PT500 USER MANUAL

IDACOM
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HEWLETT PACKARD

IDACOM
PROTOCOL TESTER
PT500

PT500 User Manual
PT500 User Manual

January 1992

Operating System 2.0
Home Menu 2.2
FCC CLASS A COMPLIANCE

Your unit might or might not be compliant to FCC Part 15 Class A. This is indicated on the serial number plate on the back of the unit; if compliant, the following applies:

⚠️ NOTE
This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.

⚠️ NOTE
All interconnecting cables must be shielded with a shielding effectiveness according to FCC Docket 20780 in order to be compliant to FCC Part 15 Class A.
This manual is intended to provide a quick and easy-to-use reference guide to the basic operation of the PT500 Protocol Tester.

This manual is not intended to provide information concerning protocol specifications, nor is it intended as a programmer's manual. Refer to the protocol specific Programmer's Manual for programming information.

The information contained in this document is subject to change without notice.

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IDACOM
A division of Hewlett-Packard

4211-95 Street
Edmonton, Alberta
Canada  T6E 5R6
Phone: (403) 462-4545
Fax: (403) 462-4869
TABLE OF CONTENTS

PREFACE

1 INTRODUCTION ................................................. 1–1
  1.1 Front and Back Views .................................... 1–2
  1.2 Configurations ............................................ 1–3
    D-Channel ............................................... 1–4
    WAN .................................................... 1–5
    WAN/WAN ............................................... 1–6
    PRA ................................................... 1–7
    PRA/WAN ............................................... 1–9
    BRA .................................................. 1–11
    BRA/WAN ............................................... 1–12
    BRA/BRA ............................................... 1–13
    PRA/BRA/WAN ......................................... 1–14
  1.3 System Architecture ..................................... 1–16
  1.4 Application Processors .................................. 1–18

2 GETTING STARTED ............................................. 2–1
  2.1 Setup Instructions ...................................... 2–2
  2.2 Power Up and Self Test .................................. 2–3
  2.3 Loading System Software ............................... 2–4
  2.4 General Operating Instructions ........................ 2–6
    Menu Mode ............................................ 2–6
    Command Mode ........................................ 2–10
    Remote Mode ......................................... 2–10
    Program Mode ........................................ 2–11
  2.5 Home Processor Topics .................................. 2–11
# TABLE OF CONTENTS [continued]

## 3 TESTING CONFIGURATIONS ............................................. 3–1

### 3.1 Monitoring at a WAN Interface (Passive Testing) ............... 3–2
- Loading an Application ........................................... 3–3

### 3.2 Emulating at a WAN Interface (Interactive Testing) ............ 3–4
- Loading an Application ........................................... 3–5

### 3.3 Monitoring at the Basic Rate Access .......................... 3–6
- Configuring the Interface ......................................... 3–8
- Loading an Application ........................................... 3–9

### 3.4 Emulating at the Basic Rate Access (Interactive Testing) ..... 3–10
- Setting the Termination Impedance ................................ 3–10
- Configuring the Interface ......................................... 3–12
- Loading an Application ........................................... 3–14

### 3.5 Monitoring at the Primary Rate Access ....................... 3–15
- T1 – Using Bantam Jacks ........................................... 3–15
- T1 – Using RJ-48C Connectors .................................... 3–16
- CEPT – Using DB-9 Connectors .................................... 3–17
- System Configuration .................................................. 3–18
- Channel Setup ......................................................... 3–22
- Loading an Application ........................................... 3–23
- Monitoring Layer 1 Errors ........................................... 3–25

### 3.6 Emulating at the Primary Rate Access ....................... 3–27
- T1 – Using Bantam Jacks ........................................... 3–27
- T1 – Using RJ-48C Connectors .................................... 3–28
- CEPT – Using DB-9 Connectors .................................... 3–29
- System Configuration .................................................. 3–30
- Ports Setup ............................................................ 3–34
- Channel Setup ......................................................... 3–38
- Loading an Application ........................................... 3–40
- Simulating Layer 1 Errors .......................................... 3–41
- Tone Generation ....................................................... 3–43

### 3.7 Drop & Insert at the Primary Rate Access .................... 3–44
- System Configuration .................................................. 3–44
- Ports Setup ............................................................ 3–48
# TABLE OF CONTENTS [continued]

## 4 ISDN BRA MONITOR

<table>
<thead>
<tr>
<th>Section</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>4.1 ISDN D-Channel Monitor</td>
<td>4-1</td>
</tr>
<tr>
<td>Loading the ISDN D-Channel Monitor Program</td>
<td>4-2</td>
</tr>
<tr>
<td>Configuration</td>
<td>4-2</td>
</tr>
<tr>
<td>ISDN Display Formats</td>
<td>4-4</td>
</tr>
<tr>
<td>Selecting a Message Set</td>
<td>4-5</td>
</tr>
<tr>
<td>Loading a Message Set</td>
<td>4-8</td>
</tr>
<tr>
<td>Saving a Message Set</td>
<td>4-10</td>
</tr>
<tr>
<td>ISDN Filters</td>
<td>4-10</td>
</tr>
<tr>
<td>ISDN Triggers</td>
<td>4-11</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Section</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>4.2 B-Channel Monitor</td>
<td>4-17</td>
</tr>
<tr>
<td>Voice</td>
<td>4-17</td>
</tr>
<tr>
<td>Loading an Application</td>
<td>4-18</td>
</tr>
</tbody>
</table>

## 5 ISDN BRA EMULATION

<table>
<thead>
<tr>
<th>Section</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>5.1 ISDN D-Channel Emulation</td>
<td>5-1</td>
</tr>
<tr>
<td>Loading the ISDN D-Channel Emulation Program</td>
<td>5-2</td>
</tr>
<tr>
<td>Configuration</td>
<td>5-2</td>
</tr>
<tr>
<td>Running the Emulation Program</td>
<td>5-4</td>
</tr>
<tr>
<td>Activating the S/T Bus</td>
<td>5-9</td>
</tr>
<tr>
<td>Defining Layer 2 Frames</td>
<td>5-10</td>
</tr>
<tr>
<td>Sending Layer 2 Frames</td>
<td>5-11</td>
</tr>
<tr>
<td>Selecting Layer 3 Messages</td>
<td>5-13</td>
</tr>
<tr>
<td>Sending Layer 3 Messages</td>
<td>5-14</td>
</tr>
<tr>
<td>Selecting a Link</td>
<td>5-16</td>
</tr>
<tr>
<td>Requesting a TEI (User Only)</td>
<td>5-17</td>
</tr>
<tr>
<td>Establishing a Link</td>
<td>5-18</td>
</tr>
<tr>
<td>Sending Frames/Messages</td>
<td>5-18</td>
</tr>
<tr>
<td>Setting a Link to Busy</td>
<td>5-19</td>
</tr>
<tr>
<td>Disconnecting a Link</td>
<td>5-20</td>
</tr>
<tr>
<td>X.25 PLP Emulation</td>
<td>5-21</td>
</tr>
<tr>
<td>Sending X.25 Packets</td>
<td>5-22</td>
</tr>
<tr>
<td>The Message Builder</td>
<td>5-30</td>
</tr>
<tr>
<td>Creating Messages (Automatic)</td>
<td>5-33</td>
</tr>
<tr>
<td>Creating Messages (Manual)</td>
<td>5-35</td>
</tr>
<tr>
<td>Displaying the Message</td>
<td>5-41</td>
</tr>
<tr>
<td>Adding a Message to the Message Pool</td>
<td>5-44</td>
</tr>
<tr>
<td>Editing Messages</td>
<td>5-46</td>
</tr>
</tbody>
</table>
TABLE OF CONTENTS [continued]

5 ISDN BRA EMULATION [continued]

<table>
<thead>
<tr>
<th>Section</th>
<th>Title</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>5.2</td>
<td>B-Channel Emulation</td>
<td>5-50</td>
</tr>
<tr>
<td></td>
<td>Voice</td>
<td>5-50</td>
</tr>
<tr>
<td></td>
<td>External</td>
<td>5-50</td>
</tr>
<tr>
<td></td>
<td>Loading an Application</td>
<td>5-51</td>
</tr>
<tr>
<td></td>
<td>Selfloop</td>
<td>5-52</td>
</tr>
<tr>
<td></td>
<td>Crossloop</td>
<td>5-52</td>
</tr>
</tbody>
</table>

6 ISDN PRA MONITOR

<table>
<thead>
<tr>
<th>Section</th>
<th>Title</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>6.1</td>
<td>Loading the ISDN D-Channel Monitor Program</td>
<td>6-2</td>
</tr>
<tr>
<td>6.2</td>
<td>Configuration</td>
<td>6-4</td>
</tr>
<tr>
<td>6.3</td>
<td>ISDN Display Formats</td>
<td>6-5</td>
</tr>
<tr>
<td>6.4</td>
<td>Selecting a Message Set</td>
<td>6-8</td>
</tr>
<tr>
<td>6.5</td>
<td>Loading a Message Set</td>
<td>6-10</td>
</tr>
<tr>
<td>6.6</td>
<td>Saving a Message Set</td>
<td>6-10</td>
</tr>
<tr>
<td>6.7</td>
<td>ISDN Filters</td>
<td>6-11</td>
</tr>
<tr>
<td>6.8</td>
<td>ISDN Triggers</td>
<td>6-15</td>
</tr>
<tr>
<td></td>
<td>Setting Conditions</td>
<td>6-16</td>
</tr>
<tr>
<td></td>
<td>Setting Actions</td>
<td>6-17</td>
</tr>
</tbody>
</table>

7 ISDN PRA EMULATION

<table>
<thead>
<tr>
<th>Section</th>
<th>Title</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>7.1</td>
<td>Loading the ISDN D-Channel Emulation Program</td>
<td>7-2</td>
</tr>
<tr>
<td>7.2</td>
<td>Configuration</td>
<td>7-4</td>
</tr>
<tr>
<td>7.3</td>
<td>Running the Emulation Program</td>
<td>7-7</td>
</tr>
<tr>
<td>7.4</td>
<td>Layer 2 Frames</td>
<td>7-8</td>
</tr>
<tr>
<td></td>
<td>Defining Frames</td>
<td>7-8</td>
</tr>
<tr>
<td></td>
<td>Sending Frames</td>
<td>7-10</td>
</tr>
</tbody>
</table>
# TABLE OF CONTENTS [continued]

## 7 ISDN PRA EMULATION [continued]

<table>
<thead>
<tr>
<th>Section</th>
<th>Description</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>7.5</td>
<td>Layer 3 Messages</td>
<td>7-11</td>
</tr>
<tr>
<td></td>
<td>Selecting Messages</td>
<td>7-11</td>
</tr>
<tr>
<td></td>
<td>Sending Messages</td>
<td>7-13</td>
</tr>
<tr>
<td>7.6</td>
<td>Services</td>
<td>7-14</td>
</tr>
<tr>
<td></td>
<td>Selecting a Link</td>
<td>7-14</td>
</tr>
<tr>
<td></td>
<td>Establishing a Link</td>
<td>7-15</td>
</tr>
<tr>
<td></td>
<td>Sending Frames/Messages</td>
<td>7-15</td>
</tr>
<tr>
<td></td>
<td>Setting a Link to Busy</td>
<td>7-17</td>
</tr>
<tr>
<td></td>
<td>Disconnecting a Link</td>
<td>7-18</td>
</tr>
<tr>
<td>7.7</td>
<td>The Message Builder</td>
<td>7-19</td>
</tr>
<tr>
<td></td>
<td>Creating Messages (Automatic)</td>
<td>7-21</td>
</tr>
<tr>
<td></td>
<td>Creating Messages (Manual)</td>
<td>7-27</td>
</tr>
<tr>
<td></td>
<td>Displaying the Message</td>
<td>7-31</td>
</tr>
<tr>
<td></td>
<td>Adding a Message to the Message Pool</td>
<td>7-32</td>
</tr>
<tr>
<td></td>
<td>Editing Messages</td>
<td>7-34</td>
</tr>
</tbody>
</table>

## 8 ISDN PRA DROP & INSERT | 8-1 |

<table>
<thead>
<tr>
<th>Section</th>
<th>Description</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>8.1</td>
<td>Monitor Submode</td>
<td>8-2</td>
</tr>
<tr>
<td></td>
<td>Channel Setup</td>
<td>8-2</td>
</tr>
<tr>
<td>8.2</td>
<td>Emulation Submode</td>
<td>8-4</td>
</tr>
<tr>
<td></td>
<td>Channel Setup</td>
<td>8-4</td>
</tr>
<tr>
<td>8.3</td>
<td>Drop &amp; Insert Submode</td>
<td>8-6</td>
</tr>
</tbody>
</table>

## 9 UNIVERSAL MONITOR | 9-1 |

<table>
<thead>
<tr>
<th>Section</th>
<th>Description</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>9.1</td>
<td>Loading the Universal Monitor Program</td>
<td>9-2</td>
</tr>
<tr>
<td>9.2</td>
<td>Configuration</td>
<td>9-3</td>
</tr>
<tr>
<td></td>
<td>Saving Menu Configurations</td>
<td>9-8</td>
</tr>
<tr>
<td></td>
<td>Loading Menu Configurations</td>
<td>9-8</td>
</tr>
<tr>
<td>9.3</td>
<td>Monitoring Live Data</td>
<td>9-9</td>
</tr>
</tbody>
</table>
## TABLE OF CONTENTS [continued]

### 9 UNIVERSAL MONITOR [continued]

<table>
<thead>
<tr>
<th>Section</th>
<th>Page(s)</th>
</tr>
</thead>
<tbody>
<tr>
<td>9.4 Autoconfiguration</td>
<td>9-10</td>
</tr>
<tr>
<td>9.5 Monitoring ASYNC Data</td>
<td>9-12</td>
</tr>
<tr>
<td>9.6 Universal Display Formats</td>
<td>9-14</td>
</tr>
<tr>
<td>9.7 Universal Filters</td>
<td>9-15</td>
</tr>
<tr>
<td>9.8 Universal Triggers</td>
<td>9-15</td>
</tr>
</tbody>
</table>

### 10 UNIVERSAL SIMULATION       10-1

<table>
<thead>
<tr>
<th>Section</th>
<th>Page(s)</th>
</tr>
</thead>
<tbody>
<tr>
<td>10.1 Loading the Universal Simulation Program</td>
<td>10-2</td>
</tr>
<tr>
<td>10.2 Configuration</td>
<td>10-3</td>
</tr>
<tr>
<td>Saving Menu Configurations</td>
<td>10-8</td>
</tr>
<tr>
<td>Loading Menu Configurations</td>
<td>10-9</td>
</tr>
<tr>
<td>10.3 Receiving Data</td>
<td>10-10</td>
</tr>
<tr>
<td>10.4 ASYNC Configuration</td>
<td>10-11</td>
</tr>
<tr>
<td>10.5 Sending Strings</td>
<td>10-13</td>
</tr>
</tbody>
</table>

### 11 X.25 MONITOR                  11-1

<table>
<thead>
<tr>
<th>Section</th>
<th>Page(s)</th>
</tr>
</thead>
<tbody>
<tr>
<td>11.1 Loading the X.25 Monitor Program</td>
<td>11-2</td>
</tr>
<tr>
<td>11.2 Configuration</td>
<td>11-4</td>
</tr>
<tr>
<td>11.3 X.25 Display Formats</td>
<td>11-6</td>
</tr>
<tr>
<td>11.4 X.25 Filters</td>
<td>11-8</td>
</tr>
<tr>
<td>11.5 X.25 Triggers</td>
<td>11-11</td>
</tr>
<tr>
<td>Chapter</td>
<td>Section</td>
</tr>
<tr>
<td>---------</td>
<td>---------</td>
</tr>
<tr>
<td>12</td>
<td>X.25 EMULATION</td>
</tr>
<tr>
<td></td>
<td>Loading the X.25 Emulation Program</td>
</tr>
<tr>
<td></td>
<td>12.1 Configuration</td>
</tr>
<tr>
<td></td>
<td>Setup</td>
</tr>
<tr>
<td></td>
<td>Frame Layer</td>
</tr>
<tr>
<td></td>
<td>Packet Layer</td>
</tr>
<tr>
<td></td>
<td>Facilities</td>
</tr>
<tr>
<td></td>
<td>LCN Setup</td>
</tr>
<tr>
<td></td>
<td>12.3 Sending X.25 Frames and Packets</td>
</tr>
<tr>
<td></td>
<td>12.4 Establishing a Link</td>
</tr>
<tr>
<td></td>
<td>12.5 Restarting the Link</td>
</tr>
<tr>
<td></td>
<td>12.6 Busy Conditions</td>
</tr>
<tr>
<td></td>
<td>12.7 Selecting a Logical Channel for an X.25 Call</td>
</tr>
<tr>
<td></td>
<td>12.8 Setting up an X.25 Call</td>
</tr>
<tr>
<td></td>
<td>12.9 Sending a Data Packet</td>
</tr>
<tr>
<td></td>
<td>12.10 Resetting the Layer 3 Connection</td>
</tr>
<tr>
<td></td>
<td>12.11 Clearing the Layer 3 Call</td>
</tr>
<tr>
<td></td>
<td>12.12 Disconnecting the Layer 2 (Link) Connection</td>
</tr>
<tr>
<td>13</td>
<td>SNA MONITOR</td>
</tr>
<tr>
<td></td>
<td>Loading the SNA Monitor Program</td>
</tr>
<tr>
<td></td>
<td>13.2 Configuration</td>
</tr>
<tr>
<td></td>
<td>13.3 SNA Display Formats</td>
</tr>
<tr>
<td></td>
<td>13.4 SNA Filters</td>
</tr>
</tbody>
</table>
TABLE OF CONTENTS [continued]

14 SDLC EMULATION ........................................... 14-1
  14.1 Loading the SDLC Emulation Program ............... 14-2
  14.2 Configuration ........................................... 14-4
  14.3 Station Setup ........................................... 14-8
  14.4 Establishing a Link to a Secondary Station ....... 14-9
  14.5 Sending SDLC Frames .................................... 14-9
  14.6 Sending SNA Information ............................... 14-10
  14.7 Resetting the Link ...................................... 14-10

15 BSC 3270 MONITOR ........................................... 15-1
  15.1 Loading the BSC 3270 Monitor Program .............. 15-2
  15.2 Configuration ........................................... 15-4
  15.3 Bisync Display Formats ................................ 15-5
  15.4 Bisync Filters ........................................... 15-7

16 BSC 3270 EMULATION ......................................... 16-1
  16.1 Loading the BSC 3270 Emulation Program ............ 16-2
  16.2 Configuration ........................................... 16-4
    Device Setup ............................................. 16-8
  16.3 Bisync Control Characters and Messages .............. 16-9
    Polling .................................................. 16-9
    Selecting a Cluster Controller and Device ............. 16-9
    Sending a Message ........................................ 16-11
    Appending Text to a Message .............................. 16-11
    Clearing the Message Buffer .............................. 16-12
# TABLE OF CONTENTS [continued]

## 17 GENERAL HOME PROCESSOR TOPICS

<table>
<thead>
<tr>
<th>Section</th>
<th>Pages</th>
</tr>
</thead>
<tbody>
<tr>
<td>17.1 TestPorts</td>
<td>17–2</td>
</tr>
<tr>
<td>17.2 Background</td>
<td>17–2</td>
</tr>
<tr>
<td>17.3 Files</td>
<td>17–4</td>
</tr>
<tr>
<td>17.4 Setup</td>
<td>17–24</td>
</tr>
<tr>
<td>17.5 FILEX</td>
<td>17–28</td>
</tr>
</tbody>
</table>

### 17.2 Background
- Configuration Diagram: 17–3
- Test Port Status Display: 17–4

### 17.3 Files
- Listing a Directory: 17–5
- Printing the Directory Listing: 17–8
- Printing a Source File: 17–8
- Editing a File: 17–9
- Editor Functions: 17–10
- System Shutdown: 17–11
- Copying Files: 17–11
- Comparing Files: 17–12
- Renaming Files: 17–13
- Deleting Files: 17–13
- Merging Files: 17–14
- Formatting a Floppy Disk: 17–15
- Creating a New File System: 17–16
- Hard Disk Organization: 17–17
- Formatting the Hard Disk: 17–17
- Partitioning the Hard Disk: 17–18
- Backing up Files: 17–21
- Restoring Backup: 17–23

### 17.4 Setup
- Configuring the Printer Port: 17–24
- Configuring the Remote Port: 17–26
- Setting Date and Time: 17–27

### 17.5 FILEX
- Configuring the Tester: 17–28
- Configuring the Host System: 17–31
- Starting the Terminal Emulator: 17–31
- Stopping the Terminal Emulator: 17–33
- Sending a BREAK Signal: 17–33
- Sending Files: 17–34
- Receiving Files: 17–35
# TABLE OF CONTENTS [continued]

## 18 GENERAL APPLICATION TOPICS

<table>
<thead>
<tr>
<th>Section</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>18.1 TestPorts</td>
<td>18-2</td>
</tr>
<tr>
<td>18.2 Background</td>
<td>18-2</td>
</tr>
<tr>
<td>Connection Diagram</td>
<td>18-3</td>
</tr>
<tr>
<td>Data Window</td>
<td>18-3</td>
</tr>
<tr>
<td>User Window</td>
<td>18-4</td>
</tr>
<tr>
<td>18.3 Capture</td>
<td>18-4</td>
</tr>
<tr>
<td>Configuring the Capture RAM Buffer</td>
<td>18-4</td>
</tr>
<tr>
<td>Clearing the Capture RAM Buffer</td>
<td>18-6</td>
</tr>
<tr>
<td>Capturing to RAM</td>
<td>18-6</td>
</tr>
<tr>
<td>Recording Live Data to Disk</td>
<td>18-6</td>
</tr>
<tr>
<td>Saving Data from RAM to Disk</td>
<td>18-7</td>
</tr>
<tr>
<td>18.4 Display</td>
<td>18-9</td>
</tr>
<tr>
<td>Live Data</td>
<td>18-10</td>
</tr>
<tr>
<td>Playing Back Data from Capture RAM</td>
<td>18-11</td>
</tr>
<tr>
<td>Playing Back Data from Disk</td>
<td>18-12</td>
</tr>
<tr>
<td>18.5 Format</td>
<td>18-13</td>
</tr>
<tr>
<td>Block Numbers</td>
<td>18-17</td>
</tr>
<tr>
<td>18.6 Search</td>
<td>18-18</td>
</tr>
<tr>
<td>Block Number</td>
<td>18-18</td>
</tr>
<tr>
<td>Timestamp</td>
<td>18-19</td>
</tr>
<tr>
<td>String</td>
<td>18-20</td>
</tr>
<tr>
<td>18.7 ResponseTime</td>
<td>18-21</td>
</tr>
<tr>
<td>18.8 Print</td>
<td>18-22</td>
</tr>
<tr>
<td>Printing the Capture RAM Buffer</td>
<td>18-22</td>
</tr>
<tr>
<td>Printing a Data File</td>
<td>18-24</td>
</tr>
<tr>
<td>Printing a Test Script/Source File</td>
<td>18-24</td>
</tr>
<tr>
<td>Printing a Screen Image</td>
<td>18-25</td>
</tr>
<tr>
<td>Manually Printing a Data File/Capture RAM</td>
<td>18-25</td>
</tr>
<tr>
<td>18.9 Filters</td>
<td>18-26</td>
</tr>
<tr>
<td>18.10 Trigger Conditions</td>
<td>18-29</td>
</tr>
<tr>
<td>Trigger Actions</td>
<td>18-34</td>
</tr>
</tbody>
</table>
# TABLE OF CONTENTS

## 18 GENERAL APPLICATION TOPICS [continued]

18.11 TestScript .................................. 18-36  
  Loading a Test Script .......................... 18-36  
  Running a Test Script ......................... 18-37  
  Displaying Test Script Messages .......... 18-37  
  Stopping a Test Script ....................... 18-38

18.12 TestKeys .................................. 18-38

## 19 PROBLEMS? .................................. 19-1

## 20 SERVICE .................................. 20-1

20.1 Transporting the Unit ................. 20-2

20.2 Maintenance .............................. 20-2

20.3 Technical Support ....................... 20-3  
  Authorization .............................. 20-3  
  Unauthorized Repair ....................... 20-4

## APPENDICES

### A DATA FORMATS .............................. A-1

### B ISDN REFERENCES .......................... B-1

B.1 Implemented ISDN Standards .......... B-2

B.2 Layer 2 State Machine ................... B-3

### C CONNECTOR PINOUTS ....................... C-1

C.1 WAN Test Connectors ..................... C-2

---

**IDACOM**  
PT500 User Manual
<table>
<thead>
<tr>
<th>CONNECTOR PINOUTS [continued]</th>
</tr>
</thead>
<tbody>
<tr>
<td>RS-232C/V.28 ..................... C-2</td>
</tr>
<tr>
<td>V.35 ............................. C-4</td>
</tr>
<tr>
<td>V.36/RS-449 ........................ C-6</td>
</tr>
<tr>
<td>V.11/X.21 ........................ C-8</td>
</tr>
</tbody>
</table>

| C.2 ISDN Basic Rate Access (BRA) Connectors ........ C-9 |
| S/T Bus RJ-45 ...................... C-9 |
| S/T Bus TAE8+4C .................... C-10 |
| RJ-14 External Voice Access .......... C-11 |
| External B–Channel Access ........... C-12 |

| C.3 ISDN Primary Rate Access (PRA) Connectors ........ C-14 |
| RJ–48C (T1) ....................... C-14 |
| Bantam (T1) ....................... C-16 |
| DB–9 (CEPT) ....................... C-17 |
| External B–Channel Access .......... C-19 |
| External Clock In and Out BNC Connectors .......... C-21 |

| C.4 External B–Channel Access (PRA/BRA/WAN) ....... C-22 |

| C.5 Miscellaneous Connectors ..................... C-23 |
| Serial Printer Port ....................... C-23 |
| Parallel Printer Port...................... C-24 |
| Remote Control Port ...................... C-26 |
| External Color CRT ...................... C-27 |

| ASCII/EBCDIC/HEX CONVERSION TABLE ............... D-1 |

INDEX
### List of Figures

<table>
<thead>
<tr>
<th>Figure</th>
<th>Description</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>1-1</td>
<td>Front View</td>
<td>1-2</td>
</tr>
<tr>
<td>1-2</td>
<td>Back View</td>
<td>1-3</td>
</tr>
<tr>
<td>1-3</td>
<td>D-Channel Connector Module</td>
<td>1-4</td>
</tr>
<tr>
<td>1-4</td>
<td>D-Channel Configuration Diagram</td>
<td>1-4</td>
</tr>
<tr>
<td>1-5</td>
<td>WAN Connector Module</td>
<td>1-5</td>
</tr>
<tr>
<td>1-6</td>
<td>WAN Configuration Diagram</td>
<td>1-5</td>
</tr>
<tr>
<td>1-7</td>
<td>WAN/WAN Connector Module</td>
<td>1-6</td>
</tr>
<tr>
<td>1-8</td>
<td>WAN/WAN Configuration Diagram</td>
<td>1-6</td>
</tr>
<tr>
<td>1-9</td>
<td>PRA Connector Module</td>
<td>1-7</td>
</tr>
<tr>
<td>1-10</td>
<td>PRA Monitor Configuration Diagram</td>
<td>1-7</td>
</tr>
<tr>
<td>1-11</td>
<td>PRA Emulation Configuration Diagram</td>
<td>1-8</td>
</tr>
<tr>
<td>1-12</td>
<td>PRA Drop &amp; Insert Configuration Diagram</td>
<td>1-8</td>
</tr>
<tr>
<td>1-13</td>
<td>PRA/WAN Connector Module</td>
<td>1-9</td>
</tr>
<tr>
<td>1-14</td>
<td>PRA/WAN Monitor Configuration Diagram</td>
<td>1-9</td>
</tr>
<tr>
<td>1-15</td>
<td>PRA/WAN Emulation Configuration Diagram</td>
<td>1-10</td>
</tr>
<tr>
<td>1-16</td>
<td>PRA/WAN Drop &amp; Insert Configuration Diagram</td>
<td>1-10</td>
</tr>
<tr>
<td>1-17</td>
<td>BRA Connector Module</td>
<td>1-11</td>
</tr>
<tr>
<td>1-18</td>
<td>BRA Configuration Diagram</td>
<td>1-11</td>
</tr>
<tr>
<td>1-19</td>
<td>BRA/WAN Connector Module</td>
<td>1-12</td>
</tr>
<tr>
<td>1-20</td>
<td>BRA/WAN Monitor Configuration Diagram</td>
<td>1-12</td>
</tr>
<tr>
<td>1-21</td>
<td>BRA/BRA Connector Module</td>
<td>1-13</td>
</tr>
<tr>
<td>1-22</td>
<td>BRA/BRA Port A Configuration Diagram</td>
<td>1-13</td>
</tr>
<tr>
<td>1-23</td>
<td>PRA/BRA/WAN Connector Module</td>
<td>1-14</td>
</tr>
<tr>
<td>1-24</td>
<td>PRA/BRA/WAN Monitor Configuration Diagram</td>
<td>1-14</td>
</tr>
<tr>
<td>1-25</td>
<td>PRA/BRA/WAN Emulation Configuration Diagram</td>
<td>1-15</td>
</tr>
<tr>
<td>1-26</td>
<td>PRA/BRA/WAN Drop &amp; Insert Configuration Diagram</td>
<td>1-15</td>
</tr>
<tr>
<td>1-27</td>
<td>System Architecture</td>
<td>1-16</td>
</tr>
<tr>
<td>1-28</td>
<td>Conceptual Data Flow Diagram</td>
<td>1-19</td>
</tr>
<tr>
<td>1-29</td>
<td>Application Program Screen Layout</td>
<td>1-20</td>
</tr>
<tr>
<td>2-1</td>
<td>Side View</td>
<td>2-2</td>
</tr>
<tr>
<td>2-2</td>
<td>Self Test With Fail Condition</td>
<td>2-3</td>
</tr>
<tr>
<td>2-3</td>
<td>Loading System Software</td>
<td>2-4</td>
</tr>
<tr>
<td>3-1</td>
<td>Monitoring at a WAN Interface</td>
<td>3-2</td>
</tr>
<tr>
<td>3-2</td>
<td>Emulating at a WAN Interface</td>
<td>3-4</td>
</tr>
<tr>
<td>3-3</td>
<td>Monitoring at the Basic Rate Access Using a Y-Cable</td>
<td>3-6</td>
</tr>
<tr>
<td>3-4</td>
<td>Monitoring at the Basic Rate Access Without a Y-Cable</td>
<td>3-7</td>
</tr>
<tr>
<td>3-5</td>
<td>Emulating at the Basic Rate Access</td>
<td>3-10</td>
</tr>
<tr>
<td>3-6</td>
<td>Monitoring at the Primary Rate Access – (T1) Bantam</td>
<td>3-15</td>
</tr>
<tr>
<td>3-7</td>
<td>Monitoring at the Primary Rate Access – (T1) RJ-48C</td>
<td>3-16</td>
</tr>
<tr>
<td>3-8</td>
<td>Monitoring at the Primary Rate Access – (CEPT) DB-9</td>
<td>3-17</td>
</tr>
<tr>
<td>3-9</td>
<td>Emulating at the Primary Rate Access – (T1) Bantam</td>
<td>3-27</td>
</tr>
<tr>
<td>3-10</td>
<td>Emulating at the Primary Rate Access – (T1) RJ-48C</td>
<td>3-28</td>
</tr>
<tr>
<td>3-11</td>
<td>Emulating at the Primary Rate Access – (CEPT) DB-9</td>
<td>3-29</td>
</tr>
<tr>
<td>4-1</td>
<td>ISDN D-Channel Monitor Program Display</td>
<td>4-3</td>
</tr>
</tbody>
</table>
## LIST OF FIGURES [continued]

<table>
<thead>
<tr>
<th>Figure</th>
<th>Description</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>5-1</td>
<td>ISDN D-Channel Emulation Program Display</td>
<td>5-3</td>
</tr>
<tr>
<td>5-2</td>
<td>Message Builder Overview</td>
<td>5-34</td>
</tr>
<tr>
<td>6-1</td>
<td>ISDN D-Channel Monitor Program Display</td>
<td>6-3</td>
</tr>
<tr>
<td>7-1</td>
<td>ISDN D-Channel Emulation Program Display</td>
<td>7-3</td>
</tr>
<tr>
<td>7-2</td>
<td>Message Builder Overview</td>
<td>7-20</td>
</tr>
<tr>
<td>9-1</td>
<td>Universal Monitor Program Display</td>
<td>9-9</td>
</tr>
<tr>
<td>10-1</td>
<td>Universal Simulation Program Display</td>
<td>10-10</td>
</tr>
<tr>
<td>11-1</td>
<td>X.25 Monitor Program Display</td>
<td>11-3</td>
</tr>
<tr>
<td>12-1</td>
<td>X.25 Emulation Program Display</td>
<td>12-3</td>
</tr>
<tr>
<td>13-1</td>
<td>SNA Monitor Program Display</td>
<td>13-3</td>
</tr>
<tr>
<td>14-1</td>
<td>SDLC Emulation Program Display</td>
<td>14-3</td>
</tr>
<tr>
<td>15-1</td>
<td>BSC 3270 Monitor Program Display</td>
<td>15-3</td>
</tr>
<tr>
<td>16-1</td>
<td>BSC 3270 Emulation Program Display</td>
<td>16-3</td>
</tr>
<tr>
<td>17-1</td>
<td>BRA/WAN Configuration Diagram</td>
<td>17-3</td>
</tr>
<tr>
<td>17-2</td>
<td>BRA/WAN Test Port Status Display</td>
<td>17-4</td>
</tr>
<tr>
<td>18-1</td>
<td>Connection Diagram</td>
<td>18-3</td>
</tr>
<tr>
<td>18-2</td>
<td>Split Screen Display</td>
<td>18-14</td>
</tr>
<tr>
<td>18-3</td>
<td>Dual Window Display</td>
<td>18-16</td>
</tr>
<tr>
<td>20-1</td>
<td>Top View - PT500 PRA/BRA/WAN Tester</td>
<td>20-5</td>
</tr>
<tr>
<td>A-1</td>
<td>Bit-Oriented Protocol Frame Format (BOP)</td>
<td>A-2</td>
</tr>
<tr>
<td>A-2</td>
<td>BISYNC Frame Formats</td>
<td>A-3</td>
</tr>
<tr>
<td>A-3</td>
<td>Control Character Descriptions</td>
<td>A-3</td>
</tr>
<tr>
<td>A-4</td>
<td>Character-Oriented Protocol Transmission (COP)</td>
<td>A-4</td>
</tr>
<tr>
<td>A-5</td>
<td>ASYNC Data Character Format</td>
<td>A-5</td>
</tr>
<tr>
<td>A-6</td>
<td>NRZ and NRZI Data Encoding</td>
<td>A-5</td>
</tr>
<tr>
<td>A-7</td>
<td>Clocking Modes</td>
<td>A-6</td>
</tr>
<tr>
<td>A-8</td>
<td>ISDN Frame Format</td>
<td>A-7</td>
</tr>
<tr>
<td>C-1</td>
<td>RS-232C/V.28 Female Connector</td>
<td>C-2</td>
</tr>
<tr>
<td>C-2</td>
<td>V.35 Female Connector</td>
<td>C-4</td>
</tr>
<tr>
<td>C-3</td>
<td>V.36/RS-449 Female Connector</td>
<td>C-6</td>
</tr>
<tr>
<td>C-4</td>
<td>V.11/X.21 Female Connector</td>
<td>C-8</td>
</tr>
<tr>
<td>C-5</td>
<td>S/T Bus RJ-45 Female Connector</td>
<td>C-9</td>
</tr>
<tr>
<td>C-6</td>
<td>S/T Bus TAE8+4C Female Connector</td>
<td>C-10</td>
</tr>
<tr>
<td>C-7</td>
<td>RJ-14 External Voice Access Female Connector</td>
<td>C-11</td>
</tr>
<tr>
<td>C-8</td>
<td>External B-Channel Female Connector</td>
<td>C-12</td>
</tr>
<tr>
<td>C-9</td>
<td>RJ-48C Female Connector</td>
<td>C-14</td>
</tr>
<tr>
<td>C-10</td>
<td>DB-9 (CEPT) Female Connector</td>
<td>C-17</td>
</tr>
<tr>
<td>C-11</td>
<td>External B-Channel Female Connector</td>
<td>C-19</td>
</tr>
<tr>
<td>C-12</td>
<td>External Clock In and Out BNC Connectors</td>
<td>C-21</td>
</tr>
<tr>
<td>C-13</td>
<td>External B-Channel Female Connector (PRA/BRA/WAN)</td>
<td>C-22</td>
</tr>
<tr>
<td>C-14</td>
<td>Serial Printer Port Female Connector</td>
<td>C-23</td>
</tr>
<tr>
<td>C-15</td>
<td>DB-25 Printer Port Female Connector</td>
<td>C-24</td>
</tr>
<tr>
<td>C-16</td>
<td>Centronics Printer Port Female Connector</td>
<td>C-25</td>
</tr>
<tr>
<td>C-17</td>
<td>Remote Control Port Male Connector</td>
<td>C-26</td>
</tr>
</tbody>
</table>
LIST OF FIGURES [continued]

C-18  DB-9 External Color CRT Connector  . . . . . . . . . . . C-27
C-19  External Color CRT Connector  . . . . . . . . . . . C-28
### LIST OF TABLES

<table>
<thead>
<tr>
<th>Table</th>
<th>Description</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>1-1</td>
<td>Processor Utilization</td>
<td>1-17</td>
</tr>
<tr>
<td>3-1</td>
<td>Alarm and Status Messages</td>
<td>3-21</td>
</tr>
<tr>
<td>3-2</td>
<td>Alarm and Status Messages</td>
<td>3-33</td>
</tr>
<tr>
<td>3-3</td>
<td>Alarm and Status Messages</td>
<td>3-47</td>
</tr>
<tr>
<td>4-1</td>
<td>SAPI/TEI – Logical Operations</td>
<td>4-13</td>
</tr>
<tr>
<td>6-1</td>
<td>SAPI/TEI – Logical Operations</td>
<td>6-13</td>
</tr>
<tr>
<td>9-1</td>
<td>Universal Monitor/Simulation Parameters</td>
<td>9-6</td>
</tr>
<tr>
<td>9-2</td>
<td>Universal Monitor/Simulation Parameters (cont’d)</td>
<td>9-7</td>
</tr>
<tr>
<td>10-1</td>
<td>Universal Monitor/Simulation Parameters</td>
<td>10-6</td>
</tr>
<tr>
<td>10-2</td>
<td>Universal Monitor/Simulation Parameters (cont’d)</td>
<td>10-7</td>
</tr>
<tr>
<td>17-1</td>
<td>Default File System Names</td>
<td>17-17</td>
</tr>
<tr>
<td>20-1</td>
<td>Physical Configuration</td>
<td>20-6</td>
</tr>
<tr>
<td>B-1</td>
<td>Layer 2 State Numbers</td>
<td>B-3</td>
</tr>
<tr>
<td>C-1</td>
<td>RS-232C/V.28 Pin Designations</td>
<td>C-3</td>
</tr>
<tr>
<td>C-2</td>
<td>V.35 Pin Designations</td>
<td>C-5</td>
</tr>
<tr>
<td>C-3</td>
<td>V.36/RS-449 Pin Designations</td>
<td>C-7</td>
</tr>
<tr>
<td>C-4</td>
<td>V.11/X.21 Pin Designations</td>
<td>C-8</td>
</tr>
<tr>
<td>C-5</td>
<td>S/T Bus RJ–45 Pin Designations</td>
<td>C-9</td>
</tr>
<tr>
<td>C-6</td>
<td>S/T Bus TAE8+4C Pin Designations</td>
<td>C-10</td>
</tr>
<tr>
<td>C-7</td>
<td>RJ–14 External Voice Access Pin Designations</td>
<td>C-11</td>
</tr>
<tr>
<td>C-8</td>
<td>External B–Channel Pin Designations</td>
<td>C-12</td>
</tr>
<tr>
<td>C-9</td>
<td>External Access Groups</td>
<td>C-13</td>
</tr>
<tr>
<td>C-10</td>
<td>RJ–48C Pin Designations – User (Port A – Default)</td>
<td>C-14</td>
</tr>
<tr>
<td>C-11</td>
<td>RJ–48C Pin Designations – Network (Port B – Default)</td>
<td>C-15</td>
</tr>
<tr>
<td>C-12</td>
<td>RJ–48C Pin Designations (Port A/B)</td>
<td>C-15</td>
</tr>
<tr>
<td>C-13</td>
<td>DB–9 Pin Designations – User (Port A – Default)</td>
<td>C-18</td>
</tr>
<tr>
<td>C-14</td>
<td>DB–9 Pin Designations – Network (Port B – Default)</td>
<td>C-18</td>
</tr>
<tr>
<td>C-15</td>
<td>DB–9 Pin Designations (Port A/B)</td>
<td>C-18</td>
</tr>
<tr>
<td>C-16</td>
<td>External B–Channel Pin Designations</td>
<td>C-19</td>
</tr>
<tr>
<td>C-17</td>
<td>External B–Channel Pin Designations</td>
<td>C-22</td>
</tr>
<tr>
<td>C-18</td>
<td>Serial Printer Port Pin Designations</td>
<td>C-23</td>
</tr>
<tr>
<td>C-19</td>
<td>DB–25 Printer Port Pin Designations</td>
<td>C-24</td>
</tr>
<tr>
<td>C-20</td>
<td>Centronics Printer Port Pin Designations</td>
<td>C-25</td>
</tr>
<tr>
<td>C-21</td>
<td>Remote Control Port Pin Designations</td>
<td>C-26</td>
</tr>
<tr>
<td>C-22</td>
<td>External Color CRT Pin Designations</td>
<td>C-27</td>
</tr>
<tr>
<td>C-23</td>
<td>External Color CRT Pin Designations</td>
<td>C-28</td>
</tr>
</tbody>
</table>
1.1 Front and Back Views

Figure 1–1 Front View
1.2 Configurations

The PT500 is available in several configurations, distinguished by the connector module at the back of the unit. For a BRA interface, the V.35 and RJ-45 connectors can be substituted with V.36 (RS-449) and TAE8+4C connectors, respectively. For a PRA interface, the RJ-48C connectors can be substituted with DB-9 (CEPT) connectors.
D-Channel

Figure 1-3  D-Channel Connector Module

Figure 1-4  D-Channel Configuration Diagram
INTRODUCTION

WAN

Figure 1-5 WAN Connector Module

Figure 1-6 WAN Configuration Diagram
Figure 1-7 WAN/WAN Connector Module

Figure 1-8 WAN/WAN Configuration Diagram
PRA

Figure 1-9 PRA Connector Module

Figure 1-10 PRA Monitor Configuration Diagram
Figure 1–11 PRA Emulation Configuration Diagram

Figure 1–12 PRA Drop & Insert Configuration Diagram
PRA/WAN

Figure 1–13 PRA/WAN Connector Module

Figure 1–14 PRA/WAN Monitor Configuration Diagram
Figure 1-15 PRA/WAN Emulation Configuration Diagram

Figure 1-16 PRA/WAN Drop & Insert Configuration Diagram
Figure 1–17  BRA Connector Module

Figure 1–18  BRA Configuration Diagram
BRA/WAN

Figure 1-19 BRA/WAN Connector Module

Figure 1-20 BRA/WAN Monitor Configuration Diagram
BRA/BRA

Figure 1-21 BRA/BRA Connector Module

Figure 1-22 BRA/BRA Port A Configuration Diagram

NOTE
The PT500 BRA/BRA has a Configuration Diagram for Port A and Port B. Select Port A (BRA-A Config) or Port B (BRA-B Config) via the Background topic prior to configuring or loading an application (see Section 17.2).
Figure 1-23 PRA/BRA/WAN Connector Module

Figure 1-24 PRA/BRA/WAN Monitor Configuration Diagram
Figure 1–25 PRA/BRA/WAN Emulation Configuration Diagram

Figure 1–26 PRA/BRA/WAN Drop & Insert Configuration Diagram

NOTE
The PT500 PRA/BRA/WAN uses the same Configuration Diagrams as PRA and BRA/WAN. PRA Configuration Diagrams are shown here as an example.
Figure 1-27 System Architecture

- Home Processor
  - Home Processor Software
  - System SW
- Application Processor AP #1
  - Application SW
  - System SW #1
- Application Processor AP #6
  - Application SW
  - System SW #6

- ISDN and/or WAN Interfaces

- VME BUS

- 9" Color CRT Display
- 2 x 800 Kbyte Floppy Disk
- 40 MB Hard Disk
- Modem (or DCE)
- Printer (Serial or Parallel)
- Keyboard
- External Color CRT Display
The PT500 is equipped with up to seven processors. Up to six application processors are available for testing BOP, COP, SYNC, and ASYNC protocols via WAN as well as ISDN Basic and Primary Access interfaces.

<table>
<thead>
<tr>
<th>Application Processor:</th>
<th>Home Processor:</th>
</tr>
</thead>
<tbody>
<tr>
<td>32 bit, 16 MHz</td>
<td>32 bit, 16 MHz</td>
</tr>
<tr>
<td>1(2) MB  RAM</td>
<td>1(2) MB RAM</td>
</tr>
<tr>
<td>Test Script Buffer</td>
<td>User/Machine Interface</td>
</tr>
<tr>
<td>Capture Buffer</td>
<td>Edit Buffer</td>
</tr>
<tr>
<td>Application Software</td>
<td>Editor &amp; File Manipulation</td>
</tr>
<tr>
<td>Operating System</td>
<td>Operating System</td>
</tr>
</tbody>
</table>

*Table 1–1 Processor Utilization*
1.4 Application Processors

The PT500 can have up to six application processors. A monitor or emulation application program must be loaded before the application processor is operational.

A typical IDACOM application software package consists of programs to perform the following functions:

**MONITOR**
- Decode, trigger, filter, capture, record, and display.

**EMULATION**
- State machine based reference implementation of protocol which can be controlled by user commands from the keyboard, a remote terminal, or a test script.

**TEST SCRIPT MANAGER**
- State machine implementation utilizing Interactive Test Language (ITL) and a library of protocol events and actions for ISDN, X.25, SNA, and BSC. Test scripts are prepared using the Editor on the Home processor.

The block diagram on page 1–19 illustrates the conceptual data flow between the functions of an application software package.
Figure 1–28 Conceptual Data Flow Diagram
**INTRODUCTION**

**Figure 1-29 Application Program Screen Layout**

- **Data Display Header Line**
- **Status Line**
- **Port Name**
- **Program Name**
- **Screen Status**
- **Date and Time**

**Port Name**: WAN Port: X.25 Monitor

**Source**: Frm Lcn Packet

**Data**: 1988-03-28 23:41:58

- **Error Message**
- **Error Window** - 3 Lines
- **Data Window** - 16 Lines
- **Test Script Window**
- **Script Window** - 3 Lines
- **Notice Window** - 1 Line

**Test Ports Background**

- **Monitor**
- **Capture**
- **Display**
- **Search**
- **Response Time**
- **Print**

**Function Key**

- **F1**
- **Configuration Menu**

**Topic Box**

**Topic Bar, Command Window, or Prompt Window**
2.1 Setup Instructions

- Press the two buttons (1) on the sides of the tester to remove the keyboard. The keyboard is not hinged to the housing and will drop forward.
- Unfold the front legs (2) by pulling them forward until they lock.
- Connect the power cord (3) to the power receptacle at the back of the unit.

![Diagram of the tester](image)

**Figure 2-1 Side View**
2.2 Power Up and Self Test

- Turn on the power switch on the front of the unit.

After the power is turned on, or the RESET button is pushed, the tester runs a self test to verify the correct operation of its hardware components. This procedure takes about 30 seconds. If the results are indicated as 'OK', the system software starts loading.

In the event of a fail condition:

![Figure 2-2 Self Test With Fail Condition]

- Push the RESET button to repeat the self test.

If the fail condition persists, call the IDACOM field support office. The customer service representative might suggest to use the diagnostic diskette labelled 'STAND–ALONE UTILITIES', to isolate the problem.
2.3 Loading System Software

Upon completion of the self test, the system software is loaded from the hard disk drive.

NOTE

If the system software is not on the hard disk, insert the disk labelled 'OPERATING SYSTEM' into the floppy disk drive and press the RESET button (1 sec).

If a floppy disk is mounted in one of the drives, the system always attempts to load from the floppy (i.e. the floppy always has priority over the hard drive).
If the hard disk has been damaged during shipment, refer to the 'Formatting the Hard Disk' section on page 17-17 for instructions to format the disk and restore software.

Loading menu system software takes approximately 15 seconds (90 seconds from floppy disk) depending on the machine type.

After the menu system software is loaded:

- Press (RETURN).

The Home processor software is now running and the Configuration Diagram is displayed.

When the menu system software is loaded, a default configuration file (HOME.D) is executed which automatically configures the remote and printer ports.

**NOTE**

Refer to the Programmer's Reference Manual to customize the configuration file.
2.4 General Operating Instructions

There are four basic modes of operation for the tester.

**Menu Mode**
Selections are made from menus or by using topics and related function keys (default).

**Command Mode**
The normal user interface is bypassed and all controls are entered as commands from the keyboard. See the Programmer's Manuals for a list of commands.

**Remote Mode**
Programs running on application processors are controlled remotely via the remote port. The Home processor can send or receive files from a remote terminal. See the Programmer's Reference Manual.

**Program Mode**
A test script which interacts with a monitor or emulation application program controls the operation of the tester. See the Programmer's Reference Manual.

⚠️ **NOTE**
This user manual describes the operation of the tester based on Menu Mode.

---

**Menu Mode**

**The Topic Bar**

The topic bar is a list of topics under which related function keys are grouped. The function keys change as the topic box is moved.
To choose a topic:

- Press the → or ← cursor keys to move the topic box to the right or left, respectively.
- Press the CTRL key and → or ← to move the topic box all the way to the right or left, respectively.
- Type the first (capital) letter of a topic. The topic box positions at next occurrence of a topic starting with that letter.

Prompts

A prompt is displayed to modify/specify input.

Example:
Set the date and time.

```
Enter the date and time [YYYY-MM-DD HH:MM:SS]: 1989-03-21 22:13:49
```
This prompt contains 6 fields. Initially, the cursor is positioned at the end of the first field. In general, the following function keys are available when a prompt is displayed.

**Clear**
Clears the contents of the current field.

**Delete**
Deletes the character under the cursor.

**Next Field**
Moves the cursor to the end of the next field.

**Execute**
Performs the prompt action.

**Exit**
Leaves the prompt.

**NOTE**
Pressing \( \text{(RETURN)} \) combines the action of the **Execute** and **Exit** function keys.

**Function Keys**
Each topic is associated with a number of function key selections.

```
+------------------+
| f1    | f2    | f3 |
+------------------+
| Menu | Emulation | Monitor |
```

A dotted line separates function keys in a function key group (only one can be selected at a time).

In this manual, highlighted function key (Monitor in this example) indicates the associated function has been selected.

