HP 4953A Protocol Analyzer

HP 18302A
SS No.7 Analysis Application

User's Guide

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"Note: Many, but not all, of the figures and definitions used in the present manual have as their basic source the material contained in the CCITT Red Book, International Telecommunication Union (ITU), Geneva, Switzerland, 1985, Fascicles VI.7 and VI.8, "Specifications of Signalling System No. 7"; the user of the present manual may consult that material for further details. The responsibility for the choice and the contents of the figures and definitions used in the present manual rests entirely and exclusively with Hewlett-Packard, without committing in any way the responsibility of the ITU."

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Critical Instructions

Critical instructions within the text of this publication are preceded by one or more of the following labels.

WARNING All operating procedures, practices, etc., that must be performed in the specified manner to preclude the possibility of personal injury or loss of life are preceded by a "Warning" label.

CAUTION All operating procedures, practices, etc., that must be performed in the specified manner to preclude the possibility of damaging the instrument or destroying programs or software are preceded by a "Caution" label.

NOTE Explanatory comments or supplementary instructions are preceded by a "Note" label.

Printing History

New editions are complete revisions of the manual. Update packages, which are issued between editions, contain additional and replacement pages to be merged into the manual by the customer. The dates on the title page change only when a new edition or a new update is published. No information is incorporated into a reprinting unless it appears as a prior update; the edition does not change when an update is incorporated.

Many product updates and fixes do not require manual changes and, conversely, manual corrections may be done without accompanying product changes. Therefore, do not expect a one-to-one correlation between product updates and manual updates.

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Introduction

Description

The HP 18302A Signalling System No.7 (SS No.7) Analysis Application for the HP 4953 Protocol Analyzer provides users of Common Channel Signalling Number 7 protocol with a powerful tool for analyzing and simulating information on the common channel. This application has simulation abilities for developers of SS No.7 equipment and clear, up-to-date data monitoring abilities for installation and maintenance.

The basis for this application was taken directly from the CCITT specification for Signalling System No.7, referred to as CCITT#7. Additional provisions have been made for the ANSI specification for Common Channel Signalling System No. 7 referred to as CCS7 and a Japanese version referred to as Japan#7. The SS No.7 Analysis Application is actually divided into two separate applications on the tape. The filename CCITT7 contains the CCITT#7 and the CCS7 versions, and the filename JAPAN7 contains the Japan#7 version.

The differences in the versions are discussed in Chapter 7, SS No.7 Reference. The protocols are collectively referred to as SS No.7 in this manual.

NOTE

This manual is to be used as a supplement to the HP 4953 Operating Manual. It assumes you are already familiar with the basic use of the protocol analyzer.

Applications

The SS No.7 Analysis Application may be used with the HP 4953 to locate common channel signalling problems and monitor performance of the link with its ability to monitor on-line data traffic as well as capture data traffic and view it off-line. You can store data traffic to tape, or directly into the Protocol Analyzer's RAM Disc. 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.

The SS No.7 Analysis Application can be used with any physical interface supported by the HP 4953.

Equipment Supplied

The SS No.7 Analysis Application includes the following:

Master Tape Blank Tape User's Guide

The Master Tape contains the two SS No.7 Analysis Application programs (CCITT7 and JAPAN7), sample data buffer, and several sample menus. The sample menus are used in conjunction with the User's Guide to help learn about the SS No.7 Analysis features. The Blank Tape 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 working copy includes your user-defined mnemonics. The User's Guide provides reference and tutorial information.

Specifications

- Extended Memory Option 001 must be present (or HP 04953-62611)
- Performs at speeds up to 64 Kbps

Features

Monitor

- Three new display formats decode show level 2 information, level 3 information, or level 3 with higher level undecoded data.
- Either FISUs or both FISUs and LSSUs can be filtered from the data capture buffer.
- Li field accuracy check will alert you to an inaccurate Li field value or an illegal frame length.

Simulation

- Automatic sequencing simulates positive message acknowledgment.
- FISUs or SIOS are automatically generated during idle time.
- Li calculation ensures the accuracy of the Li value.

Network Statistics

- Full post processing capability including interframe timing measurements assist in analysis.
- FISUs and DCE and DTE frames and certain message types are counted.
- User specified signal units and signal units on a user specified link are counted.
- Good, bad, and abort signal units are counted.

Edit Mnemonics

- The Destination and Originating Point Codes (OPC/DPC) fields can be segmented and displayed in five customized subfields.
- Service Indicator (SI), Header Codes (H0, H1) and message type field mnemonics can be modified.

2

Getting Started

Introduction

This chapter contains instructions on how to get your SS No.7 application up and running. After reading this chapter, you should be able to load the application, sample buffer data, and sample menus into your HP 4953. You will know how to save your customized mnemonics and will be familiar with the SS No.7 set up menu.

For detailed information concerning voltage and grounding requirements, power cords, and analyzer operation refer to the HP 4953 Protocol Analyzer Operating Manual.

CAUTION

Do not plug in the HP 4953 Protocol Analyzer until you are sure that the line voltage selection is correct.

Always turn off the protocol analyzer before connecting or disconnecting an interface pod.

The SS No.7 Analysis Application contains two programs on the master tape for decoding. One is the North American version (CCS7) and the European version (CCITT#7) titled CCITT7 in the tape catalog. The other is the Japanese version (Japan#7) titled JAPAN7 in the tape catalog. This User's Guide uses CCITT#7 in all examples.

Connect an Interface Pod

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

Check the Application Memory Space

Each of the SS No.7 Analysis Applications use 80 Kbytes of application memory. Before loading either application, check the amount of application memory present in your protocol analyzer.

1. From the top level menu press **<Other Choices>**.

2. Press **<Applic Menu>**.

The highlighted field on the display (Data buffer size) must show 256 Kbtyes. This indicates that your protocol analyzer has the extended memory Option 001 or Retrofit Kit HP 04953-62611 required for the SS No.7 Analysis Application.

Each of the SS No.7 Analysis Applications can be loaded and used concurrently with the Tape Edit and GPRINT applications. However, in general the SS No.7 Analysis Applications can not be used concurrently with each other or with other applications.

Make a Working Copy of the Master Tape

Hewlett-Packard recommends that you make a working copy of the master tape and provides a blank tape to do so. Use the working copy and retain the master as a backup in case your working copy of the tape fails due to wear or accidental erasure. The working copy can also be used to save user-defined mnemonics.

NOTE

Copying an application program for any reason other than your own backup violates copyright laws.

Initialize the Blank Tape

Affix a title to the blank tape that is meaningful to you, perhaps SS No. 7 Analysis Copy. Make sure that the RECORD slide is pushed in the direction of the arrow on the slide; otherwise, you will get a write protect error when you attempt to store data.

1. Insert the blank tape into the tape drive.
2. From the top level menu press **<Mass Store>**.
3. Press **<Init>**.
4. Press **<Execute>**.

When the tape activety stops, remove the initialized blank tape.

Loading the Analysis Application

At a minimum, you should make a working copy of the appropriate application program for your use. Also, it is wise to copy the sample data files so that the master tape is not used as a training tape.

1. Insert the master tape into the tape drive.
2. From the top level menu press **<Mass Store>**.
3. Press **<Catalog>**.

The tape is read and the catalog is displayed.

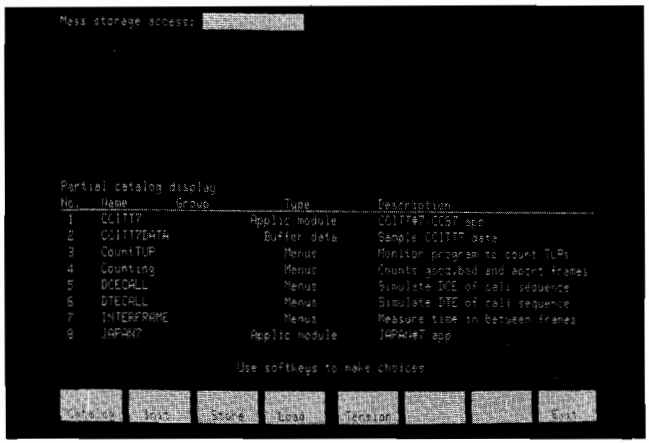

Figure 2-1. SS No. 7 Catalog

NOTE

The contents of the HP 4953 data buffer are replaced by the files you load. Store any buffer data that you wish to keep before loading the sample data.

4. Press **<Load>**.

5. Press **<Select file>**.

6. Position the highlight bar over the file named **CCITT7** or **JAPAN7**.

7. Press **<Execute>**.

The tape is read and the analysis program is loaded into the protocol analyzer memory. When the tape activity stops, remove the SS No.7 master tape.

Customizing the Mnemonics

The SS No.7 Application Analysis has the advanced capability of enabling you to customize the mnemonics and saving them for future use with your working copy. The mnemonics help to clarify the data as it is displayed by the Level 2 and Level 3 decodes. At this point you may go in and customize your mnemonics so that the new mnemonics may be saved with the working copy.

The mnemonics may be accessed from the top level menu by pressing **<Other Choices>, <Edit Mnemonics>** and then **<Edit Level 3>**. Make the changes that apply. For information on the user definable fields refer to Chapter 6, Edit Mnemonics.

Storing the Analysis Program to the Blank Tape

Use one of these methods to store the analysis program to the HP 4953 buffer memory.

1. Insert the initialized tape into the tape drive.
2. Press **<Applic Menu>**. You may want to press **<Description>** to enter a message about what will be stored.
3. Press **<Store Applic>**.
4. Press **<Execute>**.

The analysis program with your customized mnemonics is being stored to the blank tape called SS No.7 Analysis Working Copy. When the tape activity stops, remove the working copy.

Another way to store the analysis program:

1. Insert the initialized tape into the tape drive.
2. From mass store menu press **<Store>**.
3. Enter the file name **CCITT7**.
4. Enter the file type **Applic module**.
5. Enter a description of the application, something that will be meaningful to you.
6. Press **<Execute>**.

Loading & Storing Menus and Data

A basic feature of the HP 4953 is the ability to store menus and data on tape. To store the buffer data and menu files from the master to the SS No.7 Analysis working copy tape:

1. Insert the master tape into the tape drive.
2. From the top level menu, press **<Mass Store>**.
3. Press **<Catalog>**.
4. Press **<Load>**.
5. Press **<Select File>**.
6. Position the highlight bar over the file to be copied using **<Cursor down>**, **<Cursor up>**, or the keyboard arrow keys.
7. Press **<Execute>**.

The tape is read and the selected file is loaded into the protocol analyzer memory. When the tape activity stops, remove the SS No.7 master tape.

Now, store the selected file to the working copy. Insert the SS No.7 Analysis copy tape into the tape drive.

1. From the mass store menu, press **<Store>**.

2. Press **<Execute>**.

You can load, then store, each SS No.7 file in the same manner. Press **<Exit>** to return to the top level menu.

NOTE

Menus, sample menus, or buffer data stored while SS No.7 display formats are active can only be loaded back into an HP 4953 that has the SS No.7 Analysis Program loaded into its memory.

Loading From the Master Tape to RAM Disc

You can also store files onto the RAM disc memory card if you have that capability in your HP 4953. The advantage of this method is that the RAM Disc has a battery back up for memory retention so the tape does not need to be reloaded each time the protocol analyzer is turned off. It is also more efficient in that you can copy all the files at once instead of individually.

1. From the top level menu, press **<Other Choices>.**
2. Press **<RAM Disc Menu>**.
3. Press **<RAM Disc Features>**.
4. Press **<Tape Copy Utility>**.
5. Press **<Tape to RAM Disc>**.

To complete this store operation you must first define either an individual file or all tape files to be transferred. The RAM Disc operation field reads **Tape to RAM Disc** and the cursor is positioned at the file name field.

To copy all tape files to the RAM Disc:

1. Press **<Copy all files>**.
2. Press **<Execute>**.

To copy individual files:

1. Press **<File Name>**. Use the keyboard to enter the file name.

2. Press **<Group name>**. Use the keyboard to enter the group name.

3. Press **<File type>**.

   At this point you can press **<Menus>**, **<Data Code>**, **<Buffer Data>**, or **<Applic module>** to specify the file type.

4. Press **<Describe file>**.

   The instruction **Fill the field using the text keys** is displayed. Enter a description of the file for future reference.

5. Press **<Execute>** to transfer the file.

6. Press **<Exit field>** to return to the RAM Disc features menu.

Storing the Analysis Program from RAM Disc

If you stored the files using RAM Disc, use this method to store from RAM Disc to tape:

1. From the top level menu, press **<RAM Disc Menu>**, then **<RAM Disc Features>**.

2. Press **<Tape Copy Utility>**.

3. Press **<RAM Disc to Tape>**.

4. Insert the initialized tape into the tape drive.

5. Press **<Copy all Files>**.

The Setup Menu

The HP 4953 setup menu lets you reconfigure the protocol analyzer to operate within your networks parameter. See the HP 4953 Protocol Analyzer Operating Manual for information on the basic protocol analyzer features.

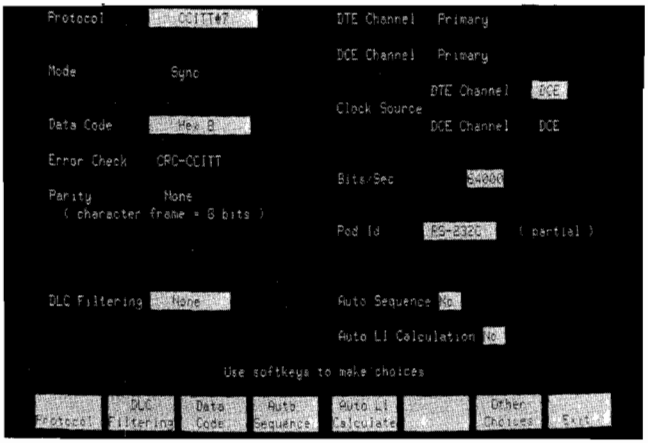

Figure 2-2. SS No. 7 Setup Menu

Notice the new fields the SS No.7 Analysis Application adds to the HP 4953 setup menu. The fields are discussed in the appropriate chapter.

For more information regarding these fields:

DLC Filtering	Chapter 3	Monitor
Auto Sequence	Chapter 4	Simulation
Auto LI Calculation	Chapter 4	Simulation

3

Monitor

Introduction

This chapter describes the real time capture, display, and decode of common channel signalling traffic. After reading this chapter, you will know how to configure the protocol for selectable filtering and you will understand the display formats.

You can monitor data at a speed of 64 Kbits per second using the SS No.7 Analysis Application. While monitoring, you can view data on-line or store the buffer data on a tape for analysis and viewing at a later date.

NOTE

You will need to load the analysis program called CCITT7 and the sample data called CCITT7DATA from your application tape for this chapter. If you need help, see Chapter 2, Getting Started.

DLC Filtering

The SS No.7 Analysis Application offers three DLC filtering choices. You can select data by filtering either FISU frames or both FISU and LSSU frames from the data capture buffer. Without any front end filtering, the buffer would fill quickly due to the 64 kbps data rate.

To Reach the Filter Choices:

1. From the top level menu, press **<Setup Menu>**.
2. Press **<DLC Filtering>**.

The display should look like Figure 3-1.

