	Select a name for the nonswitched network interface. Example: FRNWI
Description:	Identifies the NWI (Non-switched Network Interface) to which this line is attached.

DLC identifier

Range:	Valid DLCI identifier.
Suggested Value:	Set the DLC identifier (“DLCI”) to match the DLCI identifier in the Vanguard FRI Station DLCI parameter, or to match the DLCI provided by the Frame Relay network provider.
Description:	Establishes connections through the Frame Relay network.

Maximum frame size

Range:	N/A
Suggested Value:	1500 **Note** If you select a smaller frame size, the throughput of the network will decrease.
Description:	Defines the packet size used for transmission.

Exchange identifier

Range:	Valid XID Format 3 identifier
Vanguard Match Value:	Use the XID that uniquely identifies the AS/400.
Description:	Identifies the AS/400 XID 3 value exchanged with the Vanguard during the initial start-up sequence.

AS/400 APPC Controller Definition and Parameters

The AS/400 APPC (Advanced Peer-to-Peer Communication) Controller Definition has attached remote controller information. The key parameters you will need to configure for the Vanguard Communications Server feature are listed in the following tables. You must also provide remaining definition parameters to configure the AS/400.

The key parameters you will have to set or check for the AS/400 5494 Communication feature are described here.

Controller description

Range:	[Name]
Suggested Value:	Use a name to identify the Vanguard and LLC-SDLC station to attach to this controller.
Description:	Identifies the attached controller.

Category of controller

Range:	*APPC
Suggested Value:	*APPC.
Description:	Defines the controller as an APPC (Advanced Peer-to-Peer Communication) device.

Maximum frame size

Range:	265 to 16393, 265, 265, 512 . . .
Suggested Value:	16393
Description:	Shows the maximum frame size allowed by the AS/400 in the network.

Remote network identifier

Range:	[Name], *NETATR, *NONE, *ANY
Suggested Value:	Set this value to match the APPN Local Network Identifier in the Vanguard APPN Table Record.
Description:	Identifies the network to the AS/400.

Remote control point

Range:	[Name], *ANY
Suggested Value:	This should match the Local Control Point Name parameter of the LLC-SDLC Station to which this APPC controller is attached.
Description:	Connects the AS/400 with the Vanguard and with other attached controllers.

Switched disconnect

Range:	*YES, *NO
Suggested Value:	*NO This should match the Vanguard LLC-SDLC Station support.
Description:	Defines if AS/400 will terminate the line connection when the last display or printer on the controller is disconnected or powered off.

Data link role

Range:	*NEG, *PRI, *SEC
Suggested Value:	*NEG The AS/400 will do XID3 negotiation with the Vanguard.
Description:	Defines if the link role is negotiated, or if the link role is fixed as primary or secondary.

LAN remote adapter address

Range:	000000000001 to 7EFFFFFFFFFF
Suggested Value:	Set this value to match the Internal MAC Address parameter of the LLC-SDLC Station to which this controller is attached.
Description:	Identifies the LAN attachment point. This can be one of two values: • the actual Internal MAC Address found in the LAN remote adapter (in the Vanguard) • the Internal MAC address configured in the LLC-SDLC Station Table

Exchange identifier

Range:	Valid XID Format 3 identifier
Vanguard Match Value:	Must match the XID of the Vanguard LLC-SDLC Station.
Description:	Specifies the XID of the attached Controller. If no XID is entered here, then the XID from the Controller is ignored.

LAN DSAP

Range:	04, 08, 0C, 10, 14, 18, 1C
Suggested Value:	This should match the Vanguard Internal SAP parameter in the LLC-SDLC Station Table to which the controller is attached. The typical value is 04.
Description:	Specifies the node type or network function of the associated hardware. This is defined by IBM.

LAN SSAP

Range:	04, 08, 0C, 10, 14, 18, 1C
Suggested Value:	This should match the Vanguard External SAP parameter in the LLC-SDLC Station Table to which the controller is attached. The typical value is 04.
Description:	Specifies the node type or network function of the associated hardware. This is defined by IBM.

Autocreate device

Range:	*YES, *NO
Suggested Value:	*NO The AS/400 should not autocreate the device definition parameters.
Description:	Specifies if the AS/400 performs automatic device definition of the parameters.

APPN-capable

Range:	*YES, *NO
Suggested Value:	*YES
Description:	Defines the network capability to the AS/400.

AS/400 APPC Device Definition and Parameters

The AS/400 APPC Device Definition parameters define attributes for remote controllers attached through the Vanguard. The key AS/400 parameters you will have to set for the Vanguard Communications Server feature are listed in the following tables. You must also provide the remaining definition parameters as necessary to configure the AS/400.

The key parameters you will have to set or check for the AS/400 5494 Communication feature are described here.

Device description

Range:	[Name]
Suggested Value:	Name used to identify the Vanguard LLC-SDLC Station attached to the remote controller.
Description:	Identifies the attached controller to the AS/400.

Category of device

Range:	*APPC
Suggested Value:	*APPC
Description:	Defines the attached devices as APPC-capable to the AS/400.

Local location

Range:	[Name]
Suggested Value:	Set this parameter to the Remote Control Point Name of the Vanguard LLC-SDLC Station to which this APPC Device is attached.
Description:	Identifies the control point of the attached APPC Controller.

Remote location

Range:	[Name]
Suggested Value:	Set this parameter to the Local Control Point Name of the LLC-SDLC Station to which this APPC Device is attached.
Description:	Identifies the control point of the attached APPC Device.

Remote network identifier

Range:	[Name], *NETATR, *NONE, *ANY
Suggested Value:	Matches the value of the APPN Local Network Identifier in the Vanguard APPN Table Record.
Description:	Defines the network to the AS/400.

Attached controller

Range:	[Name]
Suggested Value:	This parameter should match the AS/400 APPC Controller Definition parameter of the Controller Description.
Description:	Identifies attached controllers to the AS/400.

Mode

Range:	[Name]
Suggested Value:	QRMTWSC
Description:	Identifies the Mode used by the APPC device when communicating with the attached Controller.

Local location address

Range:	[valid number]
Suggested Value:	00
Description:	Identifies a unique local address to the AS/400.

APPN capable

Range:	*YES, *NO
Suggested Value:	*YES
Description:	Defines network functionality for the AS/400.

AS/400 Mode Definition

The AS/400 uses the mode definition QRMTWSC when attaching to a Vanguard containing the AS/400 5494 Communications Server Feature. This Mode Definition is IBM-supplied. In its default setting, QRMTWSC is compatible with the Vanguard containing the AS/400 5494 Communications Server Feature.

For more information, refer to the IBM *AS/400 Communication Definition Examples* manual.

AS/400 RWS Controller Definition and Parameters

The AS/400 RWS (Remote Work Station) Controller Definition contains parameters for each remote controller connected to the AS/400 through the Vanguard Node. The key parameters you should set for the Vanguard Communications Server feature are listed in the following tables. You must also provide the remaining definition parameters required to configure the AS/400.

The key parameters you will have to set or check for the AS/400 5494 Communication feature are described here.

Controller description

Range:	[Name]
Suggested Value:	Use a unique name to identify each controller. Example: IBM5494RWS1
Description:	Identifies the Vanguard LLC-SDLC Station connection for the remote RWS controller.

Controller type

Range:	5294, 5394, 5494
Required Value:	5494
Description:	Identifies the controller type to the AS/400. **Note** You must use 5494 for the AS/400 5494 Communications Server feature to work.

Controller model

Range:	[Model Number]
Suggested Value:	2
Description:	Identifies the controller model to the AS/400. **Note** It is strongly recommended that you use **2** for the controller model. Other model numbers may not work with the AS/400 5494 Communications Server feature.

Remote location

Range:	[Name]
Suggested Value:	Set this to match the Local Control Point Name of the LLC-SDLC Station to which this APPC Device will attach.
Description:	Identifies the control point to which this APPC Device is attached.

Local location

Range:	[Name]
Suggested Value:	This parameter should be the same as the Remote Control Point name in the Vanguard LLC-SDLC Station Table.
Description:	Specifies the Control Point for the local network attachment to the AS/400.

