HP 18261A
SNA Analysis

for the HP 4952A Protocol Analyzer

User's Guide

HEWLETT PACKARD

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NOTICE

If your software application or hardware should fail, contact your local Hewlett-Packard Sales Office. A list of offices can be found in the back of the protocol analyzer operating manual.

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How To Use This Guide

If you have not used an HP 4952 Protocol Analyzer before, please become familiar with its operation before reading this guide. The protocol analyzer Operator's Manual will help you become familiar with the analyzer's basic features.

If you are familiar with the HP 4952 Protocol Analyzer, you can learn how to use the SNA Analysis very quickly. Before using SNA Analysis make certain you have a working copy of the master disc. Instructions on how to make the working copy are given in appendix A.

If you like to learn by doing, load the SNA Analysis application and the sample data as directed in chapter 2, and then follow the examples in chapter 3 Getting Started. The other chapters can be read in any order that suits your needs. If you prefer a more methodical approach, you can read the User's Guide in sequence from chapter 1 to chapter 5. The content of each chapter is given below.

Chapter 1: describes the features of SNA Analysis.

Chapter 2: provides a quick review of how to turn on the protocol analyzer and load SNA Analysis application and sample data.

Chapter 3: gives a learn-by-doing presentation of the basic use and features of SNA Analysis.

Chapter 4: presents a brief overview of SNA theory and concepts.

Chapter 5: covers the details of reading and interpreting the data in SNA displays.

Chapter 6: gives information about using simulation with SNA analysis.

Chapter 7: presents the user with simulation reference.

Chapter 8: illustrates the relationship of SNA within SDLC and of SNA within X.25.

1

Introduction

Description

The HP 18261A SNA Analysis package for the HP 4952 Protocol Analyzer provides Systems Network Architecture (SNA) users with a tool for monitoring, capturing, and decoding SNA data traffic. In particular, the package provides many features for the analysis of SNA FID types 0, 1, 2, 3, 4, and F data traffic.

The HP 18261A will decode SNA data running on an SDLC link or on an X.25 Packet Switched Network (PSN). The following X.25 Link Level Control (LLC) protocols are supported:

- QLLC
- ELLC
- PSH

Five flexible user definable formats allow custom decoding of FMH/RUs (Function Management/Request/Response Units). These custom displays can be saved for later use.

In addition, all standard HP 4952 display formats are available.

To increase the amount of useful SNA data stored into the capture buffer, link filtering is provided. You may filter out supervisory frames (which contain no SNA data), and/or only capture frames with a specific link address.

Equipment Supplied

The SNA Analysis package includes the following:

- Master Disc
- Blank Disc
- User's Guide

The master disc contains the SNA Analysis application program and a sample SNA data file. The sample data file can be used in conjunction with this User's Guide to help learn about the SNA Analysis features. The blank disc is provided so that you can make a working copy for your day-to-day use and save the master copy as a backup. The User's Guide provides reference and tutorial information and contains the master and blank disc.

Applications

The SNA Analysis package can be used anywhere SNA data flows over an SDLC link or over an X.25 PSN.

End-users can use the SNA Analysis to monitor and decode SNA traffic occurring between hosts, cluster controllers, and communications controllers within the SNA network.

Network providers can use the SNA Analysis to expedite the installation and troubleshooting of SNA components in the network.

SNA compatible equipment manufacturers can verify correct operation of their equipment.

Specifications

Physical Interface

All supported HP 4952 interfaces, including RS-232C/V.24, RS-449, V.35, and X.21.

Protocol

SNA as defined in the IBM(tm) "Systems Network Architecture Summary", GA27-3136-5, File No. Genl-30 (SNA).

Data Rates

Up to 64 kbps.

Memory Requirements

The SNA Analysis application uses 24 kbytes of application memory.

2

Loading the Application & Sample Data

Introduction

This chapter tells you how to load the SNA Analysis application and sample data into your HP 4952 Protocol Analyzer. The manual assumes that you are already familiar with the basic use of the protocol analyzer. For your convenience, brief instructions on how to get the analyzer running are given here.

For detailed information concerning voltage and grounding requirements, power cords, and operation refer to the HP 4952 Protocol Analyzer Operating Manual.

Connecting An Interface Pod

Make certain the protocol analyzer is turned off. Connect the interface pod cable to the connector in the lower center of the analyzer's back panel.

Turning On The Analyzer

Turn on the HP 4952 Protocol Analyzer by setting the LINE switch on the back panel to the "1" position. The analyzer begins an automatic self test. After the test is completed, the top level menu is displayed.

If errors have been detected by the test, a list of errors is displayed. You can go to the top level menu from the error display by pressing [EXIT]. In this case, however, proper operation cannot be assumed; contact your Hewlett-Packard Sales and Service office for assistance.

Making A Working Copy Of The Master Disc

Hewlett-Packard recommends that you make a working copy of the master disc. Use the working copy and retain the master as a backup in case your working disc fails due to wear or accidental erasure. Copying an application program for any reason other than your own backup violates copyright laws.

The HP 18261A SNA Analysis package includes a master disc and a blank disc. The blank disc is provided so you can make a working copy of the master disc. If you are not familiar with the basic features of the HP 4952, you can use the procedures presented in the HP 4952 Operators Manual.

Looking At The Disc Catalog

To see what's on the SNA Analysis disc, you can use the catalog feature.

1. Locate your working copy of the disc and insert it into the disc drive.

2. In the top level menu, press <Mass Store>.

3. The disc catalog is read and displayed. Press [EXIT] to leave the catalog display.

Loading The SNA Analysis Application

1. In the mass storage catalog display use the arrow keys to select the **SNA DECODE** Application Program.

2. Press <Load>.

3. Press <Execute>.

   The disc is read and the SNA Analysis program is loaded into the protocol analyzer memory. The top level menu reappears and shows that the SNA application is active. Whenever you turn off the analyzer, or press the <reset> softkey, the application is cleared from memory.

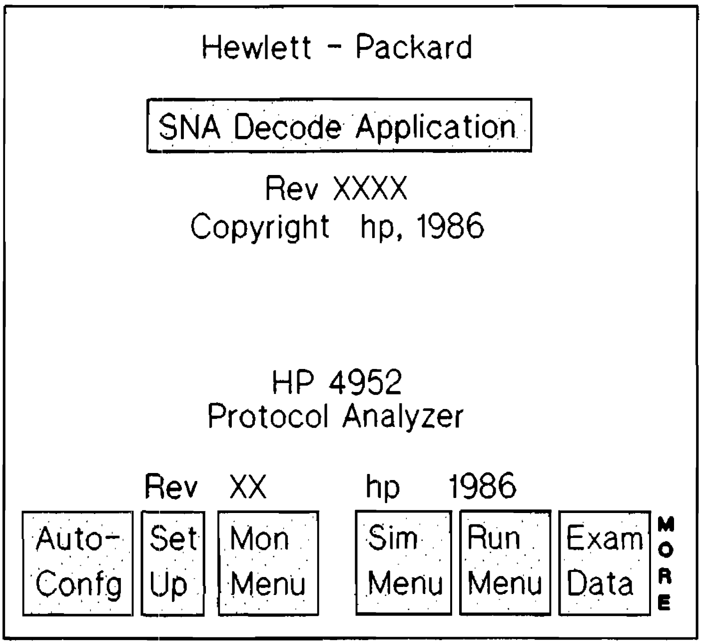

Figure 2-3. Top Level Menu With SNA

Loading SNA Sample Data

In Chapter 3 Getting Started, there are examples that use SNA sample data. To load the sample data file, use the steps given below.

NOTE

Contents of the data buffer will be replaced by the sample data. Store any buffer data that you wish to keep before loading the sample data.

---

1. From the top level menu press <Mass Store>.
2. Use the arrow keys to get to **SNA_DATA** Menu & Data.
3. Press <Load>.
4. Press <Execute>.
5. Press [EXIT] to return to the top level menu.
6. Go to Chapter 3 Getting Started.

Storing & Loading Menus

A basic feature of the HP 4952 is the storage of menus to disc. When you use this feature with the SNA Analysis loaded, in addition to storing the basic menus, you can store your SNA display format selection as well as your link filtering selections.

NOTE

Menus stored while SNA Analysis application is loaded can only be loaded back into an HP 4952 that has SNA Analysis loaded into its application memory.

Always go to the top level menu before turning off the analyzer. This saves your menus and buffer data in battery powered, nonvolatile memory.

3

Getting Started

Learn By Doing

This chapter gives you a learn-by-doing presentation of the SNA Analysis features. It will only take you about 15 minutes to follow through the examples.

You must load the SNA Analysis application and SNA sample data into the protocol analyzer. If you haven't done it already, just follow the instructions in Chapter 2.

On-line & Off-line Viewing

The SNA Analysis Application provides you not only with the capability to monitor on-line SNA data traffic, but also, to capture the data traffic and view it off-line. You can store data traffic to disc, or directly into the analyzer's data buffer. Once stored in the data buffer, you can monitor the buffer to get an instant replay of activity. In addition, you can examine the data traffic in detail in a non real-time mode.

In the following examples, we've taken advantage of these features and have provided you with sample SNA data which you've loaded into the analyzer's data buffer.

The Setup Menu

When you load the SNA Analysis application, the protocol analyzer is automatically setup for SDLC protocol. The setup menu default settings can be viewed by performing the following steps.

1. Get the top level menu and press <Set Up>.

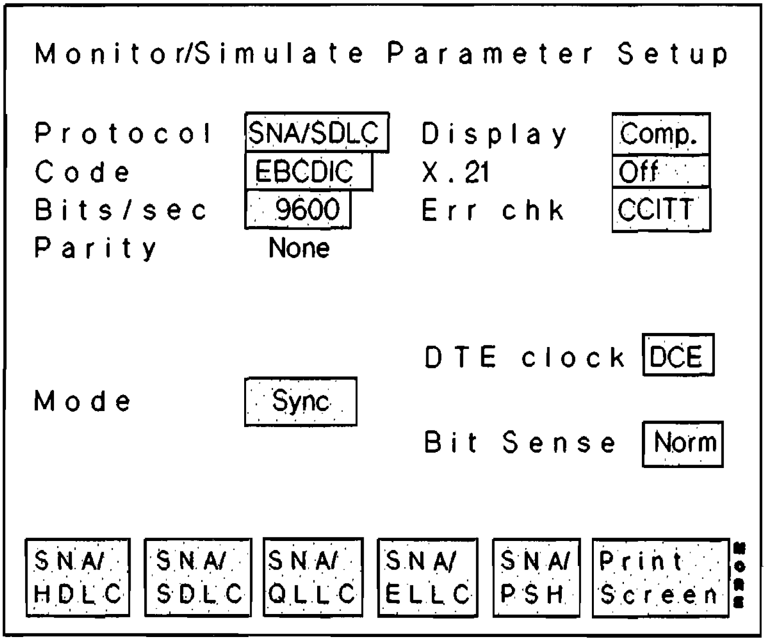

Figure 3-2. SNA Setup Menu

2. The default data code for SNA messages is EBCDIC. The data code selected in the setup menu is very important because all <Text> softkeys found in other menus refer to the data code selected in the setup menu.

3. Notice the Display field in the setup menu. While in this field the softkey choices are Composite, Transmission Header, Request/Response Header, or Function Management Header/Request/Response Unit. This display mode is used during run time and the default during examine data. You can still select other modes while in the Examine Data mode.

The SNA Filter Setup

The SNA filter menu lets you filter out frames from the buffer that do not have the correct address, or frames that are the supervisory frames, or both. Filtering out these frames will help conserve buffer memory and increase the amount of useful data.

When SNA-X.25 is being measured, the filtering will take effect on the X.25 link level frames, which may limit the effectiveness of the filtering.

1. From the top level menu, press <Run Menu>, then <Data Filter>.

   Selecting <On> will enable the filter during run time and selecting <Off> will disable the filter during run time. Once the filter is enabled, a field appears that lets you specify the Link Address in hex and hex alpha keys. When the filter is turned on, only frames with this address are captured and decoded.

   Another field allow the suppression of supervisory frames which contain no SNA data. By suppressing these frames, the amount of useful SNA data is maximized.

Monitor - SNA Format

In this example, you'll be monitoring the SNA data traffic held in the data buffer. You will see the traffic just as if you were monitoring the real transmission line.

1. Get to the top level menu.

2. Now run the protocol analyzer and observe how it monitors data traffic and displays SNA headers and data. Press <Run Menu>.

3. Press <Monitor Buffer>. The protocol analyzer is monitoring activity in its buffer.

```
FMAE DaOa Sn|Ty Ca FSC|Fm/Rc

2 0 P E  02 00  0001 RQ  SC  F   0  ACTLU
2 0 P E  00 02  0001 RS  SC  F   0  ACTLU
2 0 P N  00 02  0001 RQ  FM  F   0  NOTFY_S_L
2 0 P E  02 00  0001 RS  FM  F   0
2 0 P E  02 00  0001 RQ  SC  F   0  BIND
2 0 P E  0B 02  0002 RS  SC  F   0  BIND
2 0 P E  02 0B  0003 RQ  SC  F   0  SDT
2 0 P E  0B 02  0001 RS  SC  F   0  SDT
2 0 P N  02 0B  0001 RQ  DF  F   0  BID
2 0 P N  0B 02  0001 RS  DF  F   0  BID
2 0 P N  02 0B  0002 RQ  FM      0
2 0 P N  0B 02  0002 RS  FM      0
|Auto- | |Set| |Mon |   |Sim | |Run | |Exam|
|Config| |Up | |Menu|   |Menu| |Menu| |Data|
```

Figure 3-3. Monitoring SNA Data

Notice that each frame is displayed on a single line in the following format:

Transmission Hdr | Request/Response Hdr | Request/Response Unit

Observe the running indicator <> at the bottom of the display. When all the data in the buffer has been monitored, the display activity stops and the softkeys for the top level menu are shown.

The blank inverse video line indicates the last frame monitored. Frames below the line contain data traffic that precedes the frames shown above the line.

The flashing B at the far right of the message at the top of the display indicates a bad FCS character. A good FCS character is always assumed and thus not displayed. For more information on this topic, refer to Chapter 5 Reading SNA Displays.

Examine Data - SNA Format

The first example showed you how to monitor SNA data traffic. You saw that monitoring causes the display to show data traffic activity in real-time. This example will show you how to examine captured SNA headers and data in a non real-time mode. This lets you control the display and look for detailed information. A complete description of the display entries is given in Chapter 5 Reading SNA Displays.