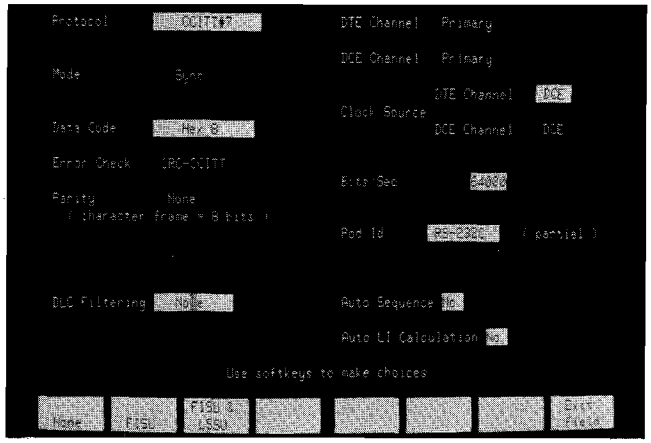

Figure 3-1. SS No.7 Setup Menu with Filtering Choices

At this point you can press the either **<None>**, **<FISU>**, or **<FISU & LSSU>** to choose the type of filtering you want. The following pages describe what is being filtered by your choice.

NOTE

DLC Filtering can not be used when the source of the data is the buffer.

None

When you select **<None>**, all frames are retained in buffer memory, whether they are MSUs, LSSUs or FISUs. One note of caution, remember that once the HP 4953 buffer is filled, additional data will push the first data stored out of the buffer. You can select **<Stop when buffer is full>** as one of your display setups to avoid losing data.

FISU Filtering

Selecting **<FISU>** causes unchanged FISU frames to be filtered.

A Fill in Signal Unit (FISU) is a signal unit containing only error control and delimitation information, which is transmitted when the are no Message Signal Units (MSUs) or Link Status Signal Units (LSSUs) to be transmitted. FISUs are only filtered if they are exactly the same as the previously sent FISU, so no valuable information is lost.

FISU & LSSU Filter

Selecting **<FISU & LSSU>** causes frames containing unchanged FISUs and unchanged LSSUs to be filtered.

A Link Status Signal Unit (LSSU) is a signal unit containing status information about the transmitted signalling link. SS No.7 requires LSSU frames be sent before the link is aligned and during the process of aligning the link. They are also sent during timing measurements. These frames can also be filtered to save buffer space. However, the LSSU filtering is selective. Only the frame identical the proceeding frame is filtered so that usable data is not missed.

Li Field Accuracy Check

The Length Indicator (Li) is a six bit field which differentiates between Message Signal Units (MSUs), Link Status Signal Units (LSSUs), and Fill-In Signal Units (FISUs). The number of octets following the Li and preceding the Check Bits (CK) is called the Signalling Information Field (SIF). The SIF makes a distinction between the signalling units. It is between 0 and 63 characters in length for the international network and may contain up to 272 octets in national signalling networks.

Li	Signal Unit
0	FISU
1 or 2	LSSU
>2	MSU

The Li field accuracy check usually alerts you to an inaccurate Li field value or to an illegal frame length. It operates in any of the three display screens (Level 2, Level 3, and Level 3 with data). The **CK** character will flash in the displays if:

- the number of the Li field does not correspond to the number of bytes within the data field.
- the length of the frame is longer than 63 characters.

Interpreting the Li Accuracy Check

The error indicator **CK** automatically flashes in any of the three decode displays when an illegal Li field or illegal frame size exists.

Display Menu

The SS No.7 Analysis Application lets you choose the format for displaying data. You can choose combinations of DTE and DCE displays or you can display Level 2, Level 3, or Level 3 with data. Level 2 decodes the forward and backward sequence numbers, the length indicator field and, depending on the type of signal unit, the Status Field (SF), sub-service field (SSF) or Service Indicator (SI) values. Level 3 decodes the routing label, which includes the Destination and Originating Point Code (DPC and OPC), and depending on the type of message unit, decodes the fields which follow the routine label. Level 3 with data shows all the data, wrapping it to the next line, if necessary.

For a more complete description of the decodes specific to the type of Message Unit, see Chapter 7, SS No.7 Reference.

NOTE

The 2X display is not supported for the special SS No.7 displays.

To Reach the SS No.7 Display Choices

1. From the top level menu, press **<Display Menu>**.
2. Press **<Display Format>**. The SS No.7 display choices are located in this menu.

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You can also change the display from the examine data menu. This procedure is explained when you start looking at the individual displays later in this chapter.
The display on your HP 4953 should look like Figure 3-2.

Figure 3-2. The SS No.7 Display Format Menu

Level 2 Display

Level 2 display decodes the Forward and Backward Sequence numbers, the Length Indicator (Li) field, and, depending on the type of signal unit, the status field, the Sub-service Field (SSF), or service indicator values.

To Reach Level 2 Display Field

You can change the display from the top level menu using **<Display Menu>** or you can use the procedure below while in the examine data menu.

1. From the top level menu, press **<Examine Data>**.
2. Press **<Other Choices>**, then **<Display Format>**.
3. Press **<Other Choices>**, then **<CCITT#7 Level 2>**.
4. Press **<Other Choices>** twice.
5. Press **<Specify Block>**.
6. Type in **5** from the keyboard and press [Return].

The display on your HP 4953 should look like Figure 3-3.

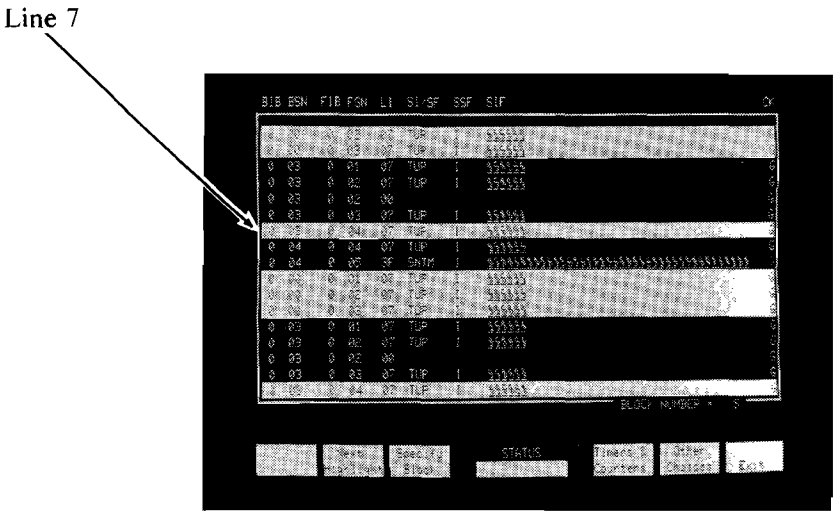


Figure 3-3. SS No. 7 Level 2 Display

The arrowed line of data is explained in Table 3-1.

Reading the Level 2 Display

Use the standard HP 4953 features for finding data traffic information: [ROLL UP], [ROLL DOWN], [NEXT PAGE], and [PREV PAGE] on the analyzer keyboard, and **<Specify Block>**.

Use the table below to read the display (see arrow in Figure 3-3):

Table 3-1. Reading Level 2 Data

MNEMONIC	PHRASE	DATA
BIB	Backward Indicator Bit	0
BSN	Backward Sequence Number	3
FIB	Forward Indicator Bit	0
FSN	Forward Sequence Number	4
LI	Length of Signal Unit	7 octets
SI	Service Indicator	Telephone User Part
SSF	Subservice Field	International TUP
SIF	Signalling Information Field	Level 3
CK	Check Bits	Good

Check Bits (CK) may indicate: G (Good) B (Bad) A (Abort)

Level 3 Display

Level 3 display decodes the routing label which includes the Destination and Originating Point Codes (DPC and OPC) and, depending on the type of Message Unit (MU), decodes the fields which follow the routing label.

A detailed description of the decodes specific to the type of MU can be found in Chapter 7, SS No.7 Reference.

To Reach the Level 3 Display Format:

You can change the display from the top level menu using **<Display Menu>** or you can use the procedure below while in the examine data menu.

1. From the top level menu, press **<Examine Data>**.
2. Press **<Other Choices>**, then **<Display Format>**.
3. Press **<Other Choices>**, then **<CCITT#7 Level 3>**.
4. Press **<Other Choices>** twice.
5. Press **<Specify Block>**.
6. Type in **5** from the keyboard and press [Return].

The display on your HP 4953 should look like Figure 3-4.

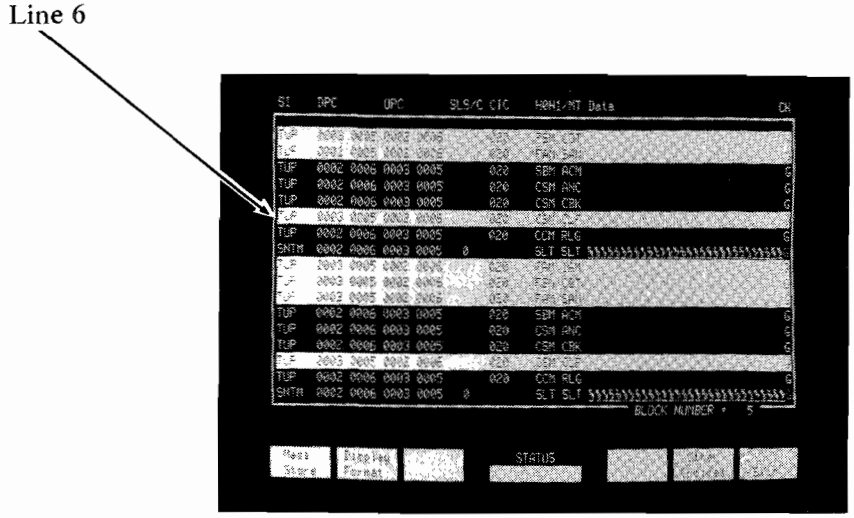


Figure 3-4. Level 3 Display

The arrowed line of data is described in Table 3-2.

Reading the Level 3 Display

Use all the standard HP 4953 features for finding data traffic information: [ROLL UP], [ROLL DOWN], [NEXT PAGE], and [PREV PAGE] on the analyzer keyboard, and **<Specify Block>**.

Use the table below to read the display (see arrow in Figure 3-4):

Table 3-2. Reading Level 3 Data

MNEMONIC	PHRASE	DATA
SI	Service Indicator	Telephone User Part
DPC	Destination Point Code	0003 0005
OPC	Originating Point Code	0002 0006
CIC	Circuit ID Code	20
H0	Header Code 0 Call Supervisor Message	CSM
H1	Header Code 1 Clear Forward Signal	CLF
CK	Check Bits	Good

Check Bits (CK) may indicate: G (Good) B (Bad) A (Abort)

Level 3 with Data Display

Level 3 with Data display decodes the level 3 data exactly as the Level 3 display. All additional data which is included in the signal unit is also shown, wrapping it to the next line if necessary.

To Reach the Level 3 With Data Display Format

You can change the display from the top level menu using **<Display Menu>** or you can use the procedure below while in the examine data menu.

1. From the top level menu, press **<Examine Data>**.
2. Press **<Other Choices>**, then **<Display Format>**.
3. Press **<Other Choices>**, then **<CCITT#7 L3 Data>**.
4. Press **<Other Choices>** twice.
5. Press **<Specify Block>**.
6. Type in **5** from the keyboard and press [Return].

The display on your HP 4953 should look like Figure 3-5.

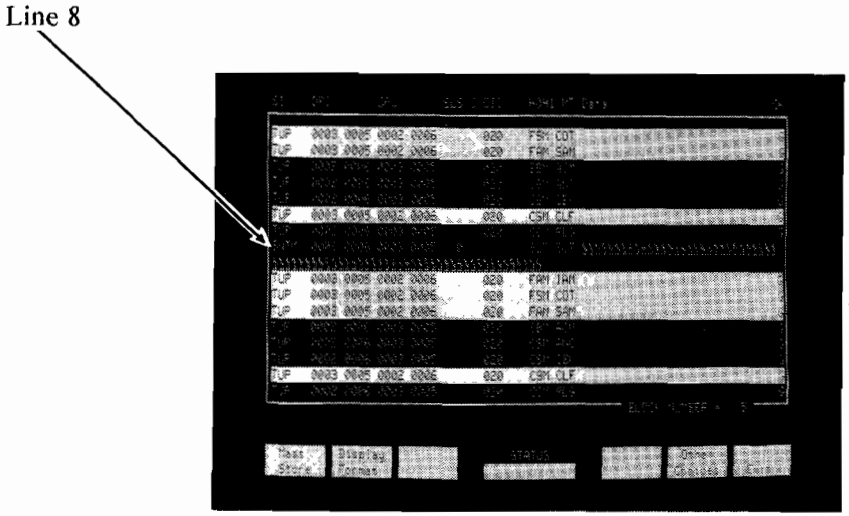


Figure 3-5. Level 3 with Data Display

The arrowed line of data is explained in Table 3-3.

Reading Level 3 with Data

Use all the standard HP 4953 features for finding data traffic information: [ROLL UP], [ROLL DOWN], [NEXT PAGE], and [PREV PAGE] on the analyzer keyboard, and **<Specify Block>**.

Use the table below to read the data (See arrow in Figure 3-5):

Table 3-3. Reading Level 3 Data

MNEMONIC	PHRASE	DATA
SI	Service Indicator	Signal Network Testing & Maintenance Message
DPC	Destination Point Code	0003 0005
OPC	Originating Point Code	0002 0006
SLC	Signalling Link Code	0
H0	Header Code 0 Signallin Link Test Message	SLT
H1	Header Code 1 Signalling Link Test Signal	SLT
CK	Check Bits	Good

Check Bits (CK) may indicate: G (Good) B (Bad) A (Abort)

4

Simulation

Introduction

This chapter provides information about simulating with the SS No.7 Analysis Application. After reading this chapter, you will understand auto sequencing, FISU and LSSU idling, and Auto Li calculation. Included are three examples to show you how to enter simulation programs.

During simulation the analyzer is active and acts as either a transmitter or a receiver. The data transmitted is determined by the program you create. The standard HP 4953 simulation capabilities allow you to:

- send strings of characters
- control leads on the interface
- delay send and set lead outputs

Along with the standard capabilities, the SS No.7 Analysis Application allows you to:

- simulate message acknowledgment with auto sequencing
- generate specific idle frames with FISU, SIOS idling
- set up the correct Li field with auto Li calculation

The following are features of SS No.7 simulation and three simulation programs that show you how to simulate FISU idling, SIOS idling and perform a phone call using the TUP.

Auto Sequencing

This feature automatically increments the Forward Sequence Number (FSN) of the transmitted Message Signal Unit (MSU) with the exception of the first one sent. The first frame uses the FSN coded in the send string. Then the FSN of any GOOD received frame is copied to the Backward Sequence Number (BSN) of the next frame sent by the receiver.

A receive frame is GOOD if it has a good frame check sequence and the frame length is correct as indicated by the Length Indicator (Li) field. This feature is used to simulate message acknowledgment.

NOTE

When using the auto sequencing feature, the Auto Idle FISU or Auto Idle SIOS feature should also be used (see Auto Idle). The generated FISUs and LSSUs will have the correct BSN and FSN based on the last good received frame.

To activate automatic sequencing:

1. From the top level menu, press **<Setup Menu>**.
2. Press **<Auto Sequencing>**.
3. To enable auto sequencing, press **<Yes>**.
   To disable auto sequencing, press **<No>**.

