

HP 37900D
Signaling Test Set
Emulation Guide

**HP 37900D Signaling Test Set
Emulation Guide**



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2. THE INSTRUMENT MUST ONLY BE USED WITH THE MAINS CABLE PROVIDED. IF THIS IS NOT SUITABLE, CONTACT YOUR NEAREST HP SERVICE OFFICE. THE MAINS PLUG SHALL ONLY BE INSERTED IN A SOCKET OUTLET PROVIDED WITH A PROTECTIVE EARTH CONTACT. THE PROTECTIVE ACTION MUST NOT BE NEGATED BY THE USE OF AN EXTENSION CORD (POWER CABLE) WITHOUT A PROTECTIVE CONDUCTOR (GROUNDING).
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 - c. Ensure that the line power (mains) plug is connected to a three-conductor line power outlet that has a protective (earth) ground. (Grounding one conductor of a two-conductor outlet is not sufficient).
 - d. Check correct type and rating of the instrument fuse(s).

How to Use This Guide

The Emulation Guide provides information on emulating a signaling device in a network. It is organized in nine main chapters:

Chapter 1 is an overview of a complete emulation operation.

Chapter 2 describes how to configure the interface cards and connect them to the network.

Chapter 3 describes how to ensure the correct personality file is active.

Chapter 4 describes how to set up the internal message catalog.

Chapter 5 describes how to set up and run the test.

Chapter 6 describes how to process the test results.

Chapter 7 describes how to preserve a No7 Signal Path in Through Emulation Mode.

Chapter 8 contains information on ISDN Emulation.

Chapter 9 contains information on X.25 Emulation.

Contents

1. Overview of Emulation Testing	
Introduction	1-1
Defining the Test	1-3
Summary	1-3
Configuring the HP 37900	1-4
Summary	1-4
Making all Elements of the Test Available	1-5
Activities Involved in an Emulation Test	1-6
Concepts to Remember	1-8
The Test Sequence	1-8
The Signaling Message	1-8
The Message Catalog	1-9
The Internal Message Catalog	1-9
2. Configuration	
Relationship between Link Number and Interface Ports	2-3
Example Configuration	2-4
Configuring the 2.048 Mbit/s CEPT Interface	2-4
Level 1 Status Indicators	2-5
Telephone Handset	2-5
Cabling to the Signaling Link	2-5
Emulate - Balanced Connection	2-6
Emulate - Unbalanced Connection	2-6
Through Emulate - Balanced Connection	2-7
Through Emulate - Unbalanced Connection	2-7
External Clock and Trigger	2-8

3. Personality and the Personality File	
Personality	3-1
Personality File	3-2
Active Personality File	3-3
4. Messages and the Message Catalog	
Signaling Message	4-1
Message Catalogs	4-1
Internal Message Catalog	4-2
Manipulating Messages in the Internal Message Catalog	4-3
5. Setting Up and Running the Test	
Personality Assignment	5-1
A - Assign personality	5-1
Test Levels	5-3
Level 2	5-3
Level 3	5-3
Level 4	5-3
Loading User-Written Pascal CALL Procedures	5-4
Ensuring all Required Messages are Available	5-4
Reading and Compiling the Test Sequence	5-5
Saving and Locking SDL Test Sequences	5-6
Saving SDL Test Sequences	5-6
Locking SDL Test Sequences	5-6
The COMPILED SDL Display and Menu	5-7
W - Write Compiled SDL to disc	5-7
R - Read Compiled SDL from disc	5-7
S - View SDL Statistics	5-8
L - Write Compiled SDL to disc as a locked file	5-8
C - Clear SDL from memory	5-8
Starting the Links	5-9
T - Terminate when test log full	5-10
A - normal or emergency Alignment	5-10
R - auto Repeat mode	5-11
O - initialised or established Operation (ISDN , X25 links)	5-11
M - Modify level 2 links	5-11
L - Link mapping facilities (No7 links)	5-12
C - Configure ISDN level 3 links	5-13

X - Configure X25 level 3 links	5-13
H - switch link Highlights	5-14
S - Start highlighted links	5-14
Example Emulation Session (IAMDEMO)	5-15
Description	5-15
Setting Up and Running the Test.	5-15
Running the Test	5-17
6. Processing the Test Results (Test Log)	
To Process a Test Log	6-1
To Decode a Message in the Test Log	6-1
The Message Decode Screen	6-2
Help.	6-3
The Field Decode Screen.	6-3
Selecting Alternative Decodes (X)	6-4
7. Preserving a No7 Signal Path in Through Emulation	
Using BYPASS and PASSTHROUGH	7-1
Control Sequence	7-2
BYPASS	7-3
PASS-THROUGH	7-3
Test Sequence Control	7-4
BYPASS	7-5
Setting Up PASS-THROUGH	7-6
8. ISDN Information	
The CONFIGURE ISDN LEVEL 3 LINKS Display and Menu	8-1
S - switch Side	8-2
T - switch TEI assignment	8-2
N - switch automatic Negotiation	8-3
On	8-3
Off	8-3
P - modify system Parameters	8-3
C - Copy link configuration	8-3
R - Read configuration from disc	8-3
W - Write configuration to disc	8-3
The Filename	8-4
Default Configurations	8-4

HP-default configuration	8-4
User-Defined Default Configuration	8-4
The MODIFY SYSTEM PARAMETERS Screen	8-5
Non-Automatic TEI Assignment	8-8
Automatic TEI Assignment	8-10
Initialised and Established Operation for ISDN Links	8-12
ISDN Level 3 Established Operation	8-12
ISDN Level 3 Initialised Operation	8-13
Messages for use in Established/Initialised Operation	8-14

9. X.25 Information

The CONFIGURE X25 LEVEL 3 LINKS Display and Menu	9-1
S - switch Side	9-2
P - modify system Parameters	9-2
C - Copy link configuration	9-2
R - Read configuration from disc	9-3
W - Write configuration to disc	9-3
The Filename	9-3
Default Configurations	9-4
HP-default configuration	9-4
User-Defined Default Configuration	9-4
The MODIFY SYSTEM PARAMETERS Screen	9-5
Initialised and Established Operation for X.25 Links	9-7
X.25 Level 3 Initialised Operation	9-7
X.25 Level 3 Established Operation	9-7
Messages for use in Established/Initialised Operation	9-9

Index

Figures

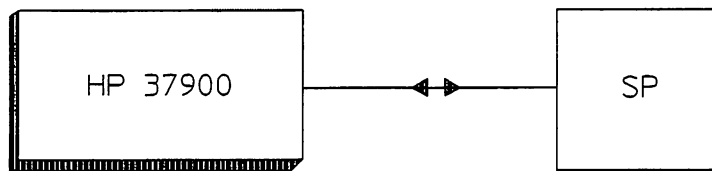
2-1. Link to Port Relationship for TERMINATE EMULATION	2-3
2-2. The 2.048 Mbit/s CEPT INTERFACE Menu	2-4
2-3. Trigger and Clock Pin Connections	2-8
4-1. The MESSAGE CATALOG EDIT FUNCTIONS Menu	4-4
4-2. EDIT MESSAGE Display and Menu (IAM)	4-5
5-1. The ASSIGN PERSONALITY Screen	5-2
5-2. The COMPILED SDL Menu	5-7
5-3. The START LINKS Screen	5-9
6-1. Message Decode Screen	6-2
6-2. Decoded Fields	6-3
6-3. Alternative Decodes	6-4
8-1. The CONFIGURE ISDN LEVEL 3 LINKS Screen	8-2
8-2. The MODIFY SYSTEM PARAMETERS Screen	8-5
8-3. Non-Automatic TEI Assignment	8-9
8-4. Automatic TEI Assignment	8-10
9-1. The CONFIGURE X25 LEVEL 3 LINKS Screen	9-2
9-2. The MODIFY SYSTEM PARAMETERS Screen	9-5



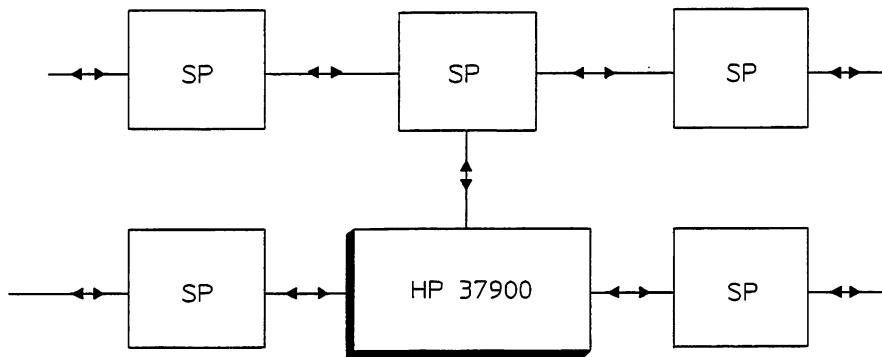
Overview of Emulation Testing

Introduction

You can use the HP 37900 to emulate a signaling device, such as a Signaling Point (SP), exchanging signaling messages with another signaling device.



It can also emulate a Signaling Transfer Point (STP) receiving and processing messages, then replying to them or passing them on as required.



All emulation activities are performed under the control of predefined tests, so there are three main requirements before you can run a test.

1. The test must be completely defined in advance.
2. The HP 37900 must be configured to enable it to perform the test.
3. All elements of the test must be available for use when required.

Defining the Test

The test runs under the control of a “test sequence”. This is a Specification and Description Language (SDL) process which governs the sequence of events during the test. The test sequence contains statements which;

- Send messages over signaling links.
- Specify the actions to be taken on receipt of specified messages (or other events such as timeouts).

The actions to be taken can include making use of Pascal “CALL Procedures”, gaining access to the full Pascal capability.

Summary

You must prepare in advance:

- The test sequence.
- A “message catalog” containing all messages specified in the test sequence.
- A library containing all CALL procedures called by the test sequence (if required).

Configuring the HP 37900

The “Personality File” customizes the HP 37900 to interpret and respond correctly to the required signaling protocol. It also contains flags enabling or disabling various optional facilities, such as “Reset Override (RO)”. Refer to the *Programming Manual* for details.

The Interface card(s) you are going to use need to be configured for the test.

Communication on the network has to be established. This means “Starting” the link(s) you are going to use.

Summary

1. Ensure the correct Personality file is active.
2. Configure the Interface card(s).
3. Start the link(s).

Making all Elements of the Test Available

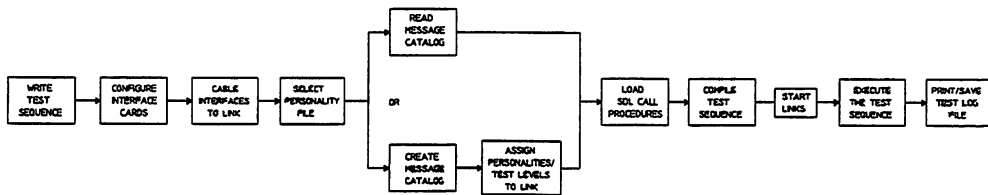
The sequence must be compiled before it is executed. If you change the sequence, or the message catalog it uses, you must recompile the sequence before you can run it.

Any number of message catalogs can be held on disc, but only the message catalog currently in computer memory (known as the “active message catalog”) can be accessed directly by an executing test sequence. You can create the active catalog prior to running the sequence, or read an existing catalog from disc.

The CALL procedures are previously written, compiled, and added to a CALL library. Any number of CALL libraries can be held on disc, but only the CALL library you load into computer memory (using an Emulation Mode menu option) can be accessed directly by an executing sequence.