1. To display the data in the buffer, press <Exam Data>.

2. Notice the two lines at the top of the display. They show more detail about the frame than is available in the run display. This is the expansion area. The first line is the expanded header. The data on the second line corresponds to the frame in which the cursor is positioned.

```
Res  QP Br Cc EP 00 01 02 03 04 05 06 07 08 09 10 11 12 13 14 15
1             0  00 SH SH SX NU NU NU NU NU
FMAE  Da Oa Sn  Ty Ca FSC Fm/Rc
20PE  00 00 00 01 RQ SC F 0 ACTPU
20PE  00 00 00 01 RQ SC F 0 ACTPU
20PE  02 00 00 01 RQ SC F 0 ACTLU
20PN  00 02 00 01 RQ SC F 0 NOTFY_S_L
20PN  00 02 00 01 RQ SC F 0 NOTFY_S_L
20PE  02 02 00 02 RQ SC F 0 BIND
20PE  02 0B 00 02 RQ SC F 0 BIND
20PE  0B 02 00 03 RQ SC F 0 SDT
20PE  02 0B 00 03 RQ SC F 0 SDT
20PN  0B 02 00 01 RQ SC F 0 BID
20PN  02 0B 01 01 RQ SC F 0 BID
     | Roll | Roll | Next | Prev | Timer  | M
 Hex | Up   | Down | Page | Page | & Cntr | O
                                            R
                                            E
```

Figure 3-4. Examine Data Display

Changing Data Codes

1. Normally, you'll be using EBCDIC data code to view data. You can change to hex code by pressing the <Hex> softkey.

2. Press <Hex>. Notice the text on the second line changes to hex.

3. Press <Text> to redisplay data in the data code selected in the setup menu, in this case EBCDIC.

Finding Data Traffic Information

1. You can roll the displayed data traffic up and down one line at a time by using the <Roll Up> and <Roll Down> softkeys. Give it a try.

2. Notice that although the screen rolled up and down the cursor remained in the same position. To move the cursor without rolling the display, use the arrow (cursor control) keys. The up arrow and the left arrow keys both move the cursor up one line. The down arrow and right arrow keys move the cursor down one line.

3. You can move more quickly through the data traffic by using the <Next Page> and <Prev Page> softkeys. These softkeys move through the display eleven lines at a time. Try it.

4. Another method of display control is to use the <Spec Block> softkey. Use the [MORE] key to get the <Spec Block> softkey. Press <Spec Block>, then type in the block of your choice and press the [RTN] key.

5. If you use highlights in your work, you can also move through the display by using the <Next Hilit> softkey. The basic use of highlights is explained in the HP 4952 Operator's Manual.

Changing the Display Modes

To change the display mode, use the [More] key to get to the <Chang Dsply> softkey. From this softkey you can choose between four different displays. They are the Composite, the Transmission Header, the Request/Response Header, or Function Management Header/Request/Response Unit.

1. Change the Display Mode to Transmission Header by pressing <TH>.

   Notice that the headings have changed. Try changing the display to RH (Request/Response Header) and then to FMH/RU (Function Management Header/Request/Response Unit). Each of the different displays will be described in more detail in Chapter 5 Reading SNA Displays.

Timers & Counters

1. Press [MORE] and locate the <Timer & Cntr> softkey. The sample data does not contain timer or counter information. You can use timers and counters in the same manner as you would with the basic protocol analyzer. If necessary, see HP 4952 Operator's Manual.

SNA Display Definition Menu

You can specify how your data is to be displayed with the SNA Display Definition Menu. This menu can be viewed by performing the following steps.

1. Get to the top level menu and press [More].
2. Press <SNA def>

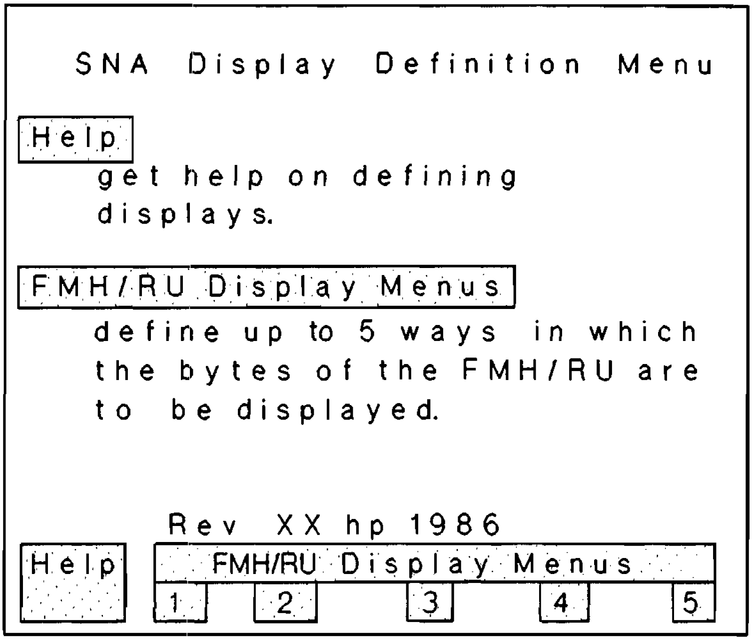

Figure 3-1. The SNA Display Definition Menu

The <Help> softkey will access a menu which is a tutorial on how to set up the FMH/RU displays.

The <FMH/RU> softkeys will access five menus in which you can specify how the data will be displayed. These menu displays are described in more detail in Chapter 5.

4

SNA Basics

Introduction

This chapter briefly presents the basic concepts of SNA that are pertinent to the features of the SNA Decode package.

An SNA network consists of physical components and software. Physical components include processors, communications controllers, and cluster controllers. These physical items can be connected by processor channels, telephone lines, microwave links, and satellites. The software consists of access methods, application subsystems, user application programs, and network control programs.

SNA is IBM^{tm} architecture for data communications systems and is a set of rules to which product designs conform. The SNA specifications describe:

- Logical structure of data communications networks
- Protocols for synchronization between networks
- Message formats
- Operational sequences and configurations

SNA is the IBM^{tm} blueprint for current and future data communications systems. This includes:

- Distributed data processing systems
- Office systems
- Communication Network Management

SNA is also a set of hardware and software products. The number and range of SNA product functions include:

- 3270 terminals
- 370X and 37X5 communications controllers
- S/370, 303X, 4300 computers
- ACF/VTAM, OS/MVS, OS/VS1, ACF/NCP/VS, etc.

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SNA Basics

End-Users

The main purpose of SNA is end-user to end-user communication. An SNA network exists to provide services for end users; the network exists to transfer data between end users. SNA strives to separate the end user from the network. SNA structures its network so the end user does not have to deal with the details of transferring data. SNA leaves the details of data communications to the network itself. Thus, in the SNA model, end users communicate with each other over a network whose operations are transparent to them. This allows physical device dependencies to be separated from application programs.

An end user may be:

- a person at a terminal
- an application program
- a printer
- a mass storage device

Every end-user is associated with a logical unit that allows communication with the services of the SNA network. The SNA network services enable end-users to communicate with each other. Data flow between users is generally referred to as message units.

SNA Nodes

The basic building block of an SNA network is the node. An SNA network is essentially a group of nodes joined together by data links.

An SNA node is a point within the network that contains SNA components. It is convenient to think of an SNA node as being a terminal, controller, or processor in the network. Strictly speaking, the SNA node refers only to the hardware and software joined together by data links that are designed to SNA specifications. Nodes are either subarea nodes or peripheral nodes.

A subarea is a part of the SNA network that contains a subarea node and all the peripheral nodes that are attached to it. A subarea can receive message units from any origin and move them toward any destination, provided that the links are available.

In contrast, a peripheral node can pass message units only between units within the node or to the subarea node to which it is attached.

SNA Services

The SNA network provides two broad categories of services. One category of services is provided by the path control network. These services allow the user to transmit data quickly and accurately between network locations, regardless of how far apart the locations are from each other.

Path Control Network Services

- Routing
- Class of Service
- Virtual Route Pacing
- Data Link Control

The other category of services is provided by network addressable units (NAU). These services facilitate the exchange of data by pairs of end-users connected to each other through the path control network. NAU services that exchange data between end-users are referred to as end-user services; and, services that allow the network to coordinate its activities are called session network services. Each NAU also contains data flow control services and transmission control services.

NAU Network Services

- End-User
- Session Network
- Data Flow Control
- Transmission Control

SNA Layers

Because a group of SNA services interacts in a specified way with adjacent nodes, the groups are referred to, and shown as layers in the SNA network. Figure 4-1 shows these layers and compares them to the OSI model.

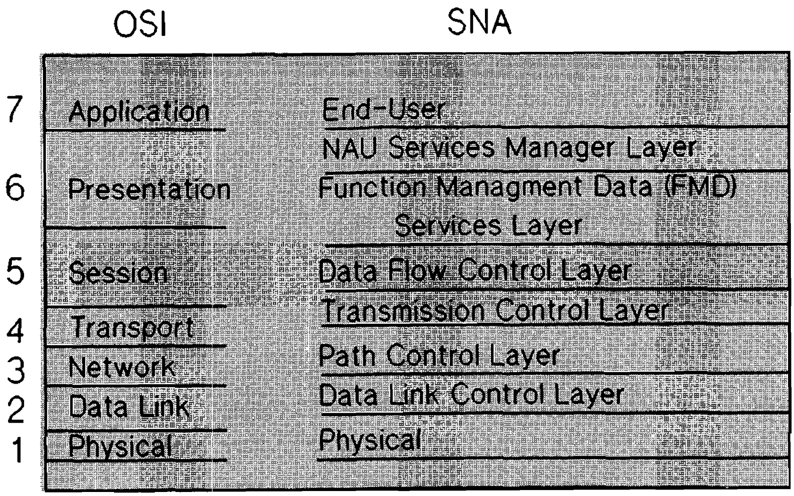


Figure 4-1. SNA Layers

The two layers, NAU Services Manager and Function Management Data, provide the NAU end-user and session network services.

Data Link Control Services

Data link control services provide three functions. First, it establishes logically full-duplex connections over each physical full-duplex or half-duplex link. Second, it transfers data over the links. Third, it detects errors during data transfers and corrects them by retransmission, if possible; if not, data link control reports them to upper levels of the SNA network.

Data link control has two forms. One is the channel data link control, as used for System 370 channels. The other form is Synchronous Data Link Control (SDLC), which is used by links that employ bit-serial transmission. The SNA Decode package works in conjunction with SDLC.

Data link control is responsible for managing and performing error recovery actions for all the varieties of link configurations, such as loops, nonswitched point-to-point, switched point-to-point, and nonswitched multipoint, in a way that does not require the action of upper layers of the SNA network. This isolation of data link control functions makes it possible to change the kinds of link connections without affecting end-users.

SNA Protocols and Headers

SNA protocols, sometimes called peer protocols, coordinate network operations through each of the layers, regardless of the types of nodes or how many of them the network contains.

Peer protocols use parameters that are passed between equivalent components in separate nodes. The parameters are placed in headers successively prefixed to the users' message units. This action occurs in each node.

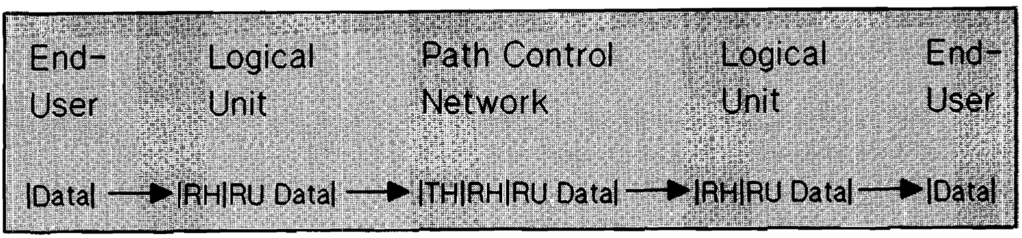


Figure 4-2. Successive Headers

The elementary message unit passing between network addressable units is the Request/Response Unit (RU). Request/Response Units are decoded by the SNA package. Detailed information is given in Chapter 5 Reading SNA Displays.

In general, Request Units contain end-user data, or control information, or both. Response Units are usually acknowledgments to requests. RU is the general term for the message unit that is accompanied by a Request/Response Header.

The parameters of Function Management Data (FMD) services layer, data flow control layer, and transmission control layer are placed in the RU, or in the Request Header that transmission control appends to the RU.

Though parameters for three layers may be packaged together, the effect within each layer is the same as if they were independently transmitted. With minor exceptions, the parameters exchanged within a layer are generated or examined only by functions within that layer; no other layer sees them.

When a logical unit appends the request header to the end-user data, a basic information unit is formed. The basic information unit is only used by the destination logical unit. The Request Header specifies the manner in which the destination logical unit is to communicate with, or respond to, the originating unit.

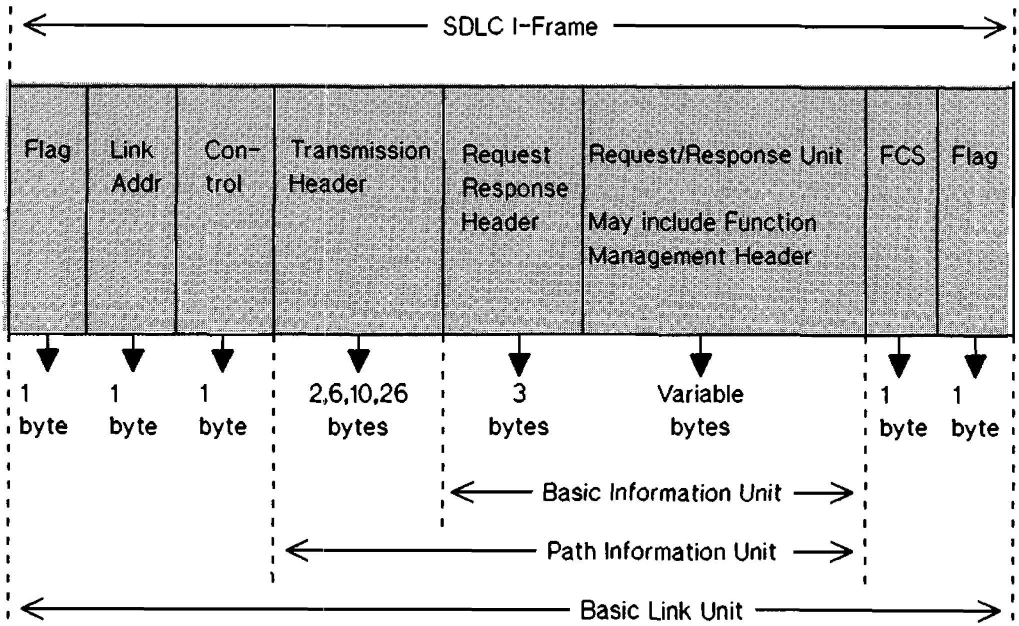


Figure 4-3. Basic Frame Format

The SNA package decodes both request and response headers, including DF and SC codes (NC codes are not decoded). Chapter 7 includes a list of all decoded values.