Li Calculation

Li calculation will automatically calculate and manipulate the Length Indicator (Li) field of a send string so the Li field has the correct value. If the length of the frame entered is 63 characters or more, the Li field is set to 63. This is according to the CCITT#7 international specifications.

To Activate Auto Li Calculation

1. From the top level menu, press **<Setup>**.

2 Press **<Auto Li Calculate>**.

3. Pressing **<Yes>** enables Li calculation.
   Pressing **<No>** disables Li calculation.

When you enter a string of text in the simulate menu, the Li field will display the correct value of the Li field and can be seen after exiting the string. To enter a string:

1. From the top level menu, press **<Simulate>**.

2. Use the arrow keys to reach **Block 1**.

3. Press **<Send>**.

4. Press **<Text>** and enter your string, using the keyboard.

6. Press **<End frame>**.

Now you should see the correct value of the Li field.

Auto Idle

Auto Idle allows you to generate specific frames before the link is aligned, during link alignment, and while the link up.

Idle FISU

When you activate Auto Idle FISU the link idles in Fill In Signal Unit (FISU) frames. An FISU contains only error control and delimitation information. The Backward Sequence Number (BSN) and Forward Sequence Number (FSN) are copied from the previously sent Message Signal Unit (MSU).

Idle SIOS

When you activate Idle SIOS the link idles in a specific type of Link Status Signal Unit (LSSU) frame, the Status Indication out of Service (SIOS) frame. According to CCITT, the link idles in SIOS signal units before the link is established and during the link alignment phase. An SIOS contains status information about the signalling link in which it is transmitted. When other frames are not being sent by the simulate menu, SIOS frames with the BSN and FSN copied from the previously sent MSU are sent.

NOTE

The link idles in FISU or LSSU frames only after the first frame has been sent.

Running Simulation Programs

#1. Setting Up FISU Idle

1. From the top level menu, press **<Simulate>**.

Use the keyboard arrow keys to reach the different fields.

2. Press **<DCE>** for the Device Emulating field.

3. The Transmission Mode field should be HDX. If not, press **<HDX>**.

4. The Interface Lead Control field should be User Defined. If it is, press **<Block 1>**. If not, press **<User Defined>** and **<Exit>**. The cursor should be at Block 1.

5. Press **<Other choices>** twice.

6. Press **<Auto Idle>**, then **<FISU>**.

7. Press **<and then>**.

8. Press **<Send>**.

9. Press **<Text>**. A start flag, good CK symbol, and an end flag appear.

10. Enter **$0_0 0_0 0_0 0_0$** from the keyboard, and then press **<End frame>**. This is an FISU send string.

11. Press **<Good FCS>**.

12. Press **<and then>** and **<Other Choices>**.

13. Press **<Goto Blk>**.

14. Type in a **2** and press **<Exit field>**.

15. Press **<Next Block>**.

At this point the appropriate signal units should be entered using **<Send>**. Chapter 7, SS No.7 Reference, presents information on what entries to make to produce accurate SS No.7 messages.

For this example, send the following string:

16. Press **<Send>** and **<Text>**.

17. Type in $0_0 0_2 0_7 0_4 8_3 8_2 C_0 0_0 0_2$ from the keyboard.

This is a Telephone User Part message signal unit.

18. Press **<End frame>**.

19. Press **<Good FCS>**.

20. Press **<and then>**.

21. Press **<Other Choices>**.

22. Press **<Goto Block>**.

23. Type in a **2** and press **<Exit Field>**.

The simulation program looks like Figure 4-1.

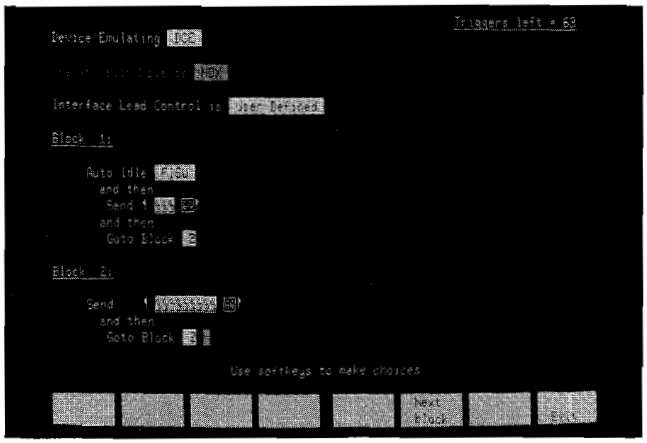


Figure 4-1. FISU Idle Simulation Display

1. Press [Exit] to leave the simulation display.
2. Press **<Run Menu>**.
3. Press **<Source of Data>**.
4. Press **<Line>**.
5. Press **<Run Mode>**.
6. Press **<Simulate>**.
7. Press **<Execute>**.

The data produced by the simulate menu is displayed on the screen.

Examine Data

1. To display the data in the buffer, press **<Stop>**.

2. Press **<Examine Data>**.

3. Use [Roll Up], [Roll Down], [Next Page], and [Prev Page] on the protocol analyzer keyboard to view the data.

The display format should be CCITT#7 Level 2. Your display should look like Figure 4-2.

BIB	BSN	FIB	FSN	LI	SI/SF	SSF	SIF	CK
0	00	0	00	00				G
0	00	0	00	00				G
0	00	0	02	07	TUP	I	83 82 C0 10 02	G
0	00	0	00	00				G
0	00	0	02	07	TUP	I	83 82 C0 10 02	G
0	00	0	00	00				G
0	00	0	02	07	TUP	I	83 82 C0 10 02	G
0	00	0	00	00				G
0	00	0	02	07	TUP	I	83 82 C0 10 02	G
0	00	0	00	00				G
0	00	0	02	07	TUP	I	83 82 C0 10 02	G
0	00	0	00	00				G
0	00	0	02	07	TUP	I	83 82 C0 10 02	G
0	00	0	00	00				G
0	00	0	02	07	TUP	I	83 82 C0 10 02	G
0	00	0	00	00				G
0	00	0	02	07	TUP	I	83 82 C0 10 02	G

BLOCK NUMBER = 1

Figure 4-2. FISU Idling

#2. Simulation Program with SIOS Idle

1. Go back to the top level menu and press **<Simulate>**.
2. Enter **<SIOS>** for the Auto Idle field.
3. At the send command in Block 1, press **<Send>** and then **<Text>**.
4. Enter $0_0 0_0 0_1 0_3$ from the keyboard. This is an SIOS link status signal unit.
5. Press **<End frame>** and **<Good FCS>**.

The simulation program looks like Figure 4-3.

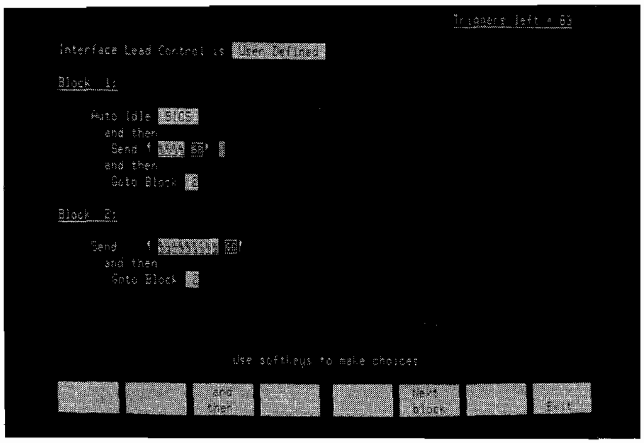


Figure 4-3. SIOS Idle Simulation Program

1. Press [Exit] to leave the simulation menu.

2. From the top level menu, press **<Run Menu>**.

The Source of Data field should still be Line, the Run Mode field should still be Simulate.

3. Press **<Execute>**.

The data produced by the simulate menu is displayed on the screen.

Examining Data

1. To display the data in the buffer, press **<Stop>**.

2. Press **<Examine Data>**.

3. Use [Roll Up], [Roll Down], [Next Page], and [Prev Page] on the protocol analyzer keyboard to view the data.

The display format should be CCITT#7 Level 2. Your display should look like Figure 4-4.

BIB	BSN	FIB	FSN	LI	SI/SF	SSF	SIF	CK
0	00	0	00	01	SIOS			G
0	00	0	00	01	SIOS			G
0	00	0	02	07	TUP	I	[illegible]	G
0	00	0	00	01	SIOS			G
0	00	0	02	07	TUP	I	[illegible]	G
0	00	0	00	01	SIOS			G
0	00	0	02	07	TUP	I	[illegible]	G
0	00	0	00	01	SIOS			G
0	00	0	02	07	TUP	I	[illegible]	G
0	00	0	00	01	SIOS			G
0	00	0	02	07	TUP	I	[illegible]	G
0	00	0	00	01	SIOS			G
0	00	0	02	07	TUP	I	[illegible]	G
0	00	0	00	01	SIOS			G
0	00	0	02	07	TUP	I	[illegible]	G
0	00	0	00	01	SIOS			G
0	00	0	02	07	TUP	I	[illegible]	G

BLOCK NUMBER = 1

Figure 4-4. SIOS Idling

Simulation

#3. DCECALL and DTECALL

The following simulate menus show an example of the sequences that would be used to perform a phone call using the TUP. The DTE is the call originator. The DCE will answer and later hang up.

1. Load the **DTECALL** program to simulate the DTE or load **DCECALL** program to simulate DCE. If you need help, go to Chapter 2, Getting Started.

2. From the top level menu, press **<Simulate>**.

Notice the Auto FISU feature, and, in the setup menu, Auto Sequence is activated.

The sequence is:

DTE Sends	DCE Sends	Meaning
IAM------>		Initial Address Message
COT------>		Continuity Signal
	<------ACM	Address Complete Message
	<------ANC	Answer Signal, Charge
	<------CBK	Clear Back Signal
CLF------>		Clear Forward Signal
	<------RLG	Release Guard Signal

Several delays are built into the program at various times to illustrate the AUTO FISU generation.

5

Network Statistics

Introduction

This chapter describes the interframe timing and network counts capabilities of the SS No. 7 Analysis Application. When you finish this chapter, you will be able to calculate the time between frames, and get a count of all DCE and DTE frames and Fill in Signal Unit (FISU) frames from both channels. User-specified signal units, messages on a specified link, and signal units with bad or abort FCSs can also be counted.

This chapter contains several sample monitor menus for you to try. You can load the application tape version of the monitor menu, modify it to suit your needs and store your customized version for later use.

Load the sample data file, called **CCITT7DATA**, from the application tape.

Interframe Timing

This feature lets you specify a start and stop frame and determines the timing between the two. You can use interframe timing for Level 2 and Level 3 displays during examine data.

Using Interframe Timing

1. From the top level menu, press **<Examine Data>**.
2. Press **<Other Choices>** twice.
3. Press **<Frame Timing>**.
4. To specify a starting frame use [ROLL UP], [ROLL DOWN], [NEXT PAGE], or [PREV PAGE] to move the start frame to the top of the display.
5. Press **<Start Time>**. The highlighted frame at the top of the display will be your starting frame.
6. To specify an ending frame use [ROLL UP], [ROLL DOWN], [NEXT PAGE], or [PREV PAGE] to move the end frame to the top of the display.
7. Press **<End Time>**. The highlighted frame at the top of the display will be your ending frame.
8. The interframe time is calculated and displayed at the top, right hand corner of the screen.

Network Counts

To determine if the link is going through changeover correctly the network counts feature counts all DCE and DTE frames and FISU frames from both channels. The link idles in FISUs. Knowing how many idle frames are on the line for a given time can be helpful to determine the efficiency of the line utilization.

Using Network Counts

1. From the top level menu, press **<Examine Data>**.

2. Press **<Timers & Counter>**.

Four new counters appear on the timers and counters menu.

The counts can also be accessed from the Run Menu during run time. Your display should look like Figure 5-1.

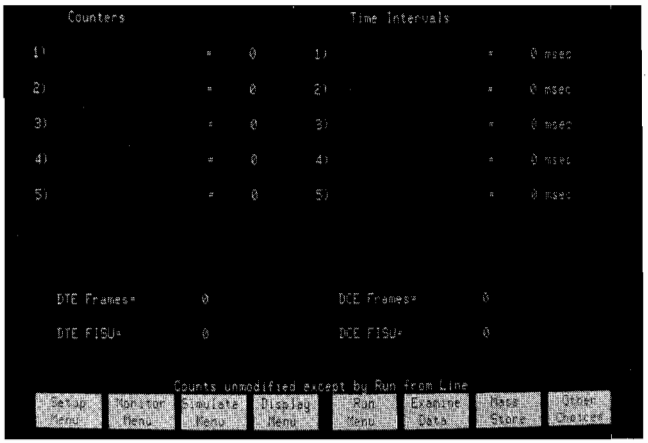


Figure 5-1. Timers and Counters Display

The four network counters at the bottom of the Timers and Counter menu have these abilities:

- monitor the activity on the line when you are receiving data
- update the display continuously when you monitor from the line
- display the last count from the last run of the menu when you monitor from the buffer

Examples of Network Statistics

The following examples show how the monitor menu can be programmed to count the following:

#1. Counts specific message types.

#2. Counts messages on a certain link.

#3. Counts Signal Units (SUs) with good, bad, and abort CK bits.

#4. Counts time between frames.

NOTE

For all of these examples, the buffer data file, **CCITT7DATA** should be loaded. See Chapter 2, Getting Started, if you need help.

As you load each menu, the previous menu will be overwritten.

Network Statistics #1

This statistics program is designed to count Telephone User Part (TUPs) frames.

1. Load the menu labeled **CountTUP** into your HP 4953. Refer to Chapter 2 if you need help.
2. From the top level menu, press **<Display Menu>**.
3. Press **<Display Format>**.
4. Change the display format to Level 3 by press **<CCITT#7 Level 3>**.
5. Return to the top level menu by pressing **<Exit>**.
6. Press **<Monitor Menu>**.

The monitor program is displayed in Figure 5-2.

7. Press **<Exit>** to leave the monitor menu.
8. Press **<Run Menu>** and **<Execute>** to execute the monitor program.
9. Press **<Examine Data>** after run time.
10. Press **<Timers and Counters>**.

The number of TUP signal units is shown to equal 44. The display should look like Figure 5-3.