Activities Involved in an Emulation Test

ACTIVITIES IN AN EMULATION TEST



Until you are familiar with Emulation testing, perform the tasks in the following order.

1. Write the test sequence and save it to disc. If necessary, write any CALL procedures needed by the sequence. These are independent user-defined procedures which can be called from within a sequence. Refer to the *HP 37900 Programming Manual* for information on writing test sequences and SDL CALL procedures.
2. Ensure that the HP 37900 has the correct “personality”. That is, ensure that the active personality file uses the correct decodes and mnemonics for the protocol you are going to test. (Chapter 2.)
3. In Configuration Mode, configure the ports of the interface(s) to be used. (Chapter 2.)
4. Connect the interfaces to the links to be tested. (Chapter 2.)
5. Start the HP 37900 links. (Chapter 5.)

6. Ensure the correct personalities are assigned to the correct links.
7. Read the message catalog containing the required signaling messages from disc, or create a new message catalog. (Chapter 4.)
8. Load the SDL CALL procedures (if required).
9. Read and compile the test sequence. (Chapter 5.)
10. Execute the test sequence. (Chapter 5.)
11. Display, print or save the Test Log. (Chapter 6.)

Concepts to Remember

The Test Sequence

Controls an Emulation test.
Specifies:
Accepted inputs
(Internal events or received messages).
Response to inputs
(output text to display or message to link).
Can call in user procedures

Text file written in STS File Manager.
Compiled and run in Emulation Mode.

The Signaling Message

Contains signaling data
(up to 273 octets).
Also defines;
Personality
Link number
Runtime operations

Created using MESSAGE CATALOG
EDIT FUNCTIONS in Emulation Mode.
Can be fully decoded to show the value
and meaning of each octet.

The Message Catalog

Contains up to 300 signaling messages.
Can be written to and read from disc.
Any number stored on disc.

Created as the Internal Message Catalog and written to disc.

The Internal Message Catalog

Contains up to 300 signaling messages.
Must contain all messages needed by sequence.

Created in Emulation Mode using MESSAGE CATALOG EDIT FUNCTIONS or read from disc.



Configuration

The basic requirements for configuring the HP 37900 are described for Monitor Mode in the *HP 37900 Monitor Guide*. The same concept is used for Emulation Mode (referred to here as EMULATE).

The modes of operation in Emulate (selected by **S * connection Setup**) are EMULATE, END EMULATE and THROUGH (THRU) EMULATE.

EMULATE The HP 37900 emulates the functions of a Signaling Point at one end of the Signaling link, performing Level 2, 3 and 4 tests.

You can use either or both ports of any or all available interfaces. Each port operates independently.

END **END EMULATE** can be used in two ways:

EMULATE
(HP 37915A)
(HP 37916A)
(HP 37918A)
(HP 37919A)

1. Use the interface as described above for EMULATE. Ports A and B emulate on their own links independently. Use the Signaling/Voice Timeslot Selection screen, as described later in this chapter, to define one signaling timeslot for each port.
2. Use *one port* of the interface (either Port A or Port B) to emulate on two timeslots of the same link. In this case define two timeslots for one port only. The other port is not used for signaling.

THROUGH
EMULATE
(HP 37915A)
(HP 37916A)
(HP 37918A)
(HP 37919A)

Emulation is performed on individual timeslots, the remaining timeslots being passed through unchanged and can remain in service.

Either:

Define one signaling timeslot for each port, and connect the signaling link through the interface via both ports.

Or

Define two timeslots for one port as described in 2. above.

THRU EMU
with BYPASS
(HP 37915A
Rev.E)

The HP 37915A Rev.E interface card has a bypass facility which allows you to apply a metallic connection between Port A and Port B of the card (providing an unbroken through path) until you are ready to start an Emulation test. This is removed automatically when you align the links. See Chapter 7 for more information.

Relationship between Link Number and Interface Ports

The following diagram illustrates the fixed relationship between link numbers and the interface ports for Emulation Mode. (References to Port A and Port B do not apply to the HP 37919A Interface card, which has only one signaling port.)

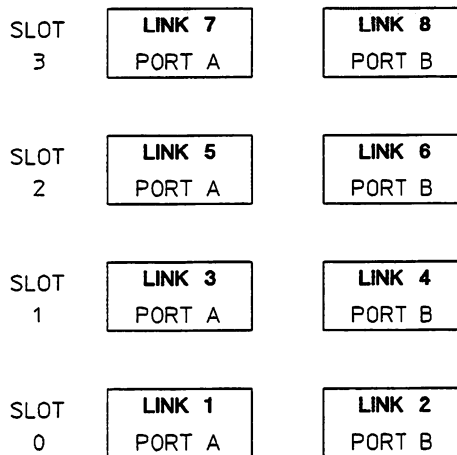


Figure 2-1. Link to Port Relationship for TERMINATE EMULATION

For example, the signaling link connected to SLOT 2, PORT A is identified as Link 3.

The example shown is for a HP 37900D. The equivalent slot numbers for the HP 37900 B/C are:

Slot 0 corresponds to Slot 1 of the HP 37900B and HP 37900C

Slot 1 corresponds to Slot 3 of the HP 37900B and HP 37900C

Slot 2 corresponds to Slot 5 of the HP 37900B with SLP expander

Slot 3 corresponds to Slot 7 of the HP 37900B with SLP expander

Example Configuration

Configuring the 2.048 Mbit/s CEPT Interface

From the Configuration Mode menu, press M and select the slot containing the interface you want to check. A typical configuration is shown below.

```

                2.048 Mbit/s CEPT INTERFACE (Sig. Card)

SLP              Port A              Port B
Slot   Card      +-----+-----+
  3    |No Card   |No Card   |
  2    |No Card   |No Card   |
  1    |No Card   |No Card   |
  0 2.048 Mbit/s Sig|HDB3 TS- 16/xx/ 4  M |HDB3 TS- xx/16/ 4  M |
                +-----+-----+

-----
                CURRENT SETTING
S * connection Setup >> THRU EMULATE >> THRU EMULATE
V * Voice setup      >> TALK/LISTEN >> TALK/LISTEN
L * Line|voice code  >> HDB3 |A Law/ADI >> HDB3 |A Law/ADI
C - Clock source     >> RECOVERED >> RECOVERED
I - No7:1/2/Voice slot >> 16/xx / 4 >> xx / 16/ 4
M - terMination     >> Unbal Bridged >> Unbal Bridged
  Idle code         >> NOT INSERTED >> NOT INSERTED
N * National bits   >> >>
D * Data inversion  >> Normal >> Normal
F - Framing         >> None >> None
O-Other port A-Auto_config other port Q-Quit R-alarMs G-diGital cont E-lEds
Enter menu option:
```

Figure 2-2. The 2.048 Mbit/s CEPT INTERFACE Menu

For example, to change the terMination;

Press M

A new menu is shown listing the available options. When you have selected the required option you are returned to the above menu.

Refer to the *HP 37900 Monitor Guide* for detailed information.

Level 1 Status Indicators

The HP 37900D has STATUS indicators on the left side of the front panel, one for each port of each card slot.

Refer to the Operator's Guide for information.

Telephone Handset

The HP 37915A 2.048 Mbit/s Interface Card provides a voice connection. If required, connect the handset (for example Accessory Number HP 15722A) to the rear-panel of the interface card.

Cabling to the Signaling Link

In the following examples:

- All cables are accessory parts and must be ordered separately.

- For Balanced connections;

All signal connections are Siemens - Siemens 3-pin.

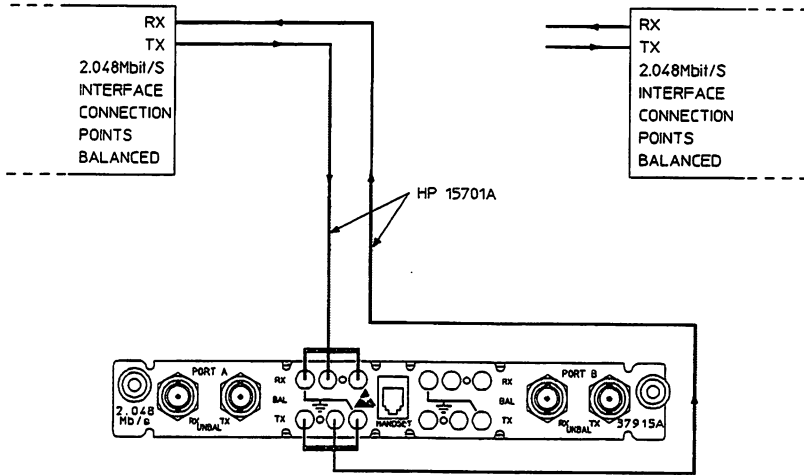
Only use the HP 15511A for unprotected monitor points.

- For Unbalanced connections;

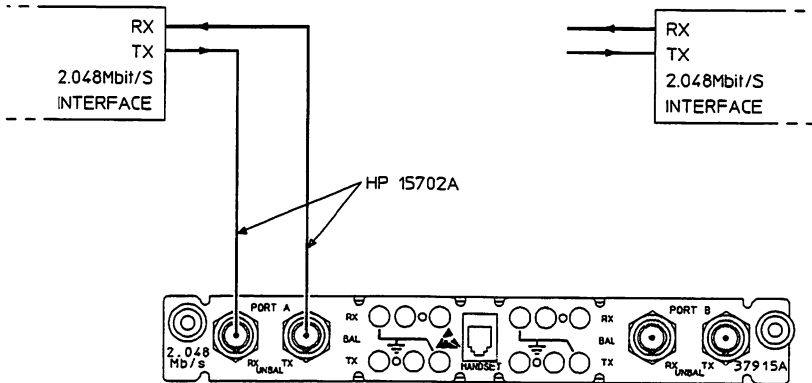
All signal connections are BNC - BNC.

Use the HP 15703A for unprotected monitor points a large distance from the HP 37900.

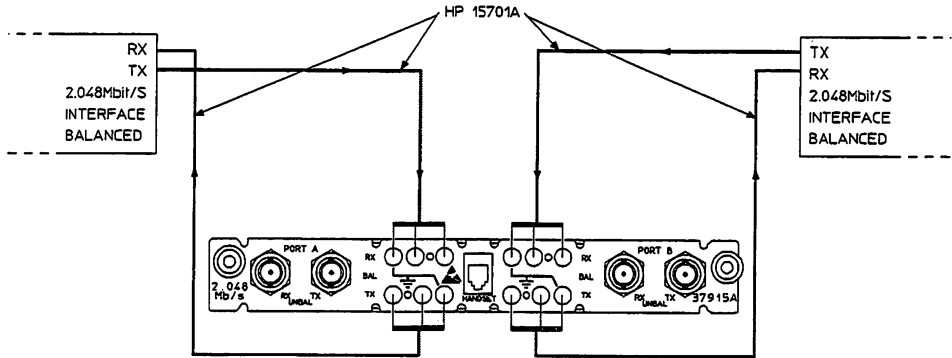
Emulate - Balanced Connection



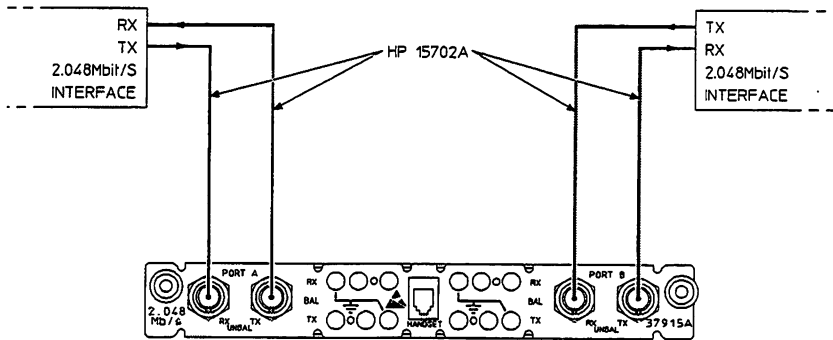
Emulate - Unbalanced RX Connection



Through Emulate - Balanced Connection



Through Emulate - Unbalanced Connection



External Clock and Trigger

An external TTL trigger source can be used to control data logging. When “External start” and/or “External stop” are defined, the HP 37900 recognizes a TTL pulse as a start or stop trigger.