Once the the originating logical unit constructs the basic information unit, it is given to the path control network for transmission to the destination. The path control node appends a transmission header to the basic information unit, forming a path information unit.

The path control component in the destination node removes the transmission header and gives the basic information unit to the destination logical unit. The destination logical unit then uses the request header information, removes the header from the request unit and gives the data in the request unit to the end-user.

PIUs & FIDs

SNA defines several formats for path information units (PIUs). The format of a path information unit is specified by a field in its transmission header called the format identifier (FID). The field may contain a 0, 1, 2, 3, 4, or F. A path information unit is referred to as a FID0 if the format identifier contains a zero. Other path information units are called FID1, FID2, FID3, FID4, and FIDF.

The SNA package decodes FID0 through FID4 and FIDF. It also decodes the PIU whether it stands alone or within BTU (Basic Transmission Unit)

5

Reading SNA Displays

Introduction

This chapter describes the setup menu, filtering, interpretation of the the SNA display formats, and the user definable displays.

After reading this chapter, you will understand what the various setup selections are, how to increase the capture buffer space via filtering, how to interpret the various SNA display formats, and how to customize your own FMH/RU displays.

The Setup Menu

The setup menu lets you set the parameters for the application. This menu can be viewed by pressing <Setup> from the top level display.

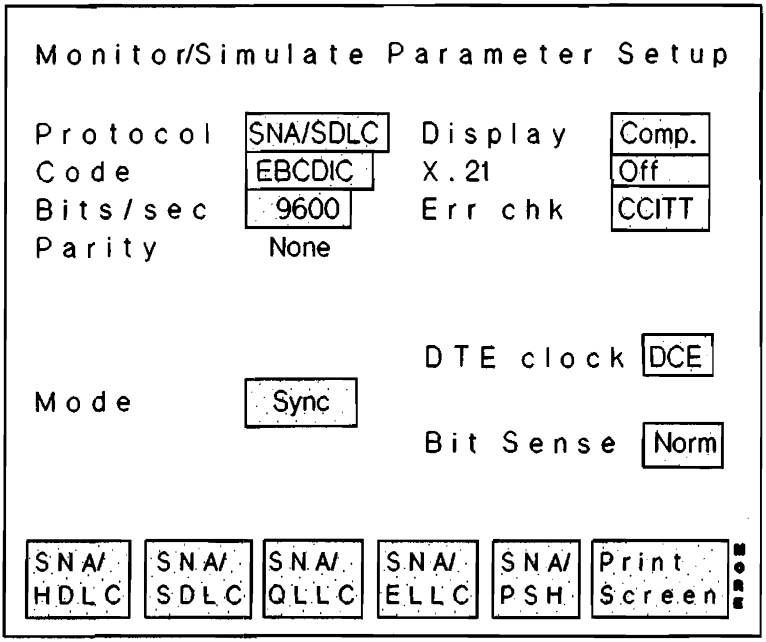


Figure 5-1. The SNA Setup Menu

The cursor will be flashing in the protocol field and the softkey labels indicate the choices available for the field. SDLC is the default condition in this field. The X.25 choices are provided for X.25 PSN with the various Logical Link Control (LLC) protocols.

Display Setup

The <Print> function appears with the LLC protocol softkeys and can be used to print the menu to a printer.

The arrow keys can be used to enter the various fields.

The choices in the display field are Composite, Transmission Header, Request/Response Header, or Function Management Header/Request/Response Unit display modes. The display field is used for run time and is the default during examine data. You can still select other modes while in the examine data mode. Each of these displays are described in more detail in this chapter.

Selecting A Link Address

NOTE

When SNA-X.25 is being measured, the filtering will take effect on the X.25 link level frames, which may limit the effectiveness of filtering.

---

1. This selection must be reached by exiting the setup menu.

2. Press <Run Menu> and <Data Filter>.

   The default setting for the Link Addr Filter is off. Press <On> to display the Link Addr field.

   When monitoring, the Link Addr field allows you to monitor a specific link address. Filtering out the frames will help conserve buffer memory. Only messages with the specified address are displayed and captured in the data buffer; all other addresses are ignored. To monitor all addresses on a link, leave the Link Addr Filter **Off**.

   The default setting is 01.

   When simulating with a specific link address chosen, data traffic for all link addresses is sent and received through the interface pod; however, only the selected address is displayed and stored in the data buffer.

Suppressing Supervisory Frames

1. From the top level menu, press <Run Menu> and <Data Filter>.

2. Use the arrows keys to position the cursor in the Superv Filter field.

   When monitoring, the Superv Filter field allows you to ignore SDLC supervisory frames; they are not displayed or captured in the data buffer. This feature is effective when the SNA data traffic consists mostly of supervisory frames in which you are not interested. Since only I-frames and U-frames are captured (only I-frames are displayed in SNA format), the buffer will contain more usable SNA data.

   The default setting is the Superv Filter turned off.

   When simulating with the Superv Filter On, SDLC supervisory frames are sent and received through the interface pod; however, they are not displayed or stored in the data buffer.

Introduction to the SNA Displays

You can see the SNA displays in the run menu and in the examine data display. They are:

- Composite (key elements from TH, RH, and FMH/RU)
- Transmission Header (TH)
- Request/Response Header (RH)
- Function Managment/Request/Response Unit (FMH/RU)

In order to set parameters that will allow the application to work properly and efficiently, separate menus are provided. The spare softkey of the top level menu is used to access these menus. The spare softkey is accessed by pressing [More] and will be labeled <SNA def>.

See the appropriate titles in this chapter for details on each display.

Run Display

The figure below shows the run display used for SNA data traffic. This example is in the Composite display which is the default condition in the SNA setup mode. The reference numbers on the left side indicate the items of the display.

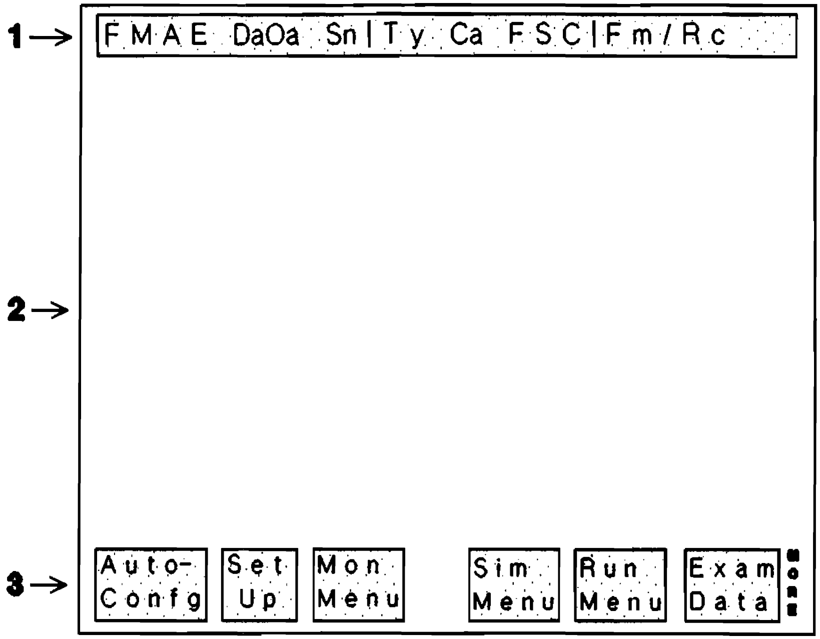


Figure 5-2. SNA Run Display

Reading SNA Displays

Item 1 is the SNA heading in the Composite display. It shows key elements from the highlighted sections in the following SNA frame:

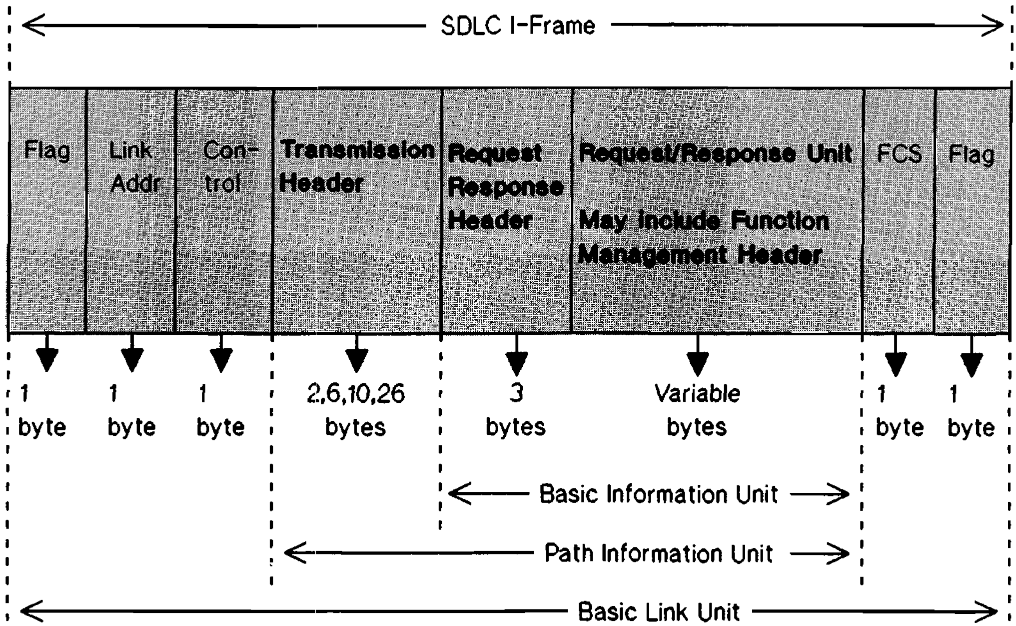


Figure 5-3. Composite Display in an SNA Frame

Item 2 is the data display area; it shows thirteen lines of data traffic; each line represents one Path Information Unit (PIU).

Item 3 is the the basic software keys. They perform the same way without the SNA package with the exception of the <Auto confg> function. When you execute the <Auto Confg> softkey, the application will intervene only if a BOPs protocol is selected (such as HDLC, SDLC, or X.25). In this case, SDLC is imposed as the protocol and the SNA Composite display mode is used when the monitor mode is entered.

Examine Data Display

Figure 5-4 shows the examine data display used for SNA data traffic. The reference numbers on the left side indicate the various rows of the display.

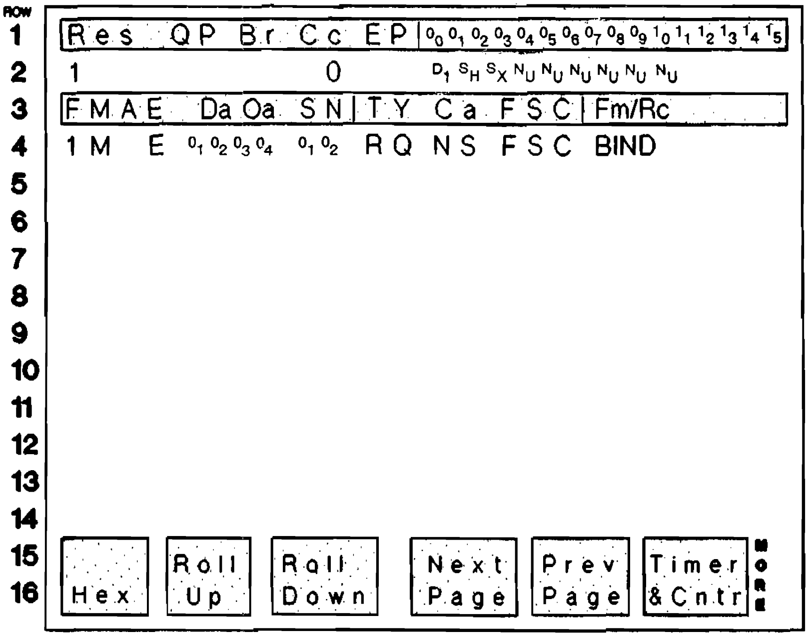


Figure 5-4. SNA Examine Data Display

Row **3** is the SNA heading in the Composite display (the setup menu's default condition). It is the same heading that appears in the run display. Vertical bars separate the heading into the three parts that the Composite display shows the key elements of: the Transmission Heading, the Request/Response Heading, and the Request/Response Unit.

Refer to the specific display in this chapter for the heading definitions used in the Composite display.

Rows **4** through **14** make up the data display area; there are eleven lines of data traffic; each line represents one frame. The far right column of each line displays special FCS characters; a flashing B for a bad frame and a flashing A for an aborted frame. When the frame is good, no FCS character is displayed.

Rows **1** and **2** show the heading lines for the expansion area. They are used to decode more data from the normally decoded lines.

Composite Display Headings

Figure 5-4. SNA Examine Data Display is a composite of the displays to be explained later in this chapter. The headings on rows **1** and **3** have column headings from the Transmission Header, the Request Response Header, and the Request/Response Unit which may also include the Function Management Header.

Note that QP is Q and P, Cc is C and c, and EP is E and P for space efficiency reasons. Also, FSC is F and S and C, and DaOa is Da and Oa for the same reasons.

Examine Data Display Format Softkeys

The softkeys can be used to select the other SNA display modes while in examine data. The standard softkeys operate in the usual way. Simply press the [More} key and the <Chang Dsply> softkey.

The print softkey offered as a standard feature of examine data is still available and will function the same when an SNA display mode is selected.

NOTE

All the displays in this chapter are artificially generated to be used as examples. They do not represent actual data.

The Transmission Header (TH)

Below is the basic SNA frame with the Transmission Header highlighted.