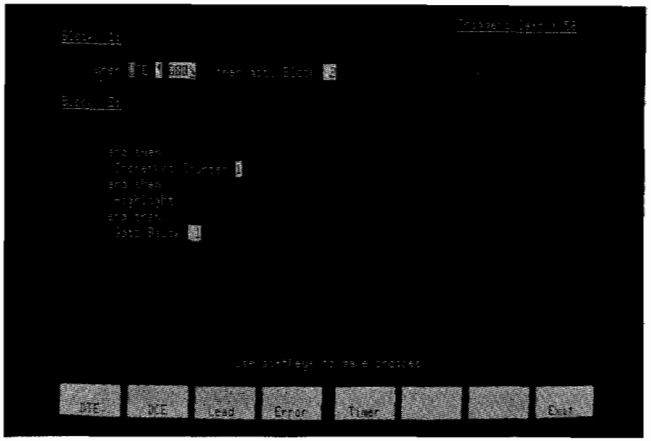


Figure 5-2. Monitor Menu with CounTUP Loaded

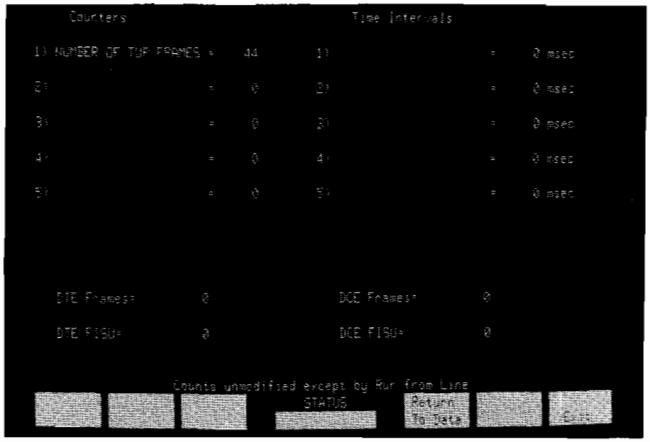


Figure 5-3. Timers/Counters Menu after Counting TUPs

Network Statistics #2

This monitor program counts frames with the SLC trigger set to 20.

1. Load the menu labeled **SLCtrig** into your HP 4953. Refer to Chapter 2 if you need help.

The display format should be Level 3. If it is, go on to step 5.

2. From the top level menu, press **<Display Menu>**.
3. Press **<Display Format>**.
4. Change the display format to Level 3 by press **<CCITT#7 Level 3>**.
5. Return to the top level menu by pressing **<Exit>**.
6. Press **<Monitor Menu>**.

The monitor menu is displayed in Figure 5-4.

7. Press **<Exit>** to leave the monitor menu.
8. Run the monitor menu by pressing **<Run>**, then **<Execute>**.
9. Press **<Examine Data>** after run time.
10. Press **<Timers and Counters>**.

The SUs with SLC equal to 20 is 44. The timers and counters menu should look like Figure 5-5.

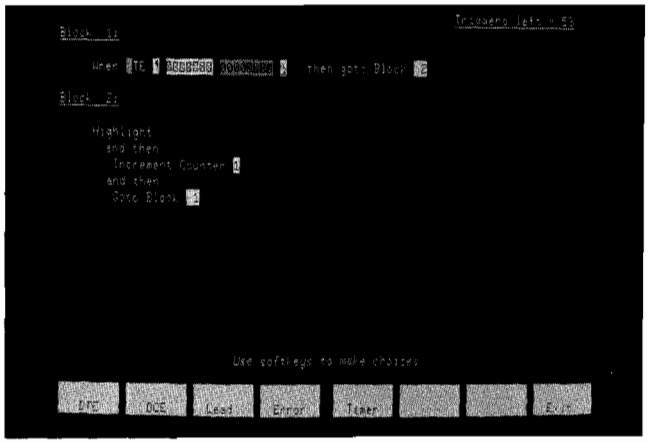


Figure 5-4. Monitor Menu with SLCtrig Loaded

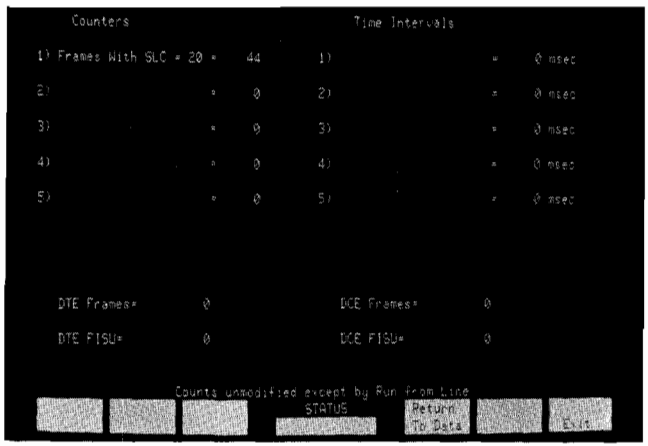


Figure 5-5. Timers/Counters Menu, SUs with SLC = 20

Statistics #3

This program counts good, bad and abort signal units.

1. Load the menu labeled **Counting** into your HP 4953. Refer to Chapter 2 if you need help.

2. From the top level menu, press **<Monitor Menu>**.

You will see the program on the display.

3. Press **<Exit>** to return to the top level menu.

4. Run the monitor program by pressing **<Run Menu>** and **<Execute>**.

5. Press **<Examine Data>** after run time.

6. Press **<Timers and Counters>**.

The Timers and Counters menu is displayed in Figure 5-6.

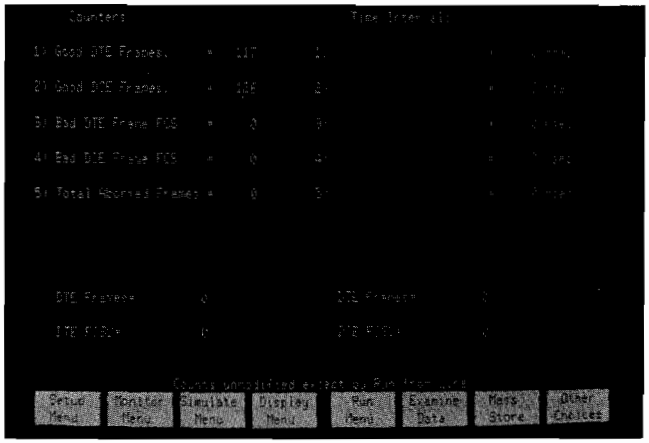


Figure 5-6. Timers/Counters with Counting Monitor Menu

Statistics #4

This program measures the time in between frames.

1. Load the menu labeled **INTERFRAME** into your HP 4953. Refer to Chapter 2 if you need help.
2. From the top level menu, press **<Monitor>**.

You will see the program on the display.

3. Press **<Exit>** to return to the top level menu.
4. Run the monitor program by pressing **<Run Menu>**, then **<Execute>**.
5. Press **<Examine Data>** after run time.
6. Press **<Timers and Counters>**.

The Timers and Counters Menu is displayed in Figure 5-7.

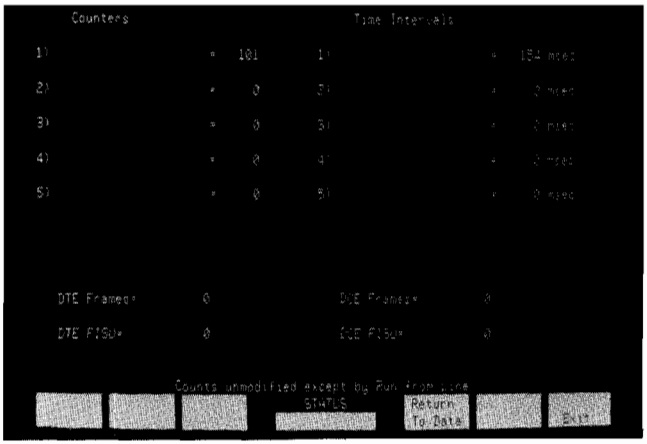


Figure 5-7. Timers/Counters w/INTERFRAME Monitor Menu

6

Edit Mnemonics

Introduction

This chapter describes the edit mnemonics feature in the SS No.7 Analysis Application. After reading this chapter, you will know the various fields that can be edited, how to edit them, and how to view the modifications.

The editing feature gives you the flexibility to customize the mnemonics and field lengths. The mnemonics help clarify the data displayed by the Level 2 and Level 3 decodes.

After customizing your mnemonics, you can store the edited version of the application as your work copy. See Chapter 2 Getting Started, for the procedure to make a working copy and, in doing so, save the customized mnemonics.

Edit Mnemonics Top Level Menu

Load the application and **CCITT7DATA**, the sample data, from the working copy. See Chapter 2 if you need help.

1. From the top level menu, press **<Other Choices>**.

2. Press **<Edit Mnemonics>**.

The screen shown in Figure 6-1 will be displayed.

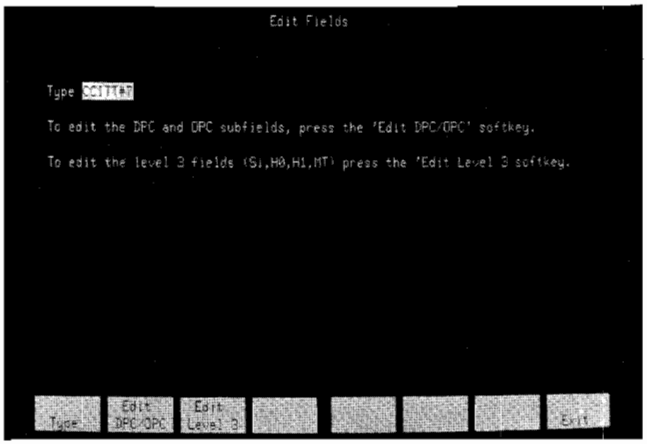


Figure 6-1. Edit Mnemonics Top Level Display

Type Field

CCITT#7 is automatically selected as the protocol if the CCITT7 analysis program is loaded. All of the examples in this chapter use CCITT#7. If your system is CCS7, the ANSI standard, use the following procedure to change the set up after working through the examples.

1. From the top level menu, press **<Edit Mnemonics>**.
2. Press **<Type>**.
3. Select **<CCS7>**.

NOTE

If your system is modeled from the Japanese standards, the analysis program called **JAPAN7** should be loaded into the Protocol Analyzer and the above information does not apply.

Edit DPC/OPC

This menu is used to change the way the DPC and OPC fields are decoded and displayed. The subfield lengths can be set up to decode the fields according to your network. Total number of bits can not exceed the maximum allowed: 14 for CCITT#7, 16 for JAPAN#7, and 24 for CCS7.

Entering the Subfields

1. From the top level menu, press **<Edit Mnemonics>**.
2. Press **<Edit DPC/OPC>**.

Your display should look like Figure 6-2.

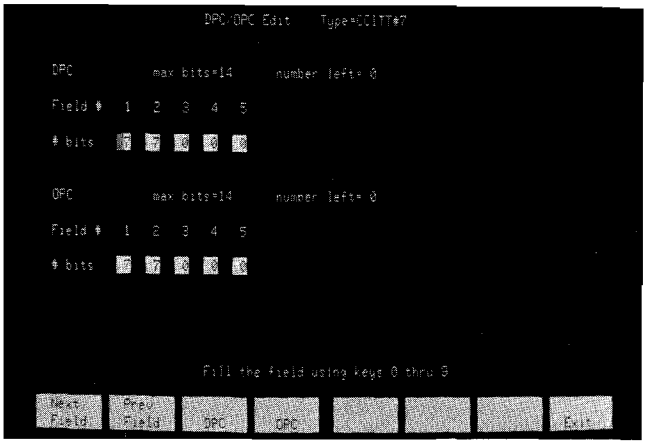


Figure 6-2. DPC/OPC Edit Menu

Use **<Next Field>** and **<Prev Field>** to move the cursor to the subfield that you wish to modify. Use the keyboard to enter your changes. Use **<DPC>** to change DPC subfields and **<OPC>** to change OPC subfields.

Modifying the DPC/OPC Fields

This is an example of modifying the DPC/OPC fields.

Start with field #1 of DPC:

1. Type in **4**.

2. Press **<Next Field>**.

Notice the **number left** field displays a **3**. This indicates that of the 14 bits (24 bits for CCS7, 16 bits for JAPAN#7) in the DPC field, you have used 11 and there are 3 bits available.

3. Type in **15** in field #2.

Notice the error message "Number of bits too large for field" at the bottom of the screen

4. Press **<Next Field>**.

Notice field #2 defaults to the last entry of that subfield (7). The highest number of bits allowed in the field is that number, which when combined with the other field entries, equals the maximum number of bits allowed.

5. Type in **3** in field #3.

Notice the number left field displays a zero.

6. Press **<OPC>** to modify the OPC subfields.

7. Type in **5** in field #1.

8. Type in **5** in field #2.

9. Type in **4** in field #3.

The Edit DPC/OPC Menu should look like Figure 6-3.

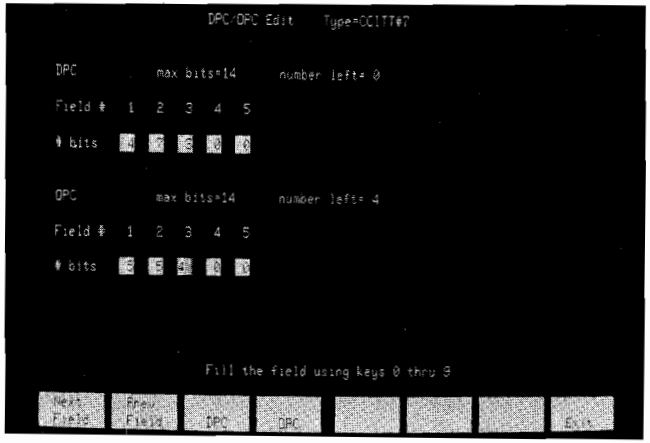


Figure 6-3. Modified DPC/OPC Edit Menu

Change your display format to Level 3 with data:

1. Press **<Exit>** twice to get to the top level menu.
2. Press **<Other Choices>**.
3. Press **<Examine Data>**.
4. Press **<Other Choices>**.
5. Press**<Display Format>**.
6. Press **<Other Choices>**.
7. Press **<CCITT#7 L3 Data>**

Your display shows Level 3 data with the DPC/OPC fields displayed in subfield lengths setup in the previous menu. It should look like Figure 6-4.

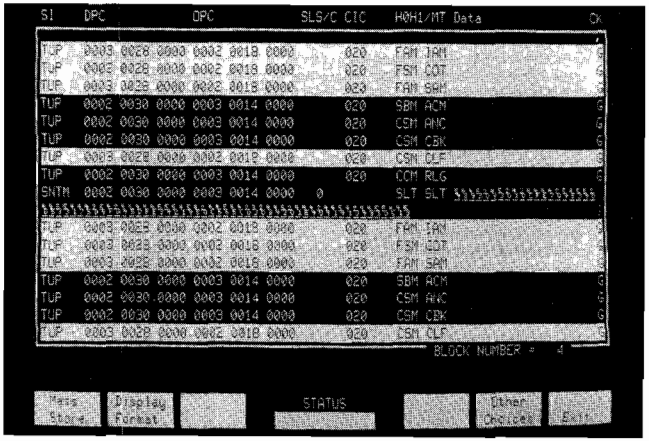


Figure 6-4. Level 3 Data with Modified DPC/OPC Fields

NOTE

Chapter 7, SS No.7 Reference, has the information on how the HP 4953 Protocol Analyzer decodes the DPC/OPC fields according to the field lengths selected in the DPC/OPC Edit menu.

NOTE

For all of these examples, **CCITT7DATA**, the buffer data file, should be loaded. See Chapter 2, Getting Started, if you need help.

Edit Level 3

This feature selects the Si number and changes the corresponding mnemonic (Si description) as well as the mnemonics for the H0 and H1 fields or message type. Use the softkeys to move to the subfield that you wish to modify, then use the keyboard to make your modifications. Figure 6-5 is the Edit Level 3 menu. To reach the Edit Level 3 menu:

1. From the top level menu, press **<Other Choices>**.
2. Press **<Edit Mnemonics>**.
3. Press **<Edit Level 3>**.

Your display should look like Figure 6-5.