**NOTE**
Some function keys such as **Execute**, **Delete**, etc. are only momentarily highlighted indicating action has been taken.
Others
The OTHERS function key is displayed when more selections are available. If a function key described in this manual is not visible on the screen, press OTHERS to display additional choices.

Execute
When a prompt is displayed, the Execute function key performs the associated action.

Exit
The Exit function key is used to:
• exit from a prompt after pressing Execute;
• close the prompt if pressed without pressing Execute first (i.e. the operation is not executed and/or the parameter value is not assigned); or
• return to a previous menu or to the topic bar.

NOTE
Pressing ✧ (RETURN) combines the action of the Execute and Exit function keys.

Menus
Most topics have one or more menu function keys which display further multiple choice selections. For example:
Selection menus can be layered. When a menu is displayed, the topic bar disappears. Pressing the Exit function key either returns to a previous menu or to the topic bar. To make selections from a menu:

- Use the cursor keys to move the arrow to the desired parameter.
- Press a function key (eg. POINT TO POINT) to make a selection.

**NOTE**

The cursor cannot be positioned to an item with a ‘---’ status.

---

**Command Mode**

To bypass the Menu Mode (topics and function key selections):

- Press the ESC key.

The operation of the unit can now be controlled by entering commands from the keyboard. For a list of commands, refer to the Programmer’s Reference Manual and the appropriate application Programmer’s Manual.

- Press the ESC key again to return to Menu Mode.

---

**Remote Mode**

FILEX provides communication between two IDACOM testers, or between an IDACOM tester and any personal computer with XMODEM capabilities.

RTP (remote test package) allows remote control of one IDACOM tester by another IDACOM tester.

R-FILEX™ provides file transfer capabilities between an IDACOM tester and any UNIX system.

Commands can be entered from a terminal, personal computer, or other device.
Program Mode

To enter program mode:
- Load an application and switch to the application processor.
- Load and run the desired test script (see Section 18.11).

2.5 Home Processor Topics

TestPorts
Switch to any application processor which has an application program loaded.

Background
Display the Configuration Diagram showing which port is connected to which application or display the status of each application processor.

WAN—Config
(WAN, BRA/WAN, PRA/WAN, & PRA/BRA/WAN or WAN—Port1
WAN—Port2
(WAN/WAN)
If the Universal Monitor program is loaded on AP #1 (AP #2), AutoConfigure attempts to configure the WAN interface according to the line protocol (the unit must be connected to a data line). Select Monitor or Emulation mode. Load an application program. None deletes the current program.

BRA—Config
(BRA/WAN, BRA, PRA/BRA/WAN, BRA/BRA, & D—Channel)
A Configuration Menu provides for the selection of voice encoding in Monitor mode, bus configuration and voice encoding in Emulation (User); and bus configuration, voice encoding, and TE power source for Emulation (Network). In Emulation mode, there are additional selections for user or network emulation and a key to bring the B—Channel processors (Basic Rate Access) Online.

B1—Channel
or B2—Channel
(BRA/WAN, BRA, PRA/BRA/WAN, BRA/BRA, & D—Channel)
Monitor Configuration:
To monitor voice on a B—Channel, the B1 or B2—Channel is connected to the voice port (via built—in CODEC). To monitor data, an application program must be loaded. The B—Channel signals can also be monitored (in TTL level) at the External #1 or External #2 port.
Emulation Configuration:
The B-Channels can be connected either to the voice port, the External #1 or #2 port, or to application processor(s). The receiver of a B-Channel can also be selflooped to its own transmitter or crosslooped to the transmitter of the other B-Channel. The application program can be loaded to emulate a protocol on the B-Channel. None deletes the program.

D-Channel
(BRA/WAN, BRA, PAA/BRA/WAN, BRA/BRA, & D-Channel)

Load the ISDN D-Channel application program on AP #3 (AP #6 for BRA/BRA) and then switch to the D-Channel processor.

PRA-Config
(PRA, PRA/WAN, & PAA/BRA/WAN, BRA/BRA, & D-Channel)

A System Menu to configure for Monitor, Emulation, or Drop & Insert mode. A Channel Menu to set and assign parameters for Test Channels 1 or 2, External Channel, or Voice Channel. Applications are loaded. A Port Menu (emulation and drop & insert) to set the transmit mode for all channels on either Port A or Port B.

PRA-L1
(PRA, PRA/WAN, & PAA/BRA/WAN)

An Error Monitor Menu counts layer 1 errors. An Error Simulate Menu (emulation and drop & insert) simulates specific layer 1 errors.

Files
Disk utility and file management program including: Directory listing and Printing, Editor, system Shutdown, Copy, Compare, Rename, Delete, Merge, Initialize, Backup, List Backup, and Restore Backup.

Setup
A Printer Menu to select printer configuration parameters. A Modem Menu to select remote port configuration parameters. A facility to enter the system Date and Time.

FILEX
A Configuration Menu to select terminal emulator and file transfer parameters. A facility to enter the Terminal Emulator.

DOS-Files
A facility to install the optional DOS-Files application.
3.1 Monitoring at a WAN Interface (Passive Testing)

The tester can be connected to the physical interface of a packet or circuit switch, as well as a leased line data circuit as illustrated in Figure 3-1.

![Figure 3-1 Monitoring at a WAN Interface](image)

**NOTE**

WAN Test Port 2 does not support control and data lead status display via the LED's on the front panel.

Loading an Application

Example:
Load the SDLC/SNA Monitor program on AP #1 to monitor data on the WAN interface.

When the application has finished loading:
3.2 Emulating at a WAN Interface (Interactive Testing)

![Diagram of WAN test ports and implementation under test]

**NOTE**

WAN Test Port 2 does not support control and data lead status display via the LED's on the front panel.

---

Loading an Application

Example:
Load the BSC 3270 Emulation program on AP #1 to emulate data transfer on the WAN interface.

When the application has finished loading:
3.3 Monitoring at the Basic Rate Access

Figure 3-3 Monitoring at the Basic Rate Access Using a Y-Cable
Figure 3-4 Monitoring at the Basic Rate Access Without a Y-Cable
Configuring the Interface

- Voice Encoding

If a phone is connected to the back of the tester, the voice encoding method must be selected in order to successfully monitor a B-Channel.

- **A LAW**
  - Selects encoding according to Rec. G.711 A-law.

- **U LAW**
  - Selects encoding according to Rec. G.711 μ-law.
Loading an Application

ISDN is the only application that can be loaded on the D–Channel (refer to Section 4.1). Applications can also be loaded on either the B1 or B2–Channel.

Example:
Load the X.25 Monitor program on AP #2 to monitor data on the B2–Channel.

When the application has finished loading:
3.4 Emulating at the Basic Rate Access (Interactive Testing)

Figure 3-5 Emulating at the Basic Rate Access

Setting the Termination Impedance

The position of the termination impedance switch depends both on the position of the tester on the S/T bus and the configuration of the S/T bus itself.

\[\text{NOTE}\]

Ensure that the S/T bus is properly terminated and is a valid bus configuration (Refer to CCITT Rec. 1.430).
Set to 100 ohm:
- if emulating an NT1.

- if emulating a TE1 or TA on an S/T bus **without** a terminating resistor.

Set to Hi-Z:
- if emulating a TE1 or TA on an S/T bus **with** a terminating resistor, or
- if emulating a TE1 or TA in the middle of the S/T bus.
Configuring the Interface

For ISDN D–Channel User (TE) Emulation:

For ISDN D–Channel Network (NT) Emulation:

NOTE

Each BRA/BRA configuration port is independent.
→ **Bus Configuration**

**POINT TO MULTIPOINT**

Restricts the timing skew between transmit and receive S/T bus frames to that defined for a point to multipoint configuration (Rec. 1.430).

**POINT TO POINT**

Allows more timing skew between transmit and receive S/T bus frames for a point to point configuration (Rec. 1.430).

→ **Voice Encoding**

If a phone is connected to the back of the tester, the voice encoding method must be selected in order to talk (establish a voice connection) over a B-Channel.

**A LAW**

Selects encoding according to Rec. G.711 A-law.

**U LAW**

Selects encoding according to Rec. G.711 μ-law.

→ **Power Source**

If the terminal device requires power to be supplied from the NT, powering for PS1 (phantom power applied to the center taps between pins 3, 6 and 4, 5) and/or PS2 (pins 7, 8) must be selected. Total maximum continuous output power is 6 Watts (PS1 + PS2).

**OFF**

Supplies no power on the selected circuit.

**FORWARD**

Supplies power of normal polarity on the selected circuit.

**REVERSE**

Supplies power with reverse polarity (for testing the emergency response of a terminal).

⚠️ **NOTE**

**FORWARD** and **REVERSE** polarity are defined according to CCITT Rec. 1.430 specifications. Some National specifications may be different.
Loading an Application

ISDN is the only application that can be loaded on the D-Channel (refer to Section 5.1). Applications can also be loaded on either the B1 or B2-Channel.

Example:
Load the X.25 Emulation program on AP #1 to emulate data transfer on the B1-Channel.

---

**B1-Channel**

| F4 |

**B1-Channel**

| F2 |

Load AP #1

---

**B-Chan Emulation Applications**

- Universal
- SDLC
- X.25
- X.25 LOAD GEN
- X.75
- V.110
- Group 4 Fax
- V.120

**Verification Applications:**
- SDLC/SNA

**Conformance Applications:**
- Universal
- X.25
- Group 4 Fax

---

F1

Load on AP #1

---

PT500 User Manual

IDACOM
When the application has finished loading:

![Switch to AP #1]

3.5 Monitoring at the Primary Rate Access

The tester can monitor at the Primary Rate access for either the T1 or CEPT rate.

**T1 – Using Bantam Jacks**

![Figure 3-6 Monitoring at the Primary Rate Access – (T1) Bantam]
T1 — Using RJ-48C Connectors

Figure 3-7 Monitoring at the Primary Rate Access — (T1) RJ-48C
CEPT - Using DB-9 Connectors

NOTE
It is also possible to monitor using the configurations illustrated in Section 3.6.

Signal Levels
The minimum input signal level is approximately 1Vpk-pk (500mVpk). Signals below this level cause the receiver(s) to go into the 'loss of signal level' condition. This allows a maximum of about 50 feet of cable between a standard DSX-1 monitor access point and the tester.
System Configuration

System Setup Menu

Port Status: Port A RED Alarm & Loss of Signal Level
Port B RED Alarm & Loss of Signal Level

System Operating Parameters:

- Operating Mode: MONITOR
- Encoding Scheme: T1 ESF
- Idle Chan Char: ---
- Ts Bit Rate: 64 kbps

Port A Transceiver:
- Clock Source: LOOP
- Connector Config.:
- Transmit Equal.:

Port B Transceiver:
- Clock Source: LOOP
- Connector Config.:
- Transmit Equal.:

→ Framing Format

T1 Interface
Supports 24 multiplexed channels with a data rate of 1.544 Mbps.

T1 D4
Uses 12 frames per multiframe. No robbed or common channel BOS (bit-oriented signalling) supported.

T1 D4 4F/M
Uses 4 frames per multiframe. The Fs bit (signalling channel framing bit) is set to 1 on the transmitter and is ignored on the receiver.

NOTE
The T1 D4 4F/M framing format requires a hardware modification and may not be supported on all units.
### T1 ESF (default)
Extended Super Frame. Uses 24 frames per multiframe with embedded CRC-6 error checking. No robbed or common channel BOS supported.

### CEPT Interface
Supports 32 multiplexed channels with a data rate of 2.048 Mbps.

- **PCM30 CCS**
  Clear Channel Signalling. Uses 16 frames per multiframe. Timeslot 16 does not carry the channel alignment signal (CAS).

- **PCM30 CAS**
  Uses 16 frames per multiframe. Timeslot 16 contains the CAS.

### CRC4
Uses 16 frames per multiframe with embedded CRC4 error checking and multiframing.

#### NOTE
The PCM30 CCS framing format requires a hardware modification and may not be supported on all units.

#### Encoding Scheme
- **AMI (T1/CEPT)**
  Alternate Mark Inversion.

- **B8ZS (T1) (default)**
  Bipolar Eight Zero Substitution. Prevents transmission of an all zero octet on the line.

- **HDB3 (CEPT)**
  High Density Bipolar Three zero substitution. Prevents transmission of four consecutive zero bits on the line.

#### Idle Chan Char
Not applicable for monitor mode.

#### Impedance
For T1 framing format, impedance can be set to 100 OHMS or HI-IMPED (default).

For CEPT framing, impedance can be set to 120 OHMS, 75 OHMS, or HI-IMPED (default).
→ **TS Bit Rate**  
Selects whether the timeslot bit rate for a T1 interface is 64 kbps (default) or 56 kbps.

→ **Clock Source**  
Indicates the clock source for Ports A and B, respectively (fixed as LOOP/LOOP for monitor mode).

⚠️ **NOTE**  
*If the above selections have been properly set for T1 or CEPT framing and a physical connection has been made to the connector module, the Port Status shows 'Synchronized' for both Port A and Port B receivers.*

→ **Connector Config.**  
Not applicable for monitor mode.

→ **Transmit Equal.**  
Not applicable for monitor mode.
<table>
<thead>
<tr>
<th>Status Message</th>
<th>Descriptions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Red Alarm (T1) Loss of Synchronization (CEPT)</td>
<td>Local receiver has lost synchronization of incoming signal</td>
</tr>
<tr>
<td>Red Alarm &amp; Loss of Signal Level (T1)</td>
<td>Loss of sync and signal level, no signal is detected at the receiver</td>
</tr>
<tr>
<td>Yellow Alarm (T1)</td>
<td>Remote receiver has lost synchronization and signal level and generates a Yellow Alarm</td>
</tr>
<tr>
<td>RAI (CEPT)</td>
<td>RAI (remote alarm indication) remote receiver had lost sync and generates an RAI</td>
</tr>
<tr>
<td>Blue Alarm</td>
<td>In the Blue Alarm state, the tester sends out continuous 1’s to remain in clock synchronization, but no data frames are being transferred</td>
</tr>
<tr>
<td>AIS</td>
<td>AIS (alarm indication signal) can only be generated by the tester and cannot be detected</td>
</tr>
<tr>
<td>Out of Frame</td>
<td>Temporary loss of sync (if more than 2.5 seconds, the receiver goes into the Red Alarm state)</td>
</tr>
<tr>
<td>Buffer Overflow</td>
<td>Internal FIFO buffer has overflowed (application in Drop &amp; Insert mode with regeneration ‘ON’ in emulation loopback)</td>
</tr>
<tr>
<td>Synchronized</td>
<td>Receiver is in sync</td>
</tr>
<tr>
<td>Lost Phase Locked Loop</td>
<td>Receiver clock recovery circuit cannot lock on signal</td>
</tr>
</tbody>
</table>

Table 3–1 Alarm and Status Messages
Channel Setup

Channel Setup Menu

- Channel : Test Chan 1
- Drop and Insert Mode :
  - Channel Submode ---

Specify Parameters :
- PRA Port ---
- Timeslot 24
- Inverted HDLC YES
- Voice Encoding ---

Current Parameters :
- PRA Port A/B
- Timeslot ---
- Inverted HDLC ---
- Voice Encoding ---

Configure Test Chan :
Assign Parameters
Application : None Loaded

Channel
Selects the appropriate test channel (Test Chan 1 or 2, External Chan, or Voice Chan) for modifying parameters and/or loading an application.

Specify Parameters:

- PRA Port
Not applicable for monitor mode.

- Timeslot
Specifies the appropriate 64 kbps D or B-Channel timeslot. Valid values are 1 through 24 for T1, and 1 through 31 for CEPT. Up to four timeslots can be assigned to Test Chan 1 or 2 to increase the bit rate (eg. 4 timeslots with the TS bit rate set to 64 Kbps now runs at 256 Kbps).

- NOTE
For PCM30 CAS, timeslot 16 is not a clear data channel because it contains the multiframe alignment signal.
**TESTING CONFIGURATIONS**

Inverted HDLC
Selects whether to invert bit values (default) on the selected channel prior to monitoring.

**Voice Encoding** (Voice Channel only)

* A-LAW
  Selects encoding according to Rec. G.711 A-law.

* SIGN-MAG
  Selects µ-law with sign magnitude data format.

* u-LAW
  Selects encoding according to Rec. G.711 µ-law.

**Configure Test Chan:**

Assign Parameters
Assigns either the default parameters or those specified by the user. If the default parameters are not applicable, ensure changes are made prior to assigning parameters. After assigning, the 'Current Parameters' take on the values under 'Specify Parameters'.

---

**NOTE**

* The error message 'Channel and port have already been assigned' is displayed if the timeslot is already allocated by the other test channel.

---

**Loading an Application**

Example:
Load the ISDN D-Channel Monitor application on TC #1 to monitor data on the PRA interface.
Channel Setup Menu

Channel: Test Chan 1
Drop and Insert Mode: Channel Subnode ---

Specify Parameters:
PRA Port ---
Timeslot 24
Inverted HDLC YES
Voice Encoding ---

Current Parameters:
PRA Port A/B
Timeslot 24
Inverted HDLC YES
Voice Encoding ---

Configure Test Chan: Configure Test Chan 
Assign Parameters: Application: None Loaded

F1
Load Application on TC #1

PRA Monitor Applications

Universal X.25 Frame Relay
SOLC/SNA X.25/0 DASS2
Group 4 Fax X.75 DPNSS
Switched D Channel 55/7 TELETEX

Statistic Applications:
SOLC/SNA X.25

F1
Load Application

When the application has finished loading:

F2
Switch to TC #1
Monitoring Layer 1 Errors

It is possible to monitor layer 1 errors whether the interface is configured as monitor, emulation, or drop & insert. The Layer 1 Error Monitor Menu reports defined layer 1 errors for the selected interface.

Report:

→ Action
Turns the error report on or off.

Error Monitoring Timers:

→ Interval
Specifies the time, in tenths of seconds, between error report updates (default is 5 seconds).

→ Duration
Selects whether the total duration of the error reporting period is 5, 10, 15, 30, or 60 minutes, or continuous. The clock is the countdown timer (in tenths of seconds); totals are frozen when the clock reaches 0.
Reported Errors:
Errors are tabulated for each time interval as well as the cumulative total for the duration of the reporting period. At the end of each reporting period, the total values are frozen, however, the interval values continue to be updated.

→ Bipolar Violation
Counts bipolar violations (valid for all framing formats).

→ Frame Error
Counts errors in the framing bits (valid for all framing formats).

→ CRC Error
Counts invalid CRC bits (valid for ESF and CRC4 framing).

→ Multiframe Error
Counts errors in the multiframe alignment pattern (valid for CEPT CRC4 framing).

→ S Bit Error
Counts errors in the signalling framing bits (valid for D4 framing).
3.6 Emulating at the Primary Rate Access

The tester provides dual port emulation to Primary Rate access user and network equipment.

T1 – Using Bantam Jacks

Figure 3-9  Emulating at the Primary Rate Access – (T1) Bantam
T1 – Using RJ-48C Connectors

![Diagram showing connection between USR and NET](image)

**Figure 3-10** Emulating at the Primary Rate Access – (T1) RJ-48C

**NOTE**
The transmit and receive directions can be reversed on the DB-9 and RJ-48C connectors (see Connector Config. on the System Setup Menu).
CEPT – Using DB–9 Connectors

NOTE
It is also possible to monitor using these configurations without physically disconnecting from the line.
System Configuration

Port Status: Port A Loss of Sync & Loss of Signal Level
Port B Loss of Sync & Loss of Signal Level

System Operating Parameters:

- Operating Mode: EMULATION
- Encoding Scheme: HDB3
- Impedance: 120 OHMS
- Framing Format: CEPT CRC4
- Idle Chan Char: 55
- Ts Bit Rate: 64 kbps

Port A Transceiver:
- Clock Source: LOOP
- Connector Config.: USER
- Transmit Equal.: G.703

Port B Transceiver:
- Clock Source: LOCAL
- Connector Config.: NETWORK
- Transmit Equal.: G.703

Framing Format

T1 Interface
Supports 24 multiplexed channels with a data rate of 1.544 Mbps.

T1 D4
Uses 12 frames per multiframe. No robbed or common channel BOS (bit-oriented signalling) supported.

T1 D4 4F/M
Uses 4 frames per multiframe. The Fs bit (signalling channel framing bit) is set to 1 on the transmitter and is ignored on the receiver.

NOTE
The T1 D4 4F/M framing format requires a hardware modification and may not be supported on all units.
T1 ESF (default)  Extended Super Frame. Uses 24 frames per multiframe with embedded CRC-7 error checking. No robbed or common channel BOS supported.

CEPT Interface
Supports 32 multiplexed channels with a data rate of 2.048 Mbps.

- **PCM30 CCS**  Clear Channel Signalling. Uses 16 frames per multiframe. Timeslot 16 does not contain the channel alignment signal (CAS).

- **PCM30 CAS**  Uses 16 frames per multiframe. Timeslot 16 contains the CAS.

- **CEPT CRC4**  Uses 16 frames per multiframe with embedded CRC4 error checking and multiframing.

→ **Encoding Scheme**
- **AMI (T1/CEPT)**  Alternate Mark Inversion.
- **B8ZS (T1) (default)**  Bipolar Eight Zero Substitution. Prevents the transmission of an all zero octet on the line.
- **HDB3 (CEPT)**  High Density Bipolar Three zero substitution. Prevents transmission of four consecutive zero bits on the line.

→ **Idle Chan Char**
Specifies the character transmitted in idle timeslots. Valid values are hex 0 through FF.

→ **Impedance**
For T1 framing, the impedance is 100 OHMS.

For CEPT framing, impedance can be set to 120 OHMS (symmetrical pair) or 75 OHMS (coax cable).

⚠️ **NOTE**
*If the previous selections have been properly set for T1 or CEPT framing and a physical connection has been made to the connector module, the Port Status shows 'Synchronized' for either the Port A or Port B receiver, as appropriate.*
TS Bit Rate
Selects whether the timeslot bit rate for a T1 interface is 64 kbps (default) or 56 kbps.

Clock Source
Selects the clock source for Port A and Port B transmitters respectively. Timing for a particular port is LOOP (user) if the transmit clock is recovered from the incoming facility. Timing is LOCAL (network) if the transmit clock is provided by the tester to the facility.

Connector Config.
Changes the default configuration (User for Port A, Network for Port B) and reverses the transmit and receive directions on the RJ-48C and DB-9.

NOTE
When using Bantam connectors select BANTAM. The 'DATA IN' and 'DATA IN' jacks are hardwired into the transceivers. A selection of User or Network is not relevant.

Transmit Equal.
For T1 framing, the transmitted pulse shape can be selected to compensate for different line lengths (transmit equalization):
- 0 - 133 ft.
- 133 - 266 ft.
- 266 - 399 ft.
- 399 - 533 ft.
- 533 - 655 ft.

For CEPT framing, transmit equalization is set according to CCITT Recommendation G.703.
<table>
<thead>
<tr>
<th>Status Message</th>
<th>Descriptions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Red Alarm (T1)</td>
<td>Loss of Synchronization (CEPT)</td>
</tr>
<tr>
<td>Loss of Synchronization</td>
<td>Local receiver has lost synchronization of incoming signal</td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td>Red Alarm &amp; Loss of Signal Level (T1)</td>
<td>Loss of sync and signal level, no signal is detected at the receiver</td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td>Yellow Alarm (T1)</td>
<td>Remote receiver has lost synchronization and signal level and generates a Yellow Alarm</td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td>RAI (CEPT)</td>
<td>RAI (remote alarm indication) remote receiver had lost sync and generates an RAI</td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td>Blue Alarm</td>
<td>In the Blue Alarm state, the tester sends out continuous 1’s to remain in clock synchronization, but no data frames are being transferred</td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td>AIS</td>
<td>AIS (alarm indication signal) can only be generated by the tester and cannot be detected</td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td>Out of Frame</td>
<td>Temporary loss of sync (if more than 2.5 seconds, the receiver goes into the Red Alarm state)</td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td>Buffer Overflow</td>
<td>Internal FIFO buffer has overflowed (application in Drop &amp; Insert mode with regeneration 'ON' in emulation loopback)</td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td>Synchronized</td>
<td>Receiver is in sync</td>
</tr>
<tr>
<td>Lost Phase Locked Loop</td>
<td>Receiver clock recovery circuit cannot lock on signal</td>
</tr>
</tbody>
</table>

Table 3–2 Alarm and Status Messages
Ports Setup

Port
Selects the physical port as either PORT A or PORT B for menu selections.

Transmit Mode
DEFAULT
Places all channels into the idle mode with the exception of any channels previously assigned to an application (see Transmit Mode Menu).

RECEIVE LOOPBACK
Transmits received data on all channels.

ALL IDLE
Places all channels in the idle mode (i.e. the idle character is transmitted in all channels).

Menu
Displays the Transmit Mode Menu. A transmit mode can be assigned to the individual channels.
TESTING CONFIGURATIONS

January 1992

Transmit Mode Menu

<table>
<thead>
<tr>
<th>System Status</th>
<th>Mode</th>
<th>EMULATION</th>
<th>Framing</th>
<th>PCM30</th>
</tr>
</thead>
<tbody>
<tr>
<td>Port A</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Port B</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Status</td>
<td>Synchronized</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Port Transmit Mode

<table>
<thead>
<tr>
<th>Channel</th>
<th>Mode</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chan. 1</td>
<td>IDLE</td>
</tr>
<tr>
<td>Chan. 2</td>
<td>IDLE</td>
</tr>
<tr>
<td>Chan. 3</td>
<td>IDLE</td>
</tr>
<tr>
<td>Chan. 4</td>
<td>IDLE</td>
</tr>
<tr>
<td>Chan. 5</td>
<td>IDLE</td>
</tr>
<tr>
<td>Chan. 6</td>
<td>IDLE</td>
</tr>
<tr>
<td>Chan. 7</td>
<td>IDLE</td>
</tr>
<tr>
<td>Chan. 8</td>
<td>IDLE</td>
</tr>
<tr>
<td>Chan. 9</td>
<td>IDLE</td>
</tr>
<tr>
<td>Chan. 10</td>
<td>IDLE</td>
</tr>
<tr>
<td>Chan. 11</td>
<td>IDLE</td>
</tr>
<tr>
<td>Chan. 12</td>
<td>IDLE</td>
</tr>
<tr>
<td>Chan. 13</td>
<td>IDLE</td>
</tr>
<tr>
<td>Chan. 14</td>
<td>IDLE</td>
</tr>
<tr>
<td>Chan. 15</td>
<td>IDLE</td>
</tr>
<tr>
<td>Chan. 16</td>
<td>IDLE</td>
</tr>
<tr>
<td>Chan. 17</td>
<td>IDLE</td>
</tr>
<tr>
<td>Chan. 18</td>
<td>IDLE</td>
</tr>
<tr>
<td>Chan. 19</td>
<td>IDLE</td>
</tr>
<tr>
<td>Chan. 20</td>
<td>IDLE</td>
</tr>
<tr>
<td>Chan. 21</td>
<td>IDLE</td>
</tr>
<tr>
<td>Chan. 22</td>
<td>IDLE</td>
</tr>
<tr>
<td>Chan. 23</td>
<td>IDLE</td>
</tr>
<tr>
<td>Chan. 24</td>
<td>IDLE</td>
</tr>
<tr>
<td>Chan. 25</td>
<td>IDLE</td>
</tr>
<tr>
<td>Chan. 26</td>
<td>IDLE</td>
</tr>
<tr>
<td>Chan. 27</td>
<td>IDLE</td>
</tr>
<tr>
<td>Chan. 28</td>
<td>IDLE</td>
</tr>
<tr>
<td>Chan. 29</td>
<td>IDLE</td>
</tr>
<tr>
<td>Chan. 30</td>
<td>IDLE</td>
</tr>
<tr>
<td>Chan. 31</td>
<td>IDLE</td>
</tr>
</tbody>
</table>

Port

Selects the physical port as either PORT A or PORT B for menu selections.

Port Transmit Mode

DEFAULT

Places all channels into the idle mode with the exception of any channels previously assigned to an application (see Transmit Mode Menu).

RECEIVE LOOPBACK

Transmits received data on all channels.

ALL IDLE

Places all channels in the idle mode (i.e. the idle character is transmitted in all channels).
→ Regeneration

**ON**

Each timeslot can be selectively set to LPBK or IDLE, or assigned to Test Chan 1 or 2, External Chan, or Voice Chan. The tester regenerates the F-bit for the T1 interface, and timeslot 0 for CEPT.

**OFF** *(default)*

The entire data stream is looped back and only signal levels are regenerated.

⚠️ **NOTE**

Regeneration can only be selected when Port Transmit Mode is RECEIVE LOOPBACK.

→ Chan. 1–24 (T1) or 1–31 (CEPT)

Timeslot(s) (1 to 24 for T1 or 1 to 31 for CEPT) can be selectively set to transmit:

- data looped back from the receiver (LPBK);
- the idle character (IDLE); or
- data from the assigned channel *(Test Chan 1 or 2, External, or Voice)*.

**LPBK**

Individual timeslot transmits data looped back from the receiver. Suspends data transmission from the assigned channel.

**IDLE**

Individual timeslot transmits idle character. Suspends data transmission from the assigned channel.

**APPL**

Activates the Test Channel if suspended.

**EXT**

Activates the External Channel if suspended.

**VOICE**

Activates the Voice Channel if suspended.

**GROUP LPBK**

These timeslots transmit data looped back from the receiver. Suspends data transmission from the assigned channel.

**GROUP IDLE**

These timeslots transmit idle character. Suspends data transmission from the assigned channel.
GROUP APPL

Activates data transmission from the assigned channel if suspended

☐ Press Exit.

→ Regeneration

ON

The tester regenerates the F-bit for the T1 interface, and timeslot 0 for CEPT.

OFF (default)

The entire data stream is looped back and only signal levels are regenerated.

⚠️ NOTE

Regeneration can only be selected when Transmit Mode is RECEIVE LOOPBACK.

The following transmit bit selections are available for the CEPT interface only.

CEPT PCM30 and CRC4

→ National

Bits allocated for national use cannot be used internationally. On a digital path crossing an international border or when not being used, set all bits to 1 (refer to CCITT table 1a/G.704).

CEPT CRC4

→ SI 1

Should be set to 1 on digital paths crossing an international border. It can be used nationally if the digital path does not cross a border (refer to CCITT table 1b/G.704).

→ SI 2

Should be set to 1 on digital paths crossing an international border. It can be used nationally if the digital path does not cross a border (refer to CCITT table 1b/G.704).

CEPT PCM30

→ International

Should be set to 1 on digital paths crossing an international border. It can be used nationally if the digital path does not cross a border (refer to CCITT table 1b/G.704).
NOTE
The same type of information is also displayed for received bits.

Channel Setup

Channel : Test Chan 1
Drop and Insert Mode:
Channel Submode

Specify Parameters:
PRA Port PORT A
Timeslot 24
Inverted HDLC YES
Voice Encoding

Current Parameters:
PRA Port
Timeslot
Inverted HDLC
Voice Encoding

Configure Test Chan:
Application: None Loaded
Assign Parameters

→ Channel
Selects the appropriate test channel (Test Chan 1 or 2, External Chan, or Voice Chan) for modifying parameters and/or loading an application.

Specify Parameters:
→ PRA Port
Specifies from which port the channel is accessed.
TESTING CONFIGURATIONS

January 1992

→ **Timeslot**
Specifies the appropriate 64 kbps D or B-Channel timeslot. Valid values are 1 through 24 for T1, and 1 through 31 for CEPT. Up to four timeslots can be assigned to Test Chan 1 or 2 to increase the bit rate (eg. 4 timeslots with the TS bit rate set to 64 Kbps now runs at 256 Kbps).

⚠️ **NOTE**
*For CEPT PCM30, timeslot 16 is not a clear data channel because it contains the multiframe alignment signal.*

→ **Inverted HDLC**
Selects whether to invert bit values of both the transmit and receive directions on the selected channel.

→ **Voice Encoding** (Voice Channel only)
- **A-LAW** Selects encoding according to Rec. G.711 A-law.
- **SIGN-MAG** Selects µ-law with sign magnitude data format.
- **u-LAW** Selects encoding according to Rec. G.711 µ-law.

**Configure Test Chan:**
→ **Assign Parameters**
Assigns either the default parameters or those specified by the user. If the default parameters are not applicable, ensure changes are made prior to assigning parameters. After assigning, the 'Current Parameters' take on the values under 'Specify Parameters'.

⚠️ **NOTE**
The error message 'Channel and port have already been assigned' is displayed if the timeslot is already allocated by the other test channel or external access.
Loading an Application

Example:
Load the ISDN D-Channel Emulation application on TC #2 to emulate data transfer on the PRA interface.

Channel Setup Menu

Channel: Test Chan 1
Drop and Insert Mode:
Channel Submode ---

Specify Parameters:
Current Parameters:
PRA Port PORT A
Timeslot 24
Inverted HDLC YES
Voice Encoding ---

Configure Test Chan:
Assign Parameters

< Application: None Loaded

Load Application on TC: #2

PRA Emulation Applications:

Universal X.25 X.75 Frame Relay
Group 4 Fax X.25 LOAD GEN SDLC DASS2
♦ ISDN D Channel SS#7 DPNSS

Verification Applications:
SDLC/SNA

Conformance Applications:
Universal X.25 SS#7 ISDN D Channel
When the application has finished loading:

```
<table>
<thead>
<tr>
<th>F2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Switch to TC #2</td>
</tr>
</tbody>
</table>
```

## Simulating Layer 1 Errors

It is possible to simulate layer 1 errors when the interface is configured as emulation or drop & insert mode.

```
<table>
<thead>
<tr>
<th>F2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Error Simulate</td>
</tr>
</tbody>
</table>
```

### Layer 1 Error Generation

<table>
<thead>
<tr>
<th>System Status</th>
<th>Mode</th>
<th>EMULATION</th>
<th>Framing</th>
<th>PCM30</th>
</tr>
</thead>
<tbody>
<tr>
<td>Port PORT A</td>
<td>Status</td>
<td>Loss of Sync &amp; Loss of Signal Level</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Alarm Generation:**
- Yellow Alarm/RAI: OFF
- Blue Alarm/AIS: OFF

**Error Generation:**

<table>
<thead>
<tr>
<th>Status</th>
<th># Generated Errors</th>
<th>Total Time (Sec)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bipolar Violation</td>
<td>OFF</td>
<td>0</td>
</tr>
<tr>
<td>Frame Error</td>
<td>---</td>
<td>---</td>
</tr>
<tr>
<td>CRC Error</td>
<td>---</td>
<td>---</td>
</tr>
<tr>
<td>Multiframe Error</td>
<td>---</td>
<td>---</td>
</tr>
<tr>
<td>S Bit Error</td>
<td>---</td>
<td>---</td>
</tr>
</tbody>
</table>

→ **Port**

Selects the physical port as PORT A or PORT B.

**Alarm Generation:**

→ **Yellow Alarm/RAI**

Generates a continuous yellow alarm on the selected port – RAI (remote alarm indication) in CEPT modes.
→ Blue Alarm/AIS
Generates a continuous blue alarm on the selected port – AIS (alarm indication signal) in CEPT modes.

Error Generation:
→ Bipolar Violation
Generates bipolar violations (valid for all framing formats).

→ Frame Error
Generates errors in the framing bits (valid for all framing formats except PCM30).

→ CRC Error
Generates invalid CRC bits (valid for the ESF and CRC4 framing).

→ Multiframe Error
Generates errors in the multiframe alignment pattern (valid for CEPT CRC4 framing).

→ S Bit Error
Generates errors in the signalling framing bits (valid for D4 framing).

The following function keys are available for all items under Error Generation.

OFF
Turns off the error generation for the specified type of error.

ON
Turns on the error generation for the specified type of error.

# Generated Errors
Specifies the number of consecutive errors to be generated.

Total Time
Specifies the time interval to generate errors.

Burst Mode
Selects the burst mode of error transmission. A burst of errors is transmitted each time the error generation is turned on.
Tone Generation

After allocating a voice channel to a timeslot, a tone can be selected from the Tone Generation Menu.

### Tone Generation Menu

<table>
<thead>
<tr>
<th>System Status</th>
<th>Mode</th>
<th>EMULATION</th>
<th>Framing</th>
<th>PCM30</th>
<th>Channel</th>
<th>Status</th>
<th>Loss of Sync &amp; Loss of Signal Level</th>
</tr>
</thead>
<tbody>
<tr>
<td>Port PORT A</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Tones:**
- Audible Ring: OFF
- Busy: OFF
- Call Wait: OFF
- Confirm: OFF
- Dial: OFF
- Intercept: OFF
- Reorder: OFF
- Special Audible Ring: OFF
- Busy Verify: OFF
- Busy Verify Start: OFF
- Busy Verify Cycle: OFF
- Executive Override: OFF
- Recall Dial: OFF
3.7 Drop & Insert at the Primary Rate Access

NOTE
The physical connection is the same as emulation. Refer to Section 3.6.

System Configuration

```
| Port Status: | Port A | Loss of Sync & Loss of Signal Level |
| Port B | Loss of Sync & Loss of Signal Level |

System Operating Parameters:

- Operating Mode: DROP&INS
- Encoding Scheme: HDB3
- Framing Format: CEPT CRC4
- Idle Char Char: 55
- Ts Bit Rate: 64 kbps

Port A Transceiver:
- Clock Source: LOOP
- Connector Config.: USER
- Transmit Equal.: 0.703

Port B Transceiver:
- Clock Source: LOOP
- Connector Config.: NETWORK
- Transmit Equal.: 0.703
```
→ Framing Format

T1 Interface
Supports 24 multiplexed channels with a data rate of 1.544 Mbps.

T1 D4
Uses 12 frames per multiframe. No robbed or common channel BOS (bit oriented signalling) supported.

T1 D4 4F/M
Uses 4 frames per multiframe. The Fs bit (signalling channel framing bit) is set to 1 on the transmitter and is ignored on the receiver.

 NOTE
The T1 D4 4F/M framing format requires a hardware modification and may not be supported on all units.

T1 ESF (default)
Extended Super Frame. Uses 24 frames per multiframe with embedded CRC–6 error checking. No robbed or common channel BOS supported.

CEPT Interface
Supports 32 multiplexed channels with a data rate of 2.048 Mbps.

PCM30 CCS
Clear Channel Signalling. Uses 16 frames per multiframe. Timeslot 16 does not contain the channel alignment signal (CAS).

PCM30 CAS
Uses 16 frames per multiframe. Timeslot 16 contains the CAS.

CRC4
Uses 16 frames per multiframe with embedded CRC4 error checking.

→ Encoding Scheme

AMI (T1/CEPT)
Alternate Mark Inversion.

B8ZS (T1) (default)
Bipolar Eight Zero Substitution. Prevents the transmission of an all zero octet on the line.

HDB3 (CEPT)
High Density Bipolar Three zero substitution. Prevents transmission of four consecutive zero bits on the line.
NOTE

If the previous selections have been properly set for T1 or CEPT framing and a physical connection has been made to the connector module, the Port Status shows ‘Synchronized’ for both Port A and Port B receivers.

→ Idle Chan Char
Specifies the character transmitted in idle timeslots. Valid values are hex 0 through FF.

→ Impedance
For T1 framing, the impedance is 100 OHMS.

For CEPT framing, impedance can be set to 120 OHMS (symmetrical pair) or 75 OHMS (coax cable).

→ TS Bit Rate
Selects whether the timeslot bit rate for a T1 interface is 64 kbps (default) or 56 kbps.

→ Clock Source
Selects the clock source for Port A and Port B transmitters respectively. Timing for a particular port is LOOP (user) if the transmit clock is recovered from the incoming facility. Timing is LOCAL (network) if the transmit clock is provided by the tester to the facility.

→ Connector Config.
Changes the default configuration (User for Port A, Network for Port B) and reverses the transmit and receive directions on the RJ-48C and DB-9. When using Bantam connectors, BANTAM should be selected.

→ Transmit Equal.
For T1 framing, the transmitted pulse shape can be selected to compensate for different line lengths (transmit equalization):
- 0 – 133 ft.
- 133 – 266 ft.
- 266 – 399 ft.
- 399 – 533 ft.
- 533 – 655 ft.

For CEPT framing, transmit equalization is set according to CCITT Recommendation G.703.
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<thead>
<tr>
<th>Status Message</th>
<th>Descriptions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Red Alarm (T1)</td>
<td>Local receiver has lost synchronization of incoming signal</td>
</tr>
<tr>
<td>Loss of Synchronization (CEPT)</td>
<td></td>
</tr>
<tr>
<td>Red Alarm &amp; Loss of Signal Level (T1)</td>
<td>Loss of sync and signal level, no signal is detected at the receiver</td>
</tr>
<tr>
<td>Yellow Alarm (T1)</td>
<td>Remote receiver has lost synchronization and signal level and generates a Yellow Alarm</td>
</tr>
<tr>
<td>RAI (CEPT)</td>
<td>RAI (remote alarm indication) remote receiver had lost sync and generates an RAI</td>
</tr>
<tr>
<td>Blue Alarm</td>
<td>In the Blue Alarm state, the tester sends out continuous 1’s to remain in clock synchronization, but no data frames are being transferred</td>
</tr>
<tr>
<td>AIS</td>
<td>AIS (alarm indication signal) can only be generated by the tester and cannot be detected</td>
</tr>
<tr>
<td>Out of Frame</td>
<td>Temporary loss of sync (if more than 2.5 seconds, the receiver goes into the Red Alarm state)</td>
</tr>
<tr>
<td>Buffer Overflow</td>
<td>Internal FIFO buffer has overflowed (application in Drop &amp; Insert mode with regeneration ‘ON’ in emulation loopback)</td>
</tr>
<tr>
<td>Synchronized</td>
<td>Receiver is in sync</td>
</tr>
<tr>
<td>Lost Phase Locked Loop</td>
<td>Receiver clock recovery circuit cannot lock on signal</td>
</tr>
</tbody>
</table>

Table 3–3  Alarm and Status Messages
Ports Setup

→ Port
Selects the physical port as either PORT A or PORT B for menu selections.
Transmit Mode

DEFAULT

Places all channels in the pass through mode with the exception of any channels previously assigned to an application (see Transmit Mode Menu).

ALL PASS THROUGH

Places all channels in the pass through mode (i.e. all data received in the channel is retransmitted to its original destination).

ALL IDLE

Places all channels in the idle mode (i.e. all data received in the channel is lost and the idle character is sent in the transmit direction).

Menu

Displays the Transmit Mode Menu. A transmit mode can be assigned to the individual channels.
→ Port
Selects the physical port as either Port A or Port B for menu selection.

→ Port Transmit Mode
DEFAULT
Places all channels in the pass through mode with the exception of any channels previously assigned to an application (see Transmit Mode Menu).

ALL PASS THROUGH
Places all channels in the pass through mode (i.e. all data received in the channel is retransmitted to its original destination).

ALL IDLE
Places all channels in the idle mode (i.e. all data received in the channel is lost and the idle character is sent in the transmit direction).

→ Regeneration
Not applicable for drop and insert mode.

→ Chan. 1–24 (T1) or 1–31 (CEPT)
Timeslot(s) (1 to 24 for T1) or (1 to 31 for CEPT) can be selectively set to transmit:
• data passed through from the receiver;
• the idle character (IDLE); or
• data from the assigned channel (Test Chan 1 or 2, External, or Voice).

PASS
Individual timeslot transmits data passed through from the receiver. Suspends data transmission from assigned channel.

IDLE
Individual timeslot transmits idle character. Suspends data transmission from the assigned channel.

APPL
Activates the Test Channel if suspended.

EXT
Activates the External Channel if suspended.

VOICE
Activates the Voice Channel if suspended.
**GROUP PASS**

Transmits data passed through from the receiver. Suspends data transmission from the assigned channel.

**GROUP IDLE**

Transmits idle character. Suspends data transmission from the assigned channel.

**GROUP APPL**

Activates data transmission from the assigned channel if suspended.

- Press Exit.

→ *Regeneration*

Not applicable for drop and insert mode.

The following transmit bit selections are available for the CEPT interface only.

**CEPT PCM30 and CRC4**

→ *National*

Bits allocated for national use cannot be used internationally. On a digital path crossing an international border or when not being used, set all bits to 1 (refer to CCITT table 1a/G.704).

**CEPT CRC4**

→ *S1 1*

Should be set to 1 on digital paths crossing an international border. It can be used nationally if the digital path does not cross a border (refer to CCITT table 1b/G.704).

→ *S1 2*

Should be set to 1 on digital paths crossing an international border. It can be used nationally if the digital path does not cross a border (refer to CCITT table 1b/G.704).
CEPT PCM30

→ International
Should be set to 1 on digital paths crossing an international border. It can be used nationally if the digital path does not cross a border (refer to CCITT table 1a/G.704).

■ NOTE
See Section 8 to assign the channels and select either the monitor or emulation submode.
4.1 ISDN D–Channel Monitor

Before loading the program, ensure that the interface is configured as described in Section 3.3.

Loading the ISDN D–Channel Monitor Program

When the application has finished loading:

[Diagram: F1 Load Application on AP #2, F2 Switch to AP #3]
### Figure 4-1 ISDN D-Channel Monitor Program Display

In the default configuration, data is captured to RAM, decoded, and displayed in the mnemonic format as shown above.
Configuration

Frame Sequence Number Modulo
NORMAL Selects frame level decoding according to modulo 8.
EXTENDED (default) Selects frame level decoding according to modulo 128.

Packet Communication SAPI
Decodes layer 2 frames according to the X.25 protocol (default is 16).
ISDN Display Formats

Refer to Section 18.5 in the ‘General Application Topics’ section for general display format setup information.

<table>
<thead>
<tr>
<th>Display Format Menu</th>
</tr>
</thead>
<tbody>
<tr>
<td>Display Format</td>
</tr>
<tr>
<td>Timestamp</td>
</tr>
<tr>
<td>Layer 1 Report</td>
</tr>
<tr>
<td>Layer 2 Report</td>
</tr>
<tr>
<td>Layer 3 Report</td>
</tr>
<tr>
<td></td>
</tr>
</tbody>
</table>

**Display Format**

Layer 1 Report, Layer 2 Report, and Layer 3 Report can only be modified when Display Format is set to NORMAL.

**NORMAL** (default) Data from the user and network side are interleaved.

**SPLIT** Divides the screen vertically and displays data from the network on the left and data from the user on the right (see page 18–15 for an example of a split screen display).

**TRACE** Displays only trace statements (comments) generated by an application or test script.

**NOTE**

All received and transmitted events are automatically timestamped by the system. Timestamps can be displayed in one of two resolutions.

**Layer 1 Report**

**OFF** Layer 1 information is not displayed.

**ON** Displays activation, deactivation, INFO 2 error, lost framing, and recovery conditions.
→ Layer 2 Report

**OFF**

Layer 2 information is not displayed.

**COMPLETE**

<table>
<thead>
<tr>
<th>Block No</th>
<th>Src</th>
<th>SA</th>
<th>TEI</th>
<th>C/R</th>
<th>Frame</th>
<th>P/F</th>
<th>NR</th>
<th>NS</th>
</tr>
</thead>
<tbody>
<tr>
<td>10</td>
<td>D</td>
<td>Usr</td>
<td>0</td>
<td>64</td>
<td>0</td>
<td>INFO</td>
<td>P=0</td>
<td>0</td>
</tr>
<tr>
<td>15</td>
<td>D</td>
<td>Net</td>
<td>0</td>
<td>64</td>
<td>0</td>
<td>INFO</td>
<td>F=0</td>
<td>2</td>
</tr>
</tbody>
</table>

**HEX**

<table>
<thead>
<tr>
<th>Block No</th>
<th>Src</th>
<th>Frame</th>
</tr>
</thead>
<tbody>
<tr>
<td>10</td>
<td>D</td>
<td>00 01 C4 00</td>
</tr>
<tr>
<td>15</td>
<td>D</td>
<td>00 01 01 CB</td>
</tr>
</tbody>
</table>

**TEXT**

<table>
<thead>
<tr>
<th>Block No</th>
<th>Src</th>
<th>Framen</th>
</tr>
</thead>
<tbody>
<tr>
<td>10</td>
<td>D</td>
<td>D08H</td>
</tr>
<tr>
<td>15</td>
<td>D</td>
<td>D08H</td>
</tr>
</tbody>
</table>

**MNEMONIC**

<table>
<thead>
<tr>
<th>Block No</th>
<th>Src</th>
<th>SA</th>
<th>TEI</th>
<th>C/R</th>
<th>Frame</th>
<th>P/F</th>
<th>NR</th>
<th>NS</th>
</tr>
</thead>
<tbody>
<tr>
<td>10</td>
<td>D</td>
<td>Usr</td>
<td>0</td>
<td>64</td>
<td>0</td>
<td>INFO</td>
<td>P=0</td>
<td>0</td>
</tr>
<tr>
<td>15</td>
<td>D</td>
<td>Net</td>
<td>0</td>
<td>64</td>
<td>0</td>
<td>INFO</td>
<td>F=0</td>
<td>2</td>
</tr>
</tbody>
</table>
→ **Layer 3 Report**

Selections for layer 3 HEX, TEXT, and MNEMONIC report display formats are similar to layer 2.

**COMPLETE**

| 4 | 0 | Ver 0 | 65 | 0 | INFO | PD = 0.931 | CR = 0x1B | Orig SETUP | Var. = CCITT_1988 |
---|---|------|----|---|------|-----------|----------|------------|------------------|
1 | 00000100 | INFORMATION ELEMENT : BEARER CAPability |
2 | 00000011 | IE length : 3 octets |
3 | l------- | Extension bit : not continued |
   | -00----- | Coding standard : CCITT |
   | ----0000 | Info. trans. cap. : speech |
4 | l------- | Extension bit : not continued |
   | -00----- | Transfer mode : circuit mode |
   | ----1000 | Info. transfer rate : 64 kbit/s |
5 | l------- | Extension bit : not continued |
   | -01----- | Layer identifier : 1 |
   | ----00010 | Layer 1 protocol : Rec. G.711 u-law |

**NOTE**

*If layer 3 contains X.25 data (SAPI=16), it will be decoded according to the X.25 (1980/1984) Protocol.*

→ **Message Detail**

Selects the amount of detail for a layer 3 message displayed in mnemonic, text, or hexadecimal format.

**MSG**
MSG+IE

**Message Name**

<table>
<thead>
<tr>
<th>SRC</th>
<th>SA</th>
<th>TEI</th>
<th>C/R</th>
<th>Frm</th>
<th>Orig</th>
<th>PD</th>
<th>C_Ref</th>
</tr>
</thead>
<tbody>
<tr>
<td>4</td>
<td>D</td>
<td>Uar</td>
<td>0</td>
<td>65</td>
<td>0</td>
<td>INFO</td>
<td>Org Q.031</td>
</tr>
</tbody>
</table>

**Information Elements**

MSG+IE+PA

**Message Name**

<table>
<thead>
<tr>
<th>SRC</th>
<th>SA</th>
<th>TEI</th>
<th>C/R</th>
<th>Frm</th>
<th>Orig</th>
<th>PD</th>
<th>C_Ref</th>
</tr>
</thead>
<tbody>
<tr>
<td>4</td>
<td>D</td>
<td>Uar</td>
<td>0</td>
<td>65</td>
<td>0</td>
<td>INFO</td>
<td>Org Q.031</td>
</tr>
</tbody>
</table>

**Information Elements**

**Parameters (in HEX)**

BEARER_CAP : 80 60 A2

CHANNEL_ID : 81

→ **Packet Data**

Selects the display format for X.25 data contained in a SAPI 16 I frames as hex or character mode (i.e. ASCII).