The HP 37900 can also provide the TTL output signal, which can be used to trigger another HP 37900.

There is a 7-pin DIN connector at the left side of the rear panel. Figure 2-3 shows the pins viewed from the rear of the instrument.

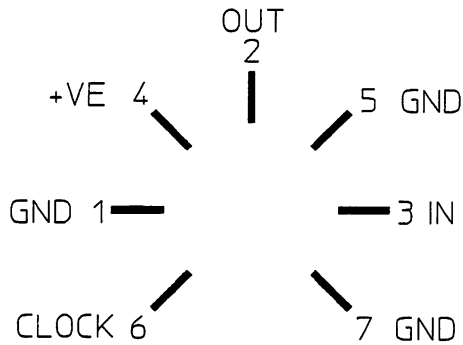


Figure 2-3. Trigger and Clock Pin Connections

Pin	Designation	Value
1	CLOCK GROUND	
2	TRIGGER OUT	High >4.3 V @ 120 μ A Low <0.15 V @ 20 μ A
3	TRIGGER IN	High >4.2 V Low <0.9 V @ 10.11 mA
4	+VE	+10 V (Nominal) 50 mA power source
5	TRIGGER OUT GROUND	
6	CLOCK	High >4.2 V Low <0.9 V @ 10.11 mA Duty cycle 50%
7	TRIGGER IN GROUND	

Caution

Voltages greater than 10 V damage the HP 37900 circuitry.





Personality and the Personality File

Personality

You can use the HP 37900 to test a wide range of signaling protocols and variants. It is necessary to ensure the HP 37900 is configured to recognize and respond correctly to the required signaling data. This configuration is referred to as “personality”.

Personality File

A personality file completely defines two personalities, and assigns a personality to each signaling link.

Note



You must ensure that;

- The correct personality file is “active” (this is the personality file currently controlling the operation of the HP 37900). See “Active Personality File”.
- The correct personalities are assigned to the links you are going to test.

Primarily, the personality file defines the decodes and mnemonics necessary to;

- Translate the received signaling data into text and display it in the required format.
- Translate user-defined messages into transmittable data.

The personality file also contains a number of flags, enabling or disabling various optional facilities.

See the *HP 37900 Programming Manual* for a list and description of the definitions which can be included in a personality file.

Active Personality File

Ensure the active personality file contains the definitions you need.

When the HP 37900 boots up, it loads the default personality file PERFILE.P.

You can temporarily select a different personality file to be active (option P from the HP 37900 Main Menu). This remains active until the system is rebooted, or you again use the P option.

You can also change the default by editing PERFILE.P or overwriting it with another personality file.

To see what personality files are available in your HP 37900:

1. Enter File Manager.
2. Use the T option to list Personality files.

The names of all available personality files, including PERFILE.P, are displayed.

To look at, and if necessary change, the contents of a personality file:

1. Highlight the file.
2. Select E - Edit.

The file is listed in edit mode. You can scroll down the listing to check the definitions and edit as required.

Refer to the *HP 37900 Programming Manual* for details on using the STS File Manager.

Note



Ensure the PERFILE.P file contains the command DUAL if you intend checking messages on different types of signaling links simultaneously, for example, "A" and Abis, or SS7 and ISDN.



Messages and the Message Catalog

Signaling Message

User-defined messages are used within test sequences, to be transmitted or compared against received data. The sequence references each message by name when required.

Messages can be created, modified, copied or decoded within Emulation Mode.

Message Catalogs

A message catalog is a file containing up to 300 test messages. One catalog contains all messages required by a test sequence. Any number of message catalogs can be stored in disc memory.

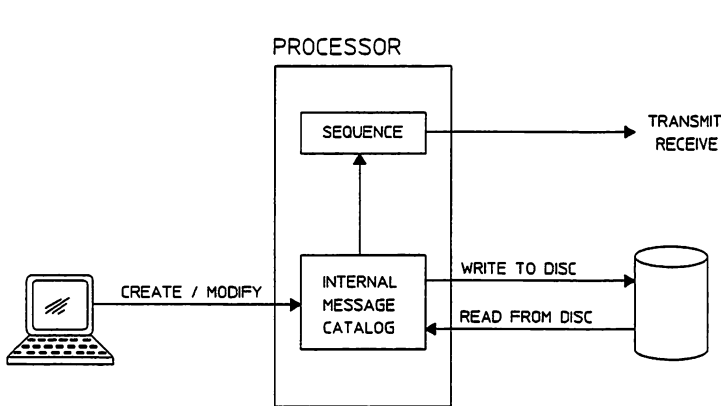
Internal Message Catalog

The internal message catalog is the message catalog currently in computer memory.

When messages are created, they are added to the internal message catalog. The internal message catalog can then be used by a test sequence, or written to disc for future use.

Only the internal message catalog can be accessed by a test sequence or from the keyboard.

If a previously written message catalog is required for use by a test sequence, or if you want to change it, you must first read it from disc into the internal message catalog.



The sequence:

- Transmits specified messages copied from the internal message catalog.
- Responds to received messages which match specified messages in the internal message catalog.

If there is already an internal message catalog, you can either overwrite it or, providing there are no duplicate messages, you can append another message catalog to it.

Manipulating Messages in the Internal Message Catalog

Use the following exercise to gain familiarity with the concept of message catalogs and the messages they contain.

1. Display the EMULATION MODE menu.

```
                                EMULATION MODE

C - Compile test sequence      E - Execute test sequence
L - Load SDL CALL procedures  P - Print test sequence

S - Start links                T - Test log

M - Message catalog edit functions  V - Compiled SDL Functions
R - Read message catalog from disc  F - File manager
W - Write message catalog to disc
H - Hardcopy of (print) internal message catalog

A - Assign personality          O - Open test control file
Q - Quit emulation mode

-----

Enter menu option:
```

The options M, R, W and H apply directly to message catalogs. You can use the File Manager to list the message catalogs currently stored on disc.

Refer to the *HP 37900 Reference Manual* for detailed information on this menu.

2. Use the R option to read the message catalog IAMCAT from disc. If you already have an internal message catalog overwrite it.
3. Now you can add or remove messages, or change the contents of messages. Select M - Message catalog edit functions.
4. Use N to see what messages are in this catalog.


```
MESSAGE CATALOG EDIT FUNCTIONS

N - list message Names

E - Edit message
C - Copy message
D - Delete message
R - Rename message

M - Multiple message edit

Q - Quit
-----

Enter menu option:
```

Figure 4-1. The MESSAGE CATALOG EDIT FUNCTIONS Menu

This enables you to List, Edit, Copy, Delete, and Rename messages.

- 5. Create a new message by using C to copy the message IAM to MESS1.
- 6. Press E and enter the message name MESS1.

If the message named already exists,
the display appears as below, showing the current contents and message name.

If you are creating a new message,
the display appears as below, showing the message name, but with all octets empty.

```

                                EDIT MESSAGE - IAM          █ - Value is
masked
Personality: REDBOOK  Link: █ Length Mask - Off  Run-time Ops: None

 48 47 46 45 44 43 42 41 40 39 38 37 36 35 34 33 | Octet Number
                                           | HEX Value

 32 31 30 29 28 27 26 25 24 23 22 21 20 19 18 17 | Octet Number
                                           00 56 57 13 31 30 01 | HEX Value

 16 15 14 13 12 11 10  9  8  7  6  5  4  3  2  1 | Octet Number
 06 08 02 41 0A 00 07 00 01 00 14 80 02 80 1E 85 | HEX Value
                                           | Tx Dirn-->
-----

L - Link specification          T - Turn length mask ON/OFF
S - Switch link mask ON/OFF    R - Run-time message operations

D - Decode message             E - Edit octets
Q - Quit                       F - File input

Enter menu option:

```

Figure 4-2. EDIT MESSAGE Display and Menu (IAM)

TX-Dirn ► indicates that the octets will be transmitted in numerical order (octet 1, octet 2 ...).

The menu allows you to;

- Specify the link used to carry this message.
- Mask the link number, so any link can be used.
- Apply the length mask. With the length mask is on, once the defined octets of a received message have been marched, the rest of the message is ignored for matching purposes.
- Specify Run-time operations (these are described in the *HP37900D Programming Manual*).
- Obtain a text decode of the displayed message (see below).
- Edit individual octets or use an input file to specify the complete message. See *HP37900D Programming Manual* for information on input files.

For example;

- a. Use S to switch off the link mask. This means the message can only be transmitted or received on the specified link.
 - b. Use D to obtain a one-line description of the purpose of each octet. Use the cursor to select the DPC octet and press D again to fully decode that octet.
 - c. Decide on a change you can make and work out the value to give the octet. Press Q.
 - d. Press E then C and change the value of the selected octet. Decode again to see the change.
7. Return to the MESSAGE CATALOG EDIT FUNCTIONS menu and delete MESS1.
 8. Return to the EMULATION MODE menu and write the message catalog to disc, naming it MESSCAT.
 9. Start the File Manager. Use T to list the message catalog files. Delete MESSCAT.MK and MESSCAT.MG.

Note



This note refers to files written to disc using software of a revision earlier than Rev. 04.00. These files have to be updated to include the personalities and test levels before they can be used with Rev. 04.00 and above. To do this:

1. Set up the correct personalities and test levels (and Side for ISDN level 3 links).
2. Read the file from disc. You are warned;
No personality or test level details stored. Using current setting.
3. Write the file back to disc. This adds the personalities and test levels.

Note



When you use one of these options to create a new message, you are required to provide a message name. The name can have up to eight characters. The first must be alphabetic. The rest can be any combination of alphanumeric and underline characters.

Setting Up and Running the Test

Setting up the HP 37900 and running the test consists of:

- Ensuring the correct personalities are assigned to the links involved in the test.
- Loading the Pascal CALL procedures required by the test sequence.
- Ensuring all messages required by the sequence are available.
- Reading and Compiling the test sequence.
- Establishing communication on the required links (Start Links).
- Executing the test sequence.

Personality Assignment

The active personality file assigns one of its two personalities to each link. To check the personality assignment, select **A - Assign personality** from the **EMULATION MODE** menu.

A - Assign personality

Selecting this option displays the **ASSIGN PERSONALITY** screen, which shows the current personality and test level configuration for all links. The protocol associated with each personality is also shown.

You can:

- Reassign any link to one of the two available personalities.
- Reassign the test level associated with either personality. The **test level** corresponds to the OSI multi-layer model. It defines the level of the protocol to be tested. If, for example, you assign test level 3, communication below level 3 is provided automatically by the HP 37900.

If the active personality file does not contain the personality you want;

- Exit from Emulation Mode.
- Use the P option in the HP 37900 Main Menu (as described in Chapter 3) to activate another personality file.
- Return to this screen.

Links	Personality	Protocol	Test Level
-----	-----	-----	-----
1 2 3 4	1 BLUEISDN	ISDN	3
5 6 7 8	2 BLUEBOOK	No7	4

P - change Personality
L - change test Level

? - Help
Q - Quit menu

Enter menu option:

Figure 5-1. The ASSIGN PERSONALITY Screen

When you select P or L the valid responses are displayed.

