PT500
USER MANUAL

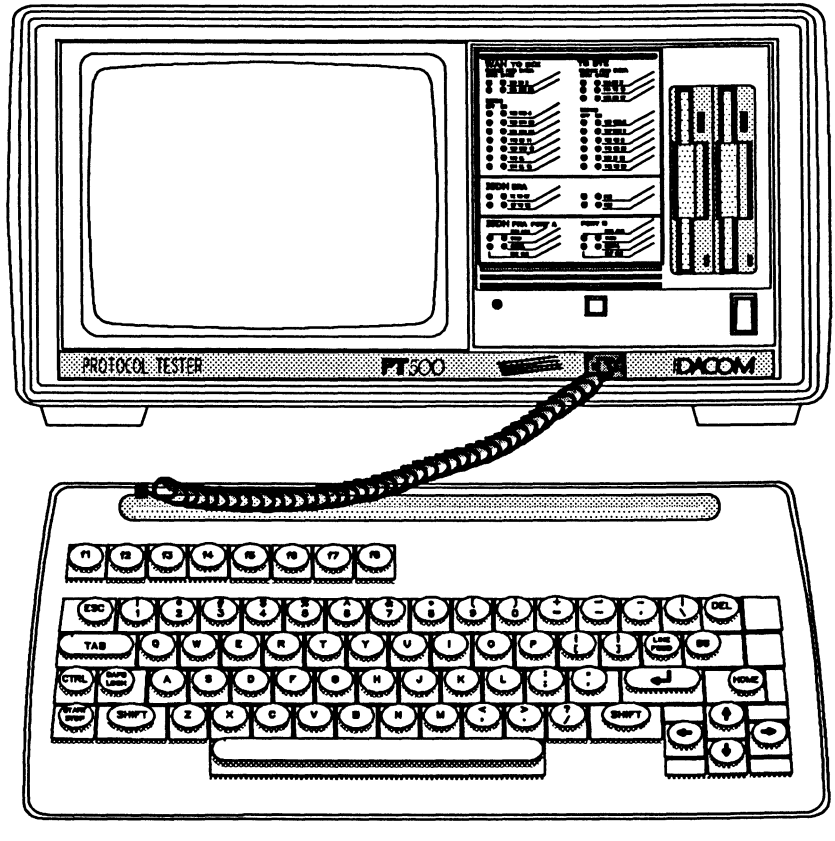
IDACOM

A division of

HEWLETT PACKARD

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.

PREFACE

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.

Hewlett-Packard makes no warranty of any kind with regard to this material, including, but not limited to, the implied warranties of merchantability and fitness for a particular purpose. Hewlett-Packard shall not be liable for errors contained herein or for incidental or consequential damages in connection with the furnishing, performance, or use of this material.

P/N 6000-1003

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

TABLE OF CONTENTS [continued]

TABLE OF CONTENTS [continued]

TABLE OF CONTENTS [continued]

TABLE OF CONTENTS [continued]

TABLE OF CONTENTS [continued]

TABLE OF CONTENTS [continued]

TABLE OF CONTENTS [continued]

TABLE OF CONTENTS [continued]

TABLE OF CONTENTS [continued]

TABLE OF CONTENTS [continued]

TABLE OF CONTENTS [continued]

LIST OF FIGURES

LIST OF FIGURES [continued]

LIST OF FIGURES [continued]

LIST OF TABLES

1
INTRODUCTION

1.1 Front and Back Views

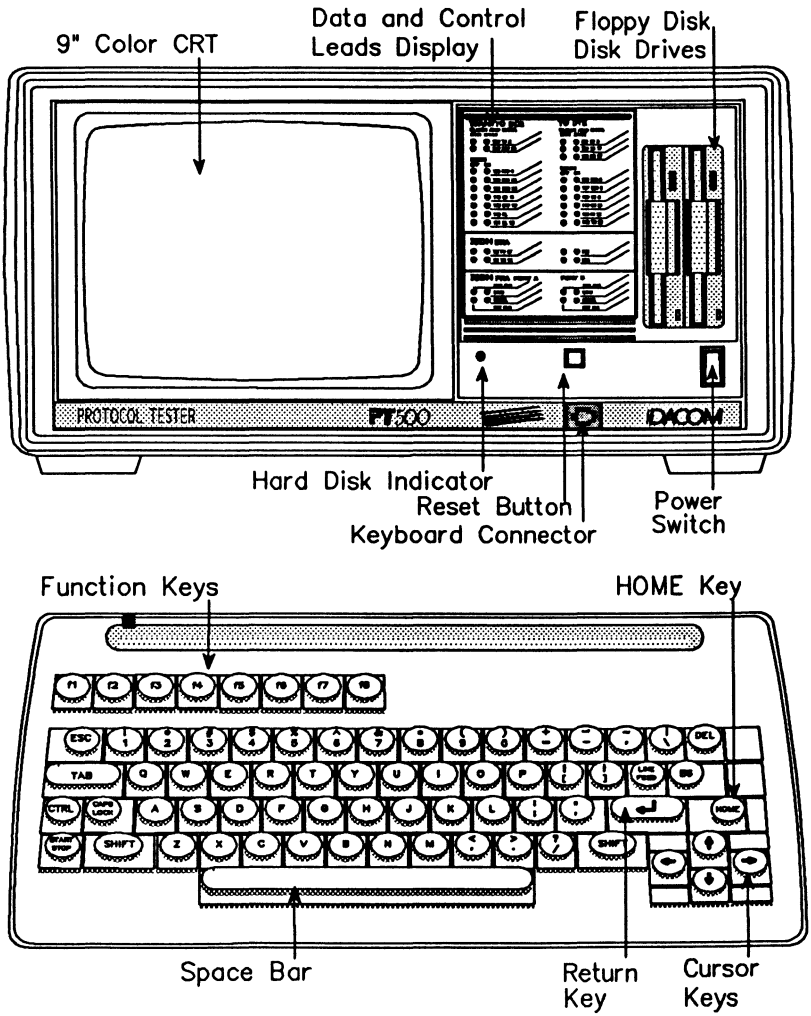


Figure 1-1 Front View

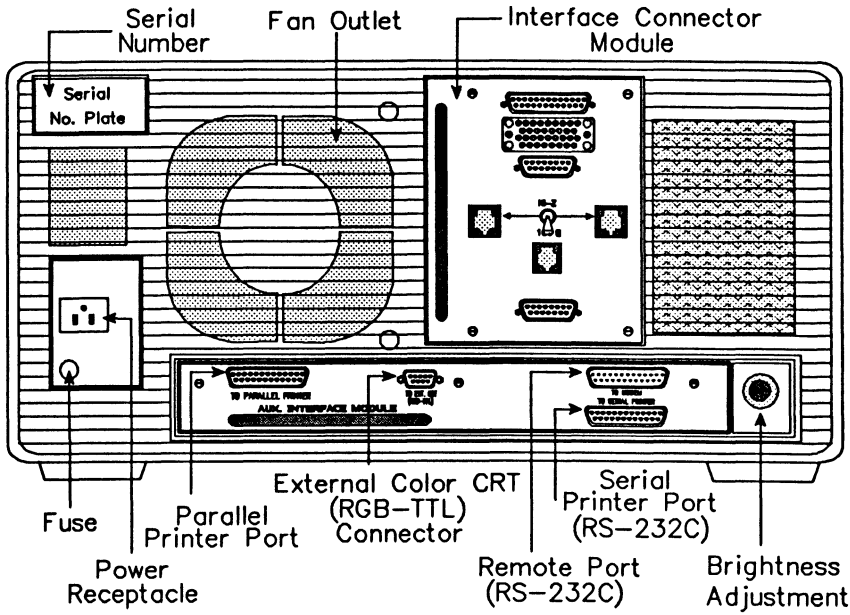


Figure 1–2 Back View

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

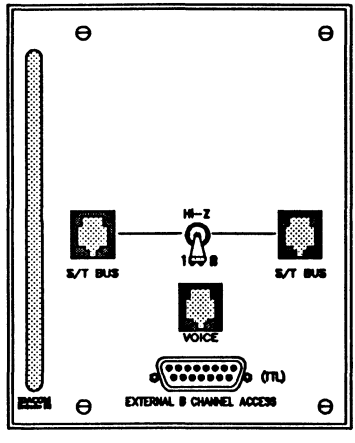


Figure 1-3 D-Channel Connector Module

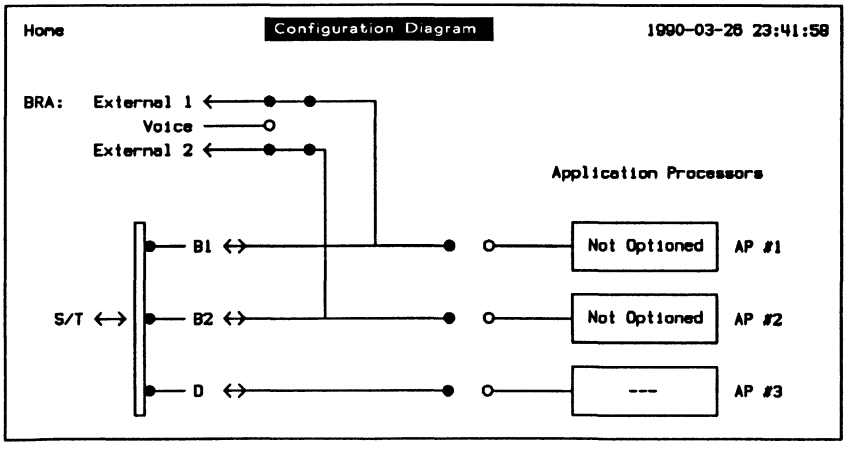


Figure 1-4 D-Channel Configuration Diagram

WAN

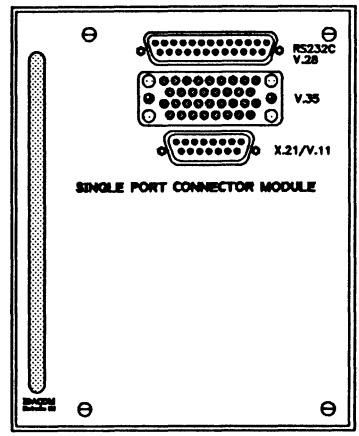


Figure 1-5 WAN Connector Module

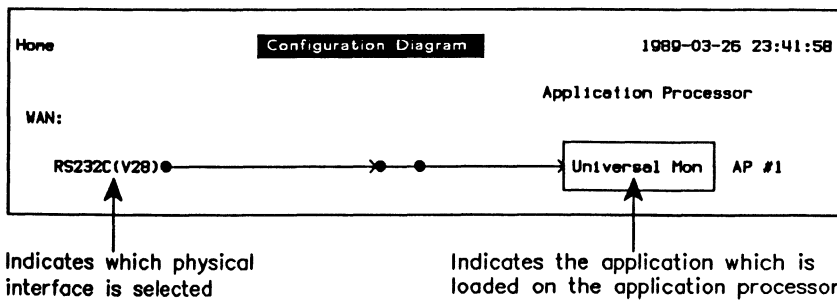


Figure 1-6 WAN Configuration Diagram

WAN/WAN

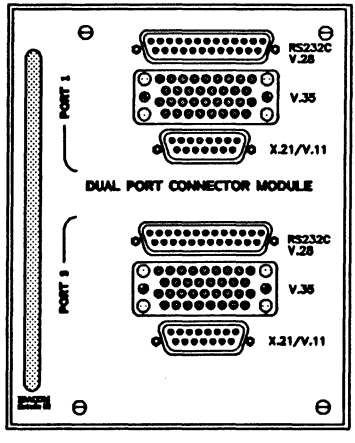


Figure 1-7 WAN/WAN Connector Module

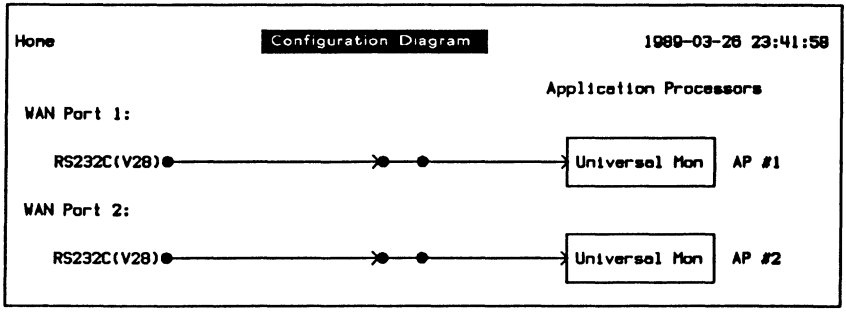


Figure 1-8 WAN/WAN Configuration Diagram

PRA

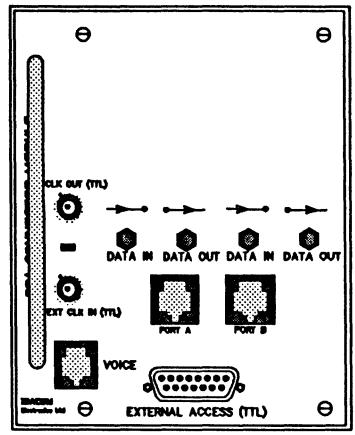


Figure 1-9 PRA Connector Module

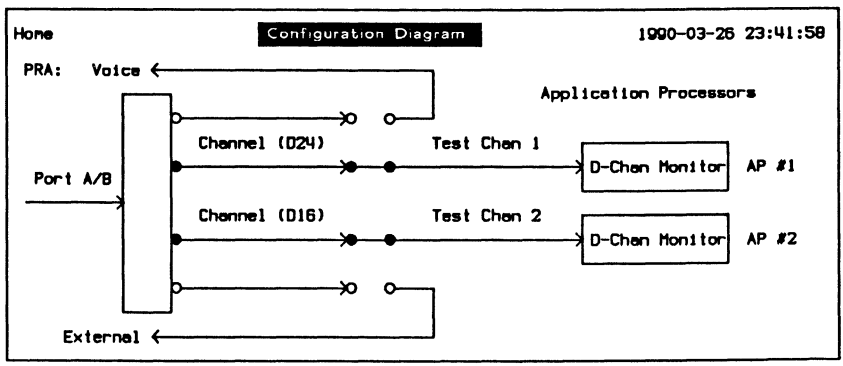


Figure 1-10 PRA Monitor Configuration Diagram

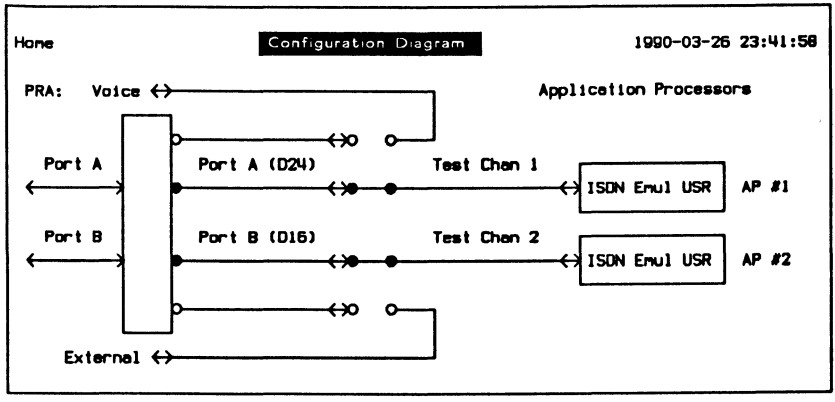


Figure 1-11 PRA Emulation Configuration Diagram

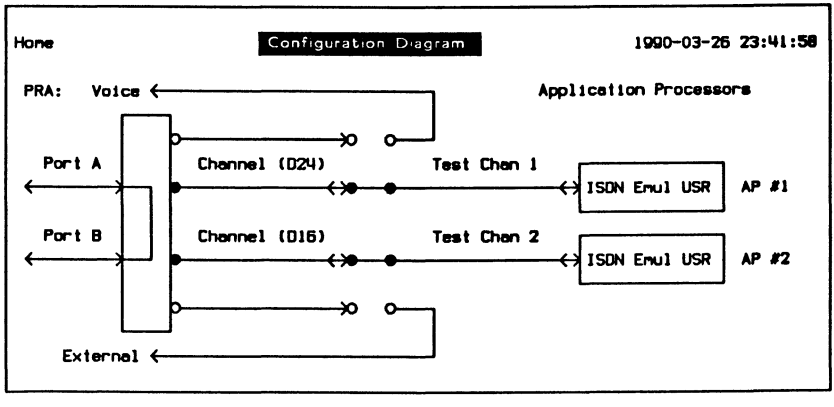


Figure 1-12 PRA Drop & Insert Configuration Diagram

PRA/WAN

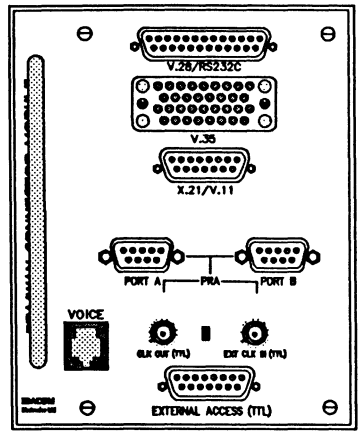


Figure 1-13 PRA/WAN Connector Module

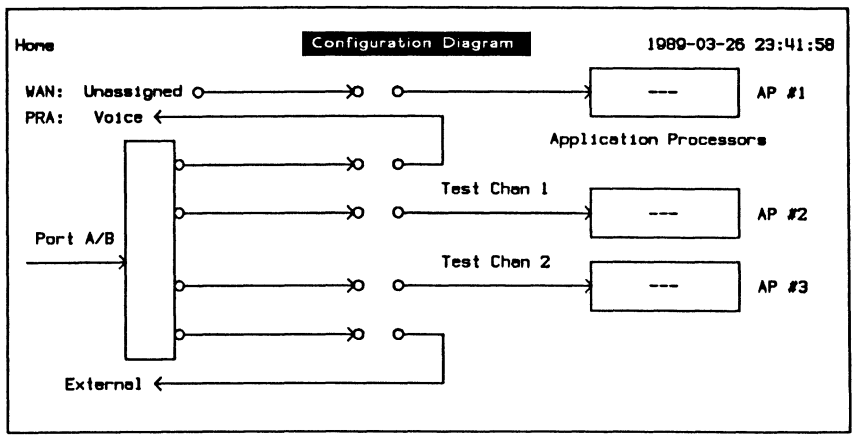


Figure 1-14 PRA/WAN Monitor Configuration Diagram

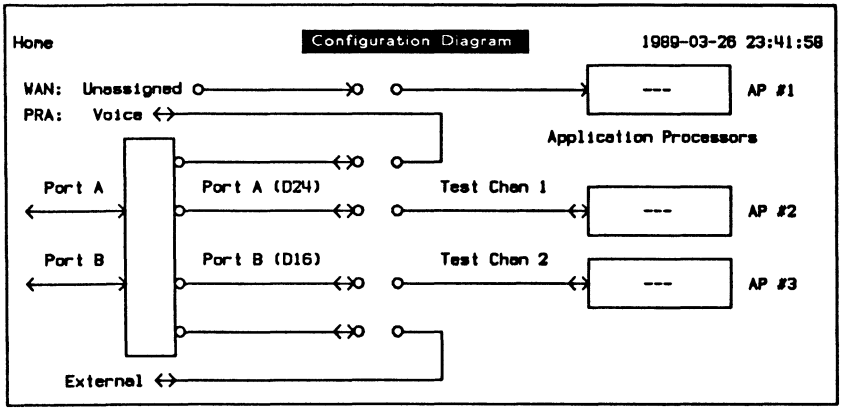


Figure 1-15 PRA/WAN Emulation Configuration Diagram

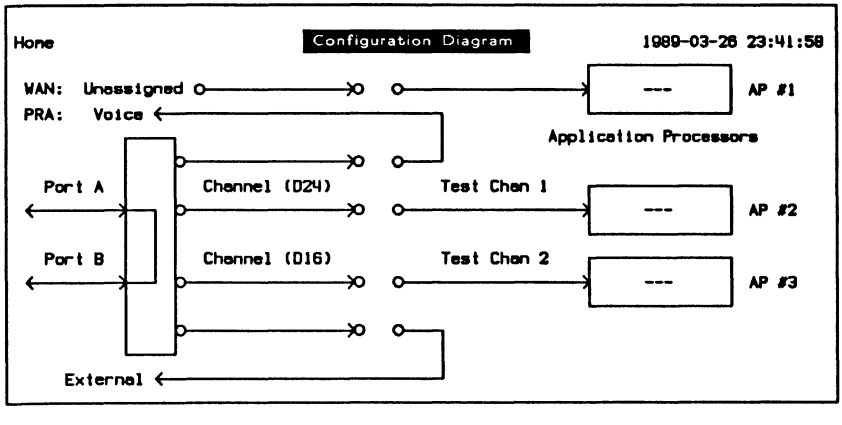


Figure 1-16 PRA/WAN Drop & Insert Configuration Diagram

BRA

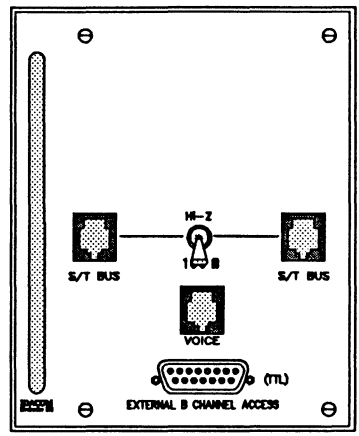


Figure 1-17 BRA Connector Module

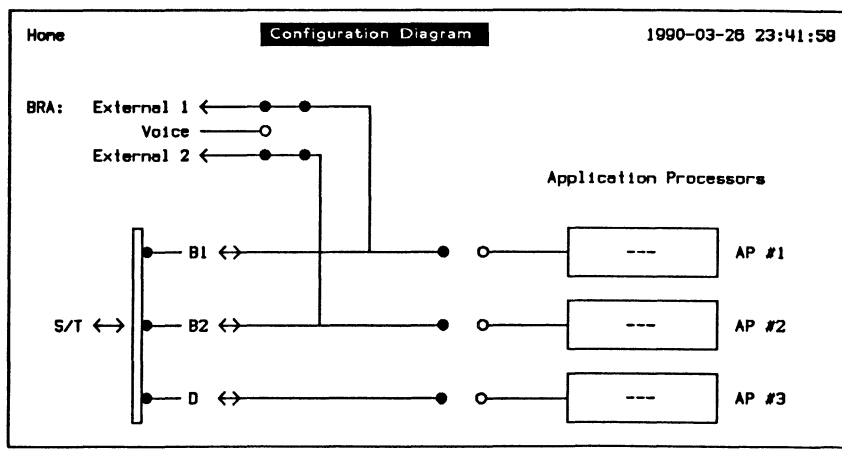


Figure 1-18 BRA Configuration Diagram

BRA/WAN

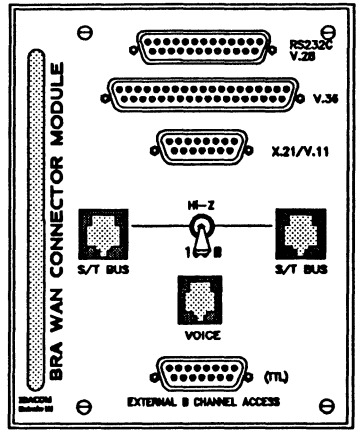


Figure 1-19 BRA/WAN Connector Module

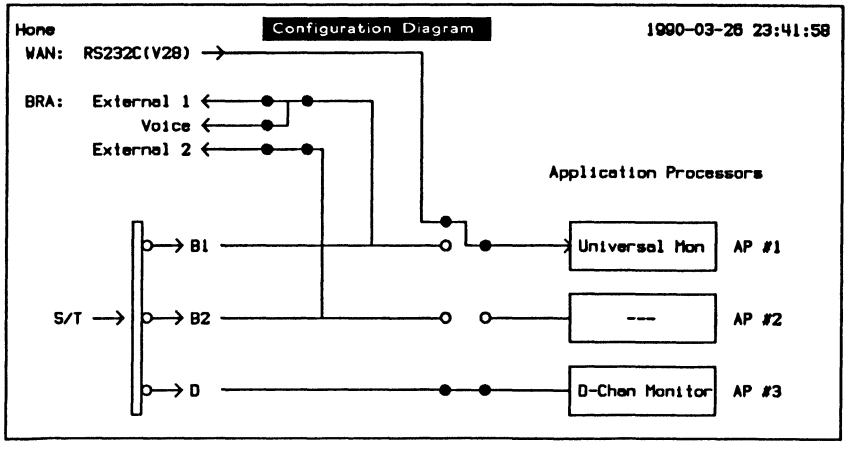


Figure 1-20 BRA/WAN Monitor Configuration Diagram

BRA/BRA

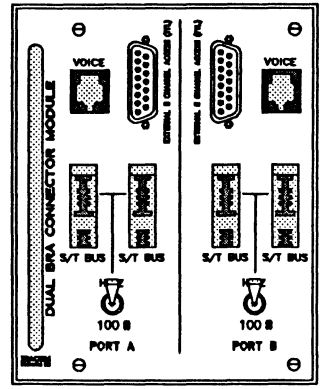


Figure 1-21 BRA/BRA Connector Module

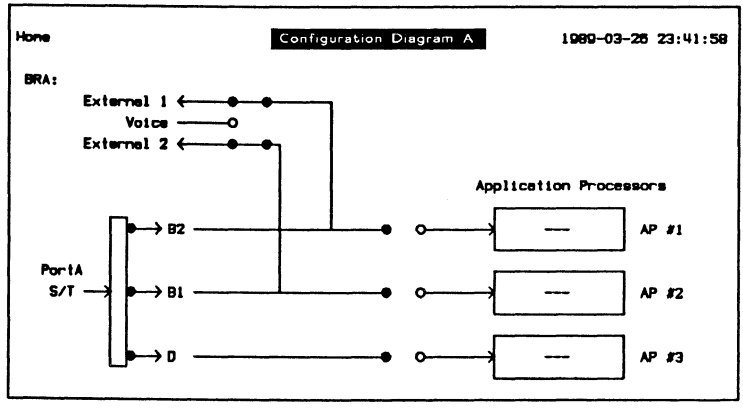


Figure 1-22 BRA/BRA Port A Configuration Diagram

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).