Remote network identifier

Range:	[Name], *NETATR, *NONE, *ANY
Suggested Value:	Set this value to match the APPN Local Network Identifier in the Vanguard APPN Table Record.
Description:	Names the Network Identifier.

Switched disconnect

Range:	*YES, *NO
Suggested Value:	*NO
Description:	Defines if the AS/400 will disconnect the line when the last device on the attached controller is turned off or disconnected.

AS/400 Device (Display) Definition and Parameters

The AS/400 Device (Display) Definition parameters control the AS/400 connection with each display unit connected to the controller. The key parameters you should define for the AS/400 5494 Communications Server feature are listed in the following tables. You must also provide the remaining parameters required to configure the AS/400.

The key parameters you will have to set or check for the AS/400 5494 Communication feature are described here.

Device description

Range:	[Name]
Suggested Value:	Use a description that identifies the Vanguard LLC-SDLC Station and remote display device.
Description:	Identifies the attached device in the Vanguard to the AS/400.

Category of device

Range:	*DSP, *PTR
Suggested Value:	*DSP
Description:	Identifies the device category to the AS/400: • *DSP = Display • *PTR = Printer

Device class

Range:	LCL, *RMT, *VRT, *SNPT
Suggested Value:	*RMT
Description:	Defines how the device attached to the controller is linked to the AS/400: • LCL = Local • *RMT = Remote • *VRT = Virtual • *SNPT = Single network point

Device type

Range:	3101, 3151, 3161, 3162 [and other device types]
Suggested Value:	Set this to the Display type of the display attached to the downstream RWS controller. The LLC-SDLC Station parameter, Downstream Display/Printer Type, must also match this parameter.
Description:	Identifies the device at the local location address. Use the equivalent IBM number for IBM-compatible devices.

Device model

Range:	[Model Number]
Suggested Value:	Select the display device model for the attached device. Use EA as the default if the model is not known or listed.
Description:	Identifies the device model for the attached device, so the AS/400 will be able to configure the display interface correctly.

Local location address

Range:	00 to FE
Suggested Value:	Set this to the Display Address of the display attached to the downstream RWS controller. The LLC-SDLC Station parameter, Downstream LU ID, must also match this parameter.
Description:	Matches the LU ID address configured in the remote controller for each device.

Attached controller

Range:	[Name]
Suggested Value:	This parameter should match the AS/400 RWS Controller Definition parameter of the Controller Description.
Description:	Identifies the attached controller to the AS/400.

Drop line at signoff

Range:	*YES, *NO
Suggested Value:	*NO **Note** The Vanguard will only support *NO.
Description:	Defines whether the AS/400 drops the Line connection to the Vanguard when the last device on the controller signs off.

AS/400 Device (Printer) Definition and Parameters

The AS/400 Device (Printer) Definition contains parameters for each printer device connected to the controller. The key parameters you should set for the Vanguard Communications Server feature are listed in the following tables. You must also provide the remaining definition parameters required to configure the AS/400.

The key parameters you will have to set or check for the AS/400 5494 Communication feature are described here.

Device description

Range:	[Name]
Suggested Value:	Use a description that identifies the Vanguard LLC-SDLC Station and remote printer device.
Description:	Identifies the attached device in the Vanguard to the AS/400.

Category of device

Range:	*DSP, *PTR
Suggested Value:	*PTR
Description:	Identifies the device category to the AS/400: • *DSP = Display • *PTR = Printer

Device class

Range:	LCL, *RMT, *VRT, *SNPT
Suggested Value:	*RMT
Description:	Defines how the device attached to the controller is linked to the AS/400: • LCL = Local • *RMT = Remote • *VRT = Virtual • *SNPT = Single network point

Device type

Range:	3101, 3151, 3161, 3162, 4224 [and other device types]
Suggested Value:	Set this to the Printer type of the printer attached to the downstream RWS controller. The LLC-SDLC Station parameter Downstream Display/Printer Type, must also match this parameter.
Description:	Identifies the device at the local location address. Use the equivalent IBM number for IBM-compatible devices.

Device model

Range:	[Model Number]
Suggested Value:	Select the printer device model for the attached device. **Note** Use A as the default if the model is not known or listed.
Description:	Identifies the device model for the attached device, so the AS/400 will be able to configure the display interface correctly.

Local location address

Range:	00 to FE
Suggested Value:	Set this to the Local location address assigned to the printer unit in the LLC-SDLC Station table and in the printer attached to the remote RWS controller.
Description:	Matches the LU ID address configured in the remote controller for each device.

Attached controller

Range:	[Name]
Suggested Value:	Set this parameter to match the AS/400 RWS Controller Definition of the Controller Description.
Description:	Identifies the attached controller to the AS/400.

Drop line at signoff

Range:	*YES, *NO
Suggested Value:	*NO The Vanguard will only support *NO.
Description:	Defines whether the AS/400 drops the Line connection to the Vanguard when the last device on the controller signs off.

AS/400 Configuration Status Display

Introduction

This section describes the AS/400 Configuration Status Display. This screen shows the current status for the APPC Controller, the APPC Devices, the RWS Controller, and the Controller Devices. You can also use this screen to change the status of attached controllers and devices from one state to another state.

AS/400 Status Display Screen

Figure 2-8 shows a typical AS/400 configuration status display. This screen can be selected through two methods:

1) Use the menu screens and options

2) Use the command line interface

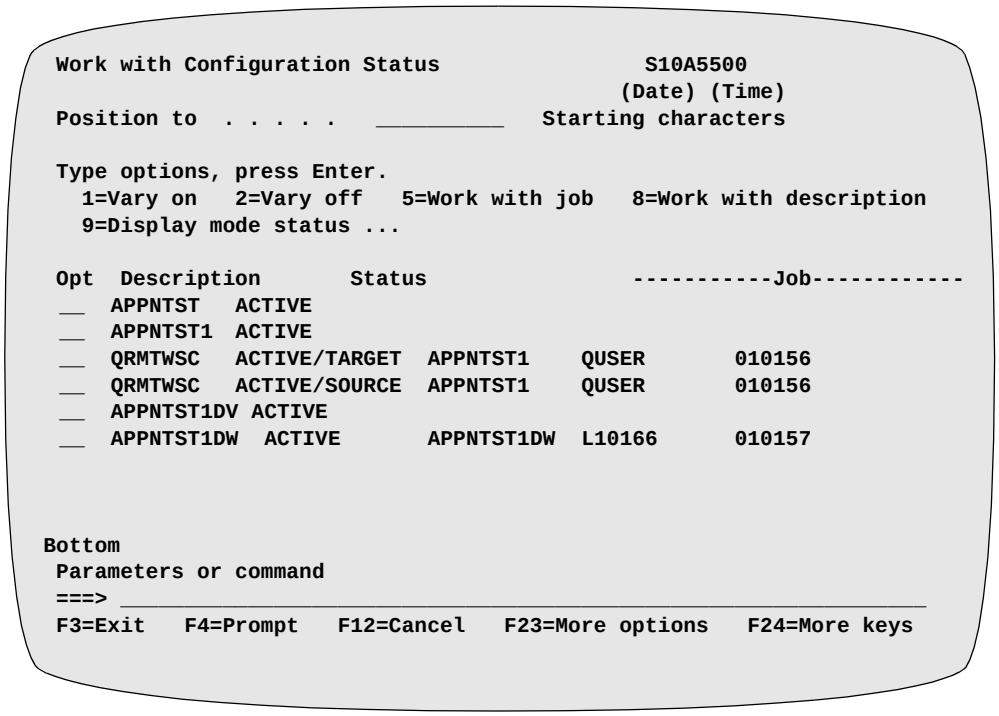


Figure 2-8. AS/400 Configuration Status Screen (after Vary On)

AS/400 Status Display Screen Terms

This table describes the terms used in the AS/400 Status Display screen.