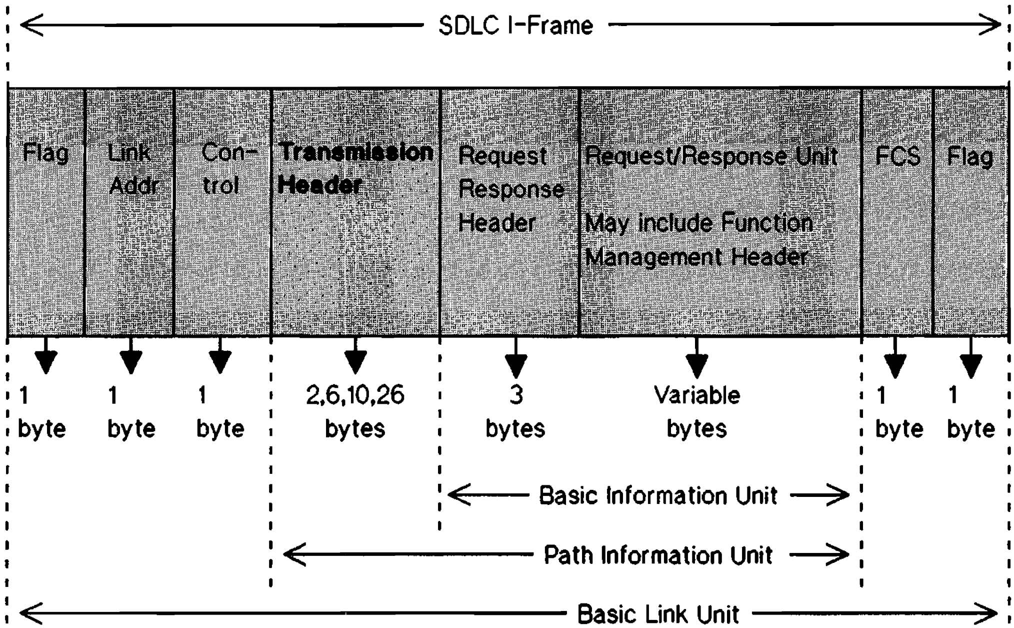


Figure 5-5. TH in the SNA Frame

The Transmission Header is the SNA data header used to identify the source and destination of the data, sequence number, and type of flow.

Chapter 7 Simulation Reference, shows a Transmission Header in more detail, including how to enter FID0 through FID4 and FIDF Transmission Headers.

Examine Data in TH Display Mode

The figure below shows the Examine Data display in the TH display mode. The reference numbers on the left side indicate the rows on the display.

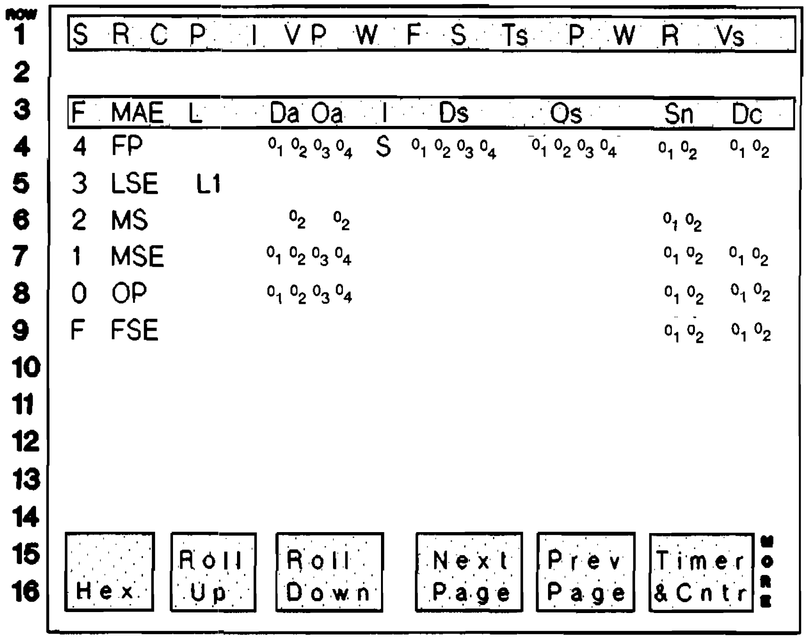


Figure 5-6. Examine Data in the TH Display

Row **3** is the basic Transmission Heading. Row **1** is the expansion heading and row **2** is the expansion decode area. The headings are defined in the following section.

Rows **4** through **14** show the normal decode area. A decode example is shown for the six FID types. The expansion header shows the way FID4 is decoded. FIDF has two extra fields, Command Format (CF) and Command Type (CT). All other FID types simply display the data after the TH in the expansion area.

Rows **15** and **16** are the softkey labels.

TH Display Headings

Note that there are two "S" headings, two "R" headings, three "P'"s, two "I'"s, and two "W'"s. These headings are intended to simply trigger the purpose or name of the field.

Main Decode Area Headings (Row 3) for TH display:

Field	Description
F	FID Type One character 0-9, A-F
M	Mapping Field M = middle L = last F = first O = only
A	Address Assigner Indicator (AAI) P = primary assigned address S = secondary assigned address
E	Expedited Flow Indicator (EFI) E = expedited
L	Local Session Identification (LSID) Hex value prefixed by one of the following: P = SSCP-PU session L = SSCP-LU session I = LU-LU session
Da	Destination Address Field (DAF) Destination Element Field (DEF for FID4) One or two hex bytes.
Oa	Origin Address Field (OAF) Origin Element Field (OEF for FID4) One or two hex bytes.

Reading SNA Displays

I SNA Indicator (SNAI, FID4 only)
S = SNA

Ds Destination Subarea Field (DSAF, FID4 only)
Four hex bytes.

Os Origin Subarea Field (OSAF, FID4 only)
Four hex bytes.

Sn Sequence Number Field (SNF)
Command Sequence Number (FIDF only)
Two hex bytes.

Dc Data Count Field (DCF)
Two hex bytes.

Expansion Area Headings (Row 1) for TH display:

S TG Sweep Indicator
S = PIU may not pass PIU's

R Explicit Route & Virtual Route Support Indicator
R = some node does not support ER & VR

C Virtual Route Pacing Count Indicator
0 = VR pacing count does equal zero

P Network Priority
P = flow is network priority

I Initial Explicit Route Number (IERN)
Explicit Route Number (ERN)
Two hex bytes

V Virtual Route Number (VRN)
One hex nibble

P Transmission Priority (TPF)
L = low
M = medium
H = high

Reading SNA Displays

W — Virtual Route Change Window Indicator
I = increment
D = decrement

F — TG Non-FIFO Indicator
F = FIFO required

S — VR Sequence & Type Indicator
N = non-sequenced/non-supervisory
S = non-sequenced/supervisory
1 = singly sequenced

Ts — Transmission Group Sequence Number (TGSNF)
Three hex nibbles (2 hex characters)

P — VR Pacing Request Indicator
P = VR pacing response requested

W — VR Change Window Reply Indicator
I = increment
D = decrement

R — VR Reset Window Indicator
R = reset window size to minimum

Vs — VR Send Sequence Number (VRSSNF)
Three hex nibbles (2 hex characters)

Cf — Command Format
One hex byte

Ct — Command Type
One hex byte

Request/Response Header (RH)

The figure below is a basic SNA frame with the Request/Response Header highlighted.

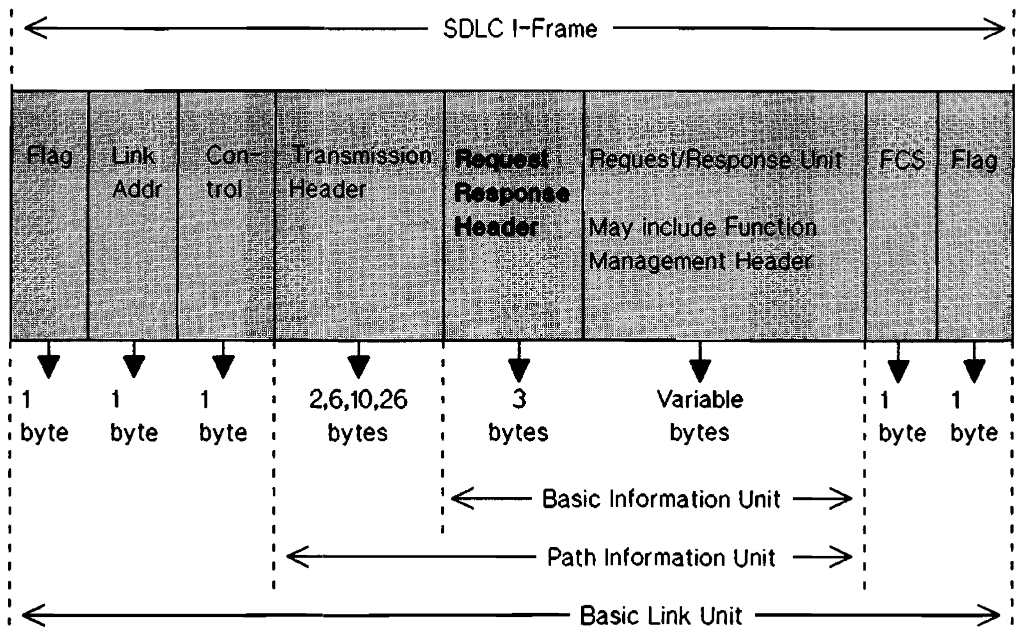


Figure 5-7. Basic SNA Frame with RH highlighted

The Request/Response Header (RH) is the unit of SNA data used for various control purposes. It describes the data as being a request or a response. It also indicates whether the transmission contains function management data, network control, data flow control, or session control.

Chapter 7 Simulation Reference, shows the Request/Response Header in more detail.

Examine Data in RH Display Mode

The figure below is the HP 4952 in examine data with the display in Request/Response Header (RH).

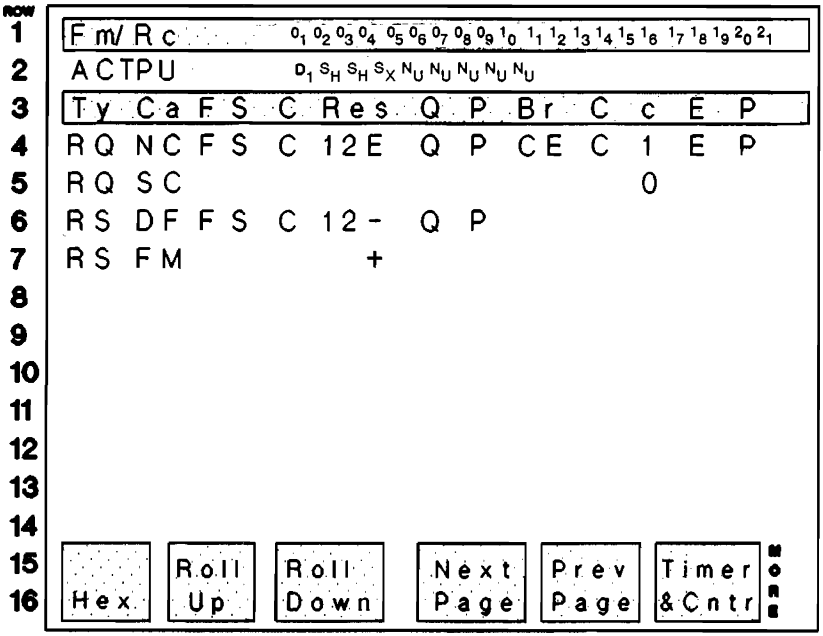


Figure 5-8. Examine Data in RH Display Mode

Row **1** is an expansion area displaying a limited portion of the FMH/RU.

Row **2** is the expansion decode area.

Row **3** is the normal heading.

Rows **4** through **14** show the normal decode area. Rows **4** and **5** show the possible values for a request, while rows **5** and **6** show the possible values for a response. The displayed values are generally displayed or left blank, indicating that the bit is on or off (set or cleared, 1 or 0).

RH Display Headings

Note that there are two "C" headings and a "c" heading, as well as two "P" headings. These headings are intended to trigger the purpose or name of the field. It is expected that you are familiar enough with the measurements or SNA to realize which field is indicated by its position.

Main Decode Area Headings (Row 3) for RH display:

Field	Description
Ty	RU Type RQ = request RS = response
Ca	RU Category FM = function management NC = network control DF = data flow control SC = session control
F	Format Indicator F = FMH follows
S	Sense Data Indicator (SDI) S = sense data included
C	Chaining Indicators (BCI, ECI) M = middle L = last F = first O = only
Res	Response Indicators (DR1I, DR2I, ERI/RTI) 1, 2, and/or E, +, or - may appear under this heading, such as 1, 2, 12, 1 E, 1 +, 1 -, 2 E, 2 +, 2 -, 12E, 12+, or 12-. 1 = definite response 1 requested or definite response 1 2 = definite response 2 requested or definite response 2 E = exception response requested + = positive response - = negative response

Q	Queued Response Indicator (QRI) Q = enqueue response	
P	Pacing Indicator (PI) P = pacing request/response	
Br	Bracketing Indicators (BBI, EBI, CEBI) E = end bracket B = begin bracket C prefixed for conditional end of bracket (CEBI is 1).	
C	Change Direction Indicator (CDI) C = change direction	
c	Code Selection Indicator (CSI) 0 = code 0 1 = code 1	
E	Enciphered Data Indicator (EDI) E = RU is enciphered	
P	Padded Data Indicator (PDI) P = RU was padded before enciphered	

Expansion Area Headings (Row 1) for RH display:

The expansion area is the same as one line of the normal area for the FMH/RU display (following), except that the bytes that are displayed are not selectable (bytes 0 through 21 decimal).

Function Management Header/ Request/Response Unit (FMH/RU)

The figure below is the basic SNA frame with the Function Management Header/Request/Response Unit section highlighted.