---

**Selecting a Message Set**

A variety of message sets can be used for layer 3 message decoding and encoding. North American basic rate message sets are displayed here as an example.

Example:
Select the CCITT_1988 message set.
<table>
<thead>
<tr>
<th>Message Set Release Number</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Current Message Set:</strong> CCITT_1988</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Name</th>
<th>Description</th>
<th>ROL</th>
</tr>
</thead>
<tbody>
<tr>
<td>NT_S208-4</td>
<td>Northern Telecom NIS S208-4 (1988), Functional</td>
<td></td>
</tr>
<tr>
<td>ATT_SE6</td>
<td>AT&amp;T 505-000-321, S66 Generic Program (03/89)</td>
<td></td>
</tr>
<tr>
<td>NT_S208-2</td>
<td>Northern Telecom NIS S208-2 (1986), Stimulus</td>
<td></td>
</tr>
</tbody>
</table>

**Page Down**
Displays the next ten message sets (if more than ten are displayed).

**Page Up**
Displays the previous ten message sets.

**Select Message Set**
Selects the current message set for layer 3 message decoding.

**Locate Message Sets**
Searches all disk drives for message set files and updates the Message Set Selection Menu.
Loading a Message Set

This function is used to load message set source files created with ISDN MDL (Message Description Language). Refer to the ISDN MDL Programmer’s Manual.

Saving a Message Set

This function is used to save a message set binary file created after ISDN MDL source files have been loaded into memory. Refer to the ISDN MDL Programmer’s Manual.
ISDN Filters

Refer to Section 18.9 in the 'General Application Topics' section for filter setup information.

Example:
Pass all layer 1 events, all layer 2 events with a SAPI=0 or TEI=2, and only SETUP and INFO messages at layer 3 (all others are blocked).

Move the cursor to the required parameters on the Layer 1, Layer 2, and Layer 3 Filter Setup Menus and use the PASS and BLOCK function keys to record (pass) only the desired events.

Layer 1 Filter Setup Menu

Filter Type RAM
Filter Status DEACTIVATED

Layer 1 Events:
ACTIVATE PASS RI2ERR PASS RECOVERY PASS
DEACTIVATE PASS LOST FRAMING PASS UNDEFINED PASS
**Link Address Events:**
A filter condition can be set to pass or block on a specific SAPI or TEI value. The SAPI and TEI conditions can be logically combined to provide complex filtering capabilities. There are a large number of possible combinations of these settings (refer to Table 4–1).

- **Layer 2 Filter Setup Menu**

  - **Filter Type**: RAM
  - **Filter Status**: DEACTIVATED

  **Link Address Events:**
  - SAPI Filter: PASS
  - SAPI: 0
  - TEI Filter: PASS
  - TEI: 2
  - Logical Operation: OR

  **Layer 2 Events:**

<table>
<thead>
<tr>
<th>RR</th>
<th>PASS</th>
<th>SABM</th>
<th>PASS</th>
<th>I</th>
<th>PASS</th>
<th>DISC</th>
<th>PASS</th>
<th>INVALID</th>
<th>PASS</th>
</tr>
</thead>
<tbody>
<tr>
<td>RNR</td>
<td>PASS</td>
<td>SABME</td>
<td>PASS</td>
<td>UA</td>
<td>PASS</td>
<td>DM</td>
<td>PASS</td>
<td></td>
<td></td>
</tr>
<tr>
<td>REJ</td>
<td>PASS</td>
<td>XID</td>
<td>PASS</td>
<td>UI</td>
<td>PASS</td>
<td>FRMR</td>
<td>PASS</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

- **Logical Operation**
  - **OR**: Selects frames which match either SAPI or TEI conditions.
  - **AND**: Selects frames which match both SAPI and TEI conditions.
**ISDN BRA MONITOR**

**September 1990**

---

**S=SAPI**

**T=TEI**

---

**Table 4–1** SAPI/TEI – Logical Operations

<table>
<thead>
<tr>
<th>SAPI</th>
<th>TEI</th>
<th>AND</th>
<th>OR</th>
</tr>
</thead>
<tbody>
<tr>
<td>BLOCK</td>
<td>BLOCK</td>
<td>=S</td>
<td>=S</td>
</tr>
<tr>
<td>BLOCK</td>
<td>PASS</td>
<td>≠T</td>
<td>≠T</td>
</tr>
<tr>
<td>PASS</td>
<td>BLOCK</td>
<td>≠S</td>
<td>≠S</td>
</tr>
<tr>
<td>PASS</td>
<td>PASS</td>
<td>≠S</td>
<td>≠S</td>
</tr>
</tbody>
</table>

**Legend:** ⊗ = BLOCK  □ = PASS

---

**Filters**

---

**Layer 3 Filter Setup Menu**

<table>
<thead>
<tr>
<th>Filter Type</th>
<th>RAM</th>
<th>Protocol Discriminator</th>
<th>OFF</th>
<th>PD Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>ALERT</td>
<td>BLK</td>
<td></td>
<td></td>
<td>HOLD_ACK</td>
</tr>
<tr>
<td>CALL_PROC</td>
<td>BLK</td>
<td>REL</td>
<td>BLK</td>
<td>HOLD_REJ</td>
</tr>
<tr>
<td>CON_CONN</td>
<td>BLK</td>
<td>RES</td>
<td>BLK</td>
<td>REG</td>
</tr>
<tr>
<td>CONN</td>
<td>BLK</td>
<td>RES_ACK</td>
<td>BLK</td>
<td>RET</td>
</tr>
<tr>
<td>CONN_ACK</td>
<td>BLK</td>
<td>RES_REJ</td>
<td>BLK</td>
<td>RET_ACK</td>
</tr>
<tr>
<td>DISC</td>
<td>BLK</td>
<td>SETUP</td>
<td>PASS</td>
<td>RET_REJ</td>
</tr>
<tr>
<td>INFO</td>
<td>PASS</td>
<td>SETUP_ACK</td>
<td>BLK</td>
<td>Undefined</td>
</tr>
<tr>
<td>NOTIFY</td>
<td>BLK</td>
<td>STATUS</td>
<td>BLK</td>
<td>Invalid</td>
</tr>
<tr>
<td>PROG</td>
<td>BLK</td>
<td>STATUS_EN</td>
<td>BLK</td>
<td></td>
</tr>
</tbody>
</table>

---

**IDACOM**

PT500 User Manual
Protocol Discriminator

OFF  Ignores the message protocol discriminator when filtering.

PASS  Passes data with the specified protocol discriminator.

PD Value

Specifies the protocol discriminator value.

Call Reference

OFF  Ignores the message call reference when filtering.

PASS  Passes only data with the specified call reference.

CR Value

Specifies the call reference value.

Refer to Section 11.4 for examples using X.25 filters.
ISDN Triggers

Refer to Section 18.10 in the 'General Application Topics' section for trigger setup information.

Example:
Trigger on a frame with SAPI=0. When received, beep, turn on disk recording, stop capture to RAM, and write a message to the data stream.

Setting Conditions

<table>
<thead>
<tr>
<th>Event Trigger</th>
<th>TRIGGER #1</th>
<th>Trigger Direction</th>
<th>FROM BOTH</th>
</tr>
</thead>
<tbody>
<tr>
<td>Trigger Status</td>
<td>UNARMED</td>
<td>Disk Full</td>
<td>OFF</td>
</tr>
<tr>
<td>Layer 1 Events</td>
<td></td>
<td>RAM Full</td>
<td>OFF</td>
</tr>
<tr>
<td>Layer 2 Events</td>
<td></td>
<td>Alarm Clock</td>
<td>OFF</td>
</tr>
<tr>
<td>Layer 3 Events</td>
<td></td>
<td>Time</td>
<td>---</td>
</tr>
<tr>
<td>X.25 L3 Events</td>
<td></td>
<td>String Match</td>
<td>OFF</td>
</tr>
<tr>
<td>String</td>
<td>---</td>
<td>String Mask</td>
<td>---</td>
</tr>
</tbody>
</table>
Layer 2 Event Menu

Link Address Events:
- SAPI ON DLCI OFF SAPI Value: 0
- TEI OFF TEI Value: ___

Layer 2 Events:
- RR OFF SABM OFF I OFF DISC OFF INVALID OFF
- RNR OFF SABME OFF UA OFF DH OFF
- REJ OFF XID OFF UI OFF FRHR OFF

Setting Actions

Trigger Action Menu

- Event Trigger: TRIGGER #1
- Trigger Status: ARMED
- Beep: ON
- Highlight: NO EFFECT
- Data Display Message: "TRIGGER NO1 HAS FIRED"
- User Window Message: ""

NOTE
Specify the drive and data filename on the Recording Menu before arming the trigger.
4.2 B-Channel Monitor

The following functions are available for B-Channel monitoring:
- Voice
- Loading an Application

Voice

Example:
Select voice for the B1-Channel.

- Connect a 2-wire analog phone set to the VOICE connector at the back of the tester (see Figure 1-2).
- Set the voice encoding method on the BRA Configuration Menu (see page 3-8).
- Connect the B-Channel which carries the voice traffic to the external voice connector:

![B1-Channel Diagram]

**NOTE**
The SETUP message of the D-Channel signalling protocol contains the B-Channel number which has been assigned for a voice connection.

The Configuration Diagram on the Home processor now displays the B1-Channel connected to the voice output (see Figure 17-1).
Loading an Application

Example:
Load the X.25 Monitor program on AP #2 to monitor data on the B2-Channel:

When the application has finished loading:
5

ISDN BRA EMULATION
Version 2.0
5.1 ISDN D-Channel Emulation

Before loading the program, ensure that the interface is configured as described in Section 3.4.

Loading the ISDN D-Channel Emulation Program

When the application has finished loading:

Switch to AP #3
The following sections describe the operation of the ISDN Emulation program. All functions are grouped under six general topics: **Emulation**, **Send**, **Services**, **X.25_Emulation**, **X.25_Send**, and **MsgBuilder**.
Configuration

Timer Duration:

→ Idle Link (T203)
The T203 timer starts after a frame is transmitted, and stops when a frame is received. If the timer expires without a frame being received, the emulation will respond with an RR poll (if enabled).

Flags:

→ XID Negotiate Proc
Enables the negotiation of the link setup parameters (Link Menu) prior to a link establishment (eg. SABME/UA exchange).

→ RR Polling Action
OFF No polling action is performed.
ENABLE Automatically polls the link with RR frames when the idle link timer expires.
Protocol Emulation:

→ L.2 State Machine

- **ON**
  
  Automatically responds to all received layer 2 events.

- **OFF**
  
  Layer 2 does not automatically respond to received events.

⚠️ **NOTE**

*This function is the same as the Run Emulation function key under the Emulation topic.*

Special SAPI:

→ Packet Communication

Layer 2 information frames having this SAPI value are decoded according to the X.25 (1984) protocol (default is 16).

Each layer 2 link has several 'static' parameters which can be set. These parameters are not changed during protocol execution.

<table>
<thead>
<tr>
<th>Emulation</th>
<th>Link No 0</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>DLCI Value:</td>
</tr>
<tr>
<td></td>
<td>SAPI 0</td>
</tr>
<tr>
<td></td>
<td>TEI 127</td>
</tr>
</tbody>
</table>

- **Modulus**:  
  
  - Mode: EXTENDED
  
  - Max. Retransmission: Primary Event (N200) 3

- **Window**:  
  
  - K 7
  
  - K-RX 7

- **Link TEI**:  
  
  - Mode: AUTOMATIC

→ **Link No**

Specifies the link number for setting parameters.
DLCI Value:

→ SAPI
Sets the SAPI (service access point identifier) for the selected link. Both standard and non-standard values can be set.
0 Used for call setup signalling.
16 Used for D-Channel packet communication (i.e. X.25).
63 Used for Management/ASP layer.

→ TEI
Sets the TEI (terminal endpoint identifier) for the selected link.

Modulus:

→ Mode
NORMAL Selects modulo 8 sequencing.
EXTENDED Selects modulo 128 sequencing.

Link TEI:

→ Mode
AUTOMATIC Assigns the TEI a value of 64 through 126 (network) or requests via the automatic TEI assignment procedures (user).
MANUAL Sets the TEI to a fixed value between 0 and 63.

Timer Duration:

→ Primary (T200)
Specifies the time, in tenths of seconds, between SABM/E retransmissions during link setup (default is 1 second).

→ T200–RX (XID NEG)
Specifies the preferred value of the T200 timer for the XID negotiation procedure.

Max. Retransmission:

→ Primary Event (N200)
Specifies the maximum number of times that a frame is retransmitted after the expiry of the T200 timer is determined by N200 (default is 3).
Data Field Length:
→ N201 (XID Neg)
Specifies the maximum length of a received I or UI frame for the XID negotiation procedure (default is 260 bytes).

→ N201-TX (XID Neg)
Specifies the maximum length of a transmitted I or UI frame for the XID negotiate procedure (default is 260 bytes).

Window:
→ K
Specifies the maximum number of I frames that can be transmitted before a response is received (default is 7).

→ K-RX
Specifies the requested value of K (transmit window) for the peer. Used during XID negotiate procedures (default is 7).

For ISDN D-Channel User (TE) Emulation:

Timer Duration:
→ TEI Request (T202) 20
→ XID Negotiate (TM20) 10

Timer Duration:
→ TEI Request (T202)
Specifies the minimum time, in tenths of seconds, between retransmission of the TEI identity request messages (default is 2 seconds).
→ **XID Negotiate (TM20)**  
Specifies the response time, in tenths of seconds, of a peer to an XID frame (default is 1 second). If a response is not received prior to the expiry of TM20, the XID frame is retransmitted.

**ML/ASP Retransmission:**  
→ **TEI Request (N202)**  
Specifies the maximum number of TEI assignment request retransmissions (default is 3).

→ **XID Negotiate (NM20)**  
Specifies the maximum number of XID command frame retransmissions (default is 3).

→ **ID Denied (N204)**  
Specifies the maximum number of attempts to acquire a TEI due to ID denials from the network (default is 2).

Refer to the latest CCITT I series document for a description of the link and management layer setup parameters.

For ISDN D-Channel Network (NT) Emulation:

```
Emulation

<table>
<thead>
<tr>
<th>F3</th>
</tr>
</thead>
<tbody>
<tr>
<td>ASP: Menu</td>
</tr>
</tbody>
</table>
```

```
Timer Duration:

- TEI ID Check (T201) 10
- XID Negotiate (TM20) 10
```

**ML/ASP Retransmission:**
- XID Negotiate (NM20) 3

**Timer Duration:**  
→ **TEI ID Check (T201)**  
Specifies the minimum time, in tenths of seconds, between network retransmission of the TEI identity check messages (default is 1 second).
→ **XID Negotiate (TM20)**
Specifies the response time, in tenths of seconds, of a peer to an XID frame (default is 1 second). If a response is not received prior to the expiry of TM20, the XID frame is retransmitted.

**ML/ASP Retransmission:**
→ **XID Negotiate (NM20)**
Specifies the maximum number of XID command frame retransmissions (default is 3).

---

**Running the Emulation Program**

![Emulation Program Interface]

**NOTE**
*Ensure that this function is highlighted to provide automatic responses to all received events. This is equivalent to the L.2 State Machine item on the Emulation Configuration Menu.*

Transmitted frames are sent correctly according to the protocol (eg. correct sequence numbers are calculated).
Activating the S/T Bus

The screen displays the following message when the bus is activated.

<table>
<thead>
<tr>
<th>Block No</th>
<th>Src</th>
<th>SA</th>
<th>TEI</th>
<th>C/R Frame</th>
<th>P/F</th>
<th>NR</th>
<th>NS</th>
<th>Orig PD</th>
<th>C_Ref</th>
<th>Msg_Type</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>DA</td>
<td>Net Layer 1 is activated</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**NOTE**
The green LED's on the front panel must be on.

Green when S/T Bus is activated
Defining Layer 2 Frames

Frames can be sent according to the parameters selected from the following menus (only valid when the layer 2 state machine is off).

<table>
<thead>
<tr>
<th>Poll/Final Bits:</th>
<th>FRMR Bits:</th>
<th>Sequence Numbers :</th>
</tr>
</thead>
<tbody>
<tr>
<td>P Bit 0</td>
<td>W Bit 0</td>
<td>NR 0</td>
</tr>
<tr>
<td>F Bit 0</td>
<td>X Bit 0</td>
<td>NS 0</td>
</tr>
</tbody>
</table>

Command/Response Bits:
Indicates when a frame is a command or a response.

FRMR Bits:
Reports the rejection condition of bits W, X, Y, and Z of an FRMR frame.

Sequence Numbers:
The receive sequence number N(R) contains the expected send sequence number of the next received I frame. The send sequence number N(S) contains the current number of transmitted I frames. Valid values are 0 through 7 for modulo 8, and 0 through 127 for modulo 128.
→ **Link No**
Selects the link number for transmitting frames. Valid values are 0 through 7.

**State Machine:**

→ **L.2 State**
Forces the layer 2 state machine to a specific state. Valid state numbers are listed in Appendix B.

**State Variables:**

→ **VS**
Specifies the V(S) (send state variable) count identifying the sequence number of the next information frame transmitted by the tester. Valid values are 0 through 7 for modulo 8, and 0 through 127 for modulo 128.

→ **VA**
Specifies the V(A) (acknowledge state variable) count identifying the sequence number of the last acknowledged frame. Valid values are 0 through 7 for modulo 8, and 0 through 127 for modulo 128.
VR
Specifies the V(R) (receive state variable) count identifying the sequence number of the next in sequence information frame expected to be received. Valid values are 0 through 7 for modulo 8, and 0 through 127 for modulo 128.

Counters:
Retransmission (RC)
Specifies the number of times a particular poll sequence has been transmitted to the peer.

Poll/Response (PRC)
Specifies the number of outstanding polls.

NOTE
DLCI Status and Negotiate Parameters Status reflect the settings made on the Link Setup Menu during configuration. These values cannot be changed on the Send Link Setup Menu.

Sending Layer 2 Frames
Layer 2 frames can be transmitted:
• automatically according to the protocol standard (the layer 2 state machine is on); or
• manually with user-defined fields (the layer 2 state machine is off).

Individual frames can be transmitted using the function keys under the Send topic. When the layer 2 state machine is on, frames are sent only when permitted by the current state. When the layer 2 state machine is off, frames are sent with values defined on the Control Field Setup and Send Link Setup Menus.

SABME, RR, RNR, REJ, UA, DISC, DM, and FRMR
Transmits the corresponding frame.

XID
Transmits an XID frame to negotiate the counters N201, the window size, and the retransmission timer.
NOTE
The XID Negotiate Procedure must be enabled on the Emulation Configuration Menu to transmit an XID frame.

Selecting Layer 3 Messages

Select Source of Information Field Contents for UI/Info Frames:

Data Source
Predefined Pkts
L.3 Default Message

Transmit Mode:
Queueing Procedure Single Frame Number of Repetitions

Message Selection:
Message Type ALERT
Pool Entry Name
Predefined Pkt#

Select Source of Information Field Contents for UI/Info Frames:

→ Data Source

Predefined Pkts Selects a fixed bit pattern for transmission via the Predefined Pkt# item.

L.3 Default Message Selects a message which contains all mandatory and selected optional information elements for a particular message via the Message Type item.

Message Pool Selects a message from a previously defined pool of messages. The message contents and the pool entry name must have been defined with the message builder.
Transmit Mode:

→ Queuing Procedure
  
  **Single Frame**
  
  Transmits a single frame.

  **Repetitive**
  
  Transmits a specified number of frames.

  **Continuous**
  
  Transmits frames continuously.

→ Number of Repetitions

Specifies the number of frames to transmit when Queuing Procedure is set to Repetitive.

Message Selection:

→ Message Type

Specifies the type of message when Data Source is set to L.3 Default Message.

---

<table>
<thead>
<tr>
<th></th>
<th>Alert</th>
<th>CALL_PROC</th>
<th>CONN</th>
<th>CONN_ACK</th>
<th>DISC</th>
<th>INFO</th>
<th>NOTIFY</th>
<th>PROG</th>
<th>REL</th>
</tr>
</thead>
<tbody>
<tr>
<td>Alert</td>
<td>REL_COM</td>
<td>RES</td>
<td>RES_ACK</td>
<td>SETUP</td>
<td>SETUP_ACK</td>
<td>STATUS</td>
<td>STATUS_EN</td>
<td>SUSP</td>
<td>SUSP_ACK</td>
</tr>
<tr>
<td></td>
<td></td>
<td>USER_INFO</td>
<td>REST_ACK</td>
<td>SEGMENT</td>
<td>FAC</td>
<td>HOLD</td>
<td>HOLD_ACK</td>
<td>REG</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>USER_INFO</td>
<td>REST_ACK</td>
<td>SEGMENT</td>
<td>FAC</td>
<td>HOLD</td>
<td>HOLD_ACK</td>
<td>REG</td>
<td></td>
</tr>
</tbody>
</table>
Pool Entry Name
Specifies the message pool entry name when Data Source is set to Message Pool.

Predefined Pkt#
Incrementing Bytes
Increments each byte in the frame.

All 1s
Transmits hex FF’s.

All 0s
Transmits hex 00’s.

Alternating Bits
Transmits alternating bits (hex 55).

Sending Layer 3 Messages
Messages can be transmitted within UI or I frames using the function keys under the Send topic. When the layer 2 state machine is on, messages are transmitted only when permitted by the current state.

I
Transmits the message selected on the Send Data Source Menu as an I frame.

L.3 UI
Transmits the message selected on the Send Data Source Menu as a layer 3 UI frame.

For ISDN D–Channel User (TE) Emulation:

ML UI
Transmits the message selected on the Send Data Source Menu as a management layer UI frame (SAPI=63, TEI=current value).

For ISDN D–Channel Network (NT) Emulation:

ASP UI
Transmits the message selected on the Send Data Source Menu as an assignment source procedure UI frame (SAPI=63, TEI=current value).
Selecting a Link

\**NOTE**

The layer 2 state machine must be on to use the function keys under the Services topic.

- Enter the link number (eg. 0) and press `\(\text{RETURN}\)`.

- Enter Link Number: 0

The ISDN Emulation program supports up to eight simultaneous links (0 through 7).
Requesting a TEI (User Only)

![Services]

F3
Request TEI

<table>
<thead>
<tr>
<th>Block No</th>
<th>Src SA TEI</th>
<th>C/R Frame</th>
<th>P/F</th>
<th>NR</th>
<th>NS</th>
<th>Orig PD</th>
<th>C_Ref</th>
<th>Msg_Type</th>
</tr>
</thead>
<tbody>
<tr>
<td>63</td>
<td>D</td>
<td>User 63 127</td>
<td>0</td>
<td>UI</td>
<td>P=0</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>identity request</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Management entity identifier = 15</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Reference number (RI) = 04788</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Message type = 1</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Action indicator (AI) = 127</td>
</tr>
<tr>
<td>1</td>
<td>D</td>
<td>Net 63 127</td>
<td>1</td>
<td>UI</td>
<td>P=0</td>
<td></td>
<td></td>
<td>identity assigned</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Management entity identifier = 15</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Reference number (RI) = 04788</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Message type = 2</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Action indicator (AI) = 84</td>
</tr>
</tbody>
</table>

Establishing a Link

![Services]

F2
Establish

<table>
<thead>
<tr>
<th>Block No</th>
<th>Src SA TEI</th>
<th>C/R Frame</th>
<th>P/F</th>
<th>NR</th>
<th>NS</th>
<th>Orig PD</th>
<th>C_Ref</th>
<th>Msg_Type</th>
</tr>
</thead>
<tbody>
<tr>
<td>65</td>
<td>D</td>
<td>User 0 0 0</td>
<td>0</td>
<td>SABME</td>
<td>P=1</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>D</td>
<td>Net 65 0 65</td>
<td>0</td>
<td>UA</td>
<td>P=1</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

⚠️ NOTE
If no TEI has been assigned, the Establish function will try to assign a TEI and then establish the link.
Sending Frames/Messages

Example:
Send an I frame containing the message selected on the Send Data Source Menu.

<table>
<thead>
<tr>
<th>Services</th>
</tr>
</thead>
<tbody>
<tr>
<td>FS</td>
</tr>
<tr>
<td>Data Link Data</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Block No</th>
<th>Src SA TEI</th>
<th>C/R Frame</th>
<th>Orig PO</th>
<th>C_Ref</th>
<th>Msg_Type</th>
</tr>
</thead>
<tbody>
<tr>
<td>67</td>
<td>D</td>
<td>Uer 0 0</td>
<td>0 INFO</td>
<td>0.931</td>
<td>0X00</td>
</tr>
<tr>
<td>5</td>
<td>D</td>
<td>Net 0 0</td>
<td>0 RR</td>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>

Example:
Send a UI frame containing the message selected on the Send Data Source Menu.

<table>
<thead>
<tr>
<th>Services</th>
</tr>
</thead>
<tbody>
<tr>
<td>f6</td>
</tr>
<tr>
<td>Unit Data</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Block No</th>
<th>Src SA TEI</th>
<th>C/R Frame</th>
<th>Orig PO</th>
<th>C_Ref</th>
<th>Msg_Type</th>
</tr>
</thead>
<tbody>
<tr>
<td>67</td>
<td>D</td>
<td>Uer 0 0</td>
<td>0 INFO</td>
<td>0.931</td>
<td>0X00</td>
</tr>
<tr>
<td>5</td>
<td>D</td>
<td>Net 0 0</td>
<td>0 RR</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>68</td>
<td>D</td>
<td>Uer 0 0</td>
<td>0 UI</td>
<td>0.931</td>
<td>0X00</td>
</tr>
</tbody>
</table>
Example:
Send a management UI frame (SAPI=63) containing the message selected on the Send Data Source Menu.

<table>
<thead>
<tr>
<th>Block No</th>
<th>Src SA</th>
<th>TEI</th>
<th>C/R Frame</th>
<th>Orig PD</th>
<th>C_Ref</th>
<th>Msg_Type</th>
</tr>
</thead>
<tbody>
<tr>
<td>68</td>
<td>D</td>
<td>0</td>
<td>0</td>
<td>UI</td>
<td>Org</td>
<td>0.931 0X00</td>
</tr>
<tr>
<td>69</td>
<td>D</td>
<td>0</td>
<td>63</td>
<td>UI</td>
<td>Org</td>
<td>0.931 0X00</td>
</tr>
</tbody>
</table>

Setting a Link to Busy

<table>
<thead>
<tr>
<th>Block No</th>
<th>Src SA</th>
<th>TEI</th>
<th>C/R Frame</th>
<th>Orig PD</th>
<th>C_Ref</th>
<th>Msg_Type</th>
</tr>
</thead>
<tbody>
<tr>
<td>75</td>
<td>D</td>
<td>0</td>
<td>0</td>
<td>RNR</td>
<td></td>
<td></td>
</tr>
<tr>
<td>12</td>
<td>D</td>
<td>0</td>
<td>0</td>
<td>RR</td>
<td></td>
<td></td>
</tr>
<tr>
<td>13</td>
<td>D</td>
<td>0</td>
<td>0</td>
<td>RR</td>
<td></td>
<td></td>
</tr>
<tr>
<td>76</td>
<td>D</td>
<td>0</td>
<td>0</td>
<td>1 RR</td>
<td></td>
<td>RNR</td>
</tr>
<tr>
<td>77</td>
<td>D</td>
<td>0</td>
<td>0</td>
<td>1 RNR</td>
<td></td>
<td></td>
</tr>
<tr>
<td>78</td>
<td>D</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td></td>
<td>RR</td>
</tr>
<tr>
<td>15</td>
<td>D</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td></td>
<td>RR</td>
</tr>
</tbody>
</table>
To clear the busy state:

![Services](image)

The active link sends an RR frame with P=1 and responds to incoming events with an RR frame.

<table>
<thead>
<tr>
<th>Block No</th>
<th>Src</th>
<th>SA</th>
<th>TEI</th>
<th>C/R Frame</th>
<th>Orig PD</th>
<th>C_Ref</th>
<th>Msg_Type</th>
</tr>
</thead>
<tbody>
<tr>
<td>75</td>
<td>D</td>
<td>User 0</td>
<td>0</td>
<td>0</td>
<td>RR</td>
<td></td>
<td></td>
</tr>
<tr>
<td>12</td>
<td>D</td>
<td>Net 0</td>
<td>0</td>
<td>0</td>
<td>RR</td>
<td></td>
<td></td>
</tr>
<tr>
<td>13</td>
<td>D</td>
<td>Net 0</td>
<td>0</td>
<td>1</td>
<td>RR</td>
<td></td>
<td></td>
</tr>
<tr>
<td>76</td>
<td>D</td>
<td>User 0</td>
<td>0</td>
<td>1</td>
<td>RR</td>
<td></td>
<td></td>
</tr>
<tr>
<td>14</td>
<td>D</td>
<td>Net 0</td>
<td>0</td>
<td>1</td>
<td>RR</td>
<td></td>
<td></td>
</tr>
<tr>
<td>77</td>
<td>D</td>
<td>User 0</td>
<td>0</td>
<td>1</td>
<td>RR</td>
<td></td>
<td></td>
</tr>
<tr>
<td>78</td>
<td>D</td>
<td>User 0</td>
<td>0</td>
<td>0</td>
<td>RR</td>
<td></td>
<td></td>
</tr>
<tr>
<td>15</td>
<td>D</td>
<td>Net 0</td>
<td>0</td>
<td>0</td>
<td>RR</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Disconnecting a Link

![Services](image)

![Release](image)

<table>
<thead>
<tr>
<th>Block No</th>
<th>Src</th>
<th>SA</th>
<th>TEI</th>
<th>C/R Frame</th>
<th>Orig PD</th>
<th>C_Ref</th>
<th>Msg_Type</th>
</tr>
</thead>
<tbody>
<tr>
<td>70</td>
<td>D</td>
<td>User 0</td>
<td>0</td>
<td>0</td>
<td>DISC</td>
<td></td>
<td></td>
</tr>
<tr>
<td>15</td>
<td>D</td>
<td>Net 0</td>
<td>0</td>
<td>0</td>
<td>UA</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
X.25 PLP Emulation

The X.25 PLP (packet layer procedure) Emulation operates as a layer 3 emulation connected to the ISDN Basic Rate D–Channel layer 2. The following features are supported to interface to the layer 2 emulation:

- One SAPI is assigned to X.25 packet mode operation. The default value for this SAPI is 16.
- 255 simultaneous logical channel connections.
- Each logical channel can be connected to any of the 8 link connections.

**Emulation Mode**

**DTE**

Selects a logical DTE emulation mode (default when configured as user).

**DCE**

Selects a logical DCE emulation mode (default when configured as network).

**Protocol Standard**

**NONE**

Conforms to a combination of the CCITT X.25 (1980 and 1984) Recommendations. The behaviour can be modified by the user.

**X.25(1980)**


NOTE
The protocol standard selection affects some emulation parameters and procedures.

Depending on the emulation selected, either the DTE or DCE Packet Layer Menu is displayed. The DTE emulation uses timers T20 to T23; DCE emulation uses timers T10 to T13. All other configuration commands are used by both emulation modes.

Packet Layer:
✦ Emulation
Selects whether to provide automatic responses to all received packets.

✦ Max Data Size
Specifies the maximum number of bytes in the data field of transmitted or received data packets for all logical channels. Valid values are 1 through 4100 (default is 128).

NOTE
The maximum frame size should be sufficiently larger than the maximum data size to allow for the address and control fields plus the data packet header.

✦ Sequence Numbering
Selects whether sequence numbering is modulo 8 (basic format) or modulo 128 (extended format) for the packet layer.
The following timers are used for DTE emulation.

→ **T20 Timer**
Specifies the duration, in tenths of seconds, the tester waits for a restart indication packet after transmitting a restart request packet (default is 180 seconds).

→ **T21 Timer**
Specifies the duration, in tenths of seconds, the tester waits for a call connect, clear indication, or incoming call after transmitting a call request packet (default is 200 seconds).

→ **T22 Timer**
Specifies the duration, in tenths of seconds, the tester waits for a reset confirmation or reset indication after transmitting a reset request packet (default is 180 seconds).

→ **T23 Timer**
Specifies the duration, in tenths of seconds, the tester waits for a clear confirmation or clear indication packet after transmitting a clear request packet (default is 180 seconds).

The following timers are used for DCE emulation.

→ **T10 Timer**
Specifies the duration, in tenths of seconds, the tester waits for a restart request packet or restart confirmation packet after transmitting a restart indication packet (default is 60 seconds).

→ **T11 Timer**
Specifies the duration, in tenths of seconds, the tester waits for a call accept, clear request, or call request packet after transmitting an incoming call packet (default is 180 seconds).
→ **T12 Timer**
Specifies the duration, in tenths of seconds, the tester waits for a reset confirmation or reset request packet after transmitting a reset indication packet (default is 60 seconds).

→ **T13 Timer**
Specifies the duration, in tenths of seconds, the tester waits for a clear confirmation or clear request packet after transmitting a clear indication packet (default is 60 seconds).

**Facilities**

<table>
<thead>
<tr>
<th>Facility</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>X25 Emulation</td>
<td></td>
</tr>
<tr>
<td>F3</td>
<td>Facility Menu</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Facility Menu</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Call Request Facility</td>
<td>NONE</td>
</tr>
<tr>
<td>User Defined Facility</td>
<td>---</td>
</tr>
<tr>
<td>Call Accept/Connect</td>
<td>USE ADDRESS</td>
</tr>
<tr>
<td>Call Accept Facility</td>
<td>ECHO</td>
</tr>
<tr>
<td>User Defined Facility</td>
<td>---</td>
</tr>
<tr>
<td>Call User Data</td>
<td>NONE</td>
</tr>
<tr>
<td>Clear User Data</td>
<td>NONE</td>
</tr>
</tbody>
</table>

→ **Call Request Facility**
Specifies the facilities used in transmitted call request/incoming call packets on all 255 logical channels.

*NONE* (default) Facilities are not included.

*NEGOTIATE*  
Automatically negotiates data packet size, packet window size, throughput class, and fast select facilities.

*USER DEFINED*  
Negotiates user-defined facilities.
→ **User Defined Facility**  
Specifies facilities up to 26 bytes for negotiation in call request/incoming call packets.

Example:  
Define a facility for a packet size negotiation size of 256.

| F1 | Modify Facility |

- Enter values in hex and press ← (RETURN).

```
Enter Facility in Hex: 03420806
```

→ **Call Accept/Connect**  
Selects whether call accept/connect packets use the address field (default) on all 255 logical channels.

→ **Call Accept Facility**  
Selects facilities used in transmitted call accept/connect packets on all 255 logical channels.  

- **NONE**  
  Facilities are not included.

- **ECHO** (default)  
  Uses the facility field from the last received call request/incoming call packet.

- **USER DEFINED**  
  Facilities are user-defined.

→ **User Defined Facility**  
Specifies facilities up to 26 bytes in transmitted call accept/connect packets.

**NOTE**  
See the example used in defining facilities for call request/incoming call packets.
Call User Data
Specifies the content of the user data for the call request/incoming call packet. A hex string of up to 54 characters can be entered. If there is no call user data, NONE will be displayed as the status.

Clear User Data
Specifies the content of the user data for the clear request/clear indication packet. A hex string of up to 54 characters can be entered. If there is no clear user data, NONE will be displayed as the status.

Example:
Define a call user data field that contains 11 characters.

```
Modify Call User Data

Enter User Data in Hex: C00000003010025B00064
```

LCN Setup

```
X25 Emulation

Modify LCN Setup
```

IDACOM

PT500 User Manual
NOTE
When the same LCN value is specified for different channels, the emulation uses the first one found.

The X.25 PLP Emulation supports 255 logical channels which can be set to any of 4095 LCN’s (logical channel numbers). For each of these channels, the user can specify:
- the logical channel number (1 through 4095);
- the link connection that the channel uses for transmitting and receiving traffic;
- SVC (switched virtual circuit) or PVC (permanent virtual circuit) operation;
- the called and calling addresses placed into call request packets sent by this logical channel (SVC);
- the window size used by data packets on this channel; and
- whether data packets received on the logical channel will be echoed as data packets on the same logical channel.

The corresponding entry for each logical channel that originates or accepts a call can be specified. The calling and called addresses are placed in the call request packet for originating calls.

NOTE
When the same logical channel number value is specified for different channels, the emulation uses the first one found.
Each of the 255 logical channels can also be configured for fast select facility, clear request format, and clear confirm format from the LCN Setup Menu 2. Each of the 255 channels can be configured for:

- fast select facility when call request facilities are negotiated. Fast select can be set to off, on without restriction, or on with restrictions;
- clear request packets to use extended or non-extended format. Extended format includes use of address, facility, and clear user data fields; and
- clear confirm packets to use extended or non-extended format. Extended format includes use of address, facility, and clear user data fields.

**NOTE**

Clear Request and Clear Confirm extended format are not supported by X.25 (1980).
Sending X.25 Packets

Before transmitting an X.25 packet:
- the ISDN BRA connection must be in a state which allows transmission;
- the S/T bus must be activated; and
- a connection must be established on the link.

Establishing a Link

1. Enter the link CES identifier and press \( \rightarrow \) (RETURN).

2. **Enter Link CES on which traffic will be sent (0-7):**

Restarting the Link

1. Enter the restart cause and diagnostic and press \( \rightarrow \) (RETURN).

2. **The RESTART packet contains (HEX) cause 0_ and diagnostic 0_.**

Refer to the CCITT X.25 (1980/1984) Recommendations for valid values.

Wait for an acknowledgement.
Selecting a Logical Channel

Enter the logical channel number and press ← (RETURN).

Setting Up an X.25 Call (SVC)

Wait for call accept.

Sending a Data Packet

Wait for an acknowledgement.
Resetting the LCN Connection

- Enter the reset cause and diagnostic and press \( \text{RETURN} \).

The RESET packet contains (HEX) cause 0_ and diagnostic 0_.

Refer to the CCITT (1980/1984) Recommendations for valid values.

Wait for confirmation.

Clearing the X.25 Call (SVC)

- Enter the clearing cause and diagnostic and press \( \text{RETURN} \).

The CLEAR packet contains (HEX) cause 0_ and diagnostic 0_.

Refer to the CCITT (1980/1984) Recommendations for valid values.

Wait for confirmation.
The Message Builder

Layer 3 messages (including IE's and parameters) from any message set can be built either manually or automatically. Once built, the messages can be transmitted in conjunction with the Send Data Source Menu or from within a test script.

In manual mode, a message type is selected and the IE's are built incrementally after the message header in the specified order.

In automatic mode, the IE's are selected first and placed in the correct order before the message header is built.

Generated messages can be copied to the edit buffer. Once in the edit buffer, the hex contents of the message can be manipulated to create invalid variations.

A completed message can be copied into a message pool. A message pool is a collection of up to 60 messages which can be saved to floppy or hard disk for future retrieval and use.
A functional overview is shown in the following figure.

**Message Menu**
- Select message including IE's and parameters
- Build messages

**Edit Menu**
- Create/edit invalid messages complete with headers, IE's, and parameters using HEX code

**Message Pool Menu**
- Entry Number 1
- Entry Comment
- Pool Name: MYPOOL
- Entry Name: SETUP1
- Mag Length: 32

**Figure 5-2 Message Builder Overview**
Creating Messages (Automatic)

In automatic mode, messages are created by:
• selecting the message type;
• selecting the information elements;
• including/excluding octets for the selected IE's;
• modifying parameter values for included octets; and
• generating the message.

Messages are then placed in the buffer in correct protocol order.

Example:
Create a user SETUP message containing the single mandatory IE: *BEARER_CAP* (Bearer Capability) and the optional IE: *CALLED_NUM* (Called Party Number). Exclude all octets except 3, 4, and 5 for the *BEARER_CAP* IE. Set *BEARER_CAP* to indicate G.711 μ-law and circuit switched voice.
Message Options:

→ Direction
Selects the direction of the message as NETWORK TO USER or USER TO NETWORK. The set of mandatory or optional IE's for each message might be different for each direction.

Call Reference:

→ CR Length
Specifies the length of the call reference. Valid values are 0 through 3 octets.

→ CR Flag
Sets the call reference flag to either 0 (Origination message) or 1 (Destination message).

→ CR Value
Sets the value of the call reference.

→ SETUP

If there are no mandatory IE's for the selected message, the optional IE's will be displayed. If there are no mandatory or optional IE's, all other IE's will be displayed.
Selecting the IE's

IE Selection Menu

Message Type  SETUP
Direction      NETWORK TO USER

Build Mode  MANUAL

Mandatory IEs:

BEAVER CAP

Optional:alo

Display the list of optional IE's for the message.

IE Selection Menu

Message Type  SETUP
Direction      NETWORK TO USER

Build Mode  AUTOMATIC

Optional IEs:

SEND_COMP  CALLING_SAD
REP_IND    CALLING_NUM
CHANNEL_ID  CALLED_SAD
FACILITY    TRANS_NV_SEL
PROGRESS_IND  LOW_LAY_COMP
NET_FACIL  HI_LAY_COMP
KEYPAD  UU_INFO
SWITCHHOOK
FEAT_ACT
CALLING_NUM
Return to the mandatory IE Selection Menu.

Including/Excluding Octets

<table>
<thead>
<tr>
<th>Octet Selection Menu</th>
</tr>
</thead>
<tbody>
<tr>
<td>Message Type</td>
</tr>
<tr>
<td>Information Element</td>
</tr>
<tr>
<td>Octets Included</td>
</tr>
<tr>
<td>Octets Excluded</td>
</tr>
</tbody>
</table>

- OCTET 3
  - Coding standard: CCITT
  - Info. trans. cap.: unrestricted digital information

- OCTET 4
  - Transfer mode: circuit mode
  - Info. transfer rate: 64 kbit/s

- OCTET 4A
  - Structure: 8 kHz integrity
  - Configuration: point-to-point

Use the Page Down and Page Up function keys to view all octets of the IE.
Modifying the Parameter Values

Information element parameters can be modified using one of three methods.

NOTE

The status of included/excluded octets is reported at the top of the menu.

<table>
<thead>
<tr>
<th>Message Type</th>
<th>SETUP</th>
</tr>
</thead>
<tbody>
<tr>
<td>Information Element</td>
<td>BEARER CAPability</td>
</tr>
<tr>
<td>Octets Included</td>
<td>3 4 5</td>
</tr>
<tr>
<td>Octets Excluded</td>
<td>4A 4B 5A 5B 5C 5D 6 7</td>
</tr>
</tbody>
</table>

- Establishment: demand
- OCTET 4B: bidirectional symmetric
- Info. transfer rate: 64 kbit/s
- OCTET 5:
  - Layer identifier: 0b01
  - Layer 1 protocol: CCITT rate adaption V.110/X.30
- OCTET 5A: synchronous

Method 1

- Cycle through the list of valid values until the desired parameter is displayed on the menu.

Method 2

- Select the desired value from the Field Value Selection Menu.
### Field Value Selection Menu

<table>
<thead>
<tr>
<th>Message Type</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>SETUP</td>
<td></td>
</tr>
<tr>
<td>Information Element</td>
<td>BEARER CAPability</td>
</tr>
<tr>
<td>Field Name</td>
<td>Layer 1 protocol</td>
</tr>
<tr>
<td>Field Value</td>
<td>Ob00010 Rec. G.711 u-law</td>
</tr>
</tbody>
</table>

Ob00001 CCITT rate adaption V.110/X.30

- Ob00010 Rec. G.711 u-law
- Ob00011 Rec. G.711 A-law
- Ob00100 Rec. G.721 32 kbit/s ADPCM
- Ob00101 Rec. G.722 and G.724 7kHz audio
- Ob00110 Rec. G.7XX 384 kbit/s video
- Ob00111 non-CCITT rate adaption
- Ob01000 CCITT rate adaption V.120
- Ob01001 CCITT rate adaption X.31 HDLC

---

#### Method 3

- Specify the value from a prompt (used when an invalid value is desired).

---

#### Generating the Message

- Press Exit three times (or until the Message Selection Menu is displayed).
Creating Messages (Manual)

In manual mode, messages are built incrementally by:
- building the header (CR Value, Length, and Flag);
- selecting the message type;
- including/excluding octets for the selected IE;
- modifying parameter values for included octets; and
- building the IE.

IE's are then added to the message header regardless of order. Therefore, messages not conforming to the Q.931 standard can be created.

Example:
Create a SETUP message out of order by selecting \textit{CALLED_NUM} (Called Party Number) first and then \textit{BEARER_CAP} (Bearer Capability).

![Message Selection Menu]

- **Message Options**: Active PD 8
- **Build Mode**: MANUAL
- **Message Set**: CCITT_1988
- **CR Length**: 1 OCTET
- **Call Reference**: MANUAL
- **Active Message**: SETUP
- **CR Flag**: ORIG
- **Direction**: NETWORK TO USER
- **CR Value**: 0

**Layer 3 Messages**
- ALERT
- CALL_PROC
- CON_CONN
- CONN
- CONN_ACK
- DISC
- INFO
- NOTIFY

- **STATUS**
- SEGMENT
- RET_REJ
- PROG
- REL
- REL_COM
- RES
- RES_ACK
- RES_REJ
- SETUP
- RES

- **STATUS_EN**
- FAC
- SUSP
- HOLD
- SUSP_ACK
- HOLD_ACK
- SUSP_REJ
- HOLD_REJ
- USER_INFO
- RET
- SETUP_ACK
- RET_ACK
Selecting the IE's

<table>
<thead>
<tr>
<th>Message Type</th>
<th>SETUP</th>
<th>Build Mode</th>
<th>MANUAL</th>
</tr>
</thead>
<tbody>
<tr>
<td>Direction</td>
<td>NETWORK TO USER</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Mandatory IEs:
- BEARER_CAP
Including/Excluding Octets

- Include/exclude octets and modify parameter values as described for automatic messages.
- Press Exit (until the IE Selection Menu is displayed).
NOTE
When an IE is built, the Remove Last function key can be used to remove the IE from the end of the message buffer. Only the most recent IE can be removed.

- Repeat the same procedure for the BEARER.Cap IE. Include/exclude octets, modify parameter values, and then build the IE.

Displaying the Message

The message can be displayed from either the Message Selection Menu or the IE Selection Menu (manual mode).
The display format can be selected from the Display Buffer Menu or, in more detail, from the Message Format Menu. The display format modes are identical to those of the monitor (see the 'ISDN Display Formats' section on page 4–5).

### Message Format Menu

<table>
<thead>
<tr>
<th>Layer 3 Report</th>
<th>MNEMONIC</th>
<th>Character Set</th>
<th>OFF</th>
</tr>
</thead>
<tbody>
<tr>
<td>Message Detail</td>
<td>MSG</td>
<td>Printer</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>F1</th>
<th>F2</th>
<th>F3</th>
<th>F4</th>
<th>F5</th>
<th>F6</th>
<th>F8</th>
</tr>
</thead>
<tbody>
<tr>
<td>Format Menu</td>
<td>Msg Comp</td>
<td>Msg</td>
<td>MSG</td>
<td>MSG+IE</td>
<td>MSG+IE+PA</td>
<td>Exit</td>
</tr>
</tbody>
</table>
Adding a Message to the Message Pool

Pool Entry

\[ \text{Entry Number} \]

Select Entry

Specifies the pool entry. Valid values are 1 through 60.

Next

Increments the selected pool entry number.

Previous

Decrements the selected pool entry number.

Copy MBuf

Copies the message from the message buffer to the selected pool entry.
Copy Ebuf
Copies the message from the edit buffer to the selected pool entry.

Copy
Copies from one message entry to another.

Move
Moves one message entry to another.

Clear
Clears/deletes a message entry from the pool.

Display Entry
Displays the message (only after it has been copied from either the message buffer – Copy MBuf or the edit buffer – Copy Ebuf). See the 'Displaying the Message' section on page 5-44.

→ Entry Comment
Specifies the comment associated with a pool entry. The maximum length of the comment field is 50 characters.

→ Pool Name
Modify File Name
Specifies the name of the message pool.

Load
Loads the message pool from disk.

Save
Saves the message pool to disk.

Append
Appends a saved message pool to the pool buffer.

Clear
Clears/deletes all messages from the message pool.

→ Entry Name
Specifies the name of the pool entry. The maximum length of the name field is 20 characters, although only 10 appear on the menu.

→ Drive
Specifies the disk drive to save to or load from disk.

Msg Length
Displays the length, in bytes, of the current message.
Max Entries
Displays the maximum number of message pool entries allowed in a message pool. There are 60 entries initially available. Individual entries of more than 130 bytes in length reduce the maximum number of entries by 1.

Editing Messages
Messages not conforming to the Q.931 standard, or containing illegal fields, can be built using the Buffer Edit Menu.

The contents of the edit buffer are set using hex entry.

Example:
Build a SETUP message containing an illegal call reference length (the second byte of the message).
<table>
<thead>
<tr>
<th>Command</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Insert</td>
<td>Inserts typed characters before the current cursor position.</td>
</tr>
<tr>
<td>Append</td>
<td>Inserts typed characters after the current cursor position.</td>
</tr>
<tr>
<td>Replace</td>
<td>Overwrites existing data at the cursor position.</td>
</tr>
<tr>
<td>Cut Byte</td>
<td>Deletes the byte at the current cursor position.</td>
</tr>
<tr>
<td>Clear</td>
<td>Deletes all data in the edit buffer.</td>
</tr>
<tr>
<td>Copy Mbuf</td>
<td>Copies the message from the message buffer to the edit buffer.</td>
</tr>
<tr>
<td>Copy Entry</td>
<td>Copies the specified pool entry to the edit buffer.</td>
</tr>
<tr>
<td>Append Mbuf</td>
<td>Appends the contents of the message buffer to the end of the edit buffer.</td>
</tr>
<tr>
<td>Append Entry</td>
<td>Appends the specified pool entry to the end of the edit buffer.</td>
</tr>
</tbody>
</table>
5.2 B–Channel Emulation

The following B–Channel selections are available from either the B1–Channel or the B2–Channel topic on the Home processor:

- Voice
- External Access
- Loading an Application
- Selfloop
- Crossloop

Voice

Voice traffic emulation can be generated via the VOICE connector (at the back of the tester). Before emulating voice traffic, ensure that the interface is configured as described in Section 3.4.

External

B–Channel data can be routed via an external connector. Ensure that the interface is configured as described in Section 3.4.

By default, external connector #1 is associated with the B1–Channel, and external connector #2 is associated with the B2–Channel.
Loading an Application

Ensure that the interface is configured as described in Section 3.4.