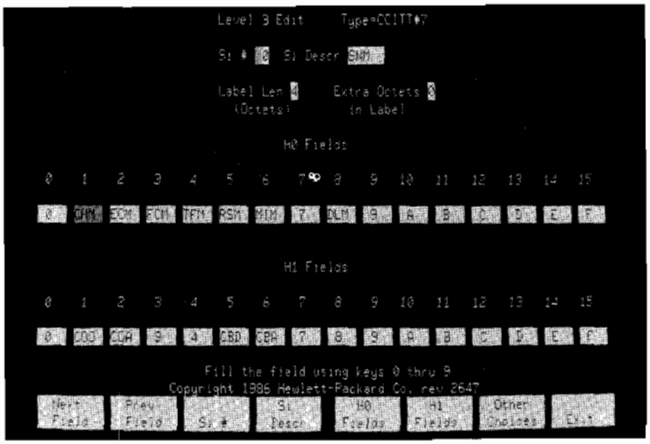


Figure 6-5. The Top Level Edit Level 3 Menu

Pressing **<Other Choices>** offers you the following softkeys:

Figure 6-6. Additional Softkeys in the Edit Level 3 Menu

Level 3 Editing

The following examples show you how to edit the fields in the Edit Level 3 menu. You will also see the results of the modifications.

Example #1

1. From the Level 3 Edit menu, press **<Si #>**.
2. Type in **4** on the HP 4953 keyboard.
3. Press **<Si Descr>**.

Notice that the Si description (Si Descr) field is TUP indicating that an MSU with Si=4 is a Telephone User Part message. Change this description to the generic International 4:

4. Type in **INTL4** on the HP 4953 keyboard.
5. Press **<Exit>** twice to exit the Edit Mnemonics menu.

Examine Data

6. Press **<Other Choices>** to get to the top level menu.
7. Press **<Examine Data>**.

Figure 6-7 shows the level 3 data with the new Si International 4 description that you entered in the Edit Mnemonics menu. This modification, along with others you make can be saved by storing the application as a working copy on the blank tape which comes with the application package. See Chapter 2, Getting Started for instructions.

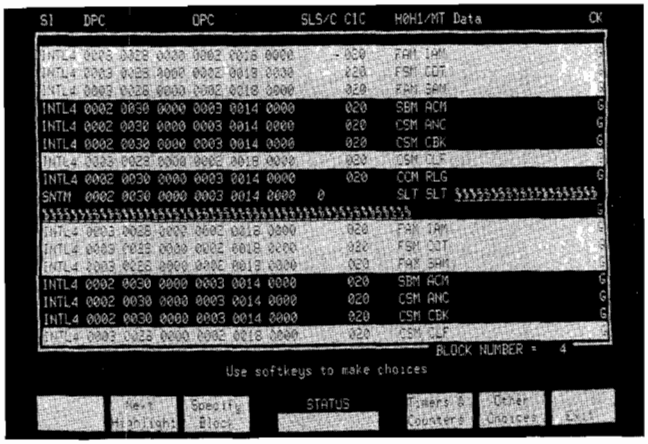


Figure 6-7. Si Edited Display

To restore the Level 3 Edit menu to its default value:

1. Press **<Exit>**, then **<Other Choices>**.
2. Press **<Edit Mnemonics>**.
3. Press **<Edit Level 3>**. At this point make sure that the Si# is 4.
4. Press **<Si Descr>**.
5. Type in **TUP, space, space** on the HP 4953 keyboard.

Example #2

The H0, or H1 header code field or Message Type field mnemonics may be modified. The H0 header code tells exactly what message type group the signal unit belongs to. The H1 header code names the Message Signal Unit (MSU), as does the message type field of the SCCP and ISDN User Parts.

The H1 mnemonics displayed correspond to the H0 marked by half bright video. The following example shows how to modify the H0 field mnemonic.

1. Press **<H0 Fields>**.

2. Press **<Next Field>**.

Notice the **FAM** mnemonic. The following procedure changes this name to **1**.

3. Type in **1, space, space** in H0 field #1 and press [Return].

Examine Data

4. Press **<Exit>** twice to exit the Edit Mnemonics menu.

5. Press **<Other Choices>** to get to the top level menu.

6. Press **<Examine Data>**.

Notice that under the H0 display column FAM is now displayed as a 1.

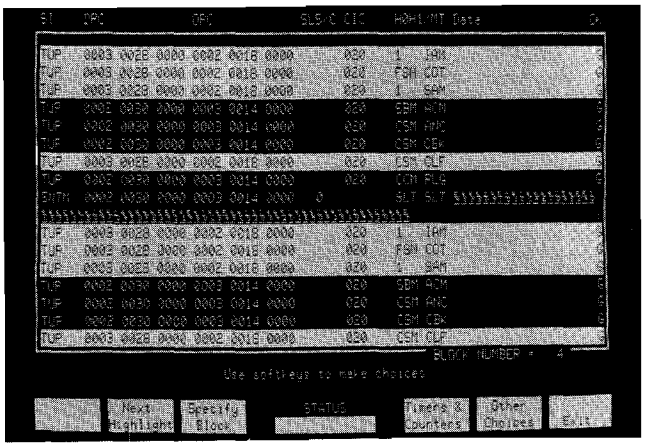


Figure 6-8. Display FAM as 1

Chapter 7, SS No.7 Reference, shows the default values of the header code fields and message type fields.

Example #3

The extra octets field allows you to modify the decode so that up to four supplementary octets in between MTP and the user part (between the label and H0 or MT) are decoded.

The following procedure demonstrates how to use the level 3 extra octets.

1. From the top level menu, press **<Edit Mnemonics>**.
2. Press **<Other Choices>**.
3. Press **<Edit Level 3>**
4. Press **<Si #>**.
5. Type in **1**.
6. Press **<Other Choices>**.
7. Press **<Extra Octets>**.
8. Type in a **2**.
9. Press [RETURN] to enter the number.
10. Press **<Exit>** twice to exit from the Edit Mnemonics menu.
11. Press **<Other Choices>** to get to the top level menu.

Examine Data

1. From the top level menu, press **<Examine Data>**.
2. Press **<Other Choices>**.
3. Press **<Display Format>**.
4. Press **<Other Choices>**.
5. Press **<CCITT7 L3 Data>**.

The display below shows Level 3 data with two extra octets decoded before the Header codes (H0, H1).

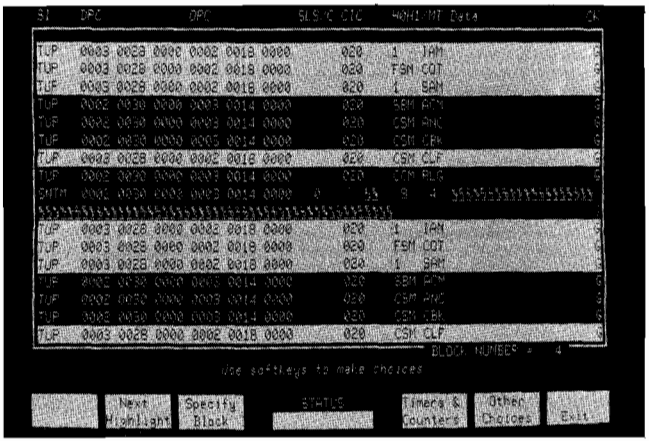


Figure 6-9. Level 3 w/Extra Octets

Label Length Field

Modifying the Label Length allows further customization of the application to fit the standards of your nation. Label Lengths of 4, 5, or 6 are possible. The default Label Lengths are displayed in Table 6-1. Modifying the length of the label will bring about a change in how that particular MSU is decoded.

NOTE

Modification of the Label Length field is only possible with the CCITT#7 version of SS No.7. The Label Length for CCS7 is fixed at 7 octets. The Label Length for JAPAN#7 is fixed at 6 octets.

See the frame formats in Chapter 7, SS No.7 Reference, for the appropriate Label Length selection.

Printing the Menu

Notice **<Print Screen>** in Figure 6-6. You have the ability to print the menu if the printer is set up. See the HP 4953 Protocol Analyzer Operating Manual for information on using a printer.

Reference

In Chapter 7, SS No.7 Reference, there is an index of values for the SI, H0, H1, and Message Type. Also in Chapter 7 there is an index of the mnemonics used in the analysis package, listed alphabetically.

Table 6-1 in this chapter lists the default values for the SI number, the SI description, the label length, and extra octets field.

Table 6-1. Si Numbers and Description

Si #	SI Mnem-onic	Label Length (octets)	Extra Octets In Label	Meaning of Mnemonic
00	SNM	4	0	Signal Network Management Message
01	SNTM	4	0	Signal Network Testing & Maintenance Messages
02	INTL2	4	0	**User Definable** (International 2)
03	SCCP	4	0	Signalling Connection Control Part
04	TUP	5	0	Telephone User Part
05	ISUP	6	0	ISDN User Part (Extra Octets=2 when Type=CCS7)
06	INTL6	5	0	**User Definable** (International 6)
07	INTL7	4	0	**User Definable** (International 7)
08	INTL8	4	0	**User Definable** (International 8)
09	INTL9	4	0	**User Definable** (International 9)
10	INTLA	4	0	**User Definable** (International A)
11	INTLB	4	0	**User Definable** (International B)
12	NATLC	4	0	**User Definable** (National C)
13	NATLD	4	0	**User Definable** (National D)
14	NATLE	4	0	**User Definable** (National E)
15	NATLF	4	0	**User Definable** (National F)

7

SS No.7 Reference

Introduction

Signalling System No. 7 (SS No.7) by CCITT is an internationally standardized, all-purpose common channel signalling system. It is a transport system for signalling information and is used to transport other information such as data and network management. It is optimized for operation over 64 kbit/sec digital channels and can operate over analog links at lower speeds. SS No.7 is used for point to point terrestrial and satellite links.

A single channel is used to convey information relating to a multiplicity of circuits in the case of Common Channel Signalling. Some of the advantages are:

- Signalling information is separated from the voice channels
- Signalling information can be routed separately
- More efficient use of channel capacity

Although it does not include the special features for use in point to multipoint operation, it can be extended to cover such an application.

Signalling System No. 7 has also been adopted as the interexchange signalling system for the Integrated Services Digital Network (ISDN).

Main Characteristics

SS No.7 uses signalling links to transfer information, to do this in a reliable way, the following provisions are made.

- Error detection and correction. It uses signalling links to transfer signalling messages; each link has its own error detection and correction capabilities.

- Automatic diversion of signalling links in case of failures. Signalling traffic is automatically diverted (rerouted or changed over) to alternate paths if there is a link failure.

- Signalling points are the nodes in the common channel signalling. A signalling point at which the message is generated is also called the originating point of that message. A signalling point to which the message is destined is the destination point of that message. A signalling point that transfers the message received on a link to another link is a Signalling Transfer Point (STP).

The functional structure is specified to ensure flexibility and modularity for diverse applications. This way the system can easily be adapted to the requirements of a particular application.

Functional Parts

There are three functional parts to SS No.7: The MTP, SCCP, and the User Part.

Message Transfer Part (MTP)

The first part is the Message Transfer Part which serves as a transport system to ensure reliable transfer of signalling messages. It consists of three levels which correspond to the first 3 layers of the OSI model.

Level 1 - Signalling Data Link

The Signalling Data Link layer defines the physical, electrical, and mechanical characteristics of the interface.

Level 2 - Signalling Link Functions

The Signalling Link Functions oversee the reliable transport (error free) of signalling messages over a signalling link. These functions are listed below:

Frame Delimiters	The beginning and end of a Signal Unit (SU) are delimited by a flag (0111 1110). A link will go out of alignment when more than six consecutive 1s in a row are received or when a certain maximum length of SU is exceeded.
Bit Stuffing	To avoid flag imitation, the transmitting signalling link terminal inserts a 0 after every sequence of five consecutive 1s. At the receiving signalling link terminal, after flag detection, each 0 following five consecutive 1s is deleted.

Error Detection

Attaches a CRC-CCITT error check at the end of the SU. The received FCS is then compared with the calculated FCS at the receiving side.

Error Correction

The basic method, for signalling links using non-intercontinental terrestrial means and/or intercontinental links with one way propagation delays of less than 15 ms, holds a transmitted SU at the transmitted side until a positive acknowledgment is received. Unacknowledged frames are retransmitted upon receipt of a negative acknowledgment.

The preventative cyclic retransmission method, for satellite links and intercontinental links with one way propagation delays greater than 15 ms, holds the transmitted SU at the transmit end until a positive acknowledgment is received. When there are no new SUs to be transmitted, all non-positve acknowledged SUs are cyclical retransmitted. The forced retransmission procedure ensures that forward error correction occurs during high traffic load or when high error rate occurs.

Link Failure Detection

The Signal Unit Error Rate Monitor (SUERM), used while a link is in service, provides one criteria in the decision of taking a link out of service.

The Alignment Error Rate Monitor (AERM) is also used while a link is in the proven state of the initial alignment procedure.

Initial Alignment

The signalling link controls initial alignment. Two signalling points exchange status information during a predetermined period.

Level 3 - Signalling Network Functions

The Signalling Network Functions control the following signalling network functions:

Signalling Message Handling	Directs the message to the user part, based on the routing label contained in the DPC, OPC, or SLS/SLC messages. It has three primary functions: Message Routing selects the outgoing signalling link. Message Discrimination, used at the signalling point, determines if a signal should be routed to a particular signalling point. Message Distribution delivers the signalling message to the specified user part.
Signalling Network Management	Reconfigures the signalling network in case of failures and other related tasks. There are three management functions: Signalling Traffic Management diverts or temporarily slows down traffic. Signalling Link Management restores failed signalling links, activates idle links, and deactivates aligned signalling links. Signalling Route Management distributes information about the signalling network status.

Signalling Connection Control Part (SCCP)

The second functional part of SS No.7 is the SCCP. It provides additional capabilities for the MTP and addresses operation, maintenance, and administration services. The combination of the MTP and the SCCP is defined as the Network Service Part.

User Part

The third part, the User Part, is a functional entity which uses the transport capability provided by the MTP.

Each user part defines functions and procedures that are particular to a certain user of the network. Some of the user groups include:

TUP	Telephone User Part
DUP	Data User Part
ISDN-UP	ISDN User Part
Nationally defined user parts	

Figure 7-1 is a block diagram of how the different parts of SS No.7 interact with each other.