Note



If you make changes, use the Start Links option before running a test sequence.

If you read a message catalog from disc, the personalities are reassigned to the values defined in the message catalog.

Test Levels

The test level shows the level of messages in the message catalog. The HP 37900 adds all lower level parts to complete the message.

Level 2. You control the level 2 and above parts of messages so that, for example, you can send illegal level 2 messages. The HP 37900 adds a 16-bit check code and a flag pattern to messages before sending them.

Level 3. You control level 3 and above parts of messages. Communication below level 3 is provided automatically by the HP 37900.

Level 4. This applies only to No7 personalities. You control level 4 and most of the level 3 messages. The HP 37900 automatically responds to the level 3 Test and Maintenance messages MTN, MTNR, MTNS and Network Management messages SNM. These messages are not recorded in the test log.

1. The HP 37900 responds to the Signaling Link Test Message with a Signaling Link Test Acknowledgement Message which contains a copy of the test pattern sent in the original message.
2. The HP 37900 responds to the Signaling Route Set Test Signal for Prohibited Destination message with a Transfer Allowed message which contains a copy of the Destination Point Code (DPC) sent in the original message.
3. When any other level 3 message is received, it is displayed and recorded in the test log.

Loading User-Written Pascal CALL Procedures

The CALL procedures provided with the HP 37900 are loaded automatically when you enter Emulation Mode.

All of the user-procedures used by a test sequence must be in memory for the test sequence to work.

The user-procedures are held in libraries. There can only be one library in memory, so all of the user-procedures used by a test sequence must be in one library. Use the L command to bring the required library into memory.

From the EMULATION MODE menu, select L - Load SDL CALL procedures and enter the name of the required file.

Ensuring all Required Messages are Available

All of the messages used by a test sequence must be in memory for the test sequence to work.

The messages are held in message catalogs. There can only be one message catalog in memory, so all of the messages used by a test sequence must be in one library. Use the R command to bring the required message catalog into memory.

From the EMULATION MODE menu, select R - Read message catalog from disc and enter the name of the required file.

This then becomes the internal message catalog, and can be accessed by a test sequence.

If an internal message catalog already exists, you are asked whether you want the disc catalog to overwrite it or be appended to it. If you try to append a disc catalog which contains a message name duplicated in the internal catalog, an error message is displayed and the read is aborted.

When the message catalog has been read, the HP 37900 reassigns personality numbers and test levels to all links to regain the conditions under which the catalog was saved. If the currently active personality file does not contain the

appropriate personalities, a warning message is displayed for each link defined in the catalog.

Note

This note refers to files written to disc using software of a revision earlier than Rev. 04.00. These files have to be updated to include the personalities and test levels before they can be used with Rev. 04.00 software. To do this:

1. Set up the correct personalities and test levels (and Side for ISDN level 3 links).
2. Read the file from disc. You are warned;
No personality or test level details stored. Using current setting.
3. Write the file back to disc. This adds the personalities and test levels.

Reading and Compiling the Test Sequence

When all test messages used by your sequence are present in the internal message catalog, use the **C - Compile test sequence** option to compile the sequence.

A successfully compiled sequence can be executed repeatedly without re-compiling. If you change the sequence or message catalog, you must compile again before you can execute.

Saving and Locking SDL Test Sequences

From the EMULATION MODE menu, use V - Compiled SDL Functions to obtain the COMPILED SDL menu.

Saving SDL Test Sequences

When SDL sequences are compiled, the associated message catalog must be loaded first. This means that the two have to be treated as a single entity. Hence, a compiled SDL file contains the contents of the message catalog and the compiled SDL details. This compiled SDL file can be saved using the V - Compiled SDL Functions option. Loading a compiled SDL file has the same effect as Reading a message catalog followed by Compiling an SDL sequence. Note that the same warnings and error messages appear as if the original source message catalog was being loaded. Compiled SDL files are given the extension ".CS" which means that the file name can be up to six characters long. You can replace the existing three files (i.e. .MG and .MK for message catalog and .TEXT for SDL sequence) with a single .CS file.

To read and write compiled SDL files, the following conditions must be satisfied.

- The message catalog must be read normally.
- The SDL sequence must be compiled without any errors.

Having compiled this successfully, press V to display the COMPILED SDL menu which is shown and described later in this chapter.

Locking SDL Test Sequences

Locking an SDL sequence disables a number of the load and edit features of emulation. This means that it cannot be altered in any respect. SDL sequences can only be locked when compiled SDL is saved to disc using the L option in the COMPILED SDL menu.

There are two methods of unlocking Emulation. One is to quit emulation and restart it. However, a quicker method is to use the C - Clear feature in the COMPILED SDL menu.

The COMPILED SDL Display and Menu

From the EMULATION MODE menu;

Press **V**

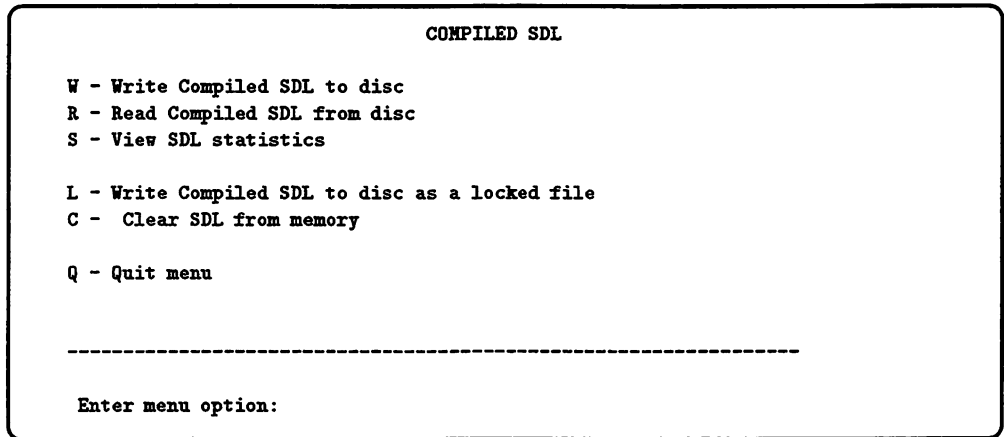


Figure 5-2. The COMPILED SDL Menu

W - Write Compiled SDL to disc

This writes the current message catalog and compiled SDL to a file. You are prompted for an existing filename which is automatically given the extension .CS. Press **(RETURN)** to abandon the Write operation. If there is no message catalog or successfully compiled SDL loaded, an error is displayed.

R - Read Compiled SDL from disc

This reads a previously written compiled SDL file from the disc. You are prompted for a filename. Do not specify an extension, the system adds .CS. This performs in a very similar fashion to Reading a message catalog followed by compiling an SDL sequence. Warnings about personality mismatches will be presented. However, you are not given the option to append to an existing catalog. Any existing SDL and catalog will be overwritten.

S - View SDL Statistics

This displays some useful information about the currently loaded SDL. It shows the levels of usage of the various internal structures and also indicates whether the current file is locked.

L - Write Compiled SDL to disc as a locked file

This is identical to W - Write except that the file is marked as locked. This means that any future load of this file will inhibit all further read or edit functions.

C - Clear SDL from memory

This is the Clear function which reinitialises all message catalog and SDL to the state they were in on entry to Emulation i.e. all messages and SDL are removed. Note that if a locked file is loaded, the menu will change to indicate this. Similarly, if there is no SDL loaded, this option will not be included in the menu. You are asked to confirm the Clear function with a Yes/No prompt.

Starting the Links

From the EMULATION MODE menu, use S - Start links to obtain the START LINKS display and menu.

```

                                START LINKS

Link 8: NOT CONFIGURED          ISDN L3
Link 7: NOT CONFIGURED          ISDN L3
Link 6: NOT CONFIGURED          ISDN L3
Link 5: NOT CONFIGURED          ISDN L3
Link 4: Configured              No7 L4
Link 3: Configured              No7 L4
Link 2: Configured              No7 L4
Link 1: Configured              No7 L4
-----
T - Terminate when test log full    >> No <<
A - normal or emergency Alignment (No7 links only)  >> Normal <<
R - auto Repeat mode                >> Off <<
0 - initialised or established Operation (ISDN, X25 links) >>Initialised <<

M - Modify level 2 links            L - Link mapping facilities (No7 links)
C - Configure ISDN level 3 links
X - Configure X25 level 3 links
H - switch link Highlights          ? - Help
S - Start highlighted links         Q - Quit menu

Enter menu option:
```

Figure 5-3. The START LINKS Screen

1. Use the configuration options described below to set up the test.
2. Use H - switch link Highlights to select the links you intend to use.
3. Use S - Start highlighted links to establish communication on the selected links.
4. Quit back to the EMULATION MODE menu and use E - Ex

Link Status

Each link can be in any of the following states:

Configured (for Emulation)

NOT CONFIGURED

Initialising ... (levels 2/3 establishing communication)

Initialised (Levels 2/3 in communication) *INITIALISATION FAILED
(Check the GPIO cabling)

Aligning ... (Normal or Emergency)

ALIGNMENT FAILED (Displayed with more detailed information)

Link operational

NOT OPERATIONAL (Was aligned but has gone out of service. Detailed information is displayed.)

A link must have been configured for Emulation before it can be made operational. At least one link must be operational for a test sequence to be executed.

If a link fails while a test sequence is executing, abort the test sequence and start the link again to bring it back into service.

Menu Options

T - Terminate when test log full

This option toggles between Yes and No. The current selection is displayed.

Yes When the test log is full the test stops.

No When the test log is full logging continues, overwriting the data in the test log.

A - normal or emergency Alignment

This option toggles between Normal and Emergency alignment. (For example, see the CCITT Blue Book Q.703.) The current selection is displayed.

R - auto Repeat mode

Pressing R toggles auto-repeat mode on and off. With auto-repeat on, if an operational link becomes unoperational during a test sequence;

- The sequence stops and the HP 37900 attempts to re-align all SELECTED links. The attempts are repeated until the links are operational. During this time the link status screen is displayed.
- When the links are operational the sequence re-starts.

O - initialised or established Operation (ISDN , X25 links)

This toggles between Initialised and Established operation.

In Initialised operation, the level 2/3 establish/release primitives are provided by your test sequences. In Established operation, when you Start links, the level 2/3 establish/release primitives needed to establish communication are provided automatically by the HP 37900. Refer to Chapter8 for ISDN information, Chapter9 for X.25.

M - Modify level 2 links

For level 2 testing, this option allows you to omit repeated messages (for example, strings of FISUs) or errored messages. The errored messages omitted are Frame errors, CRC errors, Abort errors, and DMA length errors.

When you press M a new screen is displayed. The top of the display shows the current configuration for each available link. The following menu is also displayed.

R - omit/include Repeated messages

E - omit/include Errored messages

D - select Default values

? - help

Q - Quit menu

R and E toggle between omit and include. You are asked for the number of the link you want to change.

The default is all links include both parameters.

L - Link mapping facilities (No7 links)

In THROUGH EMULATION or THROUGH EMULATION WITH BYPASS, this option allows you to establish a signaling path through a pair of links. Pressing L displays the following screen.

```

                                LINK MAPPING FACILITIES

    Link           Corresponding Link

    2
    1

-----

A - Add link mapping
D - Delete link mapping
P - enable/disable Pass-through mode      >> Disabled <<
R - enable/disable automatic Re-alignment >> Disabled <<

? - help
Q - Quit menu

Enter menu option:
```

Link Mapping

The upper part of the screen shows currently defined mappings. For example, if you use A to add a link mapping between links 1 and 2 the following is displayed.