PRA/BRA/WAN

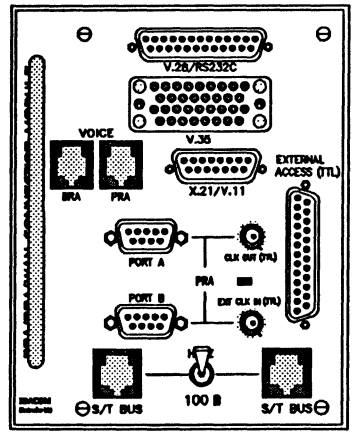


Figure 1-23 PRA/BRA/WAN Connector Module

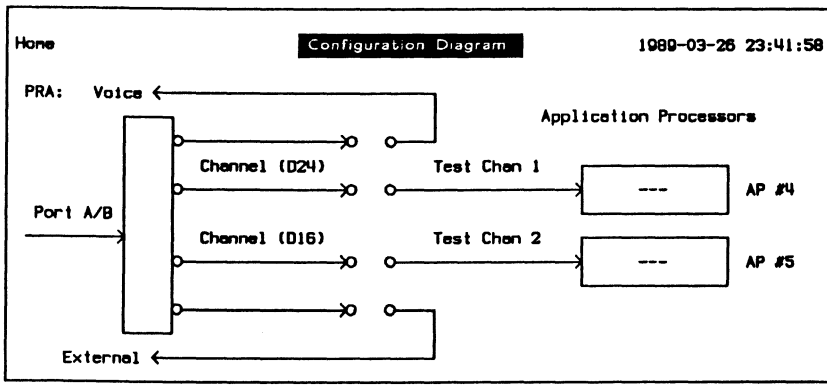


Figure 1-24 PRA/BRA/WAN Monitor Configuration Diagram

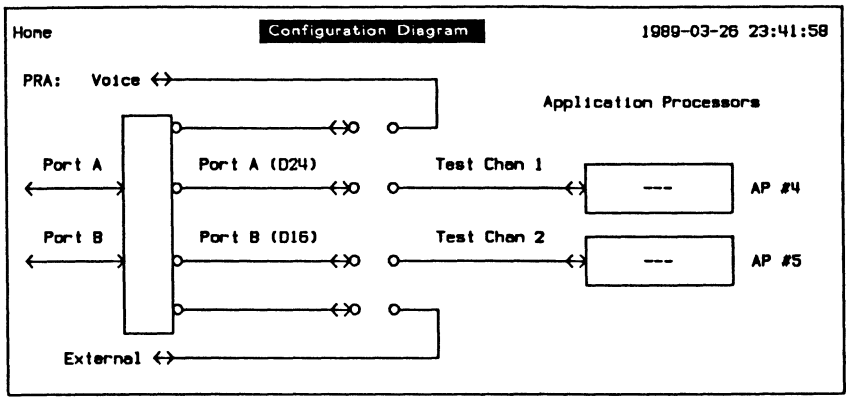


Figure 1-25 PRA/BRA/WAN Emulation Configuration Diagram

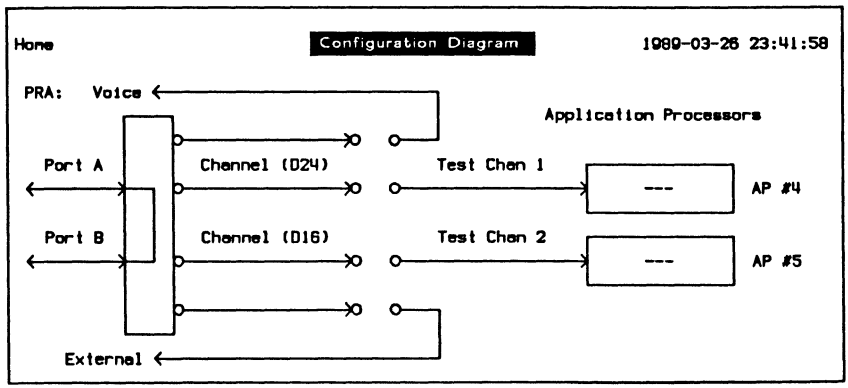


Figure 1-26 PRA/BRA/WAN Drop & Insert Configuration Diagram

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.

1.3 System Architecture

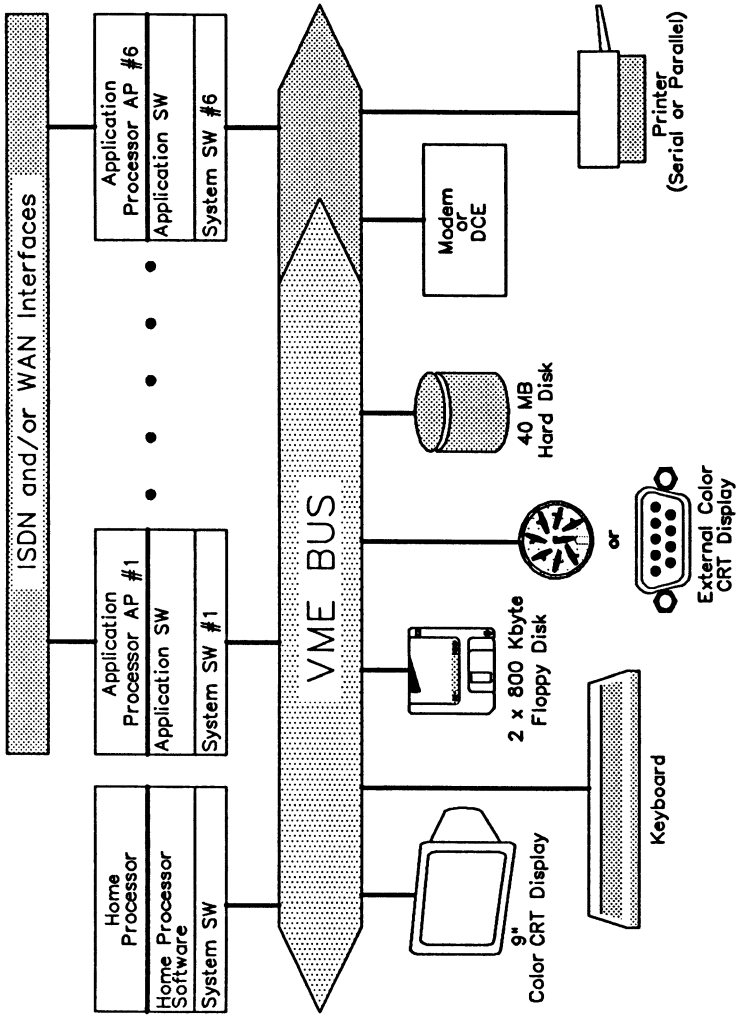


Figure 1-27 System Architecture

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.

Application Processor: 32 bit, 16 MHz 1(2) MB RAM
Test Script Buffer
Capture Buffer
Application Software
Operating System

Home Processor: 32 bit, 16 MHz 1(2) MB RAM
User/Machine Interface
Edit Buffer
Editor & File Manipulation
Operating System

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.

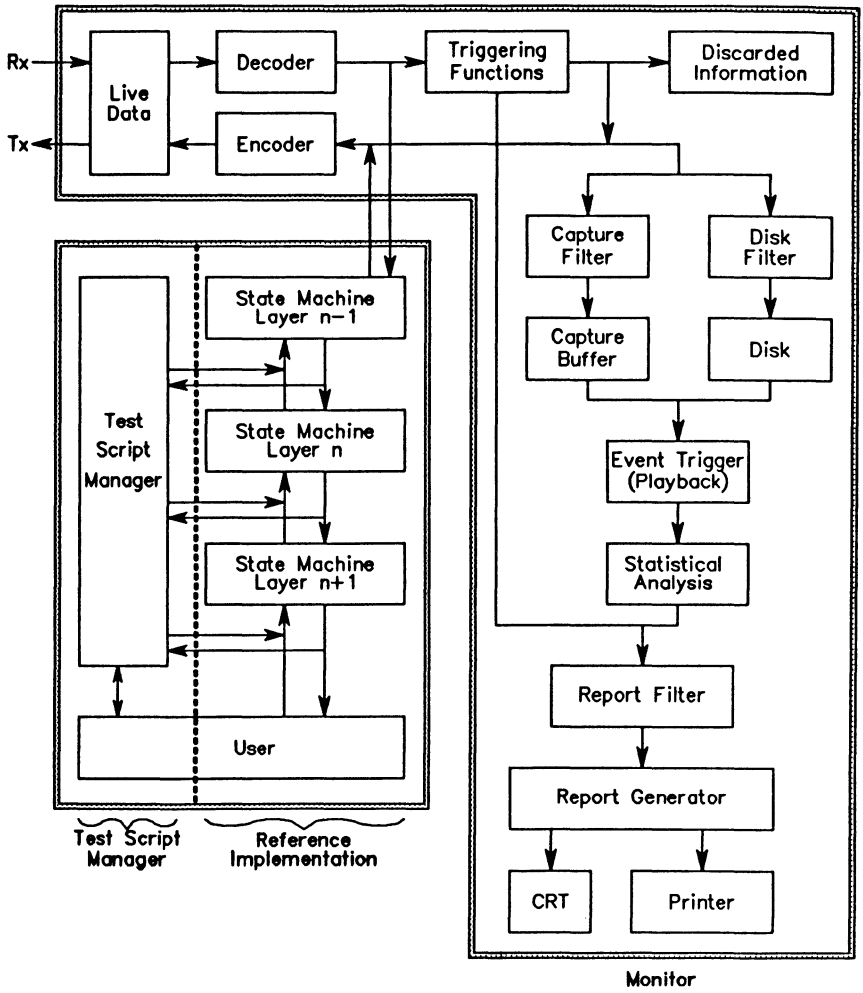


Figure 1-28 Conceptual Data Flow Diagram

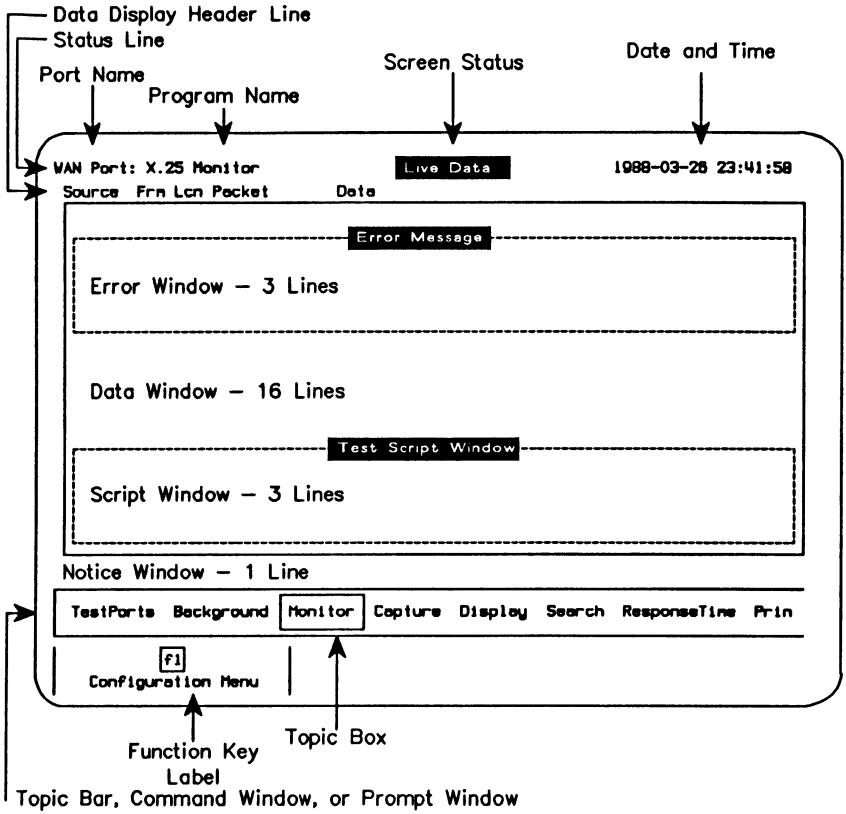


Figure 1-29 Application Program Screen Layout

2
GETTING STARTED

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.

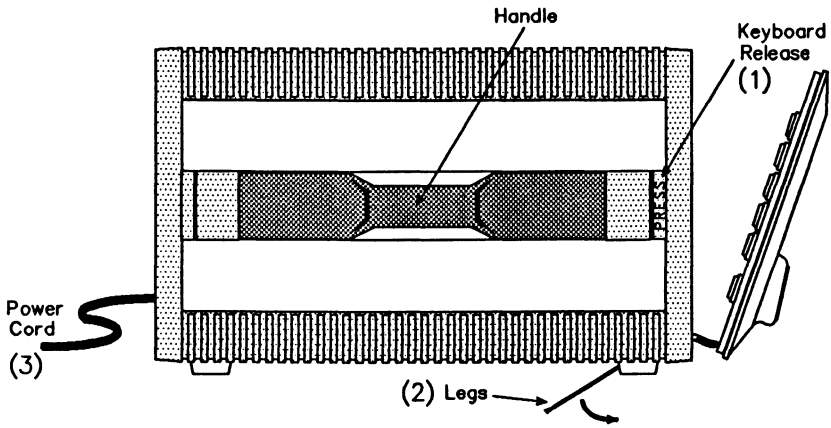


Figure 2-1 Side View

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:

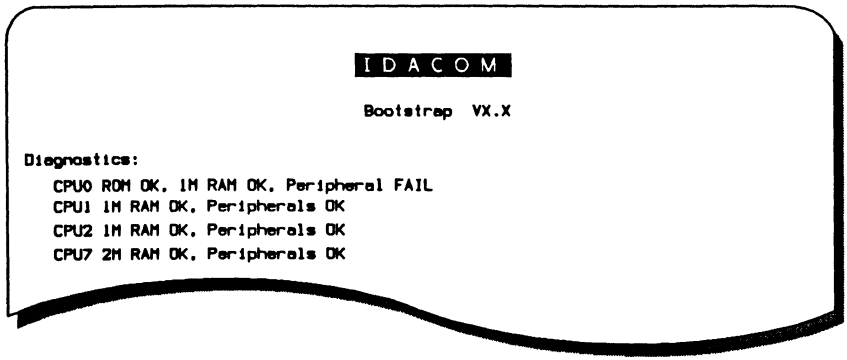


Figure 2–2 Self Test With Fail Condition

- 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.

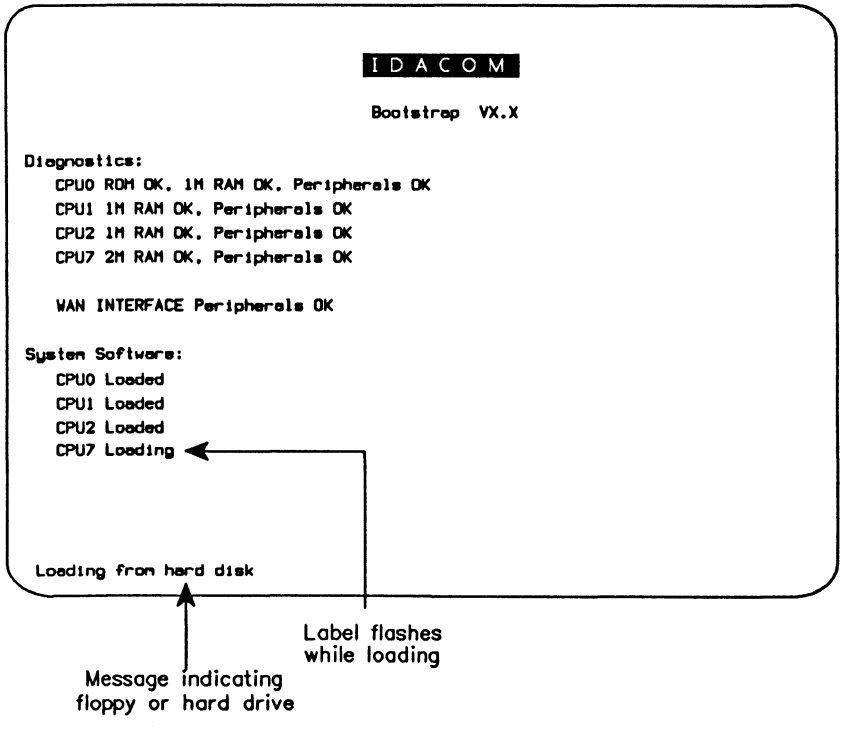


Figure 2-3 Loading System Software

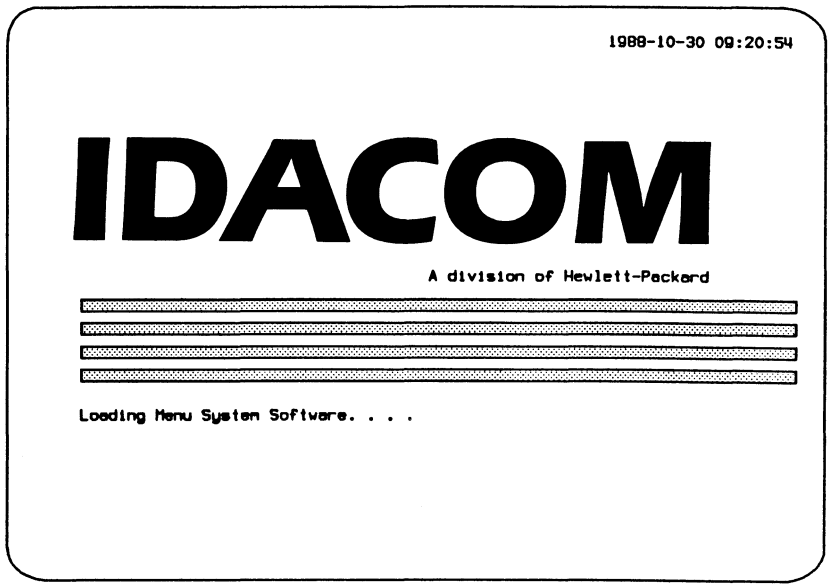
NOTE

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.

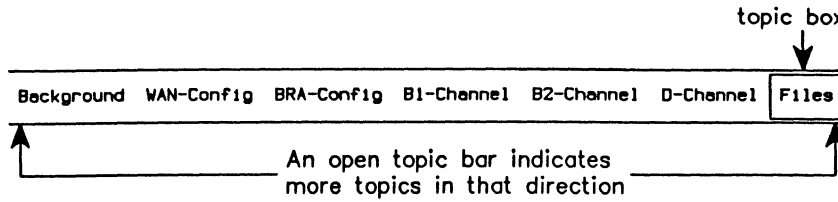
Program Mode
A test script which interacts with a monitor or emulation application program controls the operation of the tester. See the Programmer's Reference Manual.

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.



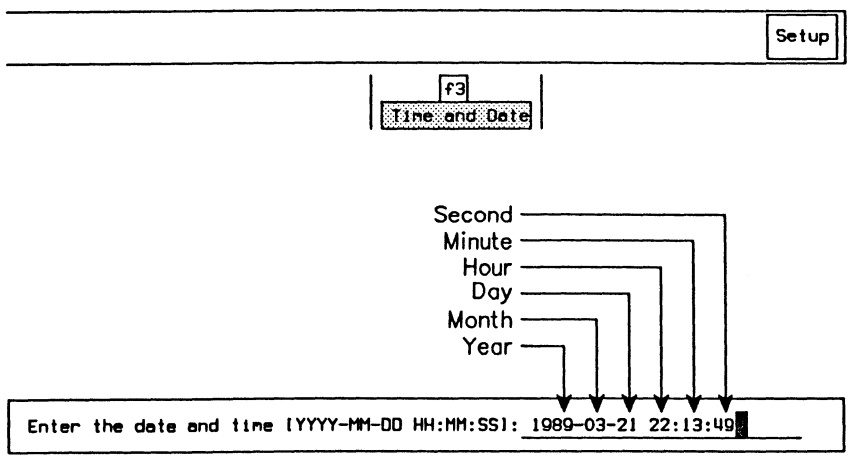
To choose a topic:

- 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.



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

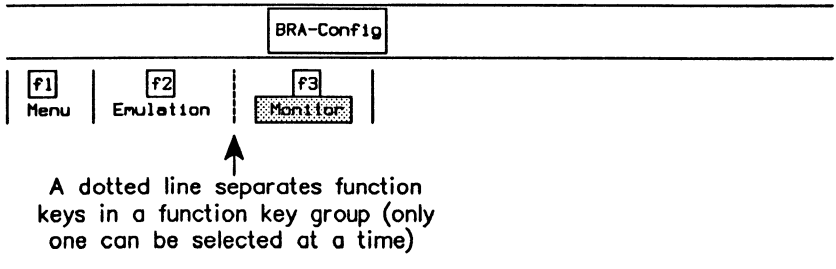
Clear	Clears the contents of the current field.
Delete	Deletes the character under the cursor.
Next Field	Moves the cursor to the end of the next field.
Execute	Performs the prompt action.
Exit	Leaves the prompt.

NOTE

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

Function Keys

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



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:

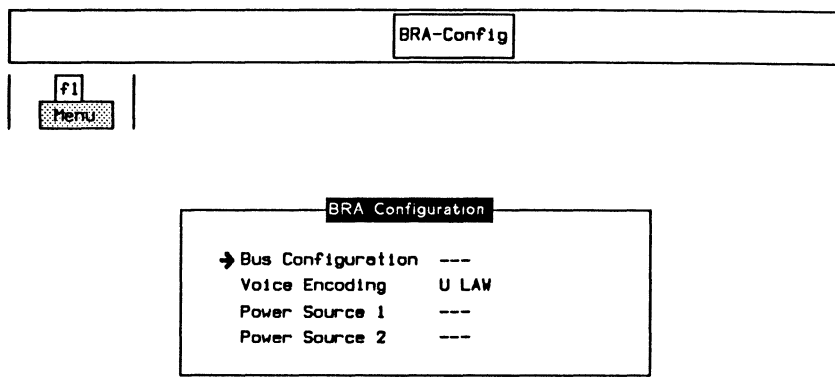
- exit from a prompt after pressing *Execute*;
- close the prompt if pressed without pressing *Execute* first (i.e. the operation is not executed and/or the parameter value is not assigned); or
- return to a previous menu or to the topic bar.

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, PRA/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, &	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, & PRA/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
TESTING CONFIGURATIONS

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.

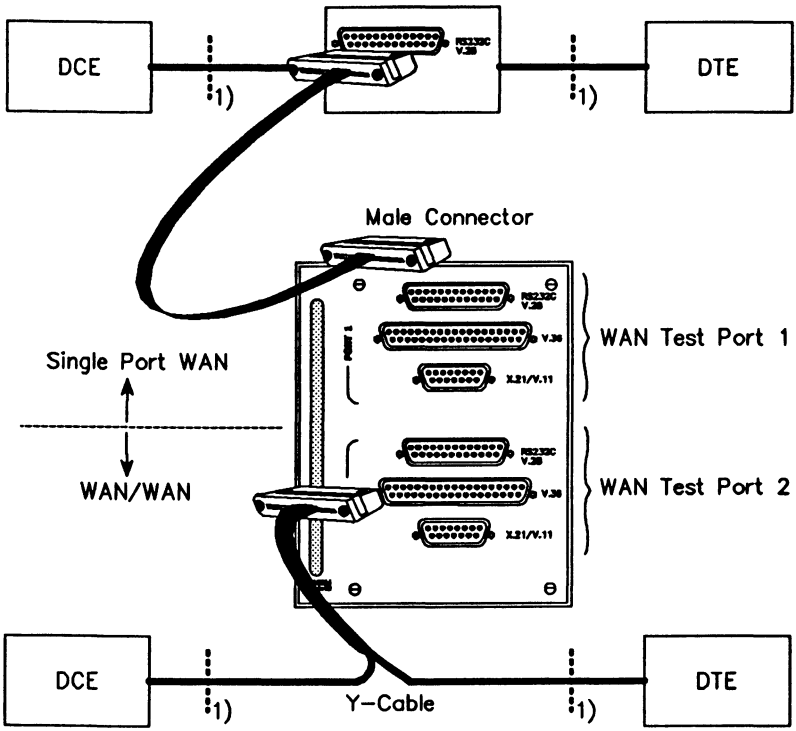


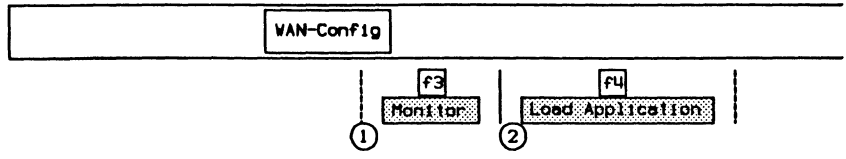
Figure 3-1 Monitoring at a WAN Interface

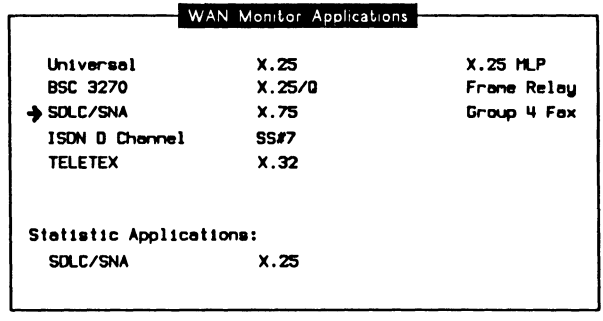
NOTE
WAN Test Port 2 does not support control and data lead status display via the LED's on the front panel.

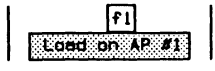
1 Physical interface according to: RS-232C/V.28, V.35, V.36 or V.11/X.21.

Loading an Application

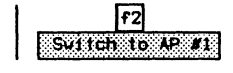
Example:
Load the SDLC/SNA Monitor program on AP #1 to monitor data on the WAN interface.







When the application has finished loading:



3.2 Emulating at a WAN Interface (Interactive Testing)

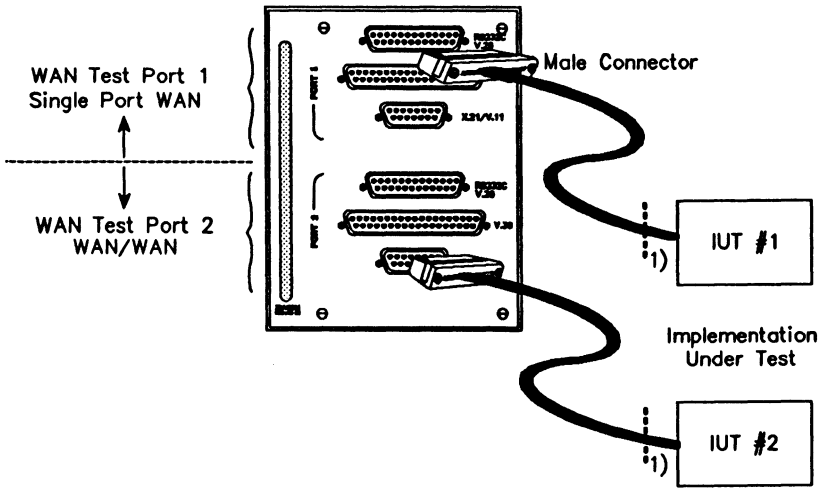


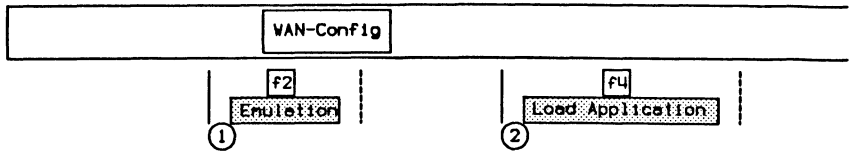
Figure 3-2 Emulating at a WAN Interface

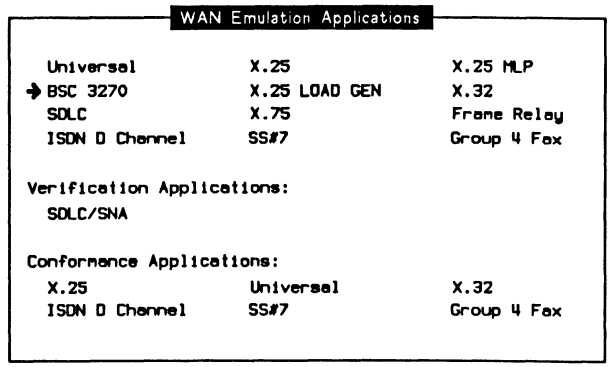
NOTE
WAN Test Port 2 does not support control and data lead status display via the LED's on the front panel.