Example:
Load the X.25 Emulation program on AP #1 to emulate data transfer on the B1-Channel.
When the application has finished loading:

**Selfloop**

Data can be echoed back on the same B-Channel. This feature can be used to self-test the tester's functionality or test other equipment. Ensure that the interface is configured as described in Section 3.4.

**Crossloop**

Data can be sent on one B-Channel and echoed back on the other B-Channel. Two TE's or two phones and a network can be simulated when only one S/T bus is available. Ensure that the interface is configured as described in Section 3.4.
6

ISDN PRA MONITOR
Version 2.0
6.1 Loading the ISDN D–Channel Monitor Program

Before loading the program, ensure that the system is configured as described in Section 3.5.

```
Channel Setup Menu

Channel : Test Chan 1  Drop and Insert Mode :
     
Specify Parameters :
PRA Port    ---  Current Parameters :
Timeslot    24  PRA Port        A/B
Inverted HDLC YES  Timeslot        24
Voice Encoding ---  Inverted HDLC    YES
Voice Encoding ---  Voice Encoding  ---

Configure Test Chan :
Assign Parameters

+ Application : None Loaded

F1
Load Application on TC #1

PRA Monitor Applications

Universal      X.25
SDLC/SNA       X.25/Q
TELETEX        X.75
ISDN D Channel SS#7

Statistic Applications:
SDLC/SNA        X.25

F1
Load Application
```
When the application has finished loading:

![Switch to TC #1]

Figure 6-1 ISDN D-Channel Monitor Program Display

In the default configuration, data is captured to RAM, decoded, and displayed in the mnemonic format as shown above.
6.2 Configuration

- Frame Sequence Number Modulo
  - NORMAL: Selects frame level decoding according to modulo 8.
  - EXTENDED (default): Selects frame level decoding according to modulo 128.

- Packet Communication SAPI
  Decodes layer 2 frames according to the X.25 protocol (default is 16).
6.3 ISDN Display Formats

Refer to Section 18.5 in the 'General Application Topics' section for general display format setup information.

<table>
<thead>
<tr>
<th>Display Format Menu</th>
</tr>
</thead>
<tbody>
<tr>
<td>Display Format</td>
</tr>
<tr>
<td>Timestamp</td>
</tr>
<tr>
<td>Layer 1 Report</td>
</tr>
<tr>
<td>Layer 2 Report</td>
</tr>
<tr>
<td>Layer 3 Report</td>
</tr>
<tr>
<td>Message Detail</td>
</tr>
<tr>
<td>Packet Data</td>
</tr>
<tr>
<td>Character Set</td>
</tr>
<tr>
<td>Dual Window</td>
</tr>
<tr>
<td>Trace Display Format</td>
</tr>
<tr>
<td>Trace Display Format</td>
</tr>
<tr>
<td>Short Interval (sec)</td>
</tr>
<tr>
<td>Long Interval (sec)</td>
</tr>
</tbody>
</table>

Display Format

Layer 1 Report, Layer 2 Report, and Layer 3 Report can only be modified when Display Format is set to NORMAL.

NORMAL (default) Data from the user and network side are interleaved.

SPLIT Divides the screen vertically and displays data from the network on the left and data from the user on the right (see page 18-15 for an example of a split screen display).

TRACE Displays only trace statements (comments) generated by an application or test script.

NOTE

All received and transmitted events are automatically timestamped by the system. Timestamps can be displayed in one of two resolutions.

Layer 1 Report

OFF Layer 1 information is not displayed.

ON Displays red alarm, yellow alarm, red alarm and lost signal level, buffer overflow, and out of frame alarm conditions.
→ Layer 2 Report
OFF
Layer 2 information is not displayed.

COMPLETE

<table>
<thead>
<tr>
<th>Command</th>
<th>Net</th>
<th>Usr</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>1</td>
<td>1</td>
<td>0</td>
</tr>
</tbody>
</table>

Poll/Final Bit

<table>
<thead>
<tr>
<th>Block No</th>
<th>Src SA</th>
<th>TEI</th>
<th>C/R</th>
<th>Frame</th>
<th>P/F</th>
<th>NR</th>
<th>NS</th>
</tr>
</thead>
<tbody>
<tr>
<td>10</td>
<td>T1</td>
<td>UA8</td>
<td>0</td>
<td>64</td>
<td>0</td>
<td>INFO</td>
<td>P=0</td>
</tr>
<tr>
<td>15</td>
<td>T1</td>
<td>NIA</td>
<td>0</td>
<td>64</td>
<td>0</td>
<td>INFO</td>
<td>F=0</td>
</tr>
</tbody>
</table>

HEX

<table>
<thead>
<tr>
<th>Block No</th>
<th>Src Frame</th>
</tr>
</thead>
<tbody>
<tr>
<td>10</td>
<td>T1 UA8 00 01 C4 00</td>
</tr>
<tr>
<td>15</td>
<td>T1 NIA 00 01 01 CB</td>
</tr>
</tbody>
</table>

TEXT

<table>
<thead>
<tr>
<th>Block No</th>
<th>Src Frame</th>
</tr>
</thead>
<tbody>
<tr>
<td>10</td>
<td>T1 UA8 1M^P^H 0D^M^U</td>
</tr>
<tr>
<td>15</td>
<td>T1 NIA 1M^P^H 0F1</td>
</tr>
</tbody>
</table>

MNEMONIC

<table>
<thead>
<tr>
<th>Block No</th>
<th>Src SA</th>
<th>TEI</th>
<th>C/R</th>
<th>Frame</th>
</tr>
</thead>
<tbody>
<tr>
<td>10</td>
<td>T1</td>
<td>UA8</td>
<td>0</td>
<td>64</td>
</tr>
<tr>
<td>15</td>
<td>T1</td>
<td>NIA</td>
<td>0</td>
<td>64</td>
</tr>
</tbody>
</table>
Layer 3 Report

Selections for layer 3 HEX, TEXT, and MNEMONIC report display formats are similar to layer 2.

COMPLETE

<table>
<thead>
<tr>
<th>4</th>
<th>T1</th>
<th>Ue8</th>
<th>0</th>
<th>85</th>
<th>0</th>
<th>INFO</th>
</tr>
</thead>
<tbody>
<tr>
<td>PD = Q.931 CR = 0X1B Orig SETUP Var. = CCITT_1988</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>00000100 INFORMATION ELEMENT : BEARER CAPability</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>00000011 IE length : 3 octets</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>l----- Extension bit : not continued</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>-00----- Coding standard : CCITT</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>-------0000 Info. trans. cap. : speech</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>l----- Extension bit : not continued</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>-00----- Transfer node : circuit node</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>-------10000 Info. transfer rate : 64 kbit/s</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>l----- Extension bit : not continued</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>-01----- Layer identifier : 1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>-------00010 Layer 1 protocol : Rec. G.711 u-law</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

NOTE

If layer 3 contains X.25 data (SAPI=16), it will be decoded according to the X.25 (1980/1984) Protocol.

Message Detail

Selects the amount of detail for a layer 3 message displayed in mnemonic, text, or hexadecimal format.

MSG
MSG+IE

MSG+IE+PA

Packet Data
Selects the display format for X.25 data contained in a SAPI 16 I frames as hex or character mode (i.e. ASCII).

6.4 Selecting a Message Set

A variety of message sets can be used for layer 3 message decoding and encoding. North American primary rate message sets are displayed here as an example.

Example:
Select the CCITT_1988 message set.
Message Set Release Number

Current Message Set: CCITT_1988

<table>
<thead>
<tr>
<th>Name</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>NT_A211-1</td>
<td>Northern Telecom NIS A211-1 (1988), Issue AB01 (03/87)</td>
</tr>
<tr>
<td>ATT_4144Q</td>
<td>AT&amp;T Primary Rate Interface Spec. TR4144Q (07/89)</td>
</tr>
</tbody>
</table>

Page Down: Displays the next ten message sets (if more than ten are displayed).

Page Up: Displays the previous ten message sets.

Select Message Set: Selects the current message set for layer 3 message decoding.

Locate Message Sets: Searches all disk drives for message set files and updates the Message Set Selection Menu.
6.5 Loading a Message Set

This function is used to load message set source files created with ISDN MDL (message description language). Refer to the ISDN MDL Programmer's Manual.

6.6 Saving a Message Set

This function is used to save a message set binary file created after ISDN MDL source files have been loaded into memory. Refer to the ISDN MDL Programmer's Manual.
6.7 ISDN Filters

Refer to Section 18.9 in the 'General Application Topics' section for filter setup information.

Example:
Pass all layer 1 events, all layer 2 events with a SAPI=0 or TEI=2, and only SETUP and INFO messages at layer 3 (all others are blocked).

Move the cursor to the required parameters on the Layer2, Layer 2, and Layer 3 Filter Setup Menus and use the PASS and BLOCK function keys to record (pass) only the desired events.

Layer 1 Events:

» SYNONRONIZED
The line receiver is locked to the clock signal and framing format.

» LOST SIGNAL
The signal amplitude falls below the minimum threshold as defined by the interface.

» RED ALARM
Signal framing is lost for more than 2.5 seconds.
→ LOST PHASE
The unit cannot synchronize to the frequency of the signal.

→ YELLOW ALARM
A yellow alarm is received.

→ OUT OF FRAME
The receiver is unable to recover the framing pattern.

**Layer 2 Filter Setup Menu**

- **Filter Type**: RAM
- **Filter Status**: DEACTIVATED

**Link Address Events**:
- SAPI Filter: PASS, SAPI: 0
- TEI Filter: PASS, TEI: 2

**Logical Operation OR**

**Layer 2 Events**:
- RR PASS SABM PASS I PASS DISC PASS PASS INVALID PASS
- RNR PASS SABME PASS UA PASS DM PASS
- REJ PASS XID PASS UI PASS FRMR PASS

**Link Address Events**:
A filter condition can be set to pass or block on a specific SAPI or TEI value. The SAPI and TEI conditions can be logically combined to provide complex filtering capabilities. There are a large number of possible combinations of these settings (refer to Table 6-1).

→ SAPI Filter
→ TEI Filter
- **OFF**
  - Selective filtering is not performed.
- **PASS**
  - Sets a pass condition for the specified value.
- **BLOCK**
  - Sets a block condition for the specified value.
→ **SAPI**
Specifies the SAPI value when *SAPI Filter* is set to *PASS* or *BLOCK*. Valid values are 0 through 63.

→ **TEI**
Specifies the TEI value when *TEI Filter* is set to *PASS* or *BLOCK*. Valid values are 0 through 127.

→ **Logical Operation**

**OR**
Selects frames which match either SAPI or TEI conditions.

**AND**
Selects frames which match both SAPI and TEI conditions.

<table>
<thead>
<tr>
<th>S=SAPI</th>
<th>T=TEI</th>
<th>SAPI/TEI of Received Frame</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>AND</td>
</tr>
<tr>
<td></td>
<td></td>
<td>=S</td>
</tr>
<tr>
<td></td>
<td></td>
<td>=T</td>
</tr>
<tr>
<td>BLOCK</td>
<td>BLOCK</td>
<td>□</td>
</tr>
<tr>
<td>BLOCK</td>
<td>PASS</td>
<td>□</td>
</tr>
<tr>
<td>PASS</td>
<td>BLOCK</td>
<td>□</td>
</tr>
<tr>
<td>PASS</td>
<td>PASS</td>
<td>PASS</td>
</tr>
</tbody>
</table>

**LEGEND:** □ = BLOCK □ = PASS

Table 6–1  SAPI/TEI – Logical Operations
Layer 3 Filter Setup Menu

<table>
<thead>
<tr>
<th>Filter Type</th>
<th>RAM</th>
<th>Protocol Discriminator</th>
<th>PD Value</th>
<th>Filter Status</th>
<th>Call Reference</th>
<th>CR Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>ALERT</td>
<td>BLK</td>
<td>REL</td>
<td>BLK</td>
<td>ACTIVATED</td>
<td>SUSP</td>
<td>HOLD_ACK</td>
</tr>
<tr>
<td>CALL_PROC</td>
<td>BLK</td>
<td>REL_COM</td>
<td>BLK</td>
<td>ACTIVATED</td>
<td>SUSP_ACK</td>
<td>HOLD_REJ</td>
</tr>
<tr>
<td>CON_CONN</td>
<td>BLK</td>
<td>RES</td>
<td>BLK</td>
<td>ACTIVATED</td>
<td>SUSP_REJ</td>
<td>REG</td>
</tr>
<tr>
<td>CONN_ACK</td>
<td>BLK</td>
<td>RES_REJ</td>
<td>BLK</td>
<td>ACTIVATED</td>
<td>REST</td>
<td>RET_ACK</td>
</tr>
<tr>
<td>DISC</td>
<td>BLK</td>
<td>SETUP</td>
<td>PASS</td>
<td>ACTIVATED</td>
<td>REST_ACK</td>
<td>RET_REJ</td>
</tr>
<tr>
<td>INFO</td>
<td>PASS</td>
<td>SETUP_ACK</td>
<td>BLK</td>
<td>ACTIVATED</td>
<td>SEGMENT</td>
<td>Undefined</td>
</tr>
<tr>
<td>NOTIFY</td>
<td>BLK</td>
<td>STATUS</td>
<td>BLK</td>
<td>ACTIVATED</td>
<td>FAC</td>
<td>Invalid</td>
</tr>
<tr>
<td>PROG</td>
<td>BLK</td>
<td>STATUS_EN</td>
<td>BLK</td>
<td>ACTIVATED</td>
<td>HOLD</td>
<td>BLK</td>
</tr>
</tbody>
</table>

Protocol Discriminator

**OFF**
Ignores the message protocol discriminator when filtering.

**PASS**
Passes data with the specified protocol discriminator.

**PD Value**
Specifies the protocol discriminator value.

Call Reference

**OFF**
Ignores the message call reference when filtering.

**PASS**
Passes only data with the specified call reference.

**CR Value**
Specifies the call reference value.
Refer to Section 11.4 for examples using X.25 filters.

---

**Filters**

<table>
<thead>
<tr>
<th>Filter Type</th>
<th>DISPLAY</th>
<th>Selective Address ALL</th>
</tr>
</thead>
<tbody>
<tr>
<td>Filter Status</td>
<td>DEACTIVATED</td>
<td>Selective LCN #1 ALL</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Selective LCN #3 ALL</td>
</tr>
<tr>
<td></td>
<td></td>
<td>LCN #2 ALL</td>
</tr>
<tr>
<td></td>
<td></td>
<td>LCN #4 ALL</td>
</tr>
</tbody>
</table>

**Packet Layer:**

- Call: PASS RR PASS Restart PASS Registration PASS
- Clear: PASS RNR PASS Reset PASS Diagnostic PASS
- Date: PASS REJ PASS Interrupt PASS Invalid PASS

---

**6.8 ISDN Triggers**

Refer to Section 18.10 in the 'General Application Topics' section for trigger setup information.

Example:
Trigger on a frame with SAPI=0. When received, beep, turn on disk recording, stop capture to RAM, and write a message to the data stream.
Setting Conditions

**Trigger Conditions Menu**

- **Event Trigger**: TRIGGER #1
- **Trigger Status**: UNARMED
- **Layer 1 Events**: Disk Full OFF
- **Layer 2 Events**: RAM Full OFF
- **Layer 3 Events**: Alarm Clock OFF
- **X.25 L3 Events**: Time ---
- **String Match**: OFF
- **String**: ---
- **Mask**: ---

**Layer 2 Event Menu**

- **Link Address Events**: SAPI ON DLCI OFF SAPI Value 0
  - TEI OFF TEI Value ---
- **Layer 2 Events**: RNR OFF SABM OFF I OFF DISC OFF INVALID OFF
  - RR OFF SABME OFF UA OFF DM OFF
  - REJ OFF XID OFF UI OFF FRMR OFF
Setting Actions

| Event Trigger | TRIGGER #1 | Display   | NO EFFECT |
| Trigger Status | ARMED       | RAM Recording | TURN OFF  |
| Beep          | ON          | Disk Recording | TURN ON   |
| Highlight     | NO EFFECT   |             |           |

Data Display Message: "TRIGGER NO1 HAS FIRED"
User Window Message: ""
7.1 Loading the ISDN D-Channel Emulation Program

Before loading the program, ensure that the system is configured as described in Section 3.6.

Channel Setup Menu

Channel: Test Chan 1
Drop and Insert Mode:
  Channel Submode: --

Specify Parameters:
  PRA Port: PORT A
  Timeslot: 24
  Inverted HDLC: YES
  Voice Encoding: ---

Current Parameters:
  PRA Port: PORT A
  Timeslot: 24
  Inverted HDLC: YES
  Voice Encoding: ---

Configure Test Chan:
  Application: None Loaded
  Assign Parameters

PRA Emulation Applications:

Universal X.25
SDLC X.25 LOAD GEN
  ISDN D Channel SS#7
X.75

Verification Applications:
  SDLC/SNA

Conformance Applications:
  Universal X.25
  ISDN D Channel SS#7
When the application has finished loading:

![Switch to AP #2]

**Figure 7-1  ISDN D-Channel Emulation Program Display**

The following sections describe the operation of the ISDN Emulation program. All functions are grouped under four general topics: **Emulation, Send, Services, and MsgBuilder.**
7.2 Configuration

Timer Duration:
- Idle Link (T203) 300

Flags:
- XID Negotiate Proc OFF
- RR Polling Action OFF

Protocol Emulation:
- L.2 State Machine ON

Special SAPI:
- Packet Communication 18

Timer Duration:
- Idle Link (T203)

The T203 timer starts after a frame is transmitted and stops when a frame is received. If the timer expires without a frame being received, the emulation will respond with an RR poll (if enabled).

Flags:
- XID Negotiate Proc
  Not required for Primary Rate.

- RR Polling Action
  OFF
  No polling action is performed.
  ENABLE
  Automatically polls the link with RR frames when the idle link timer expires.
Protocol Emulation:
→ L.2 State Machine
  ON Automatically responds to all received layer 2 events.
  OFF Layer 2 does not automatically respond to received events.

**NOTE**
This function is the same as the Run Emulation function key under the Emulation topic.

Special SAPI:
→ Packet Communication
Layer 2 information frames having this SAPI value are decoded according to the X.25 (1984) protocol (default is 16).

Each layer 2 link has several 'static' parameters which can be set. These parameters are not changed during protocol execution.

<table>
<thead>
<tr>
<th>Link No</th>
<th>0</th>
</tr>
</thead>
<tbody>
<tr>
<td>DLCI Value</td>
<td>Timer Duration</td>
</tr>
<tr>
<td>SAPI 0</td>
<td>Primary (T200) 10</td>
</tr>
<tr>
<td>TEI 0</td>
<td>T200-RX (XID Neg) 10</td>
</tr>
</tbody>
</table>

Modulus: EXTENDED
Max. Retransmission: Primary Event (N200) 3
Window: K 7

Link TEI: AUTOMATIC

→ Link No
Specifies the link number for setting parameters.
DLCI Value:

→ SAPI
Sets the SAPI (service access point identifier) for the selected link. Both standard and non-standard values can be set.

- 0 Used for call setup signalling.
- 16 Used for D-Channel packet communication (i.e. X.25).
- 63 Used for Management/ASP layer.

→ TEI
Sets the TEI (terminal endpoint identifier) for the selected link.

Modulus:

→ Mode
NORMAL Selects modulo 8 sequencing.

EXTENDED Selects modulo 128 sequencing.

Link TEI:

→ Mode
Not required for Primary Rate.

Timer Duration:

→ Primary (T200)
Specifies the time, in tenths of seconds, between SABM/E retransmissions during link setup (default is 1 second).

→ T200–RX (XID NEG)
Not required for Primary Rate.

Max. Retransmission:

→ Primary Event (N200)
Specifies the maximum number of times that a frame is retransmitted after the expiry of the T200 timer is determined by N200 (default is 3).
Data Field Length:

$\rightarrow N201 \ (XID \ Neg)$
Specifies the maximum length of a received I or UI frame for the XID negotiation procedure (default is 260 bytes).

$\rightarrow N201-TX \ (XID \ Neg)$
Not required for Primary Rate.

Window:

$\rightarrow K$
Specifies the maximum number of I frames that can be transmitted before a response is received (default is 7).

$\rightarrow K-RX$
Not required for Primary Rate.

\[\textbf{NOTE}\]
The ML and ASP Menus are not required since neither the TEI assignment or XID procedures are supported in Primary Rate.

7.3 Running the Emulation Program

\[\text{Emulation}\]
\[\text{Run Emulation}\]

\[\textbf{NOTE}\]
This is equivalent to the L.2 State Machine item on the Emulation Configuration Menu.

Transmitted frames are sent correctly according to the protocol (i.e. correct sequence numbers are calculated).
### 7.4 Layer 2 Frames

Layer 2 frames can be transmitted:
- automatically according to the protocol standard (the layer 2 state machine is on); or
- manually with user-defined fields (the layer 2 state machine is off).

### Defining Frames

Frames can be sent according to the parameters selected from the following menus (only valid when the layer 2 state machine is turned off).

#### Poll/Final Bits:
All frames contain a P/F (poll/final) bit. Command frames contain a P bit and response frames contain an F bit.

#### Command/Response Bits:
Indicates when a frame is a command or a response.

#### FRMR Bits:
Reports the rejection condition of bits W, X, Y, and Z of an FRMR frame.
Sequence Numbers:
The receive sequence number N(R) contains the expected send sequence number of the next received frame. The send sequence number N(S) contains the current number of transmitted frames. Valid values are 0 through 7 for modulo 8, and 0 through 127 for modulo 128.

→ Link No
Selects the link number for transmitting frames. Valid values are 0 through 7.

State Machine:
→ L.2 State
Forces the layer 2 state machine to a specific state. Valid state numbers are listed in Appendix B.

State Variables:
→ VS
Specifies the V(S) (send state variable) count identifying the sequence number of the next information frame transmitted by the tester. Valid values are 0 through 7 for modulo 8, and 0 through 127 for modulo 128.

→ VA
Specifies the V(A) (acknowledge state variable) count identifying the sequence number of the last acknowledged frame. Valid values are 0 through 7 for modulo 8, and 0 through 127 for modulo 128.
→ VR
Specifies the V(R) (receive state variable) count identifying the sequence number of the next in sequence information frame expected to be received. Valid values are 0 through 7 for modulo 8, and 0 through 127 for modulo 128.

Counters:
→ Retransmission (RC)
Specifies the number of times a particular poll sequence has been transmitted to the peer.

→ Poll/Response (PRC)
Specifies the number of outstanding polls.

⚠️ NOTE
DLCI Status and Negotiate Parameters Status reflect the settings made on the Link Setup Menu during configuration. These values cannot be changed on the Send Link Setup Menu.

Sending Frames

Individual frames can be transmitted using the function keys under the Send topic. When the layer 2 state machine is on, frames are sent only when permitted by the current state. When the layer 2 state machine is off, frames are sent with values defined on the Control Field Setup and Send Link Setup Menus.

SABME, RR, RNR, REJ, UA, DISC, DM, and FRMR
Transmits the corresponding frame.

XID
Not required for Primary Rate.
7.5 Layer 3 Messages

Layer 3 messages can be transmitted in either an I, UI, or Management UI frame. The content of the message must be specified first.

Selecting Messages

Select Source of Information Field Contents for UI/Info Frames:

Data Source L.3 Default Message

Transmit Mode:
Queueing Procedure Single Frame Number of Repetitions ---

Message Selection:
⇒ Message Type ALERT
Pool Entry Name ---
Predefined Pkt# ---

Select Source of Information Field Contents for UI/Info Frames:

⇒ Data Source
Predefined Pkt# Selects a fixed bit pattern for transmission via the Predefined Pkt# item.

L.3 Default Message Selects a message which contains all mandatory and selects optional information elements for a particular message via the Message Type item.

Message Pool Selects a message from a previously defined pool of messages. The message contents and the pool entry name must have been defined with the message builder.
Transmit Mode:

→ Queuing Procedure

**Single Frame** Transmits a single frame.

**Repetitive** Transmits a specified number of frames.

**Continuous** Transmits frames continuously.

→ Number of Repetitions

Specifies the number of frames to transmit when Queuing Procedure is set to Repetitive.

Message Selection:

→ Message Type

Specifies the type of message when Data Source is set to L.3 Default Message.

<table>
<thead>
<tr>
<th>F1</th>
<th>Modify Type</th>
</tr>
</thead>
</table>

Send Message Type Menu

<table>
<thead>
<tr>
<th>Message Set CCITT_1988</th>
<th>Current Message Type: ALERT</th>
</tr>
</thead>
<tbody>
<tr>
<td>ALERT</td>
<td>REL_COM</td>
</tr>
<tr>
<td>CALL_PROC</td>
<td>RES</td>
</tr>
<tr>
<td>CON_CON</td>
<td>RES_ACK</td>
</tr>
<tr>
<td>CONN</td>
<td>RES_REJ</td>
</tr>
<tr>
<td>CONN_ACK</td>
<td>SETUP</td>
</tr>
<tr>
<td>DISC</td>
<td>SETUP_ACK</td>
</tr>
<tr>
<td>INFO</td>
<td>STATUS</td>
</tr>
<tr>
<td>NOTIFY</td>
<td>STATUS_EN</td>
</tr>
<tr>
<td>PROG</td>
<td>SUSP</td>
</tr>
<tr>
<td>REL</td>
<td>SUSP_ACK</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>F1</th>
<th>Set Message Type</th>
</tr>
</thead>
</table>

Press Exit.
→ **Pool Entry Name**
Specifies the message pool entry name when *Data Source* is set to *Message Pool*.

→ **Predefined Pkt#**

<table>
<thead>
<tr>
<th>Incrementing Bytes</th>
<th>Increments each byte in the frame.</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>All 1s</strong></td>
<td>Transmits hex FF’s.</td>
</tr>
<tr>
<td><strong>All 0s</strong></td>
<td>Transmits hex 00’s.</td>
</tr>
<tr>
<td><strong>Alternating Bits</strong></td>
<td>Transmits alternating bits (hex 55).</td>
</tr>
</tbody>
</table>

### Sending Messages

Messages can be transmitted with UI or I frames using the function keys under the *Send* topic. When the layer 2 state machine is on, messages are transmitted only when permitted by the current state.

- **I**
  Transmits the message selected on the Send Data Source Menu as an I frame.

- **L.3 UI**
  Transmits the message selected on the Send Data Source Menu as a layer 3 UI frame.

For ISDN D–Channel User (TE) Emulation:

- **ML UI**
  Transmits the message selected on the Send Data Source Menu as a management layer UI frame (SAPI=63, TEI=current value).

For ISDN D–Channel Network (NT) Emulation:

- **ASP UI**
  Transmits the message selected on the Send Data Source Menu as an assignment source procedure UI frame (SAPI=63, TEI=current value).
7.6 Services

The Services topic provides control for the automatic operation of the emulation program.

NOTE
The layer 2 state machine must be on to use the function keys under the Services topic.

Selecting a Link

Enter the link number (eg. 0) and press (RETURN).

The ISDN Emulation program supports up to eight simultaneous links (0 through 7).
Establishing a Link

<table>
<thead>
<tr>
<th>Block No</th>
<th>Src SA TEI C/R Frame P/F</th>
<th>NR</th>
<th>NS</th>
<th>Orig PD</th>
<th>C_Ref</th>
<th>Msg_Type</th>
</tr>
</thead>
<tbody>
<tr>
<td>85</td>
<td>Ti</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>SABME P=1</td>
</tr>
<tr>
<td>3</td>
<td>Ti</td>
<td>0</td>
<td>0</td>
<td>85</td>
<td>0</td>
<td>UA P=1</td>
</tr>
</tbody>
</table>

Sending Frames/Messages

Example:
Send an I frame containing the message selected on the Send Data Source Menu.

<table>
<thead>
<tr>
<th>Block No</th>
<th>Src SA TEI C/R Frame Orig PD</th>
<th>C_Ref</th>
<th>Msg_Type</th>
</tr>
</thead>
<tbody>
<tr>
<td>87</td>
<td>Ti</td>
<td>0 0 0</td>
<td>INFO Org 0.931 0x0000 SETUP</td>
</tr>
<tr>
<td>5</td>
<td>T1</td>
<td>0 0 0</td>
<td>RR</td>
</tr>
</tbody>
</table>
Example:
Send a UI frame containing the message selected on the Send Data Source Menu.

```
<table>
<thead>
<tr>
<th>Block No</th>
<th>Src SA TEI C/R Frame Orig PD</th>
<th>C_Ref</th>
<th>Msg_Type</th>
</tr>
</thead>
<tbody>
<tr>
<td>67</td>
<td>T1 User 0 0 0 INFO Org 0.931 0x0000</td>
<td>SETUP</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>T1 Net 0 0 0 RR</td>
<td></td>
<td></td>
</tr>
<tr>
<td>68</td>
<td>T1 User 0 0 0 UI Org 0.931 0x0000</td>
<td>SETUP</td>
<td></td>
</tr>
</tbody>
</table>
```

Example:
Send a management UI frame (SAPI=63) containing the message selected on the Send Data Source Menu.

```
<table>
<thead>
<tr>
<th>Block No</th>
<th>Src SA TEI C/R Frame Orig PD</th>
<th>C_Ref</th>
<th>Msg_Type</th>
</tr>
</thead>
<tbody>
<tr>
<td>68</td>
<td>T1 User 0 0 0 UI Org 0.931 0x0000</td>
<td>SETUP</td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>T1 Net 0 0 0 RR</td>
<td></td>
<td></td>
</tr>
<tr>
<td>69</td>
<td>T1 User 63 0 0 UI Org 0.931 0x0000</td>
<td>SETUP</td>
<td></td>
</tr>
</tbody>
</table>
```
Setting a Link to Busy

The active link sends an RNR frame with \( P=1 \) and responds to incoming events with an RNR frame.

<table>
<thead>
<tr>
<th>Block No</th>
<th>Src SA</th>
<th>TEI</th>
<th>C/R Frame</th>
<th>Orig PD</th>
<th>C_Ref</th>
<th>Msg_Type</th>
</tr>
</thead>
<tbody>
<tr>
<td>75</td>
<td>T1</td>
<td>Var</td>
<td>0 0 0</td>
<td>RNR</td>
<td></td>
<td></td>
</tr>
<tr>
<td>12</td>
<td>T1</td>
<td>Net</td>
<td>0 0 0</td>
<td>RR</td>
<td></td>
<td></td>
</tr>
<tr>
<td>13</td>
<td>T1</td>
<td>Net</td>
<td>0 0 1</td>
<td>RR</td>
<td></td>
<td></td>
</tr>
<tr>
<td>76</td>
<td>T1</td>
<td>Var</td>
<td>0 0 1</td>
<td>RNR</td>
<td></td>
<td></td>
</tr>
<tr>
<td>14</td>
<td>T1</td>
<td>Net</td>
<td>0 0 1</td>
<td>RR</td>
<td></td>
<td></td>
</tr>
<tr>
<td>77</td>
<td>T1</td>
<td>Var</td>
<td>0 0 1</td>
<td>RNR</td>
<td></td>
<td></td>
</tr>
<tr>
<td>78</td>
<td>T1</td>
<td>Var</td>
<td>0 0 0</td>
<td>RR</td>
<td></td>
<td></td>
</tr>
<tr>
<td>15</td>
<td>T1</td>
<td>Net</td>
<td>0 0 0</td>
<td>RR</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

To clear the busy state:
The active link sends an RR frame with $P=1$ and responds to incoming events with an RR frame.

<table>
<thead>
<tr>
<th>Block No</th>
<th>Src SA</th>
<th>TEI</th>
<th>C/R Frame</th>
<th>Orig PD</th>
<th>C_Ref</th>
<th>Msg_Type</th>
</tr>
</thead>
<tbody>
<tr>
<td>75</td>
<td>T1</td>
<td>User</td>
<td>0 0 0</td>
<td>RR</td>
<td></td>
<td></td>
</tr>
<tr>
<td>12</td>
<td>T1</td>
<td>Net</td>
<td>0 0 0</td>
<td>RR</td>
<td></td>
<td></td>
</tr>
<tr>
<td>13</td>
<td>T1</td>
<td>Net</td>
<td>0 0 1</td>
<td>RR</td>
<td></td>
<td></td>
</tr>
<tr>
<td>76</td>
<td>T1</td>
<td>User</td>
<td>0 0 1</td>
<td>RR</td>
<td></td>
<td></td>
</tr>
<tr>
<td>14</td>
<td>T1</td>
<td>Net</td>
<td>0 0 1</td>
<td>RR</td>
<td></td>
<td></td>
</tr>
<tr>
<td>77</td>
<td>T1</td>
<td>User</td>
<td>0 0 1</td>
<td>RR</td>
<td></td>
<td></td>
</tr>
<tr>
<td>78</td>
<td>T1</td>
<td>User</td>
<td>0 0 0</td>
<td>RR</td>
<td></td>
<td></td>
</tr>
<tr>
<td>15</td>
<td>T1</td>
<td>Net</td>
<td>0 0 0</td>
<td>RR</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Disconnecting a Link

<table>
<thead>
<tr>
<th>Block No</th>
<th>Src SA</th>
<th>TEI</th>
<th>C/R Frame</th>
<th>Orig PD</th>
<th>C_Ref</th>
<th>Msg_Type</th>
</tr>
</thead>
<tbody>
<tr>
<td>70</td>
<td>T1</td>
<td>User</td>
<td>0 0 0</td>
<td>DISC</td>
<td></td>
<td></td>
</tr>
<tr>
<td>18</td>
<td>T1</td>
<td>Net</td>
<td>0 0 0</td>
<td>UA</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
7.7 The Message Builder

Layer 3 messages (including IE’s and parameters) from any message set can be built either manually or automatically. Once built, the messages can be transmitted in conjunction with the Send Data Source Menu or from within a test script.

In manual mode, a message type is selected and the IE’s are built incrementally after the message header in the specified order.

In automatic mode, the IE’s are selected first and placed in the correct order before the message header is built.

Generated messages can be copied to the edit buffer. Once in the edit buffer, the hex contents of the message can be manipulated to create invalid variations.

A completed message can be copied into a message pool. A message pool is a collection of up to 60 messages which can be saved to floppy or hard disk for future retrieval and use.
A functional overview is shown in the following figure.

**Message Menu**
- Select message including IE's and parameters
- Build messages

**Edit Menu**
- Create/edit invalid messages complete with headers, IE's, and parameters using HEX code

**Message Pool Menu**

![Figure 7-2 Message Builder Overview](Image)
Creating Messages (Automatic)

In automatic mode, messages are created by:

- selecting the message type;
- selecting the information elements;
- including/excluding octets for the selected IE's;
- modifying parameter values for included octets; and
- generating the message.

Messages are then placed in the buffer in correct protocol order.

Example:
Create a user SETUP message containing the single mandatory IE: BEARER_CAP (Bearer Capability) and the optional IE: CALLED_NUM (Called Party Number). Exclude all octets except 3, 4, and 5 for the BEARER_CAP IE. Set BEARER_CAP to indicate G.711 µ-law and circuit switched voice.
Message Options:

→ Direction
Selects the direction of the message as NETWORK TO USER or USER TO NETWORK. The set of mandatory or optional IE's for each message might be different for each direction.

Call Reference:

→ CR Length
Specifies the length of the call reference. Valid values are 0 through 3 octets.

→ CR Flag
Sets the call reference flag to either 0 (Origination message) or 1 (Destination message).

→ CR Value
Sets the value of the call reference.

→ SETUP

If there are no mandatory IE's for the selected message, the optional IE's will be displayed. If there are no mandatory or optional IE's, all other IE's will be displayed.
Selecting the IE's

Display the list of optional IE's for the message.
Return to the mandatory IE Selection Menu.

Including/Excluding Octets

<table>
<thead>
<tr>
<th>Message Type</th>
<th>SETUP</th>
</tr>
</thead>
<tbody>
<tr>
<td>Information Element</td>
<td>BEARER CAPability</td>
</tr>
<tr>
<td>Octets Included</td>
<td>3 4 4B 5 5A 5B 5C 5D 6 7</td>
</tr>
<tr>
<td>Octets Excluded</td>
<td>4A</td>
</tr>
</tbody>
</table>

**OCET 3**
- Coding standard: CCITT
- Info. trans. cap.: unrestricted digital information

**OCET 4**
- Transfer mode: circuit mode
- Info. transfer rate: 64 kbit/s

**OCET 4A**
- Structure: 8 kHz integrity
- Configuration: point-to-point

Use the Page Down and Page Up function keys to view all octets of the IE.
Modifying the Parameter Values

Information element parameters can be modified using one of three methods.

\*NOTE\*

The status of included/excluded octets is reported at the top of the menu.

![Octet Selection Menu](image)

**Method 1**

- Cycle through the list of valid values until the desired parameter is displayed on the menu.

**Method 2**

- Select the desired value from the Field Value Selection Menu.
Field Value Selection Menu

<table>
<thead>
<tr>
<th>Message Type</th>
<th>SETUP</th>
</tr>
</thead>
<tbody>
<tr>
<td>Information Element</td>
<td>BEARER CAPability</td>
</tr>
<tr>
<td>Field Name</td>
<td>Layer 1 protocol</td>
</tr>
<tr>
<td>Field Value</td>
<td>Ob00010 Rec. G.711 u-law</td>
</tr>
</tbody>
</table>

Ob00001 CCITT rate adaption V.110/X.30
Ob000010 Rec. G.711 u-law
Ob00011 Rec. G.711 A-law
Ob00100 Rec. G.721 32 kbits/s ADPCM
Ob00101 Rec. G.722 and G.724 7kHz audio
Ob00110 Rec. G.7XX 384 kbit/s video
Ob00111 non-CCITT rate adaption
Ob01000 CCITT rate adaption V.120
Ob01001 CCITT rate adaption X.31 HDLC

Method 3

- Specify the value from a prompt (used when an invalid value is desired).

Generating the Message

- Press Exit three times (or until the Message Selection Menu is displayed).
Creating Messages (Manual)

In manual mode, messages are built incrementally by:
- building the header (CR Value, Length, and Flag);
- selecting the message type;
- including/excluding octets for the selected IE;
- modifying parameter values for included octets; and
- building the IE.

IE's are then added to the message header regardless of order. Therefore, messages not conforming to the Q.931 standard can be created.

Example:
Create a SETUP message out of order by selecting CALLED_NUM (Called Party Number) first and then Bearer_CAP (Bearer Capability).
Selecting the IE's

IE Selection Menu

- Message Type: SETUP
- Build Mode: MANUAL
- Direction: NETWORK TO USER
- Mandatory IEs:
  - Bearer Cap
**ISDN PRA EMULATION**

**Message Type** | **SETUP** | **Build Mode** | **MANUAL**  
**Direction**    | NETWORK TO USER |               | 

**Optional IEs:**  
- SEND_COMP  
- REP_IND  
- CHANNEL_ID  
- FACILITY  
- PROGRESS_IND  
- NET_FACIL  
- KEYPAD  
- SWITCHHOOK  
- FEAT_ACT  
- CALLING_NUM

- **f3**
- **Optional**

---

**f6**

- **Callout Menu**

---

IDACOM

PT500 User Manual
Including/Excluding Octets

- Include/exclude octets and modify parameter values as described for automatic messages.
- Press Exit (until the IE Selection Menu is displayed).

<table>
<thead>
<tr>
<th>Optional IEs:</th>
<th>Calling_SAD</th>
<th>Called_NUM</th>
</tr>
</thead>
<tbody>
<tr>
<td>SEND_COMP</td>
<td></td>
<td></td>
</tr>
<tr>
<td>REP_IND</td>
<td></td>
<td></td>
</tr>
<tr>
<td>CHANNEL_ID</td>
<td></td>
<td></td>
</tr>
<tr>
<td>FACILITY</td>
<td></td>
<td></td>
</tr>
<tr>
<td>PROGRESS_IND</td>
<td></td>
<td></td>
</tr>
<tr>
<td>NET_FACIL</td>
<td></td>
<td></td>
</tr>
<tr>
<td>KEYPAD</td>
<td></td>
<td></td>
</tr>
<tr>
<td>SWITCHHOOK</td>
<td></td>
<td></td>
</tr>
<tr>
<td>FEAT_ACT</td>
<td></td>
<td></td>
</tr>
<tr>
<td>CALLING_NUM</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**NOTE**

When an IE is built, the Remove Last function key can be used to remove the IE from the end of the message buffer. Only the most recent IE can be removed.

- Repeat the same procedure for the BEARER_CAP IE.
  Include/exclude octets, modify parameter values, and then build the IE.
Displaying the Message

The message can be displayed from either the Message Selection Menu or the IE Selection Menu (manual mode).

The display format can be selected from the Display Buffer Menu or, in more detail, from the Message Format Menu. The display format modes are identical to those of the monitor (see Section 6.3).
Adding a Message to the Message Pool

Pool Entry

Entry Number
Select Entry
Next
Previous

Specifies the pool entry. Valid values are 1 through 60.

Increments the selected pool entry number.

Decrements the selected pool entry number.
Copy MBuf
Copies the message from the message buffer to the selected pool entry.

Copy Ebuf
Copies the message from the edit buffer to the selected pool entry.

Copy
Copies from one message entry to another.

Move
Moves one message entry to another.

Clear
Clears/deletes a message entry from the pool.

Display Entry
Displays the message (only after it has been copied from either the message buffer – Copy MBuf or the edit buffer – Copy Ebuf). See the 'Displaying the Message' section on page 5-44.

→ Entry Comment
Specifies the comment associated with a pool entry. The maximum length of the comment field is 50 characters.

→ Pool Name
Modify File Name
Specifies the name of the message pool.

Load
Loads the message pool from disk.

Save
Saves the message pool to disk.

Append
Appends a saved message pool to the pool buffer.

Clear
Clears/deletes all messages from the message pool.

→ Entry Name
Specifies the name of the pool entry. The maximum length of the name field is 20 characters, although only 10 appear on the menu.

→ Drive
Specifies the disk drive to save to or load from disk.
**Msg Length**
Displays the length, in bytes, of the current message.

**Max Entries**
Displays the maximum number of message pool entries allowed in a message pool. There are 60 entries initially available. Individual entries of more than 130 bytes in length reduce the maximum number of entries by 1.

---

**Editing Messages**

Messages not conforming to the Q.931 standard, or containing illegal fields, can be built using the Buffer Edit Menu.

The contents of the edit buffer are set using hex entry.

Example:
Build a SETUP message containing an illegal call reference length (the second byte of the message).

```
Pool Entry Name : ---
Message Buffer Type : SETUP
Edit Buffer Length : 26
08 FF 00 00 05 04 08 88 10 10 00 21 05 20 38 C0 C8 E0 08 01 31 32 33 34 35
```
<table>
<thead>
<tr>
<th>Command</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Insert</td>
<td>Inserts typed characters before the current cursor position.</td>
</tr>
<tr>
<td>Append</td>
<td>Inserts typed characters after the current cursor position.</td>
</tr>
<tr>
<td>Replace</td>
<td>Overwrites existing data at the cursor position.</td>
</tr>
<tr>
<td>Cut Byte</td>
<td>Deletes the byte at the current cursor position.</td>
</tr>
<tr>
<td>Clear</td>
<td>Deletes all data in the edit buffer.</td>
</tr>
<tr>
<td>Copy Mbuf</td>
<td>Copies the message from the message buffer to the edit buffer.</td>
</tr>
<tr>
<td>Copy Entry</td>
<td>Copies the specified pool entry to the edit buffer.</td>
</tr>
<tr>
<td>Append Mbuf</td>
<td>Appends the contents of the message buffer to the end of the edit buffer.</td>
</tr>
<tr>
<td>Append Entry</td>
<td>Appends the specified pool entry to the end of the edit buffer.</td>
</tr>
</tbody>
</table>
8.1 Monitor Submode

To monitor in drop and insert mode, first configure the system as described in Section 3.8.

Channel Setup

Channel Submode

Selects the appropriate test channel (Test Chan 1 or 2, External Chan, or Voice Chan) for modifying parameters and/or loading an application.

Drop and Insert Mode:

Channel Submode
Specify Parameters:

→ **PRA Port**
Not applicable for monitor mode.

→ **Timeslot**
Specifies the appropriate 64 kbps D or B-Channel timeslot. Valid values are 1 through 24 for T1, and 1 through 31 for CEPT.

⚠️ **NOTE**
In CEPT PCM30, timeslot 16 is not a clear data channel because it contains the multiframe alignment signal.

→ **Inverted HDLC**
Selects whether to invert bit values on the selected channel prior to monitoring.

→ **Voice Encoding (Voice Channel only)**

  - **A-LAW**
    Selects encoding according to Rec. G.711 A-law.

  - **SIGN-MAG**
    Selects μ-law with sign magnitude data format.

  - **u-LAW**
    Selects encoding according to Rec. G.711 μ-law.

Configure Test Chan:

→ **Assign Parameters**
Assigns either the default parameters or those specified by the user. If the default parameters are not applicable, ensure changes are made prior to assigning parameters. After assigning, the 'Current Parameters' take on the values under 'Specify Parameters'.

⚠️ **NOTE**
The error message 'Channel and port have already been assigned' is displayed if the timeslot is already allocated by the other test channel or external access.
NOTE
Refer to the 'Loading an Application' section on page 3-23 for instructions to load an application on a PRA Test Channel.

8.2 Emulation Submode

To emulate in drop and insert mode, first configure the system as described in Section 3.7.

Channel Setup

![Channel Setup Menu]

- **Channel:** Test Chan 1
- **Drop and Insert Mode:**
  - Channel Submode: EMULATION

Specify Parameters:
- PRA Port: PORT A
- Timeslot: 24
- Inverted HDLC: YES
- Voice Encoding: ---

Current Parameters:
- PRA Port: PORT A
- Timeslot: 24
- Inverted HDLC: YES
- Voice Encoding: ---

Configure Test Chan:
- Application: None Loaded

Channel
Selects the appropriate test channel (Test Chan 1 or 2, External Chan, or Voice Chan) for modifying parameters and/or loading an application.
Channel Submode

Specify Parameters:
- **PRA Port**
  Specifies from which port the channel is accessed.

- **Timeslot**
  Specifies the appropriate 64 kbps D or B-Channel timeslot. Valid values are 1 through 24 for T1, and 1 through 31 for CEPT.

  **NOTE**
  *In CEPT PCM30, timeslot 16 is not a clear data channel because it contains the multiframe alignment signal.*

- **Inverted HDLC**
  Selects whether to invert bit values of both the transmit and receive directions on the selected channel.

- **Voice Encoding (Voice Channel only)**
  - **A-LAW**
    Selects encoding according to Rec. G.711 A-law.
  - **SIGN-MAG**
    Selects μ-law with sign magnitude data format.
  - **u-LAW**
    Selects encoding according to Rec. G.711 μ-law.

Configure Test Chan:
- **Assign Parameters**
  Assigns either the default parameters or those specified by the user. If the default parameters are not applicable, ensure changes are made prior to assigning parameters. After assigning, the 'Current Parameters' take on the values under 'Specify Parameters'.
NOTE
The error message 'Channel and port have already been assigned' is displayed if the timeslot is already allocated by the other test channel or external access.

NOTE
Refer to the 'Loading an Application' section on page 3–39 for instructions to load an application on a PRA Test Channel.

8.3 Drop & Insert Submode

Drop & Insert submode is not presently available.
9.1 Loading the Universal Monitor Program

The Universal Monitor program can be loaded on a WAN interface, a BRA B–Channel, or a PRA Test Channel. This section uses the WAN interface as an example.

\textbf{NOTE}

Refer to Section 3.3 for instructions to load an application on a BRA B–Channel, and Section 3.5 to load on a PRA Test Channel.

\begin{figure}[h]
\centering
\includegraphics[width=\textwidth]{van-config.png}
\end{figure}

When the application has finished loading:

\begin{figure}[h]
\centering
\includegraphics[width=\textwidth]{f2.png}
\end{figure}
9.2 Configuration

The default configuration is offline mode. If the characteristics of the data on the circuit are known, the default settings can be changed on the Monitor Configuration Menu and the monitor placed online to receive live data. If the characteristics of the data on the circuit are unknown, choose the autoconfiguration feature (see Section 9.4).

![Monitor Configuration Menu]

<table>
<thead>
<tr>
<th>Interface Type</th>
<th>RS232C/V.28</th>
<th>Interface Leads</th>
<th>DISABLED</th>
</tr>
</thead>
<tbody>
<tr>
<td>Protocol Configuration:</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Framing</td>
<td>HDLC/SDLC</td>
<td>Reset Enable</td>
<td>---</td>
</tr>
<tr>
<td>Clocking</td>
<td>NRZ WITH CLOCK</td>
<td>Sync Reset Character</td>
<td>---</td>
</tr>
<tr>
<td>Bit Rate</td>
<td>84000</td>
<td>DCD Control</td>
<td>OFF</td>
</tr>
<tr>
<td>Bits/Character</td>
<td>8</td>
<td>CRC</td>
<td>CCITT</td>
</tr>
<tr>
<td>Stop Bits</td>
<td>---</td>
<td>Strip Sync</td>
<td>ON</td>
</tr>
<tr>
<td>Parity</td>
<td>NONE</td>
<td>Message Length</td>
<td>---</td>
</tr>
<tr>
<td>Sync Character</td>
<td>HEX 7E</td>
<td>Message Timeout</td>
<td>---</td>
</tr>
<tr>
<td>Interframe Fill</td>
<td>SYNC</td>
<td>End of Frame Character</td>
<td>---</td>
</tr>
</tbody>
</table>

⚠️ NOTE
Some field values cannot be modified when running on a B-Channel.

→ Interface Type
The WAN connector module contains three interface connectors:
- V.28/RS-232C (default)
- V.35 or V.36
- V.11/X.21

→ Interface Leads
Interface leads can be enabled or disabled (default). Leads must be enabled for test manager detection, filters, and triggers.
Protocol Configuration:

→ Framing

⚠️ WARNING

Framing must be the first item selected. All other items, except bit rate, change to the default configuration for each framing type.

**HDLC/SDLC (default)** Selects synchronous framing with a SYNC character of hex 7E. Uses bit-oriented procedure with 8 bits no parity.

**CHARACTER SYNC** Selects synchronous framing with a choice of SYNC characters, number of bits/character, and parity. Uses character-oriented procedure.

**ASYNC** Selects asynchronous framing with a choice of number of bits/character and parity.

**BISYNC EBCDIC** Selects Bisync framing with a SYNC character of hex 32. Uses EBCDIC control characters.

**BISYNC ASCII** Selects Bisync framing with a SYNC character of hex 16. Uses ASCII (7 bit odd parity) control characters.

→ Clocking

**NRZ WITH CLOCK** Selects standard non-return to zero line encoding with modem provided clocks (valid in all framing methods except ASYNC).

**EXTERNAL TX CLOCK** Selects a DTE provided clock transmit clock on pin 24 of an RS-232C connector (valid in all framing methods except ASYNC).

**NRZI** Selects the non-return to zero-inverted method of encoding with timing information extracted from the data signal (valid in HDLC/SDL).

**NRZI WITH CLOCK** Selects the non-return to zero inverted method of encoding with timing information extracted from the provided clock signals (valid in HDLC/SDL).
→ Bit Rate
When asynchronous framing, NRZI, or external TX clocking is selected, the interface speed must be selected from preset values on the Interface Port Speed Menu or set to a user-defined speed.