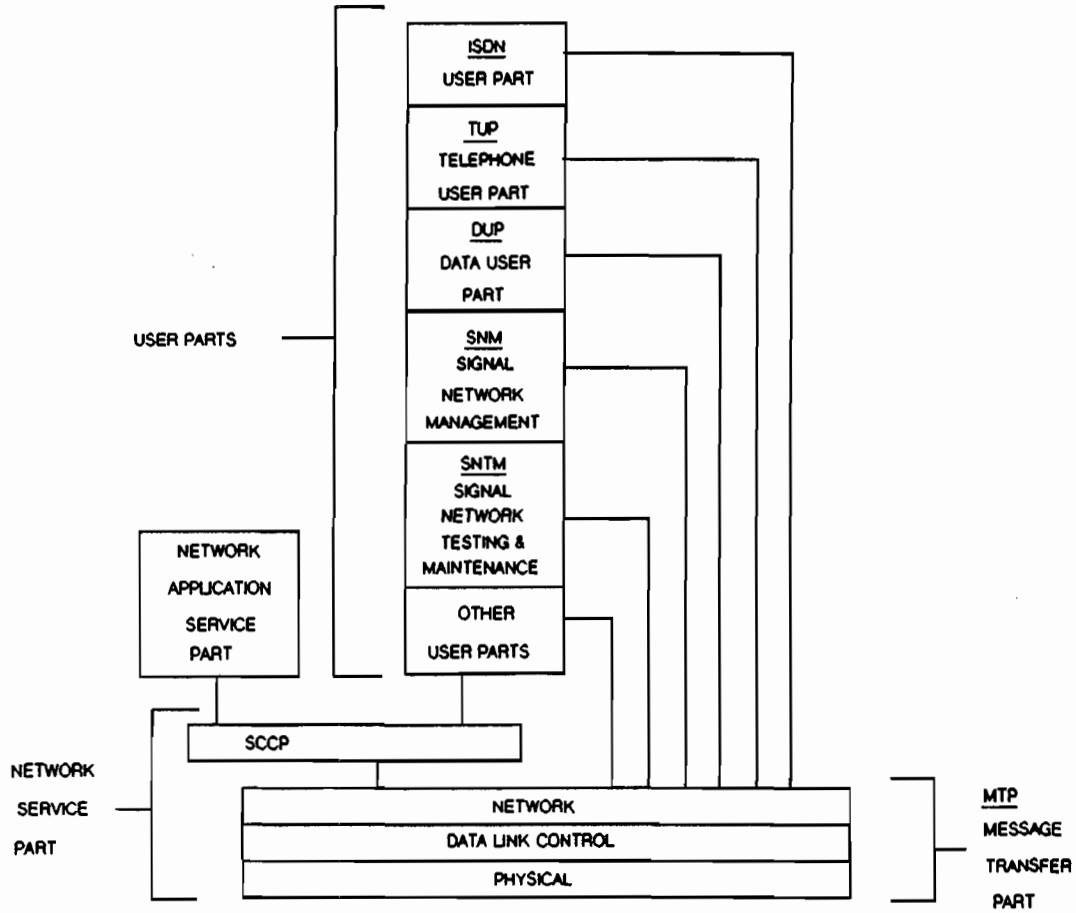


Figure 7-1. Block Diagram of SS No.7

Signalling Formats

SS No.7 uses 3 different types of signal units to transfer the signalling message: Fill In Signal Unit (FISU), Link Status Signal Unit (LSSU), Message Signal Units (MSU).

The length indicator (Li) is what discriminates between the different signalling units.

FISU (Li=0)

The FISU or Fill In Signal Unit ensures that SS No.7 always runs with 100% line utilization. Whenever there is idle time on the line FISUs will be sent. Figure 7-2 is an FISU frame.

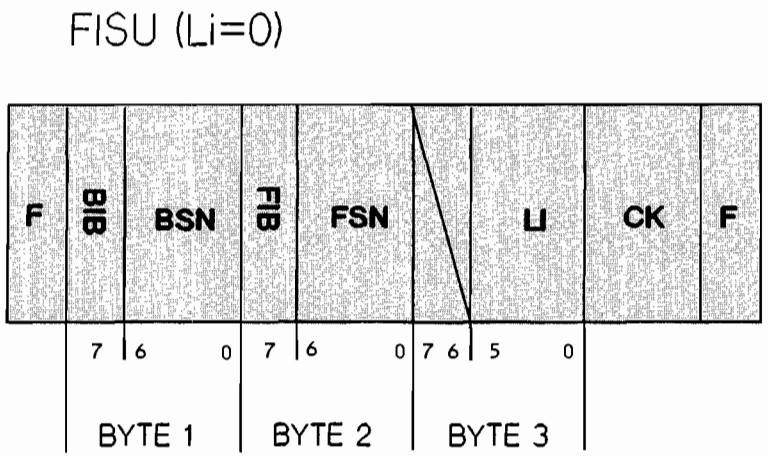


Figure 7-2. FISU Frame

LSSU (Li=1 or 2)

The LSSU or Link Status Signal Unit indicates the status of the line by means of the Status Field.

Figure 7-3 is an LSSU frame:

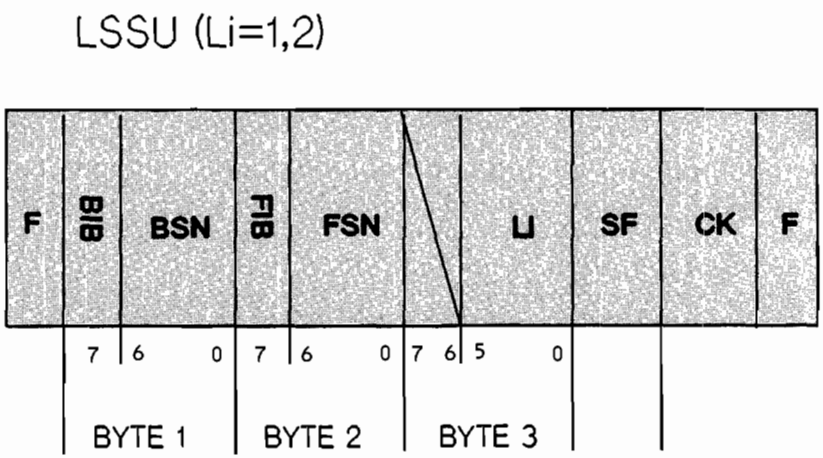
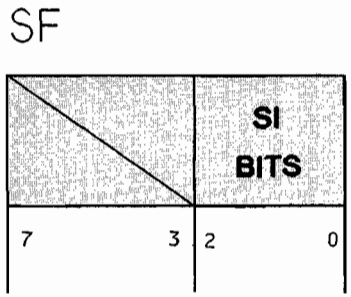


Figure 7-3. LSSU Frame

It is important to remember that if Li=1 then the SF is one octet long, if Li=2 then the SF is two octets long. Figure 7-4 illustrates the location of the status indication bits within the SF field and how they are coded.



bits
2 1 0
0 0 0 - Status indication "SIO" : out of alignment
0 0 1 - Status indication "SIN" : normal alignment status
0 1 0 - Status indication "SIE" : emergency alignment status
0 1 1 - Status indication "SIOS": out of service
1 0 0 - Status indication "SIPO": processor outage
1 0 1 - Status indication "SIB" : busy

Figure 7-4. LSSU Status Field and Codes

MSU (Li > 2)

Message signalling units (MSUs) transfer information over the signalling links. An MSU contains the information to be transmitted along with a label for routing the message through the network. The basic MSU or Message Signal Unit is shown in Figure 7-5.

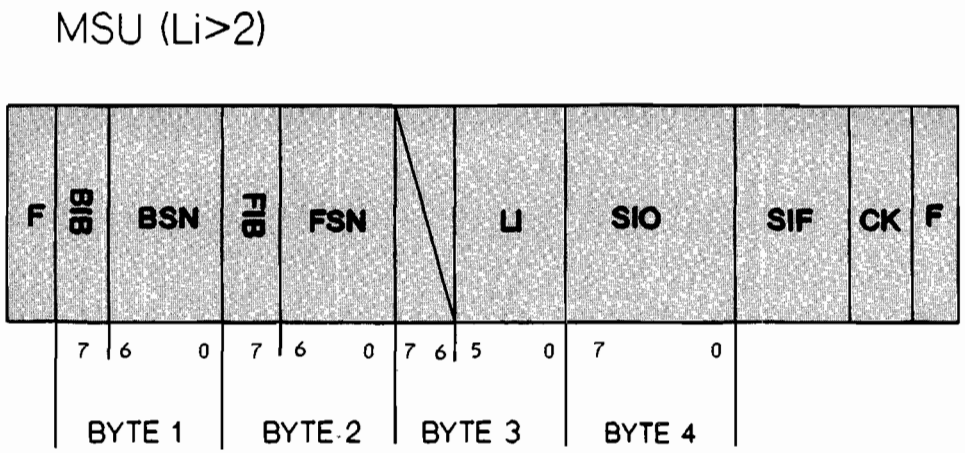


Figure 7-5. MSU Frame

The Service Information Octet (SIO) is divided up into the Service Indicator (SI) and the Sub-Service Field (SSF).

Service Indicator

The Service Indicator (SI) is used by the signalling handling functions to perform message distribution and to associate the signal with a particular user part.

These are the SI codes for the international signalling network:

bits 3 2 1 0	
0 0 0 0	Signalling Network Management Messages (SNM)
0 0 0 1	Signalling Network Testing & Maintenance Messages (SNTM)
0 0 1 0	Spare
0 0 1 1	Signalling Connection Control Part (SCCP)
0 1 0 0	Telephone User Part (TUP)
0 1 0 1	ISDN User Part (ISUP)
0 1 1 0	Data User Part: call & circuit related messages (DUP)
0 1 1 1	Data User Part: facility registration & cancellation messages)

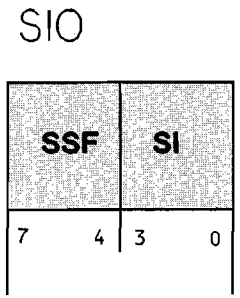


Figure 7-6. SIO Frame

The Sub-Service Field

The Sub-Service Field (SSF) indicates whether the user part refers to national or international networks.

These are the network indicator codes:

bits 7 6	
0 0	International network (I)
0 1	Spare (S) for international use only
1 0	National network (N)
1 1	Reserved for national use (R)

Signalling Information Field

The Signalling Information Field (SIF) consists of an integral number of octets, greater than or equal to 2 and less than or equal to 62. In national signalling networks, it may consist of up to 272 octets. The SIF consists of a routing label and user part dependent data.

Routing Label

The routing label is used by the Message Transfer Part (MTP) to route the message to its destination point. The routing label consists of the following fields:

Point Codes — Destination Point Code (DPC) and the Originating Point Code (OPC). The point codes indicate the destination and originating points of the message. The coding of these codes is pure binary. Within each field the least significant bit occupies the first position and is transmitted first.

These are the Point Code lengths:

CCITT#7	Europe	14 bit fields
CCS7	N. America	24 bit fields
Japan#7	Japan	16 bit fields

SLS — Signalling Link Selection (SLS) is a field that is used, where appropriate, in performing load sharing.

SLC — Signalling Link Code (SLC) indicates the link between the two points to which the message refers.

User Part Dependent Data

The routing label is followed by user part dependent data. The format, meaning, and amount of data depends on the type of message.

Heading Codes	Found in SNM, SNTM, and TUP messages. H0, a four bit field, identifies the specific message group. H1, a four bit field, contains a signal code which indicates a specific signal within that message group.
Message Type (MT)	Found in SCCP and ISDN messages. Defines the function and format of the message.
The Circuit ID Code (CIC)	Circuit identification found in ISDN messages.

CCITT#7 Routing Label Format

The following diagrams show the routing label format of common user parts for the CCITT#7 version of SS No.7.

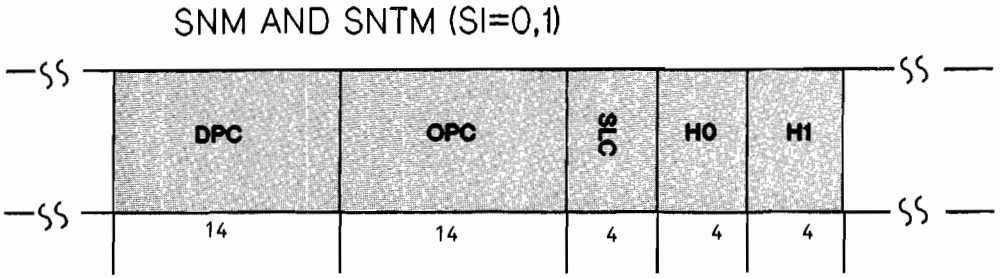


Figure 7-7. SNM and SNTM

Label Length = 4 octets

Mnemonics

DPC	Destination Point Code
OPC	Originating Point Code
SLC	Signalling Link Code
H0	Header Code 0
H1	Header Code 1

SCCP (SI=3)

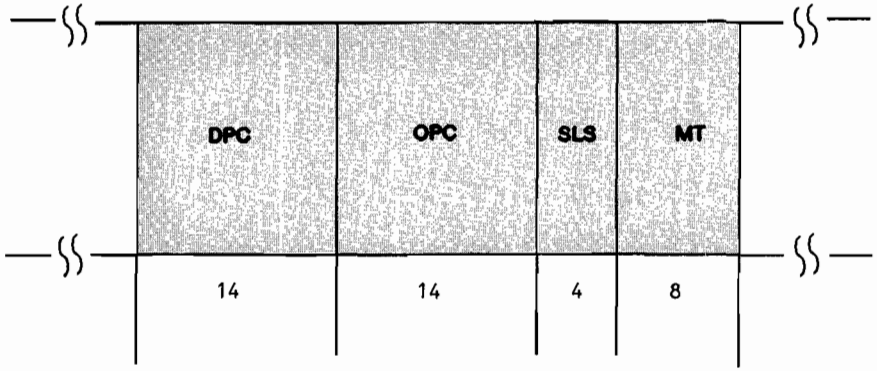


Figure 7-8. SCCP

Label Length = 4 octets

Mnemonics

DPC	Destination Point Code
OPC	Originating Point Code
SLS	Signalling Link Selection Code
MT	Message Type

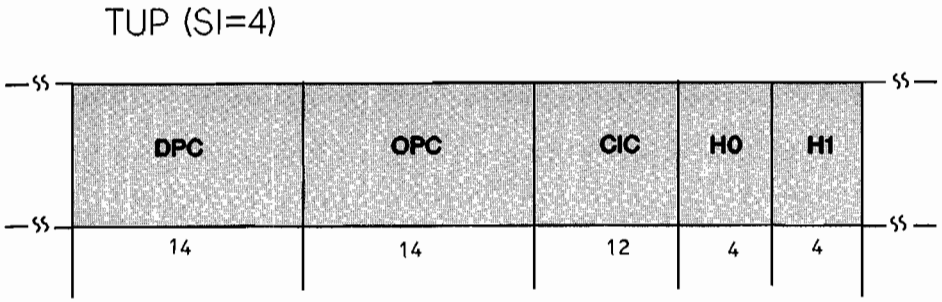


Figure 7-9. TUP

Label Length = 5 octets

Mnemonics

DPC	Destination Point Code
OPC	Originating Point Code
CIC	Circuit Identification Code
H0	Header Code 0
H1	Header Code 1

ISUP (SI=5)

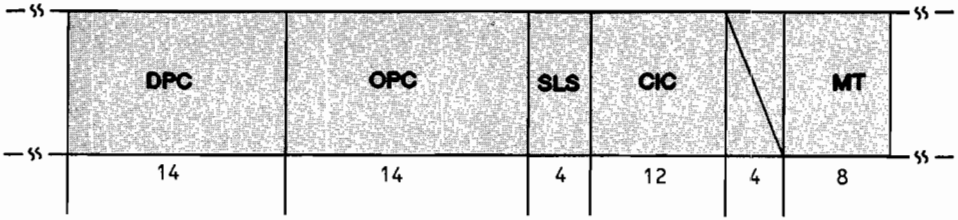


Figure 7-10. ISUP

Label Length = 6 octets

Mnemonics

DPC	Destination Point Code
OPC	Origination Point Code
SLS	Signalling Link Selection Code
CIC	Circuit Identification Code
MT	Message Type

CCS7 Routing Label Format

The following diagrams show the routing label format of common user parts for the CCS7 version of SS No.7.