LINK MAPPING FACILITIES

<u>Link</u>	<u>Corresponding Link</u>
2 --->	1
1 --->	2

You still need to press P to enable Passthru. While Passthru is enabled, traffic passes unaltered in both directions through links 1 and 2 without being logged.

You can also use this menu to enable automatic re-alignment. This means;

- If an operational link goes down, the HP 37900 automatically attempts to re-align it.
- If a mapped link goes down, its corresponding link is silenced by sending SIOS. The HP 37900 then automatically attempts to re-align both links.

Refer to Chapter7 for information on using this facility.

C - Configure ISDN level 3 links

When a link has been assigned to ISDN test level 3, the level 2 functions are provided automatically by the HP 37900. This option enables you to see the current settings for the level 2 parameters, and to change them as required. Refer to Chapter8.

X - Configure X25 level 3 links

When a link has been assigned to X.25 test level 3, the level 2 functions are provided automatically by the HP 37900. This option enables you to see the current settings for the level 2 parameters, and to change them as required. Refer to Chapter9.

H - switch link Highlights

Use this to select the links you intend to Start. In the upper part of the display, if the link number (first column) of a configured link is highlighted, it is ready to be started.

When you press H, you are asked for the number of the link to be selected or deselected. Enter a link number (or A for all links) and press **Return**.

S - Start highlighted links

Use this option to establish communication on the selected links. Links are started in ascending numerical order.

Example Emulation Session (IAMDEMO)

Hewlett-Packard have provided a demonstration test sequence (IAMDEMO) and message catalog (IAMCAT) for the HP 37900D.

Use this example with the **HP 37915A 2.048 Mbit/s Interface** or **HP 37916A 1.544 Mbit/s Interface**.

Description

Ports A and B of the same interface card simulate two Signaling Points communicating over a signaling path.

Setting Up and Running the Test.

- Install the interface in Slot 0 of the HP 37900D.
- Cable Port A of the interface to Port B as follows.

Port A TX to Port B RX (simulates Link 1)
Port A RX to Port B TX (simulates Link 2)

- Select Configuration Mode and configure the interface as follows.

Type M then 0 and press Return.

Press S to modify the connection Setup.
Press E to select End emulate.

Press C to modify the Clock source.
Press I to select Internal.

Press M to modify the termination.

Press B for Balanced (for 1.544 Mbit/s or if using 3-pin cables on 2.048 Mbit/s).

Press U for Unbalanced if using BNC cables on 2.048 Mbit/s.

Press 0 to modify the Other port.

Press C to modify the Clock source.
Press R to select Recovered.

Press Q to Quit the Modify link menu.

Press Q then Y to Quit Configuration Mode and return to the HP 37900 Main Menu.

- Type P and read the Personality file CCITTRB.
- Select Emulation Mode. The following activities are all started from the EMULATION MODE menu.
- Use Assign personality to ensure that links 1 and 2 have been assigned:
 - Personality - REDBOOK
 - Protocol - No7
 - Test Level - 4
- Read the message catalog IAMCAT from disc.
- Start links 1 and 2 only.
- Compile the test sequence IAMDEMO.
- Select Execute and watch the display. The display represents the traffic between the two simulated SPs. The messages transmitted on link 1 are displayed on the left, those received on link 2 on the right.

Running the Test

The sequence is verified during compilation. This includes ensuring that all named messages are in the internal message catalog.

There must be a valid compilation of the sequence for the sequence to run.

Use the START LINKS menu to;

- Set up the link test conditions.
- Highlight the links that are to be included in the test.
- Start (establish communication on) the selected links.



Processing the Test Results (Test Log)

During an Emulation test, all events are recorded in the Test Log. After the test you can process the data or write it to disc for future processing.

To Process a Test Log

From the EMULATION MODE menu;

Press T - Test log

The TEST LOG menu is displayed, allowing you to display the test log currently in memory, write it to disc, print it, or read a previously saved test log from disc.

To Decode a Message in the Test Log

Press S to display the test log and associated menu.

Find the message number of the message you want to decode.

Press D

Type the message number, and press .

Refer to "The Message Decode Screen" on the next page.

The Message Decode Screen

The decoded message is displayed in the format shown below.

Help	(Press [D] to decode field indicated)
1 1011101	Backward Indicator Bit, Backward Sequence Number
1 0101011	Forward Indicator Bit, Forward Sequence Number
00 001111	Length Indicator (LI) - MSU
0000 0011	SCCP message, International network
0000 1010	14 Bit Destination Point Code (DPC)
00 000000	
0000 1010	14 Bit Originating Point Code (OPC)
0010 0000	4 Bit Signalling Link Selection (SLS)
F 0000 1111	MT = Protocol Data Unit Error (ERR)
F 0001 1011	Destination Local Reference
F 0000 0001	Destination Local Reference
F 1100 1000	Destination Local Reference
F 1111 1111	Error Cause
V 0000 0001	Pointer to start of optional part
O 0000 1011	Diagnostic Parameter
O 0000 0001	LI of Diagnostic parameter
O 0000 0000	Diagnostic
O 0000 0000	End of Optional Part Parameter

Figure 6-1. Message Decode Screen

Each octet of the message is displayed accompanied by a name or summarized description. The fields are separated by vertical and horizontal lines.

Letters at the beginning of a line in some decodes refer to the message parts to which the octet belongs.

F means Fixed Part

V means Variable Part

O means Optional Part

M means Mandatory (ISDN)

To decode a field, use the or key to select the required field and press D (or other option, as described in the "Help" screen, see below).

When you select an octet, the octet number is shown against the cursor.

For some messages, there is too much data to display in one screen. Use the key to move the cursor "<" to the bottom of the display, then continue pressing the key to roll the display up.

Help.

With the cursor at any field, pressing ? or H displays the "Help" screen, which contains important information on further decoding of the message. Alternatively, press D, when the cursor is positioned beside the "Help" field.

The Field Decode Screen.

When you start the decode, as described above, the selected octet is highlighted, and the decoded field(s) displayed.

Help		<u>SCCP message, International network</u>							
1	1011101	D	C	B	A	D	C	B	A
1	0101011	<u>Sub-service Field</u>		<u>Service Indicator</u>					
00	001111	Service Indicator : 0011 = SCCP, Signalling Connection Control Part							
	0000 1010	Sub-service Field : 0000 = IN							
	00 000000	bits DC : Network indicator							
	0000 1010	00 = International network							
	0010 0000	bits BA : Spare							
F	0000 1111	00 = spare							
F	0001 1011								
F	0000 0001								
F	1100 1000								
F	1111 1111								
V	0000 0001								
0	0000 1011								
0	0000 0001								
0	0000 0000								
0	0000 0000								

Figure 6-2. Decoded Fields

Selecting Alternative Decodes (X)

Pressing X displays the alternative decodes available for the current message, and instructions on how to use this facility.

Help		<u>Decodes available for current message type</u>	
1	1011101		
1	0101011		
00	001111		
	0000 0011 ←	LAP	CBQ763
	0000 1010		AAAAAA
00	000000	HTP	
0000	1010		
0010	0000	Service Part	
F	0000 1111		
F	0001 1011	UserData Part	
F	0000 0001		
F	1100 1000		
F	1111 1111	The current decode is	00010000
V	0000 0001		
0	0000 1011	Use left/right arrow keys to move between decodes.	
0	0000 0001	Use up/down arrow keys to move between rows of decodes.	
0	0000 0000	Use [Select] key to make the indicated decode current.	
0	0000 0000		AAAAAAAAA

Use Q key to return to decode screen. If an alternative decode has been selected, then

Figure 6-3. Alternative Decodes

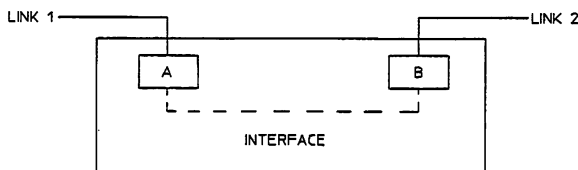
You can also override the current decode for part of a message, by pressing the appropriate key to select a “key-selected” decode. Key-selected decodes are defined in the active personality file.

This selection only applies for the current message.

Preserving a No7 Signal Path in Through Emulation

Using BYPASS and PASSTHROUGH

The HP 37900 can be inserted into an active signaling path to perform operations on selected messages.



For example, the test sequence can extract predefined messages, process them and pass them on.

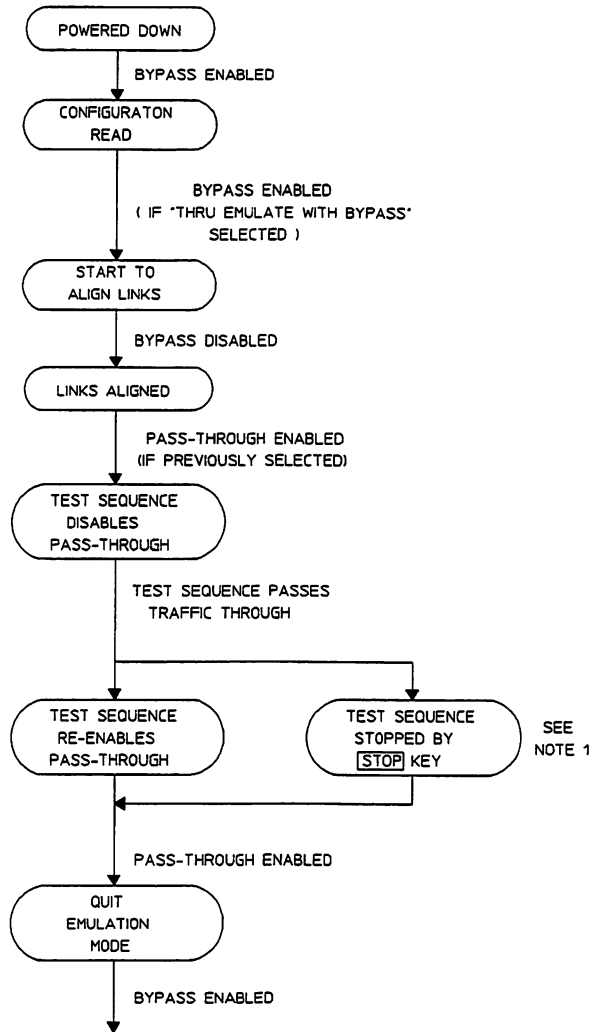
The facilities described below are used to preserve the active signaling path until the test sequence takes control.

It is assumed that **THRU EMULATE WITH BYPASS** mode has previously been selected in Configuration Mode. (This facility is available with the Revision E version of the HP 37915A 2.048 Mbit/s card.)

BYPASS Until you are ready to start the test, relay contacts connect Ports A and B bypassing the interface circuitry.

PASS-THROUGH When you align the links the prior to starting the test, the bypass is removed and a software controlled **PASS-THROUGH** is established.

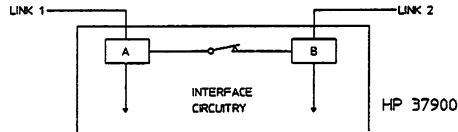
Control Sequence



Note 1: PASS-THROUGH is only re-enabled after use of the **Stop** key if the Pascal procedure `SetupStopISR` is called early in the test sequence.

BYPASS

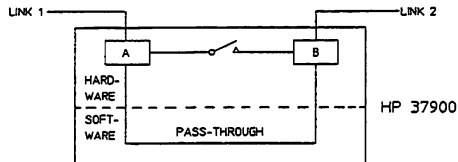
Until you are ready to set up the test, closed relay contacts bypass the interface circuitry. (This is also the condition when the HP 37900 is powered down.)