Term	Description
Type options	Selectable options include: • Vary on = The controller or device is activated in the AS/400 configuration. • Vary off = The controller or device is deactivated in the AS/400 configuration. • Work with job = The list of active jobs is selected for modification. • Work with description = The description of the job or device is selected for modification. • Display mode status = Shows the current mode for the devices and jobs.
Opt[ion]	This column is used to select the option choice for the item.
Description	Shows the various lines, controllers, and attached devices known to the AS/400. The cursor in the Option column is used to select the active item. The display or printer devices are indented under the controller.
Status	Shows the current status of the item: • ACTIVE = Device is active. • ACTIVE/TARGET = Device is active and is destination for AS/400 messages. • ACTIVE/SOURCE = Device is active and is source for AS/400 messages • INACTIVE = Device is not active.
Job	Shows the Name, User and Job Number for any active jobs in the AS/400.
Parameter or command	Command entry line.

Configuring the Vanguard Node

Introduction

This section of the manual covers the key parameters you must set to configure the Vanguard that contains the AS/400 5494 Communication Server feature.

Configuration can be divided into two distinct processes:

- Vanguard configuration
- Modifications or specific configuration of the AS/400 5494 Communications Server feature.

Note

Refer to Chapter 1 for a complete listing of Vanguard documentation relating to the configuration of Vanguard products.

AS/400 5494 Communications Server Feature Configuration

The configuration requirements for the Vanguard Communications Server feature are listed below. The Vanguard parameter tables and records that must be configured are:

- LAN Control Menu (Σεε ®Χονφιγυρινγ τηε ΛΑΝ Χοντρολ Μενυ© ον παγε 35.)
- APPN Tables (See “Configuring the APPN Table” on page 36.)
- Node Record (See “Configuring the Node Record” on page 37.)
- Port Records (See “Configuring Port Records” on page 39.)
- Station Records (See “Configuring Station Records” on page 48.)

These configuration requirements are summarized in this section. For additional information, refer to the appropriate document. For examples, refer to the three Configuration Application examples presented earlier in this section for sample parameter settings. However, you must use the names and addresses assigned for your particular network.

Configuring the LAN Control Menu

Introduction

The LAN Control Menu is used to set the MAC Address Display Format parameter.

Configuration

Use the steps in the table below to configure the MAC Address Display Format.

Step	*Action*	*Result*
1	Select **LAN Control** from the CTP Main menu.	The LAN Control menu is displayed.
2	Select **MAC Address Display Format** from the LAN Control menu	The MAC Address Display Format screen is displayed.
3	Select the correct display format: • **Non-Canonical** for Token Ring networks • **Canonical** for Ethernet networks	The MAC Address format shows the setting selected.

LAN Control Parameter

The table below describes the LAN Control Menu parameter.

MAC Address Format

Range:	Canonical, Non-Canonical
Default:	Non-Canonical
Description	Select the correct MAC Address Format. The MAC Address consists of six two-digit hex numbers, which are separated by colons or dashs. There are two choices: • Canonical: Used for Ethernet LAN networks, digits are separated by dashes. For example: 00-00-00-00-00-00 • Non-Canonical: Used for Token Ring LAN networks, digits are separated by colon. For example: 00:00:00:00:00:00

Configuring the APPN Table

Introduction

This section describes the configuration of the APPN Table to activate the AS/400 5494 Communication Server feature.

Configuration

Use the steps listed in the table below to configure the APPN Table.

Step	*Action*	*Result*
1	Select **Configure** from the CTP Main menu.	The Configure menu appears.
2	Select **APPN Table** from the Configure menu**.**	The APPN Node Configuration menu appears.
3	Select **APPN** for the **APPN Local Network Identifier** parameter.	The APPN Table is configured for the AS/400 5494 Communication Server feature.

APPN Table Parameter

The table below describes the APPN Table parameter:

Note

A change to this parameter requires a node boot to take effect.

*APPN Node

Range:	0 to 8 alphanumeric characters, use the space character to blank field.
Default:	APPN
Description:	Defines the Local Network Identifier associated with this Vanguard. It must be capitalized and begin with an alpha character. **Note** This should match the Network Identifier parameter in the AS/400 Network Attributes Definition. This parameter can also be configured in the AS/400 APPC Controller Definition and the AS/400 RWS Controller Definition.

Configuring the Node Record

Introduction

This section describes configuration of the Vanguard Node record parameters required for the AS/400 5494 Communications Server feature.

Note

You may also need to change the Route Selection Table Size parameter and the Mnemonic Table Size parameter if you have more than 16 entries in either table.

Configuration

Use the steps listed in the table below to configure the Node Record parameters.

Step	*Action*	*Result*
1	Select **Configure** from the CTP Main menu.	The Configure menu appears.
2	Select **Node** from the Configure menu**.**	The Node Record Configuration screen appears, showing the Node Name: parameter.
3	Enter the **Node Name:** parameter.	The parameters for the Node Record appear in sequence. **Note** When an asterisk appears beside a parameter in a record, a Node Boot is needed for any changes to that parameter to take effect.

Node Record Parameters

The tables below describe the Node Record Parameters.

Node Name

Range:	0 to 8 alphanumeric characters,
Default:	Nodename
Description:	Enter a unique node name, which will be used for all alarm reports and network monitoring functions. **Note** Use the space character to blank this field.

Node Address

Range:	0 to 13 BCD digits, use the space character to blank field.
Default:	(blank)
Description:	Insert an appropriate unique node address. The node address specifies the main part of the network address for calls destined within this node. An optional individual subaddress is used to specify an exact location within the node.

Node Number

Range:	0 to 65535
Default:	0
Description:	Select a unique number to identify this node for network routing. This number can be the same as the Node Address value.

Configuring Port Records

Introduction

Port Records store the port configuration parameters, with each active port having a separate record. Active port number (location) and port type must be defined before you configure the remaining Port Record parameters.

Note

For more information on specific Port Record parameters for each Vanguard product, refer to the respective configuration manuals and guides for that product.

Note

After ports are configured, you must reboot the Vanguard node to reset the port parameters.

Configuration

Use the steps listed in the table below to configure the Port Records.

Step	*Action*	*Result*
1	Select **Configure** from the CTP Main menu.	The Configure menu appears.
2	Select **Port** from the Configure menu**.**	The Port Number parameter appears.
3	At the prompt, enter the number of the port you want to configure and press Return.	The parameters are successively displayed. **Note** When an asterisk appears beside a parameter in a record, a Node Boot is needed for any changes to that parameter to take effect.

Configuring the Port Number

The ports correspond to the Vanguard hardware ports (for port numbers under 100) and virtual ports (for port numbers over 100). The hardware port number is determined by the slot location of the interface card or motherboard port in the Vanguard product.

The LAN Port (Token Ring or Ethernet) is configured to match the actual physical connections to the AS/400 Host System. Typically, the Token Ring or Ethernet card will be installed in Port 13 (or higher) for Vanguard 6520/6560 systems. Other Vanguard products may have different port arrangements. If you have both Ethernet and Token Ring ports, or multiple LAN ports, you must configure all active ports.

The table below describes the Port Number parameter.

Port number

Range:	1 to 54
Default:	1
Description:	Selects the port number to configure the Port Record. This number corresponds to the physical port position at the rear of the Vanguard product and is the Port Record reference number.

Configuring The Port Type

The AS/400 5494 Communications Server feature can operate with one or more of these port types:

- Token Ring LAN
- Ethernet LAN
- Frame Relay Interface (FRI-Bypass)

Other port types used to attach remote Vanguards and downstream RWS devices are:

- Frame Relay Interface (FRI-Annex_G)
- X.25
- SDLC

Note

Each port type has a different set of parameters.

The table below describes the Port Type parameter.

*Port type

Range:	X.25, TRLAN, ELAN, FRI, SDLC, APAD
Default:	X.25
Description:	Specifies the port type to be used for this port: • X.25 = X.25 port • TRLAN = Token Ring LAN port • ELAN = Ethernet LAN port • FRI = Frame Relay Interface port • SDLC = SDLC port *A change to this parameter requires a node boot to take effect.

Configuring Token Ring LAN Port Parameters

Token Ring LAN port parameters that must be configured are described in the following tables:

Note

The complete Port Record must be configured for new Token Ring LAN installations.