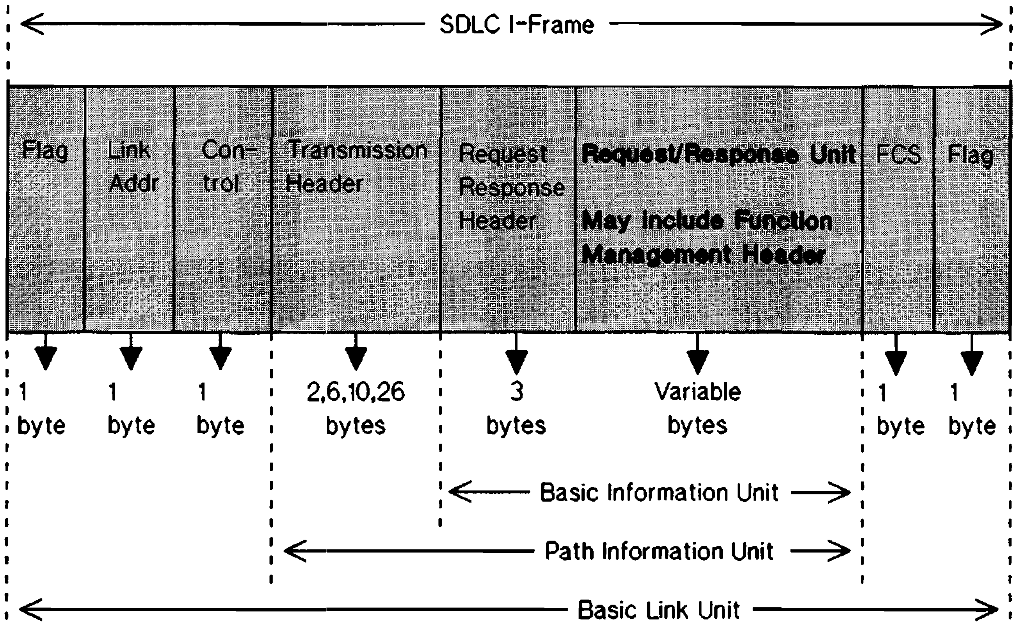


Figure 5-9. FMH/RU in the SNA Frame

The Function Management Header in the Request Unit is used for selecting end user functions and devices. The Request/Response Unit contains user data, acknowledgment of user data, network commands, or responses to commands.

Chapter 7 Simulation Reference shows the Function Management Header/Request/Response Unit in greater detail.

Examine Data in the FMH/RU Display

The figure below shows the examine data display in the FMH/RU display mode. The reference numbers on the left side indicate the rows on the display.

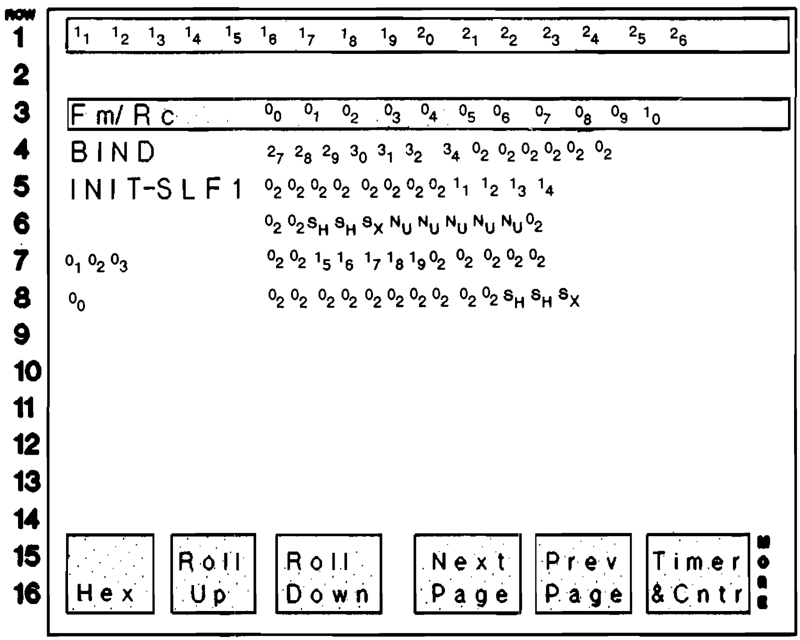


Figure 5-10. Examine Data in FMH/RU Display Mode

Row **3** is the normal heading, row **1** is the Expansion Heading and row **2** is the expansion decode area.

Rows **4** through **14** show the normal decode area.

Row **4** shows an example of a request code decoded into the mnemonic for a BIND.

Row **5** shows a function management code decoded into the INIT-SELF mnemonic.

Row **6** is a display of user data or sense data.

Row **7** is an example where the function management code was not valid, and so the data is left to the user to evaluate.

Row **8** is an error example for a request code.

Rows **15** and **16** are the softkey labels.

FMH/RU Display Headings

Main Decode Area Headings (Row 3) for FMH/RU Display:

Field	Description
Fm/Rc	Function Management Code / Request Code The mnemonic for the 3 byte FMC or 1 byte RC goes under this column heading. If an unrecognized FMC or RC is encountered, the bytes for the code are displayed in simple hex or text.
data	The data that follows the FMC or RC, or the data classified as user data or sense data starts under this heading. The byte number within the FMH/RU is used in the heading(s).

Expansion Area Headings (Row 1) for FMH/RU Display:

The expansion area will be used as a continuation of the data from the main decode area, if any, as selected by the user in the FMH/RU Display Menu.

SNA Display Definition Menu

The SNA Display Definition Menu is an advanced capability of the SNA Application Package. It lets you specify how your data is to be displayed. This menu can be viewed by performing the following steps.

1. Get to the top level menu.
2. Press [More].
3. Press <SNA def>

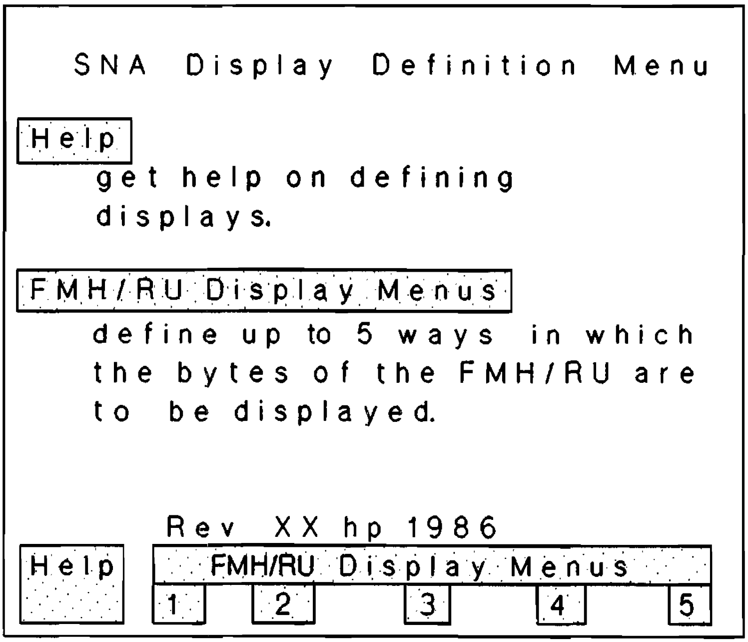


Figure 5-11. The SNA Display Definition Menu

The <Help> softkey will access a menu which is a tutorial on how to set up the FMH/RU displays.

The <FMH/RU> softkeys will access five menus in which you can specify how the data will be displayed.

You can turn a particular byte ON or OFF by pressing the corresponding softkey, labeled at the bottom. When the field is on, the characters under the byte number indicate how the byte will be displayed by the application. The first character tells whether the byte will appear in the normal decode area (N), or in the expansion area (E). Use the softkeys to select which area the byte will be displayed in. The second character indicates whether the byte will be decoded as a hex or text value (H), or a binary value (B), with softkeys available for this selection.

Your are not allowed to select more bytes than will fit in either the normal display area or expansion area. The status line at the bottom of the menu tells you how much space is left to work with. If you try to select more bytes than will fit on a display, the count for the area that would overflow will blink.

You can decode the parameters for request codes or function management headers according to the particular headers you use the most often. Five of these menus are provided and you can switch among them during examine data.

The default condition for this menu selects the first 11 bytes of the FMH/RU to be displayed in hex in the normal area and the next 16 bytes to be displayed in hex in the expansion area.

Storing Your Customized FMH/RU Menu

You also have the option of storing your customized FMH/RU menu to a disc for future use. After specifying how you want your data to be displayed simply insert a disc into the disc drive and press <Mass Store> from the top level menu.

Press <Load> and type in a name for your file.

Press <Store> and then <Extended Menu>.

Reading SNA Displays

6

Simulation

Introduction

This section provides information about using simulation with SNA Analysis. If you are not familiar with simulation on the HP 4952 Protocol Analyzer, you should read the HP 4952 Operators Manual before proceeding.

An example is used in this chapter to demonstrate the simulation feature. You'll use simulation to send an SNA frame and then you'll use the examine data feature to check the results of your transmission.

NOTE

Make certain the protocol analyzer is disconnected from your network before running the simulate program.

Be sure you have chosen SNA/SDLC protocol in the setup menu. The display field in the setup menu should be in the Composite mode.

SNA Frame Format

In order to successfully use the protocol analyzer simulation feature with SNA data traffic, you must have an understanding of SNA frame formats. This application will decode SNA data running on an SDLC link or over an X.25 PSN. You must specify which type of LLC protocol is being measured.

The basic frame format is shown below.

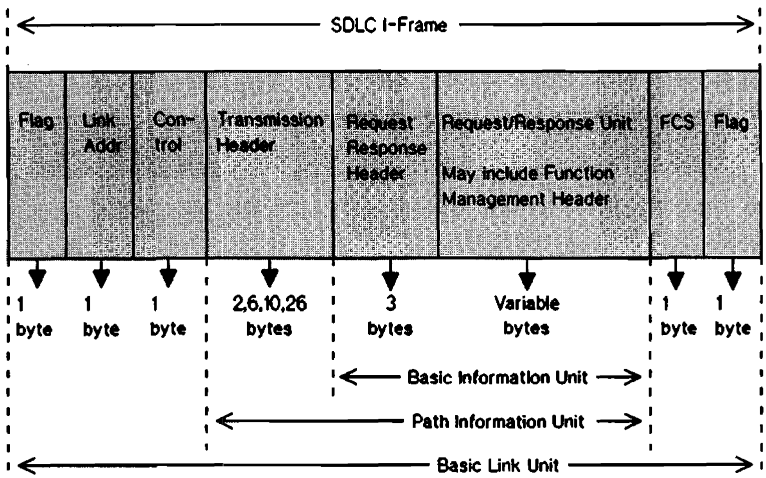


Figure 6-1. Basic Frame Format

The protocol analyzer simulation feature lets you enter all of these fields. The following example shows you how to use analyzer to enter the information required in the various fields.

Although the example may not represent the exact type of SNA traffic you want to simulate, please give it a try. It illustrates the basic steps and ease of simulation.

Simulation

Sending A FID2 Frame

This example shows you how to send a FID2 frame. FID2 is used because it has a short Transmission Header. The frame is sent repeatedly only for the purpose of making it easy to view data on the displays.

The Frame Bytes

1. Get the top level menu and press <Simulate>.

2. When the simulate display appears, press the <DCE> softkey.

3. Press <Send>. A start flag, good FCS symbol, and an end flag appear. The flashing cursor indicates the point to enter the link address.

4. Press the <Hex> softkey to make the link address entry in hex. Enter a link address of ^{0}1 by pressing the 0 and 1 keys.

5. Next, the SDLC control field must be entered. Make the control field for an I-frame by entering ^{0}0.

6. Now, enter bytes 0 through 5 of the Transmission Header as follows:

   Enter ^{2}D. Byte 0... FID=2, MPF=O (only), AI=P and EFI= E.

   Enter ^{0}0. Byte 1... Don't Care

   Enter ^{0}A. Byte 2... DAF=0A

   Enter ^{0}B. Byte 3... OAF=0B

   Enter ^{0}0 then ^{0}C. Bytes 5&6... SNF=000C

7. Now add a Request Header to the frame. The header is three bytes as follows:

Enter ^{4}3. Byte 0... RRI=RQ, RU CAT=DF, FI=blank, SDI=blank, BCI ECI=O

Enter ^{2}3. Byte 1... DR1I DR2I ERI=DEF, QRI=Q, PI=P

Enter ^{2}3. Byte 2... BBI EBI=CE, CDI=C, CSI=0, EDI=blank, PDI=P

8. Add an RU by entering ^{0}5; this sets the request code to ready-to-receive (RTR).

9. Press [RTN], then <Next Block>.

10. Press [MORE], then <Goto Blk>. The simulation display now looks like this:

Simulate DCE

Block 1
Send | ^{0}1 ^{0}0 ^{2}D ^{0}0 ^{0}A ^{0}B ^{0}0 ^{0}C ^{4}3 ^{2}3 ^{2}3 ^{0}5 **GG** |

Block 2
Goto Block 1

Figure 6-2. Frame Bytes

Running The Simulation Program

1. Press [EXIT] to leave the simulation display.

2. Press <Run Menu>.

3. Press <Simulate>. The display should be running as shown below.

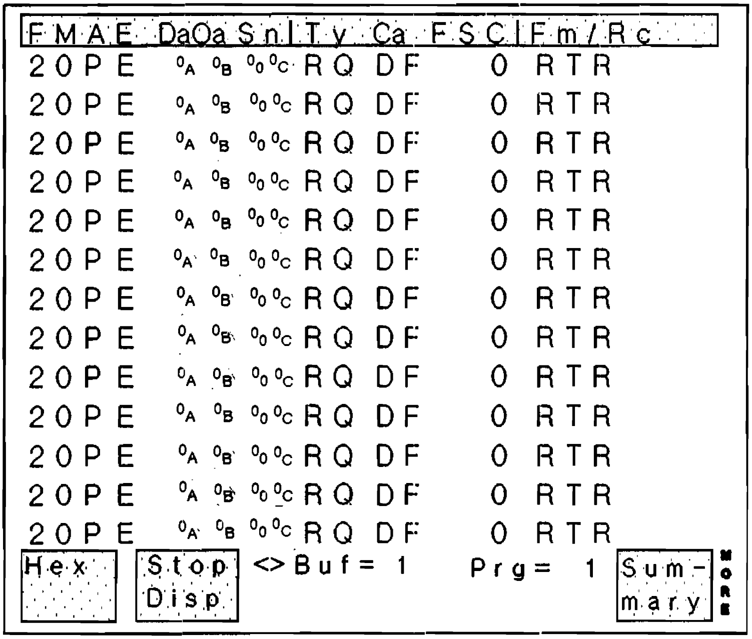


Figure 6-3. Running Simulation

4. Press [EXIT] to stop the simulation.

Simulation

Examining Data

1. To display the data in the buffer, press <Exam Data> in the top level menu.

```
Res  QP Br Cc  EP |00 01 02 03 04 05 06 07 08 09 10 11 12 13 14 15
1            0        SH SH SX NU NU NU NU NU
FMAE   Da Oa  Sn | Ty  Ca  FSC | Fm/Rc
20PE   0A 0B 00 0C  RQ  DF  F  0  RTR
20PE   0A 0B 00 0C  RQ  DF  F  0  RTR
20PE   0A 0B 00 0C  RQ  DF  F  0  RTR
20PE   0A 0B 00 0C  RQ  DF  F  0  RTR
20PE   0A 0B 00 0C  RQ  DF  F  0  RTR
20PE   0A 0B 00 0C  RQ  DF  F  0  RTR
20PE   0A 0B 00 0C  RQ  DF  F  0  RTR
20PE   0A 0B 00 0C  RQ  DF  F  0  RTR
20PE   0A 0B 00 0C  RQ  DF  F  0  RTR
20PE   0A 0B 00 0C  RQ  DF  F  0  RTR
20PE   0A 0B 00 0C  RQ  DF  F  0  RTR
[    ] [Roll] [Roll] [Next] [Prev] [Timer ]
[Hex ] [Up  ] [Down] [Page] [Page] [& Cntr]
```