1 Physical interface according to: RS-232C/V.28, V.35, V.36 or V.11/X.21.

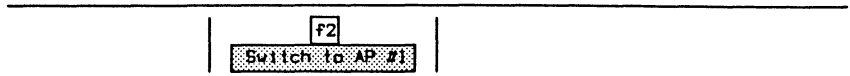
Loading an Application

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

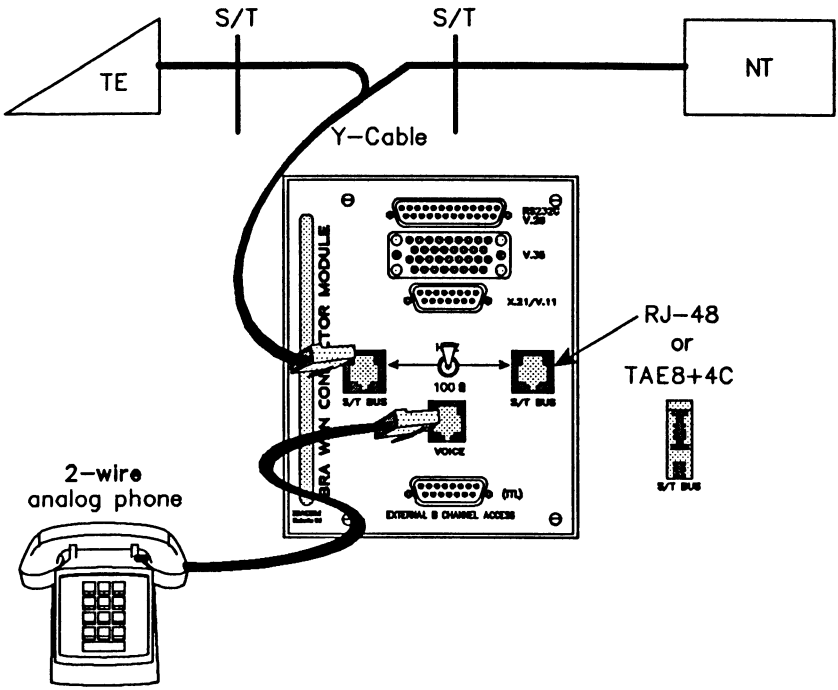


Figure 3-3 Monitoring at the Basic Rate Access Using a Y-Cable

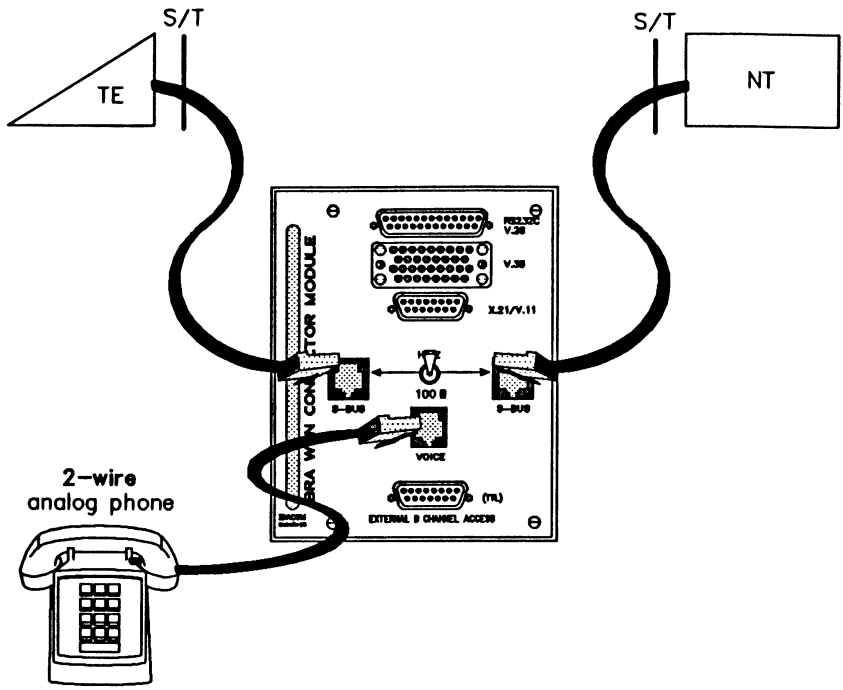
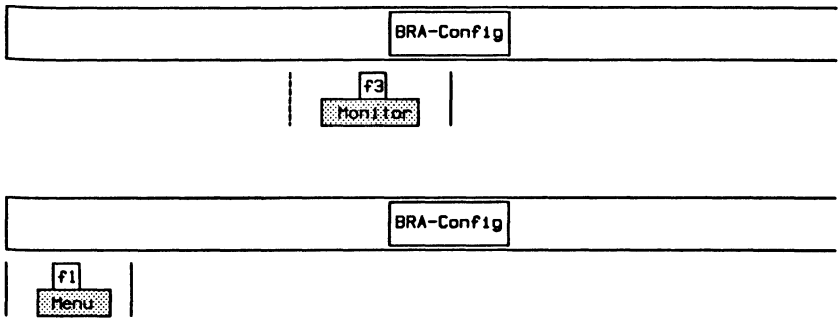


Figure 3-4 Monitoring at the Basic Rate Access Without a Y-Cable

Configuring the Interface



BRA Configuration

→ Bus Configuration ---
Voice Encoding U LAW
Power Source 1 ---
Power Source 2 ---

→ *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.

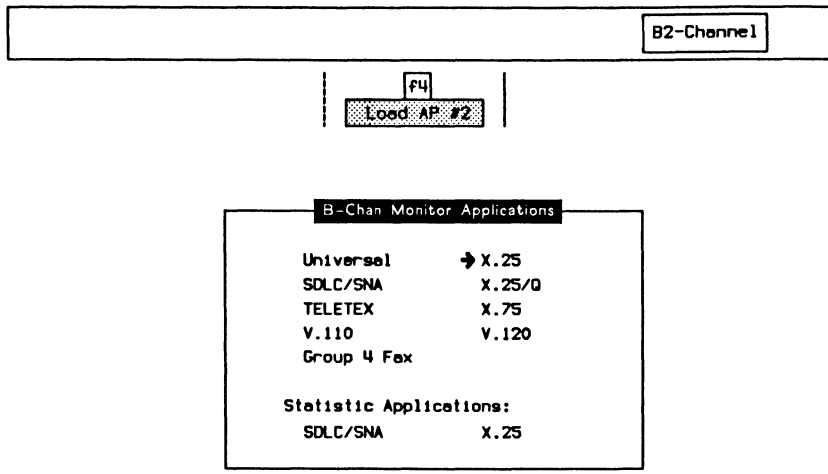
A LAW Selects encoding according to Rec. G.711 A-law.

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

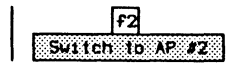
Loading an Application

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)

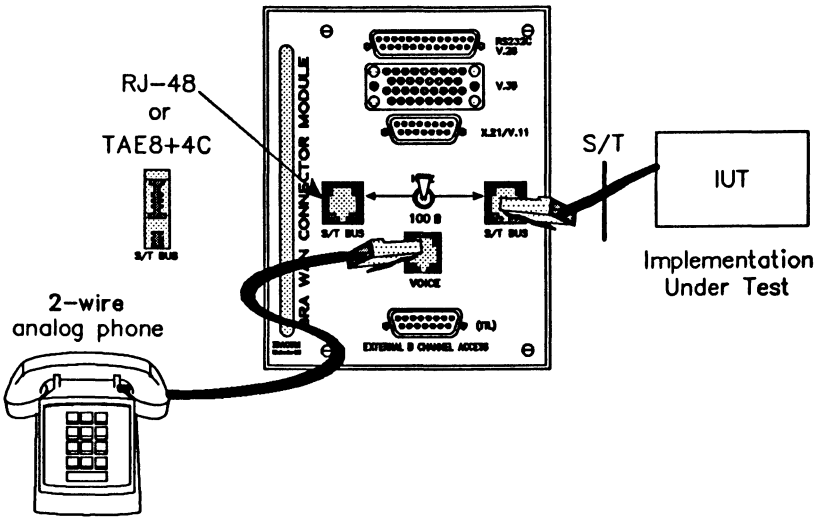


Figure 3-5 Emulating at the Basic Rate Access

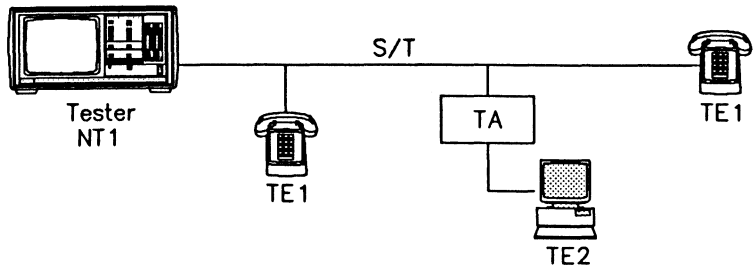
Setting the Termination Impedance

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.

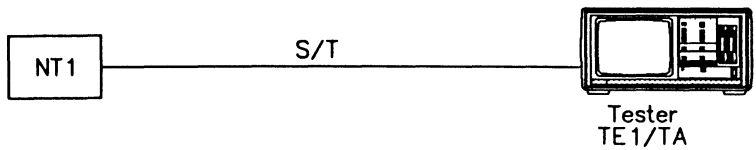
NOTE
Ensure that the S/T bus is properly terminated and is a valid bus configuration (Refer to CCITT Rec. I.430).

Set to 100 ohm:

- if emulating an NT1.

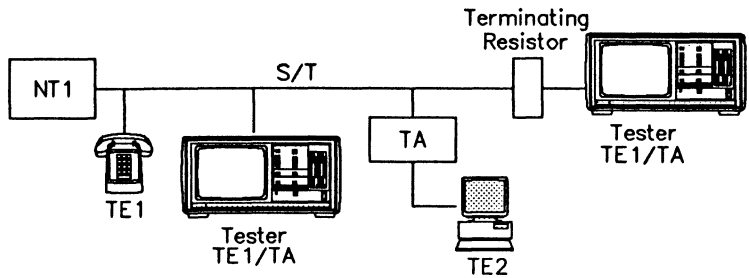


- if emulating a TE1 or TA on an S/T bus **without** a terminating resistor.



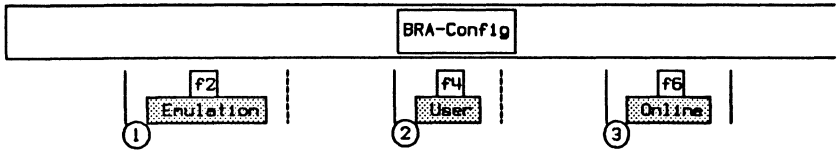
Set to Hi-Z:

- 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.

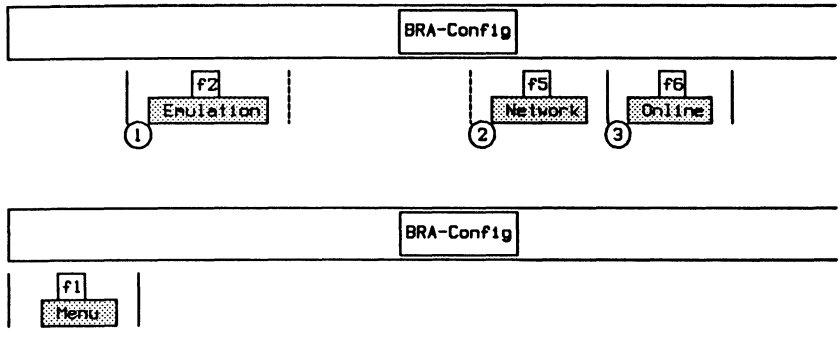


Configuring the Interface

For ISDN D-Channel User (TE) Emulation:



For ISDN D-Channel Network (NT) Emulation:



BRA Configuration

→ Bus Configuration	POINT TO POINT
Voice Encoding	U LAW
Power Source 1	---
Power Source 2	---

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. I.430).

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

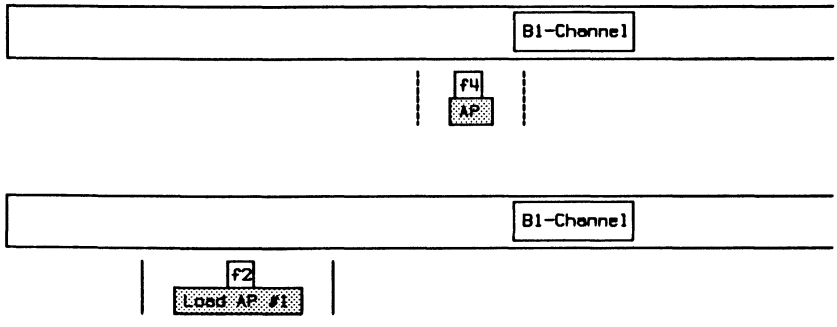
NOTE

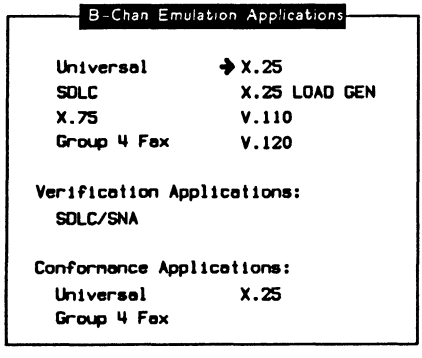
FORWARD and REVERSE polarity are defined according to CCITT Rec. I.430 specifications. Some National specifications may be different.

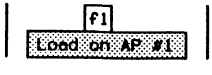
Loading an Application

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.

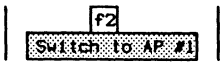
Example:
Load the X.25 Emulation program on AP #1 to emulate data transfer on the B1-Channel.







When the application has finished loading:



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

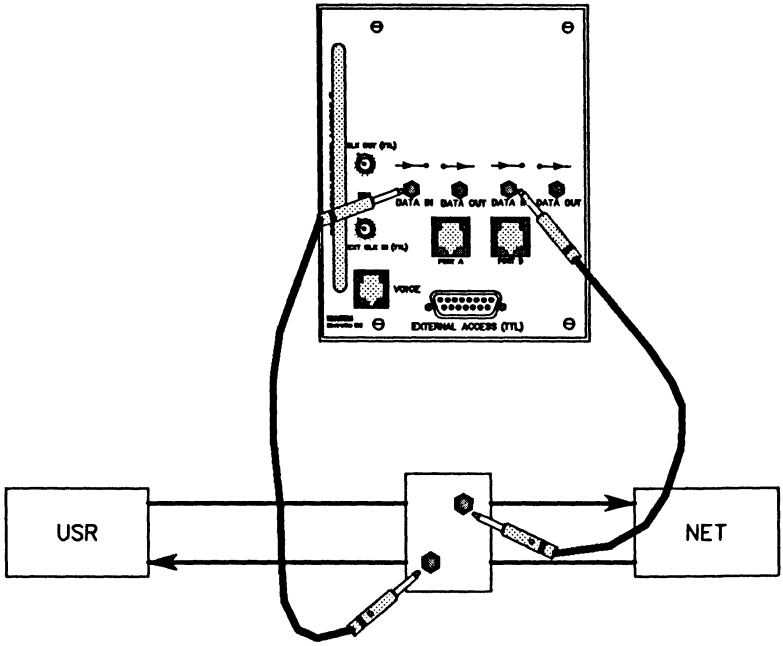


Figure 3–6 Monitoring at the Primary Rate Access – (T1) Bantam

T1 – Using RJ-48C Connectors

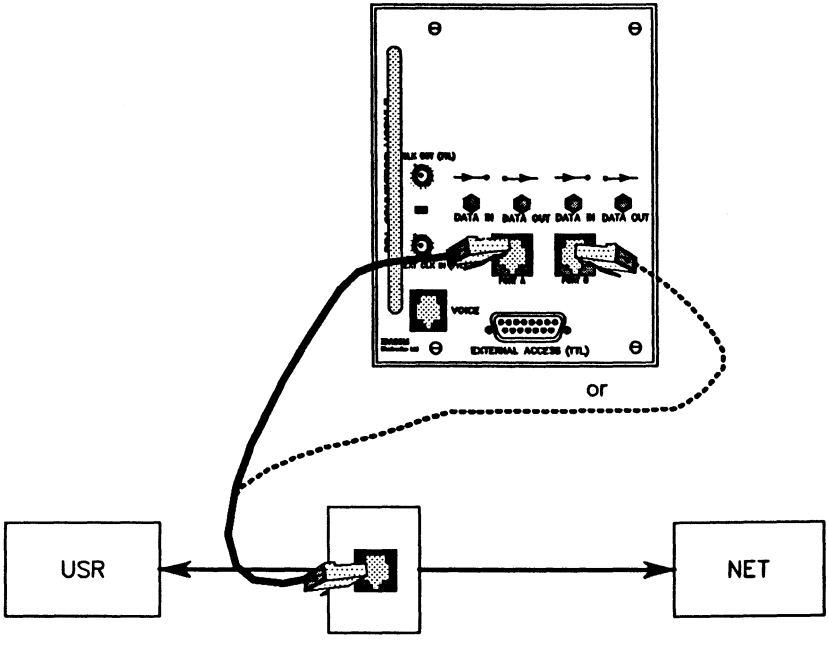


Figure 3-7 Monitoring at the Primary Rate Access – (T1) RJ-48C

CEPT – Using DB–9 Connectors

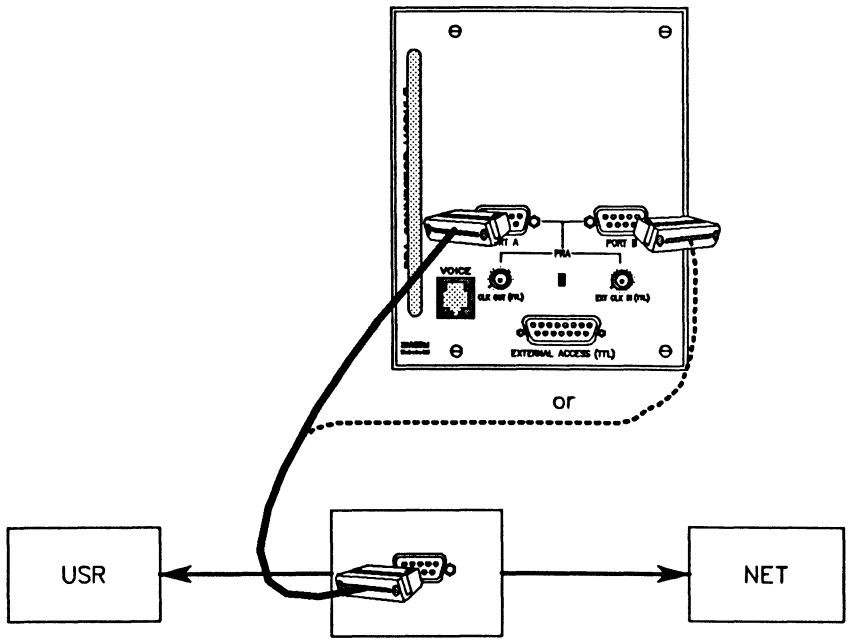
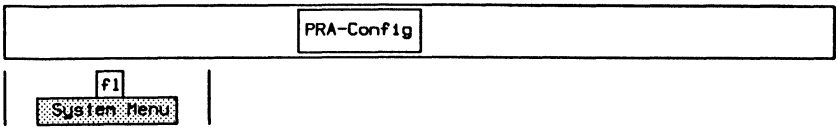


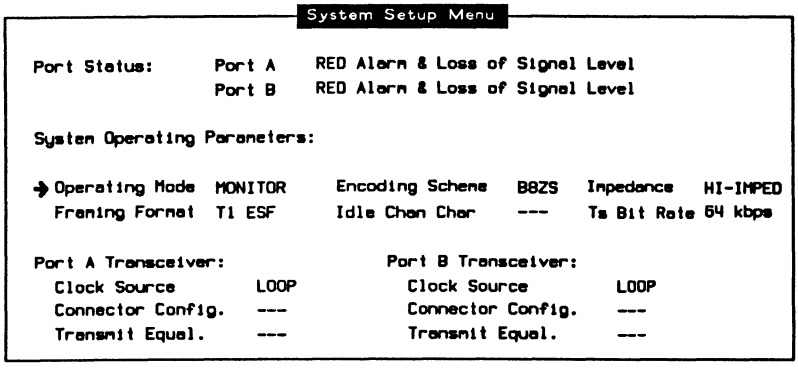
Figure 3–8 Monitoring at the Primary Rate Access – (CEPT) DB–9

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





→ *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.

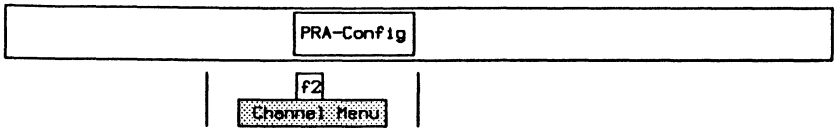
→ *Connector Config.*
Not applicable for monitor mode.

→ *Transmit Equal.*
Not applicable for monitor mode.

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

Table 3–1 Alarm and Status Messages

Channel Setup



Channel Setup Menu

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

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

→ *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.

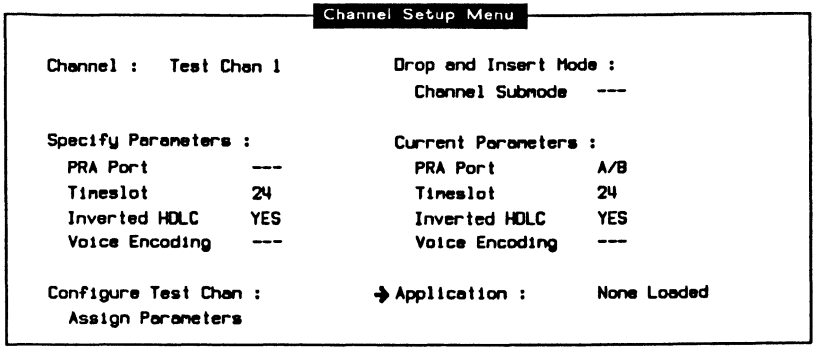
Configure Test Chan:

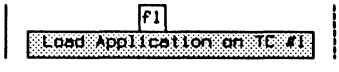
→ *Assign Parameters*
Assigns either the default parameters or those specified by the user. If the default parameters are not applicable, ensure changes are made prior to assigning parameters. After assigning, the 'Current Parameters' take on the values under 'Specify Parameters'.

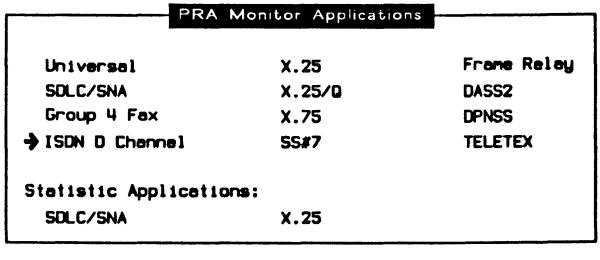
NOTE
The error message 'Channel and port have already been assigned' is displayed if the timeslot is already allocated by the other test channel.

Loading an Application

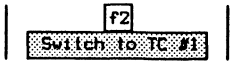
Example:
Load the ISDN D-Channel Monitor application on TC #1 to monitor data on the PRA interface.