LAN cable type

Range:	UTP, STP
Default:	STP
Description:	Specifies the type of cable, and the associated connector, which is used for the LAN interface: • UTP = Unshielded Twisted Pair • STP = Shield Twisted Pair

*Port MAC Address

Range:	00:00:00:00:00:00:00 to 7F:FF:FF:FF:FF:FF:FF
Default:	MAC Address burned into PROM in Vanguard.
Description:	Specifies the MAC address of the LAN port. The entered value of "00-00-00-00-00-00-00" will be replaced by the Burned-In Address (BIA) if the LAN hardware is present. **Note** This parameter requires a Node Boot to reset the parameter.

*Local Ring Number

Range:	001 to FFF
Default:	001
Description:	Specifies the local ring number to which this port is attached. **Note** This parameter requires a Node Boot to reset the parameter.

Ring Speed

Range:	4M, 16M
Default:	4M
Description:	Selects the ring speed used in the network. **Note** This parameter setting must match the corresponding AS/400 configuration parameter.

*Bridge Link Number

Range:	1 to 4
Default:	1
Description:	Specifies the bridge link number associated with this LAN port. The corresponding bridge link record must be configured under Bridge Configuration menu. **Note** This parameter requires a Node Boot to reset the parameter.

Configuring Ethernet LAN Port Record Parameters

The Ethernet LAN port parameters that you should configure for the Communications Server Feature are described in these tables.

Note

The Ethernet LAN port can support multiple SDLC-to-LLC Conversion Stations (which can be used for this feature).

LAN Cable Type

Range:	UTP, AUI
Default:	AUI
Description:	Select the type of LAN cable used: • AUI = Attachment Unite Interface (DB-15) • UTP = Unshielded Twisted Pair (RJ-45)

*Port MAC Address

Range:	00-00-00-00-00-00 to FE-FF-FF-FF-FF-FF
Default:	MAC Address burned into PROM.
Description:	Specifies the MAC Address of the LAN port. The entered value of “00-00-00-00-00-00” will be replaced by the Burned-In Address (BIA) if the LAN hardware is present.

*Bridge Link Number

Range:	1 to 4
Default:	1
Description:	Specifies the bridge link number associated with this LAN port. The corresponding bridge link record must be configured under the Bridge Configuration menu. **Note** This parameter requires a Node Boot to reset the parameter.

Configuring FRI Port Record Parameters

The Frame Relay Interface port parameters that you should configure for the Communications Feature are described in these tables.

Connection Type

Range:	SIMP, SIMPb, DTR
Default:	SIMP
Description:	Specifies the control signal handshake and clocking required for a connection to be made to this port: • SIMP = simple, no control signals required • SIMPb = simple, no control signals required for data transmission and reception. By default, output leads will be LOW. • DTR = dedicated, requires the Data Terminal Ready (DTR) signal.

Clock Source

Range:	INT, EXT, EXTINT, EXTLP
Default:	EXT
Description:	Specifies the clock source for signal timing: • INT = internal clock source • EXT = external clock source • EXTINT = internal receive and external transmit clock source (DCE only) • EXTLP = external receive and loopback transmit clock source (DTE only) **Note** EXTLP must be configured in conjunction with EXTINT.

Clock Speed

Range:	1200 to 2048000
Default:	64000
Description:	Specifies the clock speed used by the port.

Control Protocol Support

Range:	NONE, ANNEX_D, LMI, ANNEX_A, AUTO
Default:	AUTO
Description:	Specifies which Control Protocol is enabled: • NONE = No Control Protocol enabled • ANNEX_D = Annex D (ANSI T1.617) enabled • ANNEX_A = Annex A (CCITT Q.933) enabled • LIM = LMI support enabled • AUTO = Auto-learn function for Network Control Protocol enabled

Configuring FRI Station Record Parameters

The Frame Relay Interface (FRI) Station parameters that you should configure for the Communications Feature are described in the following tables:

Station Type

Range:	ANNEX_G, BYPASS
Default:	ANNEX_G
Description:	Specifies the station type: • ANNEX_G • BYPASS **Note** The Station Type must be set to BYPASS for the Communications Server Feature with LLC-SDLC Stations with Link Type = 5494.

*DLCI Address

Range:	0, 16 to 1007
Default:	0
Description:	Specifies the unique identifier for the station on the FRI port, called the Data Link Connection Identifier (DLCI). A zero value in the DLCI Address parameter places the FRI in DLCI Auto-Learn mode. In this mode, the station is eligible for automatic assignment of an available network DLCI. A configured value between 16 to 1007 must match a DLCI on the Frame Relay networking node.

Committed Information Rate (CIR)

Range:	0 to 2048000
Default:	16000
Description:	Specifies the rate (in bits-per-second) that the Frame Relay network agrees to transfer information under congested conditions for the FRI Station. This parameter is used to throttle data on the FRI station to control congestion. The CIR cannot be greater than the link speed.

Committed Burst Size (BC)

Range:	0 to 4096000
Default:	16000
Description:	Specifies the maximum amount of data (in bits) that the Frame Relay network agrees to transfer over a time interval: T = Committed Burst Size/Committed Information Rate. This value must be greater than 1/20th of the Committed Information Rate. The Committed Burst Size parameter is used for congestion control.

Congestion Control Mode

Range:	NORMAL, DISABLE, CONG, LIMIT
Default:	NORMAL
Description:	Selects the method of congestion control: • NORMAL = Congestion control is normal. • DISABLE = Never enter Congested State (CTRL) • CONG = Never enter a Non-Congested State (UCTRL) • LIMIT = Congestion control is limited.

Note

X.25 Ports, Additional Frame Relay ports, and Annex-G Frame Relay Stations may be required to connect to downstream Vanguards.

Maximum Information Rate (MIR)

Range:	0 to Maximum Access Rate
Default:	0
Description:	Specifies the station Maximum Information Rate. The purpose of this parameter is to reduce chances for congestion when the local access rate is greater than the remote one. This parameter has to be set to a value equal to or greater than CIR and less than the local interface access rate (in order for the average outgoing information rate to match remote interface access rate). If the entered value is less than CIR, CIR will apply. If it is greater than the interface access rate, packets are transmitted at the maximum possible rate determined by the interface access rate. Response to network congestion is determined by the Congestion Control Mode parameter. When this parameter set to 0 it disables MIR control and the station transmits according to Congestion Control Mode parameter. **Note** This parameter is shown only when Congestion Control Mode parameter is set to NORMAL, DISABLE or LIMIT. Perform a station boot to have changes to this parameter take effect.

Configuring SDLC Port Record Parameters

The SDLC port parameters that must be configured are described in the following tables.

*Subtype

Range:	HPAD, TPAD
Default:	HPAD
Description:	Indicates the port subtype: • HPAD - if the port is functioning as a Host PAD. • TPAD - if the port is functioning as a Terminal PAD. **Note** TPAD is used for attaching RWS controllers with the AS/400 5494 Communications Server feature. **Note** *A change to this parameter requires a node boot to take effect.

Transmission Encoding

Range:	NRZ, NRZI
Default:	NRZ
Description:	Specify the data encoding used for this SDLC link to match the RWS Controller: • NRZ = Non-Return to Zero • NRZI = Non-Return to Zero Inverted

Transmission Type

Range:	TWA
Default:	TWA
Description:	Specifies the transmission type. **Note** The Vanguard product with the AS/400 5494 Communication Server feature only supports TWA.

Number of Controllers

Range:	0 to 64
Default:	1
Description:	Enter the number of RWS controllers attached to the SDLC line.

Configuring Station Records

Introduction

Station records store the station configuration parameters, with each station assigned a separate record. The ports must be defined before you can configure the station record parameters.

Station records are configured through the various sets of LLC-to-SDLC Station Table parameters. The four types of station tables are:

- LLC Profile Table (SLAC station type)
- Token Ring Station Table
- Ethernet Station Table
- Frame Relay Interface Station Table

Note

For more information on specific Station Record parameters for each Vanguard product, refer to the respective configuration manuals and guides for that product.