When synchronous framing and any other clocking mode is selected, the interface speed is measured, in bits per second, directly from the physical line.

⚠️ NOTE
The bit rate status is UNKNOWN if there is no physical connection.

For information about the other items on the Monitor Configuration Menu, see the following tables.
<table>
<thead>
<tr>
<th>Parameter</th>
<th>Description</th>
<th>HDLC/SDLC</th>
<th>CHARACTER SYNC</th>
<th>BISYNC EBCDIC</th>
<th>BISYNC ASCII</th>
<th>ASYNC (4)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Clocking (1)</td>
<td>See Below</td>
<td>NRZ with clock</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>External Tx clock</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bit Rate (2) (3)</td>
<td>Number of bits per second</td>
<td>50, 75, 110, 134.5, 150, 200, 300, 1200, 1800, 2000, 2400, 3600, 4800, 7200, 9600, 14400, 16000, 19200, 38400, 48000, 56000, 64000, 72000, 128000</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bits/Character</td>
<td>Number of bits per character</td>
<td>8</td>
<td>5, 6, 7, 8</td>
<td>8</td>
<td></td>
<td>5, 6, 7, 8</td>
</tr>
<tr>
<td>Stop Bits</td>
<td>Number of stop bits</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>1, 1.5, 2</td>
</tr>
<tr>
<td>Parity</td>
<td>Check bit which makes the sum of the binary digits, including the check bit (always odd or even)</td>
<td>None</td>
<td>None</td>
<td>Odd</td>
<td></td>
<td>None</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Even</td>
<td></td>
<td>Odd</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Mark</td>
<td></td>
<td>Even</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Space</td>
<td></td>
<td>Mark</td>
</tr>
<tr>
<td>SYNC Character</td>
<td>Bit pattern that identifies the start and end of a block of data</td>
<td>Hex 7E</td>
<td>Hex 16, 32, 96</td>
<td>Hex 32</td>
<td></td>
<td>Hex 16</td>
</tr>
<tr>
<td>Interframe Fill</td>
<td>Bit pattern that is transmitted between blocks of data</td>
<td>SYNC Mark</td>
<td>Mark</td>
<td>Mark</td>
<td></td>
<td>Mark</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

For ISDN B1 and B2-Channels:
(1) Clocking not applicable
(2) Only 64000 bps is supported (Basic Rate)
(3) Only 64000 and 56000 bps are supported (Primary Rate)
(4) ASYNC is not supported

NOTE: In ASYNC and CHARACTER SYNC framing, mark, space, odd, and even parity are available with 5, 6, and 7 bits/character.
<table>
<thead>
<tr>
<th>Parameter</th>
<th>Description</th>
<th>HDLC/SDLC</th>
<th>CHARACTER SYNC</th>
<th>BISYNC EBCDIC</th>
<th>BISYNC ASCII</th>
<th>ASYNC (3)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Reset Enable</td>
<td>Determines if the SYNC reset character is enabled</td>
<td></td>
<td>ON</td>
<td>OFF</td>
<td></td>
<td></td>
</tr>
<tr>
<td>SYNC Reset Character</td>
<td>Character which causes receiver to start a new sync search</td>
<td></td>
<td>Hex FF User-defined</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>DCD Control (4)</td>
<td>While the Data Carrier Detect is 0/SPACE, the received data is ignored</td>
<td>ON OFF</td>
<td>ON OFF</td>
<td>OFF</td>
<td>OFF</td>
<td>OFF</td>
</tr>
<tr>
<td>CRC</td>
<td>Cyclic Redundance Check/Frame Check Sequence</td>
<td>CRC-CCITT</td>
<td>None</td>
<td>CRC-16</td>
<td>VRC/LRC CRC-16</td>
<td></td>
</tr>
<tr>
<td>Strip SYNC</td>
<td>Sync characters are not displayed or captured</td>
<td>ON</td>
<td>ON</td>
<td>ON</td>
<td>ON</td>
<td></td>
</tr>
<tr>
<td>Message Length</td>
<td>Maximum number of characters recorded or displayed in a block of data</td>
<td></td>
<td>DISABLED 1-5000 characters</td>
<td></td>
<td>DISABLED 1-5000 characters (60)</td>
<td></td>
</tr>
<tr>
<td>Message Timeout</td>
<td>Maximum elapsed time between characters before characters are recorded or displayed as a block of data</td>
<td></td>
<td></td>
<td>DISABLED 1-65535 msec. (17)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>End of Frame Character</td>
<td>Specified character terminates block of data</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>4 separate characters can be specified</td>
</tr>
</tbody>
</table>

For ISDN B1 and B2 Channels:
(3) ASYNC is not supported.
(4) DCD Control is not supported.
**Saving Menu Configurations**

Previously defined configuration settings can be saved in a disk file for future retrieval.

Example:
Save the current configuration in a file named ASYNC1.

![Image of Save Config button]

- Enter the name of the file and press \( \leftarrow \) (RETURN).

![Image of Enter Configuration Filename: ASYNC1]

The configuration file is created and ".C" is appended to the specified name.

**Loading Menu Configurations**

Previously saved configuration settings can be retrieved from disk.

Example:
Retrieve the configuration settings saved in ASYNC1.

![Image of Load Config button]
9.3 Monitoring Live Data

The received data is captured to RAM, decoded, and displayed as shown above.
9.4 Autoconfiguration

Autoconfiguration determines whether the protocol is bit-oriented (HDLC/SDLC), character-oriented (COP), BISYNC, or ASYNC. The following characteristics are determined.

<table>
<thead>
<tr>
<th>Type of Protocol</th>
<th>Characteristics Determined</th>
</tr>
</thead>
<tbody>
<tr>
<td>HDLC/SDLC</td>
<td>Baud Rate Encoding scheme (NRZ or NRZIC)</td>
</tr>
<tr>
<td>Character SYNC</td>
<td>Baud Rate SYNC Character (0x16, 0x32, 0x96)</td>
</tr>
<tr>
<td>BISYNC</td>
<td>Baud Rate Character Set (ASCII, EBCDIC)</td>
</tr>
<tr>
<td>ASYNC</td>
<td>Baud Rate Bits/Character (5, 6, 7, 8) Parity (NONE, ODD, EVEN)</td>
</tr>
</tbody>
</table>

Baud rates recognized for synchronous framing include 300, 1200, 2400, 4800, 7200, 9600, 14400, 16000, 19200, 384000, 56000, and 64000 baud.

Baud rates recognized for asynchronous framing include 300, 1200, 2400, 4800, 7200, 9600, 14400, and 19200.

⚠️ **NOTE**

*If the line has a baud rate other than those listed above, autoconfigure selects the closest supported speed.*
During autoconfiguration, notices appear indicating the progress of the procedure. If autoconfiguration is successful, the monitor goes online, the received data is displayed, and captured to RAM. If autoconfiguration is unsuccessful, the following notice is displayed:

```
Configuration not found.
```

<table>
<thead>
<tr>
<th>Framing</th>
<th>Autoconfiguration Time</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>300 bps</td>
</tr>
<tr>
<td>SYNC</td>
<td>30 sec.</td>
</tr>
<tr>
<td>ASYNC</td>
<td>25 sec.</td>
</tr>
</tbody>
</table>

Autoconfiguration might fail to determine the configuration if:
- the data circuit is idle;
- the data circuit contains small bursts of data;
- the data circuit uses space for interframe fill or space for rest idle;
- the data circuit contains synchronous data and the DCE clock line is not a one times (1x) clock; or
- the protocol is not supported.
9.5 Monitoring ASYNC Data

Example:
Monitor ASYNC on the RS-232C/V.28 interface. ASCII characters (7 bits/character with odd parity) are transmitted. Set the line speed to 200 bits/second. Received strings are terminated after:

- 80 characters (Message Length);
- 20 milliseconds elapse between characters (Message Timeout); or
- a carriage return (End of Frame Character).

**NOTE**

*The Universal Monitor should be in offline mode (Online function key is not highlighted) when making configuration changes to prevent reception of invalid data or problems on the line.*

Move the cursor to the required parameters and press the appropriate function keys. Specify and enable the first end of frame character as a carriage return (hex 0D).
Enter the end of frame character and press ← (RETURN).

Enter End of Frame Character (hexadecimal): 0D

To receive data:

Monitor

NOTE

Ensure that the Online function key is highlighted.
9.6 Universal Display Formats

Refer to Section 18.5 in the ‘General Application Topics’ section for general display format setup information.

![Display Format Menu]

<table>
<thead>
<tr>
<th>Display Format</th>
<th>Dual Window</th>
<th>Timestamp</th>
<th>Trace Display Format</th>
<th>Throughput Graph</th>
</tr>
</thead>
<tbody>
<tr>
<td>SHORT</td>
<td>OFF</td>
<td>OFF</td>
<td>SHORT</td>
<td>OFF</td>
</tr>
</tbody>
</table>

Character Set

**BAUDOT**

Specifies the Baudot character set for data display (only available in ASYNC, 5 bits/character).

The following display is an example using short display format.

```
<table>
<thead>
<tr>
<th>Block No</th>
<th>Source</th>
<th>Transmit</th>
<th>Receive</th>
<th>Length of Received Frame</th>
<th>User Data</th>
</tr>
</thead>
<tbody>
<tr>
<td>7</td>
<td>P2 Tx</td>
<td>5</td>
<td></td>
<td></td>
<td>HELLO</td>
</tr>
<tr>
<td>8</td>
<td>P2 Rx</td>
<td>7</td>
<td></td>
<td></td>
<td>GOODBYE</td>
</tr>
<tr>
<td>8</td>
<td>P2 Tx</td>
<td>5</td>
<td></td>
<td></td>
<td>HELLO</td>
</tr>
<tr>
<td>9</td>
<td>P2 Rx</td>
<td>7</td>
<td></td>
<td></td>
<td>GOODBYE</td>
</tr>
<tr>
<td>9</td>
<td>P2 Tx</td>
<td>5</td>
<td></td>
<td></td>
<td>HELLO</td>
</tr>
<tr>
<td>10</td>
<td>P2 Rx</td>
<td>7</td>
<td></td>
<td></td>
<td>GOODBYE</td>
</tr>
<tr>
<td>10</td>
<td>P2 Tx</td>
<td>5</td>
<td></td>
<td></td>
<td>HELLO</td>
</tr>
<tr>
<td>11</td>
<td>P2 Rx</td>
<td>7</td>
<td></td>
<td></td>
<td>GOODBYE</td>
</tr>
<tr>
<td>11</td>
<td>P2 Tx</td>
<td>5</td>
<td></td>
<td></td>
<td>HELLO</td>
</tr>
<tr>
<td>12</td>
<td>P2 Rx</td>
<td>7</td>
<td></td>
<td></td>
<td>GOODBYE</td>
</tr>
<tr>
<td>12</td>
<td>P2 Tx</td>
<td>5</td>
<td></td>
<td></td>
<td>HELLO</td>
</tr>
<tr>
<td>13</td>
<td>P2 Rx</td>
<td>7</td>
<td></td>
<td></td>
<td>GOODBYE</td>
</tr>
<tr>
<td>13</td>
<td>P2 Tx</td>
<td>5</td>
<td></td>
<td></td>
<td>HELLO</td>
</tr>
</tbody>
</table>
```
9.7 Universal Filters

Refer to Section 18.9 in the 'General Application Topics' section for filter setup information.

**NOTE**

There are no filters for received data. The only available filters are for trace statements and lead changes. Interface leads must be enabled.

9.8 Universal Triggers

Refer to Section 18.10 in the 'General Application Topics' section for trigger setup information.
10.1 Loading the Universal Simulation Program

The Universal Simulation program can be loaded on a WAN interface, a BRA B-Channel, or a PRA Test Channel. This section uses the WAN interface as an example.

**NOTE**

Refer to Section 3.4 for instructions to load an application on a BRA B-Channel, and Section 3.6 to load on a PRA Test Channel.

When the application has finished loading:

- **F2**
  - Switch to AP #1
10.2 Configuration

The default configuration is offline mode. After changing the settings on the Simulation Configuration Menu, the emulation must be placed online to receive/transmit live data.

Received/transmitted events are captured in the capture RAM buffer and displayed in the short display format.

<table>
<thead>
<tr>
<th>Interface Type</th>
<th>RS232C/V.28</th>
<th>Interface Leads</th>
<th>DISABLED</th>
</tr>
</thead>
<tbody>
<tr>
<td>Simulation Mode</td>
<td>TO DCE</td>
<td>Protocol Configuration:</td>
<td></td>
</tr>
<tr>
<td>Framing</td>
<td>HDLC/SDLC</td>
<td>Reset Enable</td>
<td>---</td>
</tr>
<tr>
<td>Clocking</td>
<td>NRZ WITH CLOCK</td>
<td>Sync Reset Character</td>
<td>---</td>
</tr>
<tr>
<td>Bit Rate</td>
<td>84000</td>
<td>DCD Control</td>
<td>OFF</td>
</tr>
<tr>
<td>Bits/Character</td>
<td>8</td>
<td>CRC</td>
<td>CCITT</td>
</tr>
<tr>
<td>Stop Bits</td>
<td>---</td>
<td>Strip Sync</td>
<td>ON</td>
</tr>
<tr>
<td>Parity</td>
<td>NONE</td>
<td>Message Length</td>
<td>---</td>
</tr>
<tr>
<td>Sync Character</td>
<td>HEX 7E</td>
<td>Message Timeout</td>
<td>---</td>
</tr>
<tr>
<td>Interframe Fill</td>
<td>SYNC</td>
<td>End of Frame Character</td>
<td>---</td>
</tr>
</tbody>
</table>

**NOTE**

Some field values cannot be modified when running on a B-Channel.

**Interface Type**

The WAN connector module contains three interface connectors:

- V.28/RS-232C (default)
- V.35 or V.36
- V.11/X.21
→ Interface Leads
All interface leads can be enabled or disabled (default). Leads must be enabled for test manager detection, filters, and triggers.

→ Simulation Mode

TO DCE
Selects the 'to DCE' interface. The tester is connected to a modem.

TO DTE
Selects the 'to DTE' interface. The tester is connected to a terminal.

Protocol Configuration:
→ Framing

⚠️ WARNING
Framing must be the first item selected. All other items depend on the framing chosen.

HDLC/SDLC (default)
Selects synchronous framing with a SYNC character of hex 7E. Uses bit-oriented procedure with 8 bits no parity.

CHARACTER SYNC
Selects synchronous framing with a choice of SYNC characters, number of bits/character, and parity. Uses character-oriented procedure.

ASYNC
Selects asynchronous framing with a choice of number of bits/character and parity.

BISYNC EBCDIC
Selects Bisync framing with a SYNC character of hex 32. Uses EBCDIC control characters.

BISYNC ASCII
Selects Bisync framing with a SYNC character of hex 16. Uses ASCII (7 bit odd parity) control characters.

→ Clocking

NRZ WITH CLOCK
Selects standard non-return to zero line encoding with modem provided clocks (valid in all framing methods except ASYNC).
**EXTERNAL TX CLOCK**
Selects a DTE provided clock transmit clock on pin 24 of an RS-232C connector (valid in all framing methods except ASYNC).

**NRZI**
Selects the non-return to zero-inverted method of encoding within timing information extracted from the data signal (valid in HDLC/SDLC).

**NRZI WITH CLOCK**
Selects the non-return to zero-inverted method of encoding with timing information extracted from the provided clock signals (valid in HSLC/SDLC).

→ **Bit Rate**
The interface speed can be selected from preset values on the Interface Port Speed Menu, set to a user-defined speed, or measured depending on the emulation interface and clocking selections.

**NOTE**
When asynchronous framing or a 'to DTE' interface is selected, the interface speed can only be selected from preset values on the Interface Port Speed Menu or set to a user-defined speed.

<table>
<thead>
<tr>
<th>Clocking</th>
<th>HDLC/SDLC</th>
<th>CHARACTER SYNC</th>
<th>BISYNC EBCDIC</th>
<th>BISYNC ASCII</th>
</tr>
</thead>
<tbody>
<tr>
<td>NRZ WITH CLOCK</td>
<td>Measure</td>
<td>Measure</td>
<td>Measure</td>
<td>Measure</td>
</tr>
<tr>
<td>EXTERNAL TX CLOCK</td>
<td>Select</td>
<td>Select</td>
<td>Select</td>
<td>Select</td>
</tr>
<tr>
<td>NRZI</td>
<td>Select</td>
<td>---</td>
<td>---</td>
<td>---</td>
</tr>
<tr>
<td>NRZI WITH CLOCK</td>
<td>Measure</td>
<td>---</td>
<td>---</td>
<td>---</td>
</tr>
</tbody>
</table>

**NOTE**
The bit rate status is UNKNOWN if there is no physical connection.

**NOTE**
Clocking is provided by the attached equipment when the bit rate can be selected.

For information about the other items on the Simulation Configuration Menu, see the following tables.
<table>
<thead>
<tr>
<th>Parameter</th>
<th>Description</th>
<th>HDLC/SDLC</th>
<th>CHARACTER SYNC</th>
<th>BISYNC EBCDIC</th>
<th>BISYNC ASCII</th>
<th>ASYNC (4)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Clocking (1)</td>
<td>See Below</td>
<td>NRZ with clock</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>External Tx Clock</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>NRZI</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>NRZI with clock</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bit Rate (2) (3)</td>
<td>Number of bits per second</td>
<td>50, 75, 110, 134.5, 150, 200, 300, 1200, 1800, 2000, 2400, 3600, 4800, 7200, 9600, 14400, 16000, 19200, 38400, 48000, 56000, 64000, 72000, 128000</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bits/Character</td>
<td>Number of bits per character</td>
<td>8</td>
<td>5, 6, 7, 8</td>
<td>8</td>
<td>7</td>
<td>5, 6, 7, 8</td>
</tr>
<tr>
<td>Stop Bits</td>
<td>Number of stop bits</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Parity</td>
<td>Check bit which makes the sum of the binary digits, including the check bit (always odd or even)</td>
<td>None</td>
<td>None</td>
<td></td>
<td>Odd</td>
<td>None</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Odd</td>
<td></td>
<td></td>
<td>None Odd</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Even</td>
<td></td>
<td></td>
<td>Even</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Mark</td>
<td></td>
<td></td>
<td>Mark</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Space</td>
<td></td>
<td></td>
<td>Space</td>
<td></td>
</tr>
<tr>
<td>SYNC Character</td>
<td>Bit pattern that identifies the start and end of a block of data</td>
<td>Hex 7E</td>
<td>Hex 16, 32, 96</td>
<td>Hex 32</td>
<td>Hex 16</td>
<td></td>
</tr>
<tr>
<td></td>
<td>(User-defined)</td>
<td></td>
<td>User-defined</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Interframe Fill</td>
<td>Bit pattern that is transmitted between blocks of data</td>
<td>SYNC Mark</td>
<td>Mark</td>
<td>Mark</td>
<td>Mark</td>
<td></td>
</tr>
</tbody>
</table>

For ISDN B1 and B2-Channels:
1) Clocking not applicable
2) Only 64000 bps is supported (Basic Rate)
3) Only 64000 and 56000 bps are supported (Primary Rate)
4) ASYNC is not supported

NOTE: In ASYNC and CHARACTER SYNC framing, mark, space, odd, and even parity are available with 5, 6, and 7 bits/character.
<table>
<thead>
<tr>
<th>Parameter</th>
<th>Description</th>
<th>HDLC/SDLC</th>
<th>CHARACTER SYNC</th>
<th>BISYNC EBCDIC</th>
<th>BISYNC ASCII</th>
<th>ASYNC (3)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Reset Enable</td>
<td>Determines if the SYNC reset character is enabled</td>
<td></td>
<td>ON</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>SYNC Reset Character</td>
<td>Character which causes receiver to start a new sync search</td>
<td></td>
<td>Hex FF</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>User-defined</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>DCD Control (4)</td>
<td>While the Data Carrier Detect is 0/SPACE, the received data is ignored</td>
<td>ON</td>
<td>ON</td>
<td>ON</td>
<td>ON</td>
<td>OFF</td>
</tr>
<tr>
<td>CRC</td>
<td>Cyclic Redundance Check/Frame Check Sequence</td>
<td>CRC-CCITT</td>
<td>None</td>
<td>CRC-16</td>
<td>VRC/LRC CRC-16</td>
<td></td>
</tr>
<tr>
<td>Strip SYNC</td>
<td>Sync characters are not displayed or captured</td>
<td>ON</td>
<td>ON</td>
<td>ON</td>
<td>ON</td>
<td></td>
</tr>
<tr>
<td>Message Length</td>
<td>Maximum number of characters recorded or displayed in a block of data</td>
<td></td>
<td>DISABLED 1-5000 characters</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Message Timeout</td>
<td>Maximum elapsed time between characters before characters are recorded or displayed as a block of data</td>
<td></td>
<td></td>
<td></td>
<td>DISABLED 1-65535 msec. (17)</td>
<td></td>
</tr>
<tr>
<td>End of Frame Character</td>
<td>Specified character terminates block of data</td>
<td></td>
<td></td>
<td></td>
<td>4 separate characters can be specified</td>
<td></td>
</tr>
</tbody>
</table>

For ISDN B1 and B2 Channels:
(3) ASYNC is not supported.
(4) DCD Control is not supported.
Saving Menu Configurations

Previously defined configuration settings can be saved in a disk file for future retrieval.

Example:
Save the current configuration in a file named ASYNC2.

- Enter the name of the file and press ← (RETURN).

The configuration file is created and '.C' is appended to the specified name.
Loading Menu Configurations

Previously saved configuration settings can be retrieved from disk.

Example:
Retrieve the configuration settings saved in ASYNC2.

- Enter the name of the file, excluding the trailing '.C', and press (RETURN).

```
Enter Configuration Filename: ASYNC2
```
10.3 Receiving Data

Data is captured to RAM, decoded, and displayed as shown above.

Figure 10-1 Universal Simulation Program Display
10.4 ASYNC Configuration

Example:
Configure as a DTE for ASYNC on the RS-232C/V.28 interface. ASCII characters (7 bits/character with odd parity) are transmitted. Set the line speed to 200 bits/second. Received strings are terminated after:
- 80 characters (Message Length);
- 20 milliseconds elapse between characters (Message Timeout); or
- a carriage return (End of Frame Character).

**NOTE**
The Universal Simulation should be in offline mode (Online function key is not highlighted) when making configuration changes to prevent reception of invalid data or problems on the line.

Move the cursor to the required parameters and press the appropriate function keys. Specify and enable the first end of frame character as a carriage return (hex OD).
Enter the end of frame character and press

Enter End of Frame Character (hexadecimal): 0D

To receive or send data:

Ensure that the Online function key is highlighted.
10.5 Sending Strings

Four user-defined strings can be transmitted.

Example:
Define the string as 'ABC' and send it.

- Enter the string and press (RETURN).

The following message indicates that the string has been converted to 7 bit ASCII with odd parity.

```
String (ASCII) has been constructed according to current configuration.
```

To transmit the string:

The string is then displayed on the screen.
NOTE
Most control characters cannot be entered directly. To insert
control characters in a string, type \ (back slash) immediately
followed by the control character.

Example:
To enter $x$ in a string, type '\' immediately followed by Control B.

Enter string: $x$
11.1 Loading the X.25 Monitor Program

The X.25 Monitor program can be loaded on a WAN interface, a BRA B-Channel, or a PRA Test Channel. This section uses the WAN interface as an example.

**NOTE**

Refer to Section 3.3 for instructions to load an application on a BRA B-Channel, and Section 3.5 to load on a PRA Test Channel.

---

![Diagram of WAN Monitor Applications]

- Universal \(\rightarrow\) X.25
- BSC 3270 \(\rightarrow\) X.25/Q
- SOLC/SNA \(\rightarrow\) X.75
- ISDN D Channel \(\rightarrow\) SS#7
- TELETEX \(\rightarrow\) X.32

**Statistic Applications:**
- SOLC/SNA \(\rightarrow\) X.25

When the application has finished loading:

![Diagram of Switch to AP #1]
The unit is now ready to monitor an X.25 data circuit. In the default configuration, data is captured to RAM, decoded, and displayed.

**Figure 11–1 X.25 Monitor Program Display**

The unit is now ready to monitor an X.25 data circuit. In the default configuration, data is captured to RAM, decoded, and displayed.
11.2 Configuration

For a PRA interface, the physical layer is configured using the Home processor and simply reported on the Monitor Configuration Menu.

For a WAN interface, the physical layer is configured using the Monitor Configuration Menu after the application is loaded.

![Configuration Menu]

- **NOTE**
  *Some field values cannot be modified when running on a B-Channel.*

- **Protocol Standard**
  Selects a protocol standard for monitor decoding.
  - **NONE** Decodes received frames according to the user setting.
  - **X.25(1980)** Decodes received frames according to the CCITT Recommendation X.25 (1980).
Decodes received frames according to CCITT Recommendation X.25 (1988).

**Interface Type**
The WAN connector module contains three interface connectors:
- V.28/RS-232C (default)
- V.35 or V.36
- V.11/X.21

**Interface Leads**
Interface leads can be enabled or disabled (default).

**Bit Rate**
The interface speed is measured, in bits per second, directly from the physical line.

**NOTE**
The bit rate status is UNKNOWN if there is no physical connection.

**Modulo Detection**
Selects whether to provide automatic detection of modulo (sequence numbering) when a SABM or SABME is received.

**NOTE**
When a SABM or SABME is received, the program is automatically placed into modulo 8 or 128, respectively (only if automatic modulo detection is selected).

**Link Access Procedure**

**LAP**
Decodes frames according to LAP procedure (i.e. SARM and CMDR).

**LAPB** (default)
Decodes frames according to LAPB procedure (i.e. DM and FRMR).

**Frame Sequence Number Modulo**

**MOD 8** (default)
Expects frames to be numbered 0 through 7.

**MOD 128**
Expects frames to be numbered 0 through 127.
→ Link Procedure

**SINGLE LINK** (default) Uses single link procedure for decoding and reporting.

**MULTILINK** Uses multilink procedure for decoding and reporting.

### 11.3 X.25 Display Formats

Refer to Section 18.5 in the 'General Application Topics' section for general display format setup information.

<table>
<thead>
<tr>
<th>Display Format Menu</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Display Format</strong></td>
</tr>
<tr>
<td>Timestamp</td>
</tr>
<tr>
<td>Character Set</td>
</tr>
<tr>
<td>Frame Layer</td>
</tr>
<tr>
<td>Packet Layer</td>
</tr>
<tr>
<td>Data Field</td>
</tr>
</tbody>
</table>

→ Frame Layer
→ Packet Layer

OFF

**TEXT** (default) Displays field names and values on the corresponding layer.

**HEX** Displays each byte on the corresponding layer using two hexadecimal digits.

**CHARACTER** Displays each byte on the corresponding layer in the currently selected character set.
The following display is an example in complete display format.

<table>
<thead>
<tr>
<th>Timestamp</th>
<th>Source</th>
<th>Complete Frame and Packet Report</th>
</tr>
</thead>
<tbody>
<tr>
<td>57:52.5450</td>
<td>DTE ADDRESS=01</td>
<td>FRAME=INFO F=0 NR=1 NS=1</td>
</tr>
<tr>
<td></td>
<td></td>
<td>GF=1 D=0 A=0 LCN=1 CALL REQUEST PACKET</td>
</tr>
<tr>
<td></td>
<td></td>
<td>ADDRESS - CALLED = 43042001 CALLING = 33001001</td>
</tr>
<tr>
<td>57:52.5575</td>
<td>DTE ADDRESS=03</td>
<td>FRAME=INFO F=0 NR=3 NS=1</td>
</tr>
<tr>
<td></td>
<td></td>
<td>GF=1 D=0 A=0 LCN=1 CALL CONNECT PACKET</td>
</tr>
<tr>
<td></td>
<td></td>
<td>ADDRESS - CALLED = 43042001 CALLING = 33001001</td>
</tr>
<tr>
<td>57:52.7423</td>
<td>DTE ADDRESS=01</td>
<td>FRAME=INFO F=0 NR=1 NS=3</td>
</tr>
<tr>
<td></td>
<td></td>
<td>GF=1 D=0 Q=0 LCN=1 DATA PACKET PR=0 PS=7 M=0</td>
</tr>
<tr>
<td></td>
<td></td>
<td>PACKET INFORMATION</td>
</tr>
<tr>
<td></td>
<td></td>
<td>USER DATA (between brackets)</td>
</tr>
<tr>
<td>57:52.7533</td>
<td>DTE ADDRESS=01</td>
<td>FRAME=INFO F=0 NR=3 NS=3</td>
</tr>
<tr>
<td></td>
<td></td>
<td>GF=1 D=0 Q=0 LCN=1 DATA PACKET PR=0 PS=7 M=0</td>
</tr>
<tr>
<td></td>
<td></td>
<td>PACKET INFORMATION</td>
</tr>
<tr>
<td></td>
<td></td>
<td>USER DATA (between brackets)</td>
</tr>
<tr>
<td>57:52.7780</td>
<td>DTE ADDRESS=01</td>
<td>FRAME=INFO F=0 NR=1 NS=3</td>
</tr>
<tr>
<td></td>
<td></td>
<td>GF=1 D=0 Q=0 LCN=1 DATA PACKET PR=0 PS=7 M=0</td>
</tr>
<tr>
<td></td>
<td></td>
<td>PACKET INFORMATION</td>
</tr>
<tr>
<td></td>
<td></td>
<td>USER DATA (between brackets)</td>
</tr>
</tbody>
</table>
11.4 X.25 Filters

Refer to Section 18.9 in the 'General Application Topics' section for filter setup information.

Example 1:
Program a filter to display data from a specific calling or called address.

Filter Setup Menu

Filter Type | DISPLAY | Trace Statements | ON
--- | --- | --- | ---
Filter Status | DEACTIVATED | | |
Lead Changes | BLOCK | | |
--- | --- | --- | ---
Selective Address | 4034624545 | | |
Selective LCN 1 | PASS | | |
Selective LCN 2 | PASS | | |
Selective LCN 3 | PASS | | |
Selective LCN 4 | PASS | | |
Frame Layer:
SABM | PASS | PASS | UA | PASS | DM | PASS
SABME | PASS | PASS | DISC | PASS | FRMR/CHDR | PASS
SARM | PASS | PASS | REJ | PASS | Invalid | PASS
--- | --- | --- | --- | --- | --- | ---
Packet Layer:
Call | PASS | PASS | Restart | PASS | Registration | PASS
Clear | PASS | PASS | Reset | PASS | Diagnostic | PASS
Data | PASS | PASS | Interrupt | PASS | Invalid | PASS
--- | --- | --- | --- | --- | --- | ---

- Enter either the called or calling address and press ← (RETURN).
The display is turned off. When a call request is received containing the specified address, traffic on that LCN only is displayed until a clear confirmation on that LCN is received.

**NOTE**
If a call request containing the specified address is received on a different LCN prior to receiving a clear confirmation on the first LCN, the displayed traffic comes from the second LCN only.

**NOTE**
The capture buffer contains all data including data prior to the call request packet.

Example 2:
Program a filter to display data from logical channels 21, 32, 43, and 54.
Enter the logical channel number (eg. 21) and press \( \Rightarrow \) (RETURN).

Enter Logical Channel Number (0 - 4095): 21

Enter the appropriate logical channel numbers for LCN#2, LCN#3, and LCN#4.

The monitor now displays only data received on logical channels 21, 32, 43, and 54.

\( \text{\textbf{\textcolor{red}{\textit{NOTE}}}} \)

\textit{The capture buffer contains data from all logical channels.}

Example 3:
Program a filter to pass only Invalid and Frame Reject frames at layer 2, and Reject, Invalid, Interrupt, and Diagnostic packets at layer 3.

\( \text{\textbf{\textcolor{red}{\textit{NOTE}}}} \)

\textit{I frames must be enabled to pass packets.}

Move the cursor to the required parameters and use the \textcolor{red}{PASS} and \textcolor{red}{BLOCK} function keys to display (pass) only required frames/packets.

\begin{center}
\begin{tabular}{|c|c|c|c|c|c|}
\hline
Filter Type & DISPLAY & Trace Statements & ON & Trace Statements & ON \\
Filter Status & ACTIVATED & Selective Address & ALL & Selective Address & ALL \\
Load Changes & BLOCK & Selective LCN #1 & ALL & Selective LCN #2 & ALL \\
& & Selective LCN #3 & ALL & Selective LCN #3 & ALL \\
Frame Layer: & & Selective LCN #4 & ALL & Selective LCN #4 & ALL \\
\hline
SABM & BLOCK & I & PASS & UA & BLOCK \\
SABME & BLOCK & RR & BLOCK & DISC & BLOCK \\
SARM & BLOCK & RNR & BLOCK & REJ & PASS \\
& & & & MLP Reset & --- \\
Packet Layer: & SARM & BLOCK & REJ & PASS & Invalid \\
Call & BLOCK & RR & BLOCK & Restart & BLOCK \\
Clear & BLOCK & RNR & BLOCK & Reset & BLOCK \\
Data & BLOCK & REJ & PASS & Interrupt & PASS \\
& & & & MLP Confirm & --- \\
\hline
\end{tabular}
\end{center}
11.5 X.25 Triggers

Refer to Section 18.10 in the 'General Application Topics' section for trigger setup information.

Example:
Ten frames after receipt of an invalid packet, set up a trigger to:
- stop the display and capture RAM; and
- display a message in the Data Window.
## Trigger Action Menu

<table>
<thead>
<tr>
<th>Event Trigger</th>
<th>TRIGGER #1</th>
</tr>
</thead>
<tbody>
<tr>
<td>Trigger Status</td>
<td>ARMED</td>
</tr>
<tr>
<td>Beep</td>
<td>NO EFFECT</td>
</tr>
<tr>
<td>Highlight</td>
<td>NO EFFECT</td>
</tr>
<tr>
<td>Trigger Delay</td>
<td>ON</td>
</tr>
<tr>
<td>#Frames</td>
<td>10</td>
</tr>
</tbody>
</table>

- **Data Display Message**: "TRIGGER NO1 HAS FIRED"
- **User Window Message**: ""

### Trigger Delay

Delays execution of the trigger actions until the specified number of frames have been received (default is no delay).

### # Frames

Specifies the number of frames used when trigger delay is on.

The X.25 Monitor captures and displays all data until it receives an invalid packet. Ten frames after the invalid packet is received, the display and capture RAM data is stopped and the message 'TRIGGER NO1 HAS FIRED' is displayed in the Data Window.
12.1 Loading the X.25 Emulation Program

The X.25 Emulation program can be loaded on a WAN interface, a BRA B-Channel, or a PRA Test Channel. This section uses the WAN interface as an example.

NOTE
Refer to Section 3.4 for instructions to load an application on a BRA B-Channel, and Section 3.6 to load on a PRA Test Channel.

When the application has finished loading:
### Figure 12-1 X.25 Emulation Program Display

Assuming that the unit is connected to an X.25 link which corresponds to the configuration, it will respond automatically to any incoming data. In the default configuration, data is captured to RAM, decoded, and displayed.
12.2 Configuration

Six menus are used to set the parameters for emulation configuration:

- Setup Menu (general setup and physical layer)
- Frame Layer Menu
- Packet Layer Menus (DCE or DTE)
- Facility Menu (call/clear request packets)
- LCN Setup Menu 1 and 2 (logical channels)

Setup

<table>
<thead>
<tr>
<th>Emulation Mode</th>
<th>DTE</th>
<th>Protocol Standard</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>X.25(1980)</td>
</tr>
</tbody>
</table>

Physical Layer:
- Emulation Interface: TO DCE
- Interface Type: RS232C/V.28
- Interface Leads: DISABLED
- Interframe Fill: FLAG
- External Tx Clock: OFF

Protocol Standard

Selects a protocol standard for emulation.

NONE: Conforms to a combination of CCITT Recommendation X.25 (1980/1984). The behaviour can be changed by the user.


X.25 EMULATION


\textrightarrow \textbf{Emulation Mode}

\textit{DTE} (default) Selects a logical DTE emulation mode.

\textit{DCE} Selects a logical DCE emulation mode.

\textbf{NOTE}

The relationship between emulation mode and the network is shown in the following figure.
EXISTING DATA CIRCUIT

DTE

Modem

Modem

Controller/Switch

USING THE TESTER TO EMULATE PARTS OF A DATA CIRCUIT

Modem

Modem

DTE

Modem

Modem

EMULATION MODE | EMULATION INTERFACE
---|---
DTE | TO_DCE
DCE | TO_DTE
DTE | TO_DTE
DCE | TO_DCE
Physical Layer:

→ Emulation Interface
TO DCE (default) Selects the 'to DCE' interface.

TO DTE Selects the 'to DTE' interface.

→ Interface Type
The WAN connector module has three interface connectors:
- V.28/RS-232C (default)
- V.35 or V.36
- V.11/X.21

→ Interframe Fill
Selects the bit pattern transmitted between blocks of data.

MARK Transmits continuous MARK characters (hex FF).

FLAG (default) Transmits continuous FLAG characters (hex 7E).

→ Bit Rate
The interface speed can be selected from preset values on the Interface Port Speed Menu, set to a user-defined speed, or measured depending on the emulation interface and external clock selections.

<table>
<thead>
<tr>
<th>External Tx Clock</th>
<th>TO DTE</th>
<th>TO DCE</th>
</tr>
</thead>
<tbody>
<tr>
<td>OFF</td>
<td>Select</td>
<td>Measure</td>
</tr>
<tr>
<td>ON</td>
<td>Measure</td>
<td>Select</td>
</tr>
</tbody>
</table>

⚠️ NOTE
The bit rate status is UNKNOWN if there is no physical connection.

⚠️ NOTE
Clocking is provided by the attached equipment when the bit rate can be selected.
→ Interface Leads
Interface leads can be enabled or disabled (default).

→ External Tx Clock
There are two clocking modes:
- OFF (Normal)
- ON (External)

Using normal clocking on the EIA–RS–232C (V.24/V.28) interface, the DCE provides the transmit and receive clock for the DTE on pins 15 and 17, respectively. Using external clocking, the DTE provides the transmit clock on pin 24 and the DCE echoes the transmit clock on pin 15; the DCE provides the receive clock for the DTE on pin 17.

DTE | DCE
--- | ---
15 | Transmit clock from DCE (DCE provided)
17 | Receive clock from DCE (DCE provided)
24 | Transmit clock to DCE (DTE provided)
Frame Layer Menu

<table>
<thead>
<tr>
<th>Frame Layer:</th>
<th>Value</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Emulation</td>
<td>AUTOMATIC</td>
<td>T1 Timer (Sec)</td>
</tr>
<tr>
<td>Modulo Detection</td>
<td>AUTOMATIC</td>
<td>Idle Timer (Sec)</td>
</tr>
<tr>
<td>Max Tx Frame Size</td>
<td>261</td>
<td>NZ Retry Counter</td>
</tr>
<tr>
<td>Max Rx Frame Size</td>
<td>261</td>
<td>Window Size</td>
</tr>
<tr>
<td>Sequence Numbering</td>
<td>MOD 8</td>
<td>Initial Poll</td>
</tr>
</tbody>
</table>

→ **Emulation**
Selects whether to provide automatic responses to all received frames (default).

→ **Modulo Detection**
Selects whether to provide automatic detection (default) of modulo (sequence numbering) when a SABM or SABME is received.

⚠️ **NOTE**
*When a SABM or SABME is received, the program is automatically placed into modulo 8 or 128, respectively (only if automatic modulo detection is selected).*

→ **Max Tx Frame Size**
Specifies the maximum number of bytes in transmitted frames. Valid values are 7 through 4110 (default is 261).

→ **Max Rx Frame Size**
Specifies the maximum number of bytes in received frames. Valid values are 7 through 4110 (default is 261).
→ **Sequence Numbering**
Selects whether sequence numbering is modulo 8 (basic format) or modulo 128 (extended format) for the frame layer (default is modulo 8).

⚠️ **NOTE**
The CCITT Recommendation X.25 (1980) does not support extended Sequence Numbering.

→ **T1 Timer (Sec)**
Specifies the duration, in tenths of seconds, of the T1 link timer. T1 must be greater than the maximum time between retransmission of a command frame and reception of the corresponding response frame. Valid values are 0 through 999999.9 (default is 3 seconds).

→ **Idle Timer (Sec)**
Specifies the duration, in tenths of seconds, of the link idle timer. When this timer expires, polling resumes to maintain activity on the link. Valid values are 0 through 999999.9 (default is 30 seconds).

→ **N2 Retry Count**
Specifies the number of retries (N2) when no response has been received for transmitted frames (default is 10).

→ **Window Size**
Specifies the frame window size (maximum number of unacknowledged frames). Valid values are 1 through 7 for modulo 8, and 1 through 127 for modulo 128 (default is 7).

→ **Initial Poll**
Transmits the first supervisory or unnumbered command frame with the poll bit set to 0 or 1 (default).

⚠️ **NOTE**
The CCITT Recommendation X.25 (1984) does not support Initial Poll of 0.
Packet Layer

Depending on the emulation mode selected, either the DCE or the DTE Packet Layer Menu is displayed. DTE emulation uses timers T20 to T23; DCE emulation uses timers T10 to T13. All other configuration parameters are used by both emulation modes.

- **Emulation**
  Selects whether to provide automatic responses to all received packets (default).

- **Max Data Size**
  Specifies the maximum number of bytes in the data field of transmitted or received data packets for all logical channels. Valid values are 0 through 4100 (default is 128).

- **NOTE**
  The maximum frame size should be sufficiently larger than the maximum data size to allow for the address and control fields plus the data packet header.

- **Sequence Numbering**
  Selects whether sequence numbering is modulo 8 (basic format) or modulo 128 (extended format) for the packet layer.
-> **Automatic Restart**
Selects whether to automatically restart the packet layer whenever the link layer is established (default is NO).

-> **TOA/NPI Addresses**
Selects whether the TOA/NPI address subscription facility is in effect. The TOA/NPI address format is used in all call setup and clearing packets which is sent and is expected from the IU7 as well.

**NOTE**

TOA/NPI (type of address/numbering plan identifier) addresses are described in CCITT Recommendation X.25 (1988). They are not supported by the 1980 or 1984 standards.

The following timers are used for DTE emulation.

-> **T20 Timer (Sec)**
Specifies the duration, in tenths of seconds, the tester waits for a restart indication packet after transmitting a restart request packet (default is 180 seconds).

-> **T21 Timer (Sec)**
Specifies the duration, in tenths of seconds, the tester waits for a call connect, clear indication, or incoming call after transmitting a call request packet (default is 200 seconds).

-> **T22 Timer (Sec)**
Specifies the duration, in tenths of seconds, the tester waits for a reset confirmation or reset indication after transmitting a reset request packet (default is 180 seconds).

-> **T23 Timer (Sec)**
Specifies the duration, in tenths of seconds, the tester waits for a clear confirmation or clear indication packet after transmitting a clear request packet (default is 180 seconds).
The following timers are used for DCE emulation.

\( \rightarrow T10 \) Timer (Sec)
Specifies the duration, in tenths of seconds, the tester waits for a restart request packet or restart confirmation packet after transmitting a restart indication packet (default is 60 seconds).

\( \rightarrow T11 \) Timer (Sec)
Specifies the duration, in tenths of seconds, the tester waits for a call accept, clear request, or call request packet after transmitting an incoming call packet (default is 180 seconds).

\( \rightarrow T12 \) Timer (Sec)
Specifies the duration, in tenths of seconds, the tester waits for a reset confirmation or reset request packet after transmitting a reset indication packet (default is 60 seconds).

\( \rightarrow T13 \) Timer (Sec)
Specifies the duration, in tenths of seconds, the tester waits for a clear confirmation or clear request packet after transmitting a clear indication packet (default is 60 seconds).
Facilities

Call Request Facility
Selects the facilities used in transmitted call request/incoming call packets on all 255 logical channels.

NONE (default) Facilities are not included.

NEGOTIATE Automatically negotiates data packet size, packet window size, throughput class, and fast select facilities.

USER DEFINED Negotiates user-defined facilities.
→ User Defined Facility
Specifies facilities, up to 26 bytes, for negotiation in call request/incoming call packets.

Example:
Define a facility for a packet size negotiation size of 256.

Enter values in hex and press ← (RETURN).

Enter Facility in Hex: 0342080B

→ Call Accept/Connect
Selects whether call accept/connect packets use the address field (default) on all 255 logical channels.

→ Call Accept Facility
Selects facilities used in transmitted call accept/connect packets on all 255 logical channels.

NONE
Facilities are not included.

ECHO (default)
Uses the facility field from the last received call request/incoming call packet.

USER DEFINED
Facilities are user-defined.

→ User Defined Facility
Specifies facilities up to 26 bytes in transmitted call accept/connect packets.

NOTE
See the example used in defining facilities for call request/incoming call packets.
→ Call User Data
Specifies the contents of the user data for the call request/incoming call and call accept/connect packets. A hex string of up to 54 characters can be entered. If there is no call user data, NONE will be displayed as the status.

→ Clear User Data
Specifies the contents of the user data for the clear request/clear indication packet. A hex string of up to 54 characters can be entered. If there is no clear user data, NONE will be displayed as the status.

Example:
Define a call user data field that contains 11 characters.

Enter values in hex and press ↵ (RETURN).

Enter User Data in Hex: C00000003010025800054
The X.25 Emulation supports 255 logical channels which can be set to any of 4095 LCN's (logical channel numbers). For each of these channels, the user can specify:

- the logical channel number (1 through 4095);
- SVC (switched virtual circuit) or PVC (permanent virtual circuit) operation;
- the called and calling addresses placed into call request packets sent by this logical channel (SVC);
- the window size used by data packets on this channel; and
- whether data packets received on the logical channel are echoed as data packets on the same logical channel.

The corresponding entry for each logical channel that originates or accepts a call can be specified. The called and calling addresses are placed in the call request packet for originating calls.

NOTE
When the same logical channel number value is specified for different channels, the emulation uses the first one found.
Each of the 255 logical channels can also be configured for fast select facility, clear request format, and clear confirm format from LCN Setup Menu 2.

<table>
<thead>
<tr>
<th>LCN</th>
<th>Fast Select</th>
<th>Clear Request</th>
<th>Clear Confirm</th>
</tr>
</thead>
<tbody>
<tr>
<td>CH1</td>
<td>1 OFF</td>
<td>Not Extended</td>
<td>Not Extended</td>
</tr>
<tr>
<td>CH2</td>
<td>2 OFF</td>
<td>Not Extended</td>
<td>Not Extended</td>
</tr>
<tr>
<td>CH3</td>
<td>3 OFF</td>
<td>Not Extended</td>
<td>Not Extended</td>
</tr>
<tr>
<td>CH4</td>
<td>4 OFF</td>
<td>Not Extended</td>
<td>Not Extended</td>
</tr>
<tr>
<td>CH5</td>
<td>5 OFF</td>
<td>Not Extended</td>
<td>Not Extended</td>
</tr>
<tr>
<td>CH6</td>
<td>8 OFF</td>
<td>Not Extended</td>
<td>Not Extended</td>
</tr>
<tr>
<td>CH7</td>
<td>7 OFF</td>
<td>Not Extended</td>
<td>Not Extended</td>
</tr>
<tr>
<td>CH8</td>
<td>8 OFF</td>
<td>Not Extended</td>
<td>Not Extended</td>
</tr>
<tr>
<td>CH9</td>
<td>9 OFF</td>
<td>Not Extended</td>
<td>Not Extended</td>
</tr>
<tr>
<td>CH10</td>
<td>10 OFF</td>
<td>Not Extended</td>
<td>Not Extended</td>
</tr>
</tbody>
</table>

Each of the 255 logical channels can be configured for:
- fast select facility when call request facilities are negotiated. Fast select can be set to off, on without restriction, or on with restrictions;
- clear request packets to use extended or non-extended format. Extended format includes use of address, facility, and clear user data fields; and
- clear confirm packets to use extended or non-extended format. Extended format includes use of address, facility, and clear user data fields.

**NOTE**

Clear request and clear confirm extended format are not supported by X.25(1980).
12.3 Sending X.25 Frames and Packets

If the X.25 connection is in a state which allows transmission of a particular frame or packet, pressing the corresponding function key will transmit the frame/packet (eg. no packets are sent if the link is down).

12.4 Establishing a Link

Wait for a UA or DM response.

For modulo 8:

Wait for a UA response.
12.5 Restarting the Link

- Enter the restart cause and diagnostic and press \( \text{RETURN} \).

The RESTART packet contains (HEX) cause 0_ and diagnostic 0_

Refer to the CCITT Recommendation X.25 for valid values.

Wait for an acknowledgement.

12.6 Busy Conditions

The following function keys are used to set the layer 2 link into a not busy/busy condition, respectively.
12.7 Selecting a Logical Channel for an X.25 Call

L3Send

[F1]
Enter LCN:

- Enter the logical channel number and press \( \rightarrow \) (RETURN).

Enter Logical Channel Number on which traffic will be sent (1-4095): 1

12.8 Setting up an X.25 Call

L3Send

[F3]

CALL:

Wait for call accept.

12.9 Sending a Data Packet

L3Send

[F4]

DATA:

Wait for an acknowledgement.
12.10 Resetting the Layer 3 Connection

Enter the reset cause and diagnostic and press \( \rightarrow \) (RETURN).

The RESET packet contains (HEX) cause 0_ and diagnostic 0_.

Refer to the CCITT Recommendation X.25 for valid values.

Wait for confirmation.

12.11 Clearing the Layer 3 Call

Enter the clearing cause and diagnostic and press \( \rightarrow \) (RETURN).

The CLEAR packet contains (HEX) cause 0_ and diagnostic 0_.

Refer to the CCITT Recommendation X.25 for valid values.

Wait for confirmation.
12.12 Disconnecting the Layer 2 (Link) Connection

Wait for a UA response.
13.1 Loading the SNA Monitor Program

The SNA Monitor program can be loaded on a WAN interface, a BRA B-Channel, or a PRA Test Channel. This section uses the WAN interface as an example.

\[ \text{NOTE} \]
Refer to Section 3.3 for instructions to load an application on a BRA B-Channel, and Section 3.5 to load on a PRA Test Channel.

When the application has finished loading:

[Screen shot with F3 and F4 options]

[Screen shot with F1 option]

[Screen shot with F2 option]
Figure 13–1 SNA Monitor Program Display

The unit is now ready to monitor an SNA data circuit. In the default configuration, data is captured to RAM, decoded, and displayed.
13.2 Configuration

Some field values cannot be modified when running on a B-Channel.

Interface Type
The WAN connector module contains three interface connectors:
• V.28/RS-232C (default)
• V.35 or V.36
• V.11/X.21

Interface Leads
Interface leads can be enabled or disabled (default).

Bit Rate
When NRZI clocking is selected, the interface speed can be selected from preset values on the Interface Port Speed menu or set to a user-defined speed. When any other clocking mode is selected, the interface speed is measured, in bits per second, directly from the physical line.