Figure 6-4. Examining Data

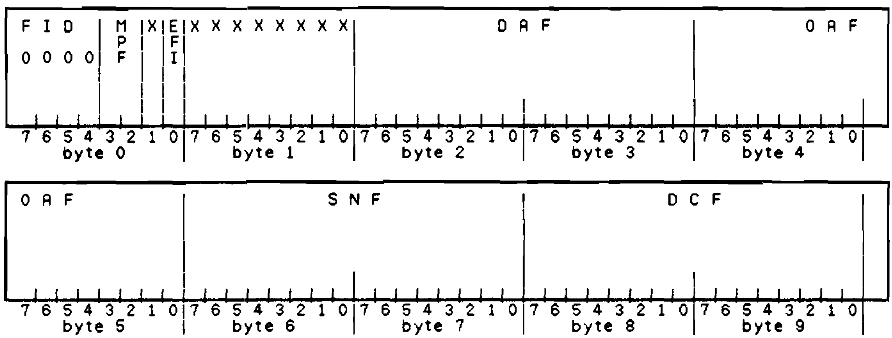
7

Simulation Reference

Entering a FID0 Transmission Header

FID0 transmission headers require ten bytes. The table below shows the simulation inputs that you must make in order to produce the desired output. Simulation input values are shown in binary or hex. Fields or bits that are not defined (don't care) must be entered; however, the "don't care" symbol is not available when making simulation entries. Follow conventional SNA practice and enter a 0 (not a 1) for undefined bits.

Table 7-1. FID0 Transmission Header



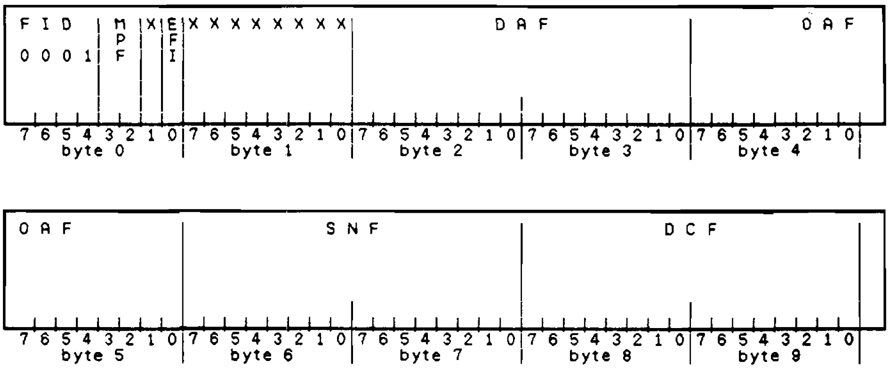
Field	Desired Outputs	Simulaton Inputs
All X's	na	0's
FID0	Fi = 0	0000
MPF	Mp = M, L, F, 0	00, 01, 10, 11
EFI	Ef = blank, E	0, 1
DAF	Da = 0000-FFFF hex	0000-FFFF hex
OAF	Oa = 0000-FFFF hex	0000-FFFF hex
SNF	Sn = 0000-FFFF hex	0000-FFFF hex
DCF	Dc = 0000-FFFF hex	0000-FFFF hex

Entering A FID1 Transmission Header

FID1 transmission headers require ten bytes. The table below shows the simulation inputs that you must make in order to produce the desired output. Simulation input values are shown in binary or hex.

Fields or bits that are not defined (don't care) must be entered; however, the "don't care" symbol is not available when making simulation entries. Follow conventional SNA practice and enter a 0 (not a 1) for undefined bits.

Table 7-2. FID1 Transmission Header



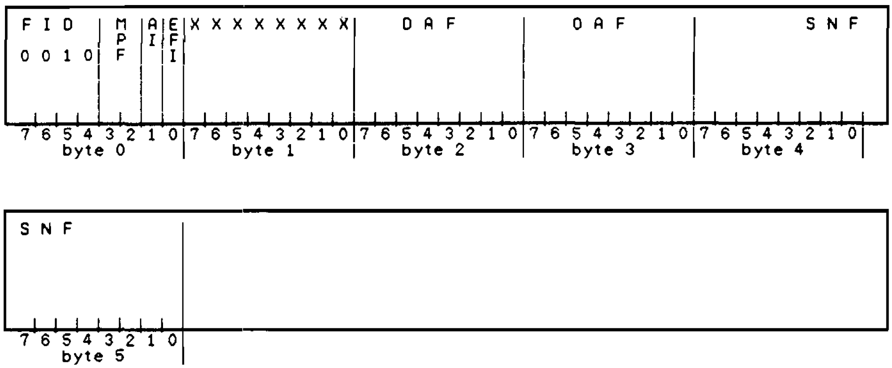
Field	Desired Outputs	Simulaton Inputs
All X's	na	0's
FID1	Fi = 1	0001
MPF	Mp = M, L, F, 0	00, 01, 10, 11
EFI	Ef = blank, E	0, 1
DAF	Da = 0000-FFFF hex	0000-FFFF hex
OAF	Oa = 0000-FFFF hex	0000-FFFF hex
SNF	Sn = 0000-FFFF hex	0000-FFFF hex
DCF	Dc = 0000-FFFF hex	0000-FFFF hex

Entering A FID2 Transmission Header

FID2 transmission headers require six bytes. The table below shows the simulation inputs that you must make in order to produce the desired output. Simulation input values are shown in binary or hex.

Fields or bits that are not defined (don't care) must be entered; however, the "don't care" symbol is not available when making simulation entries. Follow conventional SNA practice and enter a 0 (not a 1) for undefined bits.

Table 7-3. FID2 Transmission Header



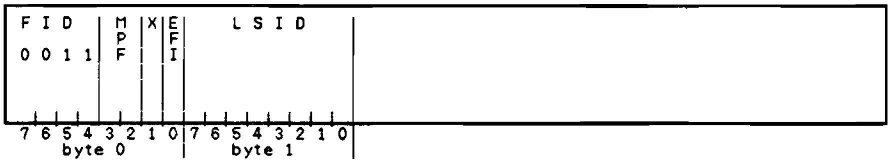
Field	Desired Outputs	Simulation Inputs
All X's	na	0's
FID2	Fi = 2	0010
MPF	Mp = M, L, F, O	00, 01, 10, 11
AI	A = P, S	0, 1
EFI	Ef = blank, E	0, 1
DAF	Da = 00-FF hex	00-FF hex
OAF	Oa = 0000-FFFF hex	0000-FFFF hex
SNF	Sn = 0000-FFFF hex	0000-FFFF hex

Entering A FID3 Transmission Header

FID3 transmission headers require two bytes. The table below shows the simulation inputs that you must make in order to produce the desired output. Simulation input values are shown in binary or hex.

Fields or bits that are not defined (don't care) must be entered; however, the "don't care" symbol is not available when making simulation entries. Follow conventional SNA practice and enter a 0 (not a 1) for undefined bits.

Table 7-4. FID3 Transmission Header



Field	Desired Outputs	Simulation Inputs
All X's	na	0's
FID3	Fi = 3	0011
MPF	Mp = M, L, F, 0	00, 01, 10, 11
EFI	Ef = blank, E	0, 1
LSID	Ls = 00-FF hex	00-FF hex

Entering A FID4 Transmission Header

FID4 transmission headers require twenty six bytes. The table below shows the simulation inputs that you must make in order to produce the desired output. Simulation input values are shown in binary or hex.

Fields or bits that are not defined (don't care) must be entered; however, the "don't care" symbol is not available when making simulation entries. Follow conventional SNA practice and enter a 0 (not a 1) for undefined bits.

Table 7-5. FID4 Transmission Header

Field	Desired Outputs	Simulation Inputs
All X's	na	0's
FID4	Fi = 4	0100
TGSI	Tgs = P, blank	0, 1
ERVRSI	Rs = S, blank	0, 1
VRPCI	Vpc = NZ, Z	0, 1
NP	P = L, E	0, 1
IERN	Ien = 0-F hex	0-F hex
ERN	En = 0-F hex	0-F hex
VRN	Vn = 0-F hex	0-F hex
TPF	Tpf = LOW, MED, HI, blank	00, 01, 10, 11
VRCWI	Vcw = INC, DEC	0, 1
TGNFI	Tgnf = FIFO, blank	0, 1
VRSTI	Vst = blank, SUP, SEQ	00 or 11, 01, 10
TGSNF	Tgsn = 000000-FFFFFF hex	000000-FFFFFF hex
VRPRQ	Vprq = blank, REQ	0, 1
VRPRS VRCWRI	Vprs = blank, INC, DEC	00 or 01, 10, 11
VRRWI	Vrw = blank, RST	0, 1
VRSSNF	Vsn = 000000-FFFFFF hex	000000-FFFFFF hex
DSAF	Dsaf = 00000000-FFFFFFFF	00000000-FFFFFFFF hex
OSAF	Osaf = 00000000-FFFFFFFF	00000000-FFFFFFFF hex
SNAI	Sna = blank, SNA	0, 1
MPF	Mp = M, L, F, O	00, 01, 10, 11
EFI	Ef = blank, E	0, 1
DEF	Da = 0000-FFFF hex	0000-FFFF hex
OEF	Oa = 0000-FFFF hex	0000-FFFF hex
SNF	Sn = 0000-FFFF hex	0000-FFFF hex
DCF	Dc = 0000-FFFF hex	0000-FFFF hex

Table 7-5. FID4 Transmission Header (Continued)

byte 0	7 6 5 4	FID (0 1 0 0)
byte 0	3	TGSI
byte 0	2	ERVRSI
byte 0	1	VRPCI
byte 0	0	NP
byte 1	7 6 5 4 3 2 1 0	X X X X X X X X
byte 2	7 6 5 4	IERN
byte 2	3 2 1 0	ERN
byte 3	7 6 5 4	VRN
byte 3	3 2	X X
byte 3	1 0	TPF
byte 4	7	VRCWI
byte 4	6	TGNFI
byte 4	5 4	VRSTI
byte 4	3 2 1 0	TGSNF
byte 5	7 6 5 4 3 2 1 0	TGSNF
byte 6	7	VRPRQ
byte 6	6	VRPRS
byte 6	5	VRCWRI
byte 6	4	VRRWI
byte 6	3 2 1 0	VRSSNF
byte 7	7 6 5 4 3 2 1 0	VRSSNF
byte 8 – byte 11	7 6 5 4 3 2 1 0	DSAF
byte 12 – byte 15	7 6 5 4 3 2 1 0	OSAF
byte 16	7 6 5	X X X
byte 16	4	SNAI
byte 16	3 2	MPF
byte 16	1	X
byte 16	0	EFI
byte 17	7 6 5 4 3 2 1 0	X X X X X X X X
byte 18 – byte 19	7 6 5 4 3 2 1 0	DEF
byte 20 – byte 21	7 6 5 4 3 2 1 0	OEF
byte 22 – byte 23	7 6 5 4 3 2 1 0	SNF
byte 24 – byte 25	7 6 5 4 3 2 1 0	DCF

Simulation Reference

Entering a FIDF Transmission Header

FIDF transmission headers require twenty six bytes. The table below shows the simulation inputs that you must make in order to produce the desired output. Simulation input values are shown in binary or hex.

Fields or bits that are not defined (don't care) must be entered; however, the "don't care" symbol is not available when making simulation entries. Follow conventional SNA practice and enter a 0 (not a 1) for undefined bits.

Table 7-6. FIDF Transmission Header

Field	Desired Outputs	Simulation Inputs
All X's	na	0's
FIDF	Fi = F	1111
CF	Cf = 00-FF hex	00-FF hex
CT	Ct = 00-FF hex	00-FF hex
CSN	Sn = 0000-FFFF hex	0000-FFFF hex
DCF	Dc = 0000-FFFF hex	0000-FFFF hex

Simulation Reference

Table 7-6. FIDF Transmission Header (Continued)

	7 6 5 4 3 2 1 0	
byte 0	7–4	F I D (1 1 1 1)
byte 0	3–0	X X X X
byte 1	7–0	X X X X X X X X
byte 2	7–0	C F
byte 3	7–0	C T
byte 4	7–0	C S N
byte 5	7–0	C S N
byte 6	7–0	X X X X X X X X
byte 7	7–0	X X X X X X X X
byte 8	7–0	X X X X X X X X
byte 9	7–0	X X X X X X X X
byte 10	7–0	X X X X X X X X
byte 11	7–0	X X X X X X X X
byte 12	7–0	X X X X X X X X
byte 13	7–0	X X X X X X X X
byte 14	7–0	X X X X X X X X
byte 15	7–0	X X X X X X X X
byte 16	7–0	X X X X X X X X
byte 17	7–0	X X X X X X X X
byte 18	7–0	X X X X X X X X
byte 19	7–0	X X X X X X X X
byte 20	7–0	X X X X X X X X
byte 21	7–0	X X X X X X X X
byte 22	7–0	X X X X X X X X
byte 23	7–0	X X X X X X X X
byte 24	7–0	D C F
byte 25	7–0	D C F

Entering A Request Header

Request headers require three bytes. The table below shows the simulation inputs that you must make in order to produce the desired output. Simulation input values are shown in binary.

Fields or bits that are not defined (don't care) must be entered; however, the "don't care" symbol is not available when making simulation entries. Follow conventional SNA practice and enter a 0 (not a 1) for undefined bits.