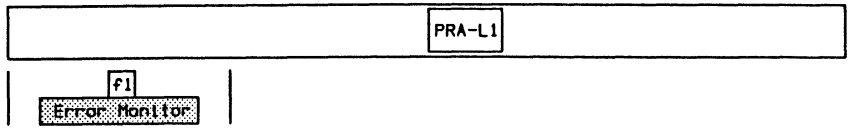


When the application has finished loading:



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.




```
                    Layer 1 Error Monitor

 System Status :    Mode     MONITOR     Framing  D4
 Port Status :      Port A   RED Alarm & Loss of Signal Level
                    Port B   RED Alarm & Loss of Signal Level
 Report :             Error Monitoring Timers :
→Action  OFF          Interval 50      Duration  5 MIN    Clock  3000

 Reported Errors :            PORT A                    PORT B
                    (Interval)     (Total)    (Interval)     (Total)
  Bipolar               0            0            0            0
  Frame                 0            0            0            0
  CRC                   ---          ---          ---          ---
  Multiframe            ---          ---          ---          ---
  S Bit Errors          0            0            0            0
```

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

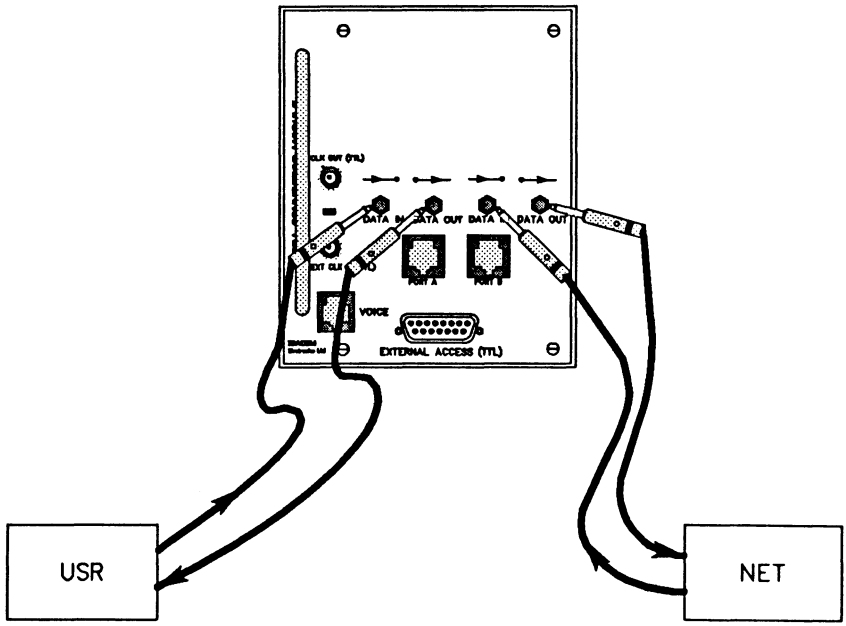


Figure 3–9 Emulating at the Primary Rate Access – (T1) Bantam

T1 – Using RJ-48C Connectors

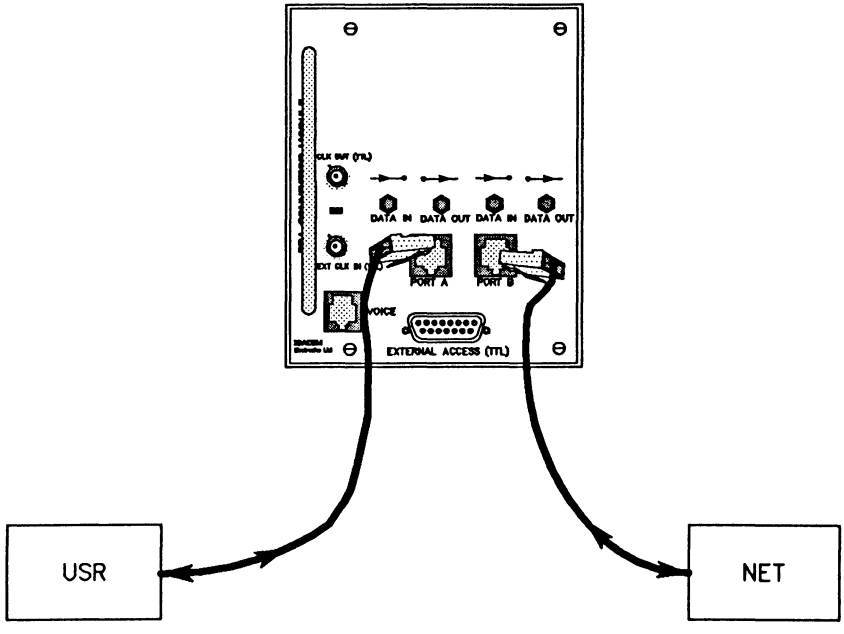


Figure 3-10 Emulating at the Primary Rate Access – (T1) RJ-48C

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

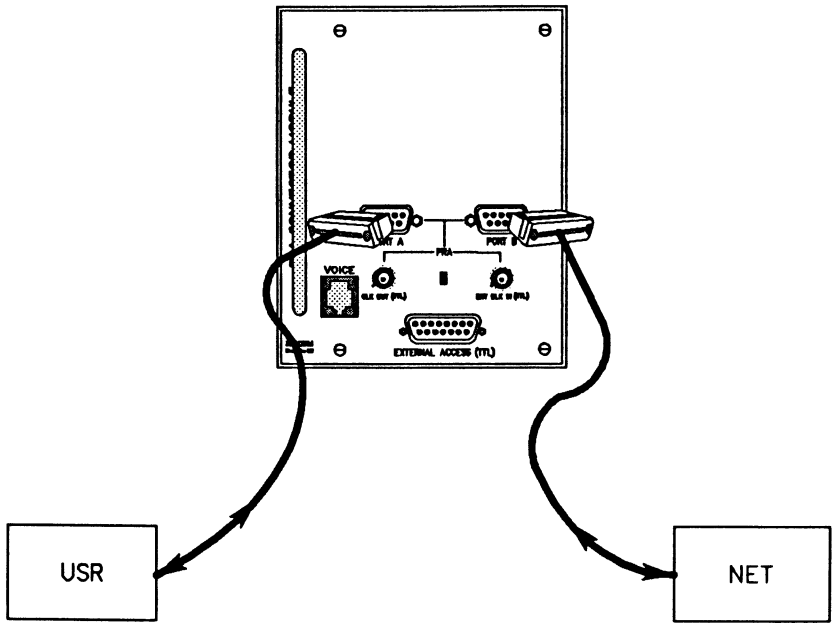
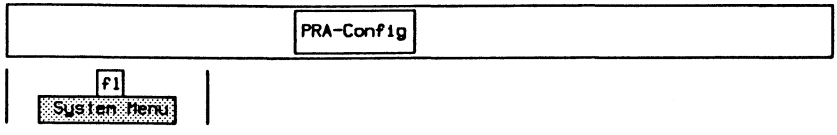
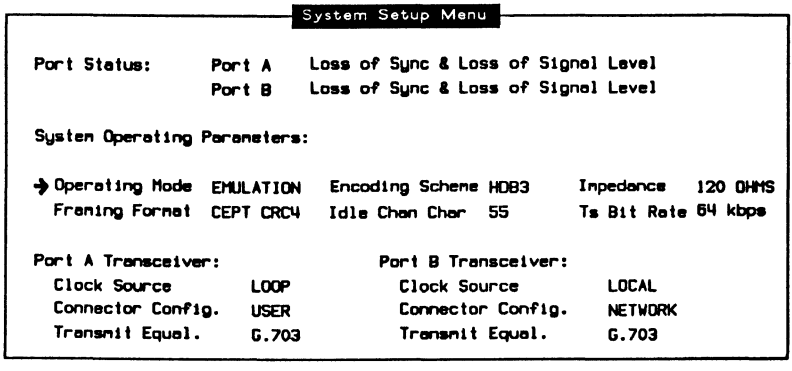


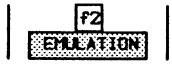
Figure 3–11 Emulating at the Primary Rate Access – (CEPT) DB–9

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

System Configuration







→ *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):

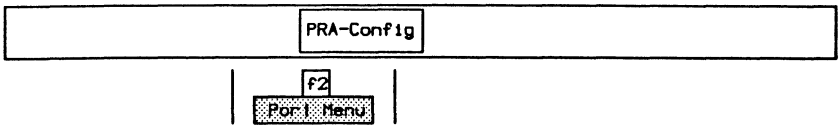
- 0 - 133 ft.
- 133 - 266 ft.
- 266 - 399 ft.
- 399 - 533 ft.
- 533 - 655 ft.

For CEPT framing, transmit equalization is set according to CCITT Recommendation G.703.

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

Table 3–2 Alarm and Status Messages

Ports Setup

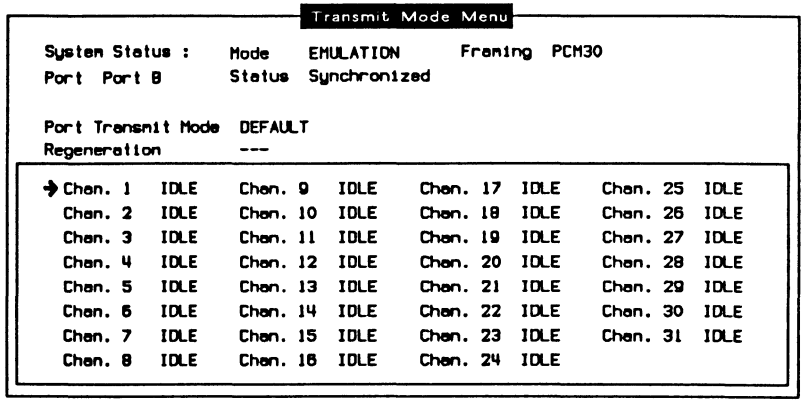



```
                    Ports Setup Menu

  System Status :    Mode    EMULATION   Framing  CRC4
→ Port  PORT B       Status  Synchronized

  Transmit Mode  DEFAULT
  Regeneration   ---

        Transmit Bits                    Receive Bits
  CEPT PCM30 and CRC4              CEPT PCM30 and CRC4
    National              11111      National              10111
  CEPT CRC4                        CEPT CRC4
    SI 1                  0          SI 1                  0
    SI 2                  0          SI 2                  0
  CEPT PCM30                       CEPT PCM30
    International         ---        International
```

→ *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.



→ *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).

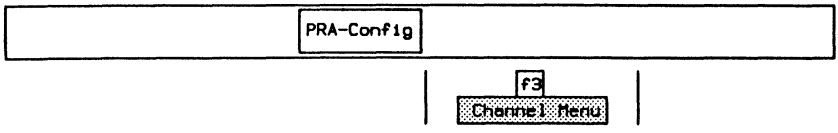
→ *SI 2*
Should be set to 1 on digital paths crossing an international border. It can be used nationally if the digital path does not cross a border (refer to CCITT table 1b/G.704).

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 Setup Menu

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

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

→ *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.

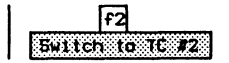
```
                    Channel Setup Menu

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

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

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

```
f1
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
                                                     TELETEX

Verification Applications:
  SDLC/SNA

Conformance Applications:
  Universal            X.25              SS#7          ISDN D Channel
```

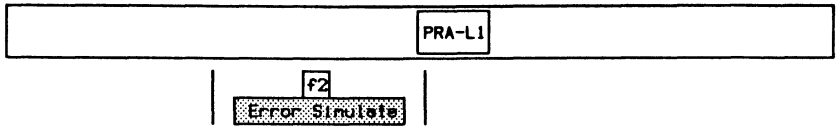
```
f1
Load Application
```

When the application has finished loading:



Simulating Layer 1 Errors

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



Layer 1 Error Generation

```
System Status :    Mode    EMULATION    Framing  PCM30
→Port  PORT A      Status  Loss of Sync & Loss of Signal Level

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

Error Generation :     Status      # Generated Errors     Total Time (Sec)
   Bipolar Violation    OFF               0                    BURST
   Frame Error          ---               ---                  ---
   CRC Error            ---               ---                  ---
   Multiframe Error     ---               ---                  ---
   S Bit Error          ---               ---                  ---
```

→ *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).

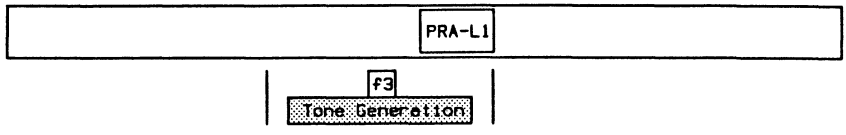
→ *S Bit Error*
Generates errors in the signalling framing bits (valid for D4 framing).

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

System Status : Mode EMULATION Framing PCM30 Channel 1
Port PORT A Status Loss of Sync & Loss of Signal Level

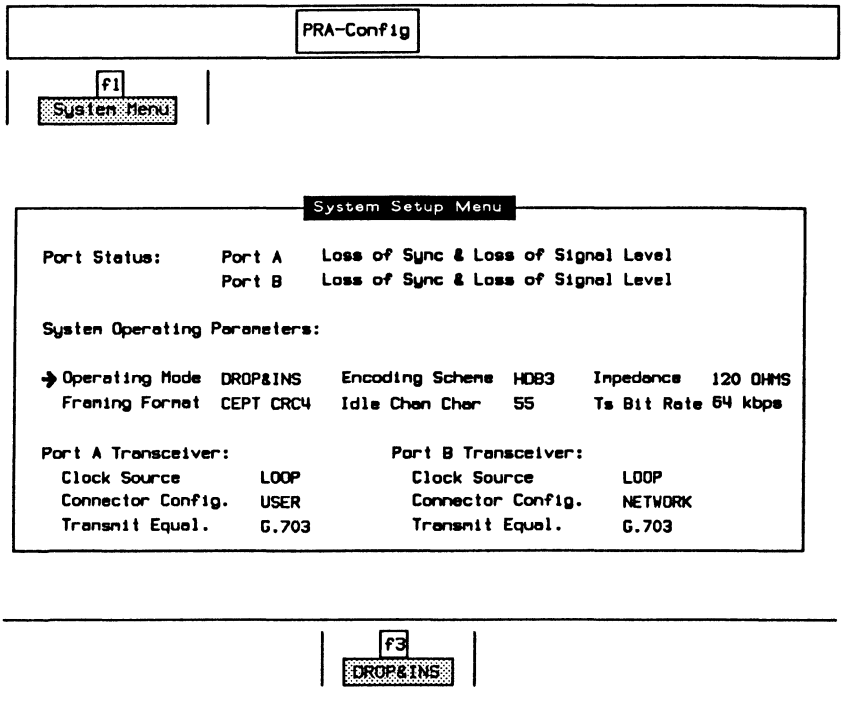
Tones:

→ Audible Ring	OFF	Special Audible Ring	OFF
Busy	OFF	Busy Verify	OFF
Call Wait	OFF	Busy Verify Start	OFF
Confirm	OFF	Busy Verify Cycle	OFF
Dial	OFF	Executive Override	OFF
Intercept	OFF	Recall Dial	OFF
Reorder	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



→ *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):

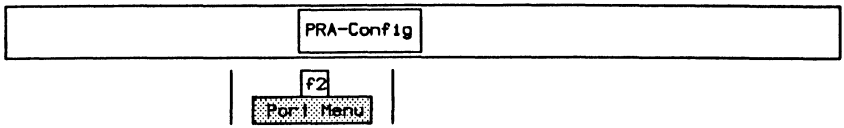
- 0 - 133 ft.
- 133 - 266 ft.
- 266 - 399 ft.
- 399 - 533 ft.
- 533 - 655 ft.

For CEPT framing, transmit equalization is set according to CCITT Recommendation G.703.

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

Table 3-3 Alarm and Status Messages

Ports Setup




```
                    Ports Setup Menu

  System Status :    Mode    DROP&INS    Framing  CRC4
→ Port  PORT B       Status  Synchronized

  Transmit Mode  DEFAULT
  Regeneration   ---

       Transmit Bits                    Receive Bits
CEPT PCM30 and CRC4              CEPT PCM30 and CRC4
  National              11111      National              10111
CEPT CRC4                        CEPT CRC4
  SI 1                  0          SI 1                  0
  SI 2                  0          SI 2                  0
CEPT PCM30                       CEPT PCM30
  International         ---        International
```

→ *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.

Transmit Mode Menu

System Status : Mode DROP&INS Framing PCM30
Port Port B Status Synchronized

Port Transmit Mode DEFAULT
Regeneration ---

→ Chan. 1	IDLE	Chan. 9	IDLE	Chan. 17	IDLE	Chan. 25	IDLE
Chan. 2	IDLE	Chan. 10	IDLE	Chan. 18	IDLE	Chan. 26	IDLE
Chan. 3	IDLE	Chan. 11	IDLE	Chan. 19	IDLE	Chan. 27	IDLE
Chan. 4	IDLE	Chan. 12	IDLE	Chan. 20	IDLE	Chan. 28	IDLE
Chan. 5	IDLE	Chan. 13	IDLE	Chan. 21	IDLE	Chan. 29	IDLE
Chan. 6	IDLE	Chan. 14	IDLE	Chan. 22	IDLE	Chan. 30	IDLE
Chan. 7	IDLE	Chan. 15	IDLE	Chan. 23	IDLE	Chan. 31	IDLE
Chan. 8	IDLE	Chan. 16	IDLE	Chan. 24	IDLE		

→ *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

→ *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 1a/G.704).

NOTE

See Section 8 to assign the channels and select either the monitor or emulation submode.

4

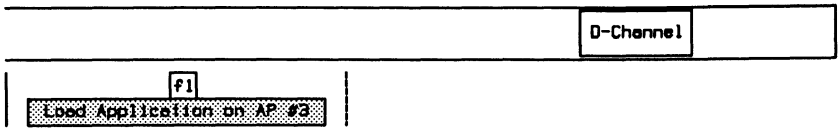
ISDN BRA MONITOR

Version 2.0

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:

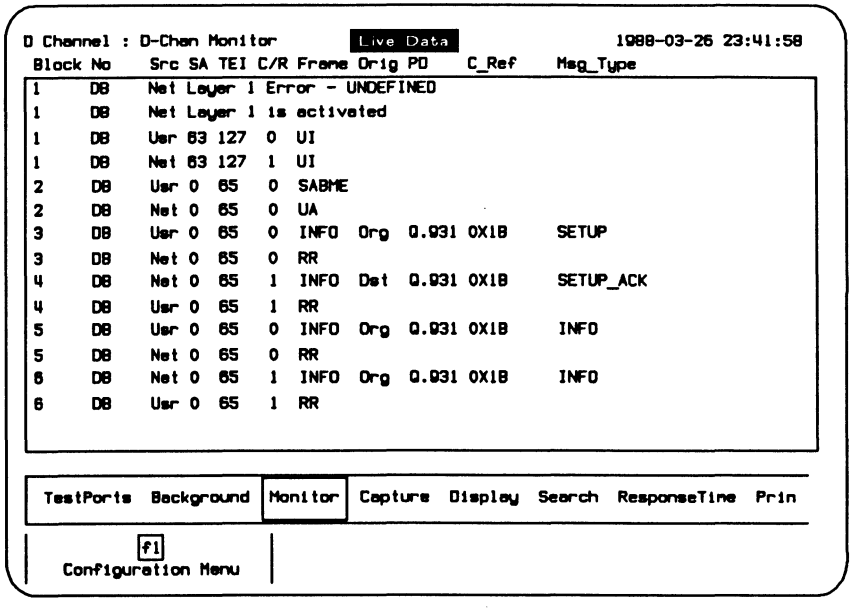
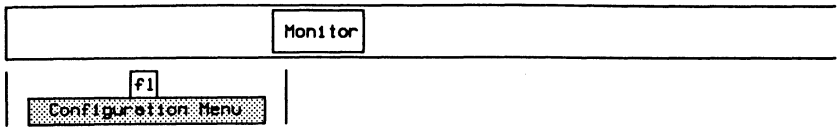
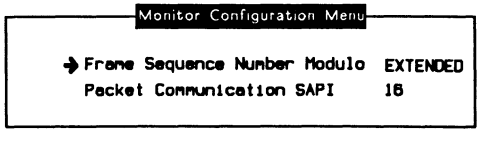


Figure 4-1 ISDN D-Channel Monitor Program Display

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.

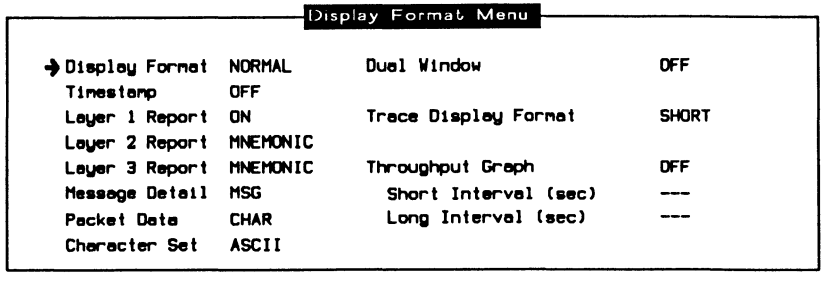
EXTENDED (default) Selects frame level decoding according to modulo 128.

→ *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.



→ *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*

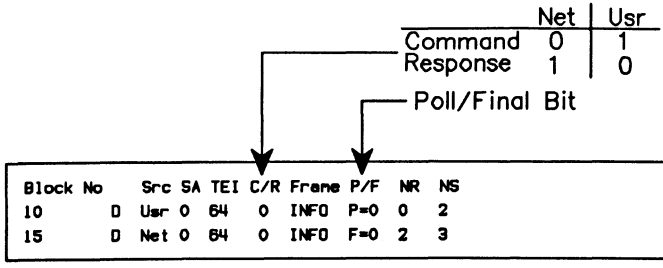
OFF — Layer 1 information is not displayed.

ON — Displays activation, deactivation, INFO 2 error, lost framing, and recovery conditions.

→ *Layer 2 Report*

OFF Layer 2 information is not displayed.

COMPLETE




```
Block No    Src SA TEI C/R Frame P/F  NR  NS
10       D  Usr 0  64   0  INFO  P=0  0   2
15       D  Net 0  64   0  INFO  F=0  2   3
```

HEX

```
Block No    Src  Frame
10       D  Usr  00 01 C4 00
15       D  Net  00 01 01 C8
```

TEXT

```
Block No    Src  Frame
10       D  Usr  [NUSHDNU]
15       D  Net  [NUSHSHF]
```

MNEMONIC

```
Block No    Src SA TEI C/R Frame
10       D  Usr 0  64   0  INFO
15       D  Net 0  64   0  INFO
```

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

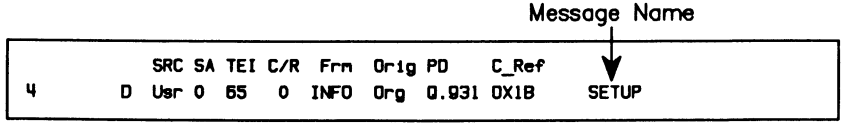
COMPLETE

```
4       D   Usr 0  65   0  INFO
PD = Q.931  CR = 0X1B        Orig  SETUP                    Ver. = CCITT_1988
       1  00000100  INFORMATION ELEMENT : BEARER CAPability
       2  00000011  IE length           : 3 octets
       3  1-------  Extension bit       : not continued
          -00-----  Coding standard     : CCITT
          ---00000  Info. trans. cap.   : speech
       4  1-------  Extension bit       : not continued
          -00-----  Transfer mode       : circuit mode
          ---10000  Info. transfer rate : 64 kbit/s
       5  1-------  Extension bit       : not continued
          -01-----  Layer identifier    : 1
          ---00010  Layer 1 protocol    : Rec. G.711 u-law
```

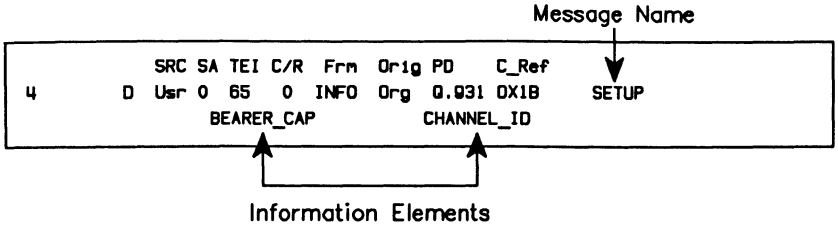
NOTE
If layer 3 contains X.25 data (SAPI=16), it will be decoded according to the X.25 (1980/1984) Protocol.

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

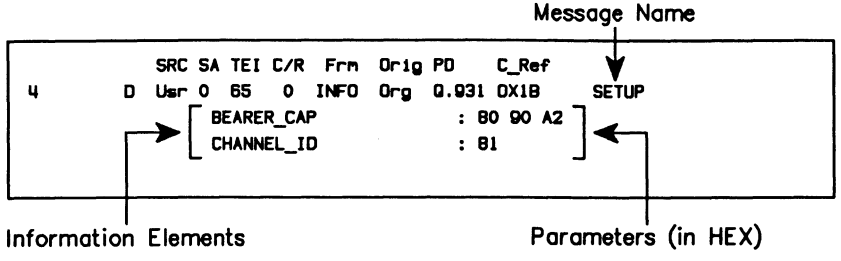
MSG



MSG+IE



MSG+IE+PA

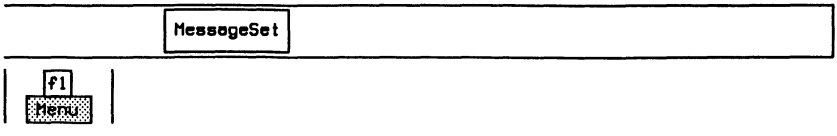


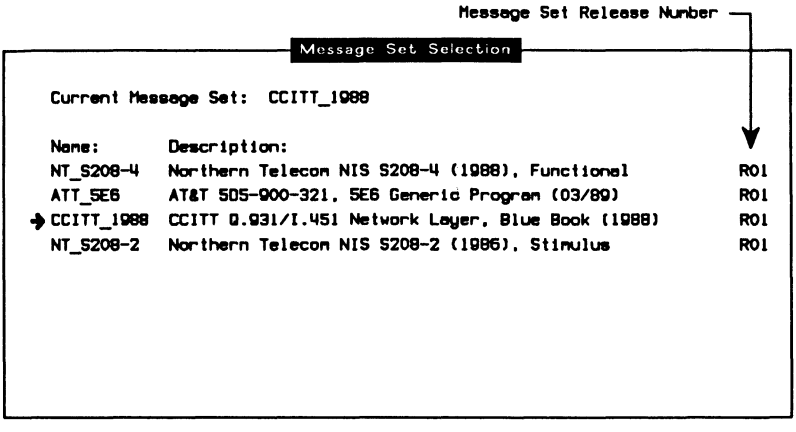
→ *Packet Data*
Selects the display format for X.25 data contained in a SAPI 16 I frames as hex or character mode (i.e. ASCII).

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.





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

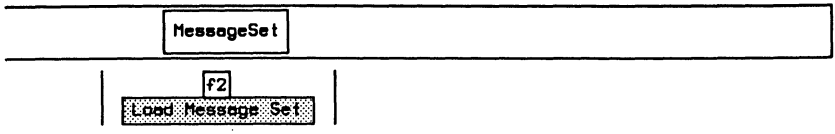
Page Up — Displays the previous ten message sets.

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.

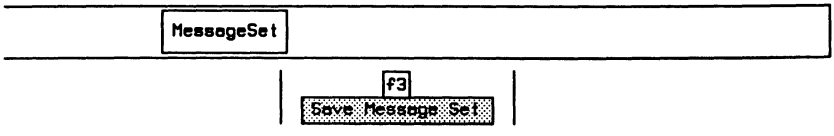
Loading a Message Set

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.

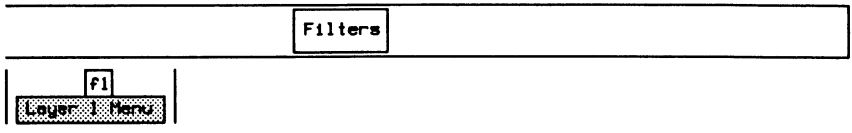


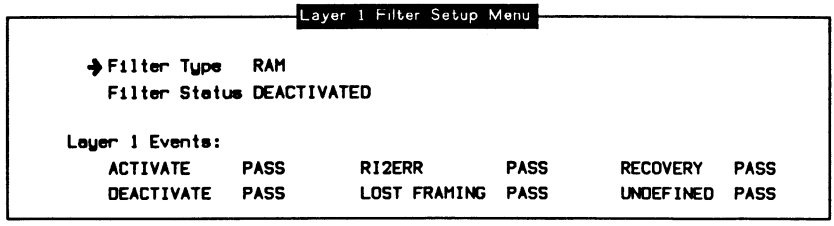
ISDN Filters

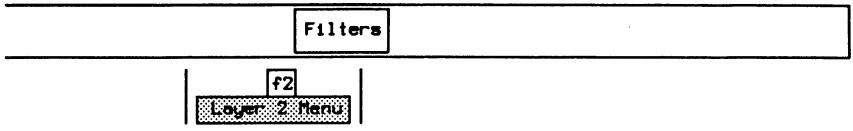
Refer to Section 18.9 in the 'General Application Topics' section for filter setup information.

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 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    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 4-1).

→ *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.

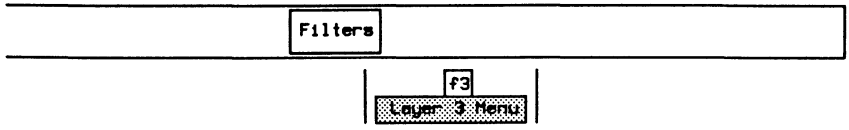
→ *Logical Operation*

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

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

S=SAPI T=TEI		SAPI/TEI of Received Frame							
		AND				OR			
SAPI	TEI	=S =T	=S ≠T	≠S =T	≠S ≠T	=S =T	=S ≠T	≠S =T	≠S ≠T
BLOCK	BLOCK	▩	▩	▩	PASS	BLK	□	□	□
BLOCK	PASS	▩	▩	PASS	▩	□	BLK	□	□
PASS	BLOCK	▩	PASS	▩	▩	□	□	BLK	□
PASS	PASS	PASS	▩	▩	▩	□	□	□	BLK
LEGEND: ▩ = BLOCK □ = PASS									

Table 4–1 SAPI/TEI – Logical Operations



Layer 3 Filter Setup Menu

Filter Type RAM Protocol Discriminator OFF PD Value ---
Filter Status ACTIVATED Call Reference OFF CR Value ---
Message Set CCITT_1988

ALERT	BLK	REL	BLK	SUSP	BLK	HOLD_ACK	BLK
CALL_PROC	BLK	REL_COM	BLK	SUSP_ACK	BLK	HOLD_REJ	BLK
CON_CON	BLK	RES	BLK	SUSP_REJ	BLK	REG	BLK
CONN	BLK	RES_ACK	BLK	USER_INFO	BLK	RET	BLK
CONN_ACK	BLK	RES_REJ	BLK	REST	BLK	RET_ACK	BLK
DISC	BLK	→ SETUP	PASS	REST_ACK	BLK	RET_REJ	BLK
INFO	PASS	SETUP_ACK	BLK	SEGMENT	BLK	Undefined	BLK
NOTIFY	BLK	STATUS	BLK	FAC	BLK	Invalid	BLK
PROG	BLK	STATUS_EN	BLK	HOLD	BLK		

→ *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*

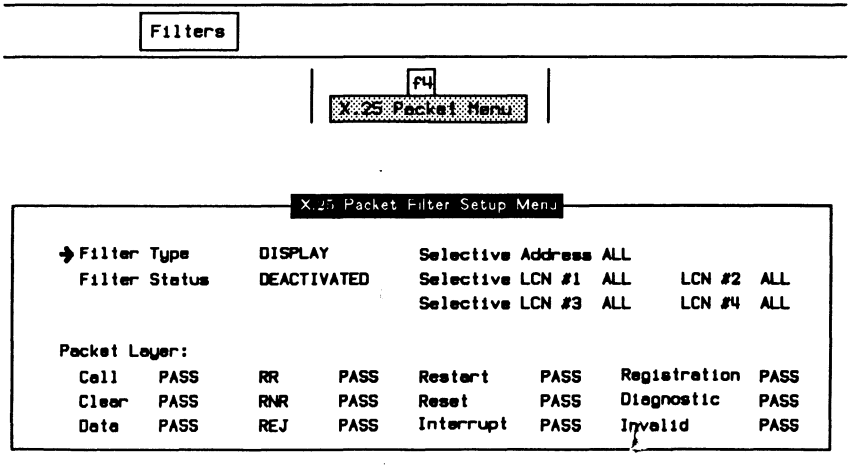
OFF — Ignores the message call reference when filtering.

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.

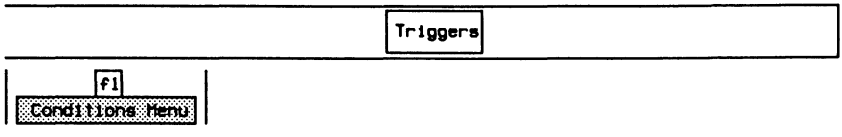


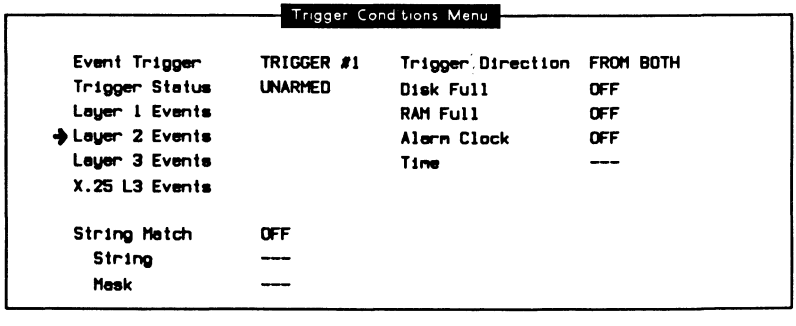
ISDN Triggers

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

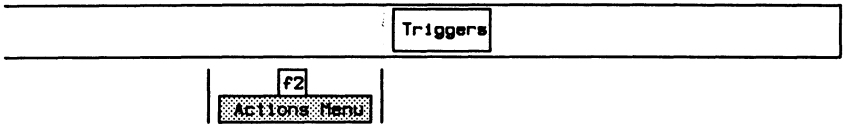




Layer 2 Event Menu