NOTE
The bit rate status is UNKNOWN if there is no physical connection.
→ Clocking
NRZ WITH CLOCK (default) Selects standard non-return to zero line encoding with DCE provided clocks.

EXTERNAL TX CLOCK Selects a DTE provided transmit clock on pin 24 of an RS-232C connector.

NRZI Selects the non-return to zero-inverted method of encoding with timing information extracted from the data signal.

NRZI WITH CLOCK Selects the non-return to zero inverted method of encoding with timing information extracted from the provided clock signals.

→ Frame Sequence Number Modulo
MOD 8 (default) Expects frames to be numbered 0 through 7.

MOD 128 Expects frames to be numbered 0 through 127.
13.3 SNA Display Formats

Refer to Section 18.5 in the 'General Application Topics' section for general display format setup information.

<table>
<thead>
<tr>
<th>Display Format Menu</th>
</tr>
</thead>
<tbody>
<tr>
<td>Display Format COMPLETE</td>
</tr>
<tr>
<td>Timestamp</td>
</tr>
<tr>
<td>Character Set</td>
</tr>
<tr>
<td>Frame Layer</td>
</tr>
<tr>
<td>Transmission Header</td>
</tr>
<tr>
<td>Request/Resp Header</td>
</tr>
<tr>
<td>Sense Data</td>
</tr>
<tr>
<td>Request/Resp Unit</td>
</tr>
<tr>
<td>Data Field</td>
</tr>
</tbody>
</table>

→ Frame Layer
→ Transmission Header
→ Request/Resp Header
→ Sense Data
→ Request/Resp Unit
OFF

Data on the corresponding layer is not displayed.

TEXT (default) Displays field names and values on the corresponding layer.

HEX Displays each byte on the corresponding layer using two hexadecimal digits.

CHARACTER Displays each byte on the corresponding layer in the currently selected character set.
The following display is an example in complete display format.

<table>
<thead>
<tr>
<th>Block No</th>
<th>Source</th>
<th>Complete Report Format</th>
</tr>
</thead>
<tbody>
<tr>
<td>7</td>
<td>7</td>
<td>PI PRI ADDRESS=C1 FRAME=INFO P=0 NR=0 NS=0</td>
</tr>
</tbody>
</table>

- **Port Identifier**: Primary or Secondary
- **PU Address**: JPU
- **Address**: Source
- **Block No**: 7
- **Session Control Format**: 1
- **Sense Data Indication**: SENSE DATA NOT INCLUDED
- **Chain Indicator**: ONLY RU OF CHAIN
- **Response Type Requested**: RQD1
13.4 SNA Filters

Refer to Section 18.9 in the 'General Application Topics' section for filter setup information.

Example 1:
Program a filter to display only I frames from a specific PU (physical unit).

```
Filter Setup Menu 1

Filter Type       DISPLAY        Filter Status          ACTIVATED
Trace Statements  OFF            ➔ Selective PU       103
Lead Changes      BLOCK          Selective LU        ALL

Frame Layer:
SNRM  BLOCK  I  PASS  SIM  BLOCK  CFGR  BLOCK
DISC  BLOCK  RR  BLOCK  RIM  BLOCK  FRMR  BLOCK
UA    BLOCK  RNR BLOCK  BCN BLOCK  UP   BLOCK
DM    BLOCK  REJ BLOCK  XID BLOCK  Invalid BLOCK
RO    BLOCK  UI  BLOCK  TEST BLOCK
```

![Image](image.png)

- Enter the PU link address and press ← (RETURN).

```
Enter PU link address (0 - 255): 103
```
The monitor now only displays I frames destined for, and originating from, that specific PU.

⚠️ **NOTE**

*Because only the display filter has been activated, the capture buffer contains data from all physical units.*

Example 2:
Program the filters to display only frames containing an FID2 transmission header, FMD request/response header and/or sense data.

---

**Filter Setup Menu 1**

<table>
<thead>
<tr>
<th>Filter Type</th>
<th>DISPLAY</th>
<th>Filter Status</th>
<th>ACTIVATED</th>
</tr>
</thead>
<tbody>
<tr>
<td>Trace Statements</td>
<td>ON</td>
<td>Selective PU</td>
<td>ALL</td>
</tr>
<tr>
<td>Load Changes</td>
<td>BLOCK</td>
<td>Selective LU</td>
<td>ALL</td>
</tr>
</tbody>
</table>

**Frame Layer:**

- **SNRM**: BLOCK I PASS SIM BLOCK CFGR BLOCK
- **DISC**: BLOCK RR BLOCK RIM BLOCK FRMR BLOCK
- **UA**: BLOCK RNR BLOCK BCN BLOCK UP BLOCK
- **DM**: BLOCK REJ BLOCK XID BLOCK Invalid BLOCK
- **RD**: BLOCK UI BLOCK TEST BLOCK

Move the cursor to the required parameters and use the **PASS** and **BLOCK** function keys to display (pass) the required frames.

⚠️ **NOTE**

*I frames must be enabled to pass transmission headers.*
## Filters

### Filter Setup Menu 2

<table>
<thead>
<tr>
<th>Filter Type</th>
<th>DISPLAY</th>
<th>Filter Status</th>
<th>DEACTIVATED</th>
</tr>
</thead>
<tbody>
<tr>
<td>Transmission Header:</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>FID 0 BLOCK FID 1</td>
<td>BLOCK</td>
<td>FID 2 PASS</td>
<td>FID 3 BLOCK</td>
</tr>
<tr>
<td>FID 4 BLOCK FID F</td>
<td>BLOCK</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Request/Response Header:</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>FMD PASS NC</td>
<td>BLOCK</td>
<td>DFC BLOCK</td>
<td>SC BLOCK</td>
</tr>
<tr>
<td>Invalid BLOCK</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sense Data:</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>REQ REJ PASS USER</td>
<td>PASS</td>
<td>REQ ERR PASS</td>
<td>ST ERR PASS</td>
</tr>
<tr>
<td>RH USAGE PASS</td>
<td>PATH ERRDR PASS</td>
<td>Invalid PASS</td>
<td></td>
</tr>
</tbody>
</table>

**NOTE**

A transmission header must be enabled to pass request/response headers or sense data.
14.1 Loading the SDLC Emulation Program

The SDLC Emulation program can be loaded on a WAN interface, a BRA B-Channel, or a PRA Test Channel. This section uses the WAN interface as an example.

NOTE
Refer to Section 3.4 for instructions to load an application on a BRA B-Channel, and Section 3.6 to load on a PRA Test Channel.

When the application has finished loading:
Figure 14-1 SDLC Emulation Program Display

Assuming that the unit is connected to an SDLC link which corresponds to the configuration, it responds automatically to any incoming data. In the default configuration, data is captured to RAM, decoded, and displayed.
14.2 Configuration

<table>
<thead>
<tr>
<th>Emulation Configuration Menu</th>
</tr>
</thead>
<tbody>
<tr>
<td>Emulation Mode: SECONDARY</td>
</tr>
<tr>
<td>Physical Layer:</td>
</tr>
<tr>
<td>Emulation Interface: TO DCE</td>
</tr>
<tr>
<td>Interface Type: RS232C/V.28</td>
</tr>
<tr>
<td>Interface Leads: DISABLED</td>
</tr>
<tr>
<td>Bit Rate: UNKNOWN</td>
</tr>
<tr>
<td>Clocking: NRZ WITH CLOCK</td>
</tr>
<tr>
<td>Interframe Fill: FLAG</td>
</tr>
<tr>
<td>Frame Layer:</td>
</tr>
<tr>
<td>Emulation: AUTOMATIC</td>
</tr>
<tr>
<td>Max Frame Size: 4096</td>
</tr>
<tr>
<td>Secondary Stations: 32</td>
</tr>
<tr>
<td>Multipoint: ---</td>
</tr>
<tr>
<td>Two Way Mode: ALTERNATE</td>
</tr>
<tr>
<td>Poll Timer (Sec): 1.0</td>
</tr>
</tbody>
</table>

**NOTE**
Some field values cannot be modified when running on a B-Channel.

> Emulation Mode

**PRIMARY**
The tester emulates a primary station which issues commands and receives expected responses.

**SECONDARY**
(default)
The tester emulates a secondary station which receives commands and issues responses in accordance with the nature of the command received and the mode of operation used.

**NOTE**
The relationship between emulation mode and the network is shown in the following figure.
EXISTING DATA CIRCUIT

Using the tester to emulate parts of a data circuit

Emulation mode vs Emulation interface:
- Secondary TO_DCE
- Primary TO_DTE
- Secondary TO_DTE
- Primary TO_DCE
Physical Layer:

→ Emulation Interface

TO DCE (default) Selects the ‘to DCE’ interface.

TO DTE Selects the ‘to DTE’ interface.

→ Interface Type

The WAN connector module has three interface connectors:
- V.28/RS-232C (default)
- V.35 or V.36
- V.11/X.21

→ Interface Leads

Interface leads can be enabled or disabled (default).

→ Bit Rate

The interface speed can be selected from preset values on the Interface Port Speed Menu, set to a user-defined speed, or measured depending on the emulation interface and clocking selections.

<table>
<thead>
<tr>
<th>Emulation Interface Clocking</th>
<th>TO DTE</th>
<th>TO DCE</th>
</tr>
</thead>
<tbody>
<tr>
<td>NRZ WITH CLOCK</td>
<td>Select</td>
<td>Measure</td>
</tr>
<tr>
<td>EXTERNAL TX CLOCK</td>
<td>Select</td>
<td>Select</td>
</tr>
<tr>
<td>NRZI</td>
<td>Select</td>
<td>Select</td>
</tr>
<tr>
<td>NRZI WITH CLOCK</td>
<td>Select</td>
<td>Measure</td>
</tr>
</tbody>
</table>

⚠️ **NOTE**
The bit rate status is UNKNOWN if there is no physical connection.

⚠️ **NOTE**
Clocking is provided by the attached equipment when the bit rate can be selected.

→ Clocking

NRZ WITH CLOCK (default) Selects standard non-return to zero line encoding.

EXTERNAL TX CLOCK Selects a DTE provided transmit clock on pin 24 of an RS-232C connector.
NRZI
Selects the non-return to zero inverted method of encoding with timing information extracted from the data signal.

NRZI WITH CLOCK
Selects the non-return to zero inverted method of encoding with timing information extracted from the provided clock signal.

→ Interframe Fill
Selects the bit rate pattern transmitted between blocks of data.

MARK
Transmits continuous MARK characters (hex FF).

FLAG (default)
Transmits continuous FLAG characters (hex 7E).

Frame Layer:

→ Emulation
Selects whether to provide protocol responses to all received frames automatically (default).

→ Max Frame Size
Specifies the maximum number of bytes in transmitted or received frames. Valid values are 1 through 4096 (default).

→ Secondary Stations
Specifies the number of active secondary stations (data links) that can be emulated simultaneously (default is 32).

→ Multipoint
Selects whether multipoint configuration is on or off (default).

→ Two Way Mode
Selects whether the transmission mode is two way alternate (default) or two way simultaneous.

→ Poll Timer (Sec)
Specifies the time, in tenths of seconds, of the poll timer for primary emulation (default is 1 second).
14.3 Station Setup

SDLC Emulation supports the simultaneous emulation of up to 32 stations. The number of secondary stations is determined on the Emulation Configuration Menu (Secondary Stations). For each station, the user can set the:

- station address (1 through 254);
- window size (1 through 7);
- primary side non-response timer (default is 3 seconds); and
- maximum retry value (default is 20).

\[ \text{NOTE} \]

The values for non-response timer and maximum retry are used during primary emulation only.

Example:
Set the address to 20 for secondary station 0.

<table>
<thead>
<tr>
<th>Secondary Station</th>
<th>Address</th>
<th>Window</th>
<th>Timeout (Sec)</th>
<th>Retries</th>
</tr>
</thead>
<tbody>
<tr>
<td>Secondary 0</td>
<td>20</td>
<td>4</td>
<td>3.0</td>
<td>20</td>
</tr>
<tr>
<td>Secondary 1</td>
<td>2</td>
<td>4</td>
<td>3.0</td>
<td>20</td>
</tr>
<tr>
<td>Secondary 2</td>
<td>3</td>
<td>4</td>
<td>3.0</td>
<td>20</td>
</tr>
<tr>
<td>Secondary 3</td>
<td>4</td>
<td>4</td>
<td>3.0</td>
<td>20</td>
</tr>
<tr>
<td>Secondary 4</td>
<td>5</td>
<td>4</td>
<td>3.0</td>
<td>20</td>
</tr>
<tr>
<td>Secondary 5</td>
<td>6</td>
<td>4</td>
<td>3.0</td>
<td>20</td>
</tr>
<tr>
<td>Secondary 6</td>
<td>7</td>
<td>4</td>
<td>3.0</td>
<td>20</td>
</tr>
<tr>
<td>Secondary 7</td>
<td>8</td>
<td>4</td>
<td>3.0</td>
<td>20</td>
</tr>
<tr>
<td>Secondary 8</td>
<td>9</td>
<td>4</td>
<td>3.0</td>
<td>20</td>
</tr>
<tr>
<td>Secondary 9</td>
<td>A</td>
<td>4</td>
<td>3.0</td>
<td>20</td>
</tr>
</tbody>
</table>
Enter the secondary station link address and press ← (RETURN).

Enter Secondary Station Link Address (0-FF): 20

14.4 Establishing a Link to a Secondary Station

Press the ESC key to display the command line.

Enter in the command from the following list that corresponds to the desired frame type and press ← (RETURN).

- SNRM
- RD
- DISC
- RIM
- SIM
- XID

Refer to the SDLC/SNA Programmer’s Manual for an explanation of these commands.
14.6 Sending SNA Information

To send an ACTLU request, enter the information in hex and press (RETURN).

Enter Information in Hex: 2D0002000B536B00000D

14.7 Resetting the Link

Polling action stops.
15.1 Loading the BSC 3270 Monitor Program

The BSC 3270 Monitor program can be loaded on a WAN interface, a BRA B-Channel, or a PRA Test Channel. This section uses the WAN interface as an example.

**NOTE**
Refer to Section 3.3 for instructions to load an application on a BRA B-Channel, and Section 3.5 to load on a PRA Test Channel.

When the application has finished loading:
Figure 15–1 BSC 3270 Monitor Program Display

The unit is now ready to monitor a Bisync data circuit. In the default configuration, data is captured to RAM, decoded, and displayed.
15.2 Configuration

Framing

- **EBCDIC**
  - Uses EBCDIC control characters and a SYNC character of hex 32.
- **ASCII**
  - Uses ASCII control characters and a SYNC character of hex 16.

Interface Type
The WAN connector module contains three interface connectors:
- V.28/RS-232C
- V.35 or V.36
- V.11/X.21

Interface Leads
Interface leads can be enabled or disabled (default).

Bit Rate
The interface speed is measured, in bits per second, directly from the physical line.

NOTE
*The bit rate status is UNKNOWN if there is no physical connection.*
15.3 Bisync Display Formats

Refer to Section 18.5 in the 'General Application Topics' section for general display format setup information.

---

**Display Format Menu**

- **Display Format** COMPLETE
- **Dual Window** OFF
- **Timestamp** OFF
- **Trace Display Format** SHORT
- **Character Set** ASCII
- **Control Layer** TEXT
- **Throughput Graph** OFF
- **Message Layer** TEXT
- **Short Interval (sec)** 10
- **Data Field** CHARACTER
- **Long Interval (sec)** 600

---

**Control Layer**

**Message Layer**

**OFF**

Data on the corresponding layer is not displayed.

**TEXT**

Displays field names and values on the corresponding layer.

**HEX**

Displays each byte on the corresponding layer using two hexadecimal digits.

**CHARACTER**

Displays each byte on the corresponding layer using the specified character set.
The following display is an example in complete display format.

<table>
<thead>
<tr>
<th>Block No</th>
<th>Source</th>
<th>Complete Report</th>
</tr>
</thead>
<tbody>
<tr>
<td>422</td>
<td>P1 Rx</td>
<td>CONTROL = EOT</td>
</tr>
<tr>
<td>106</td>
<td>P1 Tx</td>
<td>CONTROL = EOT</td>
</tr>
<tr>
<td>107</td>
<td>P1 Tx</td>
<td>CONTROL = GENERAL POLL</td>
</tr>
<tr>
<td></td>
<td></td>
<td>CONTROLLER = 1</td>
</tr>
<tr>
<td>423</td>
<td>P1 Rx</td>
<td>CONTROL = EOT</td>
</tr>
<tr>
<td>108</td>
<td>P1 Tx</td>
<td>CONTROL = EOT</td>
</tr>
<tr>
<td>109</td>
<td>P1 Tx</td>
<td>CONTROL = GENERAL POLL</td>
</tr>
<tr>
<td></td>
<td></td>
<td>CONTROLLER = 1</td>
</tr>
<tr>
<td>424</td>
<td>P1 Rx</td>
<td>CONTROL = EOT</td>
</tr>
<tr>
<td>110</td>
<td>P1 Tx</td>
<td>CONTROL = EOT</td>
</tr>
<tr>
<td>111</td>
<td>P1 Tx</td>
<td>CONTROL = SELECT</td>
</tr>
<tr>
<td></td>
<td></td>
<td>CLUSTER = 1  STATION = 0</td>
</tr>
</tbody>
</table>
15.4 Bisync Filters

Refer to Section 18.9 in the 'General Application Topics' section for filter setup information.

Example 1:
Program a filter to display only communication with a Cluster ID of 29.

```
| F1 | Menu 1 |
```

```
<table>
<thead>
<tr>
<th>Filter Setup Menu 1</th>
</tr>
</thead>
<tbody>
<tr>
<td>Filter Type</td>
</tr>
<tr>
<td>Selective CU</td>
</tr>
<tr>
<td>Lead Changes</td>
</tr>
<tr>
<td>Filter Status</td>
</tr>
<tr>
<td>Selective LU</td>
</tr>
<tr>
<td>Trace Statements</td>
</tr>
<tr>
<td>Control Characters</td>
</tr>
<tr>
<td>NAK PASS</td>
</tr>
<tr>
<td>EOT PASS</td>
</tr>
<tr>
<td>ENQ PASS</td>
</tr>
<tr>
<td>ACK 0 PASS</td>
</tr>
<tr>
<td>ACK 1 PASS</td>
</tr>
<tr>
<td>TTD PASS</td>
</tr>
<tr>
<td>SPECIFIC POLL PASS</td>
</tr>
<tr>
<td>GENERAL POLL PASS</td>
</tr>
<tr>
<td>SHORT FRAME PASS</td>
</tr>
</tbody>
</table>
```

```
| F2 | ONE |
```

- Enter in the Cluster ID and press (RETURN).

```
Enter CU Number (0 - 31): 29
```

The monitor now displays inbound or outbound traffic with the specified Cluster ID.
**NOTE**

The capture buffer contains all data including data on all clusters.

Example 2:
Program the filters to display only BCC errors and invalid frames.

<table>
<thead>
<tr>
<th>Filter Type</th>
<th>DISPLAY</th>
<th>Filter Status</th>
<th>ACTIVATED</th>
</tr>
</thead>
<tbody>
<tr>
<td>Selective CU</td>
<td>ALL</td>
<td>Selective LU</td>
<td>ALL</td>
</tr>
<tr>
<td>Lead Changes</td>
<td>BLOCK</td>
<td>Trace Statements</td>
<td>ON</td>
</tr>
</tbody>
</table>

Control Characters

- \(\text{NAK BLOCK}\)
- \(\text{WACK BLOCK}\)
- \(\text{BLOCK}\)
- \(\text{TTO BLOCK}\)
- \(\text{ETB DATA BLOCK}\)
- \(\text{EDT BLOCK}\)
- \(\text{RVI BLOCK}\)
- \(\text{SPECIFIC POLL BLOCK}\)
- \(\text{ETX DATA BLOCK}\)
- \(\text{ENQ BLOCK}\)
- \(\text{BCC ERROR PASS}\)
- \(\text{GENERAL POLL BLOCK}\)
- \(\text{HASP BID BLOCK}\)
- \(\text{ACK 0 BLOCK}\)
- \(\text{ILLEGAL PASS}\)
- \(\text{SHORT FRAME PASS}\)
- \(\text{SELECT BLOCK}\)

Move the cursor to the required parameters and use the *PASS* and *BLOCK* function keys to display (pass) only required frames.
16
BSC 3270 EMULATION
Version 2.0
16.1 Loading the BSC 3270 Emulation Program

The BSC 3270 Emulation program can be loaded on a WAN interface, a BRA B-Channel, or a PRA Test Channel. This section uses the WAN interface as an example.

NOTE

Refer to Section 3.4 for instructions to load an application on a BRA B-Channel, and Section 3.6 to load on a PRA Test Channel.

When the application has finished loading:

1. F2
   - Emulation
2. F4
   - Load Application

<table>
<thead>
<tr>
<th>WAN Emulation Applications</th>
</tr>
</thead>
<tbody>
<tr>
<td>Universal X.25</td>
</tr>
<tr>
<td>✗ BSC 3270 X.25 LOAD GEN</td>
</tr>
<tr>
<td>SDLC X.75</td>
</tr>
<tr>
<td>ISDN D Channel SS#7</td>
</tr>
</tbody>
</table>

Verification Applications:
- SDL/C/SNA

Conformance Applications:
- X.25 Universal
- ISDN D Channel SS#7
Assuming that the unit is connected to a Bisync line which corresponds to the configuration, it will respond automatically to any incoming data. The data will also be captured to RAM, decoded, and displayed.
16.2 Configuration

Emulation Configuration Menu

- Emulation Mode
Selects whether to emulate a CLST/3274 (cluster controller) or a COMM/3705 (communications controller).

- Emulation
Selects whether to provide protocol responses to all received frames automatically (default).

- Emulation Interface
  TO DCE Selects the 'to DCE' interface.
  TO DTE Selects the 'to DTE' interface.

- Interface Type
The WAN connector module has three interface connectors:
  - V.28/RS-232C (default)
  - V.35 or V.36
  - V.11/X.21
EXISTING BISYNC DATA CIRCUIT

USING THE TESTER TO EMULATE PARTS OF A DATA CIRCUIT

<table>
<thead>
<tr>
<th>EMULATION MODE</th>
<th>EMULATION INTERFACE</th>
</tr>
</thead>
<tbody>
<tr>
<td>CLUST/3274</td>
<td>TO_DCE</td>
</tr>
<tr>
<td>COMM/3705</td>
<td>TO_DTE</td>
</tr>
<tr>
<td>CLUST/3274</td>
<td>TO_DTE</td>
</tr>
<tr>
<td>COMM/3705</td>
<td>TO_DCE</td>
</tr>
</tbody>
</table>
→ **Interface Leads**
Interface leads can be enabled or disabled (default).

→ **Carrier Detect Control**
Selects whether the DCE device asserts CD (carrier detect) leads to indicate valid transmission.

→ **RTS/CTS Control**
Selects whether the DTE device asserts RTS (request to send) leads and waits for an asserted CTS (clear to send) lead before transmitting data.

⚠ **NOTE**
The RTS lead is turned off after transmission. This handshaking is ignored if the CTS lead is asserted permanently by the test partner.

→ **Bit Rate**
The interface speed can be selected from preset values on the Interface Port Speed Menu, set to a user-defined speed, or measured depending on the emulation interface and clocking selections.

<table>
<thead>
<tr>
<th>External Tx Clock</th>
<th>TO DTE</th>
<th>TO DCE</th>
</tr>
</thead>
<tbody>
<tr>
<td>OFF</td>
<td>Select</td>
<td>Measure</td>
</tr>
<tr>
<td>ON</td>
<td>Measure</td>
<td>Select</td>
</tr>
</tbody>
</table>

⚠ **NOTE**
The bit rate status is UNKNOWN if there is no physical connection.

⚠ **NOTE**
Clocking is provided by the attached equipment when the bit rate can be selected.

→ **Framing**

**EBCDIC**
- Uses EBCDIC control characters and a SYNC character of hex 32.

**ASCII**
- Uses ASCII control characters and a SYNC character of hex 16.
External Tx Clock

There are two clocking modes:

- **OFF** (Normal)
- **ON** (External)

Example:
Using normal clocking on the EIA–RS–232C (V.24/V.28) interface, the DCE provides the transmit and receive clock for the DTE on pins 15 and 17, respectively. Using external clocking, the DTE provides the transmit clock on pin 24 and the DCE echoes the transmit clock on pin 15; the DCE provides the receive clock for the DTE on pin 17.

15 Transmit clock from DCE (DCE provided)
17 Receive clock from DCE (DCE provided)
24 Transmit clock to DCE (DTE provided)
Each controller (0–31) must be selected on or off. Correspondingly, each device for a specific controller must be selected on (active) or off (inactive).

When emulating a 3705 communications controller, the Bisync Emulation can communicate with up to 32 cluster controllers, each having up to 32 devices. Selecting specific clusters sets up the poll train list for the emulator (i.e. the emulation sends a general poll to each cluster controller selected in the menu). Any devices not responding are retried two times prior to polling the next device.

The CLST/3274 Bisync Emulation can emulate up to 32 cluster controllers simultaneously. Selecting a cluster and device ensures a response to a specific poll to that device. The selected cluster responds to a general poll if it is activated and not busy.
16.3 Bisync Control Characters and Messages

If the Bisync connection is in a state which allows transmission of a particular control character or message, pressing the corresponding function key transmits the control character/message (eg. no messages are sent if polling has not been initiated or the particular device is not active).

Polling

To initiate the continuous polling sequence from the communications controller:

Selecting a Cluster Controller and Device

As a communications controller, the emulation transmits (by default) all messages to cluster controller 0, device 0.

Example:
Send messages to cluster controller 10, device 29.

- Press the ESC key to display the command line.
- Enter the cluster and device ID's followed by the SET_TRANSMIT_LUS command and press (RETURN).

COMMAND: 10 29 SET_TRANSMIT_LUS
The SET_TRANSMIT_LUS command specifies the cluster and device (refer to the Bisync 3270 Programmer's Manual for an explanation of SET_TRANSMIT_LUS).

As a cluster controller, the emulation transmits (by default) all messages from cluster 0, device 0.

Example:
Send messages from cluster controller 10, device 29.

- Press the ESC key to display the command line.
- Enter the CLUST_LU command, followed by the cluster ID and press (RETURN).

COMMAND: CLUST_LU 10

- Enter the device ID followed by the SET_TRANSMIT_LU command and press (RETURN).

COMMAND: 29 SET_TRANSMIT_LUS

Refer to the Bisync Programmer's Manual for an explanation of SET_TRANSMIT_LU and CLUST_LU.

**NOTE**

SET_TRANSMIT_LUS works for a communications controller setting both cluster controller ID and device ID. SET_TRANSMIT_LU works for a cluster controller and sets device ID only.
Sending a Message

Example:
Transmit the text 'ABC'.

- Enter the desired message and press Execute to send the message.

**NOTE**
The entered text is automatically bound by STX and ETX characters before transmission. The text is 8 bit no parity ASCII and no conversion to EBCDIC or 7 bit odd parity ASCII takes place.

Appending Text to a Message

Example:
Add text 'DEF' to original message.

- Enter in additional text.

Repeat the above procedure until the desired message is created.
Press *Execute* to send the message.

**NOTE**
*Messages longer than 255 characters are transmitted in multiple transmissions using ETB characters.*

---

**Clearing the Message Buffer**

To clear the current message buffer for completely new messages:

```
F3
New Message
```
As well as loading protocol specific software onto an application processor, the Home processor controls:
- machine configuration and status display;
- disk and file management;
- the printer and remote ports;
- the real–time clock; and
- the full screen, visual editor.

### 17.1 TestPorts

The user can switch to any of up to six test ports (channels) if an application program has been loaded on the respective application processor (eg. the B2–Channel).

![Testports](image)

∫ **NOTE**

*The function keys vary depending on machine configuration.*

### 17.2 Background

The Home processor maintains status information on the system configuration as well as the activity of the application processors. This can be viewed via the Configuration Diagram and the Test Port Status Display.
Configuration Diagram

The Configuration Diagram shows which test port channel is connected to which application processor and/or external data or voice output.

NOTE
The function keys vary depending on the machine configuration.

NOTE
The BRA/BRA has a Configuration Diagram for Port A (BRA–A Config) and Port B (BRA–B Config). The port must be selected prior to configuring or loading an application.
Test Port Status Display

The Test Port Status Display provides a dynamically updated overview of the application processor/test port activities.

![Test Port Status Display]

<table>
<thead>
<tr>
<th>Test Port Status Display</th>
<th>WAN Interface</th>
<th>B2 Channel</th>
<th>D Channel</th>
</tr>
</thead>
<tbody>
<tr>
<td>Application</td>
<td>Universal Mon</td>
<td>---</td>
<td>D-Chan Monitor</td>
</tr>
<tr>
<td>Interface</td>
<td>RS232-C (V.28)</td>
<td>---</td>
<td>ISDN BRA &amp; BUS</td>
</tr>
<tr>
<td>Live Data</td>
<td>Off</td>
<td>---</td>
<td>On</td>
</tr>
<tr>
<td>Recording:</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Capture RAM</td>
<td>On</td>
<td>---</td>
<td>On</td>
</tr>
<tr>
<td>Date File</td>
<td>Off</td>
<td>---</td>
<td>Off</td>
</tr>
<tr>
<td>Filters:</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Display</td>
<td>---</td>
<td>---</td>
<td>Deactivated</td>
</tr>
<tr>
<td>RAM</td>
<td>---</td>
<td>---</td>
<td>Deactivated</td>
</tr>
<tr>
<td>Disk</td>
<td>---</td>
<td>---</td>
<td>---</td>
</tr>
<tr>
<td>Triggers</td>
<td>Off</td>
<td>---</td>
<td>Off</td>
</tr>
</tbody>
</table>

Figure 17–2 BRA/WAN Test Port Status Display

⚠️ NOTE
The function keys vary depending on the machine configuration.

17.3 Files

Mass storage is available as an 800 Kb floppy or a 40 Mb hard disk. The Home processor controls utilities to copy, delete, list, etc. disk contents.
Listing a Directory

Directory Listing

| File Name | Format | SHORT
|-----------|--------|-------
| Current Device | DRO | Order By NAME
| Write Protected | NO | File Type ALL

- All sizes in KBytes -

File System PT_DISK

<table>
<thead>
<tr>
<th>Size</th>
<th>Free</th>
<th>Files</th>
</tr>
</thead>
<tbody>
<tr>
<td>800</td>
<td>212</td>
<td>(210)</td>
</tr>
</tbody>
</table>

Files 8/8

A LOAD
A LOAD1
A LOAD2
LOGO.COLOUR
MENU.B
facpla.sys
facpib.sys
main.sys

→ File Name
Specifies the filename to match. If the filename is specified as * (wildcard character), any filename will be matched.

Example:
List only files starting with the word 'TEST'.

- Enter the filename (TEST*) and press ← (RETURN).

List files matching: TEST*
→ *Current Device*
The directory listing corresponds to the currently selected device.

→ *Write Protected*
Selects whether the disk is write protected (i.e. no data can be recorded or files saved to it).

→ *Format*

**SHORT** (default) Displays only the filename.

**LONG** Displays the filename, file type, size, status, and creation date.

<table>
<thead>
<tr>
<th>Filename</th>
<th>Type</th>
<th>Size</th>
<th>Permissions</th>
<th>Date Created</th>
</tr>
</thead>
<tbody>
<tr>
<td>X25.SCRIPT</td>
<td>Src</td>
<td>8</td>
<td>Perm</td>
<td>1988-06-21 18:25:01</td>
</tr>
<tr>
<td>X25.DAT</td>
<td>Data</td>
<td>15</td>
<td>Perm</td>
<td>1988-06-21 18:25:15</td>
</tr>
<tr>
<td>MENU.B1</td>
<td>Obj</td>
<td>95</td>
<td>Perm</td>
<td>1988-06-21 18:21:48</td>
</tr>
<tr>
<td>fecplb.sys</td>
<td>Exec</td>
<td>105</td>
<td>Perm</td>
<td>1988-06-21 18:21:02</td>
</tr>
<tr>
<td>fecplae.sys</td>
<td>Exec</td>
<td>105</td>
<td>Perm</td>
<td>1988-06-21 18:21:59</td>
</tr>
<tr>
<td>main.sys</td>
<td>Exec</td>
<td>135</td>
<td>Perm</td>
<td>1988-06-21 18:20:48</td>
</tr>
<tr>
<td>MENU.B</td>
<td>Obj</td>
<td>170</td>
<td>Perm</td>
<td>1988-06-21 18:21:39</td>
</tr>
</tbody>
</table>

→ *Order By*

**NAME** Lists files in alphabetical order.

**SIZE** Lists files starting with the smallest to the largest.
TYPE
Lists system files (Exec) first, then object, source, and data files.

DATE
Lists files starting with the oldest date.

File Type

ALL
Lists all files.

SRC
Lists only source code files.

DATA
Lists only data files.

OBJ
Lists only object code files.

File System (<Name>)
This name is set by the user during the initialization of the device.

Size
The total space available on this device (in Kbytes).

\[\text{\textbf{NOTE}}\]
The hard disk is partitioned during initialization and is divided into a number of segments, or partitions. The size of each segment is defined at the time of initialization.

Free (eg. 314/312)
The first number represents the total available free space and the second number, the largest contiguous area of free space.

Files (eg. 12/12)
This is the number of files displayed vs. the total number of files in that directory. The number of files displayed can be limited by using a wildcard with the Change Filename function key, or be changing the file type displayed.
Printing the Directory Listing

**NOTE**

Before printing, connect a serial or parallel printer to the back of the tester and configure the printer as described in the 'Configuring the Printer Port' section on page 17-24.

**WARNING**

Do not move to another topic while printing!

---

NOTE

The location of the Print function key varies depending on the position of the cursor on the Directory Listing Menu.

Printing a Source File

- Specify the device and filename (eg. WD2:TEST1) and press \( \leftarrow \) (RETURN).

---

IDACOM
Editing a File

**NOTE**
*Line numbers can be displayed by pressing the Line #'s function key.*

- Specify the device and filename (eg. WD1:TEST1) and press (RETURN) to edit a source or test script file.

```plaintext
Edit script: WD1:TEST1
```

```
TCLR
0 VARIABLE COUNTER11 0 VARIABLE COUNTER12 0 VARIABLE COUNTER13
0 VARIABLE COUNTER14 0 VARIABLE COUNTER15 0 VARIABLE COUNTER16
0 VARIABLE COUNTER17 0 VARIABLE COUNTER18 0 VARIABLE COUNTER19
0 VARIABLE COUNTER20 0 VARIABLE COUNTER21 0 VARIABLE COUNTER22
0 VARIABLE COUNTER23 0 VARIABLE COUNTER24 0 VARIABLE COUNTER25
0 VARIABLE COUNTER26 0 VARIABLE COUNTER27 0 VARIABLE COUNTER28
0 VARIABLE COUNTER29 0 VARIABLE COUNTER30

: ZERO_CNT  ( --- )  ( Zero statistic counts )
 0 COUNTER1 0 COUNTER2 0 COUNTER3 0 COUNTER4 0 COUNTER5
 0 COUNTER6 0 COUNTER7 0 COUNTER8 0 COUNTER9 0 COUNTER10
 0 COUNTER11 0 COUNTER12 0 COUNTER13 0 COUNTER14 0 COUNTER15
 0 COUNTER16 0 COUNTER17 0 COUNTER18 0 COUNTER19 0 COUNTER20
```
Editor Functions

Overwrite
Overwrites existing text with new characters. The default is to insert new text at the current position.

Edit
Edits a new file.

Delete
Deletes the character under the edit cursor.

Cut Line
Deletes the line on which the edit cursor is positioned.

Paste Line
Copies the last deleted line to the line above the edit cursor.

Save
Saves the file to disk. The user is prompted for a filename.

Find
Locates and/or replaces text.

Quit
Leaves the editor.

If the HOME key is inadvertently pressed while editing a file, the current file can be re-entered (without losing edits).
System Shutdown

To park the head of the hard disk drive:

- Confirm system shutdown:
  - Remove the disk from the floppy disk drive.
  - Turn off the power.

Copying Files

Example:
Copy the file 'TEST1' on WD1 to 'TEST1' on DR0.

- Specify the device and filename for the first field (WD1:TEST1), then press the Next Field function key and specify the target device and filename (DR0:TEST1).
- Press ← (RETURN) to start copying.
NOTE
Ensure that the Verify function key is highlighted to verify the copy against the original after copying is complete, and that the Pause on Error function key is highlighted to pause if an error occurs.

NOTE
If the filename is specified as * (wildcard character), all files will be copied.

Comparing Files

Example:
Compare file 'DATA1' on WD0 with 'DATA2' on WD1.

- Specify the device and filename for the first field (WD0:DATA1), then press the Next Field function key and specify the device and filename (WD1:DATA2).
- Press (RETURN) to start comparing.

NOTE
Ensure that the Pause on Error function key is highlighted to pause if an error occurs.
NOTE

If the filename is specified as * (wildcard character), all files will be compared to those on the destination drive.

Renaming Files

Example:
Rename file 'ABC' on WDO to 'XYZ'.

1. Specify the device and filename for the first field (WDO:ABC), then press the Next Field function key and specify the device and filename (WDO:XYZ).
2. Press ← (RETURN) to rename the file.

Deleting Files

Example:
Delete file 'XYZ' from DR0.

1. Specify the device and filename (DR0:XYZ) to delete and press ← (RETURN).
NOTE

The * (wildcard character) cannot be used to delete files.

Merging Files

Example:
Merge files 'ABC' and 'DEF' on DR0 into file 'XYZ'.

Specify the device and filenames for the first field (DR0:ABC), the second field (DR0:DEF), and the merged filename in the third field (DR0:XYZ). Use the Next Field function key to advance to the next field.

Press \(\Rightarrow\) (RETURN) to merge the files.
Formatting a Floppy Disk

The floppy disk must be formatted before recording data or creating a test script.

Enter the new file system name (eg. DATA) and press (RETURN).

The following warning message is displayed:

WARNING: This will delete current contents - F7 to continue, F8 to quit

Press f7 to continue or f8 to quit.
Creating a New File System

In order to quickly clear a formatted disk or a hard disk partition of all files, create a new file system.

Enter the new file system name (e.g., DATA123) and press <RETURN>.

Enter new file system name: DATA123

The following warning message is displayed:

WARNING: This will delete current contents - F7 to continue, F8 to quit.

Press f7 to continue or f8 to quit.
Hard Disk Organization

The hard disk drive is logically divided into a maximum of eight partitions: WD0 through WD7. Each partition serves as an independent disk storage area for data, test scripts, or programs.

A file system name describes each partition's contents. The following table lists the default file system names, size (in Kbytes), and contents.

<table>
<thead>
<tr>
<th>Partition</th>
<th>File System</th>
<th>Size</th>
<th>Contents</th>
</tr>
</thead>
<tbody>
<tr>
<td>WD0</td>
<td>SYSTEM</td>
<td>2000</td>
<td>Operating System and Home Processor Software</td>
</tr>
<tr>
<td>WD1</td>
<td>APPLICATIONS</td>
<td>7500</td>
<td>Universal Simulation/Monitor X.25 Monitor/Emulation SDLC/SNA Emulation/Monitor BSC 3270 Monitor/Emulation ISDN Monitor/Emulation</td>
</tr>
<tr>
<td>WD2</td>
<td>PROGRAMS</td>
<td>2000</td>
<td>User Test Scripts</td>
</tr>
<tr>
<td>WD3</td>
<td>DATA</td>
<td>2000</td>
<td>Data files and general purpose</td>
</tr>
</tbody>
</table>

TABLE 17-6 Default File System Names

Formatting the Hard Disk

⚠️ WARNING

*Formatting the hard disk erases all data on the hard disk.*

When the tester is shipped, the hard disk has already been formatted and all necessary software installed. In the event of a disk failure or exposure to strong magnetic fields, it might be necessary to reformat the hard disk and reload the application software from floppy disk.

- Insert the disk labelled 'STAND–ALONE UTILITIES' into the floppy disk drive.
- Turn on the power switch or press the RESET button.
The following prompt is displayed.

- Enter N.

```
Do you want to run Diagnostics? Press Y or N: N
```

![Main Menu](image)

- Press f1 to format the hard disk.

The following prompt is displayed.

- Enter Y.

```
Formatting will destroy hard disk contents.
Do you want to continue with Formatting? Press Y or N: Y
```

---

**Partitioning the Hard Disk**

⚠️ **WARNING**  
*Partitioning the hard disk erases all data on the hard disk.*

After the disk has been formatted, it is necessary to divide the disk into partitions. When partitioning the hard disk drive, use IDACOM’s recommended partitions or customize the disk for your own requirements.
Example:
A customized configuration could require three partitions: one for the Operating System, one for X.25 software, and finally, the largest for data recording. In this case, set WD0 to 2500 Kbytes, WD1 to 2500 Kbytes, and by setting all others to 0 Kbytes, WD2 contains the remaining space on the hard drive.

- Insert the disk(s) labelled 'OPERATING SYSTEM' into the floppy disk drive DRO.
- Turn on the power switch or press the RESET button.

<table>
<thead>
<tr>
<th>Partition</th>
<th>Size in KB</th>
</tr>
</thead>
<tbody>
<tr>
<td>WD0</td>
<td>2500</td>
</tr>
<tr>
<td>WD1</td>
<td>2500</td>
</tr>
<tr>
<td>WD2</td>
<td>0</td>
</tr>
<tr>
<td>WD3</td>
<td>0</td>
</tr>
<tr>
<td>WD4</td>
<td>0</td>
</tr>
<tr>
<td>WD5</td>
<td>0</td>
</tr>
<tr>
<td>WD6</td>
<td>0</td>
</tr>
<tr>
<td>WD7</td>
<td>0</td>
</tr>
</tbody>
</table>

Partition Total 5000
Physical Disk Size 19647
Move the cursor to each partition WD0 to WD7.

- Enter the new partition size and press \(\leftarrow\) (RETURN).

Enter the partition size in KBtyes: 2500

After all the partition sizes are set:

- Press f7 to continue or f8 to quit.

If the sum of the partitions is less than the physical disk size, another partition is created containing the rest of the disk space; if all the partitions are specified, the difference is added to WD7. In the example, WD2 is assigned all remaining available space, or approximately 15,000 Kbytes.
Backing up Files

Files on the hard disk (Source) can be backed up to floppy disk (Destination).

Filename
Specifies a single filename or wildcard.

Example 1:
Back up all files (default).

NOTE
If the filename is specified as * (wildcard character), all files will be backed up.

Enter * to back up all files and press (RETURN).
Example 2:
Back up the file 'ISDN_EMUL.B1'.

- Enter the filename and press  (RETURN).

Backup files matching: ISDN_EMUL.B1

Example 3:
Back up all files with 'DAT' as the first three characters in the filename.

- Enter DAT and * and press  (RETURN).

Backup files matching: DAT

⚠️ **NOTE**
*Ensure that the Verify function key is highlighted to automatically compare the files with the backup.*

To start copying:

To list the files on the backup disk:
Restoring Backup

If the hard disk has been initialized, repartitioned, or files have been lost for some other reason, they can be restored from the floppy disk. To restore the operating system:

- Insert the disk(s) labelled 'OPERATING SYSTEM' into the floppy disk drive DRO.
- Turn on the power switch or press the RESET button.

The following warning message is displayed:

WARNING: This will delete current contents - F7 to continue, F8 to quit

- Press f7 to continue or f8 to quit.
To restore a single file:

- Enter the filename you wish to restore (eg. TEST1) and press RETURN.

- Enter the name of the file you wish to restore: TEST1

---

17.4 Setup

The Home processor controls the configuration and operation of the printer and remote ports, as well as the real-time clock.

---

Configuring the Printer Port

- Printer Port: Serial
- Baud Rate: 1200
- Flow Control: OFF
- End-of-Line Character: LF and CR
- Format: CHARACTER
- Characters/Line: 80
- Lines/Page: 50
GENERAL HOME PROCESSOR TOPICS

September 1990

Printer Port

| SERIAL     | Connects to a serial printer. |
| PARALLEL   | Connects to a parallel printer. |

Baud Rate

Specifies the interface speed in bits per second.

Flow Control

| OFF        | Flow control is not used. |
| XON/XOFF   | Starts/stops transmission to the printer upon reception of XON (hex 13) and XOFF (hex 11), respectively. |
| DTR        | Outputs to the printer while the DTR (CCITT #108) control lead is on. |
| CTS/RTS    | Outputs to the printer while the RTS (CCITT #105) control lead is on. |

NOTE

Combinations of XON/XOFF, DTR, and CTS/RTS can be selected.

End-of-Line Character

| NONE       | End of line character is not printed. |
| CR         | Outputs a carriage return (hex 0D) at the end of each line. |
| LF and CR  | Outputs both a carriage return and a line feed (hex 0A) at the end of each line. |

Format

| RAW        | Outputs all characters without conversion. |
| CHARACTER  | Translates all non-printable characters into hex. |
| HEX        | Translates all characters into hex. |

IDACOM

PT500 User Manual
NOTE

Characters translated into hex are enclosed in angle brackets (i.e. 'AB$H$C' prints as 'AB<01>C').

→ Characters/Line
Specifies the maximum number of characters/line before sending a carriage return.

→ Lines/Page
Specifies the maximum number of lines/page before advancing to the next page.

Configuring the Remote Port

→ Baud Rate
Specifies the interface speed in bits per second.

→ Flow Control
OFF
Flow control is not used.

XON/XOFF
Starts/stops transmission to the modem upon reception of XON (hex 13) and XOFF (hex 11), respectively.
**DTR**
Asserts DTR (CCITT #108) control lead while sending data.

**CTS/RTS**
Outputs to the modem while CTS (#106) control lead is on.

→ *Remote Interpret*
Selects whether data received on the modem port is interpreted on the Home processor.

---

**Setting Date and Time**

![Diagram showing setting date and time](image)

- Enter the values for each of the six fields using the `Next Field` function key, and press `←` (RETURN).
17.5 FILEX

FILEX provides terminal emulator and file transfer capabilities via the remote port. FILEX can be used to communicate with another tester/computer.

Configuring the Tester

Configuration Menu

- Configuration File
  FILEX SETUP.F

Terminal Emulator:
  Communication Mode FULL DUPLEX
  End-of-Line CRLF

File Transfer:
  Receive Drive DRO
  Error Correction CRC
  Translate OFF
  Control-Z Is EOF YES

  Receive Timeout Value 8.0
  Send Timeout Value 80.0
  Retry Counter 10

- Configuration File
  Save Configuration File Saves the current configuration parameters in the specified source file. These source files can then be edited and values modified.

  Restore Configuration File Restores the configuration parameters from the specified source file. The current configuration is replaced.

- NOTE
  The specified file must be in ITL source code format.
Terminal Emulator:

→ Communication Mode

FULL DUPLEX (default) Keyboard input is not locally echoed to the terminal screen. The host must be set up to echo the keyboard input back to the terminal.

HALF DUPLEX Locally echoes keyboard input to the Terminal Emulator screen.

💡 NOTE
In half duplex mode, local keyboard input is displayed in green, and remote input in white.

→ End-of-Line

CR Transmits a carriage return character to the host computer when the RETURN key is pressed.

CRLF (default) Transmits both a carriage return and a linefeed character to the host computer when the RETURN key is pressed.

File Transfer:

→ Receive Drive
Specifies on which device to store files received over the remote port (default is DR0).

→ Error Correction
Selects whether the XMODEM error correction scheme is CHECKSUM or CRC when transmitting/receiving a file over the remote port.

→ Translate
Selects whether files are translated as they are transferred (default is OFF – no translation).

When transmitting files from the tester, end-of-line markers are added and IDACOM character attributes are removed.

When receiving files on the tester, end-of-line markers are replaced with blank character padding and character attribute bytes are added.
NOTE
Translate should only be used when transferring ASCII files between a tester and another tester/computer.

NOTE
When transmitting files from one tester to another, Translate should be set to OFF on both machines as no format conversion is required.

-Control-Z Is EOF
Selects whether control-Z is the end-of-file marker (default) for files received by the tester. If set to YES, any characters after control-Z will be discarded.

-Receive Timeout Value
Specifies the time, in tenths of seconds, the tester waits for another computer to transmit a data packet during a receive file transfer (default is 8 seconds).

-Send Timeout Value
Specifies the time, in tenths of seconds, the tester waits for another computer to acknowledge after transmitting a data packet (default is 80 seconds).

-Retry Counter
Specifies the number of times to retransmit a data packet after receiving no acknowledgement. The interval between retransmissions during a receive file transfer is specified under Receive Timeout Value.

NOTE
Receive Timeout Value, Send Timeout Value, and Retry Counter should be set accordingly to accommodate modems with a slow or erroneous transmission system.
Configuring the Host System

The following termcap file entry is required to use the IDACOM FILEX terminal emulator with a UNIX* system. This termcap entry must be invoked and the number of rows set to 15 (refer to UNIX* man pages tset and termcap).

```
I0|ida-pt|idacom pt vt100 terminal emulator: \ 
   :do=\033J:co\#80:li\#15:cl=\E[;H\E[2J:sf=\ED:\ 
   :le=\033H:bs:am:cm=\E[%i%d;%dh:nd=\E[C:up=\E[A: \ 
   :ce=\E[K:cd=\E[J:so=\E[7m:se=\E[m:ue=\E[m:\ 
   :md=\E[1m:mr=\E[7m:me=\E[m:is=\E[1;15r\E[15;1H:\ 
   :ks=\E[?1h:E=:ke=\E[?1l:\ 
   :ku=EOA:kd=EOB:kr=EOC:kl=EOD:kb=\033H:\ 
   :ho=\E[H:pt:sr=\EM:\ 
   :sc=\E7:rc=\E8:cs=\E[%i%d;%d:
```

Starting the Terminal Emulator

Before starting the terminal emulator:
- physically connect a host computer/tester to the remote port of the tester;
- configure the terminal emulation and file transfer parameters; and
- configure the remote port.

* UNIX is a Trademark of Bell Laboratories
All keyboard entries except the ESC and HOME keys, are processed and displayed on the Terminal Emulator screen. Enter 'v' followed by the ESC key to transmit an ESC character.

If the HOME key or the Exit function key is pressed, the Home menu will be displayed and terminal emulation will continue in the background. Entries received from the remote port will still be treated as terminal input; local keyboard entries will not.
Stopping the Terminal Emulator

The terminal emulator must be disconnected to release control of the remote port and keyboard (i.e. keyboard and remote port entries are not treated as terminal input).

Sending a BREAK Signal

NOTE
The effect of a BREAK signal varies depending on the connected computer.
Sending Files

Disk files can be transmitted from the tester through the remote port to a remote computer.

The remote computer must use the XMODEM protocol to receive files. The source file is unaffected by the file transfer.

Example:
Transmit the file WD1:TEST1.

- Specify the device and filename (WD1:TEST1) and press \( \leftarrow \) (RETURN).

\[
\text{Enter filename to send: WD1:TEST1}
\]

\[\text{NOTE}\]
Wildcard characters are permitted within the filename to transfer multiple files.
Receiving Files

Files received from a remote computer through the remote port can be stored on the tester.