Note

After stations are configured, you must reboot the Vanguard node to reset the station parameters.

Configuring the LLC-to-SDLC Tables

The LLC-to-SDLC Tables must be configured for each active station and conversion type. The LLC-to-SDLC Tables menu displays only the relevant tables (for example, if you do not have an Ethernet card installed, there will be no selection for Ethernet Station Table. If you have multiple station types (such as Ethernet and Token Ring), you will need to configure all stations for each station type.

This table lists the steps to access the different station record tables.

Step	*Action*	*Result*
1	Select **Configure** from the CTP Main menu.	The Configure menu appears.
2	Select **LLC to SDLC Tables** from the Configure menu.	The LLC to SDLC Tables menu appears, with a prompt for the selection.
3	Select the station type to configure: • LLC Profile Table • Token Ring Station Table • Frame Relay Station Table • Ethernet Station Table	The corresponding Station Table Configuration appears, with the prompt for the entry number. **Note** The station type will be listed only if the interface card is inserted and the port is configured.
4	Select the first entry number.	The prompt for the first station parameter appears. As you enter each parameter, the next parameter choice is displayed.

Note
After the stations are configured, you will have to reboot (warm) the Vanguard node to reset the station parameters.

Configuring LLC-SDLC Conversion Station Parameters

LLC-SDLC Stations must be configured to support the AS/400 5494 Communications Server Feature. Token Ring, Ethernet, and Frame Relay LLC-SDLC Stations all support attachment to the AS/400 for support of downstream non-5494 controllers. The following tables describe the LLC-SDLC Station parameters that must be configured for Token Ring, Ethernet, and Frame Relay LLC-SDLC Stations:

Note
The LLC Profile Table may be modified to adjust LLC timing parameters.

External MAC Address (Token Ring and Ethernet Stations only)

Range:	Token Ring: 00:00:00:00:00:01 to 7F:FF:FF:FF:FF:FF Ethernet: 00-00-00-00-00-01 to 7F-FF-FF-FF-FF-FF
Default:	00-00-00-00-00-00
Description:	Specifies the MAC Address of the AS/400 LAN Port. **Note** Non-canonical format is used for Token Ring, and Canonical format is used for Ethernet.

*Internal MAC Address (Token Ring and Ethernet Stations only)

Range:	Token Ring: 00:00:00:00:00:01 to 7F:FF:FF:FF:FF:FF Ethernet: 00-00-00-00-00-01 to 7F-FF-FF-FF-FF-FF
Default:	(MAC Address of the LAN Port)
Description:	Defines the LAN Remote Adapter Address used in the AS/400 APPC Controller Definition, which the APPC Controller uses to communicate with this LLC-SDLC Station. **Note** A change to this parameter requires a Node Boot to take effect.

*Frame Relay Port Number (Frame Relay LLC-SDLC Stations only)

Range:	1 to 254
Default:	1
Description:	Specifies the port used to connect to the AS/400. This is the port number of the Frame Relay port used by this LLC-SDLC Conversion station. **Note** A change to this parameter requires a Node Boot to take effect.

*Frame Relay Station Number (Frame Relay LLC-SDLC Stations only)

Range:	1 to 254
Default:	1
Description:	Specifies the attachment on the Frame Relay port to which this LLC-SDLC Conversion Station is connected. This Frame Relay Station Number matches the DLCI used to attach to the AS/400. **Note** A change to this parameter requires a Node Boot to take effect.

Internal SAP

Range:	01 to FE (hexadecimal)
Default:	04
Description:	Matches the LAN DSAP specified in the AS/400 APPC Controller Definition for the APPC Controller, which is used to communicate with this LLC-SDLC Station.

External SAP

Range:	01 to FE (hexadecimal)
Default:	04
Description:	Matches the LAN SSAP specified in the AS/400 APPC Controller Definition for the APPC Controller, which is used to communicate with this LLC-SDLC Station.

Link Station Type

Range:	SLAC, 5494, SNABSC
Default:	SLAC
Description:	Defines the type of Link Layer conversion supported: • SLAC = LLC-SDLC Conversion (non-5394 support) • 5494 = APPN LEN Link Station for support of RWS downstream controllers • SNABSC = SNA PU type 2.0 Link Station for support of SNA to Bisync Conversion. **Note** You must select 5494 to enable the AS/400 5494 Communications Server Feature. The prompt for Link Station Type appears only if the AS/400 5494 Communications Server license is installed, and there is sufficient memory available to support this Communications Server feature. If the license is not installed, the SLAC option is automatically selected and this prompt will not appear. This means that you will not be able to use the Communications Server feature.

Local Control Point Name

Range:	[Name] Maximum of 8 alphanumeric characters. **Note** The Local Control Point Name must start with a letter, and must be capitalized.
Default:	*LLC-SDLC Station name*
Description:	Identifies each Vanguard LLC-SDLC Station to the AS/400. The default name provided by the LLC-SDLC Station is unique to each Vanguard product. The formula is based on station type, port number, and station number. For example, for T13S001: • T = Token Ring • 13 = Port 13 • S = Station • 001 = Station number **Note** This parameter must match the Remote Location parameter configured in the AS/400 APPC Controller Definition, APPC Device Definition, and Remote Work Station Controller Definition for the controller and device to which the LLC-SDLC Station is connected. **Note** The parameter prompt appears only if the AS/400 5494 Communications Server license is installed, and there is sufficient memory available to support this Communications Server feature.

Remote Control Point Name

Range:	[Name] **Note** The Remote Control Point Name must start with a letter, and must be capitalized.
Default:	REMOTE
Description:	Identifies each LLC-SDLC Station in the Vanguard to the AS/400. This parameter must match the Remote Location parameter configured in the AS/400 APPC Controller Definition, APPC Device Definition, and Remote Work Station Controller Definition for the controller and device to which the LLC-SDLC Station is connected. The Remote Control Point Name should match the AS/400 Local Control Point Name in the AS/400 Network Attributes Definition. **Note** The parameter prompt appears only if the AS/400 5494 Communications Server license is installed, and there is sufficient memory available to support this Communications Server feature.

External PU Type

Range:	4, 2, 2.1
Default:	2.1
Description:	Defines the External PU Type supported. These are: • PU 4 = Front-End Processors • PU 2 = Dependent Controller • PU2.1 = 5494 Controllers and AS/400 **Note** This parameter must be set to 2.1 to support the AS/400 5494 Communications Server feature.

Initiate Test Frame

Range:	ON, WAIT, XID_WAIT
Default:	ON
Description:	Selects how the Test Frame will be initiated between the Vanguard Conversion Station and the attached Controller: • ON = Vanguard initiates Test Frame • WAIT = Vanguard waits for Test Frame from Controller • XID_WAIT = Vanguard waits to begin XID exchange before sending Test Frame. **Note** The WAIT and XID_WAIT options are not supported in the AS/400 5494 Communications Server feature.

Number of Downstream Displays/Printers

Range:	0 to 16
Default:	1
Description:	Specifies the number of devices attached to the remote RWS controller. **Note** If this number is not accurate, the devices will not go ACTIVE. **Note** The parameter prompt appears only if the AS/400 5494 Communications Server license is installed, and there is sufficient memory available to support this Communications Server feature.

Downstream LU ID [0]

Range:	00 to 37 hexadecimal
Default:	00
Description:	Specifies the LU ID of the display/printer attached to the downstream RWS controller. This number must be unique to this LLC Station. This is the Logical Unit Address of the device attached to the controller, and must match the configuration in the remote device and within the AS/400 Display/Printer Device Definition. **Note** The parameter prompt appears only if the AS/400 5494 Communications Server license is installed, and there is sufficient memory available to support this Communications Server feature.

Downstream Display/Printer Type

Range:	Displays: 5291, 3476, 3180 (IBM 5394, Perle 394, and IBM 5294 Controllers Printers: 4224 (IBM 5394, Perle 394)
Default:	Display: 3476 Printer: 4224
Description:	Defines the type of display or printer attached to the downstream RWS controller. **Note** No printers are supported for 5294 controllers. **Note** The parameter appears only if the AS/400 5494 Communications Server license is installed, and there is sufficient memory available to support this Communications Server feature.