PASS-THROUGH

Refer to "Setting Up PASS-THROUGH" for setup instructions.

When you select Start links prior to starting the test, the bypass is removed. When the links are aligned the path is maintained by passing all traffic through the software.



Note

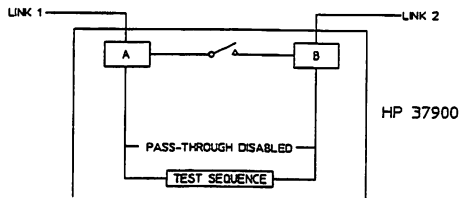


If the HP 37900D front panel Status LEDs change to red when you try to align the links, check carefully that the links are properly connected to the interface card.

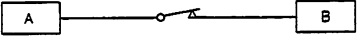
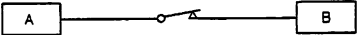
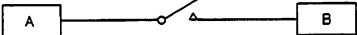
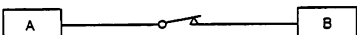
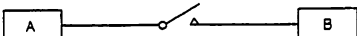
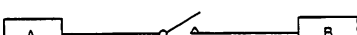
Test Sequence Control

- PASS-THROUGH is disabled.
- The selected messages are processed and passed on.
- All other traffic is passed on unaltered.

This is all controlled by the test sequence. For example, the PASS-THROUGH path is disabled (and re-enabled when the test is complete) by the Pascal CALL procedures `DisablePassthru` and `EnablePassthru`.



BYPASS

HP 37900 Powered down	
Powered up - before starting Configuration Mode	
BYPASS previously selected.	
A different mode previously selected.	
Quitting Configuration Mode and entering Emulation Mode	
BYPASS selected.	
A different mode selected.	
At Link Alignment prior to running Emulation test	
Quitting Emulation Mode after completion of test	Returns to Configuration Mode setting

Setting Up PASS-THROUGH

In the Emulation START LINKS menu, before starting the links, map together the pair of links you are using as a signal path. For example, select;

L - Link mapping facilities (No7 links)

to display the following screen.

LINK MAPPING FACILITIES	
<u>Link</u>	<u>Corresponding Link</u>
2	
1	
A - Add link mapping	
D - Delete link mapping	
P - enable/disable Pass-through mode	>> Disabled <<
R - enable/disable automatic Re-alignment	>> Disabled <<
? - help	
Q - Quit menu	
Enter menu option:	

Link Mapping

Use A to map links 1 and 2. You can only do this if slot 0 has been configured for THROUGH EMULATE or THROUGH EMULATE WITH BYPASS.

The upper part of the screen then shows the mapping.

LINK MAPPING FACILITIES

<u>Link</u>		<u>Corresponding Link</u>
2	--->	1
1	--->	2

Press P to enable PASS-THROUGH. While PASS-THROUGH is enabled, traffic passes unaltered in both directions through links 1 and 2 without being logged.

You can also use this menu to enable automatic re-alignment. This means;

- If an operational link goes down, the HP 37900 automatically attempts to re-align it.
- If a mapped link goes down, its corresponding link is silenced by sending SIOS. The HP 37900 then automatically attempts to re-align both links.



ISDN Information

The CONFIGURE ISDN LEVEL 3 LINKS Display and Menu

When a link has been assigned to ISDN test level 3, the level 2 functions can be provided automatically by the HP 3790. To make this possible, you have to set up various level 2 parameters.

Hewlett-Packard have provided a default configuration, this is referred to as the "HP-default configuration". You can create your own default configuration, which will always override the HP-default configuration. This is referred to as the "user-defined default configuration". Refer to "Default Configurations" which follows this menu description.

From the EMULATION MODE menu;

Press S to obtain the START LINKS screen

Press C

The upper part of the display shows for each link:

Side - User or Network.

TEI assignment - Automatic or non-automatic.

Automatic Negotiation - On or off.

To see the rest of the definable parameters, press P (described below).

CONFIGURE ISDN LEVEL 3 LINKS Menu

Side	TEI Assignment	Automatic Negotiation
8: User	Automatic	on
7: Network	Automatic	on
6: User	Non-automatic	on
5: Network	Non-automatic	on
4: User	Automatic	off
3: Network	Automatic	off
2: User	Non-automatic	off
1: Network	Non-automatic	off

S - switch Side
T - switch TEI assignment
N - switch automatic Negotiation
P - modify system Parameters

Q - Quit menu

Enter menu option:

C - Copy link configuration
R - Read configuration from disc
W - Write configuration to disc

Figure 8-1. The CONFIGURE ISDN LEVEL 3 LINKS Screen

S - switch Side

This decides whether the HP 37900 emulates the User side or the Network side.

T - switch TEI assignment

“Automatic” means the TEI is assigned by the Network side in response to a request.

“Non-automatic” means you have to assign a TEI.

TEI assignment is described under “The MODIFY SYSTEM PARAMETERS Screen”.

N - switch automatic Negotiation

On

The User Side and Network Side use the negotiation process defined in the CCITT Blue Book Q.921 Appendix IV Recommendations to agree on the system parameters which control level 2 communication.

Off

The system parameters are user defined. See under "The MODIFY SYSTEM PARAMETERS Screen" later in this chapter.

P - modify system Parameters

This displays the MODIFY SYSTEM PARAMETERS Menu, which enables you to set up the system parameters which control level 2 communication for each link. You are first asked for the link you want to change. The MODIFY SYSTEM PARAMETERS Menu is described after this menu description.

C - Copy link configuration

This copies all system parameters from one link to another (or to All links).

R - Read configuration from disc

Read an ISDN Level 3 configuration file from disc. You are asked for the filename. When you have entered the filename (and pressed) the current configuration is overwritten.

W - Write configuration to disc

Write the current ISDN level 3 configuration to a disc file. If you want this configuration to become the default configuration, use the filename EMUDF.CF (refer to "Default Configurations").

CONFIGURE ISDN LEVEL 3 LINKS Menu

The Filename

The filename can have up to seven alphanumeric characters (the .CF extension is added automatically). The filenames are CASE SENSITIVE. Do not have spaces between characters. Do not include any of the following characters:

* , : = ? []

Default Configurations

HP-default configuration

Hewlett-Packard have provided a default configuration, which is referred to as the "HP-default configuration". This configuration is assumed unless a "user-defined default configuration" has been created.

User-Defined Default Configuration

You can create your own default configuration, which will always override the HP-default configuration.

- To create a user-defined default configuration:
 1. Set up the configuration you want, using the CONFIGURE ISDN LEVEL 3 LINKS menu.
 2. Using the filename EMUDEF.CF, write your configuration to disc.
- To change the user-defined default configuration, repeat the above process overwriting EMUDEF.CF.
- To return to the HP-default configuration, just delete or rename EMUDEF.CF. To do this, exit from the STS software and use the Pascal Filer:
 - Remove to delete.
 - Change to rename.

The MODIFY SYSTEM PARAMETERS Screen

This screen is used to define user definable system parameters which control ISDN level 2 communication. Some set timers and counters, others define values for TEIs. Not all parameters are valid in every configuration, so the HP 37900 displays only those which are relevant for the current link configuration of Side, TEI Assignment and Automatic Negotiation. (See Figure 8-2).

The default values shown are from the CCITT Blue Book Q.921 Recommendations.

From the EMULATION MODE menu;

Press S to obtain the START LINKS screen

Press C to obtain the CONFIGURE ISDN LEVEL 3 screen

Press P

```

                                MODIFY SYSTEM PARAMETERS
Link: 1   Side: USER   TEI Assignment: AUTOMATIC   Auto. Negotiation: OFF
Link Idle Timer (T203): 100           Max. Information Field Length (N201)
                                         RX: 260           TX: 260
Retransmission Timer (T200): 10       Max. Frame Retransmissions (N200): 3
                                         Max. Outstanding I frames (k): 7
TEI ID Request Timer (T202): 20      Max. TEI Request Transmissions (N202): 3
-----
Enter the name of the system parameter to be modified, terminated by [RETURN].
(Press [RETURN] to quit.)

System parameter names: T203, N201-RX, N201-TX, T200, N200, k, T202, N202.

System parameter name:

```

Figure 8-2. The MODIFY SYSTEM PARAMETERS Screen

MODIFY SYSTEM PARAMETERS Menu

To retain the values currently defined, press only.

To change a parameter, type the parameter name as shown in the lower line of the display and press (for example T203).

Type the new value and press .

The new value is shown on the screen. When you have finished, press again to save the new values and return to the CONFIGURE ISDN LEVEL 3 screen.

During system parameter negotiation, three of the parameters are negotiated between the User and Network sides. The User side requests its values for:

Retransmission Timer (T200)

Maximum Information Field Length (N201 Rx and Tx)

Maximum Outstanding I Frames (k)

The Network side either agrees or asserts its own values. Parameters are therefore said to be desired by the User side and supported by the Network side.

Link Idle Timer (T203)

This sets the maximum time allowed with no frames being exchanged. It is specified in tenths of a second. The range is 0..9999. The default value is 100 (10 seconds).

Retransmission Timer (T200)

This is the waiting time between transmissions. It allows time for a response to arrive before retransmission. It is specified in tenths of a second. The range is 0..9999. The default value is 10 (1 second).

Max. Frame Retransmissions (N200)

This is the number of times a frame can be retransmitted. It is in the range 0..255 and the default is 3.

Max. Information Field Length (N201 Rx & Tx)

This is the maximum number of octets in an information field which is either received from the line (Rx) or transmitted, having been transferred down from layer 3 (Tx). Both Rx and Tx are in the range 0..270 and the default value is 260.

Max. Outstanding I Frames (k)

This is the number of sequentially numbered I frames that can be unacknowledged at one time. The range is 1..127 and the default value is 7.

XID Negotiate Timer (TM20)

This applies to links defined as User Side and with Automatic Negotiation on. It sets the time between XID request transmissions. It is specified in tenths of a second. The range is 0..9999. The default value is 25 (2.5 seconds).

Max. XID Transmissions (NM20)

This applies to links defined as User Side and with Automatic Negotiation on. It sets the maximum number of XID command frame retransmissions. It is in the range 0..255 and the default is 3.

Max. TEI Request Transmissions (N202)

This applies to links defined as User Side and with Automatic TEI Assignment. It is the maximum number of transmissions of a TEI Identity Request message. The range is 0..255 and the default is 3.

TEI ID Request Timer (T202)

This applies to links defined as User Side and with Automatic TEI Assignment. It sets the minimum time between transmissions of TEI Identity request messages. It is specified in tenths of a second. The range is 0..9999. The default value is 20 (2 seconds).

TEI ID Check Timer (T201)

This applies to links defined as Network Side and with Automatic TEI Assignment. It sets the minimum time between retransmissions of TEI identity check messages. It is specified in tenths of a second and can be in the range 0..9999. The default value is 10 (1 second).

TEI value (User side)

This allows you to define TEI values for links configured as:

- User Side with Non-Automatic TEI Assignment.
- Network Side and with either Automatic or Non-Automatic TEI Assignment.

“Non-Automatic TEI Assignment” and “Automatic TEI Assignment” explain how the HP 37900 uses the TEI values you assign.

Non-Automatic TEI Assignment

If the HP 37900 is emulating user equipment, it uses the TEI value you assign it to identify itself to the network equipment, and to recognize response messages from the network equipment.

In part A of Figure 8-3, you have assigned a TEI value of 1 to a HP 37900 link configured as User Side with Non-Automatic TEI assignment. The HP 37900 allows values in the range 0..255 (Q.921 specifies 0..63 for non-automatic User equipment). The default value is 0.