Example:
Store a received file in the file 'TEST1'.

- Specify the destination filename (TEST1) and press \(\leftarrow\) (RETURN).

If the specified file already exists on the destination drive, the old file will be overwritten.

\(\text{\small \textbf{NOTE}}\)
If the destination filename is not specified, a filename will automatically be assigned by the tester. For files transferred between two testers (with Translate set to OFF), the source filename is used as the destination filename. Other files are assigned the filename 'USER.nn', where 'nn' is a unique and sequential number.
Each application processor tests one data channel using protocol dependent application software.

The following functions are common to most application programs:
- Switching between different test channels
- Displaying different background screens
- Capturing to RAM and recording to disk
- Selecting the data source
- Changing the display format
- Searching for data within capture RAM or disk
- Calculating response time
- Printing
- Filters and triggers
- Loading and running test scripts

### 18.1 TestPorts

The user can switch to the Home processor or any of up to six test ports (channels) if an application program has been loaded on the respective application processor (e.g., the B2-Channel):

```
[Textports]
```

**NOTE**

The function keys vary depending on the machine configuration.

### 18.2 Background

The following background windows are available to the user:
- Connection Diagram
- Data Window (default)
- User Window
Connection Diagram

The Connection Diagram is a graphic representation of the current data path (highlighted line).

![Connection Diagram](image)

Figure 18-1 Connection Diagram

Data Window

The Data Window (default) displays data from the line (live), from the capture RAM buffer, or a disk file (playback). Trace statements can also be displayed in the Data Window (see Section 18.5).
User Window

The User Window is a 16 line blank screen area dedicated for test script use. Simple messages, detailed statistics, or graphics can be displayed in this window under the control of a user program (see the Programmer’s Reference Manual).

18.3 Capture

Data from the line can be captured to either RAM or disk in real-time. Data in RAM can later be transferred to disk for long term storage.

Configuring the Capture RAM Buffer

<table>
<thead>
<tr>
<th>Data File:</th>
<th>RAM Buffer:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Disk Drive</td>
<td>When Buffer Full</td>
</tr>
<tr>
<td>File Name</td>
<td>When Capturing Starts</td>
</tr>
<tr>
<td>When File Full</td>
<td>WRAP</td>
</tr>
<tr>
<td>File Size (Kbytes)</td>
<td>APPEND</td>
</tr>
</tbody>
</table>

PT500 User Manual
Data File:

→ Disk Drive
Specifies the default disk drive for data recording.

→ File Name
Specifies the default filename for data recording. The maximum length of the filename is 14 characters.

→ When File Full
  WRAP Performs an ‘endless loop’ recording to disk.
  STOP Halts disk recording once the data file is full.

→ File Size (Kbytes)
Specifies the maximum data file size in Kbytes. If there is not enough space on the disk, the maximum continuous free space will be reserved for the file. When the data recording is stopped, any unused space is truncated. In most cases, the file size should be specified as maximum.

⚠️ NOTE
Disk recording is performed in tracks of 5 Kbytes (5120 bytes). Thus, the specified data file size should be a multiple of 5 Kbytes; otherwise it is rounded off to the next greatest multiple of 5.

RAM Buffer:

→ When Buffer Full
  WRAP Performs an ‘endless loop’ recording to capture RAM.
  STOP Halts capture to RAM once the buffer is full.

→ When Capturing Starts
  APPEND Adds newly captured data to the end of previous data.
  OVERWRITE Clears the capture RAM buffer each time RAM recording is activated.
Clearing the Capture RAM Buffer

NOTE
Ensure that this function key is highlighted to capture data in the RAM buffer.

Capturing to RAM

NOTE
Ensure that this function key is highlighted to capture data in the RAM buffer.

Recording Live Data to Disk

NOTE
Ensure that this function key is highlighted to open a file for disk recording.
Enter the filename (eg. DATA1234567890) and press \( \text{RETURN} \). The maximum length of the filename is 14 characters.

```
Enter filename for recording: DATA1234567890
```

Data recording to disk can be suspended without closing the data file.

If pressed again, data recording resumes.

⚠️ **NOTE**
To close the data file, ensure that the Record to Disk function key is not highlighted.

---

**Saving Data from RAM to Disk**

```
Transfer the RAM Buffer to the file: DATA1234567890
```
NOTE
If the disk drive has not been defined on the Recording Menu, enter the disk drive and filename eg. WD3:DATA123456 (maximum length of filename is 10 characters if the drive is specified).

Transfer from RAM to disk will start when the Execute key is pressed.

To transfer all data from the capture RAM buffer to disk:

To transfer only a portion of the data:

- Use the cursor keys to move to the first block to be transferred.

- Use the cursor to move to the last block to be transferred.

- Press the Execute function key to start transferring data.

The following message indicates the transfer is complete:

End of RAM Buffer
To stop the transfer:

Press f1 to stop the Transfer from RAM to disk

![Quit Transferring]

**NOTE**
The transfer operation must be completed or stopped before accessing other topics.

### 18.4 Display

The data source (Live Data, Playback from RAM, and Playback from Disk) to be displayed can be selected via the **Display** topic.

![Display]

**Disk Drive**
Specifies the default disk drive for data playback.

**File Name**
Specifies the default filename for data playback. The maximum length of the filename is 14 characters.
Selective Playback
Selectively plays back data recorded on any test port, regardless of machine type.

Playback Mode
Data can be played back continuously or by using the cursor keys. The START/STOP key toggles between cursor controlled and continuous modes.

Playback Rate
Sets the playback speed to fast, medium, or slow if in continuous mode.

To clear the Data Window:

![Clear button]

This has no effect on the capture buffer or disk files. To change the format of the screen display and to vary the degree of decoding, refer to Section 18.5.

Live Data
The next three display functions are best illustrated by displaying the Connection Diagram (see page 18–3).

The path from the test port (connector) to the display is highlighted, eg. the display shows Live Data (unless a display filter is activated).
The data which is actually captured to RAM (after a possible RAM filter) is displayed.

![Display]

The data which is actually recorded to disk (after a possible disk filter) is displayed.

![Display]

### Playing Back Data from Capture RAM

- Press the ↑ or ↓ cursor keys to scroll line by line.
- Hold down the **CTRL** key and press the ↑ or ↓ cursor keys to scroll page by page.
- Hold down the **CTRL** and **SHIFT** keys and press the ↑ or ↓ cursor keys to go to the beginning or end of the capture buffer, respectively.
- Use the **START/STOP** function key to toggle between cursor controlled and continuous playback modes.

⚠️ **NOTE**

*Data is not captured to the capture RAM buffer during RAM playback.*
WARNING
When capture RAM filters and display filters are both activated, it is possible that no data will be displayed when playing back from capture RAM.

Playing Back Data from Disk

- Enter the filename (eg. DATA1234567890) and press RETURN. The maximum length of the filename is 14 characters.

Data will not be captured in RAM buffer during disk playback

If the data file is located, the data is displayed on the screen.

- Press the ↑ or ↓ cursor keys to scroll line by line.
- Hold down the CTRL key and press the ↑ or ↓ cursor keys to scroll page by page.
- Hold down the CTRL and SHIFT keys and press the ↑ or ↓ cursor keys to go to the beginning or end of the data file, respectively.
- Use the START/STOP function key to toggle between cursor controlled and continuous playback modes.

WARNING
When capture RAM filters and display filters are both activated, it is possible that no data will be displayed when playing back from capture RAM.
18.5 Format

The functions under this topic can be used to change the format of the selected data source and the decoding level of individual protocols (see Section 18.4).

Except for the Universal Monitor, which displays all data in raw (e.g., character or hex) mode, all monitor application programs can decode protocol data units into clear text. Each individual protocol layer can be displayed in different formats including hex, character, or the decoded text mode. In this section, items common to all applications are discussed. For protocol layer-specific display formats, see the appropriate monitor section.

This is an example of the Display Format Menu from X.25.

- **Display Format**
  - **OFF**: Data is not displayed on the screen.
  - **SHORT**: Displays data in a condensed protocol report.
  - **COMPLETE**: Displays data in a comprehensive protocol report. Each protocol layer has its own display generator and may be set to on, off, hex, or character.
CHARACTER
Displays each byte using the specified character set.

HEX
Displays each byte using two hexadecimal digits.

SPLIT
Displays data in a short report with frames sent from the DCE on the left and from the DTE on the right.

NOTE
Only the first 38 characters of a trace statement are displayed when split display format is selected.

WAN Port: X.25 Monitor

<table>
<thead>
<tr>
<th>Source</th>
<th>Frm</th>
<th>Lcn</th>
<th>Packet</th>
<th>Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>DCE 01</td>
<td>RR</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>DCE 01</td>
<td>RR</td>
<td></td>
<td>DATA 128</td>
<td>The quick</td>
</tr>
<tr>
<td>DCE 03</td>
<td>I</td>
<td>1</td>
<td>DATA 128</td>
<td>The quick</td>
</tr>
<tr>
<td>DCE 03</td>
<td>I</td>
<td>2</td>
<td>DATA 128</td>
<td>The quick</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Source</th>
<th>Frm</th>
<th>Lcn</th>
<th>Packet</th>
<th>Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>DTE 01</td>
<td>I</td>
<td>8</td>
<td>CALL ACCEPTED</td>
<td></td>
</tr>
<tr>
<td>DTE 03</td>
<td>RR</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>DTE 01</td>
<td>I</td>
<td>1</td>
<td>RR</td>
<td></td>
</tr>
<tr>
<td>DTE 03</td>
<td>RR</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>DTE 01</td>
<td>I</td>
<td>1</td>
<td>RR</td>
<td></td>
</tr>
</tbody>
</table>

Figure 18–2 Split Screen Display

TRACE
Displays only trace statements (comments) generated by an application or test script.


→ **Timestamp**
Displays the start and end of frame timestamps. Each transmitted/received data block and layer 1 event is automatically timestamped.

**OFF**
Timestamps are not displayed; block sequence numbers are displayed (see the 'Block Numbers' section on page 18-17). Frames received from the DTE and DCE are numbered sequentially and independently.

**MM:SS.ssss**
Displays timestamps in minutes, seconds, and tenths of milliseconds.

**DD HH:MM:SS**
Displays timestamps in days, hours, minutes, and seconds.

⚠ **NOTE**
*Display Format must be set to COMPLETE, HEX, or CHARACTER to display timestamps.*

→ **Character Set**
Selects the character set for data display (ASCII, EBCDIC, HEX, or JIS8).

→ **Data Field**
Selects the display format of the data field for data packets.

→ **Dual Window**
If more than one application has been loaded, the screen can be divided horizontally to display data from two applications. Data from the current application is always displayed in the top window. Depending on the machine configuration and which applications have been loaded, the function keys indicate the application to be displayed in the bottom window.
Figure 18–3 Dual Window Display

→ Trace Display Format
Selects the display format for trace reports.

SHORT Displays the trace statement on one line containing only user-defined text.

COMPLETE Displays the trace statement on two lines. Block sequence numbers or timestamps are displayed on the first line, and user-defined text on the second line.

→ Throughput Graph
The line utilization can be measured and displayed in bits/sec for the measured interval and as a percentage of the line speed. The user can specify two measuring intervals (long and short) and then print the results.

NOTE
For accurate throughput measurement, the bit rate (line speed) must be set on the Monitor/Emulation Configuration Menu to match the actual line speed.
### Analyze Line Throughput

**Short Interval:** 10 sec
**Long Interval:** 800 sec

<table>
<thead>
<tr>
<th>User</th>
<th>Line Throughput</th>
<th>Net Throughput</th>
</tr>
</thead>
<tbody>
<tr>
<td>Long</td>
<td>17920 B/S</td>
<td>8600 B/S</td>
</tr>
<tr>
<td>Short</td>
<td>21120 B/S</td>
<td>25600 B/S</td>
</tr>
</tbody>
</table>

100% represents 64000 bps in this example.

#### NOTE
Displaying the throughput graph turns off the dual window display (i.e., data from the current application is displayed using the full screen).

### Block Numbers

All transmitted/received data blocks are automatically numbered. These sequential numbers are displayed when timestamp reporting is turned off.

<table>
<thead>
<tr>
<th>Block No</th>
<th>Source</th>
<th>Complete Frame and Packet Report</th>
</tr>
</thead>
<tbody>
<tr>
<td>18</td>
<td>P2 DTE</td>
<td>ADDRESS=03 FRAME=RR F=0 NR=1</td>
</tr>
<tr>
<td>19</td>
<td>P2 DTE</td>
<td>ADDRESS=01 FRAME=INFO P=0 NR=1 NS=0</td>
</tr>
<tr>
<td></td>
<td></td>
<td>GF=1 D=0 Q=0 LCN=1 RR PACKET PR=7</td>
</tr>
<tr>
<td>20</td>
<td>P2 DCE</td>
<td>ADDRESS=01 FRAME=RR F=0 NR=1</td>
</tr>
<tr>
<td></td>
<td></td>
<td>GF=1 D=0 Q=0 LCN=1 DATA PACKET PR=0 PS=7 H=0</td>
</tr>
<tr>
<td></td>
<td></td>
<td>IDACOM ELECTRONICS LTD BRINGS TO YOU THE P T !!!!</td>
</tr>
<tr>
<td></td>
<td></td>
<td>THE PROTOCOL TESTER THAT LEADS THE WAY INTO THE!</td>
</tr>
<tr>
<td></td>
<td></td>
<td>FUTURE )</td>
</tr>
<tr>
<td>21</td>
<td>P2 DTE</td>
<td>ADDRESS=03 FRAME=RR F=0 NR=2</td>
</tr>
<tr>
<td>21</td>
<td>P2 DTE</td>
<td>ADDRESS=01 FRAME=INFO P=0 NR=2 NS=1</td>
</tr>
<tr>
<td></td>
<td></td>
<td>GF=1 D=0 Q=0 LCN=1 RR PACKET PR=0</td>
</tr>
</tbody>
</table>

#### NOTE
Block sequence numbers for trace and data are numbered independently.
18.6 Search

The contents of either capture RAM or a disk file can be searched for a block number, a timestamp, or a specified string. Before searching, choose the search direction (forward or backward).

Block Number

Example:
Search forward in trace statements or transmitted/received data for block number 24.

Enter the block number and press \( \leftarrow \) (RETURN).

Enter block number: 24
**Timestamp**

Example:
Search in trace statements or transmitted/received data for the timestamp 32:24:0015.

Enter the timestamp and press ENTER (RETURN).

```
Enter timestamp [MM:SS:ssss]: 32:24:0015
```

⚠️ **NOTE**
The prompt displayed is dependent on the timestamp format selected on the Display Format Menu (MM:SS:ssss or DD HH:MM:SS).

⚠️ **NOTE**
A timestamp search finds the first frame with a value equal to or greater than the specified value when searching forward. When searching backward, a timestamp search finds the first frame with a timestamp equal to or less than the specified value.
String

Transmitted/received data can be searched for an ASCII, HEX, or EBCDIC string.

Example:
Search backward in transmitted/received data for the ASCII string 'IDACOM'.

⚠️ Enter the string in ASCII and press ← (RETURN).

⚠️ The specified hex string is left justified (i.e. the hex string 123 searches for hex 1230)

⚠️ The actual string might not be displayed if in short format (see Section 18.5 to change the display format).
18.7 ResponseTime

To calculate the time between two frames:

- Use the cursor keys to move through the capture RAM buffer or data file to identify the first block.

- Move the cursor to another data block.

To see the time (hours, minutes, seconds, and microseconds) between the first and second block:

Response time (Hour, Min, Sec, Microsec) 0 0 0 734050
18.8 Print

The contents of capture RAM, data files, test scripts, or the screen display, can be printed.

\[\text{NOTE}\]
Before printing, connect a serial or parallel printer to the back of the tester and configure the printer on the Printer Port Setup Menu on the Home processor (see Section 17.4).

\[\text{WARNING}\]
Do not move to another topic while printing.

Printing the Capture RAM Buffer

<table>
<thead>
<tr>
<th>Print</th>
</tr>
</thead>
<tbody>
<tr>
<td>[F1] RAM Buffer</td>
</tr>
</tbody>
</table>

Printing will start when the Execute key is pressed

| Print RAM Buffer from Start to End |

To print all data:

| [F1] ALL |
To print only a portion of the data:

- Use the cursor keys to move to the first block to be printed.

- Press the `Execute` function key to start printing.

To stop printing:

- Press f1 to quit the printing of data file

**NOTE**

 Printing must be completed or stopped to access other topics.
Printing a Data File

Enter the filename (eg. WD2:DATA1) and press ← (RETURN).

Enter file name to be printed: WD2:DATA1

NOTE
See the 'Printing the Capture RAM Buffer' section on page 18–22 to print all or a portion of the data file or to stop printing.

Printing a Test Script/Source File

Enter the filename (eg. WD2:TEST1) and press ← (RETURN).

Enter file name to be printed: WD2:TEST1
Printing a Screen Image

To print an exact image of the screen, including the status line and function key labels:

![Print Screen]

**NOTE**

An image of the screen can also be printed by pressing the SHIFT and CTRL keys simultaneously and then pressing the f1 function key.

Manually Printing a Data File/Capture RAM

The contents of capture RAM or a data file can be printed line-by-line starting at the current cursor position. Each line is printed as it is displayed.

Example:
Print line 4 through line 7 of a data file.

- Position the cursor before line 4.

- Position the cursor after line 7.
When Print On is selected, either the Data File or RAM Buffer function key is highlighted to indicate the printing source.

18.9 Filters

Three independently defined filters can be inserted (activated) into the data paths to the display, capture RAM buffer, and/or disk recording file. In this section, items common to all applications are discussed. For protocol specific filters, see the appropriate monitor section.
This is an example of the Filter Setup Menu from X.25.

→ Filter Type
   DISPLAY (default) Specifies filters for the display.
   RAM Specifies filters for capture to RAM.
   DISK Specifies filters for disk recording.

→ Filter Status
   Selects whether the filter mechanism is activated or deactivated (default).

→ Lead Changes
   Lead changes can be passed or blocked (default) when filters are active.

⚠️ NOTE
   Lead changes are not applicable when the application is running on a Basic or Primary Rate interface.

→ Trace Statements
   Trace statements can be passed (default) or blocked when filters are active.
To check which filter has been activated:

**Connection Diagram**

- **RAM Filter**
  - Active
  - Capture RAM
  - Data File
  - Display
18.10 Triggers

Triggers provide the capability to react to specific events. A trigger consists of condition(s) and action(s). When any one of the defined conditions occurs, the defined actions are executed. This section describes features common to most applications. For protocol specific trigger conditions, see the appropriate monitor section.

Trigger Conditions

![Trigger Conditions Menu]

This is an example of the Trigger Conditions Menu from X.25.

- Event Trigger
There are four triggers which act independently. Thus, trigger conditions must be defined separately for each trigger that is used. TRIGGER #1 is the default.
→ Trigger Status

**UNARMED** (default) Trigger mechanism is not activated. Defined actions are not performed if trigger condition is met.

**ARMED** Trigger mechanism is activated. Defined actions are performed if trigger condition is met.

→ Trigger Direction

The source of the data can be specified as a trigger condition.

**FROM DTE** Triggers on events received or transmitted from the DTE only.

**FROM DCE** Triggers on events received or transmitted from the DCE only.

**FROM BOTH** (default) Triggers on events received or transmitted from both the DTE and DCE.

**PLAYBACK** Triggers on events while playing back from the RAM buffer or a data file.

→ Disk Full

**ON** Triggers when disk recording is full.

**OFF** (default) Full disk recording is not a trigger condition.

⚠️ **WARNING**

*If the data file has been opened in WRAP mode, the Disk Full trigger condition is never met.*

→ RAM Full

**ON** Triggers when capture RAM is full.

**OFF** (default) Full capture RAM is not a trigger condition.

⚠️ **WARNING**

*If capture RAM is in WRAP mode, the RAM Full trigger condition is never met.*
→ **Alarm Clock**

**ON**
Alarm clock timer indication occurs within defined minute.

**OFF** (default)
Alarm clock timer is not used as a trigger condition.

→ **Time**
Sets alarm clock trigger condition to year, month, day, hour, and minute. The trigger occurs at some time within the minute specified (i.e. not exactly at zero seconds).

→ **String Match**

**ON**
Trigger condition is an anchored match from the first character in a received frame.

**OFF** (default)
String match is not a trigger condition.

→ **String**

**Modify String**
Changes currently defined string.

**ASCII** (default)
String for match defined in ASCII character set. Default string is 'TEXT'.

**EBCDIC**
String for match defined in EBCDIC character set.

**HEX**
String for match defined in hex character set.

⚠️ **NOTE**
A "don't care" position can be specified by inserting the '?' or the hex value 3F.

→ **Mask**

**Modify Mask**
Changes currently defined mask.

**ASCII**
Defines mask in ASCII character set.

**EBCDIC**
Defines mask in EBCDIC character set.

**HEX**
Defines mask in hex character set.
NOTE
If a bit in the mask is set to one, the corresponding bit position in the string is compared. If a bit is set to zero, the corresponding bit position is not compared. When no bit mask is defined (default), an exact comparison of all bits is performed.

Layer Specific Trigger Events

→ Lead Transition
Displays the Lead Transitions Menu for the currently selected WAN interface.

![Select Lead Transitions]

### WAN Lead Transition Triggers

<table>
<thead>
<tr>
<th>ON to OFF Transitions:</th>
<th>OFF to ON Transition:</th>
</tr>
</thead>
<tbody>
<tr>
<td>RTS ON DTR OFF</td>
<td>RTS OFF DTR OFF</td>
</tr>
<tr>
<td>DSR OFF SRTS OFF</td>
<td>DSR OFF SRTS OFF</td>
</tr>
<tr>
<td>LL OFF SS OFF</td>
<td>LL OFF SS OFF</td>
</tr>
<tr>
<td>CTS OFF SQ OFF</td>
<td>CTS OFF SQ OFF</td>
</tr>
<tr>
<td>DSR OFF RI OFF</td>
<td>DSR OFF RI OFF</td>
</tr>
<tr>
<td>CD OFF TM OFF</td>
<td>CD OFF TM OFF</td>
</tr>
</tbody>
</table>

Duration Sensitive:

- Lead Transition OFF
- Lead ---
- Transition ---
- Duration (msec) ---

NOTE
Lead Transition cannot be selected when the application is running on a B or D-Channel.
ON to OFF Transitions:
→ RTS
Specifies whether the trigger condition is a transition from on to off for individual or all leads.

⚠️ NOTE
This applies to all control leads shown on the menu. Off to on transitions behave in a similar manner.

Duration Sensitive:
→ Lead Transition
Specifies the trigger condition as a duration sensitive transition for an individual lead.

→ Lead
Selects an individual lead for duration sensitive transition.

→ Transition
Specifies the lead transition as on to off or off to on.

→ Duration
Sets time or duration for which lead transition must remain stable.
Trigger Actions

This is an example of the Trigger Action Menu from X.25.

→ Event Triggers
Trigger actions must be defined separately for each trigger. These triggers correspond to those on the Trigger Conditions Menu. TRIGGER #1 is the default.

→ Trigger Status
UNARMED (default)  Deactivates the trigger mechanism. Defined actions are not taken if trigger condition is met.

ARMED  Activates the trigger mechanism. Defined actions are taken if trigger condition is met.

→ Beep
NO EFFECT (default)  Produces no beep when a trigger condition is met.

ON  Produces an audible beep when a trigger condition is met.
When a trigger condition is met, the next received frame can be displayed in blue or red.

**Highlight**

<table>
<thead>
<tr>
<th>Option</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Display</strong></td>
<td>Screen display is not affected when trigger condition is met.</td>
</tr>
<tr>
<td><strong>NO EFFECT</strong></td>
<td>Screen display is not affected when trigger condition is met.</td>
</tr>
<tr>
<td><strong>TURN ON</strong></td>
<td>Turns on screen display when a trigger condition is met.</td>
</tr>
<tr>
<td><strong>TURN OFF</strong></td>
<td>Turns off screen display when a trigger condition is met.</td>
</tr>
</tbody>
</table>

**RAM Recording**

<table>
<thead>
<tr>
<th>Option</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>NO EFFECT</strong></td>
<td>Capture to RAM is not affected when a trigger condition is met.</td>
</tr>
<tr>
<td><strong>TURN ON</strong></td>
<td>Turns on capture to RAM when a trigger condition is met.</td>
</tr>
<tr>
<td><strong>TURN OFF</strong></td>
<td>Turns off capture to RAM when a trigger condition is met.</td>
</tr>
</tbody>
</table>

**Disk Recording**

<table>
<thead>
<tr>
<th>Option</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>NO EFFECT</strong></td>
<td>Disk recording is not affected when a trigger condition is met.</td>
</tr>
<tr>
<td><strong>TURN ON</strong></td>
<td>Turns on disk recording when a trigger condition is met.</td>
</tr>
<tr>
<td><strong>TURN OFF</strong></td>
<td>Turns off disk recording when a trigger condition is met.</td>
</tr>
</tbody>
</table>

**Data Display Message**

Specifies a message to display in the Data Window when a trigger condition is met.

**User Window Message**

Specifies a message to display in the User Window when a trigger condition is met.
18.11 TestScript

A test script is a program written in ITL (Interactive Test Language) provided by IDACOM or written by the user. Test scripts control the interaction between the protocol data on the line and the protocol monitor or simulation program. To develop a test script, refer to the Programmer’s Reference Manual and the protocol specific Programmer’s Manual.

\[\text{NOTE}\]

To create or modify a test script, see the 'Editing a File' section on page 17-9 or refer to the Programmer’s Manual.

Loading a Test Script

The test script must be loaded from the floppy or hard disk and run on an application processor.

- Enter the test script filename (eg. DR0:TEST_SEQ.F) and press Enter (RETURN) to load the test script.

```
Enter test script filename: DR0:TEST_SEQ.F
```
Running a Test Script

To display a message in the Script Window:

If the test script expects string input for the ?KEYBOARD command (see the Programmer's Reference Manual):

⚠️ **NOTE**
*Ensure that this function key is highlighted to run a test script.*

Displaying Test Script Messages

Depending on the test script, messages can be displayed in the Test Script Window, the Output Window, the User Window, or the Data Window (see Section 18.2). Messages destined for the Data Window are displayed, captured, or recorded within the data stream.

To display a message in the Script Window:

If the test script expects string input for the ?KEYBOARD command (see the Programmer's Reference Manual):

⚠️ **NOTE**
*Ensure that the Script Window and Script Keys function keys are highlighted.*
### Stopping a Test Script

Ensure that this function key is not highlighted to stop a test script.

#### 18.12 TestKeys

Eight unassigned function keys can control the operation of a test script. The function keys are labelled UF1 through UF8 (default) when no test script is running. The test script can be programmed to dynamically change the label on these keys and assign specific actions/functions to them (see the Programmer’s Reference Manual for more information).
19

PROBLEMS?
THE SCREEN DISPLAY IS GARbled, OR NO DATA IS DISPLAYED

Layer 1
- Check the cables and connections.

BRA
- Are the TE to NT / NT to TE green LED's lit indicating the S/T bus is active.
- Are the PS1 and PS2 green LED's lit indicating the attached equipment has a power source?
  Check attached equipment for power source?
  For network emulation, select the required power source on the BRA Configuration Menu (refer to Section 3.5).

PRA
- Check Red Alarm LED's.
- Are the Sync and Signal green LED's lit?

Refer to Sections 3.5, 3.6, and 3.7 to:
- Check the System Setup Menu.
  Has the correct operating mode (Monitor, Emulation, or Drop & Insert) been selected?
  Has the correct framing format (T1 D4, T1 ESF, CEPT CRC4, or CEPT PCM30) been selected?
  Has the correct encoding scheme (AMI, B8ZS, or HDB3) been selected?
  Has the correct clock source (LOOP, LOCAL) been selected?
- Check the Channel Setup Menu for correct:
  - PRA Port
  - Timeslot
  - Channel Type
  - Inverted HDLC
- For an emulation, check the Layer 1 Error Generation Menu to determine if layer 1 errors are being simulated.

WAN
- Are the green TD/RD LED's lit?
- Has the correct interface type (V.28, V.35, V.36, or V.11) been selected?
- Are the correct green clock LED's highlighted for application configuration (refer to Figure A-7)?
- Is data NRZ or NRZI encoded (refer to Figure A-6)?
- For USM, is the application online (refer to Sections 9 and 10)?
**PROBLEMS?**

**Layer 2**
- Is the Data Window selected (refer to Section 18.2)?
- Is the display selected for Live Data (refer to Section 18.4)?
- Is the display format selected (refer to Section 18.5)?
- Are any triggers armed (refer to Section 18.10)?
- Are any filters activated (refer to Section 18.9)?
- Is a test script which disables the display running (refer to Section 18.11)?
- For ISDN, is the correct message set selected?

- **NO RESPONSE TO KEYBOARD ENTRY**
  - Press CTRL, SHIFT, and f8 simultaneously and press \(\leftarrow\) (RETURN).
  - System responds with 'OK-x' (x = number of current processor).
  - Type MENU and press \(\leftarrow\) (RETURN) to initialize the application software.
20.1 Transporting the Unit

The tester is designed for easy portability. The carrying case protects the unit during normal transportation as hand-carried or checked baggage. If travelling abroad, be sure an appropriate power cord is available. IDACOM supplies power cords suitable for international use.

To optimize safety and convenience when travelling, use the following checklist:

- Save any work and remove the floppy disk from the drive. If the unit is equipped with a floppy disk head protector, slide it into the drive.
- Park the hard disk head (see the ‘System Shutdown’ section on page 17-4).
- Turn off the unit and unplug all connections at the back of the unit.
- Fold the legs back into the flat position and latch the keyboard into the front bezel.
- Slide the unit into the carrying case provided, making sure the velcro straps are securely fastened.
- Make sure all cables, connector modules, and manuals are packed into the side pockets provided.

20.2 Maintenance

The tester requires little maintenance, however, the following points are often overlooked:

- The air vents at the back of the unit should be cleaned regularly. Dust can clog the vents and cause the unit to overheat.
- Keep liquids away from the tester.
- Clean the display occasionally, using window cleaner or similar agent sprayed on a soft cloth. Do not spray directly onto the unit.
- The plastic housing of the tester will withstand considerable abuse. To restore its appearance, a damp cloth will remove most dirt.
20.3 Technical Support

Questions regarding software or hardware problems should be directed to your local distributor or the following IDACOM technical support centers:

- **Canada (Edmonton)**
  1-800-661-3868 (toll free)
  (403) 462-4545 (direct)
  (403) 462-4869 (fax)

- **Eastern U.S. (New Jersey)**
  (201) 846-8010 (direct)
  (201) 846-0525 (fax)

- **Western U.S. (California)**
  (714) 261-7663 (direct)
  (714) 261-8679 (fax)

- **Europe (West Germany)**
  49-6151-314043 (direct)
  49-6151-317116 (fax)

International customers should contact the distributor in their area.

**Authorization**

After reporting a problem, technical support personnel will then determine whether to ship replacement modules or have the unit returned to the factory.

On occasion, you might be instructed to return one or more modules for repair or replacement. Refer to Figure 20-1 for module names and locations.
If returning the unit, a Return Material Authorization (RMA) number will be issued. This number must be on the outside of the package, and cited in all documentation, written correspondence, or telephone conversations concerning the repair.

⚠️ WARNING

IDACom will refuse any return shipment not bearing an RMA number. Please ensure the RMA number is clearly marked on all packages and documents.

If warranty or maintenance contracts have expired for the unit, either:
- authorize the amount of repair; or
- request an estimate for the amount of repair.

Unauthorized Repair

The installation, modification, or repair of any part of the unit is specifically forbidden without the express consent of IDACOM. Such unauthorized maintenance can void the warranty and/or the maintenance contract.
Figure 20-1 Top View – PT500 PRA/BRA/WAN Tester
<table>
<thead>
<tr>
<th>Model</th>
<th>Slot #</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1</td>
</tr>
<tr>
<td>WAN</td>
<td>Main CPU Module</td>
</tr>
<tr>
<td>WAN/WAN</td>
<td>Main CPU2 Module</td>
</tr>
<tr>
<td>PRA</td>
<td>Main CPU Module</td>
</tr>
<tr>
<td>BRA/WAN</td>
<td>Main CPU Module</td>
</tr>
<tr>
<td>BRA</td>
<td></td>
</tr>
<tr>
<td>D-Channel</td>
<td></td>
</tr>
</tbody>
</table>

**Table 20-1  Physical Configuration**
In general:

For example:

HDLC Frame Format
Control/response formats:

<table>
<thead>
<tr>
<th>SYN</th>
<th>SYN</th>
<th>Control Characters</th>
</tr>
</thead>
<tbody>
<tr>
<td>SYN</td>
<td>SYN</td>
<td>Leading Character</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Control Characters</td>
</tr>
</tbody>
</table>

Text/header formats:

<table>
<thead>
<tr>
<th>SYN</th>
<th>SYN</th>
<th>SOH</th>
<th>Header</th>
<th>ETB</th>
<th>BCC</th>
</tr>
</thead>
<tbody>
<tr>
<td>SYN</td>
<td>SYN</td>
<td>SOH</td>
<td>Header</td>
<td>STX</td>
<td>Text</td>
</tr>
<tr>
<td>SYN</td>
<td>SYN</td>
<td>STX</td>
<td>Text</td>
<td>ETB</td>
<td>EXT</td>
</tr>
<tr>
<td>SYN</td>
<td>SYN</td>
<td>DLE</td>
<td>STX</td>
<td>Transparent Text</td>
<td>DLE</td>
</tr>
</tbody>
</table>

Figure A-2 BISYNC Frame Formats

<table>
<thead>
<tr>
<th>Mnemonic</th>
<th>Name</th>
<th>ASCII HEX</th>
<th>EBCDIC HEX</th>
</tr>
</thead>
<tbody>
<tr>
<td>SYN</td>
<td>Synchronous Idle</td>
<td>16</td>
<td>32</td>
</tr>
<tr>
<td>SOH</td>
<td>Start of Heading</td>
<td>01</td>
<td>01</td>
</tr>
<tr>
<td>STX</td>
<td>Start of Text</td>
<td>02</td>
<td>02</td>
</tr>
<tr>
<td>ETX</td>
<td>End of Text</td>
<td>03</td>
<td>03</td>
</tr>
<tr>
<td>ETB</td>
<td>End of Transmission Block</td>
<td>17</td>
<td>26</td>
</tr>
<tr>
<td>DLE</td>
<td>Data Link Escape</td>
<td>10</td>
<td>10</td>
</tr>
<tr>
<td>BCC</td>
<td>Block Check Character</td>
<td></td>
<td></td>
</tr>
<tr>
<td>EOT</td>
<td>End of Transmission</td>
<td>04</td>
<td>37</td>
</tr>
<tr>
<td>ENQ</td>
<td>Enquiry</td>
<td>05</td>
<td>2D</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Mnemonic</th>
<th>Name</th>
<th>ASCII HEX</th>
<th>EBCDIC HEX</th>
</tr>
</thead>
<tbody>
<tr>
<td>NAK</td>
<td>Negative Acknowledgement</td>
<td>15</td>
<td>3D</td>
</tr>
<tr>
<td>ITB</td>
<td>End of Intermediate Block Transmission</td>
<td>1F</td>
<td>1F</td>
</tr>
<tr>
<td>ACK 0</td>
<td>Acknowledgement 0</td>
<td>1000</td>
<td>1070</td>
</tr>
<tr>
<td>ACK 1</td>
<td>Acknowledgement 1</td>
<td>1001</td>
<td>1061</td>
</tr>
<tr>
<td>WACK</td>
<td>Wait for positive acknowledgement</td>
<td>103B</td>
<td>106B</td>
</tr>
<tr>
<td>RVI</td>
<td>Reverse Interrupt</td>
<td>103C</td>
<td>107C</td>
</tr>
<tr>
<td>TTD</td>
<td>Temporary Text Delay</td>
<td>0205</td>
<td>022D</td>
</tr>
</tbody>
</table>

Figure A-3 Control Character Descriptions
In general:

```
SYN  SYN          ...          SYN
```

One or more
SYN characters

Control characters

Data characters

Control characters

For example:

```
8    8          8   14   11   8   8   8   16  8-131,064  16
SYN  SYN  SOH or ENQ or DLE  Count or control code  Response #  Sequence #  Address  Header checksum CRC-16  Data  Data checksum CRC-16
```

DDCMP Frame Format
The Universal Simulation/Monitor and SDLC/SNA Emulation/Monitor applications support two different digital signal encoding formats:

**NRZ (Non-Return to Zero)**
- A 1 bit maps to a mark signal.
- A 0 bit maps to a space signal.

**NRZI (Non-Return to Zero Inverted)**
- A 1 bit maps to no transition.
- A 0 bit maps to a transition.

**Figure A-6 NRZ and NRZI Data Encoding**
The tester supports four different clocking modes:

<table>
<thead>
<tr>
<th>CLOCKING MODE</th>
<th>ENCODING SCHEME</th>
<th>CLOCK SOURCE</th>
</tr>
</thead>
<tbody>
<tr>
<td>NRZ With Clock</td>
<td>NRZ</td>
<td>DTE 15 17 DCE</td>
</tr>
<tr>
<td>External Tx Clock</td>
<td>NRZ</td>
<td>DTE 15 17 DCE</td>
</tr>
<tr>
<td>NRZI With Clock</td>
<td>NRZI</td>
<td>DTE 15 17 DCE</td>
</tr>
<tr>
<td>NRZI</td>
<td>NRZI</td>
<td>Clock speed is extracted from the data signal</td>
</tr>
</tbody>
</table>

15 – Transmit clock from DCE (DCE provided)
17 – Receive clock from DCE (DCE provided)
24 – Transmit clock to DCE (DTE provided)

Figure A–7 Clocking Modes
NOTE - Dots demarcate those parts of the frame that are independently DC-balanced.
B.1 Implemented ISDN Standards

Layer 2 is implemented in accordance with the following standards:

- **TEI ASSIGNMENT PROCEDURE:**

- **XID PROCEDURE:**

- **LINK ESTABLISH: LINK RELEASE: & DATA TRANSFER PHASES:**

- **DL-ESTABLISH-CONFIRM and DL-RELEASE-CONFIRM primitives:**
## Table B-1 Layer 2 State Numbers

<table>
<thead>
<tr>
<th>IDACOM</th>
<th>CCITT</th>
<th>State Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>1</td>
<td>TEI Unassigned</td>
</tr>
<tr>
<td>2</td>
<td>2</td>
<td>TEI Being Assigned</td>
</tr>
<tr>
<td>3</td>
<td>3</td>
<td>Awaiting TEI &amp; Establishment</td>
</tr>
<tr>
<td>4</td>
<td>4</td>
<td>TEI Assigned</td>
</tr>
<tr>
<td>5</td>
<td>5</td>
<td>Awaiting Establishment</td>
</tr>
<tr>
<td>6</td>
<td>6</td>
<td>Awaiting Release</td>
</tr>
<tr>
<td>70</td>
<td>7.0</td>
<td>Normal</td>
</tr>
<tr>
<td>71</td>
<td>7.1</td>
<td>Reject</td>
</tr>
<tr>
<td>72</td>
<td>7.2</td>
<td>Own Receiver Busy</td>
</tr>
<tr>
<td>73</td>
<td>7.3</td>
<td>Own Receiver Busy &amp; Reject</td>
</tr>
<tr>
<td>74</td>
<td>7.4</td>
<td>Peer Receiver Busy</td>
</tr>
<tr>
<td>75</td>
<td>7.5</td>
<td>Peer Receiver Busy &amp; Reject</td>
</tr>
<tr>
<td>76</td>
<td>7.6</td>
<td>Peer Receiver &amp; Own Receiver Busy</td>
</tr>
<tr>
<td>77</td>
<td>7.7</td>
<td>Peer Receiver &amp; Own Receiver Busy &amp; Reject</td>
</tr>
<tr>
<td>80</td>
<td>8.0</td>
<td>Normal</td>
</tr>
<tr>
<td>81</td>
<td>8.1</td>
<td>Reject</td>
</tr>
<tr>
<td>82</td>
<td>8.2</td>
<td>Own Receiver Busy</td>
</tr>
<tr>
<td>83</td>
<td>8.3</td>
<td>Own Receiver Busy &amp; Reject</td>
</tr>
<tr>
<td>84</td>
<td>8.4</td>
<td>Peer Receiver Busy</td>
</tr>
<tr>
<td>85</td>
<td>8.5</td>
<td>Peer Receiver Busy &amp; Reject</td>
</tr>
<tr>
<td>86</td>
<td>8.6</td>
<td>Peer Receiver &amp; Own Receiver Busy</td>
</tr>
<tr>
<td>87</td>
<td>8.7</td>
<td>Peer Receiver &amp; Own Receiver Busy &amp; Reject</td>
</tr>
<tr>
<td>1</td>
<td>1</td>
<td>Idle</td>
</tr>
<tr>
<td>2</td>
<td>2</td>
<td>TEI Being Assigned</td>
</tr>
<tr>
<td>3</td>
<td>3</td>
<td>TEI Checking</td>
</tr>
<tr>
<td>1</td>
<td>1</td>
<td>TEI Unassigned</td>
</tr>
<tr>
<td>2</td>
<td>2</td>
<td>TEI Being Assigned</td>
</tr>
<tr>
<td>3</td>
<td>3</td>
<td>XID Response Waiting</td>
</tr>
<tr>
<td>4</td>
<td>4</td>
<td>TEI Assigned</td>
</tr>
</tbody>
</table>
CONNECTOR PINOUTS

C

CONNECTOR PINOUTS

IDACOM

PT500 User Manual
C.1 WAN Test Connectors

The WAN connectors can be configured as a DTE, DCE, or high impedance monitor using the application software. Only one of the WAN connectors is active at a time. All other connectors are switched off in a high impedance mode. Networks connected to an inactive connector are completely isolated from the tester.

RS-232C/V.28

![Diagram of RS-232C/V.28 Female Connector]

Figure C-1 RS-232C/V.28 Female Connector
<table>
<thead>
<tr>
<th>CCITT Circuit</th>
<th>Pin #</th>
<th>Mnemonic</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1</td>
<td>PG</td>
<td>Protective Ground</td>
</tr>
<tr>
<td>103</td>
<td>2</td>
<td>SD</td>
<td>Send Data</td>
</tr>
<tr>
<td>104</td>
<td>3</td>
<td>RD</td>
<td>Receive Data</td>
</tr>
<tr>
<td>105</td>
<td>4</td>
<td>RTS</td>
<td>Request to Send</td>
</tr>
<tr>
<td>106</td>
<td>5</td>
<td>CTS</td>
<td>Clear to Send</td>
</tr>
<tr>
<td>107</td>
<td>6</td>
<td>DSR</td>
<td>Data Set Ready</td>
</tr>
<tr>
<td>109</td>
<td>7</td>
<td>SG</td>
<td>Signal Ground</td>
</tr>
<tr>
<td>116</td>
<td>8</td>
<td>CD</td>
<td>Carrier Detect</td>
</tr>
<tr>
<td></td>
<td>11</td>
<td>SS</td>
<td>Select Standby</td>
</tr>
<tr>
<td></td>
<td>12</td>
<td>SCD</td>
<td>Secondary Carrier Detect *</td>
</tr>
<tr>
<td></td>
<td>13</td>
<td>SCTS</td>
<td>Secondary Clear to Send *</td>
</tr>
<tr>
<td></td>
<td>14</td>
<td>SSD</td>
<td>Secondary Send Data *</td>
</tr>
<tr>
<td></td>
<td>15</td>
<td>SCT</td>
<td>Transmit Clock from DCE</td>
</tr>
<tr>
<td></td>
<td>16</td>
<td>SRD</td>
<td>Secondary Receive Data *</td>
</tr>
<tr>
<td></td>
<td>17</td>
<td>SCR</td>
<td>Receive Clock from DCE</td>
</tr>
<tr>
<td>115</td>
<td>18</td>
<td>LL</td>
<td>Local Loopback</td>
</tr>
<tr>
<td>120</td>
<td>19</td>
<td>SRTS</td>
<td>Secondary Request to Send</td>
</tr>
<tr>
<td></td>
<td>20</td>
<td>DTR</td>
<td>Data Terminal Ready</td>
</tr>
<tr>
<td></td>
<td>21</td>
<td>SQD</td>
<td>Signal Quality</td>
</tr>
<tr>
<td>125</td>
<td>22</td>
<td>RI</td>
<td>Ring Indicate</td>
</tr>
<tr>
<td>111</td>
<td>23</td>
<td>DRS</td>
<td>Data Signal Rate Select</td>
</tr>
<tr>
<td>113</td>
<td>24</td>
<td>SCTE</td>
<td>Transmit Clock to DCE</td>
</tr>
<tr>
<td></td>
<td>25</td>
<td>TM</td>
<td>Test Indicator</td>
</tr>
</tbody>
</table>

* Not supported by IDACOM

Pins 9 and 10 are unassigned.

Table C–1  RS–232C/V.28 Pin Designations
V.35

This connector can be optionally replaced with a V.36/RS-449 connector.

Figure C-2  V.35 Female Connector
<table>
<thead>
<tr>
<th>CCITT Circuit</th>
<th>Pin #</th>
<th>Mnemonic</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>PG</td>
<td>Protective Ground</td>
<td></td>
</tr>
<tr>
<td>B</td>
<td>SG</td>
<td>Signal Ground</td>
<td></td>
</tr>
<tr>
<td>105</td>
<td>C</td>
<td>RTS</td>
<td>Request to Send</td>
</tr>
<tr>
<td>106</td>
<td>D</td>
<td>CTS</td>
<td>Clear to Send</td>
</tr>
<tr>
<td>107</td>
<td>E</td>
<td>DSR</td>
<td>Data Set Ready</td>
</tr>
<tr>
<td>109</td>
<td>F</td>
<td>CD</td>
<td>Carrier Detect</td>
</tr>
<tr>
<td>108</td>
<td>H</td>
<td>DTR</td>
<td>Data Terminal Ready</td>
</tr>
<tr>
<td>125</td>
<td>J</td>
<td>RI</td>
<td>Ring Indicate</td>
</tr>
<tr>
<td>104</td>
<td>R</td>
<td>RD</td>
<td>Received Data A–Wire</td>
</tr>
<tr>
<td>104</td>
<td>T</td>
<td>RD</td>
<td>Received Data B–Wire</td>
</tr>
<tr>
<td>115</td>
<td>V</td>
<td>SCR</td>
<td>Receiver Signal Element Timing A–Wire</td>
</tr>
<tr>
<td>115</td>
<td>X</td>
<td>SCR</td>
<td>Receiver Signal Element Timing B–Wire</td>
</tr>
<tr>
<td>114</td>
<td>Y</td>
<td>SCT</td>
<td>Transmitter Signal Element Timing A–Wire (From DCE)</td>
</tr>
<tr>
<td>114</td>
<td>AA</td>
<td>SCT</td>
<td>Transmitter Signal Element Timing B–Wire (From DCE)</td>
</tr>
<tr>
<td>103</td>
<td>P</td>
<td>SD</td>
<td>Transmitted Data A–Wire</td>
</tr>
<tr>
<td>103</td>
<td>S</td>
<td>SD</td>
<td>Transmitted Data B–Wire</td>
</tr>
<tr>
<td>113</td>
<td>U</td>
<td>SCTE</td>
<td>Transmitter Signal Element Timing A–Wire (To DCE)</td>
</tr>
<tr>
<td>113</td>
<td>W</td>
<td>SCTE</td>
<td>Transmitter Signal Element Timing B–Wire (To DCE)</td>
</tr>
</tbody>
</table>

Pins K, L, M, N, Z, BB, CC, DD, EE, FF, HH, JJ, KK, LL, MM, and NN are unassigned.

Table C–2 V.35 Pin Designations
V.36/RS-449

This connector can be optionally replaced with a V.35 connector.

![V.36/RS-449 Female Connector Diagram]

**NOTE**

A, B, and C in the following pinouts indicate the associated interchange points as designated in CCITT recommendations V.10 and V.11. The B designation applies only when a V.11 generator is used and the C designation applies only when a V.10 generator is used.
<table>
<thead>
<tr>
<th>CCITT Circuit</th>
<th>Pin #</th>
<th>Mnemonic</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>PG / SG</td>
<td>Protective or Signal Ground</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>SI</td>
<td>Data Signal Rate Select *</td>
<td></td>
</tr>
<tr>
<td>103</td>
<td>SD</td>
<td>Transmitted Data (A)</td>
<td></td>
</tr>
<tr>
<td>114</td>
<td>ST</td>
<td>Transmitted Signal Element Timing From DCE (A)</td>
<td></td>
</tr>
<tr>
<td>104</td>
<td>RD</td>
<td>Received Data (A)</td>
<td></td>
</tr>
<tr>
<td>105</td>
<td>RS</td>
<td>Request to Send (A)</td>
<td></td>
</tr>
<tr>
<td>115</td>
<td>RT</td>
<td>Receiver Signal Element Timing From DCE (A)</td>
<td></td>
</tr>
<tr>
<td>106</td>
<td>CS</td>
<td>Clear to Send (A)</td>
<td></td>
</tr>
<tr>
<td>141</td>
<td>LL</td>
<td>Local Loopback (A)</td>
<td></td>
</tr>
<tr>
<td>107</td>
<td>DM</td>
<td>Data Set Ready (A)</td>
<td></td>
</tr>
<tr>
<td>108</td>
<td>TR</td>
<td>Data Terminal Ready (A)</td>
<td></td>
</tr>
<tr>
<td>109</td>
<td>RR</td>
<td>Data Channel Received Line Signal Detector (A)</td>
<td></td>
</tr>
<tr>
<td>140</td>
<td>RL</td>
<td>Remote Loopback</td>
<td></td>
</tr>
<tr>
<td>125</td>
<td>IC</td>
<td>Calling Indicator</td>
<td></td>
</tr>
<tr>
<td>111</td>
<td>SR / SF</td>
<td>Data Signal Rate Select to DCE or Select Tx Frequency to DCE</td>
<td></td>
</tr>
<tr>
<td>113</td>
<td>TT</td>
<td>Transmit Signal Element Timing From DTE (A)</td>
<td></td>
</tr>
<tr>
<td>142</td>
<td>TM</td>
<td>Test Indicator</td>
<td></td>
</tr>
<tr>
<td>19</td>
<td>SG</td>
<td>Signal Ground</td>
<td></td>
</tr>
<tr>
<td>20</td>
<td>RC</td>
<td>DCE Circuit Ground</td>
<td></td>
</tr>
<tr>
<td>103</td>
<td>SD</td>
<td>Transmitted Data (B or C)</td>
<td></td>
</tr>
<tr>
<td>114</td>
<td>ST</td>
<td>Transmitted Signal Element Timing From DCE (B or C)</td>
<td></td>
</tr>
<tr>
<td>104</td>
<td>RD</td>
<td>Received Data (B or C)</td>
<td></td>
</tr>
<tr>
<td>105</td>
<td>RS</td>
<td>Request to Send (B or C)</td>
<td></td>
</tr>
<tr>
<td>115</td>
<td>RT</td>
<td>Receiver Signal Element Timing From DCE (B or C)</td>
<td></td>
</tr>
<tr>
<td>106</td>
<td>CS</td>
<td>Clear to Send (B or C)</td>
<td></td>
</tr>
<tr>
<td>107</td>
<td>DM</td>
<td>Data Set Ready (B or C)</td>
<td></td>
</tr>
<tr>
<td>108</td>
<td>TR</td>
<td>Data Terminal Ready (B or C)</td>
<td></td>
</tr>
<tr>
<td>109</td>
<td>RR</td>
<td>Data Channel Received Line Signal Detector (B or C)</td>
<td></td>
</tr>
<tr>
<td>32</td>
<td>SS</td>
<td>Select Standby *</td>
<td></td>
</tr>
<tr>
<td>33</td>
<td>SQ</td>
<td>Signal Quality Detector *</td>
<td></td>
</tr>
<tr>
<td>113</td>
<td>TT</td>
<td>Transmit Signal Element Timing From DTE (B or C)</td>
<td></td>
</tr>
<tr>
<td>36</td>
<td>SB</td>
<td>Response to SS *</td>
<td></td>
</tr>
<tr>
<td>37</td>
<td>SC</td>
<td>DTE Circuit Ground</td>
<td></td>
</tr>
</tbody>
</table>

* Not supported by IDACOM

Pins 3, 21, 28, and 34 are unassigned.