QLLC Station Address

Range:	00 to FF
Default:	FF
Description:	Specifies the QLLC Station address used by the controller. Use FF for the Communications Server feature.

XID Value

Range:	Valid XID 3 Identifier
Default:	[Blank]
Description:	Specifies the Vanguards XID value: • For 5394 controller support, this can be left [Blank] if no XID is entered in the AS/400 APPC Controller Definition to attach to this LLC-SDLC Station. • If an XID is entered in the AS/400 APPC Controller Definition, it must be configured here, with 0231 added as a prefix. Example: if the AS/400 has an XID of 07300001, then you would enter 023107300001. • If this field is [Blank], then this LLC-SDLC Station will use 07300001 during the XID exchange.

Configuring 5394 Controllers

Introduction

Each 5394 controller in the network must be configured to match the parameters in both the Vanguard product containing the AS/400 5494 Communications Server feature, and the AS/400.

Note

You should remember that the Vanguard Communications Server feature provides an simulation of a 5494 controller towards the AS/400, but it does not change the actual physical 5394 controller.

Configuring Key 5394 Controller Parameters

These tables describe these parameters for 5394 RWS Controllers:

Note

You may have to configure additional Controller parameters. Refer to your Controller documentation for details.

Field AA - Line Type

Range:	SDLC, X.25, X.21
Suggested Value:	Select the line type connection to the Vanguard.
Description:	Defines the line type connection between the Controller and the Vanguard: • SDLC = 0 • X.25 = 1 • X.21 Switched = 2 • X.21 Leased = 3 • Token Ring = 4 **Note** Vanguard products do not support the X.21 option.

Field 2 - Station Address

Range:	01 to FE (hexadecimal)
Default:	01
Description:	Sets the LU ID address for the controller, which must be defined in the AS/400 parameters.

.

Field 3 Sub-Fields

Subfield	Description	Setting
1	Connection: • Leased = 0 • Switched = 1	Must be 0.
2	Duplexing: • Half Duplex = 0 • Full Duplex = 1	Set to 1.
3	Point-to-point: • Multipoint = 0 • Point-to-point = 1	Must be 1
4	Data encoding method: • NRZI = 0 • NRZ = 1	Must match AS/400 configuration.
5	DTR (Data Transmit Ready): • DTR = 0 • CDSTL = 1	Must be 0.
6	Send Leading Pad: • No = 0 • Yes = 1	Must be 0.
7	Local Loopback: • Not supported = 0	Must be 0.

Sample 5394 Parameter Configuration

The following parameter configuration for the 5394 Controller works with the default TPAD parameter configuration in the attached Vanguard:

Field	*Setting*
Field AA	0
Field 2	FE
Field 3, Subfield 1	0 = Leased Line
Field 3, Subfield 2	1 = FDX
Field 3, Subfield 3	1 = PTP
Field 3, Subfield 4	0 = NRZI
Field 3, Subfield 5	0 = DTR
Field 3, Subfield 6	0 = OFF
Field 3, Subfield 7	0 = OFF

Chapter 3
Statistics and Troubleshooting

Introduction

This chapter contains information to assist you in analyzing and troubleshooting configuration and operation problems. Three major areas are covered:

- Additional Statistics/status screens
- Troubleshooting table
- Trace descriptions

Additional Statistics/status screens for the Vanguard have been added for the AS/400 5494 Communications Server feature. These screens provide additional information in the Detailed Statistics/status screen displays.

A table listing possible problems with recommended actions is presented as a troubleshooting aid.

The trace descriptions, for traces between the AS/400 and the Vanguard node, can assist technicians who are attemting to pinpoint communication faults.

Statistics/status Screens for the AS/400 5494 Communications Server Feature

New LLC-to-SDLC Station Statistics Screens

Two new screens for Conversion statistics have been added to the LLC-to-SDLC Station Statistics for each line type (Token Ring, Ethernet, and Frame Relay).

Note

These screens are displayed only if the LLC-to-SDLC station parameter Link Station Type is set to 5250.

Use this procedure to view these new screens:

Step	*Action*	*Result*
1	Select **Status/Statistics** from the CTP Main menu.	The menu for Status/statistics appears.
2	Select **LLC to SDLC Statistics**.	The menu for LLC to SDLC Statistics appears.
3	Select the defined line type for the Detailed Station Statistics: • **TR** = Token Ring • **FR** = Frame Relay • **ETH** = Ethernet	The prompt for the Entry Number appears.
4	Select the **Entry Number** corresponding to the port connection for the line.	The first page of the LLC-SDLC Conversion Detailed Station Statistics screen appears.
5	Advance to page 4 (of 6 pages).	The SNA Data Summary page (page 4 of the screen displays) appears. See Figure 3-1.
6	Advance to page 5 (of 6 pages).	The Remote Workstation information page appears. See Figure 3-2.

SNA Data Summary Screen

Figure 3-1 shows an example of the Detailed SNA Data Summary page.

```
Node:              Address:              Date:              Time:

 LLC-SDLC Conversion Detailed Statistics                  Page: 4 of 6

Interface Type: Ethernet           Station Number: 1 Station Status: Up

SNA Data Summary:
                  IN       OUT
Characters:       6648     387117      Flow Ctrl Ons   16
Info Frames:      496      1037        Flow Ctrl Offs:  16

Current Queued QLLC Tx Packets:    0
Maximum Queued QLLC Tx Packets:    3

Station Connection State:  ALLOCATED   QLLC Tx Flow State:  CLEAR


         Station              04:16:35               67793          1%


Press any key to continue (ESC to exit)
```

Figure 3-1. LLC-to-SDLC Detailed Station Statistics Screen (Page 4)

The screen terms are described in this table:

Term	Description
Characters IN	Number of characters received by the QLLC Station from the remote controller.
Characters OUT	Number of characters sent by the QLLC Station to the remote controller.
Info Frames IN	Number of information frames received by the QLLC Station from the remote controller.
Info Frames OUT	Number of information frames sent by the QLLC Station to the remote controller.
Flow Ctrl Ons Rx	The number of times QLLC detected flow control (indicating network congestion).
Flow Ctrl Offs Rx	The number of times QLLC detected no flow control (indicating no network congestion).
Current Queued QLLC Tx Packets	The current number of queued data packets awaiting transmission.
Maximum Queued QLLC Tx Packets	The greatest number of queued data packets awaiting transmission.

Term *(continued)*	***Description***
Station Connection State	The current state of the SLAC Station which is establishing a connection between the remote 5393-type controller and the LAN or Frame Relay connection. The possible values are: • RECONFIGURING: SLAC station is currently disabled and is waiting for reconfiguration or enable commands. • AS400 LINE DOWN: The AS/400 connection for LAN or Frame Relay is not active. • QLLC LINE DOWN: The AS/400 line is active, but the QLLC connection is inactive. • ALLOCATING: The AS/400 LAN or Frame Relay connection is active, the QLLC connection is active, and the LU6.2 session is currently being allocated. • PARTIALLY ALLOCATED: The first part of the LU6.2 session allocation is completed. • QLLC XID EXCHANGE: The XID exchange with the remote controller across the QLLC connection is in negotiation. • WAITING FOR LSTRT: XID exchange is complete, and QLLC is waiting for the controller to enter NRM (Normal Response Mode) state. • ALLOCATED: The LU6.2 session is fully allocated.
QLLC Tx Flow State	This is the current flow state for sending data to the QLLC station: • CLEAR: No current flow control condition (no network congestion) • BLOCKED: Flow control condition exists (network congestion).

Remote Workstation (LU) Information Screen

Figure 3-2 shows an example of the Remote Workstations (LU) information screen. This page displays the LU IDs and statuses for each remote workstation configured for the selected station (on the Vanguard connected to the controller). This information is useful in determining if the remote workstation devices have established a connection with the AS/400 (the ALLOCATED state).