```
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    DM    OFF
  REJ   OFF     XID    OFF     UI   OFF    FRMR  OFF
```

Setting Actions



Trigger Action Menu

```
   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   ""
```

NOTE
Specify the drive and data filename on the Recording Menu before arming the trigger.

4.2 B-Channel Monitor

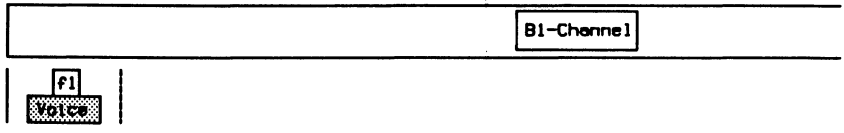
The following functions are available for B-Channel monitoring:

- 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:

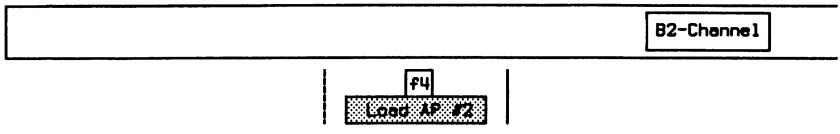


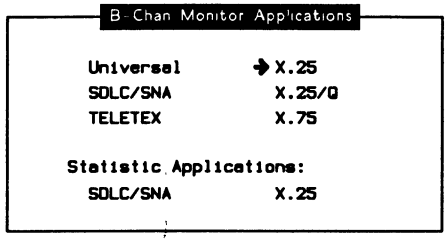
NOTE
The SETUP message of the D-Channel signalling protocol contains the B-Channel number which has been assigned for a voice connection.

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

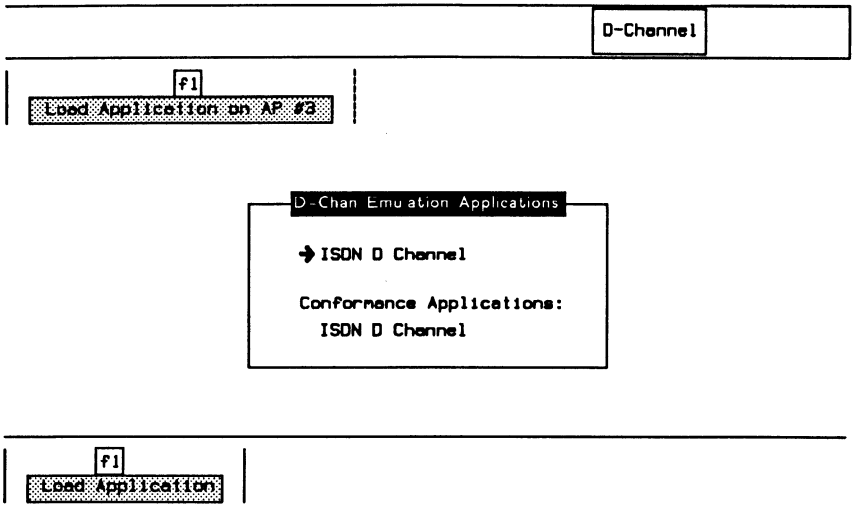
ISDN BRA EMULATION

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:

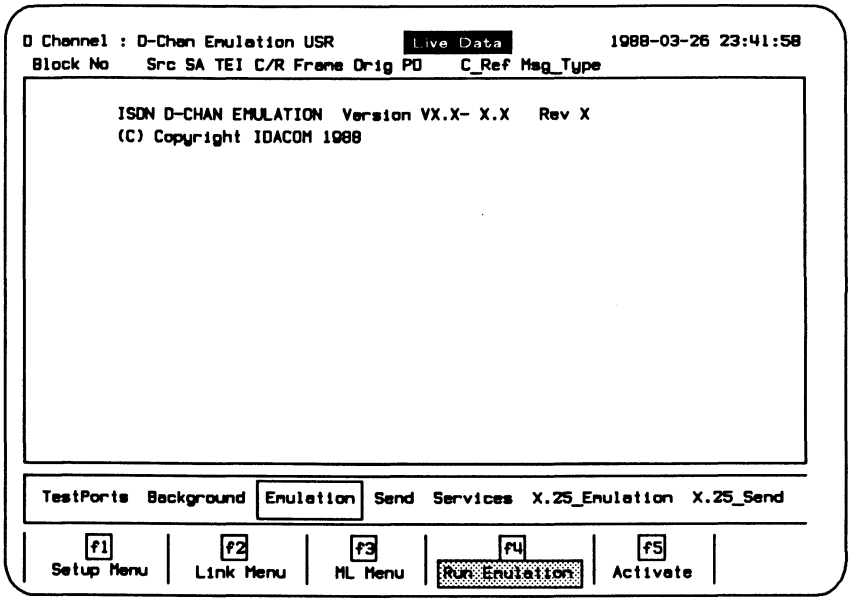
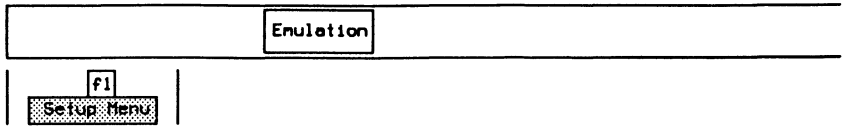


Figure 5–1 ISDN D–Channel Emulation Program Display

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



Emulation Configuration

Timer Duration :	Protocol Emulation :
→ Idle Link (T203) 300	L.2 State Machine ON
Flags :	Special SAPI :
XID Negotiate Proc OFF	Packet Communication 16
RR Polling Action OFF	

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

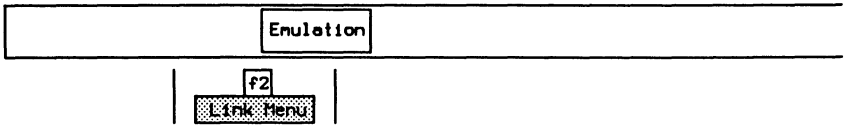
This function is the same as the Run Emulation function key under the Emulation topic.

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.



Link Setup

```
→Link No   0
 DLCI Value :        Timer Duration :              Data Field Length :
   SAPI     0          Primary (T200)       10      N201 (XID Neg)     260
   TEI      127        T200-RX (XID Neg)    10      N201-TX (XID Neg) 260

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

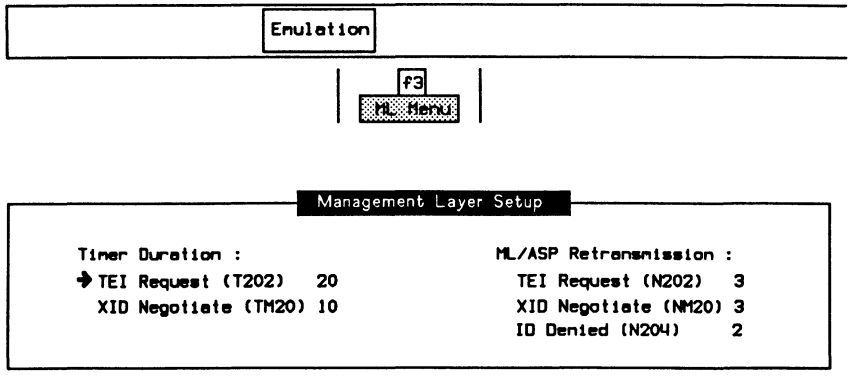
→ *N201-TX (XID Neg)*
Specifies the maximum length of a transmitted I or UI frame for the XID negotiate procedure (default is 260 bytes).

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)*
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:

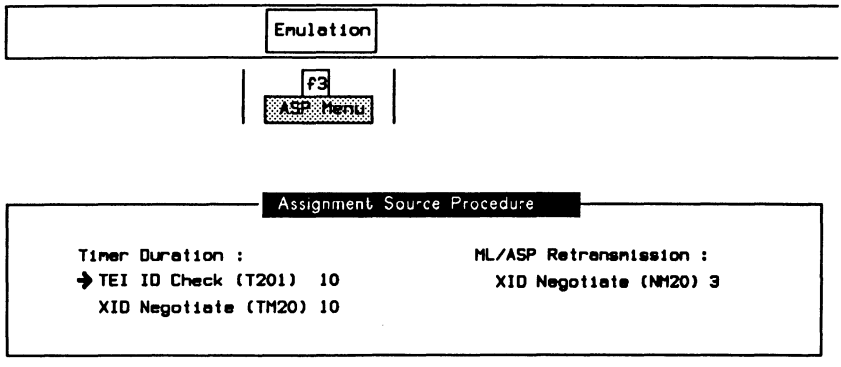
→ *TEI Request (N202)*
Specifies the maximum number of TEI assignment request retransmissions (default is 3).

→ *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:



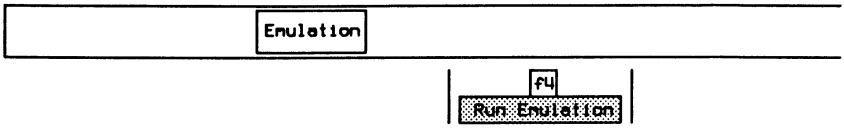
Timer Duration:

→ *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).

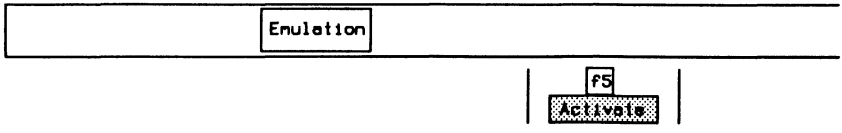
Running the Emulation Program



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).

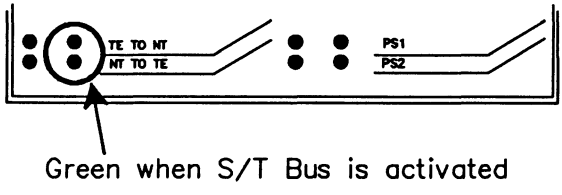
Activating the S/T Bus



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

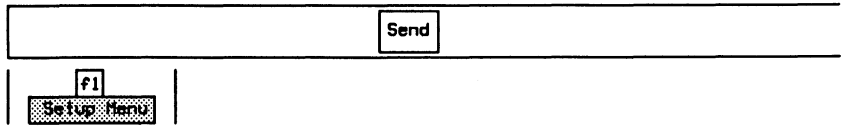
```
Block No    Src SA TEI C/R Frame P/F  NR  NS  Orig PD    C_Ref     Msg_Type
1      DA   Net Layer 1 is activated
```

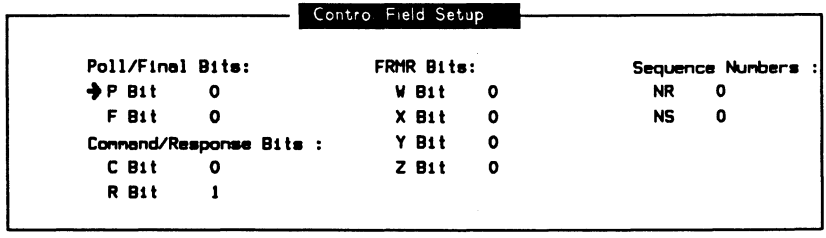
NOTE
The green LED's on the front panel must be on.



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).



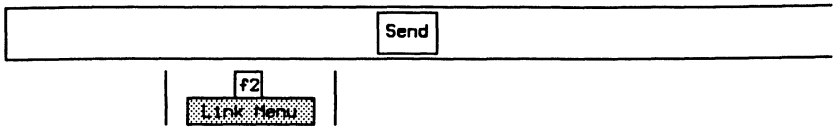


Poll/Final Bits:
All frames contain a P/F (poll/final) bit. Command frames contain a P bit and response frames contain an F bit.

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 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.



Send Link Setup

```
→Link No 0
  State Machine :          Counters :                    Negotiate
    L.2 State 1              Retransmission (RC) 0       Parameters Status :
                             Poll/Response (PRC) 0         N201-TX 260
  State Variables :                                        N201    260
    VS 0                   DLCI Status :                   K-RX    7
    VA 0                     SAPI 63                       T200-RX 10
    VR 0                     TEI  127
```

→ *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

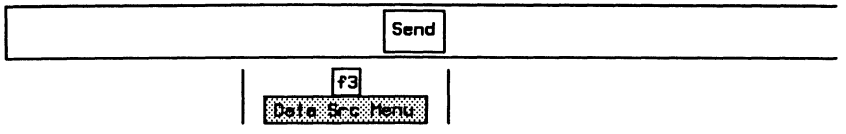
Layer 2 frames can be transmitted:
- automatically according to the protocol standard (the layer 2 state machine is on); or
- manually with user-defined fields (the layer 2 state machine is off).

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




```
                Send Data Source Menu

Select Source of Information Field Contents for UI/Info Frames:
  Data Source          L.3 Default Message

Transmit Mode:
  Queuing 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.

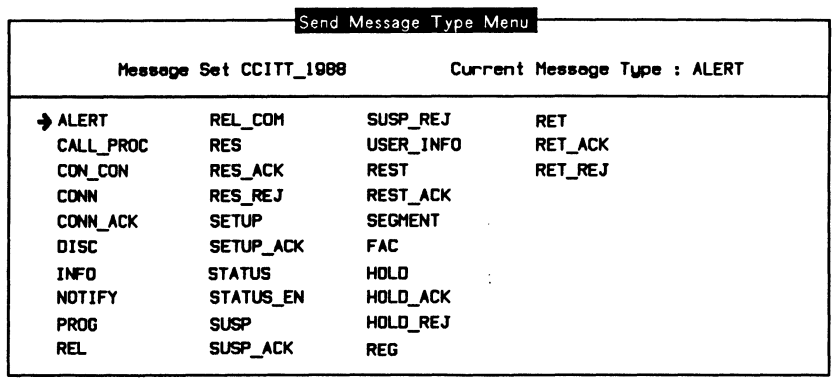
→ *Number of Repetitions*

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*.



- Press *Exit*.

→ *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:

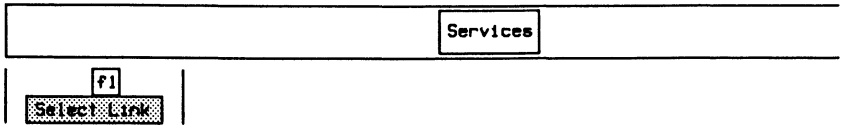
ML UI	Transmits the message selected on the Send Data Source Menu as a management layer UI frame (SAPI=63, TEI=current value).

For ISDN D-Channel Network (NT) Emulation:

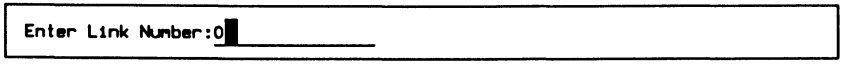
ASP UI	Transmits the message selected on the Send Data Source Menu as an assignment source procedure UI frame (SAPI=63, TEI=current value).

Selecting a Link

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

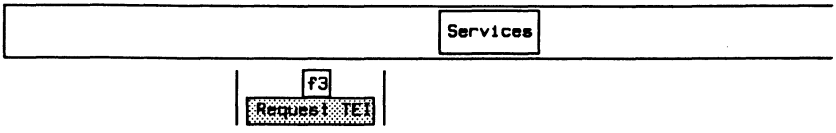


- Enter the link number (eg. 0) and press ↵ (RETURN).



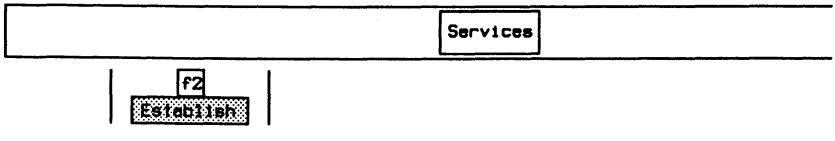
The ISDN Emulation program supports up to eight simultaneous links (0 through 7).

Requesting a TEI (User Only)




```
Block No    Src SA TEI C/R Frame P/F  NR  NS  Orig PD    C_Ref     Msg_Type
63      D   Usr 63 127  0  UI    P=0
                Message name                 : identity request
                Management entity identifier : 15
                Reference number ( RI )      : 64788
                Message type                 : 1
                Action indicator ( AI )      : 127
1       D   Net 63 127  1  UI    P=0
                Message name                 : identity assigned
                Management entity identifier : 15
                Reference number ( RI )      : 64788
                Message type                 : 2
                Action indicator ( AI )      : 64
```

Establishing a Link



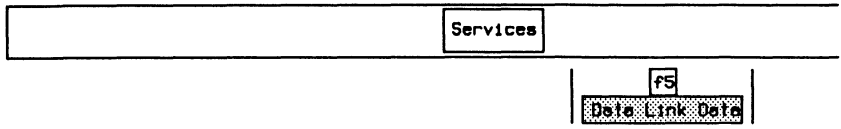

```
Block No    Src SA TEI C/R Frame P/F  NR  NS  Orig PD    C_Ref     Msg_Type
65      D   Usr 0  0    0  SABME P=1
3       D   Net 0  65   0  UA    P=1
```

NOTE

If no TEI has been assigned, the Establish function will try to assign a TEI and then establish the link.

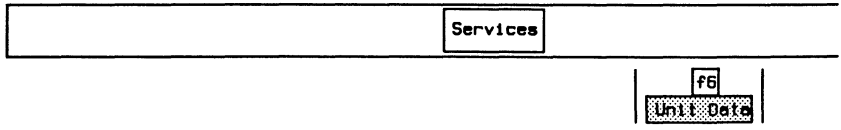
Sending Frames/Messages

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



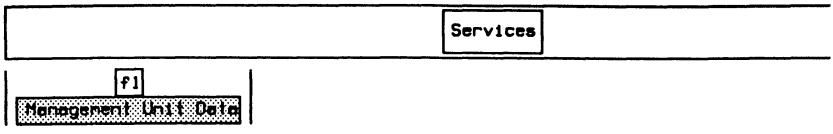
Block No	Src	SA	TEI	C/R	Frame	Orig	PD	C_Ref	Msg_Type
67 D	Usr	0	0	0	INFO	Org	Q.931	0X00	SETUP
5 D	Net	0	0	0	RR				

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



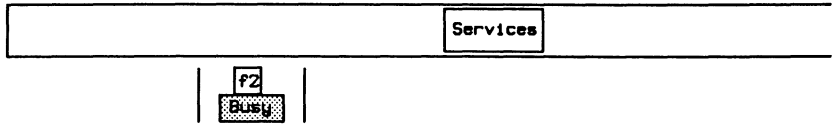
Block No	Src	SA	TEI	C/R	Frame	Orig	PD	C_Ref	Msg_Type
67 D	Usr	0	0	0	INFO	Org	Q.931	0X00	SETUP
5 D	Net	0	0	0	RR				
68 D	Usr	0	0	0	UI	Org	Q.931	0X00	SETUP

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



Block No		Src	SA	TEI	C/R	Frame	Orig	PD	C_Ref	Msg_Type
68	D	Usr	0	0	0	UI	Org	Q.931	0X00	SETUP
6	D	Net	0	0	0	RR				
69	D	Usr	63	0	0	UI	Org	Q.931	0X00	SETUP

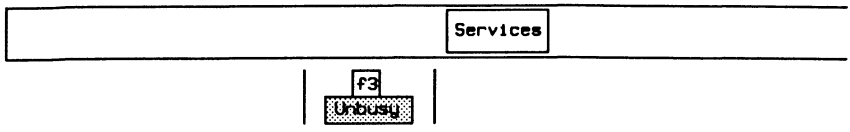
Setting a Link to Busy



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

Block No		Src	SA	TEI	C/R	Frame	Orig	PD	C_Ref	Msg_Type
75	D	Usr	0	0	0	RNR				
12	D	Net	0	0	0	RR				
13	D	Net	0	0	1	RR				
76	D	Usr	0	0	1	RNR				
14	D	Net	0	0	1	RR				
77	D	Usr	0	0	1	RNR				
78	D	Usr	0	0	0	RR				
15	D	Net	0	0	0	RR				

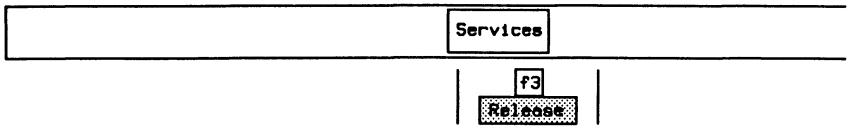
To clear the busy state:



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

Block No	Src	SA	TEI	C/R	Frame	Orig PD	C_Ref	Msg_Type
75 D	Usr	0	0	0	RR			
12 D	Net	0	0	0	RR			
13 D	Net	0	0	1	RR			
76 D	Usr	0	0	1	RR			
14 D	Net	0	0	1	RR			
77 D	Usr	0	0	1	RR			
78 D	Usr	0	0	0	RR			
15 D	Net	0	0	0	RR			

Disconnecting a Link

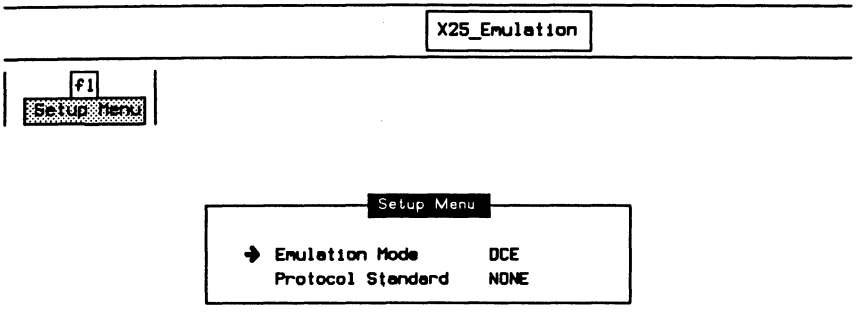


Block No	Src	SA	TEI	C/R	Frame	Orig PD	C_Ref	Msg_Type
79 D	Usr	0	0	0	DISC			
16 D	Net	0	0	0	UA			

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).

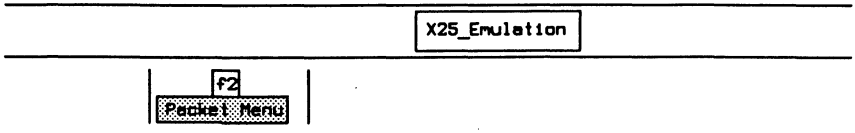
→ *Protocol Standard*

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) — Conforms to the CCITT X.25 (1980) Recommendation.

X.25(1984) (default) — Conforms to the CCITT X.25 (1984) Recommendation.

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.

DTE Packet Layer Menu