If the HP 37900 is emulating network equipment, it uses the TEI value you assign it to filter the user traffic so that it only processes messages from one user. In part B of Figure 8-3 you have assigned a TEI value of 2 to a HP 37900 link configured as Network Side with Non-Automatic TEI assignment. Only messages identified by a TEI value of 2 are logged by the HP 37900.

MODIFY SYSTEM PARAMETERS Menu

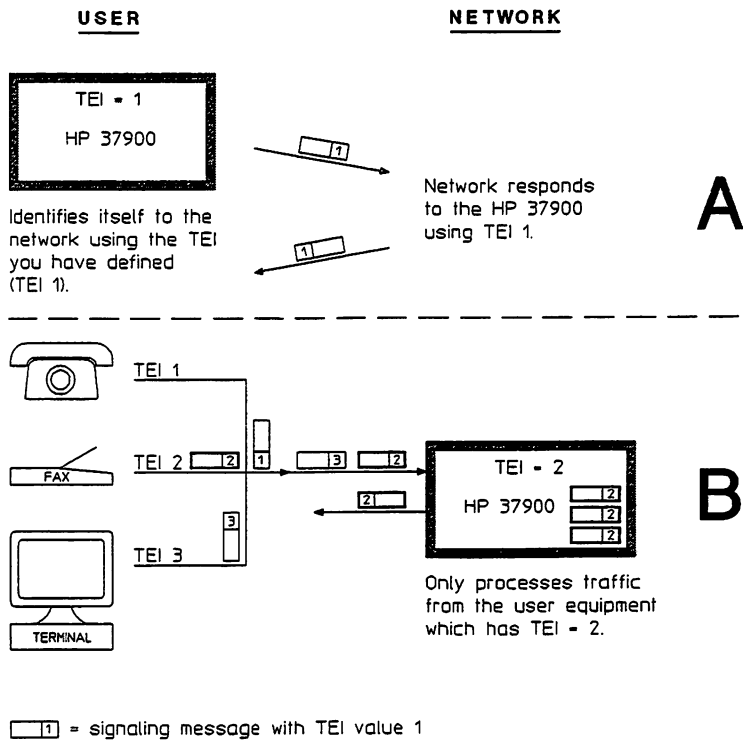


Figure 8-3. Non-Automatic TEI Assignment

MODIFY SYSTEM PARAMETERS Menu

Automatic TEI Assignment

If the HP 37900 is emulating user equipment, the TEI values are assigned automatically by the Network equipment. You cannot directly enter a value. This is shown in part A of Figure 8-4.

The HP 37900 allows values in the range 0..255 (Q.921 specifies 64 ... 126 for Automatic TEI Assignment User equipment). There are no default values.

If the HP 37900 is emulating network equipment, it assigns a TEI value to a user in response to a TEI Request.

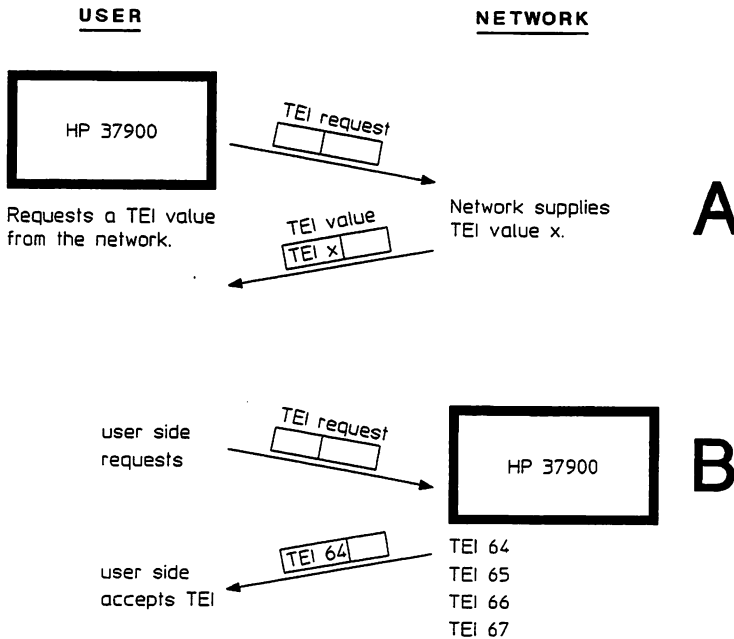


Figure 8-4. Automatic TEI Assignment

MODIFY SYSTEM PARAMETERS Menu

If the TEI value received by the user equipment is unusable (for example, outside the range 64 .. 126), the user equipment removes it and repeats the TEI Request. The HP 37900 responds by sending another value. In this configuration you can define up to four TEI values for this purpose.

In part B of Figure 8-4 you have assigned four TEI values (64, 65, 66 and 67) to a HP 37900 link configured as Network Side with Automatic TEI assignment. In response to a user TEI request, the HP 37900 assigns its first value to the user equipment.

When you select TEIs from the menu, you are asked for the first value.

Type the value and press **[Return]**

You are again asked for a value, this is repeated until either;

- You press **[Return]** only, without entering a value. Only the values you have entered are saved, all previously entered values are deleted. This also applies if you press **[Return]** only at the first prompt.
- You enter four values. When you press **[Enter]** for the fourth value, all values are saved and displayed.

For example, if you currently have four TEI values defined and choose to modify them, you might respond to the prompts as follows:

TEI value: 126 TEI value: 64 TEI value: **[RETURN]**

Now only two TEI values are defined.

Press **[RETURN]** at the System parameter name: prompt to return to the CONFIGURE ISDN LEVEL 3 LINKS menu.

Initialised and Established Operation for ISDN Links

You can set ISDN level 3 links to either Initialised or Established mode by typing 0 from the START LINKS menu. This determines if you can send level 2/3 establish/release primitives from test sequences.

If set to Initialised the HP 37900 starts the links, but to reach the MFE state you must send test sequence messages. This allows you to test both establish and release procedures on the link by including level 2 establish/release primitives in your test sequence.

If set to Established, the HP 37900 automatically sends the level 2/3 primitives needed to reach the Multiple Frame Established (MFE) state on the link. In this state, the acknowledged transfer of messages is possible.

The default setting is Initialised. The selected mode applies to all links.

ISDN Level 3 Established Operation

When in Established mode, the Start Links process gets the link into MFE state before test sequences are run. I and UI frames can be sent only when this state has been reached and the links are operational.

Before starting the links you must configure them for ISDN level 3 testing.

If no primitives are received from level 2 before timeout, the HP 37900 displays the message ESTABLISHMENT FAILED: SLP has not responded and the link becomes unoperational.

When configured as User Side, the HP 37900 automatically sends a DL_ESTABLISH_REQUEST to level 2. On receipt of a DL_ESTABLISH_CONFIRM or a DL_ESTABLISH_INDICATION from the remote level 2, the link becomes operational.

If neither of these is received, or a DL_RELEASE_INDICATION/CONFIRM is received, the link becomes unoperational.

When configured as the Network Side, the HP 37900 waits for a DL_ESTABLISH_INDICATION/CONFIRM which indicates that the link is operational. Again, if neither of these is received or a DL_RELEASE_INDICATION/CONFIRM, is received, the link becomes unoperational.

When the link has been started successfully and the test sequence is running, only DL_UNIT_DATA_REQUEST/INDICATION messages can be sent or received.

ISDN Level 3 Initialised Operation

In this mode you can send and receive all level 2/3 primitives from test sequences.

When you start the links the HP 37900 sets automatic level 2 into TEI unassigned or TEI assigned state, depending on whether the link is configured for automatic or non-automatic TEI assignment. The HP 37900 does not wait for automatic level 2 messages, so you must be ready to execute sequences immediately.

In Initialised operation you have control over the state of automatic layer 2. For example, before sending I frames, the test sequence must send a DL_ESTABLISH_REQUEST primitive to get the link into MFE state. It must then wait for a DL_ESTABLISH_CONFIRM from level 2, which shows that level 2 can do acknowledged transfer. Finally, it could send a DL_RELEASE_REQUEST to end the MFE state.

Primitives received are logged and matched against INPUT statements.

Messages for use in Established/Initialised Operation

Test Sequence Messages Reserved for Sending Primitives in Initialised Operation

When in Initialised operation, you must use reserved message names in test sequences to send and receive level 2/3 primitives. These messages cannot be declared in the message catalog but are stored internally and can be accessed from test sequences. There are no reserved messages for sending I and UI frames, which are sent in data messages (see below).

Reserved Messages for OUTPUT Statements

EST_REQ_n OUTPUTS a DL_ESTABLISH_REQUEST primitive to the automatic level 2 of link n, where n is in the range 1..8 (or X to transmit it on link 1).

REL_REQ_n OUTPUTS a DL_RELEASE_REQUEST primitive to the automatic level 2 of link n, where n is in the range 1..8 (or X to transmit it on link 1).

Reserved Messages for INPUT Statements

EST_CON_n INPUTS a DL_ESTABLISH_CONFIRM primitive from the automatic level 2 of link n, where n is in the range 1..8 or X for any link.

EST_IND_n INPUTS a DL_ESTABLISH_INDICATION primitive from the automatic level 2 of link n, where n is in the range 1..8 or X for any link.

REL_CON_n INPUTS a DL_RELEASE_CONFIRM primitive from the automatic level 2 of link n, where n is in the range 1..8 or X for any link.

REL_IND_n INPUTS a DL_RELEASE_INDICATION primitive from the automatic level 2 of link n, where n is in the range 1..8 or X for any link.

The above primitives are recorded in the test log.

Data Messages

Data messages send I and UI frames in Established or Initialised operation. There are no reserved names for these primitive messages so you must name and declare them in the message catalog. You need only store the level 3 contents (data part) of the frame in the message catalog.

Use OUTPUT and INPUT statements to send and receive messages. To send data in I frames, use the CALL procedure SetISDNackOp which sets the link to acknowledged operation. To send data in UI frames, use the CALL procedure SetISDNUnAckOp which sets the link to unacknowledged operation. For example;

```
CALL 'CALL_LIB_SetISDNackOp';           {send data as I frames}
OUTPUT 'Starting Acknowledged operation ...';
OUTPUT MESSAGENAME;
```

This sends the contents of MESSAGENAME as the data part of an I frame.

Note



OUTPUT frames are discarded without warning if the automatic level 2 is not in the MFE state.

INPUT frames are logged as I and UI frames, but the type of frame in the test sequence cannot be specified.



X.25 Information

The CONFIGURE X25 LEVEL 3 LINKS Display and Menu

When a link has been assigned to X.25 test level 3, the level 2 functions can be provided automatically by the HP 37900. To make this possible, you have to set up various level 2 parameters.

Hewlett-Packard have provided a default configuration, this is referred to as the "HP-default configuration". You can create your own default configuration, which will always override the HP-default configuration. This is referred to as the "user-defined default configuration". Refer to "Default Configurations" which follows this menu description.

From the EMULATION MODE menu;

Press S to obtain the START LINKS screen

Press X

The upper part of the display shows whether each available link is configured for DTE or DCE.

To see the rest of the definable parameters, press P (described below).

CONFIGURE X25 LEVEL 3 LINKS Menu

```
                                CONFIGURE X25 LEVEL 3 LINKS

Side
----
8: DTE
7: DCE
6: DTE
5: DCE
4: DTE
3: DCE
2: DTE
1: DCE

-----
S - switch Side                C - Copy link configuration
P - modify system Parameters   R - Read configuration from disc
                               W - Write configuration to disc

Q - Quit menu

Enter menu option:
```

Figure 9-1. The CONFIGURE X25 LEVEL 3 LINKS Screen

S - switch Side

This decides whether the HP 37900 emulates the DTE or DCE side.