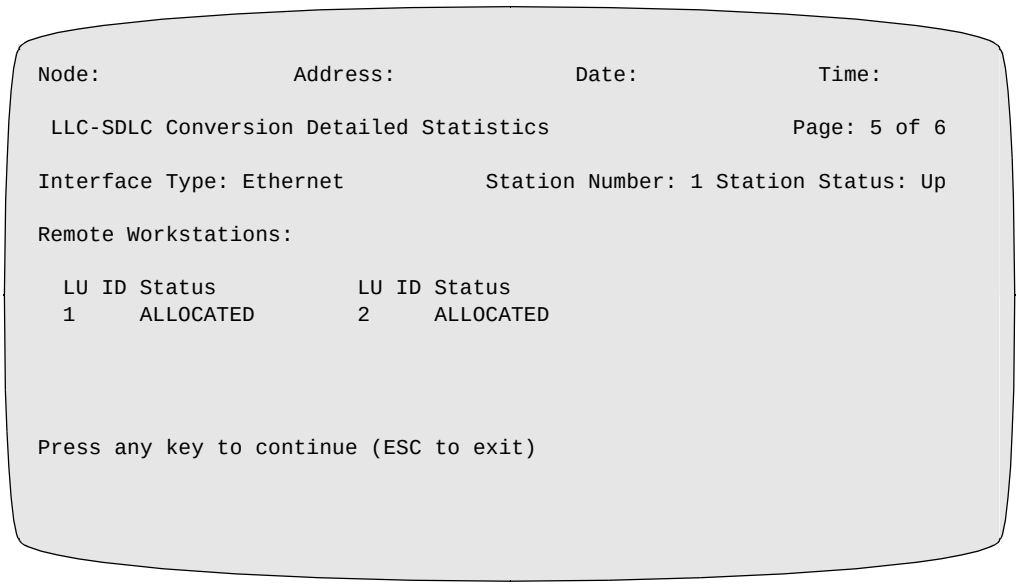


Figure 3-2. LLC-to-SDLC Detailed Station Statistics Screen (Page 5)

The screen terms are described in this table:

Term	*Description*
LU ID	The local LU identifier of the remote workstation that is configured in the station table (of the Vanguard attached to the controller).
Status	The current status of the remote workstation. The possible values are: • INITIALISING: The remote workstation session is being initialized, and there is no active connection between the AS/400 and the remote workstation. • POWERED OFF: The remote workstation is powered off or disconnected from the remote controller. • ALLOCATING: The LU6.2 session for the remote workstation is being allocated. • ALLOCATED: The LU6.2 session for the remote workstation is now allocated. • DEALLOCATING: The LU6.2 session for the remote station is being deallocated.

Troubleshooting and Diagnostics

Introduction

This table lists equipment or software conditions which may occur, and corrective actions which should be done to resolve the condition. Further remedial actions may be recommended or initiated by Customer Service.

Condition or Problem	Explanation	Suggested Actions
The Vanguard node will not start sending test frames from the Wait state.	The Wait option is not supported for Vanguard nodes with the AS/400 5494 Communications Server feature.	Configure the Vanguard node: Initiate Test = ON. For Stations in the VARY OFF state in the AS/400, disable Station on Vanguard.
Switched disconnect option in AS/400 configuration should not be used.	The Switched Disconnect parameter in the APPC Controller Definition and in the Remote Work Station Definition on the AS/400 must be set to NO for compatibility with the Vanguard Node AS/400 5494 Communication Server Option.	Set the Switched Disconnect parameter to NO in the AS/400.
The AS/400 Autocreate feature for APPC Controller Definition does not work with the Vanguard node.	AS/400 Autocreate feature is not supported for the Vanguard AS/400 5494 Communication Server feature.	User should manually create APPC Controller Definitions on the AS/400.
The AS/400 drops the line connection to the LAN (or Vanguard) when the last controller device is disconnected or turned off.	The AS/400 does not see any active devices on the line.	User must set Drop line at signoff parameter in AS/400 Device Definition to “*NO”.
AS/400 goes into RCYPND state when a Vanguard node is disabled and then re-enabled. The Vanguard stations are listed as “DOWN” and page 4 of the LLC-SDLC Conversion Detailed Statistics shows the Station Connection State as “AS/400 LINE DOWN”.	The AS/400 goes into a RCYPND (recovery pending) state for the controllers, which is not a normal condition. The AS/400 and the Vanguard apparently will not resume communication until the controllers and devices are reset in the AS/400.	The user should reset all attached units in the AS/400 Definitions. This reset process involves defining each controller and attached device to “VARY OFF” and then back to “VARY ON”.
Disruptive action on a line, port, or station causes a printer attached to a remote controller to be listed in the wrong state. The AS/400 shows the printer in the “ACTIVE/WRITER” state while the Vanguard node Conversion Station statistics show the printer in the “INITIALIZING” state.	The AS/400 system messages do not document when the printer returns on-line after the disruption. This condition will disappear after a job has been processed by the printer.	Send a test print job to the printer, and check the state in the AS/400 and in the SLAC Conversion Station. Check the workstation LU ID for the printer.

Viewing Traces

Introduction

This section describes the traces you should see between the AS/400 and the 5493-type remote controller when the AS/400 5494 Communications Server is correctly installed. These are the same traces that you will see for 5494-type controllers. You can compare these traces with traces from your equipment, to help detect problems.

Refer to Figure 1-2 for a summary of a typical start-up sequence (SDLC-LLC Station).

5494-Type Controller Startup Traces

The trace between the AS/400 and a 5394-type controller through the Vanguard emulation can be divided into three distinct parts:

- Initial BIND and ALLOCATE
- X38 Phase
- Remote Workstation Setup

Initial BIND and ALLOCATE

The following traces will be displayed during the initial BIND and ALLOCATE portion of startup:

Step	*Result*
1	The 5394-type controller sends a BIND with mode name SVCSMNGR. This BIND is received by the Vanguard Node, and converted into an LU6.2 BIND for the AS/400 through emulation by the AS/400 5494 Communications Server feature.
2	The AS/400 responds to the BIND.
3	CNOS commands are exchanged between the 5394 and AS/400 on the SVCSMNGR session through the Vanguard emulation. The session is eventually unbound by the 5394.
4	The 5394 sends a BIND with mode name QRTMWSC, which is changed into an LU6.2 BIND by the Vanguard. This BIND is for the controller sessions between the AS/400 and the 5394.
5	The AS/400 responds to the BIND.
6	The 5394 sends an ALLOCATE message, which the Vanguard then embeds into a FMH5 message (i.e., ALLOCATE) to the AS/400. This includes the following PIP data: • 00 12 12 f5 00 0e 12 e2 01 11 01 01 38 04 04 d4 07 30 The PIP data represents internal commands between the AS/400 and the 5394. The x38 refers to the LU ID within embedded LU7 messages sent during this controller session. This is described in further detail below.

Step	Result (continued)
7	The AS/400 replies to the FMH5 message with the following data: • 00 52 d8 22 00 00 ef 80 c1 d7 40 40 40 40 e2 f1 f0 c1 f5 f5 f0 f0 d7 c5 d9 d3 c5 f5 f4 f9 f4 40 82 d6 11 38 00 00 02 f0 00 0b d7 c5 d9 d3 c5 f4 f9 f4 40 40 d8 e4 e2 c5 d9 40 40 40 40 40 f0 f0 f2 f7 f0 f8 f9 f8 f0 f2 f2 f5 f1 f1 f4 f3 f4 f8 The "d8 22" is some type of header or command identifier; the remainder of the message contains information about the AS/400 configuration.

X38 Phase

The following traces will be displayed during the X38 Phase portion of startup

Step	Result
1	The AS/400 sends an embedded LU4/7 ACTLU for LU ID x38. This, and all subsequent embedded LU4/7 messages, are preceded by a four-byte header: *xx yy* d8 24 where *xx* and *yy* is the total length of the embedded message, including the four-byte header. The Vanguard removes the LU6.2 portion, and sends the message to the 5394.
2	The 5394 responds with an ACTLU response, which is passed on to the AS/400. This response contains the following additional data: • 00 84 80 00 00
3	The AS/400 sends an LU4/7 BIND for LU ID x38.
4	The 5394 responds with a BIND response, which goes through the Vanguard to the AS/400.
5	The AS/400 then sends four embedded LU4/7 messages to the Vanguard for the 5394, each of which has LU ID x38 and starts with the command code "04 f3". This command code indicates a write structured field (WSF) command. The sub-code has the format "d8 20/21/22" which is a reserved sub-code. The WSF commands may be chained if they are large.
6	The 5394 responds to each WSF command.
7	The AS/400 sends an embedded UNBIND and DACTLU to the Vanguard, which then sends the separated NBIND and DACTLU commands to the 5394. The controller responds to each command. This concludes the messages for LU ID x38.