```
Packet Layer:
→ Emulation            AUTOMATIC      T20 Timer (Sec)   180.0
  Max Data Size        128            T21 Timer (Sec)   200.0
  Sequence Numbering   MOD 128        T22 Timer (Sec)   180.0
                                      T23 Timer (Sec)   180.0
```

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.

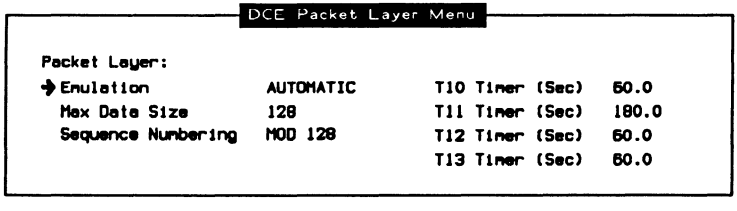
The following timers are used for DTE emulation.

→ *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.

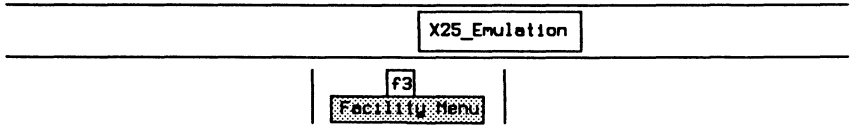
→ *T10 Timer*
Specifies the duration, in tenths of seconds, the tester waits for a restart request packet or restart confirmation packet after transmitting a restart indication packet (default is 60 seconds).

→ *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



Facility Menu

→ Call Request Facility	NONE
User Defined Facility	---
Call Accept/Connect	USE ADDRESS
Call Accept Facility	ECHO
User Defined Facility	---
Call User Data	NONE
Clear User Data	NONE

→ *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.

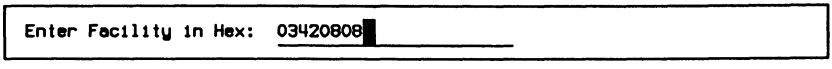
NEGOTIATE Automatically negotiates data packet size, packet window size, throughput class, and fast select facilities.

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.

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



→ *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.

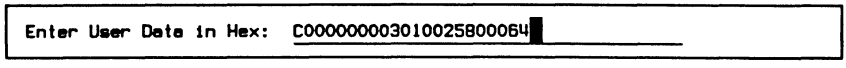
NOTE
See the example used in defining facilities for call request/incoming call packets.

→ *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.

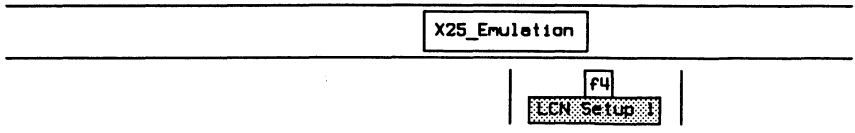
→ *Clear User Data*
Specifies the content of the user data for the clear request/clear indication packet. A hex string of up to 54 characters can be entered. If there is no clear user data, NONE will be displayed as the status.

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

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



LCN Setup



LCN Setup Menu 1

	LCN	LINK	TYPE	Called Address	Calling Address	Window	Echo
→ CH1	1	0	SVC	43042001	33001001	2	OFF
CH2	2	0	SVC	43042001	33001001	2	OFF
CH3	3	0	SVC	43042001	33001001	2	OFF
CH4	4	0	SVC	43042001	33001001	2	OFF
CH5	5	0	SVC	43042001	33001001	2	OFF
CH6	6	0	SVC	43042001	33001001	2	OFF
CH7	7	0	SVC	43042001	33001001	2	OFF
CH8	8	0	SVC	43042001	33001001	2	OFF
CH9	9	0	SVC	43042001	33001001	2	OFF
CH10	10	0	SVC	43042001	33001001	2	OFF

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.

X25_Emulation

f5
LCN Setup 2

LCN Setup Menu 2

	LCN	Fast Select	Clear Request	Clear Confirm
→ CH1	1	OFF	Not Extended	Not Extended
CH2	2	OFF	Not Extended	Not Extended
CH3	3	OFF	Not Extended	Not Extended
CH4	4	OFF	Not Extended	Not Extended
CH5	5	OFF	Not Extended	Not Extended
CH6	6	OFF	Not Extended	Not Extended
CH7	7	OFF	Not Extended	Not Extended
CH8	8	OFF	Not Extended	Not Extended
CH9	9	OFF	Not Extended	Not Extended
CH10	10	OFF	Not Extended	Not Extended

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 included 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.

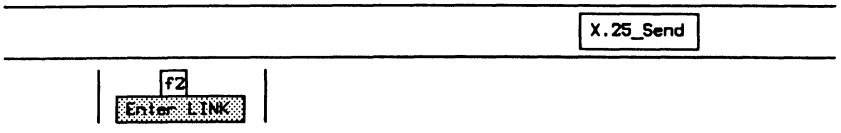
NOTE
Clear Request and Clear Confirm extended format are not supported by X.25 (1980).

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.

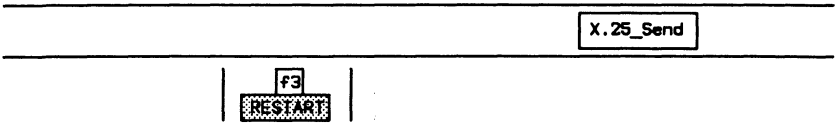
Establishing a Link



- Enter the link CES identifier and press ↵ (RETURN).

```
Enter Link CES on which traffic will be sent (0-7):0
```

Restarting the Link



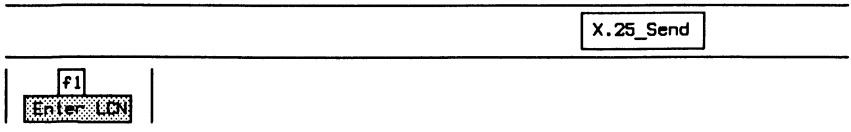
- Enter the restart cause and diagnostic and press ↵ (RETURN).

```
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.

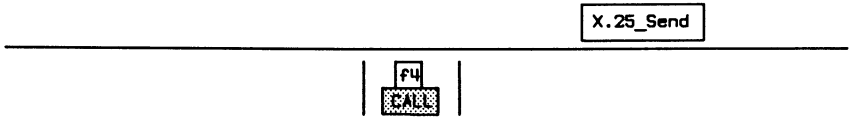
Selecting a Logical Channel



- Enter the logical channel number and press ↵ (RETURN).

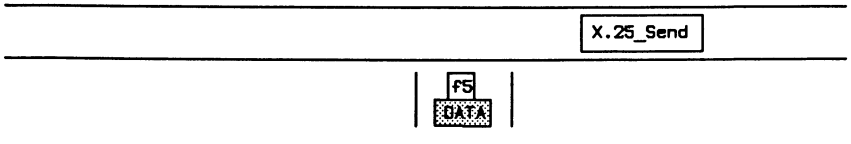
```
Enter Logical Channel Number on which traffic will be sent (1-4095):1
```

Setting Up an X.25 Call (SVC)



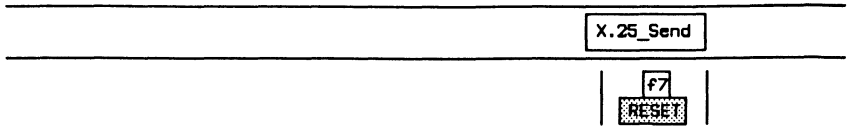
Wait for call accept.

Sending a Data Packet



Wait for an acknowledgement.

Resetting the LCN Connection



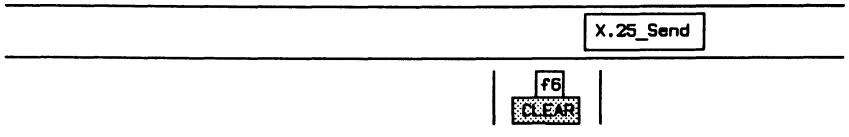
- Enter the reset cause and diagnostic and press ↵ (RETURN).

```
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 ↵ (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.

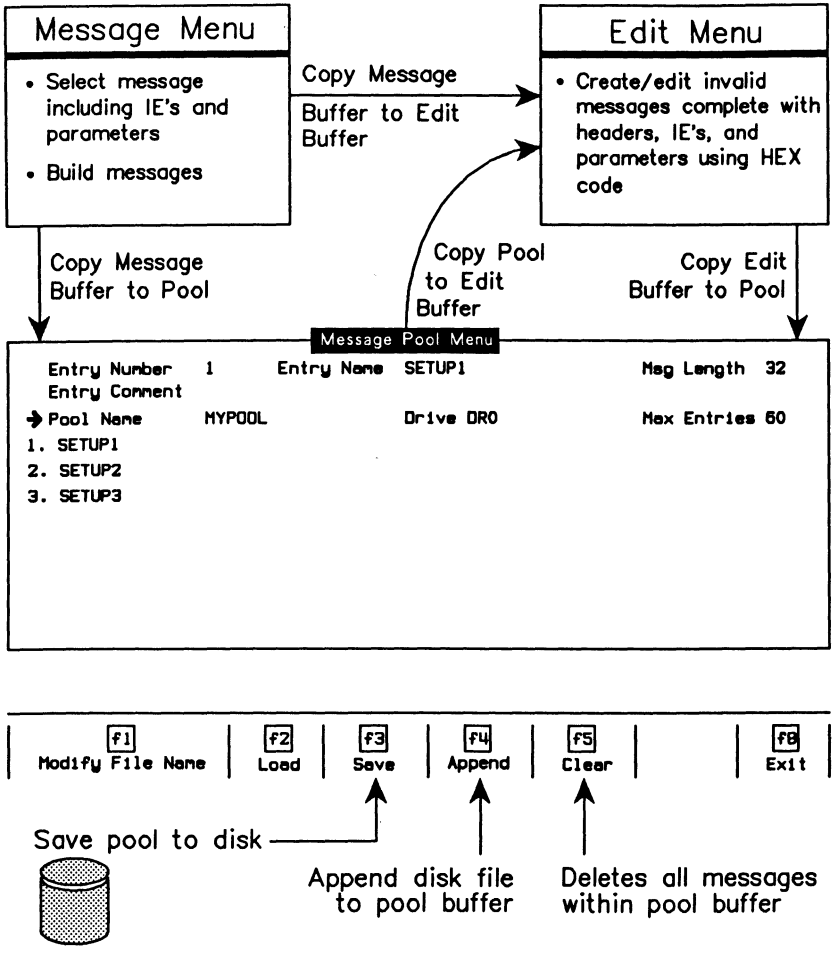


Figure 5-2 Message Builder Overview

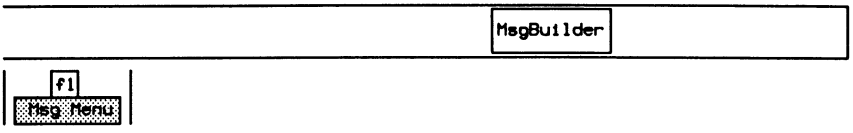
Creating Messages (Automatic)

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 Selection Menu

```
Message Options :                          Active PD       8
→ Build Mode       AUTOMATIC               Call Reference :
  Message Set      CCITT_1988                CR Length   1 OCTET
  Active Message   SETUP                     CR Flag     ORIG
  Direction        NETWORK TO USER           CR Value    0
Layer 3 Messages
  ALERT        PROG         STATUS       SEGMENT     RET_REJ
  CALL_PROC    REL          STATUS_EN    FAC
  CON_CON      REL_COM      SUSP         HOLD
  CONN         RES          SUSP_ACK     HOLD_ACK
  CONN_ACK     RES_ACK      SUSP_REJ     HOLD_REJ
  DISC         RES_REJ      USER_INFO    REG
  INFO         SETUP        REST         RET
  NOTIFY       SETUP_ACK    REST_ACK     RET_ACK
```

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.

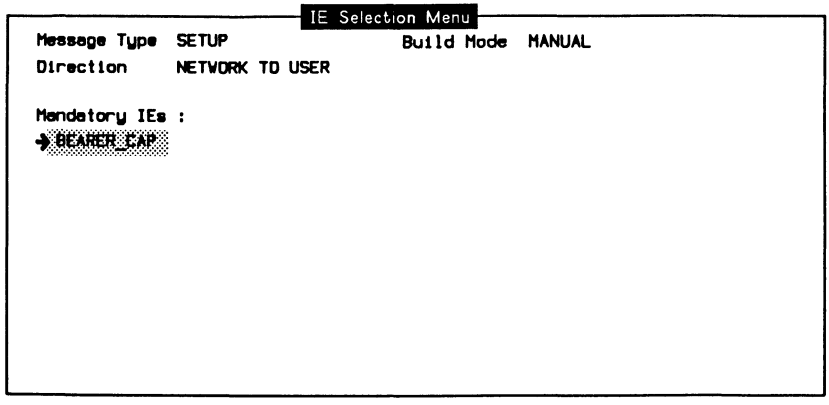
→ *CR Flag*
Sets the call reference flag to either 0 (Origination message) or 1 (Destination message).

→ *CR Value*
Sets the value of the call reference.

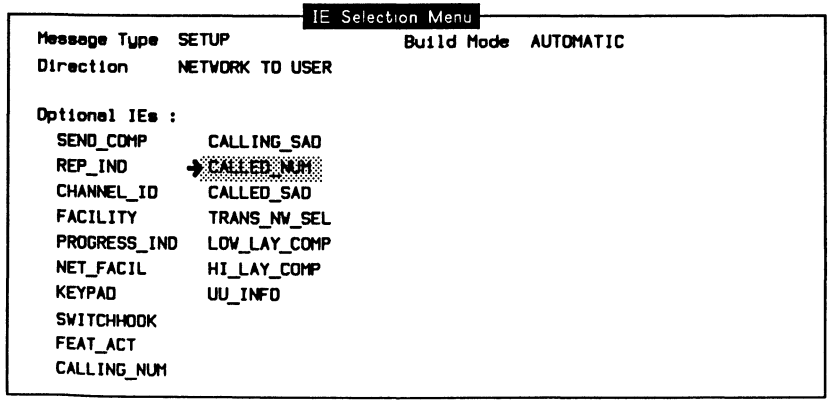
→ *SETUP*

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.



f1
Select IE

- Return to the mandatory IE Selection Menu.

f3
Mandatory

f6
Octet Menu

Including/Excluding Octets

Octet Selection Menu

```
Message Type          SETUP
Information Element   BEARER CAPability
Octets Included       3 4 4B 5 5A 58 5C 5D 6 7
Octets Excluded       4A

 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.

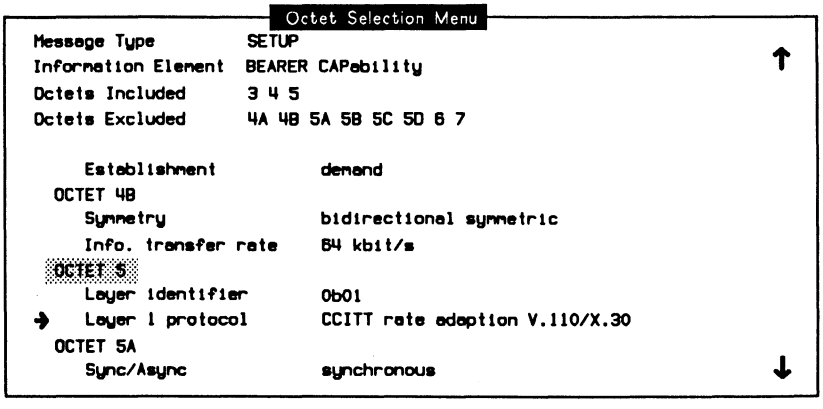
f3
Exclude

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.



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
  Message Type          SETUP
  Information Element   BEARER CAPability
  Field Name            Layer 1 protocol
  Field Value           0b00010  Rec. G.711 u-law

  0b00001  CCITT rate adaption V.110/X.30
→ 0b00010  Rec. G.711 u-law
  0b00011  Rec. G.711 A-law
  0b00100  Rec. G.721 32 kbits/s ADPCM
  0b00101  Rec. G.722 and G.724 7kHz audio
  0b00110  Rec. G.7XX 384 kbit/s video
  0b00111  non-CCITT rate adaption
  0b01000  CCITT rate adaption V.120
  0b01001  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).

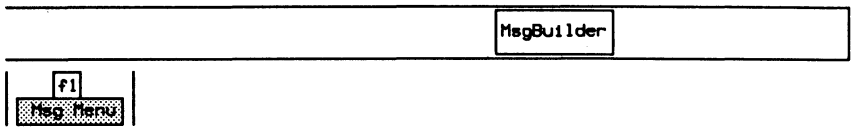
Creating Messages (Manual)

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).



Message Selection Menu

```
Message Options :                    Active PD       8
→ Build Mode      MANUAL             Call Reference :
  Message Set     CCITT_1988           CR Length  1 OCTET     MANUAL
  Active Message  SETUP                CR Flag    ORIG
  Direction       NETWORK TO USER      CR Value   0
Layer 3 Messages
  ALERT       PROG        STATUS      SEGMENT     RET_REJ
  CALL_PROC   REL         STATUS_EN   FAC
  CON_CON     REL_COM     SUSP        HOLD
  CONN        RES         SUSP_ACK    HOLD_ACK
  CONN_ACK    RES_ACK     SUSP_REJ    HOLD_REJ
  DISC        RES_REJ     USER_INFO   REG
  INFO        SETUP       REST        RET
  NOTIFY      SETUP_ACK   REST_ACK    RET_ACK
```

f2
MANUAL

→ *SETUP*

f1
Build Header

f2
IE Menu

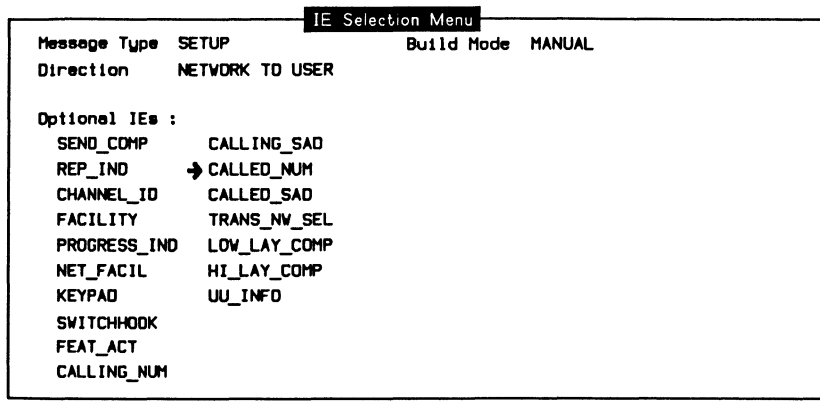
Selecting the IE's

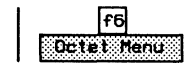
IE Selection Menu

Message Type SETUP Build Mode MANUAL
Direction NETWORK TO USER

Mandatory IEs :
→ BEARER_CAP

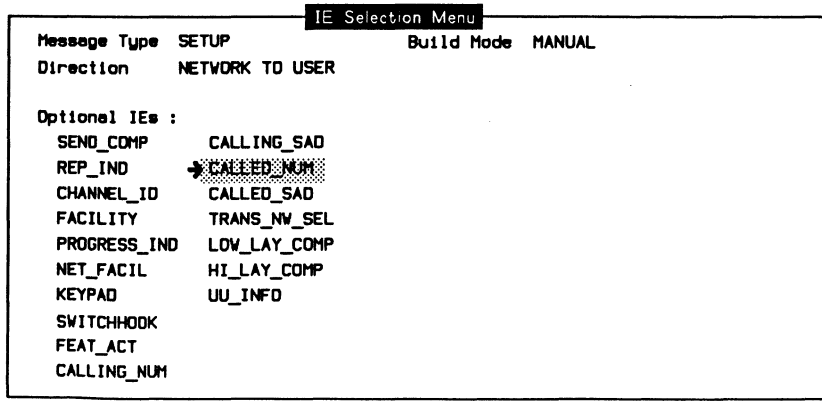
f3
Optional

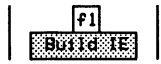




Including/Excluding Octets

- Include/exclude octets and modify parameter values as described for automatic messages.
- Press *Exit* (until the IE Selection Menu is displayed).



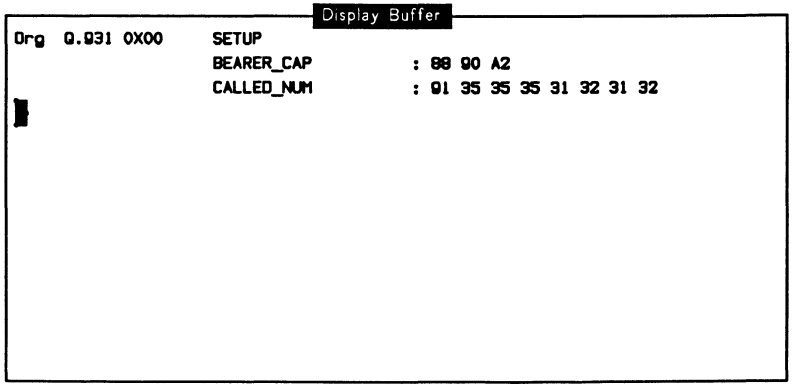


NOTE
When an IE is built, the Remove Last function key can be used to remove the IE from the end of the message buffer. Only the most recent IE can be removed.

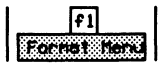
- Repeat the same procedure for the BEARER_CAP IE. Include/exclude octets, modify parameter values, and then build the IE.

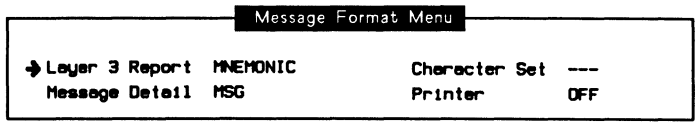
Displaying the Message

The message can be displayed from either the Message Selection Menu or the IE Selection Menu (manual mode).

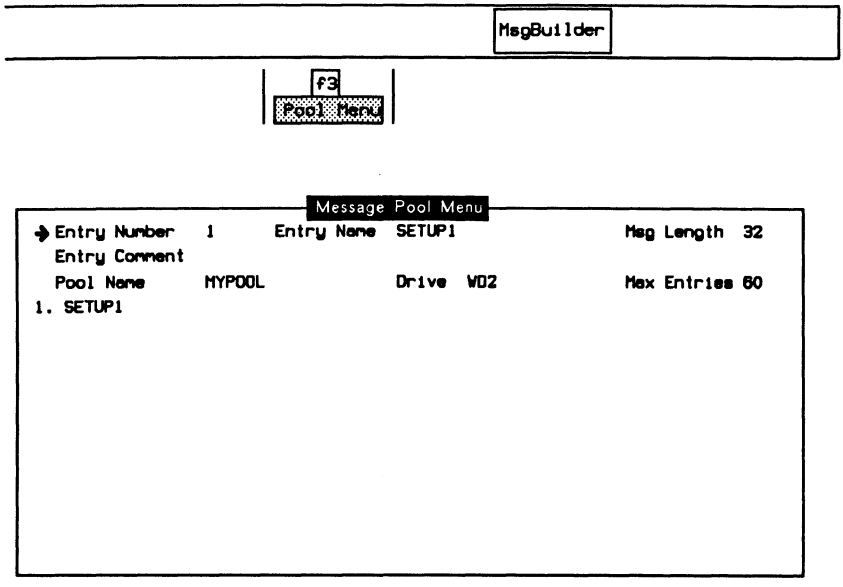


The display format can be selected from the Display Buffer Menu or, in more detail, from the Message Format Menu. The display format modes are identical to those of the monitor (see the 'ISDN Display Formats' section on page 4-5).





Adding a Message to the Message Pool



Pool Entry

→ *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 poll 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.

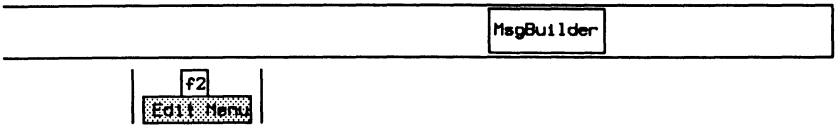
Max Entries
Displays the maximum number of message pool entries allowed in a message pool. There are 60 entries initially available. Individual entries of more than 130 bytes in length reduce the maximum number of entries by 1.

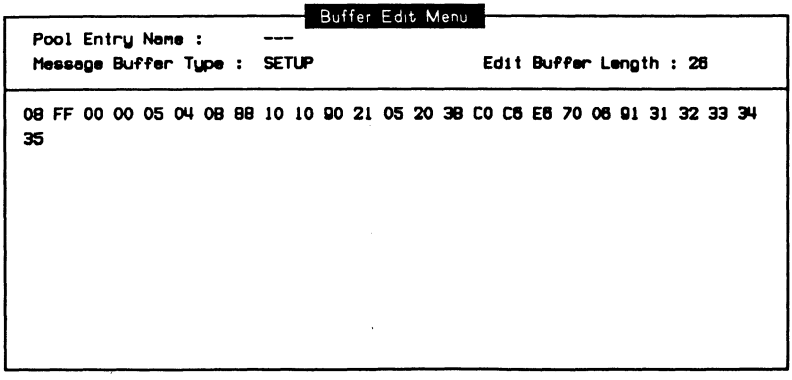
Editing Messages

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).





Insert	Inserts typed characters before the current cursor position.
Append	Inserts typed characters after the current cursor position.
Replace	Overwrites existing data at the cursor position.
Cut Byte	Deletes the byte at the current cursor position.
Clear	Deletes all data in the edit buffer.
Copy Mbuf	Copies the message from the message buffer to the edit buffer.
Copy Entry	Copies the specified pool entry to the edit buffer.
Append Mbuf	Appends the contents of the message buffer to the end of the edit buffer.
Append Entry	Appends the specified pool entry to the end of the edit buffer.