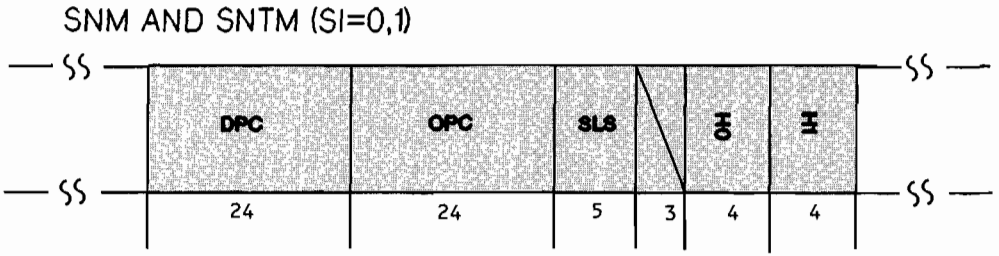


Figure 7-11. SNM and SNTM

Label Length = 7 octets

Mnemonics

DPC	Destination Point Code
OPC	Originating Point Code
SLS	Signalling Link Selection Code
H0	Header Code 0
H1	Header Code 1

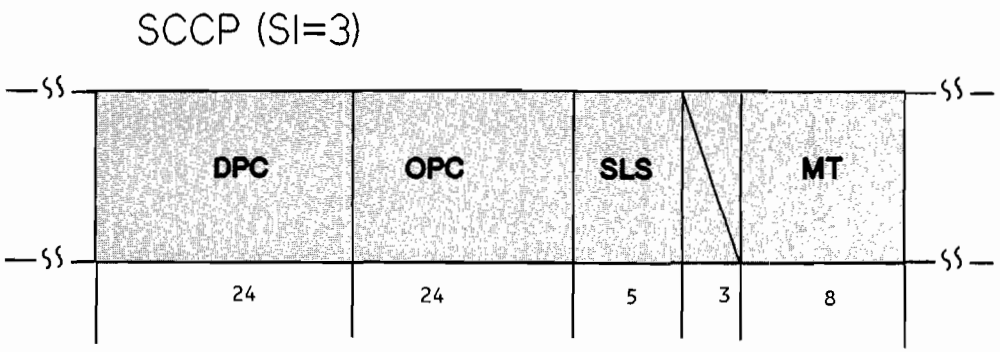


Figure 7-12. SCCP

Label Length = 7 octets

Mnemonics

DPC	Destination Point Code
OPC	Origination Point Code
SLS	Signalling Link Selection Code
MT	Message Type

ISUP (SI=5)

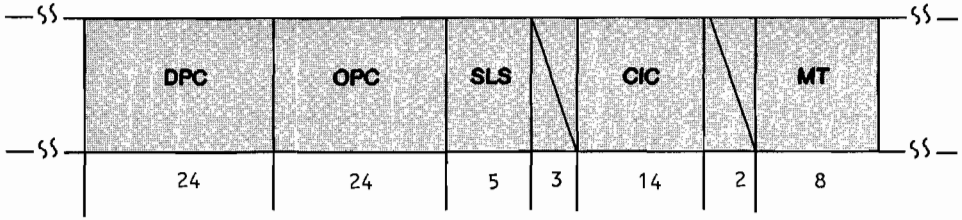


Figure 7-13. ISUP

Extra Octets = 2
Label Length = 7 octets

Mnemonics

DPC	Destination Point Code
OPC	Originating Point Code
SLS	Signalling Link Selection Code
CIC	Circuit Identification Code
MT	Message Type

JAPAN#7 Formats

The following diagrams show the MSU and SIF format of common user parts for the JAPAN#7 version of SS No.7.

JAPAN7 MSU

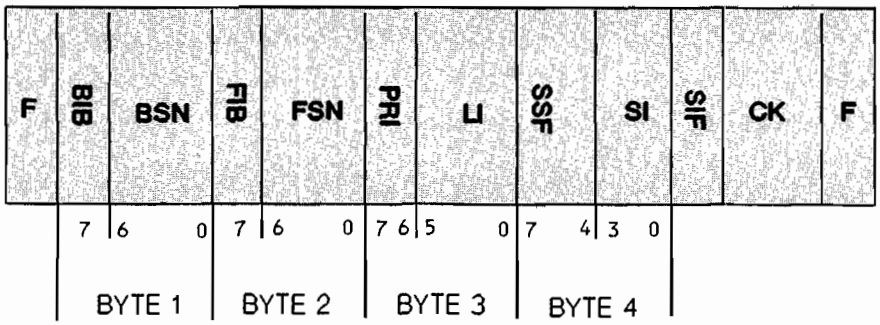


Figure 7-14. MSU Format

Label Length = 6 octets

Mnemonics

F	Start Flag
BIB	Backward Indicator Bit
BSN	Backward Sequence Number
FIB	Forward Indicator Bit
FSN	Forward Sequence Number
PRI	Priority
LI	Length Indicator
SSF	Sub-service Field
SI	Service Indicator
SIF	Signalling Information Field
CK	Check Bit
F	End Flag

JAPAN7 SIF

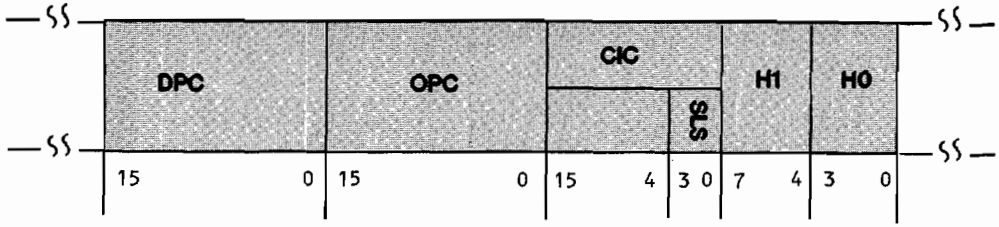


Figure 7-15. SIF Format

Label Length = 6 octets

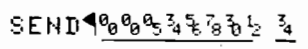
Mnemonics

DPC	Destination Point Code
OPC	Origination Point Code
CIC	Circuit Identification Code
SLS	Signalling Link Selection Code
H1	Header Code 1
H0	Header Code 1

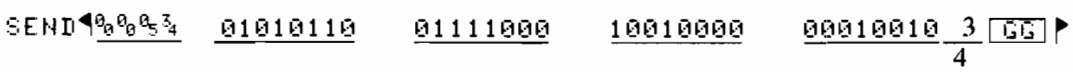
DPC/OPC Fields

This section contains instructions to help you set up MSUs that have the appropriate DPC/OPC fields for your network.

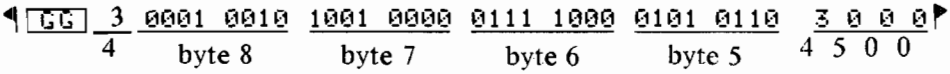
The following represents an MSU in hex:



The following is the same MSU as above, with the Signalling Information Field (SIF) represented in binary:



The protocol analyzer decodes the most significant nibble of each byte first. The following shows the same string as the analyzer would see it. The string is shown in the reverse direction:



The Edit DPC/OPC display should be set to it's default condition. See Figure 7-16.

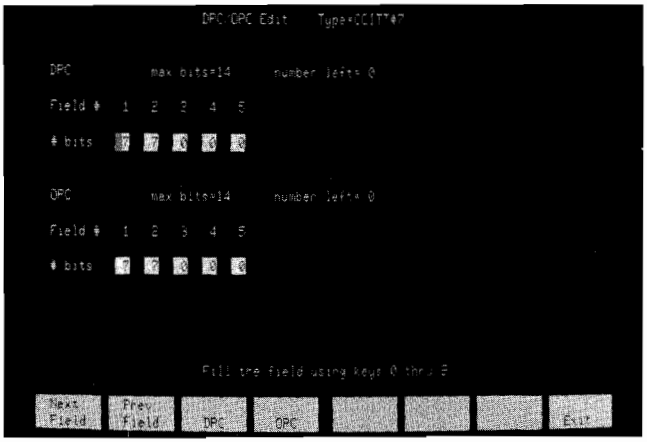
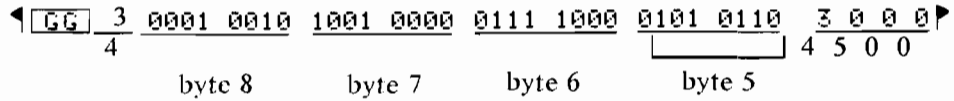


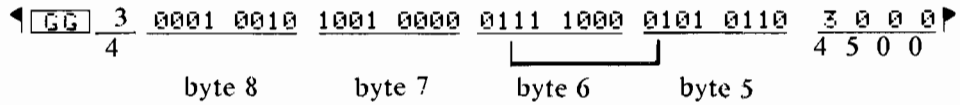
Figure 7-16. The DPC/OPC Setup

The protocol analyzer goes through the following steps to decode the DPC and OPC fields:

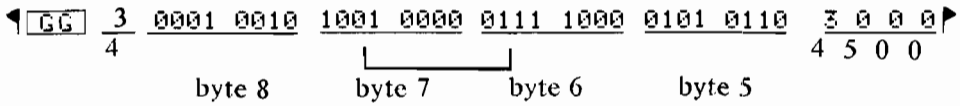
1. The analyzer decodes the first 7 bits of the DPC field (byte 5) to be 56H.



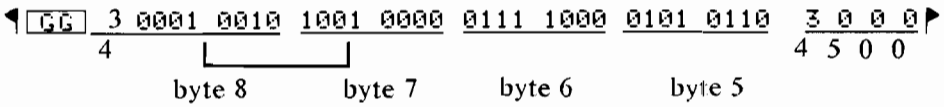
2. The analyzer decodes the next 7 bits of the DPC field (bytes 5 and 6) to be 70H.



3. The analyzer decodes the first 7 bits of the OPC field (bytes 6 and 7) to be 41H.



4. The analyzer decodes the last 7 bits of the OPC field (bytes 7 and 8) to be 14H.



The following shows the Level 3 decode of the above string:

SI	DPC	OPC	SLS/C	CIC	H0H1/MT Data	CK
TUP	0056	0070 0041	0014	341		G

Error Messages

These are error messages that may appear when using the SS No.7 Analysis Application.

1. **Counts unmodified except by Run from Line**

   This occurs if you enter the Timer/Counter menu after a Run from buffer. The frame and FISU counters that appear in the Timer/Counter menu are not updated during post-processing (Run from buffer).

2. **Number of bits too large for field**

   The DPC/OPC subfield will only allow numbers whose sum is less than or equal to max_bits. Enter a lower number in that field.

3. ***Application module conflict; load failed***

   This occurs if you attempt to load both applications. Only one application can be loaded into the HP 4953 at a time. The resident application must be deleted before the other can be loaded.

INDEX OF VALUES - U.S. & EUROPEAN VERSION

The mnemonics associated with the fields are listed below.

SI	MNEMONIC FOR SI	H0	MNEMONIC FOR H0	H1	MNEMONIC FOR H1
0	SNM	1	CHM	1	COO
0	SNM	1	CHM	2	COA
0	SNM	1	CHM	5	CBD
0	SNM	1	CHM	6	CBA
0	SNM	2	ECM	1	ECO
0	SNM	2	ECM	2	ECA
0	SNM	3	FCM	1	RCT
0	SNM	3	FCM	2	TFC
0	SNM	4	TFM	1	TFP
0	SNM	4	TFM	3	TFR
0	SNM	4	TFM	5	TFA
0	SNM	5	RSM	1	RST
0	SNM	6	MIM	1	LIN
0	SNM	6	MIM	2	LUN
0	SNM	6	MIM	3	LIA
0	SNM	6	MIM	4	LUA
0	SNM	6	MIM	5	LID
0	SNM	6	MIM	6	LFU
0	SNM	8	DLM	1	DLC
0	SNM	8	DCM	2	CSS
0	SNM	8	DLM	3	CNS
0	SNM	8	DLM	4	CNP
1	SNTM	1	SLT	1	SLT
1	SNTM	1	SLT	2	SLA
4	TUP	1	FAM	1	IAM

INDEX OF VALUES - U.S. & EUROPEAN VERSION

The mnemonics associated with the fields are listed below.

SI	MNEMONIC FOR SI	H0	MNEMONIC FOR H0	H1	MNEMONIC FOR H1
4	TUP	1	FAM	2	IAI
4	TUP	1	FAM	3	SAM
4	TUP	1	FAM	4	SAO
4	TUP	2	FSM	1	GSM
4	TUP	2	FSM	3	COT
4	TUP	2	FSM	4	CCF
4	TUP	3	BSM	1	GRQ
4	TUP	4	SBM	1	ACM
4	TUP	4	SBM	2	CHG
4	TUP	5	UBM	1	SEC
4	TUP	5	UBM	2	CGC
4	TUP	5	UBM	3	NNC
4	TUP	5	UBM	4	ADI
4	TUP	5	UBM	5	CFL
4	TUP	5	UBM	6	SSB
4	TUP	5	UBM	7	UNN
4	TUP	5	UBM	8	LOS
4	TUP	5	UBM	9	SST
4	TUP	5	UBM	A	ACB
4	TUP	5	UBM	B	DPN
4	TUP	5	UBM	C	MPR
4	TUP	5	UBM	F	EUM
4	TUP	6	CSM	0	ANU
4	TUP	6	CSM	1	ANC
4	TUP	6	CSM	2	ANN

INDEX OF VALUES - U.S. & EUROPEAN VERSION

The mnemonics associated with the fields are listed below.

SI	MNEMONIC FOR SI	H0	MNEMONIC FOR H0	H1	MNEMONIC FOR H1
4	TUP	6	CSM	3	CBK
4	TUP	6	CSM	4	CLF
4	TUP	6	CSM	5	RAN
4	TUP	6	CSM	6	FOT
4	TUP	6	CSM	7	CCL
4	TUP	6	CSM	F	EAM
4	TUP	7	CCM	1	RLG
4	TUP	7	CCM	2	BLO
4	TUP	7	CCM	3	BLA
4	TUP	7	CCM	4	UBL
4	TUP	7	CCM	5	UBA
4	TUP	7	CCM	6	CCR
4	TUP	7	CCM	7	RSC
4	TUP	8	GRM	1	MGB
4	TUP	8	GRM	2	MBA
4	TUP	8	GRM	3	MGU
4	TUP	8	GRM	4	MUA
4	TUP	8	GRM	5	HGA
4	TUP	8	GRM	6	HBA
4	TUP	8	GRM	7	HGU
4	TUP	8	GRM	8	HUA
4	TUP	8	GRM	9	GRS
4	TUP	8	GRM	A	GRA
4	TUP	8	GRM	B	SGB
4	TUP	8	GRM	C	SBA

INDEX OF VALUES - U.S. & EUROPEAN VERSION

The mnenonics associated with the fields are listed below.