Remote Workstation Setup

The following traces will be displayed during the Remote Workstation Setup portion of startup:

Step	Result
1	The AS/400 sends an embedded LU7 message with LU ID x00. The message starts with “41 03 8d” which indicates an NMVT (Network Management Vector Transport) command. The sub-vector, “80 90” indicates a Request Product Set ID command.
2	The 5394 replies to the NMVT, and then sends a number of NMVTs itself. The first NMVT contains the sub-command “00 90” which indicates a Reply Product Set ID. This is followed by “10” which is a Product Set ID sub-vector. The 5394 then sends details about itself. The AS/400 replies to this NMVT. For each workstation attached to the 5434, the 5394 then sends an NMVT which contains the following information: • 04 = SNA Address List sub-vector, including the LU4/7 LU ID. • 82 = Port attached device configuration description sub-vector. This includes the port number, which is always the same as the LU4/7 LU ID, and which also indicates if the workstation is powered on. • 10 = Product Set ID sub-vector, which includes the device type and model. • 0 = Date Time sub-vector.
3	The AS/400 responds to each NMVT sent by the 5394, through the Vanguard.

Step	Result (continued)
4	For each workstation configured in the AS/400 as a 5494 (including 5394-types emulating 5494s), the following actions occur: a) The AS/400 sends an LU6.2 BIND for the workstation session. The controller replies to the BIND. b) The AS/400 sends an FMH5 message (i.e., ALLOCATE) to the 5394. This includes the following pip data: • 00 0d 12 f5 00 09 12 e2 32 00 00 00 *xx* d7 d5 4b where *xx* is the LU4/7 LU ID of the workstation as configured on the AS/400. c) The controller replies to the ALLOCATE with the following initial data: • 00 06 e8 22 00 00 d) The AS/400 sends an embedded LU4/7 ACTLU for the LU4/7 LU ID of the workstation. The controller replies to this, with the reply containing additional bytes: • 00 84 *xx* 00 00 If the workstation receiving the ACTLU is powered on, then *xx* has the value 80; if powered off, it has the value A0. This bit 6 of the third additional byte indicates if the workstation is powered off or otherwise unavailable. e) If the workstation is powered on: The AS/400 sends an embedded LU4/7 BIND for the workstation, which is unbound by the Vanguard, then sent to the 5394. The 5394 responds to this BIND. The AS/400 sends four embedded WSF commands for the workstation. The fifth byte of each command, known as the C-byte, is *x*D8. The 5394 responds to each command with the following responses: • 00 00 88 00 0a d8 22 12 00 05 13 01 76 • 00 00 88 00 05 d8 22 10 • 00 00 88 00 0a d8 22 12 00 05 13 01 77 • 00 00 88 00 05 d8 22 10 Finally, the AS/400 sends a logon screen to the 5394, again as embedded LU4/7 data which is first separated by the Vanguard before reaching the 5394. f) If the workstation is powered off, the AS/400 sends an embedded DEACTLU to the 5394, and the 5394 responds. The AS/400 then sends an UNBIND for the LU6.2 workstation session, and the 5393 responds after the Vanguard relays the message.

5394-Type Controller Startup Traces

A trace between the AS/400 and a 5394-type controller shows the following steps during startup:

Step	Result
1	The AS/400 sends an ACTLU for LU ID 21.
2	The 5394 sends a negative response with sense code x80 x04.
3	For each workstation configured as a 5394 on the AS/400, the following actions occur: a) The AS/400 sends an LU4/7 ACTLU for the LU4/7 LU ID of the workstation. The 5394 replies to this, with the following additional bytes: • 04 84 *xx* 00 00 If the workstation receiving the ACTLU is powered on, then *xx* has a value of 80; if powered off, the value is A0. The bit 6 of the third byte indicates that the workstation is powered off or is unavailable. If the workstation is powered off, nothing further occurs. If the workstation is powered on, the remaining events are described below. b) The AS/400 sends a BIND for the workstation. c) The 5394 responds to the BIND. d) If bit 7 of byte 25 of the BIND was set, the AS/400 sends two WSF commands to the 5394, which responds. e) The AS/400 sends a logon screen to the 5394.

5494-Type Workstation Poweroff Traces

A trace between the AS/400 anT4-type controller shows the following steps when a single workstation on the 5494 is powered off.

Step	Result
1	An embedded LU4/7 RSHUTD command is send from the 5494 for the workstation being powered off.
2	The AS/400 responds to this command.
3	The AS/400 sends an embedded LU4/7 UNBIND command for the workstation to the controller.
4	The 5494 responds to this command.
5	The 5494 sends an NMVT message to the controller LU6.2 session (on the AS/400), using LU ID x00. The format of this message is: • 00 90 = Reply Product Set ID Vector. This contains the following sub-vectors: • 82 = Port attached device configuration description sub-vector. This includes the port number which is always the same as the LU4/7 LU ID, and indicates that the workstation has been powered off. • 01 = Date Time sub-vector.
6	The AS/400 replies to the NMVT message.

Step	Result (continued)
7	The AS/400 sends an embedded LU4/7 DACTLU command for the workstation.
8	The 5494 responds to this command.
9	The AS/400 sends an LU6.2 UNBIND for the workstation session.
10	The 5494 responds to this command.

5494-Type Workstation Poweron Traces

A trace between the AS/400 and a 5494-type controller shows the following steps when a single workstation on the 5494 is powered on.

Step	Result
1	The 5494 sends an NMVT command to the controller session on the AS/400 using LU ID x00. The format of this NMVT is exactly the same as the one seen during workstation startup.
2	Commands are then exchanged between the AS/400 and the 5494 which are identical to those commands seen during workstation startup.

5394-Type Workstation Poweroff Traces

A trace between the AS/400 and a 5394-type controller shows the following steps when a single workstation on the 5394 is powered off.

Step	Result
1	The 5394 sends an RSHUTD command to the AS/400 for the workstation being powered off.
2	The AS/400 responds to this command.
3	The 5394 sends an LUSTAT command to the AS/400 for the workstation, containing the following data: • 08 31 00 00 which indicates that the workstation is no longer available.
4	The AS/400 responds to this command.
5	The AS/400 sends an UNBIND command to the workstation. **Note** A DACTLU command is NOT sent; the 5394 can send an LUSTAT for the workstation when it is powered on.
6	The 5394 responds to this command.

5394-Type Workstation Poweron Traces

A trace between the AS/400 and a 5394-type controller shows the following steps when a single workstation on the 5394 is powered on.

Step	Result
1	The 5394 sends an LUSTAT command to the AS/400 with the LU ID of the workstation being powered on, and containing the following data: • 00 01 00 00 which indicates that the device is now available.
2	The AS/400 sends a BIND command to the 5394 with the LU ID of the workstation.
3	The 5394 responds to the command.
4	The AS/400 sends a logon screen to the 5394 with the LU ID of the workstation.

Traces for Deallocating the Controller Session on the AS/400 for 5494 Controllers

When the RWS controller is VARIED OFF on the AS/400, this causes the corresponding session between the AS/400 and the 5494 to be deallocated. A trace shows the following steps when this occurs:

Step	Result
1	The AS/400 sends an REQMS (request maintenance statistics) message to the 5494.
2	The 5494 responds to this request.
3	The 5494 then sends an RECFMS (record formatted maintenance statistics) message to the AS/400.
4	The AS/400 responds to this message.
5	The AS/400 sends an LU6.2 UNBIND command to the 5494.
6	The 5494 responds to this command.

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