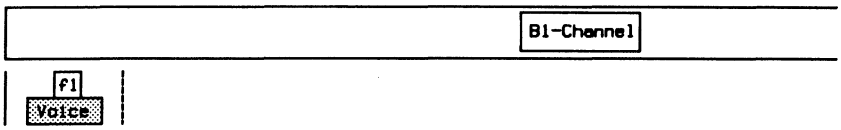
5.2 B-Channel Emulation

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

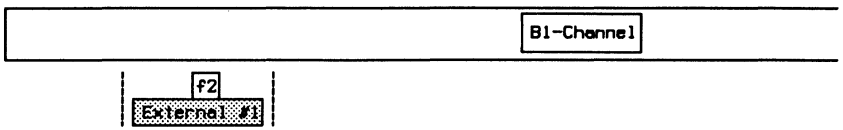
Voice

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.

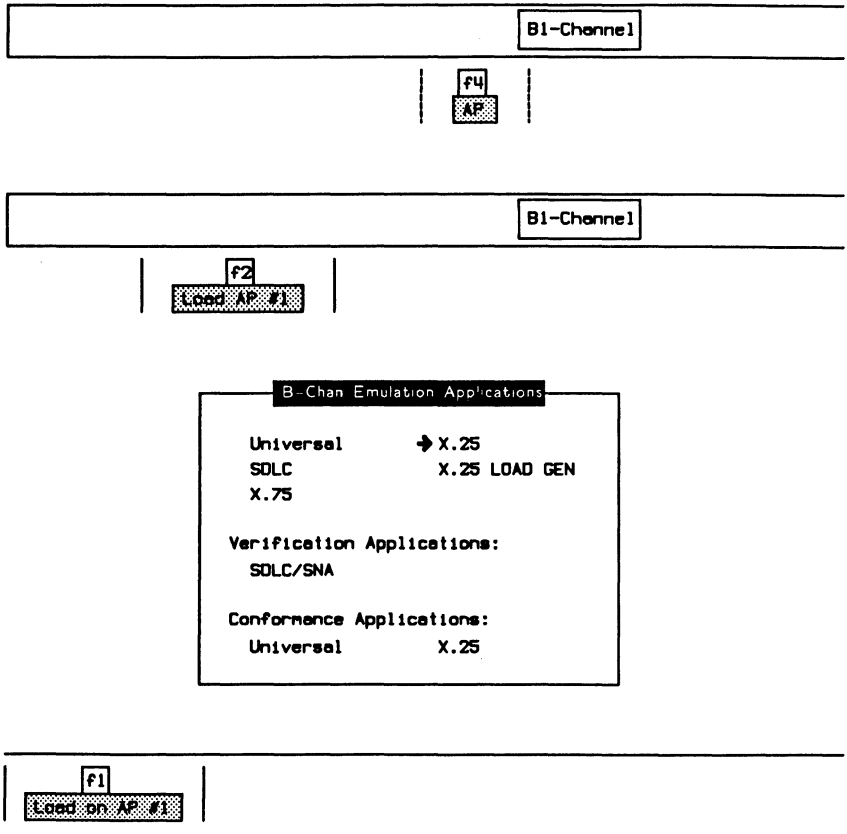


By default, external connector #1 is associated with the B1-Channel, and external connector #2 is associated with the B2-Channel.

Loading an Application

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

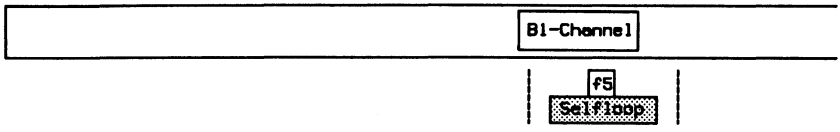
Example:
Load the X.25 Emulation program on AP #1 to emulate data transfer on the B1-Channel.



When the application has finished loading:

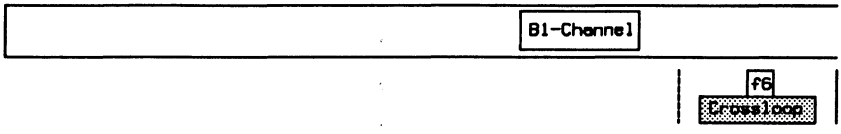
Selfloop

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.



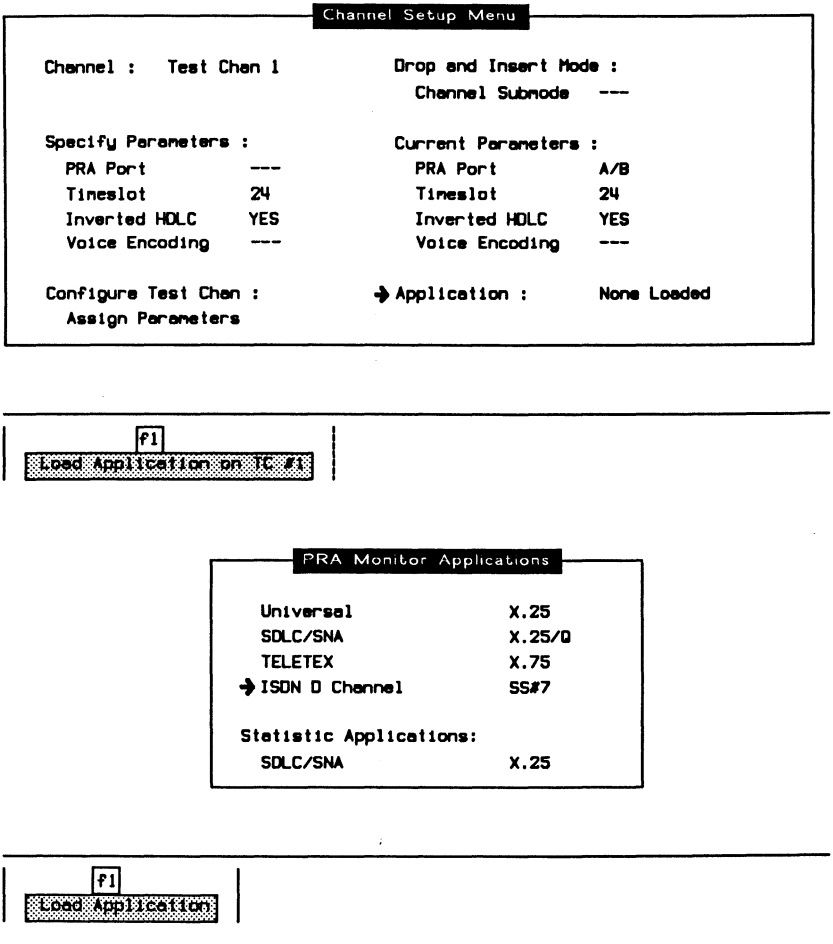
6

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.



When the application has finished loading:

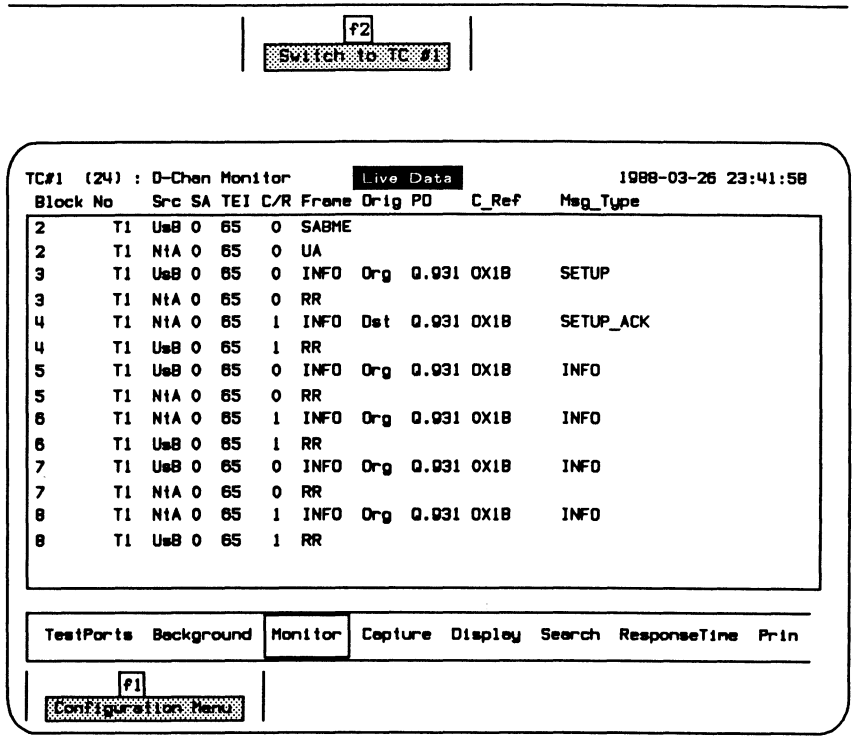
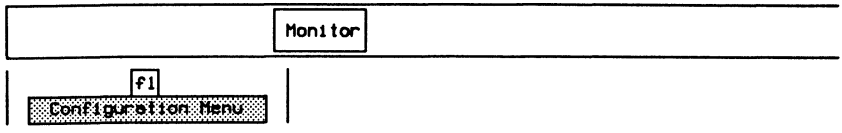
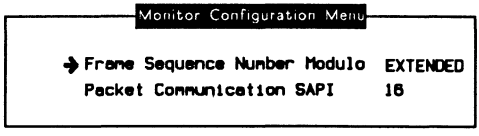


Figure 6–1 ISDN D–Channel Monitor Program Display

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.

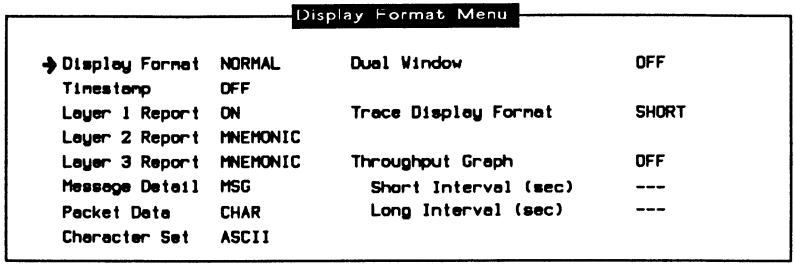
EXTENDED (default) Selects frame level decoding according to modulo 128.

→ *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.



→ *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*

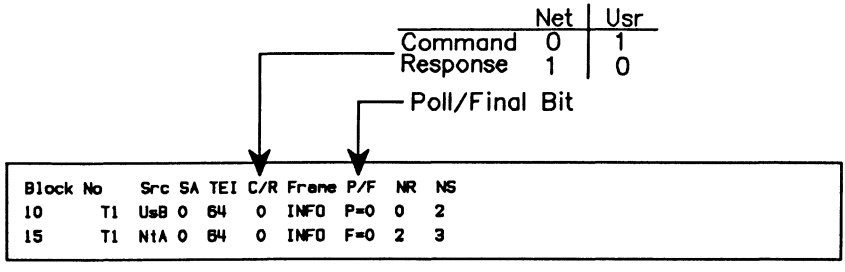
OFF — Layer 1 information is not displayed.

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




```
Block No    Src SA TEI C/R Frame P/F   NR  NS
10      T1  UsB 0  64   0  INFO  P=0  0   2
15      T1  NtA 0  64   0  INFO  F=0  2   3
```

HEX

```
Block No    Src  Frame
10      T1  UsB  00 01 C4 00
15      T1  NtA  00 01 01 C8
```

TEXT

```
Block No    Src  Frame
10      T1  UsB  [NUSHDMU]
15      T1  NtA  [NUSHSWF]
```

MNEMONIC

```
Block No    Src SA TEI C/R Frame
10      T1  UsB 0  64   0  INFO
15      T1  NtA 0  64   0  INFO
```

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

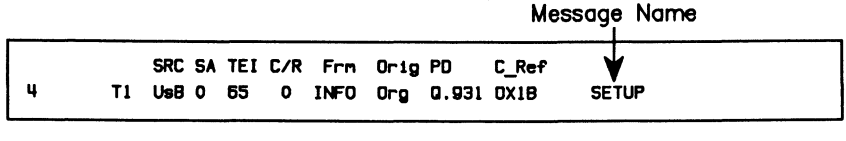
COMPLETE

```
4       T1  UsB 0  65   0  INFO
PD = Q.931  CR = 0X1B        Orig  SETUP                    Ver. = CCITT_1988
      1  00000100  INFORMATION ELEMENT : BEARER CAPability
      2  00000011  IE length           : 3 octets
      3  1-------  Extension bit       : not continued
         -00-----  Coding standard     : CCITT
         ---00000  Info. trans. cap.   : speech
      4  1-------  Extension bit       : not continued
         -00-----  Transfer mode       : circuit mode
         ---10000  Info. transfer rate : 64 kbit/s
      5  1-------  Extension bit       : not continued
         -01-----  Layer identifier    : 1
         ---00010  Layer 1 protocol    : Rec. G.711 u-law
```

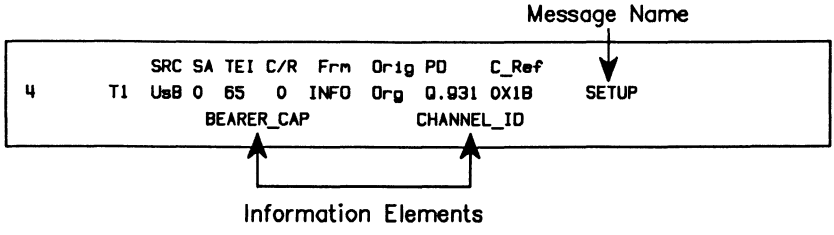
NOTE
If layer 3 contains X.25 data (SAPI=16), it will be decoded according to the X.25 (1980/1984) Protocol.

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

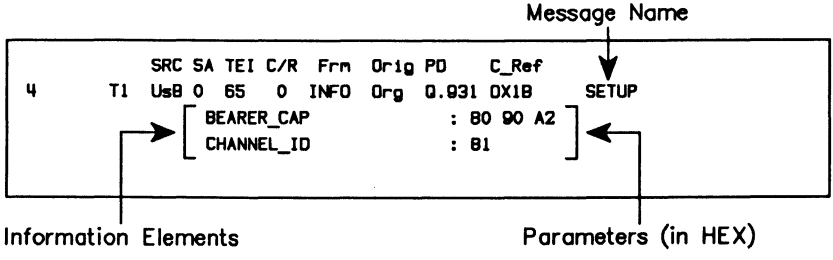
MSG



MSG+IE



MSG+IE+PA

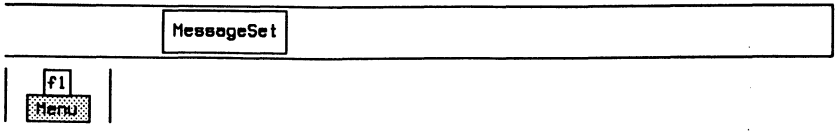


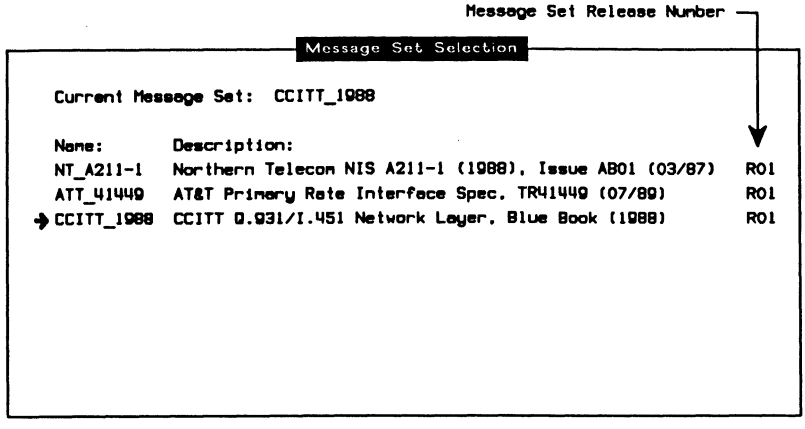
→ *Packet Data*
Selects the display format for X.25 data contained in a SAPI 16 I frames as hex or character mode (i.e. ASCII).

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.





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

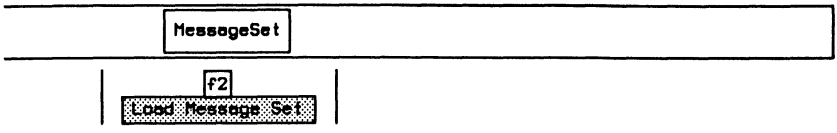
Page Up — Displays the previous ten message sets.

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.

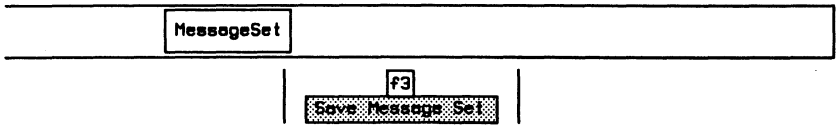
6.5 Loading a Message Set

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.

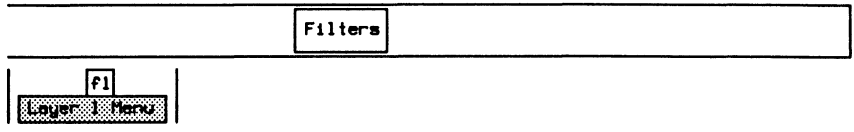


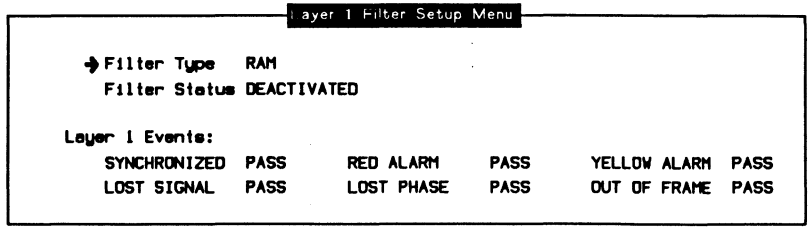
6.7 ISDN Filters

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:

→ *SYNCHRONIZED*
The line receiver is locked to the clock signal and framing format.

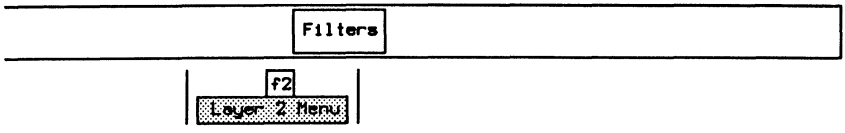
→ *LOST SIGNAL*
The signal amplitude falls below the minimum threshold as defined by the interface.

→ *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   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.

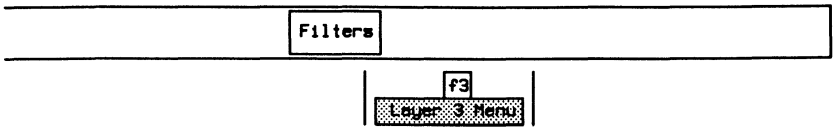
→ *Logical Operation*

OR Selects frames which match either SAPI or TEI conditions.

AND Selects frames which match both SAPI and TEI conditions.

S=SAPI T=TEI		SAPI/TEI of Received Frame							
		AND				OR			
SAPI	TEI	=S =T	=S ≠T	≠S =T	≠S ≠T	=S =T	=S ≠T	≠S =T	≠S ≠T
BLOCK	BLOCK	■	■	■	PASS	BLK	□	□	□
BLOCK	PASS	■	■	PASS	■	□	BLK	□	□
PASS	BLOCK	■	PASS	■	■	□	□	BLK	□
PASS	PASS	PASS	■	■	■	□	□	□	BLK
LEGEND: ■ = BLOCK □ = PASS									

Table 6-1 SAPI/TEI – Logical Operations



Layer 3 Filter Setup Menu

```
Filter Type   RAM          Protocol Discriminator OFF    PD Value ---
Filter Status ACTIVATED    Call Reference         OFF    CR Value ---
                           Message Set  CCITT_1988
```

ALERT	BLK	REL	BLK	SUSP	BLK	HOLD_ACK	BLK
CALL_PROC	BLK	REL_COM	BLK	SUSP_ACK	BLK	HOLD_REJ	BLK
CON_CON	BLK	RES	BLK	SUSP_REJ	BLK	REG	BLK
CONN	BLK	RES_ACK	BLK	USER_INFO	BLK	RET	BLK
CONN_ACK	BLK	RES_REJ	BLK	REST	BLK	RET_ACK	BLK
DISC	BLK	→ SETUP	PASS	REST_ACK	BLK	RET_REJ	BLK
INFO	PASS	SETUP_ACK	BLK	SEGMENT	BLK	Undefined	BLK
NOTIFY	BLK	STATUS	BLK	FAC	BLK	Invalid	BLK
PROG	BLK	STATUS_EN	BLK	HOLD	BLK		

→ *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*

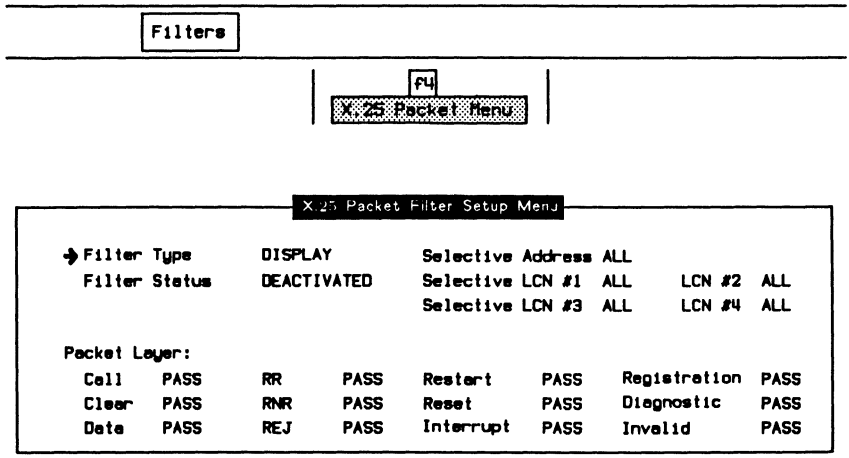
OFF — Ignores the message call reference when filtering.

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.

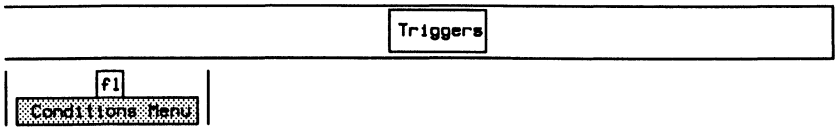


6.8 ISDN Triggers

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 Direction	FROM BOTH
Trigger Status	UNARMED	Disk Full	OFF
Layer 1 Events		RAM Full	OFF
→ Layer 2 Events		Alarm Clock	OFF
Layer 3 Events		Time	---
X.25 L3 Events			
String Match	OFF		
String	---		
Mask	---		

Layer 2 Event Menu

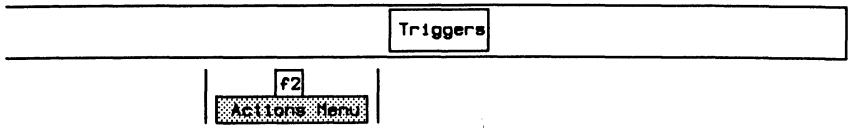
Link Address Events:

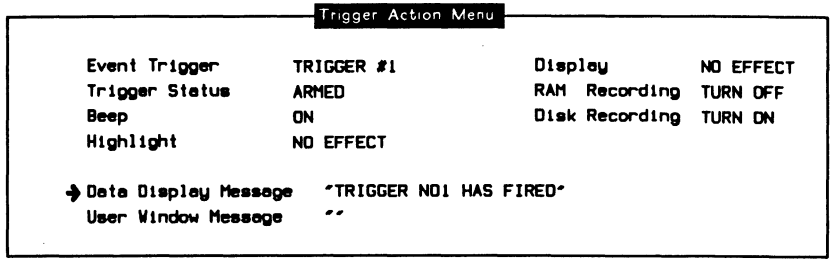
→ SAPI	ON	DLCI	OFF			SAPI Value	0		
TEI	OFF					TEI Value	---		

Layer 2 Events:

RR	OFF	SABM	OFF	I	OFF	DISC	OFF	INVALID	OFF
RNR	OFF	SABME	OFF	UA	OFF	DM	OFF		
REJ	OFF	XID	OFF	UI	OFF	FRMR	OFF		

Setting Actions





NOTE
Specify the drive and data filename on the Recording Menu before arming the trigger.

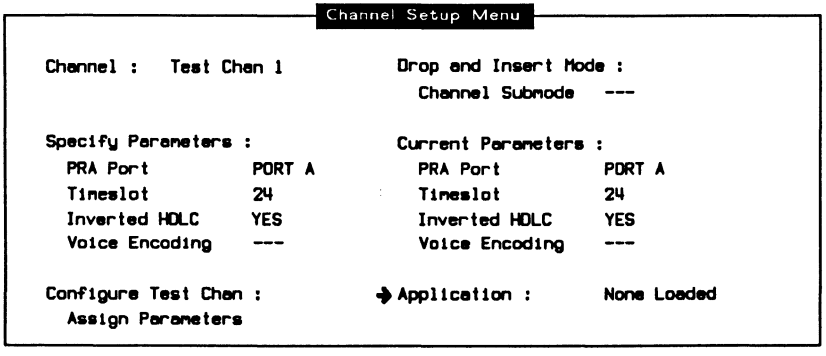
7

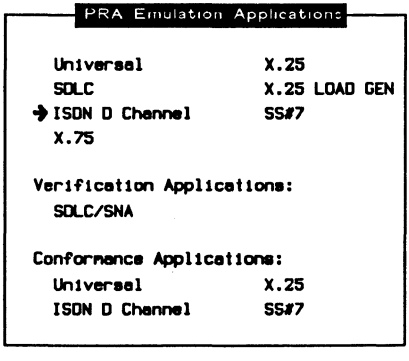
ISDN PRA EMULATION

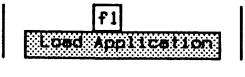
Version 2.0

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.