Table C-3  V.36/RS-449 Pin Designations
Figure C-4  V.11/X.21 Female Connector

**NOTE**

For balanced circuits, the associated pairs are designated A and B.

<table>
<thead>
<tr>
<th>CCITT Circuit</th>
<th>Pin #</th>
<th>Mnemonic</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>103</td>
<td>1</td>
<td>PG</td>
<td>Protection Ground</td>
</tr>
<tr>
<td>105</td>
<td>2</td>
<td>T</td>
<td>Transmit (A)</td>
</tr>
<tr>
<td>104</td>
<td>3</td>
<td>C</td>
<td>Control (A)</td>
</tr>
<tr>
<td>106</td>
<td>4</td>
<td>R</td>
<td>Receive (A)</td>
</tr>
<tr>
<td>114</td>
<td>5</td>
<td>I</td>
<td>Indicate (A)</td>
</tr>
<tr>
<td>103</td>
<td>6</td>
<td>S</td>
<td>Signal Element Timing (A)</td>
</tr>
<tr>
<td>105</td>
<td>7</td>
<td>F</td>
<td>Frame Start Indication (X.20) (B)</td>
</tr>
<tr>
<td>104</td>
<td>8</td>
<td>SG</td>
<td>Signal Ground</td>
</tr>
<tr>
<td>106</td>
<td>9</td>
<td>T</td>
<td>Transmit (B)</td>
</tr>
<tr>
<td>103</td>
<td>10</td>
<td>C</td>
<td>Control (B)</td>
</tr>
<tr>
<td>104</td>
<td>11</td>
<td>R</td>
<td>Receive (B)</td>
</tr>
<tr>
<td>106</td>
<td>12</td>
<td>I</td>
<td>Indicate (B)</td>
</tr>
<tr>
<td>114</td>
<td>13</td>
<td>S</td>
<td>Signal Element Timing (B)</td>
</tr>
<tr>
<td></td>
<td>14</td>
<td>F</td>
<td>Frame Start Indication (X.20)</td>
</tr>
</tbody>
</table>

Pin 15 is unassigned.

Table C-4  V.11/X.21 Pin Designations
C.2 ISDN Basic Rate Access (BRA) Connectors

The ISDN Basic Rate connectors are wired in parallel for monitor operation. The two RJ-45 or TAE8+4C connectors can be configured for user or network emulation. Connectors for a voice telephone and external access to the B-Channels are also provided.

S/T Bus RJ–45

This connector can be optionally replaced with a TAE8+4C connector.

![Diagram of S/T Bus RJ-45 Female Connector]

**Figure C–5  S/T Bus RJ–45 Female Connector**

<table>
<thead>
<tr>
<th>Pin #</th>
<th>Mnemonic</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>PS_3+</td>
<td>Power Supply 3*</td>
</tr>
<tr>
<td>2</td>
<td>PS_3-</td>
<td>Power Supply 3*</td>
</tr>
<tr>
<td>3</td>
<td>TE_NT+</td>
<td>TE to NT Pair, Power Supply 1+</td>
</tr>
<tr>
<td>4</td>
<td>NT_TE+</td>
<td>NT to TE Pair, Power Supply 1-</td>
</tr>
<tr>
<td>5</td>
<td>NT_TE-</td>
<td>NT to TE Pair, Power Supply 1-</td>
</tr>
<tr>
<td>6</td>
<td>TE_NT-</td>
<td>TE to NT Pair, Power Supply 1+</td>
</tr>
<tr>
<td>7</td>
<td>PS_2-</td>
<td>Power Supply 2</td>
</tr>
<tr>
<td>8</td>
<td>PS_2+</td>
<td>Power Supply 2</td>
</tr>
</tbody>
</table>

* Not supported by IDACOM

**Table C–5  S/T Bus RJ–45 Pin Designations**

**NOTE**

*Power supply polarities are given for a 'FORWARD' selection.*
S/T Bus TAE8+4C

This connector can be optionally replaced with an RJ-45 connector.

![Diagram of S/T Bus TAE8+4C Female Connector]

Figure C-6 S/T Bus TAE8+4C Female Connector

<table>
<thead>
<tr>
<th>Pin #</th>
<th>Mnemonic</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>3</td>
<td>NT_TE+</td>
<td>NT to TE Pair, Power Supply 1-</td>
</tr>
<tr>
<td>4</td>
<td>NT_TE-</td>
<td>NT to TE Pair, Power Supply 1-</td>
</tr>
<tr>
<td>5</td>
<td>TE_NT-</td>
<td>TE to NT Pair, Power Supply 1+</td>
</tr>
<tr>
<td>6</td>
<td>TE_NT+</td>
<td>TE to NT Pair, Power Supply 1+</td>
</tr>
<tr>
<td>7</td>
<td>PS_2+</td>
<td>Power Supply 2</td>
</tr>
<tr>
<td>8</td>
<td>PS_2-</td>
<td>Power Supply 2</td>
</tr>
</tbody>
</table>

Table C-6 S/T Bus TAE8+4C Pin Designations
RJ-14 External Voice Access

**Figure C-7** RJ-14 External Voice Access Female Connector

<table>
<thead>
<tr>
<th>Pin #</th>
<th>Mnemonic</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>TX</td>
<td>Phone Transmit/Receive</td>
</tr>
<tr>
<td>3</td>
<td>GND</td>
<td>Phone Ground</td>
</tr>
</tbody>
</table>

**Table C-7** RJ-14 External Voice Access Pin Designations
External B–Channel Access

![Diagram of External B–Channel Female Connector]

**Figure C–8 External B–Channel Female Connector**

<table>
<thead>
<tr>
<th>Pin #</th>
<th>Mnemonic</th>
<th>Description</th>
<th>Direction</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>ME1</td>
<td>Monitor, External 1 Rx</td>
<td>Output</td>
</tr>
<tr>
<td>2</td>
<td>GND</td>
<td>Ground</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>TRE2</td>
<td>Transceiver, External 2 Rx</td>
<td>Output</td>
</tr>
<tr>
<td>4</td>
<td>TTE2</td>
<td>Transceiver, External 2 Tx</td>
<td>Input</td>
</tr>
<tr>
<td>5</td>
<td>GND</td>
<td>Ground</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>E1 RxC</td>
<td>External 1 Clock</td>
<td>Output</td>
</tr>
<tr>
<td>7</td>
<td>E1 SYNC</td>
<td>External 1 Sync</td>
<td>Output</td>
</tr>
<tr>
<td>8</td>
<td>E2 SYNC</td>
<td>External 2 Sync</td>
<td>Output</td>
</tr>
<tr>
<td>9</td>
<td>ME2</td>
<td>Monitor External 2 Rx</td>
<td>Output</td>
</tr>
<tr>
<td>10</td>
<td>TRE1</td>
<td>Transceiver, External 1 Rx</td>
<td>Output</td>
</tr>
<tr>
<td>11</td>
<td>GND</td>
<td>Ground</td>
<td></td>
</tr>
<tr>
<td>12</td>
<td>TTE1</td>
<td>Transceiver, External 1 Tx</td>
<td>Input</td>
</tr>
<tr>
<td>13</td>
<td>E2 RxC</td>
<td>External 2 Clock</td>
<td>Output</td>
</tr>
<tr>
<td>14</td>
<td>FRM SYNC</td>
<td>Internal PT Frame Sync Clock</td>
<td>Input/Output</td>
</tr>
<tr>
<td>15</td>
<td>BIT CLK</td>
<td>Internal PT Bit Clock</td>
<td>Input/Output</td>
</tr>
</tbody>
</table>

**Table C–8 External B–Channel Pin Designations**

Because the External B–Channel Access connector is proprietary, additional information is provided. All signals must be TTL level NRZ and have a source impedance of 75 ohms.

The pins can be divided into three groups: B1 External Access, B2 External Access, and clocking.
External Access Groups

Each external access consists of the following signals:

<table>
<thead>
<tr>
<th>External 1</th>
<th>External 2</th>
<th>Traffic Direction</th>
<th>Monitor Mode</th>
<th>Emulation Mode</th>
</tr>
</thead>
<tbody>
<tr>
<td>EB1</td>
<td>ME2</td>
<td>TE-&gt;NT</td>
<td>Not applicable</td>
<td></td>
</tr>
<tr>
<td>TRE1</td>
<td>TRE2</td>
<td>NT-&gt;TE</td>
<td>B-Channel data received DUT-&gt; tester</td>
<td></td>
</tr>
<tr>
<td>TTE1</td>
<td>TTE2</td>
<td>Not applicable</td>
<td>B-Channel data transmit tester -&gt;DUT</td>
<td></td>
</tr>
<tr>
<td>E1 RxC</td>
<td>E2 RxC</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>E1 Sync</td>
<td>E2 Sync</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Table C-9 External Access Groups

Timing Diagram

The following diagram describes the timing relationship between the clocks and data. It is the same for both external access groups. The byte sync clocks are active low pulses that indicate byte boundaries in the basic rate frame.

![Timing Diagram](image)

Clocking Signals

The BIT CLK and FRM SYNC signals are used for internal clocking and synchronization within the unit. Using two testers in a master–slave relationship, the B-Channel access ports can be directly connected (i.e. B-Channel data can be transferred between one S/T bus and the other).

Contact IDACOM for more information regarding special configurations.
C.3 ISDN Primary Rate Access (PRA) Connectors

ISDN Primary Rate (T1 or CEPT) can be configured for monitor, emulation, or drop & insert.

**RJ-45 (T1)**

![RJ-45 Connector Diagram](image)

Figure C-9 RJ-45 Female Connector

### Emulation and Drop & Insert Modes

<table>
<thead>
<tr>
<th>Pin #</th>
<th>Pin #</th>
<th>Mnemonic</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>4</td>
<td>RX+</td>
<td>Receive Positive</td>
</tr>
<tr>
<td>4</td>
<td>3</td>
<td>TX+</td>
<td>Transmit Positive</td>
</tr>
<tr>
<td>5</td>
<td>6</td>
<td>TX-</td>
<td>Transmit Negative</td>
</tr>
<tr>
<td>8</td>
<td>5</td>
<td>RX-</td>
<td>Receive Negative</td>
</tr>
</tbody>
</table>

Table C-10 RJ-45 Pin Designations - User (Port A - Default)

<table>
<thead>
<tr>
<th>Pin #</th>
<th>Pin #</th>
<th>Mnemonic</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>4</td>
<td>TX+</td>
<td>Transmit Positive</td>
</tr>
<tr>
<td>4</td>
<td>3</td>
<td>RX+</td>
<td>Receive Positive</td>
</tr>
<tr>
<td>5</td>
<td>6</td>
<td>RX-</td>
<td>Receive Negative</td>
</tr>
<tr>
<td>8</td>
<td>5</td>
<td>TX-</td>
<td>Transmit Negative</td>
</tr>
</tbody>
</table>

Table C-11 RJ-45 Pin Designations - Network (Port B - Default)
Monitor Mode

<table>
<thead>
<tr>
<th>Pin #</th>
<th>Pin #</th>
<th>Mnemonic</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>4</td>
<td>RXA+</td>
<td>Receive Port A Positive</td>
</tr>
<tr>
<td>4</td>
<td>3</td>
<td>RXB+</td>
<td>Receive Port B Positive</td>
</tr>
<tr>
<td>5</td>
<td>6</td>
<td>RXB−</td>
<td>Receive Port B Negative</td>
</tr>
<tr>
<td>8</td>
<td>5</td>
<td>RXA−</td>
<td>Receive Port A Negative</td>
</tr>
</tbody>
</table>

Table C-12 RJ-45 Pin Designations (Port A/B)

▼ NOTE
Directions can be reversed (see RJ45 Config. on the System Setup Menu).

▼ NOTE
See Section 3.5 for minimum input signal levels.

Bantam (T1)

Each Bantam connector handles one direction of data.

Emulation and Drop & Insert Modes

TIP    = TX− or RX−
RING   = TX+ or RX+
SLEEVE = Ground

Monitor Mode

TIP    = RX−
RING   = RX+
SLEEVE = Ground

▼ NOTE
See Section 3.5 for minimum input signal levels.
DB—9 (CEPT)

Two DB—9 pin female connectors work for both the 75 ohm and 120 ohm balanced interface.

![DB-9 (CEPT) Female Connector](image)

**Figure C-10**  DB—9 (CEPT) Female Connector
Emulation and Drop & Insert Modes

<table>
<thead>
<tr>
<th>Pin #</th>
<th>Mnemonic</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>RX−</td>
<td>Receive Negative</td>
</tr>
<tr>
<td>5</td>
<td>TX−</td>
<td>Transmit Negative</td>
</tr>
<tr>
<td>6</td>
<td>RX+</td>
<td>Receive Positive</td>
</tr>
<tr>
<td>9</td>
<td>TX+</td>
<td>Transmit Positive</td>
</tr>
<tr>
<td>2,3,4</td>
<td>GND</td>
<td>Ground</td>
</tr>
</tbody>
</table>

Table C–13 DB–9 Pin Designations – User (Port A – Default)

<table>
<thead>
<tr>
<th>Pin #</th>
<th>Mnemonic</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>TX−</td>
<td>Transmit Negative</td>
</tr>
<tr>
<td>5</td>
<td>RX−</td>
<td>Receive Negative</td>
</tr>
<tr>
<td>6</td>
<td>TX+</td>
<td>Transmit Positive</td>
</tr>
<tr>
<td>9</td>
<td>RX+</td>
<td>Receive Positive</td>
</tr>
<tr>
<td>2,3,4</td>
<td>GND</td>
<td>Ground</td>
</tr>
</tbody>
</table>

Table C–14 DB–9 Pin Designations – Network (Port B – Default)

Monitor Mode

<table>
<thead>
<tr>
<th>Pin #</th>
<th>Mnemonic</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>RXA−</td>
<td>Receive Port A Negative</td>
</tr>
<tr>
<td>5</td>
<td>RXB−</td>
<td>Receive Port B Negative</td>
</tr>
<tr>
<td>6</td>
<td>RXA+</td>
<td>Receive Port A Positive</td>
</tr>
<tr>
<td>9</td>
<td>RXB+</td>
<td>Receive Port B Positive</td>
</tr>
<tr>
<td>2,3,4</td>
<td>GND</td>
<td>Ground</td>
</tr>
</tbody>
</table>

Table C–15 DB–9 Pin Designations (Port A/B)

⚠️ **NOTE**

Directions can be reversed (see RJ45(DB9) Config. on the System Setup Menu).

⚠️ **NOTE**

See Section 3.5 for minimum input signal levels.
External B-Chanel Access

Figure C-11 External B-Chanel Female Connector

<table>
<thead>
<tr>
<th>Pin #</th>
<th>Mnemonic</th>
<th>Description</th>
<th>Direction</th>
</tr>
</thead>
<tbody>
<tr>
<td>6</td>
<td>RXDCKEX</td>
<td>Receive Data Clock</td>
<td>Output</td>
</tr>
<tr>
<td>7</td>
<td>RXDFRMEX</td>
<td>Receive Frame Clock</td>
<td>Output</td>
</tr>
<tr>
<td>8</td>
<td>TXDFRMEX</td>
<td>Transmit Frame Clock</td>
<td>Output</td>
</tr>
<tr>
<td>10</td>
<td>RXDEX</td>
<td>Receive Data</td>
<td>Output</td>
</tr>
<tr>
<td>12</td>
<td>M/TXDEX</td>
<td>Monitor/Transmit Data</td>
<td>Output/Input</td>
</tr>
<tr>
<td>13</td>
<td>TXDCKEX</td>
<td>Transmit Data Clock</td>
<td>Output</td>
</tr>
<tr>
<td>2,11,5,14</td>
<td>GND</td>
<td>Ground</td>
<td></td>
</tr>
<tr>
<td>15,1,9,3,4</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Table C-16 External B-Chanel Pin Designations

All signals must be TTL level NRZ and have a source impedance of 75 ohms. M/TXDEX is high input impedance.

NOTE

M/TXDEX is an output (receive data) when the external channel is selected as a monitor channel, and input (transmit data) when the external channel is selected as an emulation channel.
Timing Diagram

The following diagram describes the timing relationships between the clocks and data. The frame clocks (8 kHz) are active high to indicate byte boundaries. The data clocks are 96.5 kHz burst clocks. This allows external access to one primary rate timeslot (64 kbps).

RXD
M/TXD in monitor mode
RXDCK
RXDFRM
M/TXD in emulation mode
TXDCK
TXDFRM
**External Clock In and Out BNC Connectors**

![BNC Connectors](image.png)

**CLK OUT (TTL)**  
**EXT CLK IN (TTL)**

**Figure C-12 External Clock In and Out BNC Connectors**

**External Clock In**

When a clock is connected to this input, it replaces the transmit clocks (in cases where the transmit clock uses the local oscillator, i.e. 'NETWORK'). Valid clocks are 1.544 MHz or 2.048 MHz ± 50 ppm, TTL with a 50% ± 2% duty cycle. Input impedance is approximately 300 ohms.

**External Clock Out**

When no clock is connected to External Clock In, then this clock is equal to the local oscillator frequency (1.544 MHz or 2.048 MHz) generated by the tester. If there is a clock connected to External Clock In then \((\text{CLK.OUT}) = F(\text{EXT.CLK.IN})\). This is a TTL output, 50% duty cycle clock with a source impedance of approximately 100 ohms.
C.4 External B−Channel Access (PRA/BRA/WAN)

Figure C−13 External B−Channel Female Connector (PRA/BRA/WAN)

<table>
<thead>
<tr>
<th>Pin #</th>
<th>Interface</th>
<th>Mnemonic</th>
<th>Description</th>
<th>Direction</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>PAA</td>
<td>RXDCKEX</td>
<td>Receive Data Clock</td>
<td>Output</td>
</tr>
<tr>
<td>2</td>
<td>PAA</td>
<td>RXDFRMEX</td>
<td>Receive Frame Clock</td>
<td>Output</td>
</tr>
<tr>
<td>3</td>
<td>PRA</td>
<td>TXDCKEX</td>
<td>Transmit Data Clock</td>
<td>Output</td>
</tr>
<tr>
<td>4</td>
<td>PRA</td>
<td>TXDFRMEX</td>
<td>Transmit Frame Clock</td>
<td>Output</td>
</tr>
<tr>
<td>5</td>
<td>BRA</td>
<td>E2 RxC</td>
<td>External 2 Clock</td>
<td>Output</td>
</tr>
<tr>
<td>6</td>
<td>BRA</td>
<td>E1 RxC</td>
<td>External 1 Clock</td>
<td>Output</td>
</tr>
<tr>
<td>7</td>
<td>BRA</td>
<td>ME2</td>
<td>Monitor External 2 Rx</td>
<td>Output</td>
</tr>
<tr>
<td>8</td>
<td>BRA</td>
<td>TRE2</td>
<td>Transceiver, External 2 Rx</td>
<td>Output</td>
</tr>
<tr>
<td>9</td>
<td>BRA</td>
<td>FRM SYNC</td>
<td>Internal PT Frame Sync Clock</td>
<td>Input/Output</td>
</tr>
<tr>
<td>10</td>
<td>BRA</td>
<td>TTE2</td>
<td>Transceiver, External 2 Tx</td>
<td>Input</td>
</tr>
<tr>
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<td>E1 SYN</td>
<td>External 1 Sync</td>
<td>Output</td>
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<tr>
<td>12</td>
<td>BRA</td>
<td>E2 SYN</td>
<td>External 2 Sync</td>
<td>Output</td>
</tr>
<tr>
<td>13</td>
<td>BRA</td>
<td>BIT CLK</td>
<td>Internal PT Bit Clock</td>
<td>Input/Output</td>
</tr>
<tr>
<td>15</td>
<td>PRA</td>
<td>RXDEX</td>
<td>Receive Data</td>
<td>Output</td>
</tr>
<tr>
<td>17</td>
<td>PRA</td>
<td>M/TXDEX</td>
<td>Monitor/Transmit Data</td>
<td>Input/Output</td>
</tr>
<tr>
<td>20</td>
<td>BRA</td>
<td>ME1</td>
<td>Monitor, External 1 Rx</td>
<td>Output</td>
</tr>
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<td>21</td>
<td>BRA</td>
<td>TRE1</td>
<td>Transceiver, External 1 Rx</td>
<td>Output</td>
</tr>
<tr>
<td>23</td>
<td>BRA</td>
<td>TTE1</td>
<td>Transceiver, External 1 Tx</td>
<td>Input</td>
</tr>
</tbody>
</table>

All unused pins are grounded

Table C−17 External B−Channel Pin Designations

NOTE
Refer to 'External B−Channel Access' in Sections C.2 and C.3 for mnemonic descriptions.
C.5 Miscellaneous Connectors

The miscellaneous connectors include the serial and parallel printer ports, the remote control port, and the external color CRT.

Serial Printer Port

The serial printer port is a female RS-232C DCE interface and can be configured to 19.2 kbps.

![Serial Printer Port Female Connector](image)

**Table C-18 Serial Printer Port Pin Designations**

<table>
<thead>
<tr>
<th>Pin #</th>
<th>Direction</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td></td>
<td>Protective Ground</td>
</tr>
<tr>
<td>2</td>
<td>From Printer</td>
<td>Receive Data</td>
</tr>
<tr>
<td>3</td>
<td>To Printer</td>
<td>Send Data</td>
</tr>
<tr>
<td>5</td>
<td></td>
<td>+ 12 volt pull up</td>
</tr>
<tr>
<td>6</td>
<td></td>
<td>+ 12 volt pull up</td>
</tr>
<tr>
<td>7</td>
<td></td>
<td>Signal Ground</td>
</tr>
<tr>
<td>8</td>
<td></td>
<td>+ 12 volt pull up</td>
</tr>
<tr>
<td>20</td>
<td>From Printer</td>
<td>Data Terminal Ready</td>
</tr>
</tbody>
</table>
Parallel Printer Port

The parallel printer port can be either a standard 36 pin contact strip connector or a DB-25 connector. All signals are TTL level.

![DB-25 Printer Port Female Connector](image)

**Figure C-15 DB-25 Printer Port Female Connector**

<table>
<thead>
<tr>
<th>Pin #</th>
<th>Direction</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>To Printer</td>
<td>Active Low (DATA STROBE)</td>
</tr>
<tr>
<td>2–9</td>
<td>To Printer</td>
<td>Send Data (DATA0–DATA7)</td>
</tr>
<tr>
<td>11</td>
<td>From Printer</td>
<td>Printer Busy (BUSY)</td>
</tr>
<tr>
<td>12</td>
<td>From Printer</td>
<td>Out of Paper (PAPER END)</td>
</tr>
<tr>
<td>13</td>
<td>From Printer</td>
<td>Printer On-Line (SELECT)</td>
</tr>
<tr>
<td>14, 18–25</td>
<td></td>
<td>Signal Ground</td>
</tr>
</tbody>
</table>

**Table C-19 DB-25 Printer Port Pin Designations**
Figure C–16 Centronics Printer Port Female Connector

<table>
<thead>
<tr>
<th>Pin #</th>
<th>Direction</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>To Printer</td>
<td>Active Low (DATA STROBE)</td>
</tr>
<tr>
<td>2–9</td>
<td>To Printer</td>
<td>Send Data (DATA0–DATA7)</td>
</tr>
<tr>
<td>11</td>
<td>From Printer</td>
<td>Printer Busy (BUSY)</td>
</tr>
<tr>
<td>12</td>
<td>From Printer</td>
<td>Out of Paper (PAPER END)</td>
</tr>
<tr>
<td>13</td>
<td>From Printer</td>
<td>Printer On-Line (SELECT)</td>
</tr>
<tr>
<td>14, 16,</td>
<td></td>
<td>Signal Ground</td>
</tr>
<tr>
<td>19–30, 33</td>
<td></td>
<td>Signal Ground</td>
</tr>
<tr>
<td>35</td>
<td></td>
<td>VCC Reference</td>
</tr>
</tbody>
</table>

Table C–20 Centronics Printer Port Pin Designations

**NOTE**

BUSY, PAPER END, and SELECT are pulled high by the tester (+5 V). Therefore the printer must drive at least BUSY and PAPER END to operate.
Remote Control Port

The remote control port is an RS-232C DTE interface and can be configured to speeds of up to 19.2 kbps.

![Remote Control Port Diagram](image)

**Figure C-17 Remote Control Port Male Connector**

<table>
<thead>
<tr>
<th>Pin #</th>
<th>Direction</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td></td>
<td>Protective Ground</td>
</tr>
<tr>
<td>2</td>
<td>To Remote</td>
<td>Send Data</td>
</tr>
<tr>
<td>3</td>
<td>To PT</td>
<td>Receive Data</td>
</tr>
<tr>
<td>4</td>
<td>To Remote</td>
<td>Request to Send</td>
</tr>
<tr>
<td>5</td>
<td>To PT</td>
<td>Clear to Send</td>
</tr>
<tr>
<td>6</td>
<td>To PT</td>
<td>Data Set Ready</td>
</tr>
<tr>
<td>7</td>
<td></td>
<td>Signal Ground</td>
</tr>
<tr>
<td>20</td>
<td>To Remote</td>
<td>Data Terminal Ready</td>
</tr>
</tbody>
</table>

**Table C-21 Remote Control Port Pin Designations**
External Color CRT

The external color CRT can be either a DB-9 or a circular 8 pin DIN connector.

![DB-9 External Color CRT Connector](image)

**Figure C-18 DB-9 External Color CRT Connector**

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<tr>
<th>Pin #</th>
<th>Description</th>
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<tr>
<td>1</td>
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</tr>
<tr>
<td>2</td>
<td>Ground</td>
</tr>
<tr>
<td>3</td>
<td>Red</td>
</tr>
<tr>
<td>4</td>
<td>Green</td>
</tr>
<tr>
<td>5</td>
<td>Blue</td>
</tr>
<tr>
<td>6</td>
<td>Intensity (pull up resistor)</td>
</tr>
<tr>
<td>8</td>
<td>Horizontal Sync</td>
</tr>
<tr>
<td>9</td>
<td>Vertical Sync</td>
</tr>
</tbody>
</table>

**Table C-22 External Color CRT Pin Designations**
Figure C–19  External Color CRT Connector

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<tr>
<th>Pin #</th>
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<tr>
<td>1</td>
<td>Ground</td>
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<tr>
<td>2</td>
<td>Ground</td>
</tr>
<tr>
<td>3</td>
<td>Ground</td>
</tr>
<tr>
<td>4</td>
<td>Horizontal Sync</td>
</tr>
<tr>
<td>5</td>
<td>Vertical Sync</td>
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<tr>
<td>7</td>
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<td>8</td>
<td>Blue</td>
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Table C–23  External Color CRT Pin Designations
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<th>HEX</th>
<th>DEC</th>
<th>OCT</th>
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<th>EBCDIC</th>
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INDEX

A LAW, see Voice Encoding
Activating Filters, 18-27
Alarms
  blue, 3-42
  red, 6-11
  triggers, 18-31, 18-34
  yellow, 3-41, 6-12
All Idle, 3-34, 3-35, 3-49, 3-50
All Pass Through, 3-49, 3-50
AMI Encoding, 3-19, 3-31, 3-45
APPL, 3-36, 3-50
Application Processors, 1-18 to 1-20
  switching, 17-2, 18-2
Arming Triggers, 18-30, 18-34
ASCII Character Set, 18-15
ASYNC Framing, 9-4, A-5
Autoconfiguration, 9-10, 9-11
88ZS Encoding, 3-19, 3-31, 3-45
Background
  Configuration Diagram, 17-3
  Connection Diagram, 18-3
  Data Window, 18-3
  Test Port Status Display, 17-4
  User Window, 18-4
Backup
  listing, 17-22
  restoring, 17-23
Basic Rate Access
  configuration, 3-8, 3-12, 4-4, 5-4
  emulating, 3-10 to 3-15
  loading an application, 3-9, 3-14
  monitoring, 3-6 to 3-9
  termination impedance, 3-10
Baud Rates, 9-10
BIM, 20-5
Bipolar Violation, 3-26, 3-42
BISYNC ASCII Framing, 9-4, 15-4, A-3
BISYNC EBCDIC Framing, 9-4, 15-4, A-3
Block Numbers
  display format, 18-17
  searching, 18-18
  Blue Alarm, 3-42
BOP Framing, 9-4, A-2
Brightness, see CRT
Burst Mode, 3-42
Called/Calling Address, 11-8
Capture RAM
  appending data, 18-5
  capturing to RAM, 18-6
  clearing, 18-6
  configuring, 18-4
  continuous, 18-5
  displaying, 18-9
  overwriting data, 18-5
  playback, 18-11
  printing, 18-22, 18-25
  response time, 18-21
  saving to disk, 18-7
  searching, 18-18
  stopping, 18-5
  triggers, 18-30, 18-35
Card Ejectors, 20-5
Carrier Detect Control, 16-6
Channels
  assigning timeslots, 3-22, 3-39, 8-3
  idle, 3-34 to 3-36, 3-49, 3-50
  logical, 11-9
  loopback, 3-35, 3-36
  pass, 3-50
  pass through, 3-49, 3-50
  selecting, 3-22, 3-38, 8-2
Character
  display, 18-14
  sets, 18-15
Clear Channel Signalling, 3-19, 3-31, 3-45
Clock Source
  PRA, 3-20, 3-32, 3-46
  WAN, A-6
Cluster Controller, 16-4
  devices, 16-6
  ID, 15-7
  selecting, 16-9
Command Mode, 2-6, 2-10
Command/Response Bits, 5-11, 7-8
Communications Controller, 16-4
Complete Display, 18-13
Configuration
  ASYNC, 9-12, 10-11
  capture RAM buffer, 18-4
  file transfer, 17-29
  ISDN BRA Emulation, 3-12
  ISDN BRA Monitor, 3-8
  ISDN BRA Emulation, 3-30 to 3-39
  ISDN BRA Select, 3-18 to 3-23
  loading, 9-8, 10-9
  port selection (BRA/BRA), 17-3
  printer port, 17-24
  remote port, 17-26
  saving, 9-8, 10-8
  terminal emulator, 17-29
Configuration Diagram, 17-3
  BRA, 1-11
  BRA/BRA, 1-13
  BRA/WAN, 1-12
  D-Channel, 1-4
  PRA, 1-7
  PRA/BRA/WAN, 1-14
  PRA/WAN, 1-9
  WAN, 1-5

PT500 User Manual
INDEX [continued]

Configuration Diagram  [continued]  
WAN/WAN, 1–6
Connection Diagram, 18–3
Connector Modules  
BRA/BRA, 1–13
BRA/WAN, 1–12
D-Channel, 1–4
PRA, 1–7
PRA/BRA/WAN, 1–14
PRA/WAN, 1–9
WAN, 1–5
WAN/WAN, 1–6
Connectors  
BNC, C–21
DB–9, C–17
External B–Channel Access, C–12, C–19, C–22
External Color CRT, 1–3, C–27
Parallel Printer Port, C–24
Remote Port, C–26
RJ–14, C–11
RJ–45, C–9, C–14
RJ–48C, 3–16, 3–28, 3–32
RS–232C/V.28, C–2
Serial Printer Port, C–23
TAE8+4C, C–10
V.11/X.21, C–8
V.35, C–4
V.36/RS–449, C–6
Control Characters, 10–14, 16–9
COP Framing, 9–4, A–4
Copy Ebuf, see Messages
Copy MBuf, see Messages
Copying Files, 17–11, 17–21
CPU2, 20–5
CRC, 9–7
CRC Error, 3–26, 3–42
CRC4 Framing, 3–19, 3–31, 3–45
Creating a File System, 17–16
Crossloop, 5–52
CRT  
brightness adjustment, 1–3
external connector, 1–3, C–27
CU Address, 15–7
Cyclic Redundancy Check, see CRC Error
Data File  
printing, 18–25
Data Files  
listing, 17–7
maximum size, 18–5
playback, 18–12
printing, 18–24
recording live data, 18–6
response time, 18–21
searching in, 18–18
transferring from capture RAM, 18–7
Data Formats, A–1 to A–7
Data Window, see Windows
Date and Time  
response time, 18–21
setting, 17–27
timestamp, see Timestamps
DCD Control, 9–7
Deactivating Filters, 18–27
Diagnostics, 2–3, 17–18
Directories  
current device, 17–6
display format, 17–6
listing, 17–5 to 17–7
printing, 17–8
write protect, 17–6
Disk Filter, 18–27
Display Filter, 18–27
Display Formats, 18–13 to 18–17
block numbers, 18–17
character, 18–14
current device, 17–6
display format, 17–6
data field, 18–15
list, 17–5
listing, 17–7
maximum size, 18–5
move, 18–24
number, 18–22
overview, 18–13
select, 18–21
Throughput graph, 18–16
traces, 18–14
timestamps, 18–15
trace statements, 18–14, 18–16
Displaying  
capture RAM, 18–11
disk recording, 18–11
live data, 18–10
triggers, 18–35
Drop & Insert  
at the Primary Rate Access, 3–44 to 3–52
emulation submode, 8–4
monitor submode, 8–2
Dual Window, 18–15
EBCDIC Character Set, 18–15
Editor Functions, 17–10
Ejectors, 20–5
Emulating  
at a WAN Interface, 3–4, 3–5
at the Basic Rate Access, 3–10 to 3–15
at the Primary Rate Access, 3–27 to 3–43
B–Channel data, 5–51
Emulating [continued]
B-Channel voice, 5-50
Emulation Mode, 14-4, 16-4
Encoding
AMI, 3-19, 3-31, 3-45
B8ZS, 3-19, 3-31, 3-45
HDB3, 3-19, 3-31, 3-45
NRZ, A-6
NRZI, A-6
Errors
bipolar violation, 3-26, 3-42
CRC, 3-26, 3-42
frame, 3-26, 3-42
lost phase, 6-12
lost signal, 6-11
monitoring, 3-25
multiframe, 3-26, 3-42
out of frame, 6-12
S bit, 3-26, 3-42
simulating, 3-41
synchronized, 6-11
Execute, see Function Keys
Exit, see Function Keys
EXT, 3-36, 3-50
External B-Channel Routing, 5-50
External Chan, see Channels, selecting
External Tx Clock, A-6
Fail Condition, see Self Test
FECP2, 20-5
File Transfer
configuration, 17-29
receiving, 17-35
transmitting, 17-34
Files, 17-4 to 17-24
backing up, 17-21
comparing, 17-12, 17-13
copying, 17-11, 17-12
creating a file system, 17-16
data files, see Data Files
deleting, 17-13, 17-14
filenames, 18-7
listing, 17-5 to 17-7
merging, 17-14
object files, 17-7
renaming, 17-13
restoring backup, 17-23
saving, 17-10
source files, see Source Files
types of, 17-7
FILEX, 17-28 to 17-35
Filters, 18-26 to 18-28
activating, 18-27
call reference, 4-14, 6-14
called/calling address, 11-8
deactivating, 18-27
disk, 18-27
display, 18-27
effect on Connection Diagram, 18-28
errors, 6-11
lead changes, 18-27
logical channel, 11-9
logical operations, 4-12, 6-13
protocol discriminator, 4-14, 6-14
RAM, 18-27
SAPI, 4-12, 6-12, 6-13
TEI, 4-12, 6-12, 6-13
trace statements, 18-27
FLAG, 12-7
Flex Circuit, 20-5
Floppy Disk, 20-5
backing up files from, 17-23
backing up files to, 17-21
creating a file system, 17-16
current device, 17-6, 18-5, 18-7
formatting, 17-15
write protect, 17-6
Formatting
floppy disk, 17-15
hard disk, 17-17
Frame Error, 3-26, 3-42
Frames
defining, 5-11 to 5-13, 7-8 to 7-10
length, 14-7
sending, 5-13, 5-14, 5-19, 7-10, 7-15
Framing
ASYNC, 9-4, A-5
BISYNC ASCII, 9-4, 15-4, A-3
BISYNC EBCDIC, 9-4, 15-4, A-3
COP, 9-4, A-2
CRC4, 3-19, 3-31, 3-45
ISDN, A-7
PCM30 CAS, 3-19, 3-31, 3-45
PCM30 CCS, 3-19, 3-31, 3-45
T1 D4, 3-18, 3-30, 3-45
T1 D4 4F/M, 3-18, 3-30, 3-45
T1 ESF, 3-19, 3-31, 3-45
FRMR Bits, 5-11, 7-8
Function Keys, 2-8
Execute, 2-9
Exit, 2-9
highlighted, 2-8
OTHERS, 2-9
unassigned, 18-38
Fuses, spare, 20-5
GROUP IDLE, 3-36, 3-51
GROUP LPBK, 3-36
GROUP PASS, 3-51
Hard Disk, 20-5
INDEX [continued]

Hard Disk [continued]
backing up, 17-21
creating a file system, 17-16
current device, 17-6, 18-5, 18-7
formatting, 17-17
organization, 17-17
parking the, 17-11
partitioning, 17-18 to 17-20
restoring backup, 17-23
shutdown, 17-11
write protect, 17-6

HDB3 Encoding, 3-19, 3-31, 3-45

Hex
character set, 18-15
display, 18-14

Home Processor
B1/B2-Channel, 2-11
Background, 2-11
BRA-Config, 2-11
D-Channel, 2-12
DOS-Files, 2-12
Files, 2-12
FILEX, 2-12
PRA-Config, 2-12
PRA-L1, 2-12
Setup, 2-12
TestPorts, 2-11
WAN-Config, 2-11
WAN-Port 1/2, 2-11

ID Denied, 5-8
Idle, see Transmit Mode
Idle Character, 3-31, 3-46
Idle Link (T203), 5-4, 7-4
Impedance, see Termination Impedance
Information Elements
octets, 5-38, 7-24
selecting, 5-36, 5-42, 7-22, 7-28
Initialize
floppy disk, 17-15
partitioning the hard disk, 17-18
Interframe Fill, 9-7, 12-7
International Bits, 3-37, 3-51, 3-52
Inverted HDLC, 3-23, 3-39, 8-3, 8-5
IUT, 3-4

JIS8 Character Set, 18-15
K, 5-7
Keyboard, 2-2
L.2 State Machine, 5-5, 5-12, 7-5, 7-9
LAP, 11-5
LAPB, 11-5
Lead Changes
filters, 18-27

triggers, 18-32
Links
access procedure, 11-5
automatic, 5-6
busy, 5-20, 7-17
disconnecting, 5-21, 7-18, 12-23
establishing, 5-18, 7-15, 14-9
initiating, 12-19
manual, 5-6
PU address, 13-8
resetting, 14-10
restarting, 12-20
SAPI, 5-6, 7-6
selecting, 5-12, 5-17, 7-9, 7-14, 14-8
single/multi, 11-6
T203 timer, 7-4
TEI, 5-6, 7-6

Live Data
capturing to RAM, 18-6
displaying, 18-10
recording, 18-6

Loading
ISDN BRA Emulation, 5-2, 5-3
ISDN BRA Monitor, 4-2, 4-3
ISDN PRA Emulation, 7-2, 7-3
ISDN PRA Monitor, 6-2, 6-3
on a B-Channel, 3-9, 3-14
on a PRA test channel, 3-23, 3-40
on a WAN interface, 3-3, 3-5
system software, 2-4, 2-5
test scripts, 18-36
USM configurations, 9-8, 10-9

Logical
channels, 5-27, 11-9, 12-21
operations, 4-12, 6-13
Loopback, see Transmit Mode
Lost Phase Error, 6-12
Lost Signal Error, 6-11

MARK, 12-7
Masking a String, 18-31
Menu Mode, 2-6 to 2-10
Menu System Software, see Home Processor
Menus, 2-9
Message Sets
loading, 4-10
saving, 4-10
selecting, 4-8

Messages
automatic, 5-35 to 5-40, 7-21 to 7-26
call reference, 5-36, 7-22
display format, 4-7, 5-44, 6-7, 7-31
displaying, 5-44, 7-31
edit buffer, 5-47, 7-33
length, 9-7
INDEX [continued]

Messages [continued]
  manual, 5-41 to 5-44, 7-27 to 7-30
  message buffer, 5-46, 7-33, 16-12
  non-CCITT, 5-48, 7-34
  pool, 5-46, 7-32
  selecting, 5-14 to 5-16, 5-36, 5-41, 7-11
to 7-13, 7-22, 7-27
  selecting IE's, 5-36, 5-42, 7-22, 7-28
  sending, 5-16, 5-19, 7-13, 7-15
  test script, 18-37
  timeout, 9-7
  triggers, 18-35

Modulo 8/128, 4-4, 5-6, 7-6, 11-5, 13-5

Monitoring
  ASYNC data, 9-12, 9-13
  at a WAN Interface, 3-2, 3-3
  at the Basic Rate Access, 3-6 to 3-9
  at the Primary Rate Access, 3-15 to 3-26
  B-Channel data, 4-18
  B-Channel voice, 4-17
  errors, 3-25
  live data, 9-9
  MSG, 4-7, 6-7
  MSG+IE, 4-8, 6-8
  MSG+IE+PA, 4-8, 6-8
  Multiframe Error, 3-26, 3-42
  Multilink, 11-6
  Multiple Timeslots, 3-22, 3-39
  Multipoint, 3-13, 14-7

N200, 5-6, 7-6
N201, 5-7, 7-7
N202, 5-8
N204, 5-8
National Bits, 3-37, 3-51
NM20, 5-8, 5-9
NRZ, see Encoding
NRZ With Clock, A-6
NRZI, see Encoding
NRZI With Clock, A-6

Offline Mode, 9-12, 10-11
Online Mode, 9-3, 10-10
OTHERS, see Function Keys
Out of Frame Error, 6-12
Output Window, see Windows

Pass Through, see Transmit Mode
Pause on Error, 17-12
PCM30 CAS Framing, 3-19, 3-31, 3-45
PCM30 CCS Framing, 3-19, 3-31, 3-45
Playback
  capture RAM, 18-11
  continuous, 18-10
  data files, 18-12
  searching, 18-18
  selective, 18-10
  speed, 18-10
  triggers, 18-30
  using cursor keys, 18-10
Point to Point, 3-13, 14-7
Poll/Final Bits, 5-11, 7-8
Polling, 16-9
Power
  LED's, 20-5
  on/off switch, 2-3
  source, 3-13
  supply, 20-5
Primary Event (N200), 5-6
Primary Rate Access
  channel setup, 3-22, 3-38, 8-2
  configuration, 6-4, 7-4
drop & insert, 3-44 to 3-52
emulating, 3-27 to 3-43
loading an application, 3-23, 3-40
monitoring, 3-15 to 3-26
monitoring errors, 3-25
ports setup, 3-34, 3-48
simulating errors, 3-41
system configuration, 3-18, 3-30 to 3-33, 3-44
Primary Station, 14-4
  multipoint, 14-7
  point to point, 14-7
  poll timer, 14-7
Printer Port, 1-3
  configuration, 17-24
  parallel, 17-25
  pinouts, C-23
  serial, 17-25
Printing
  a screen, 18-25
  capture RAM, 18-22
data files, 18-24
  directories, 17-8
  line-by-line, 18-25
  source files, 17-8, 18-24
test scripts, 17-8, 18-24
  throughput graph, 18-16
Program Mode, 2-6, 2-11
Prompts, 2-7
PU Address, 13-8
RAM Filter, 18-27
Receive Loopback, 3-34, 3-35
Recording
  captured data, 18-7
  continuous, 18-5
  live data, 18-6
  playback disk, 18-12
  stopping, 18-5
  triggers, 18-30, 18-35
INDEX [continued]

Recording [continued]
  watch disk, 18-11
Red Alarm, 6-11
Regeneration, 3-36, 3-37
Remote Mode, 2-6, 2-10
Remote Port, 1-3
  configuration, 17-26
pinouts, C-26
Repairs/Service, 20-1 to 20-6
Response Time, 18-21
Rest Idle Character, 9-7
RJ45(DB9) Config., 3-32, 3-46
RR Polling Action, 5-4, 7-4
RTS/CTS Control, 86-6
Bit Error, 3-26, 3-42
SIT Bus
  activation, 5-1
  configuration, 3-13
Saving
  configurations, 9-8, 10-8
  files, 17-10
Script Keys, 18-37
Script Window, 18-37
Searching
  for block numbers, 18-18
  for strings, 18-20
  for timestamps, 18-18
  in a data file, 18-18
  in a source file, 17-10
  in capture RAM, 18-18
Secondary Station(s), 14-4
  links, 14-6
  setup, 14-7
Self Test, 2-3
Selfloop, 5-52
Sending
  Bisync messages, 16-9 to 16-12
  ISDN frames, 5-13, 5-14, 5-19, 7-10, 7-15
  ISDN messages, 5-16, 5-19, 7-13, 7-15
  SDLC frames, 14-9
  SNA information, 14-10
  strings, 10-13
  X.25 frames and packets, 12-19
Sequence Numbers, 5-11, 7-9
Setup, 2-2
  date and time, 17-27
  printer port, 17-24
  remote port, 17-26
Short Display, 18-13
Shutdown, 17-11
SI 1/2, 3-37, 3-51
SIGN-MAG, see Voice Encoding
Simulating Errors, 3-41
Simulation Mode, 10-4
Single Link, 11-6
Source Files
  copying/pasting a line, 17-10
  creating, 17-10
  deleting text, 17-10
  editing, 17-9, 17-10
  listing, 17-7
  overwriting text, 17-10
  printing, 17-8, 18-24
  saving, 17-10
  searching in, 17-10
Split Display, 18-14
Stand-alone Utilities
  diagnostics, 2-3
  formatting the hard disk, 17-17
State Machine
  automatic, 5-5, 7-5
  counters, 5-13, 7-10
  manual, 5-5, 7-5
  variables, 5-12, 7-9
Strip SYNC, 9-7
SYNC Character, 9-5
SYNC Reset Character, 9-7
Synchronized Error, 6-11
T1 D4 4F/M Framing, 3-18, 3-30, 3-45
T1 D4 Framing, 3-18, 3-30, 3-45
T1 ESF Framing, 3-19, 3-31, 3-45
T200 Timer, 7-6
T201 Timer, 5-8
T202 Timer, 5-7
T203 Timer, 5-4, 7-4
TEI Request, 5-18
  N202, 5-8
  N204, 5-8
  T201 timer, 5-8
  T202 timer, 5-7
Terminal Emulator
  BREAK signal, 17-33
  configuration, 17-29
  starting, 17-31
Terminating Resistor, 3-11
Termination Impedance, 3-10, 3-19, 3-31, 3-46
Test Chan 1/2, see Channels, selecting
Test Port Status Display, 17-4
Test Script Window, see Windows
Test Scripts, 18-36 to 18-38
  assigning function keys, 18-38
  displaying messages, 18-37
  editing, 17-9, 17-10
  loading, 18-36
  printing, 17-8, 18-24
  running, 18-37
  stopping, 18-38
TestPorts, 18-2
INDEX [continued]

Throughput Graph, 18-16
Timers
  Idle Link (T203), 5-4, 7-4
  polling, 5-4, 7-4, 14-7
Primary (T200), 5-6, 7-6
TEI ID Check (T201), 5-8
TEI Request (T202), 5-7
XID Negotiate (T200), 5-8, 5-9
Timeslots, 8-5
Timestamps
  display format, 18-15
  searching, 18-18
Timing
  LOOP/LOCAL, 3-32
  LOOP/LOOP, 3-20
TM20 Timer, 5-8, 5-9
TO DCE/DTE, 10-4, 12-7, 14-6, 16-4
Tone Generation, 3-43
Topic Bar, 2-6
Trace Statements
  display format, 18-14, 18-16
  filters, 18-27
Transmit Equalization, 3-32, 3-46
Transmit Mode
  alternate/simultaneous, 14-7
  idle, 3-34, 3-35, 3-49, 3-50
  loopback, 3-34
  pass through, 3-49, 3-50
  queuing procedure, 5-15, 7-12
reorientation, 3-36, 3-37
Triggers, 18-29 to 18-35
  actions, 18-34, 18-35
  alarm, 18-31, 18-34
  armed, 18-30, 18-34
  capture RAM, 18-30, 18-35
  conditions, 18-29 to 18-33
  data message, 18-35
  delay, 11-12
  direction, 18-30
  disk recording, 18-30, 18-35
  highlight, 18-35
  lead transitions, 18-32, 18-33
  mask, 18-31
  playback, 18-30
  RAM recording, 18-35
  SAPI, 4-16
  screen display, 18-35
  strings, 18-31
  TEI, 4-16
  unarmed, 18-30, 18-34
  user message, 18-35
TS Bit Rate, 3-20, 3-32, 3-46

VA, 5-12, 7-9
VOICE, 3-36, 3-50
Voice
  emulating, 5-50
  monitoring, 4-17
Voice Chan, see Channels, selecting
Voice Encoding
  A-law, 3-8, 3-13, 3-23, 3-39, 8-3
  sign magnitude, 3-23, 3-39, 8-3
  u-law, 3-8, 3-13, 3-23, 3-39, 8-3
VR, 5-13, 7-10
VS, 5-12, 7-9

WAN Interface
  emulating, 3-4, 3-5
  loading an application, 3-3, 3-5
  monitoring, 3-2, 3-3
Watch Disk, 18-11
Watch RAM, 18-11
Wildcards, 17-5, 18-31
Windows
  Data Window, 18-3, 18-10
dual, 18-15
  Output Window, 18-37
  size, 5-7, 7-7
  Test Script Window, 18-37
  User Window, 18-4
Write Protect, 17-6

XID Negotiate
  N201, 5-7
  NM20, 5-8, 5-9
  procedure, 5-4
  T200 timer, 5-6
  TM20 timer, 5-8, 5-9
Y-Cable, using a, 3-6
Yellow Alarm, 3-41, 6-12

U LAW, see Voice Encoding
Unarming Triggers, 18-30, 18-34
User Window, see Windows