Table 7-7. Request Header

Byte	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
byte 0	RRI 0	RU CAT		X	FI	SDI	BCI	ECI
byte 1	DR1I	X	DR2I	ERI	X	X	QRI	PI
byte 2	BBI	EBI	CDI	X	CSI	EDI	PDI	CEBI

Field	Desired Outputs	Simulation Inputs
All X's	na	0's
RRI	Ty = RQ	0
RU CAT	Ca = FM, NC, DF, SC	00, 01, 10, 11
FI	Fi = blank, F	0, 1
SDI	Sd = blank, S	0, 1
BCI ECI	Ch = M, L, F, O	00, 01, 10, 11
DR1I DR2I ERI	Ri = NO	000
	DR	010 or 100 or 110
	ER	001 or 011 or 101 or 111
QRI	Qr = blank, Q	0, 1
PI	Pi = blank, P	0, 1
BBI EBI CEBI	Bi = blank, CE	000, 001
	E	010 or 011
	B	100 or 101 or 110 or 111
CDI	Cd = blank, C	0, 1
CSI	Cs = 0,1	0, 1
EDI PDI	Ed = blank, E, PE	00 or 01, 10 , 11
CEBI	see BBI EBI CEBI	

Entering Request Codes

A Request code is a single byte field that follows the request/response header (when no FM or sense data is in the frame).

There are three types of request codes, each corresponds to a request/response unit category (DF, NC, SC). You must set the RU CAT to the appropriate code to cause the request code to be properly simulated.

If you set the RU CAT to FM, then the three bytes immediately following the request unit are decoded as function management header data.

If you set the SDI to sense data follows, then the four bytes immediately following the request unit are decoded as sense data.

See table 7-8 for the list of request codes used in SNA Decode.

Entering Function Management Data Codes

A function management data code is a three byte field that follows the request/ response header (when no sense data is in the frame).

When you set the RU CAT to FM, then the three bytes immediately following the request unit are decoded as function management header data.

If you set the SDI to sense data follows, then the four bytes immediately following the request unit are decoded as sense data.

See table 7-9 for the list of FMD codes used in SNA Decode.

Table 7-8. Request Codes

Data Flow Control (DF) Codes

Desired Output	Simulation Input (hex)	Description
BID	C8	Bid
BIS	70	Bracket initiation stopped
CANCEL	83	Cancel
CHASE	84	Chase
LUSTAT	04	Logical unit status
QC	81	Quiesce complete
QEC	80	Quiesce at end of chain
RTR	05	Ready to receive
RELQ	82	Release quiesce
RSHUTD	C2	Request shutdown
SBI	71	Stop bracket initiation
SHUTC	C1	Shutdown complete
SHUTD	C0	Shutdown
SIG	C9	Signal

Network Control (NC) Codes

Desired Output	Simulation Input (hex)	Description
LSA	05	Lost subarea
NC-ACTVR	0D	Activate virtual routing
NC-DACTVR	0E	Deactivate virtual routing
NC-ER-A	0B	Explicit route activate
NC-ER-AR	0C	Explicit route activate reply
NC-ER-INO	06	Explicit route inoperative
NC-ER-OP	0F	Explicit route operative
NC-ER-T	09	Explicit route test
NC-ER-TR	0A	Explicit route test reply
NC-IPL-A	46	NC IPL abort
NC-IPL-F	02	NC IPL final
NC-IPL-I	03	NC IPL initial
NC-IPL-T	04	NC IPL text

Session Control (SC) Codes

Desired Output	Simulation Input (hex)	Description
ACTCDRM	14	Activate cross-domain resource manager
ACTLU	0D	Activate logical unit
ACTPU	11	Activate physical unit
BIND	31	Bind session
CLEAR	A1	Clear
CRV	C0	Cryptography verification
DACTCDRM	15	Deactivate cross-domain resource manager
DATCTLU	0E	Deactivate logical unit
DACTPU	12	Deactivate physical unit
RQR	A3	Request recovery
SDT	A0	Start data traffic
STSN	A2	Set and test sequence numbers
UNBIND	32	Unbind session

Table 7-9. Function Management Data Codes

Function Management Data (FMD or FM) Codes

Desired Output	Simulation Input (hex)	Description
ABCONN	01020F	Abandon connection
ABCONNOUT	010218	Abandon connect out
ACTCONNIN	010216	Activate connect in
ACTLINK	01020A	Activate link
ACTTRACE	010302	Activate trace
ADDLINK	41021E	Add link
ADDLINKST	410221	Add link station
ANA	010219	Assign network address
BINDF	810685	Bind failure
CDCINIT	81864B	Cross-domain control initiate
CDINIT	818641	Cross-domain initiate
CDSESSEND	818648	Cross-domain session ended
CDSESSSF	818645	Cross-domain session startup failure
CDSESSST	818646	Cross-domain session started
CDSESSTF	818647	Cross-domain session takedown failure
CDTAKED	818649	Cross-domain takedown
CDTAKEDC	81864A	Cross-domain takedown complete
CDTERM	818643	Cross-domain terminate
CINIT	810601	Control initiate
CLEANUP	810629	Clean up session
CONNOUT	01020E	Connect out
CONTACT	010201	Contact
CONTACTED	010280	Contacted
CTERM	810602	Control terminate
DACTCONNI	010217	Deactivate connect in
DACTLINK	01020B	Deactivate link
DACTTRACE	010303	Deactivate trace
DCONTACT	010202	Discontact
DELETENR	41021C	Delete network resource
DELIVER	810812	Deliver
DISPSTOR	010331	Display storage
DSRLST	818627	Direct search list
DUMPINIT	010206	Dump initial
DUMPFINAL	010208	Dump final
DUMPTEXT	010207	Dump text
ECHOTEST	810389	Echo test
ER-INOP	41021D	Explicit route inoperative
ER-TESTED	410386	Explicit route tested
ESLOW	010214	Entering slowdown
EXECTEST	010301	Execute test
EXSLOW	010215	Exiting slowdown
FNA	01021A	Free network address
FORWARD	810810	Forward
INIT-O-CD	818640	Initiate other cross-domain
INIT-OTHR	810680	Initiate other

Table 7-9. Function Management Data Codes (Continued)

Function Management Data (FMD or FM) Codes

Desired Output	Simulation Input (hex)	Description
INIT-SLF1	810681	Initiate self (format 1)
INIT-SLFO	010681	Initiate self (format 0)
INITPROC	410235	Initiate procedure
INOP	010281	Inoperative
IPLFINAL	010205	IPL final
IPLINIT	010203	IPL Initial
IPLTEXT	010204	IPL text
LCP	410287	Lost control point
LDREQD	410237	Load required
NMVT	41038D	Network management vector transport
NOTFY S/L	810620	Notify (SSCL-->LU)
NOTFY S/S	818620	Notify (SSCP-->SSCP)
NS-IPL-A	410246	NS IPL abort
NS-IPL-F	410245	NS IPL final
NS-IPL-I	410243	NS IPL initial
NS-IPL-T	410244	NS IPL text
NS-LSA	010285	NS lost subarea
NSPE	010604	NS procedure error
PROCSTAT	410236	Procedure status
RECFMS	410384	Record formatted maintenance statistics
RECMS	010381	Request maintenance statistics
RECSTOR	010334	Record storage
RECTD	010382	Record test data
RECTDR	010383	Record trace data
RECTR	410385	Record test results
REQACTLU	410240	Request activate logical unit
REQCONT	010284	Request contact
REQECHO	810387	Request echo test
REQFNA	410286	Request free network address
REQMS	410304	Request maintenance statistics
REQTEST	010380	Request test procedure
RNAA	410210	Request network address assignment
ROUTE-TST	410306	Route test
RPO	010209	Remote power off
RQDISCONT	01021B	Request discontact
SESSEND	810688	Session ended
SESSST	810686	Session started
SETCV(c)	010211	Set control vector (FMD NS(c))
SETCV(ma)	010311	Set control vector (FMD NS(ma))
TERM-O-CD	818642	Terminate other cross-domain
TERM-OTHR	810682	Terminate other
TERM-SLFO	010683	Terminate self (format 0)
TERM-SLF1	810683	Terminate self (format 1)
TESTMODE	410305	Test mode
UNBINDF	810687	Unbind failure
VR-INOP	410223	Virtual route inoperative

Entering a Response Header

Response headers require three bytes. The table below shows the simulation inputs that you must make in order to produce the desired output. Simulation input values are shown in binary.

Fields or bits that are not defined (don't care) must be entered; however, the "don't care" symbol is not available when making simulation entries. Follow conventional SNA practice and enter a 0 (not a 1) for undefined bits.

Table 7-10. Response Header

```
R| R |X|F|S|B|E|D|X|D|R|X X|Q|P|X X X X X X X X|
R| U | |I|D|C|C|R| |R|T|   |R|I|               |
I|   | | |I|I|I|1| |2|I|   |I| |               |
 | C | | | | | |I| |I| |   | | |               |
1| A | | | |1|1| | | | |   | | |               |
 | T | | | | | | | | | |   | | |               |
7 6 5 4 3 2 1 0|7 6 5 4 3 2 1 0|7 6 5 4 3 2 1 0|
    byte 0     |    byte 1     |    byte 2     |
```

Field	Desired Outputs	Simulation Inputs
All X's	na	0's
RRI	Ty = RS	1
RU CAT	Ca = FM, NC, DF, SC	00, 01, 10, 11
FI	Fi = blank, F	0, 1
SDI	Sd = blank, S	0, 1
BCI ECI	0	11
DR1I DR2I	Ri = blank, 2, 1, BO	00, 01, 10, 11
RTI	Rt = +, -	0, 1
QRI	Qr = blank, Q	0, 1
PI	Pi = blank, P	0, 1

Simulation Reference

8

Protocol Header Orientation

Introduction

This chapter tells you the orientation of the various headers. It illustrates the relationship of SNA within SDLC (Synchronous Data Link Control) and of SNA within X.25.

The HP 18261A SNA application decodes the PIU (Path Information Unit) whether it stands alone or within BTU (Basic Transmission Unit).

SNA Within SDLC

Synchronous Data Link Control (SDLC) is used for the SNA data link level protocol. The SNA message information is always contained within an SDLC information frame. SDLC controls flow and error free transmission of data on the link from node to node and has no knowledge of individual session specifics. It simply provides DLC services to messages received.

The figure below shows the entire message.

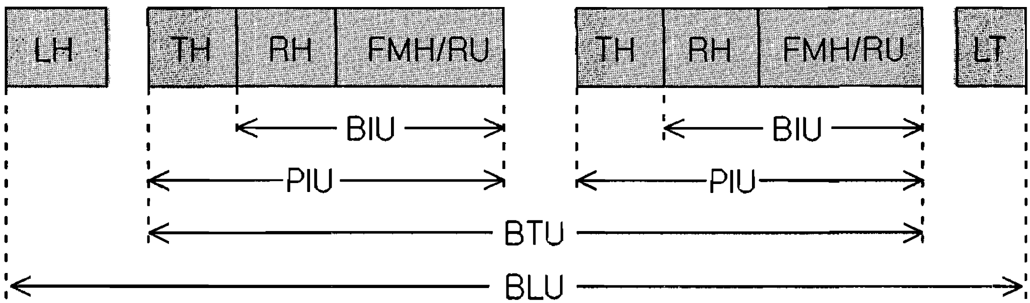


Figure 8-1. SNA Within SDLC

Field	Description
SDLC	Synchronous Data Link Control
LH	Link Header (SDLC start flag, address and control)
TH	Transmission Header
RH	Request/Response Header
FMH	Function Management Header
RU	Request/Response Unit
LT	Link Trailer (SDLC, FCS, and end flag)
BIU	Basic Information Unit
PIU	Path Information Unit
BTU	Basic Transmission Unit
BLU	Basic Link Unit

SNA Within X.25

SNA defines the communications and interfaces through the network, from end user to end user. X.25 defines the interface to the network. X.25 is a CCITT standard for interfacing to public Packet Switched Networks (PSNs).

The figure below is an X.25 Data Frame.

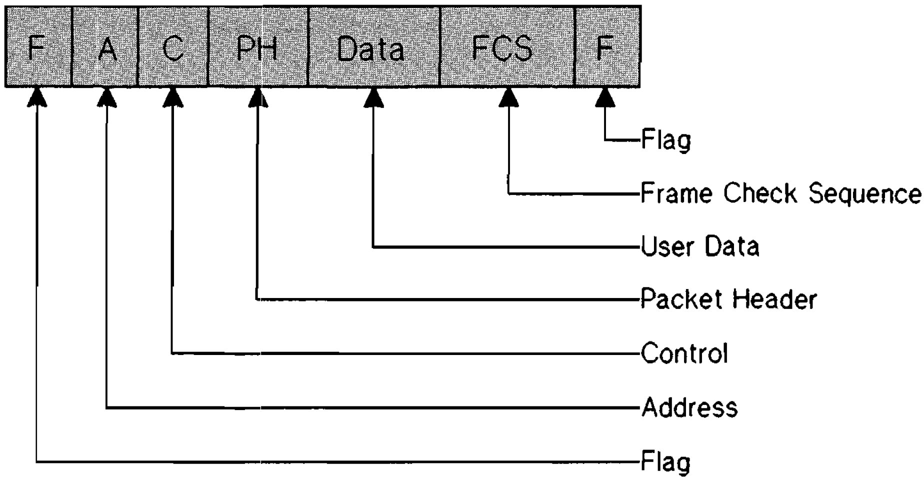


Figure 8-2. X.25 Data Frame

SNA Within X.25:PSH-LLC

Physical Services Header-Logical Link Control (PSH-LLC) is a logical link set up across the X.25 PDN. SNA-X.25 uses the logical link as if it were a physical link and uses the Physical Services Header as a Logical Link Control Protocol Data Unit (LPDU) header.

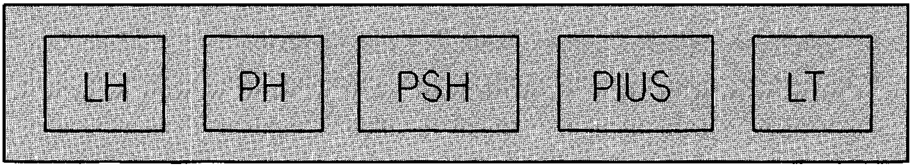


Figure 8-3. SNA Within X.25: PSH-LLC

Field	Description
PSH-LLC	Physical Services Header Logical Link Control
LH	Link Header (X.25 start flag, address and control)
PH	X.25 Packet Header (Q-bit = 0)
PSH	Physical Services Header
PIUS	Path Information Unit Segment (optional)
LT	Link Trailer (X.25 FCS and end flag)

The PIUS may be a partial PIU or a whole PIU. There is a bit in the PSH (SI-segment indicator) that indicates when the last segment of the PIU arrives (SI=0 means last or only PIUS).