SI	MNEMONIC FOR SI	H0	MNEMONIC FOR H0	HI	MNEMONIC FOR H1
4	TUP	8	GRM	D	SGU
4	TUP	8	GRM	E	SUA
4	TUP	9	NNM	1	CFM
4	TUP	9	NNM	2	CPM
4	TUP	9	NNM	3	CPA
4	TUP	9	NNM	4	CSV
4	TUP	9	NNM	5	CVM
4	TUP	9	NNM	6	CRM
4	TUP	9	NNM	7	CLI

INDEX OF VALUES - U.S. & EUROPEAN VERSION

The mnemonics associated with the fields are listed below.

SI	MNEMONIC FOR S1	MESSAGE TYPE LS BIT	MESSAGE TYPE MS BIT	MNEMONIC FOR MT
3	SCCP	0	1	IT
3	SCCP	1	0	CR
3	SCCP	2	0	CC
3	SCCP	3	0	CREF
3	SCCP	4	0	RLSD
3	SCCP	5	0	RLC
3	SCCP	6	0	DTI
3	SCCP	7	0	DT2
3	SCCP	8	0	AK
3	SCCP	9	0	UDT
3	SCCP	A	0	UDTS
3	SCCP	B	0	ED
3	SCCP	C	0	EA
3	SCCP	D	0	RSR
3	SCCP	E	0	RSC
3	SCCP	F	0	ERR
5	ISUP	0	1	RLC
5	ISUP	0	2	FAA
5	ISUP	1	0	IAM
5	ISUP	1	1	CCR
5	ISUP	1	2	FRJ
5	ISUP	2	0	SAM
5	ISUP	2	1	RSC
5	ISUP	2	2	FAD
5	ISUP	3	0	INR

INDEX OF VALUES - U.S. & EUROPEAN VERSION

The mnemonics associated with the fields are listed below.

SI	MNEMONIC FOR S1	MESSAGE TYPE LS BIT	MS BIT	MNEMONICS FOR MT
5	ISUP	3	1	BLO
5	ISUP	3	2	FAI
5	ISUP	4	0	INF
5	ISUP	4	1	UBL
5	ISUP	5	0	COT
5	ISUP	5	1	BLA
5	ISUP	5	2	CSVR
5	ISUP	6	0	ACM
5	ISUP	6	1	UBA
5	ISUP	6	2	CSVS
5	ISUP	7	1	GRS
5	ISUP	7	2	DRS
5	ISUP	8	0	FOT
5	ISUP	8	1	CGB
5	ISUP	8	2	PAM
5	ISUP	9	0	ANM
5	ISUP	9	1	CGU
5	ISUP	9	2	GRA
5	ISUP	A	0	UBM
5	ISUP	A	1	CGBA
5	ISUP	B	0	REL
5	ISUP	B	1	CGUA
5	ISUP	C	1	CMR
5	ISUP	D	0	PAU
5	ISUP	D	1	CMC

INDEX OF VALUES - U.S. & EUROPEAN VERSION

The mnemonics associated with the fields are listed below.

SI	MNEMONIC FOR S1	MESSAGE TYPE LS BIT	MS BIT	MNEMONIC FOR MT
5	ISUP	E	0	RES
5	ISUP	E	1	RCM
5	ISUP	F	0	RLSD

INDEX OF VALUES - JAPANESE VERSION

The mnemonics associated with the fields are listed below.

SI	MNEMONIC FOR SI	H0	MNEMONIC FOR H0	H1	MNEMONIC FOR H1
0	SNM	1	CHM	1	COO
0	SNM	1	CHM	2	COA
0	SNM	1	CHM	5	CBD
0	SNM	1	CHM	6	CBA
0	SNM	3	FCM	2	TFC
0	SNM	4	TFM	1	TFP
0	SNM	4	TFM	2	TPA
0	SNM	4	TFM	3	TFR
0	SNM	4	TFM	5	TFA
0	SNM	4	TFM	6	TAA
0	SNM	5	RSM	1	RST
0	SNM	5	RSM	2	RTR
4	TUP	1	FAM	1	TAM
4	TUP	2	FSM	3	COT
4	TUP	2	FSM	4	CCF
4	TUP	5	UBM	1	SEC
4	TUP	5	UBM	2	CGC
4	TUP	6	CSM	1	ANC
4	TUP	6	CSM	2	ANN
4	TUP	6	CSM	3	CBK
4	TUP	6	CSM	4	CLF
4	TUP	6	CSM	5	RAN
4	TUP	7	CCM	1	RLG
4	TUP	7	CCM	2	BLO
4	TUP	7	CCM	3	BLA

INDEX OF VALUES - JAPANESE VERSION (cont)

The mnemonics associated with the fields are listed below.

SI	MNEMONIC FOR SI	H0	MNEMONIC FOR H0	H1	MNEMONIC FOR H1
4	TUP	7	CCM	4	UBL
4	TUP	7	CCM	5	UBA
4	TUP	7	CCM	6	CCR
4	TUP	7	CCM	7	RSC
4	TUP	7	CMM	8	TQU
4	TUP	7	CCM	A	TQF
4	TUP	8	GRM	6	GRS
4	TUP	8	GRM	7	GRA

INDEX OF MNEMONICS LISTED ALPHABETICALLY

INDEX OF MNEMONICS LISTED ALPHABETICALLY

GRQ General request message
GRS Circuit group reset message
GSM General forward set-up information message
HBA Hardware failure oriented group blocking-acknowledgement message
HGB Hardware failure oriented group blocking message
HGU Hardware failure oriented group unblocking message
HUA Hardware failure oriented group unblocking-acknowledgement message
IAI Initial address message
IAM Initial information
INF Information
IT Inactivity test
LFU Link forced uninhibit signal
LIA Link inhibit acknowledgement signal
LID Link inhibit denied signal
LIN Link inhibit signal
LOS Line of service information
LUA Link uninhibit acknowledgement signal
LUN Link uninhibit signal
MBA Maintenanace oriented group blocking acknowledgement message
MGB Maintenance oriented group blocking message
MGU Maintenance oriented group unblocking message
MIM Management inhibit messages
MPR Misdialled trunk prefix
MUA Maintenance oriented groups unblocking acknowledge message
NNC National network congestion signal
NNM ode to node message
PAM Press along
PAU Pause
RAN Re-answer signal
RCT Signalling-route-set-congestion-test message
RCM Reject connect modify
REL Release
RES Resume
RLC Release complete message
RLG Release guard signal
RLSD Released message
RSC Reset circuit message
RSM Signalling-route-set-test message
RSR Signalling-route-set-test prohibited signal
RST Signalling-route-set-test signal
SAM Subsequent address message
SAO Subsequent address message with one signal
SBA Software generated group blocking-acknowledgement message
SBM Successful backward set-up information message
SCCP Signalling Connection Control Part
SEC Switching equipment congestion signal
SGB Software generated group blocking message
SLA Signalling Link Test Achnowledge Message
SLT Signalling Link Test Message
SNM Signalling Network Management
SNTM Signalling Network Test and Maintenance
SOU Software generated group unblocking message
SSB Subscriber-busy signal (electrical)
SST Send-special-information tone signal
SUA Software generated group unblocking-acknowledgement
TFA Transfer-allowed signal
TFC Transfer controlled message
TFM Transfer-prohibited-transfer-allowed-restricted-messages
TFP Transfer-prohibited signal
TFR Transfer-restricted signal
TUP Telephone User Part
UBA Unblocking-acknowledgement signal
UBL Unblocking signal
UBM Unsuccessful backward set-up information message
UDT Unitdata message
UDTS Unitdata service message
UNN Unallocated-number signal
USR User-to-user information

G

Glossary

A

Active Signalling Link
A signalling link which has successfully completed the initial alignment procedures and carries (or is ready to carry) signalling traffic.

Adjacent Signalling Points
Two signalling points that are directly interconnected by (a) signalling link(s).

Alignment Error Rate Monitoring
A procedure by which the error rate of a signalling link is measured during the initial alignment.

Alternate Routing
The routing of a given signalling traffic flow in case of failures affecting the signalling links, or routes, involved in the normal routing of that signalling traffic flow.

Associated Mode
The mode where messages for a signalling relation involving two adjacent signalling points are conveyed over a directly interconnecting signalling link.

B

Backward Indicator Bit (BIB)
A bit in a signal unit requesting, by its status change, retransmission at the remote end when a signal unit is received out of sequence.

Backward Sequence Number (BSN)
A field in a signal unit sent which contains the forward sequence number of a correctly received signal unit being acknowledged.

Basic (error correcting) Method
A non-compelled, positive/negative acknowledgment, retransmission error control system.

C

Changeback
The procedure of transferring signalling traffic from one or more alternative signalling links to a signalling link which has become available.

Changeback Code
A field in the signalling network management messages used in the changeback procedure; it is used to discriminate messages relating to different changeback procedures performed at the same time towards the same signalling link.

Changeover
The procedure of transferring signalling traffic from one signalling link to one or more different signalling links when the link in use fails or is required to be cleared of traffic.

Checkbit (CK)
A bit associated with a character or block for the purpose of checking the absence of error within the character or block.

Check Loop
A device which is attached to interconnect the Go and Return paths of a circuit at the incoming end of a circuit to permit the outgoing end to make a continuity check on a loop basis.

Circuit Identification Code (CIC)
A telephone subscriber circuit.

Common Channel Signalling
The signalling method in which a single channel conveys by the means of labeled messages, signalling information relating to a multiplicity of circuits or calls or other information such as that used for network management.

Continuity Check
A check made to a circuit or circuits in a connection to verify that an acceptable path (for transmission of data, speech, etc.) exists.

Controlled Rerouting
A procedure of transferring in a controlled way, signalling traffic from an alternative signalling route to the normal signalling route, when this has become available.

D

Data User Part (DUP)
The User Part specified for data services.

Destination Point Code (DPC)
A part of the label in a signalling message which identifies the signalling destination point of the message.

F

Fill in Signal Unit (FISU)
A signal unit containing only error control and delimitation information, which is transmitted when there are no message signal units or link status signal units to be transmitted.

Flag
The unique pattern on the signalling data link used to delimit a signal unit.

Forward Indicator Bit (FIB)
A bit in a signal unit which indicates the start of a retransmission cycle.

Forward Sequence Number (FSN)
A signal unit used to identify the transmitted message signal units.

I

Initial Alignment

A procedure by which a signalling link becomes able to carry signalling traffic either for the first time or after a failure has occurred.

Integrated Service Digital Network (ISDN)

An integrated digital network in which the same digital switches and digital paths are used to establish connections for different services, for example, telephone, data.

Integrated Digital Network

A network in which connections established by digital switching are used for the transmission of digital signals.

L

Label

Information within a signalling message used to identify the particular circuit, call, or management transaction to which the message is related.

Length Indicator (LI or Li)

A six bit field which differentiates between message signal units, link status signal units, and fill-in signal units and in the case that its binary value is less than 63, indicates the length of a signal unit.

Link Status Signal Unit (LSSU)

A signal unit which contains status information about the signalling link in which it is transmitted. It is generally used at link establishment or link changeover time.

M

Message Routing

The process for selecting, for each signalling message to be sent, the signalling link to be used.

Message Signal Unit (MSU)
A signal unit containing a service information octet and a signalling information field which is retransmitted by the signalling link control if it is received in error.

Message Transfer Part (MTP)
The functional part of a common channel signalling system which transfers signalling messages as required by all of the user and which performs the necessary subsidiary functions, for example error control and signalling security. The MTP accepts packets of data and reliably delivers them to their destination, level 3 data.

N

National Indicator
Information within a signalling message which makes a distinction between national and international messages.

Network Service Part (NSP)
Includes the Signalling Connection Control Part (SCCP) and the Message Transfer Part (MTP).

Normal Routing
The routing of a given signalling traffic flow in normal conditions (i.e. in the absence of failures).

O

Originating Point Code (OPC)
The part of the label in a signalling message with identifies the originating point of the message.

P

Preventive Cyclic Retransmission Method
A non-compelled, positive acknowledgment, cyclic retransmission forward error correction system.

Processor Outage

A situation in which a signalling link becomes unavailable, due to factors at a functional level higher than Level 2. This may be because of, for example, a central processor failure. It may also be due to a manually initiated blocking of an individual signalling link.

R

Retransmission Buffer

Storage in the signalling link control for signal units transmitted but not yet positively acknowledged.

Routing Label

The part of the message label that is used for message routing in the signalling network. It includes the Originating Point Code, the Destination Point Code, and the signalling link selection field.

S

Service Indicator (SI)

Information within a signalling message identifying the user to which the message belongs.

Service Information Octet (SIO)

Eight bits, contained in a message signal unit, comprising the service indicator and the sub-service field.

Signalling Connection Control Part (SCCP)

Functional block that provides additional capabilities to the Message Transfer Part (MTP) and addresses operation, maintenance and administrative services.

Signalling Information Field (SIF)

Makes a distinction between the signalling units. Consists of a routing label and user part dependent data.

Signalling Link

A transmission means which consists of a signalling data link and its transfer control functions, used for reliable transfer of a signalling message

Signalling Link Code (SLC)

A field of the label in the signalling network management messages, which indicates the particular signalling link to which the message refers among those interconnecting the two involved signalling points.

Signalling Link Management

Functions that control and take actions, when required, to preserve integrity of locally connected signalling links, e.g. by reconfiguration of the signalling link sets.

Signalling Link Selection (SLS)

A field of the routing label which is typically used by the message routing function to perform load sharing among different signalling links/link sets.

Signalling Link Set

A set of signalling link(s) directly connecting two signalling points.

Signalling Message

An assembly of signalling information pertaining to a call, management transaction, etc., that is transferred as an entity.

Signalling Message Route

The signalling link or consecutive links connected in tandem that are used to convey a signalling message from an originating point to its destination point.

Signalling Network

The functions which are performed by the Message Transfer Part at Level 3 and are common to, and independent of, the operation of individual signalling links. They include the signalling message handling functions and the signalling network management functions.

Signalling Network Management

Functions that, on the basis of predetermined data and information about the status of the signalling network, control the current message routing and configuration of signalling network facilities.

Signalling Point

A node in a signalling network that originates and receives signalling messages, or transfers signalling messages from one signalling link to another, or both.

Signalling Relation

A relation between two signalling points involving the possibility of information exchange between corresponding User Part functions.

Signalling Route Management

Functions that transfer information about changes in the availability of signalling routes in the signalling network.

Signalling Traffic Management

Functions that control and, when required, modify routing information used by the Message Routing function and control the transfer of signalling traffic in a manner that avoids irregularities in message flow.

Signalling Transfer Point (STP)

A signalling point with the function of transferring signalling messages from one signalling link to another and considered exclusively from the viewpoint of the transfer.

Signal Unit (SU)

A group of bits forming a separately transferable entity used to convey information on a signalling link.

Signal Unit Error Rate Monitor (SUERM)

A procedure by which the error rate of an active signalling link is measured on the basis of a count of correctly checking and erroneous signal units.

Status Field (SF)

The bits of a link status signal unit which indicate one of the major signalling link states.

Sub-service Field (SSF)

Used in LSSU frames, the SSF field indicates whether the User Part refers to national or international networks.

T

Telephone User Part (TUP)

The User Part specified for telephone services.

Transmission Buffer
Storage in the signalling link control for signal units not yet transmitted.

U

User
A functional entity, typically a telecommunication service, which uses a signalling network to transfer information.

User Part
A part of the common channel signalling system which transfers signalling messages via the Message Transfer Part. Different types of User Parts exits (e.g. for telephone and data services), each of which is specified to a particular use of the signalling system.

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