P - modify system Parameters

This displays the MODIFY SYSTEM PARAMETERS Menu, which enables you to set up the system parameters which control level 2 communication for each link. You are first asked for the link you want to change. The MODIFY SYSTEM PARAMETERS Menu is described after this menu description.

C - Copy link configuration

This copies all system parameters from one link to another (or to All links).

R - Read configuration from disc

Read an X.25 Level 3 configuration file from disc. You are asked for the filename. When you have entered the filename (and pressed **Return**) the current configuration is overwritten.

W - Write configuration to disc

Write the current X.25 level 3 configuration to a disc file. If you want this configuration to become the default configuration, use the filename EMUDX.CF (refer to "Default Configurations").

The Filename

The filename can have up to seven alphanumeric characters (the .CF extension is added automatically). The filenames are CASE SENSITIVE. Do not have spaces between characters. Do not include any of the following characters:

* , : = ? []

CONFIGURE X25 LEVEL 3 LINKS Menu

Default Configurations

HP-default configuration

Hewlett-Packard have provided a default configuration, which is referred to as the "HP-default configuration". This configuration is assumed unless a "user-defined default configuration" has been created.

User-Defined Default Configuration

You can create your own default configuration, which will always override the HP-default configuration.

- To create a user-defined default configuration:
 1. Set up the configuration you want, using the CONFIGURE X25 LEVEL 3 LINKS menu.
 2. Using the filename EMUDX.CF, write your configuration to disc.
- To change the user-defined default configuration, repeat the above process overwriting EMUDX.CF.
- To return to the HP-default configuration, just delete or rename EMUDX.CF. To do this, exit from the STS software and use the Pascal Filer:
 - Remove to delete.
 - Change to rename.

The MODIFY SYSTEM PARAMETERS Screen

This screen is used to define user definable system parameters which control X.25 level 2 communication. Some set timers and counters, others define values for TEIs. Not all parameters are valid in every configuration, so the HP 37900 displays only those which are relevant for the current link configuration of Side, TEI Assignment and Automatic Negotiation. (See Figure 9-2).

The default values shown are from the CCITT Blue Book Q.921 Recommendations.

From the EMULATION MODE menu;

Press **S** to obtain the **START LINKS** screen

Press **X** to obtain the **CONFIGURE X25 LEVEL 3** screen

Press **P** Select the link you want to modify.

MODIFY SYSTEM PARAMETERS

Link: 1 Side: DTE

Retransmission Timer (T1): 10	Max. Information Field Length (N1): 260
Link Idle Timer (T4): 100	Max. Frame Retransmissions (N2): 3
	Max. Outstanding I frames (k): 7

Enter the name of the system parameter to be modified, terminated by [RETURN].
(Press [RETURN] to quit.)

System parameter names: T1, N1, N2, k, T4.

System parameter name:

Figure 9-2. The MODIFY SYSTEM PARAMETERS Screen

MODIFY SYSTEM PARAMETERS Menu

To retain the values currently defined, press only.

To change a parameter, type the parameter name as shown in the lower line of the display and press (for example T4).

Type the new value and press .

The new value is shown on the screen. When you have finished, press again to save the new values and return to the CONFIGURE X25 LEVEL 3 screen.

Retransmission Timer (T1)

This is the waiting time between transmissions. It allows time for a response to arrive before retransmission. It is specified in tenths of a second. The range is 0..9999. The default value is 10 (1 second).

Link Idle Timer (T4)

This sets the maximum time allowed with no frames being exchanged. It is specified in tenths of a second. The range is 0..9999. The default value is 100 (10 seconds).

Max. Information Field Length (N1)

This is the maximum number of octets in an information field. The range is 0..270 and the default value is 260.

Max. Frame Retransmissions (N2)

This is the number of times a frame can be retransmitted. It is in the range 0..255 and the default is 3.

Max. Outstanding I Frames (k)

This is the number of sequentially numbered I frames that can be unacknowledged at one time. The range is 1..7 for basic (modulo 8) operation, or 1..127 for extended (modulo 128) operation. The default value is 7 for both basic and extended operation.

Initialised and Established Operation for X.25 Links

You can set X.25 level 3 links to either Initialised or Established mode by typing 0 from the START LINKS menu. This determines if you can send level 2/3 establish/release primitives from test sequences.

If set to Initialised the HP 37900 starts the links, but to reach the information transfer phase you must send test sequence messages. This allows you to test both establish and release procedures on the link by including level 2 establish/release primitives in your test sequence.

If set to Established, the HP 37900 automatically sends the level 2/3 primitives needed to reach the information transfer phase on the link. In this phase, the acknowledged transfer of messages is possible.

The default setting is Initialised. The selected mode applies to all links.

X.25 Level 3 Initialised Operation

In this mode you can send and receive all level 2/3 primitives from test sequences.

When you start the links the HP 37900 sets automatic level 2 into a disconnected phase.

In Initialised operation you have control over the state of automatic layer 2.

For example, before sending I frames, the test sequence must send a DL_ESTABLISH_REQUEST primitive to get the link into the information transfer phase. It must then wait for a DL_ESTABLISH_CONFIRM from level 2, which shows that level 2 can do acknowledged transfer. Finally, it could send a DL_RELEASE_REQUEST to end the information transfer phase.

Primitives received are logged and matched against INPUT statements.

X.25 Level 3 Established Operation

When in Established mode, the Start Links process gets the link into the information transfer phase before test sequences are run. I frames can be sent only when this state has been reached and the links are operational.

Before starting the links you must configure them for X.25 level 3 testing.

MODIFY SYSTEM PARAMETERS Menu

If no primitives are received from level 2 before timeout, the HP 37900 displays the message **ESTABLISHMENT FAILED: SLP has not responded** and the link becomes unoperational.

When configured as DTE, the HP 37900 automatically sends a **DL_ESTABLISH_REQUEST** to level 2. On receipt of a **DL_ESTABLISH_CONFIRM** or a **DL_ESTABLISH_INDICATION** from the remote level 2, the link becomes operational.

If neither of these is received, or a **DL_RELEASE_INDICATION/CONFIRM** is received, the link becomes unoperational.

When configured as the DCE, the HP 37900 waits for a **DL_ESTABLISH_INDICATION/CONFIRM** which indicates that the link is operational. Again, if neither of these is received or a **DL_RELEASE_INDICATION/CONFIRM**, is received, the link becomes unoperational.

Messages for use in Established/Initialised Operation

Test Sequence Messages Reserved for Sending Primitives in Initialised Operation

When in Initialised operation, you must use reserved message names in test sequences to send and receive level 2/3 primitives. These messages cannot be declared in the message catalog but are stored internally and can be accessed from test sequences. There are no reserved messages for sending I frames, which are sent in data messages (see below).

Reserved Messages for OUTPUT Statements

EST_REQ_n OUTPUTs a DL_ESTABLISH_REQUEST primitive to the automatic level 2 of link n, where n is in the range 1..8 (or X to transmit it on link 1).

REL_REQ_n OUTPUTs a DL_RELEASE_REQUEST primitive to the automatic level 2 of link n, where n is in the range 1..8 (or X to transmit it on link 1).

Reserved Messages for INPUT Statements

EST_CON_n INPUTs a DL_ESTABLISH_CONFIRM primitive from the automatic level 2 of link n, where n is in the range 1..8 or X for any link.

EST_IND_n INPUTs a DL_ESTABLISH_INDICATION primitive from the automatic level 2 of link n, where n is in the range 1..8 or X for any link.

REL_CON_n INPUTs a DL_RELEASE_CONFIRM primitive from the automatic level 2 of link n, where n is in the range 1..8 or X for any link.

REL_IND_n INPUTs a DL_RELEASE_INDICATION primitive from the automatic level 2 of link n, where n is in the range 1..8 or X for any link.

The above primitives are recorded in the test log.

MODIFY SYSTEM PARAMETERS Menu

Data Messages

Data messages send I frames in Established or Initialised operation. There are no reserved names for these primitive messages so you must name and declare them in the message catalog. You need only store the level 3 contents of the frame in the message catalog.

Use OUTPUT and INPUT statements to send and receive messages. To send data in I frames, use the CALL procedure SetX25AckOp which sets the link to acknowledged operation. For example;

```
CALL 'CALL_LIB_SetX25AckOp';           {send data as I frames}
OUTPUT 'Starting Acknowledged operation ...';
OUTPUT MESSAGENAME;
```

This sends the contents of MESSAGENAME as the data part of an I frame. A message can be a maximum of 273 octets in length.

Index

A

Alignment, 5-10
Alternative Decodes, 6-4
Assign Personality, 5-1
automatic Negotiation, 8-3
auto repeat, 5-11

B

BYPASS, 7-1

C

Cabling the HP 37915A, 2-5
Catalog, 4-1
Catalog,message, 4-1
Catalog, Message, 1-9
Clear SDL from memory, 5-8
Clock, external, 2-8
COMPILED SDL Display and Menu,
5-7
Configuration, 2-4

D

Decode
Field Decode Screen, 6-3
Message Decode Screen, 6-2
Decode a Message, 6-1
displays
COMPILED SDL, 5-7
EDIT MESSAGE, 4-5

E

Edit message catalog, 4-4
EDIT MESSAGE Display and Menu,
4-5
EMULATE, 2-1
EMULATION MODE Menu, 4-3
Emulation Testing, Overview, 1-1
END EMULATE, 2-1
established Operation, 5-11
External Clock, 2-8
External Triggering, 2-8

F

Field Decode Screen, 6-3

I

IAMCAT, 5-15
IAMDEMO, 5-15
I Frames (k), 8-6, 9-6
initialised Operation, 5-11
Internal catalog, 4-2
Internal Message Catalog, 1-9, 4-1

L

Link Idle Timer (T203), 8-6
Link Idle Timer (T4), 9-6
Link mapping, 5-12
Link Number, Emulation, 2-3
Link Status, 5-10
Locking SDL Test Sequences, 5-6

M

menus

COMPILED SDL, 5-7

Configuration, 2-4

EDIT MESSAGE, 4-5

EMULATION MODE, 4-3

Message Catalog, 1-9, 4-1

Message catalog edit functions, 4-4

Message Decode Screen, 6-2

Message (Emulation), 4-1

MODIFY SYSTEM PARAMETERS,
8-5, 9-5

N

N1, 9-6

N2, 9-6

N200, 8-6

N201, 8-6

N202, 8-7

Negotiation, 8-3

NM20, 8-7

P

PASSTHROUGH, 7-1

Personality Assignment, Emulation, 5-1

R

Read Compiled SDL from disc, 5-7

Retransmission Timer (T1), 9-6

Retransmission Timer (T200), 8-6

S

Saving SDL Test Sequences, 5-6

Sequence, 1-8

Side, 8-2, 9-2

SYSTEM PARAMETERS, 8-5, 9-5

T

T1, 9-6

T200, 8-6

T201, 8-7

T202, 8-7

T203, 8-6

T4, 9-6

TEI, 8-8

TEI assignment, 8-2

Terminal Endpoint Identifier (TEI)
Assignment, 8-8

test log, 6-1

Test Results (Test Log), 6-1

Test Sequence, 1-8

THROUGH EMULATE, 2-2

TM20, 8-7

Trigger, external, 2-8

TTL trigger source, 2-8

V

View SDL Statistics, 5-8

W

Write Compiled SDL to disc, 5-7

Write Compiled SDL to disc as a locked
file, 5-8

X

X Alternative Decodes, 6-4

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