SNA Within X.25: QLLC

Qualified Link Level Control (QLLC) is currently the basic protocol being being implemented for use as the LLC protocol for SNA-X.25. It performs identical functions as SDLC but is formatted differently in order to handle larger addresses and sequence numbers.

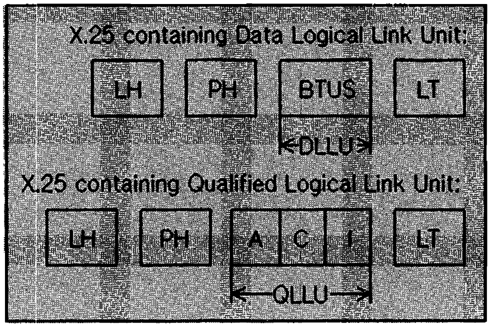


Figure 8-4. SNA Within X.25: QLLC

Field	Description
QLLC	Qualified Logical Link Control
LH	Link Header (X.25 start flag, address and control)
PH	X.25 Packet Header (Q-bit = 0)
BTUS	Basic Transmission Unit Segment
A	Address of QLLU
C	Control of QLLU
I	Information of QLLU (optional)
LT	Link Trailer (X.25 FCS and end flag)
LLU	Logical Link Unit
DLLU	Data LLU (Q-bit = 0 in PH)
QLLU	Qualified LLU (Q-bit = 1 in PH)

The BTUS may be a partial BTU or a whole BTU. There is a bit in the PH (M - More bit) that indicates when the last segment of the BTU arrives (M = 0 means last or only BTUS).

SNA Within X.25: ELLC

Extended Level Link Control (ELLC) is a protocol currently being implemented for use as the logical link set across the X.25 PDN. SNA-X.25 uses it as if it were a physical link.

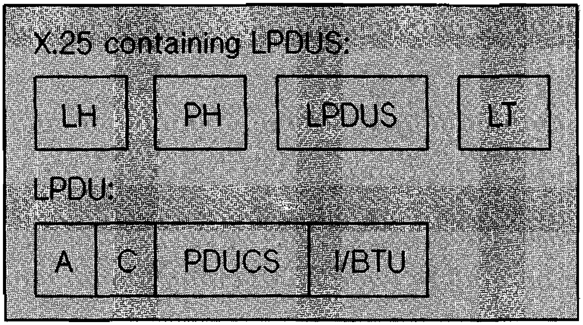


Figure 8-5. SNA Within X.25: ELLC

Field	Description
ELLC	Extended Logical Link Control
LH	Link Header (X.25 start flag, address, and control)
PH	X.25 Packet Header
LPDU	LLC Protocol Data Unit
LPDUS	LPDU Segment
A	Address of LPDU
C	Control of LPDU
PDUCS	Protocol Data Unit Checking Sequence
I	Information of LPDU (optional)
LT	Link Trailer (X.25 FCS and end flag)

The LPDUS may be a partial LPDU or a whole LPDU. There is a bit in the PH (M-More bit) that indicates when the last segment of the LPDU arrives (M=0 means last or only LPDUS). An LPDU consists of a header and an optional BTU.

A

Making a Working Copy of the Master Disc

Initialize the Blank Disc

1. Locate the blank disc, affix a label, and title it.

   Insert the blank disc into the disc drive.

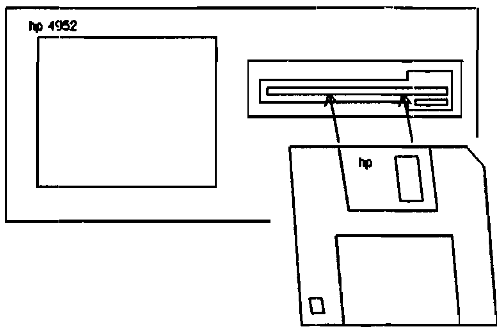


Figure A-1. Inserting A Disc Cartridge

2. Get the top level menu, press [MORE] and press <Mass Store>.

3. Press the <Init> softkey.

4. Press <Execute>. When the disc activity is done, remove the initialized disc.

Copying The Master Disc

The master disc contains the SNA Analysis application and a sample data file. You must use the copier to copy the SNA Analysis application to the working disc.

You must use the basic loading and storing features of the protocol analyzer to copy the sample data to the working disc.

The sample data file is used in conjunction with examples in the SNA Analysis user's guide, thus, it is wise to copy the sample data file so that the master disc is not used as a training disc.

Copying The SNA Analysis Application

1. Locate the master disc and insert it into the disc drive.

2. At the top level menu, press [MORE] and <Mass Store>. The disc is read and the catalog of files on the disc appears on the screen.

3. Use the arrow keys to locate SNA_ANALYSIS.

4. Press <Load> and <Execute>.

5. Remove the master disc and insert the initialized working disc into the disc drive.

6. Press <Store>. Move the cursor to the comment line and enter WORKING COPY, or a similar comment.

7. Press <Execute>. When the disc activity stops the top level menu will return.

Copying The Sample Data

1. Locate the master disc and insert it into the disc drive. At the top level menu, press [MORE] and <Mass Store>.

2. Use the arrow keys to locate SNA_DATA. Press <Load> and <Execute>. The sample data is loaded into the data buffer. When the disc activity stops the top level menu reappears.

4. Remove the master disc and insert the working disc into the disc drive.

5. Return to <Mass Store>. Press <Store>. Move the cursor to the file-type line and then press <Menus & Data>. You can add a comment on the comment line if you wish.

6. Press <Execute> to store the sample data to the working disc.

Appendices

Appendices

B

Using Highlights

Using Highlights

A highlight is a half-bright video enhancement that marks data in a display. You can highlight data by writing a monitor or simulate program. Use of this feature is described in the HP 4952 Operator's Manual.

You can use highlights in SNA displays; however, there are some points to keep in mind.

When you write a monitor or simulate program that uses highlights, remember that you are specifying a byte to be marked. Because SNA uses SDLC, a bit-oriented protocol, you may not be able to define a highlight as precisely as you may wish. For example, you cannot highlight just the FID (four bits) in byte 0 of a transmission header; you must highlight the entire byte. In a FID2 transmission header, this causes the F, M, A and E columns to have the half-bright enhancement.

When you visually scan a display looking for highlights, remember that some bytes in a frame are not displayed. For example, say that you ran a monitor program that highlights byte 1 in a FID2 transmission header. When you use the <Next Hilit> softkey to examine data, the frame containing the 'highlight' will be positioned to the top of the display, but no half-bright enhancement will be seen. This is because byte 1 is a don't-care byte and is not displayed.

Other 'highlights' that are not displayed include bytes in the RU that are past the basic request or Fmh codes, or past the first nine bytes of sense data.

Bytes 1 and 2 of the request header are displayed in SNA format; however, when these bytes are 'highlighted', no half-bright enhancement is seen because these lines appear in a half-bright area at the top of the display.

NOTE

A maximum of 63 bytes can be highlighted. When the data buffer contains more than 63 highlightable bytes, only the last 63 are marked.

G

Glossary

Application Memory
An area of memory in the protocol analyzer in which you can store only application programs.

Basic Information Unit (BIU)
The unit of data and control information passed between half-sessions. It consists of a request/response header (RH) followed by a request/response unit (RU). It is used by network addressable units.

Basic Link Unit (BLU)
The unit of data and control information transmitted over a data link by data link control.

Basic Transmission Unit (BTU)
This is the equivalent of the information field in an SDLC frame and may contain many PIUs.

Data Buffer or Data Capture Buffer
An area of memory in the protocol analyzer in which you can only store data traffic.

End-user
The ultimate destination or source of application data in an SNA network. An end user may be an application program, a terminal operator, a printer, or a mass storage device.

Explicit Route (ER)
The network's path control components that connect two subarea nodes; this includes a set of one or more transmission groups. An explicit route is identified by an origin subarea address, a destination subarea address, explicit route number, and a reverse explicit route number.

Extended Link Level Control (ELLC)
A logical link set across the X.25 PDN. SNA-X.25 uses the logical link as if it were a physical link.

Format Identifier (FID)
Identifies the format of a path information unit. It is located within the transmission header of the PIU.

Format Identifier Type 0 (FID0)
Identifies traffic involving non-SNA devices between adjacent subarea nodes when either or both nodes do not support explicit and virtual routing. FID0 is 10 bytes in length.

Format Identifier Type 1 (FID1)
Identifies traffic between adjacent subarea nodes when either or both nodes do not support explicit route and virtual routing. FID1 is 10 bytes in length.

Format Identifier Type 2 (FID2)
Identifies traffic between a subarea node and an adjacent type 2 physical unit peripheral node. FID2 is 6 bytes in length.

Format Identifier Type 3 (FID3)
Identifies traffic between an adjacent subarea node and an adjacent type 1 physical unit peripheral node. FID3 is 2 bytes long.

Format Identifier Type 4 (FID4)
Identifies traffic between adjacent subarea nodes when both nodes support explicit and virtual routing. FID4 is 26 bytes long.

Format Identifier Type F (FIDF)
Identifies certain commands sent between adjacent subarea nodes when both nodes support explicit and virtual routing. FIDF is 26 bytes long.

Function Management Header (FMH)

One or more optional headers in the leading request/response unit (RU) of an RU chain, that allow one half session in an LU-LU sesson to:

(1) select a destination at the session partner and control the way that the end-user data it sends is handled at the destination; (2) change the destination or characteristics of the data during the session, and; (3) transmit between session partners status or user information about the destination.

Link

The combination of the link connection and the link stations joining SNA nodes.

A link connection is the physical medium of transmission; for example, a telephone wire or a microwave beam. A link includes the physical medium of transmission, the protocol, and associated communication devices and programming; it is both logical and physical.

Logical Link Control (LLC)

A logical link is set up across the X.25 PDN. SNA-X.25 uses this logical link as if it were a physical link using one of the LLC protocols: QLLC, ELLC, or PSH-LLC.

LLC Protocol Data Unit (LPDU)

In the context of SNA-X.25, the LPDU bears a useful resemblence to an SDLC frame. but is contained within an X.25 packet for the purposes of transmission over the X.25 network.

Logical Unit (LU)

A port which an end-user accesses in order to communicate with another end-user and through which the functions are provided by system services control points (SSCPs). An LU is capable of supporting a least two sessions, one with an SSCP, and one with another logical unit. An LU may be capable of supporting many sessions with other logical units.

Message Unit

A generic term for the unit of data processed by any layer; for example, a basic information unit (BIU), a path information unit (PIU), a request/response unit (RU).

NAU Services Manager Layer

Layer in the NAU that works with the Function Management Data Services Layer to help prepare data for transmission through the network, facilitate data exchanges between application programs, and provide ways to configure, monitor, and control a network.

Network Addressable Unit (NAU)

A program or set of programs that carries out well-defined network functions. The three kinds of NAUs are System Service Control Point (SSCP), Logical Unit (LU), and Physical Unit (PU).

Network Services (NS)

The services within network addressable units (NAUs) that control network operation via SSCP-SSCP, SSCP-PU, and SSCP-LU sessions.

Node

The basic building block of an SNA network. An endpoint of a link or a junction common to two or more links in a network. Nodes can be distributed- or host-processors, communication controllers, cluster controllers, or terminals. Nodes can vary in routing and other functional capabilities.

Path Control (PC) Network

Performs several communications functions in the node. These include receiving information from an NAU, routing this information through the network, ensuring that the information crosses the data links without errors, and delivering the data to its destination NAU.

Path Information Unit (PIU)

A message unit consisting of a transmission header (TH) alone, or of a TH followed by a basic information unit (BIU). It is used by the path control network.

Physical Services Header (PSH)

The LPDU header used in PSH-LLC.

PSH-LLC
An LLC originally used by IBM over SNA-X.25, now being replaced by QLLC and ELLC. PSH-LLC is still found in the field.

Physical Unit (PU)
The component that manages and monitors the resources of a node (such as attached links and adjacent link stations), as requested by an SSCP via an SSCP-PU session. Each node of an SNA network contains a physical unit.

Qualified Link Level Control (QLLC)
This is the basic protocol currently being implemented for use as the LLC protocol for SNA-X.25. It performs identical functions as SDLC, but is formatted differently in order to handle larger addresses and sequence numbers.

Request
A message unit that signals initiation of a particular action or protocol. For example, INITIATE SELF is a request for activation of an LU-LU session.

Request/Response Unit (RU)
A message unit that acknowledges a request unit; it may contain prefix information received in a request unit. If positive, the response unit may contain additional information (such as session parameters in response to BIND SESSION), or if negative, contains sense data defining the exception condition.

Response
In SNA, a message unit that acknowledges receipt of a request; a response consists of a response header (RH) and optionally a response unit (RU).

In SDLC, the control information (in the C-field of the link header) sent from the secondary station to the primary station.

Response Header (RH)
A header, optionally followed by a request/response unit (RU), that indicates whether the response is positive or negative and that may contain a pacing response.

Sense Data
Another alternate type of data that may follow the RH.

Subarea Node

A node that uses network addresses for routing and whose routing tables are affected by changes in the configuration of the network. Subarea nodes can provide boundary function support for peripheral nodes.

System Services Control Point (SSCP)

A control program that manages a section of a network called a domain. Generally a part of a communications access method on a host processor.

Systems Network Architecture (SNA)

The description of the logical structure, formats, protocols, and operational sequences for transmitting information units through, and controlling the configuration and operation of networks.

The purpose of SNA is to allow the ultimate origins and destinations of information, that is, the end users, to be independent of, and unaffected by, the way in which the specific SNA network services and facilities are provided.

Systems Network Architecture-X.25 (SNA-X.25)

SNA encapsulated into X.25. This is a CCITT standard for interfacing to public packet switched networks.

Transmission Header (TH)

Control information, optionally followed by a basic information (BIU) or a BIU segment, that is created and used by path control to route message units and to control their flow within the network.

Virtual Route (VR)

A logical connection between two subarea nodes that is physically realized as a particular explicit route, or that is contained wholly within a subarea node for intra-node sessions.

A virtual route between distinct subarea nodes imposes a transmission priority on the underlying explicit route, provides flow control through virtual-route pacing, and provides data integrity through sequence numbering of path information units (PIUs).

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