When the application has finished loading:

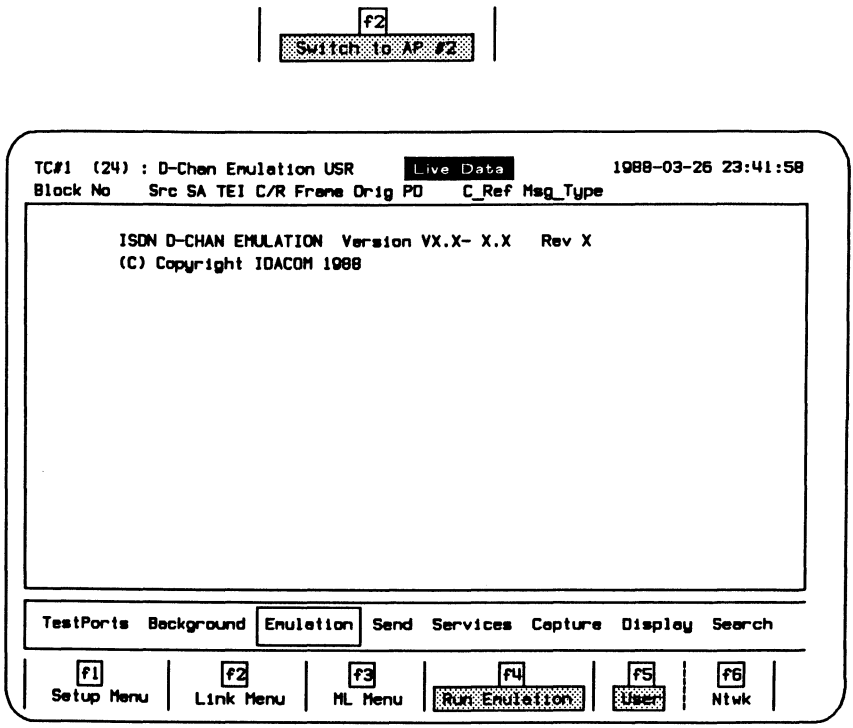
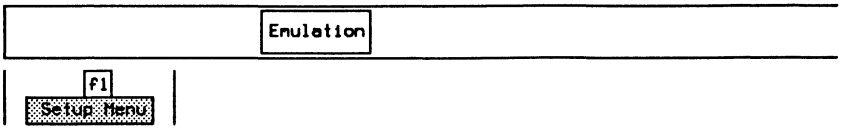


Figure 7–1 ISDN D–Channel Emulation Program Display

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



Emulation Configuration

```
Timer Duration :                    Protocol Emulation :
→Idle Link (T203)   300               L.2 State Machine     ON

Flags :                             Special SAPI :
  XID Negotiate Proc OFF              Packet Communication 16
  RR Polling Action  OFF
```

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.

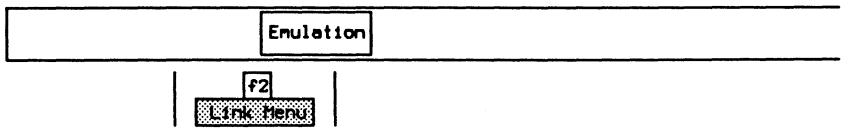
NOTE
This function is the same as the Run Emulation function key under the Emulation topic.

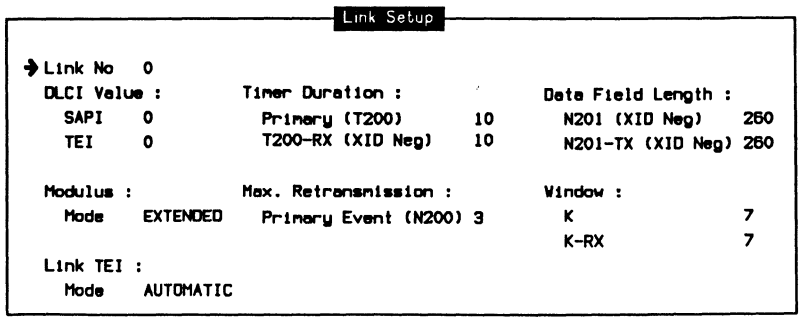
Special SAPI:

→ *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.





→ *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:

→ *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)*
Not required for Primary Rate.

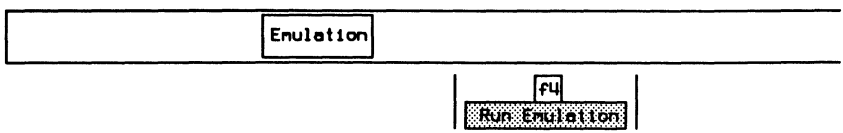
Window:

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

→ *K-RX*
Not required for Primary Rate.

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



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).

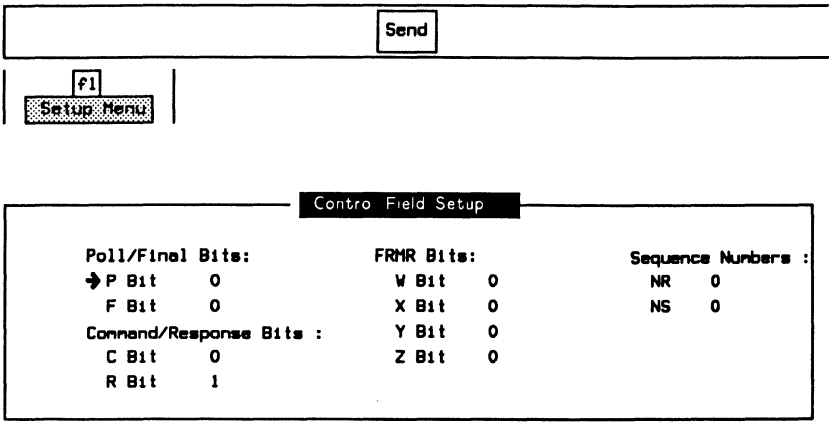
7.4 Layer 2 Frames

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).

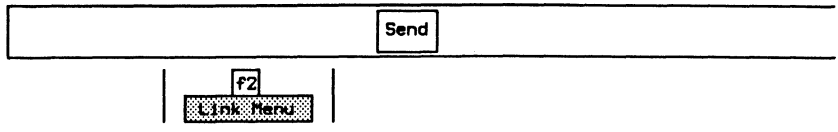


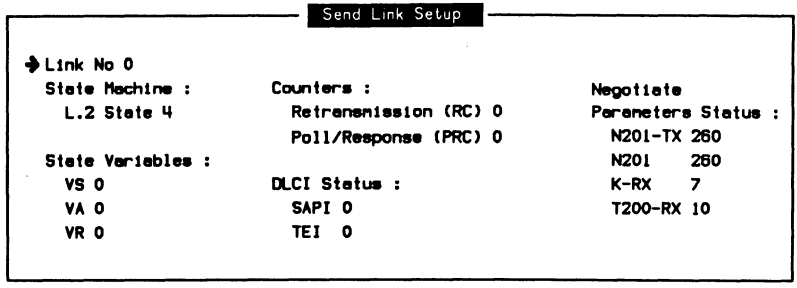
Poll/Final Bits:
All frames contain a P/F (poll/final) bit. Command frames contain a P bit and response frames contain an F bit.

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 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 Frames

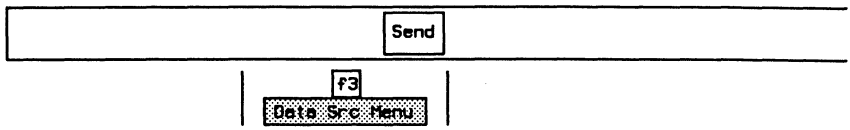
Individual frames can be transmitted using the function keys under the **Send** topic. When the layer 2 state machine is on, frames are sent only when permitted by the current state. When the layer 2 state machine is off, frames are sent with values defined on the Control Field Setup and Send Link Setup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

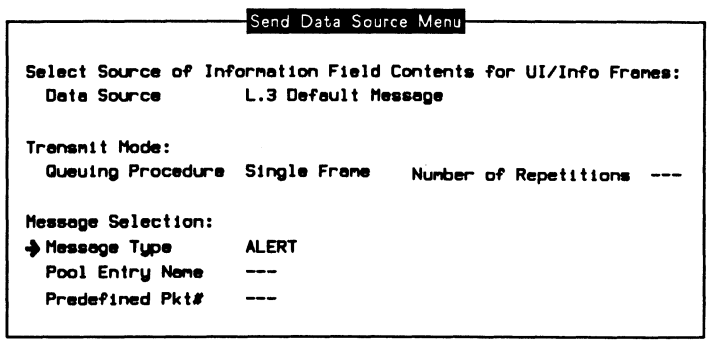
SABME, RR, RNR, REJ, UA, DISC, DM, and FRMR	Transmits the corresponding frame.
XID	Not required for Primary Rate.

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*

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 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*.

Send Message Type Menu

Message Set CCITT_1988 Current Message Type : ALERT

→ ALERT	REL_COM	SUSP_REJ	RET
CALL_PROC	RES	USER_INFO	RET_ACK
CON_CON	RES_ACK	REST	RET_REJ
CONN	RES_REJ	REST_ACK	
CONN_ACK	SETUP	SEGMENT	
DISC	SETUP_ACK	FAC	
INFO	STATUS	HOLD	
NOTIFY	STATUS_EN	HOLD_ACK	
PROG	SUSP	HOLD_REJ	
REL	SUSP_ACK	REG	

- Press *Exit*.

→ *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 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:

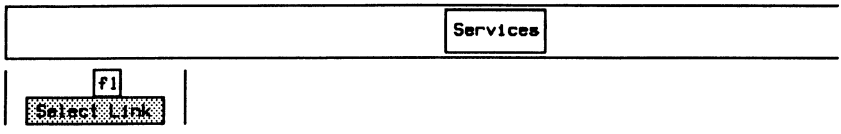
ASP UI	Transmits the message selected on the Send Data Source Menu as an assignment source procedure UI frame (SAPI=63, TEI=current value).

7.6 Services

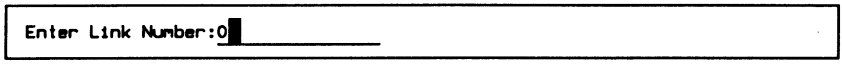
The **Services** topic provides control for the automatic operation of the emulation program.

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

Selecting a Link

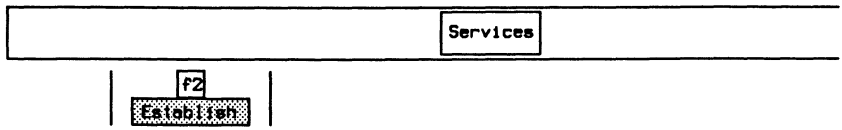


- Enter the link number (eg. 0) and press ↵ (RETURN).



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

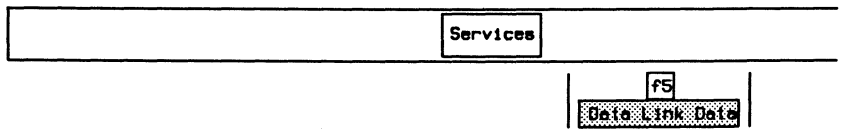
Establishing a Link




```
Block No    Src SA TEI C/R Frame P/F  NR  NS  Orig PD    C_Ref    Msg_Type
65      T1  Usr 0  0    0  SABME P=1
3       T1  Net 0  65   0  UA    P=1
```

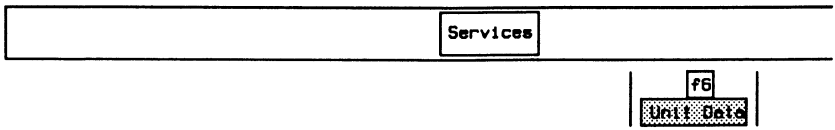
Sending Frames/Messages

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



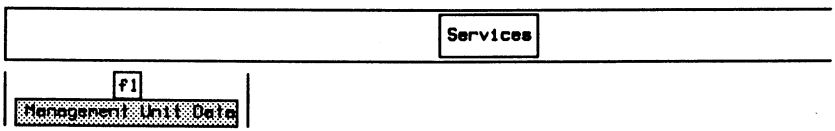

```
Block No    Src SA TEI C/R Frame Orig PD    C_Ref    Msg_Type
67      T1  Usr 0  0    0  INFO  Org  Q.931 0X0000   SETUP
5       T1  Net 0  0    0  RR
```

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



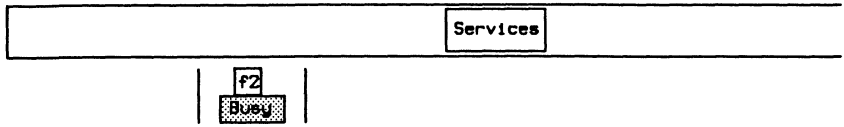
Block No		Src	SA	TEI	C/R	Frame	Orig	PD	C_Ref	Msg_Type
67	T1	Usr	0	0	0	INFO	Org	Q.931	0X0000	SETUP
5	T1	Net	0	0	0	RR				
68	T1	Usr	0	0	0	UI	Org	Q.931	0X0000	SETUP

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



Block No		Src	SA	TEI	C/R	Frame	Orig	PD	C_Ref	Msg_Type
68	T1	Usr	0	0	0	UI	Org	Q.931	0X0000	SETUP
6	T1	Net	0	0	0	RR				
69	T1	Usr	63	0	0	UI	Org	Q.931	0X0000	SETUP

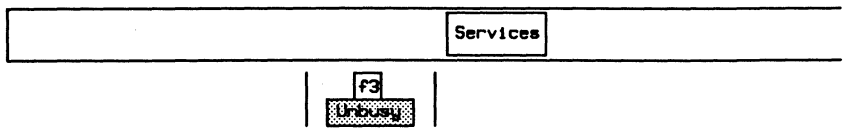
Setting a Link to Busy



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

Block No	Src	SA	TEI	C/R	Frame	Orig PD	C_Ref	Msg_Type
75	T1	Usr	0	0	0	RNR		
12	T1	Net	0	0	0	RR		
13	T1	Net	0	0	1	RR		
76	T1	Usr	0	0	1	RNR		
14	T1	Net	0	0	1	RR		
77	T1	Usr	0	0	1	RNR		
78	T1	Usr	0	0	0	RR		
15	T1	Net	0	0	0	RR		

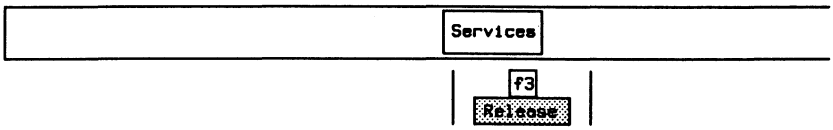
To clear the busy state:



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

Block No		Src	SA	TEI	C/R	Frame	Orig PD	C_Ref	Msg_Type
75	T1	Usr	0	0	0	RR			
12	T1	Net	0	0	0	RR			
13	T1	Net	0	0	1	RR			
76	T1	Usr	0	0	1	RR			
14	T1	Net	0	0	1	RR			
77	T1	Usr	0	0	1	RR			
78	T1	Usr	0	0	0	RR			
15	T1	Net	0	0	0	RR			

Disconnecting a Link



Block No		Src	SA	TEI	C/R	Frame	Orig PD	C_Ref	Msg_Type
79	T1	Usr	0	0	0	DISC			
16	T1	Net	0	0	0	UA			

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.

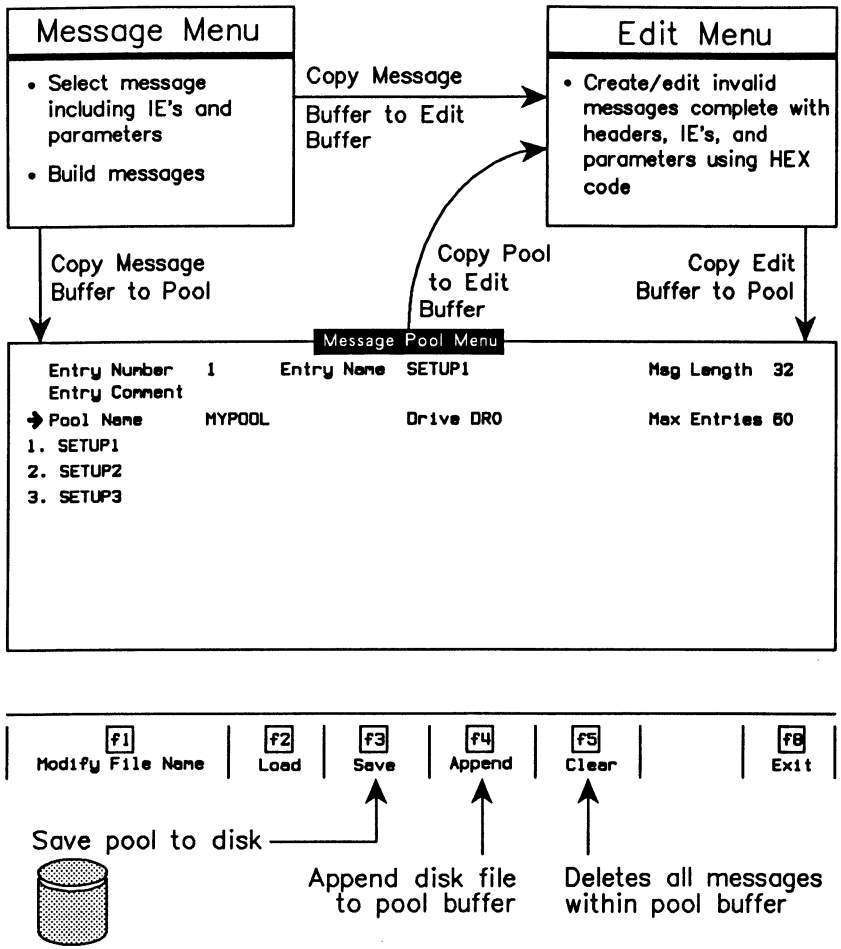


Figure 7-2 Message Builder Overview

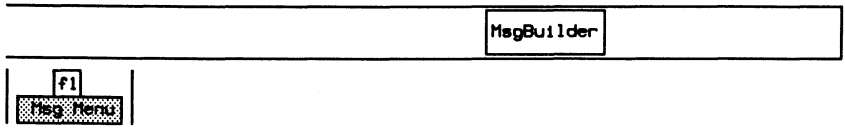
Creating Messages (Automatic)

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 Selection Menu

```
Message Options :                        Active PD       8
→ Build Mode      AUTOMATIC              Call Reference :
  Message Set     CCITT_1988               CR Length   1 OCTET
  Active Message  SETUP                    CR Flag     ORIG
  Direction       NETWORK TO USER          CR Value    0
Layer 3 Messages
  ALERT       PROG         STATUS      SEGMENT     RET_REJ
  CALL_PROC   REL          STATUS_EN   FAC
  CON_CON     REL_COM      SUSP        HOLD
  CONN        RES          SUSP_ACK    HOLD_ACK
  CONN_ACK    RES_ACK      SUSP_REJ    HOLD_REJ
  DISC        RES_REJ      USER_INFO   REG
  INFO        SETUP        REST        RET
  NOTIFY      SETUP_ACK    REST_ACK    RET_ACK
```

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.

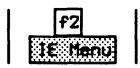
Call Reference:

→ *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).

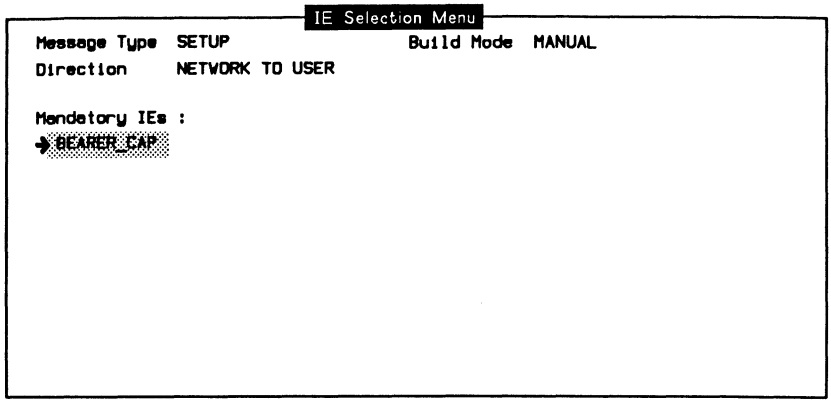
→ *CR Value*
Sets the value of the call reference.

→ *SETUP*

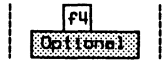


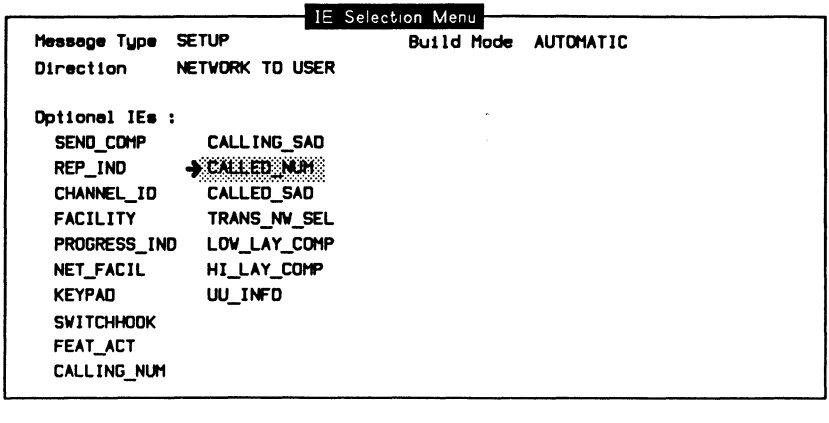
If there are no mandatory IE's for the selected message, the optional IE's will be displayed. If there are no mandatory or optional IE's, all other IE's will be displayed.

Selecting the IE's



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





f1
Select IE

- Return to the mandatory IE Selection Menu.

f3
Mandatory

f6
Octet Menu

Including/Excluding Octets

Octet Selection Menu

```
Message Type          SETUP
Information Element   BEARER CAPability
Octets Included       3 4 4B 5 5A 5B 5C 5D 6 7
Octets Excluded       4A

 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.

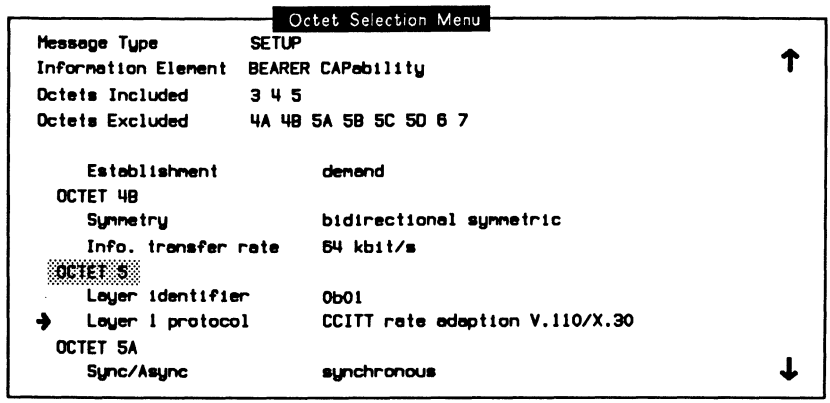
f3
Exclude

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.

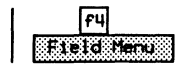


Method 1

- 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.



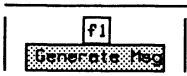
```
                    Field Value Selection Menu
  Message Type          SETUP
  Information Element   BEARER CAPability
  Field Name            Layer 1 protocol
  Field Value           0b00010  Rec. G.711 u-law

  0b00001  CCITT rate adaption V.110/X.30
→ 0b00010  Rec. G.711 u-law
  0b00011  Rec. G.711 A-law
  0b00100  Rec. G.721 32 kbits/s ADPCM
  0b00101  Rec. G.722 and G.724 7kHz audio
  0b00110  Rec. G.7XX 384 kbit/s video
  0b00111  non-CCITT rate adaption
  0b01000  CCITT rate adaption V.120
  0b01001  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).



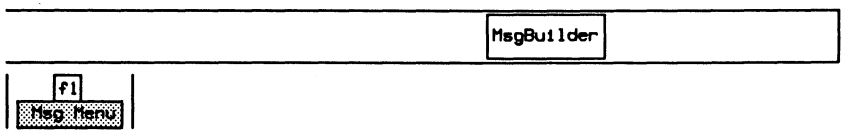
Creating Messages (Manual)

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).

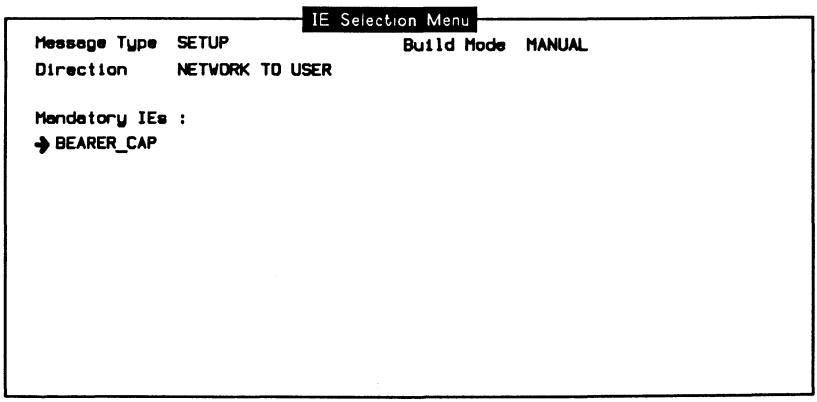


Message Selection Menu

```
Message Options :                    Active PD       8
→ Build Mode      MANUAL             Call Reference :
  Message Set     CCITT_1988           CR Length  1 OCTET    MANUAL
  Active Message  SETUP                CR Flag    ORIG
  Direction       NETWORK TO USER      CR Value   0
Layer 3 Messages
  ALERT       PROG        STATUS      SEGMENT     RET_REJ
  CALL_PROC   REL         STATUS_EN   FAC
  CON_CON     REL_COM     SUSP        HOLD
  CONN        RES         SUSP_ACK    HOLD_ACK
  CONN_ACK    RES_ACK     SUSP_REJ    HOLD_REJ
  DISC        RES_REJ     USER_INFO   REG
  INFO        SETUP       REST        RET
  NOTIFY      SETUP_ACK   REST_ACK    RET_ACK
```

→ *SETUP*

Selecting the IE's



f3
Optional

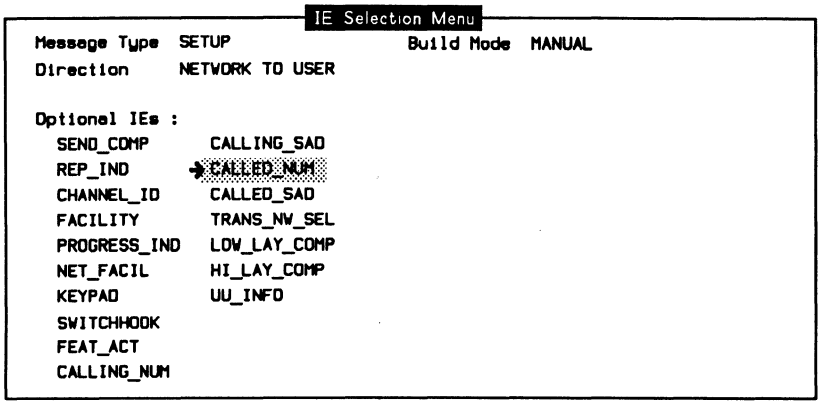
IE Selection Menu

```
Message Type  SETUP                    Build Mode  MANUAL
Direction     NETWORK TO USER

Optional IEs :
  SEND_COMP       CALLING_SAD
  REP_IND       → CALLED_NUM
  CHANNEL_ID      CALLED_SAD
  FACILITY        TRANS_NW_SEL
  PROGRESS_IND    LOW_LAY_COMP
  NET_FACIL       HI_LAY_COMP
  KEYPAD          UU_INFO
  SWITCHHOOK
  FEAT_ACT
  CALLING_NUM
```

f6
Octet Menu

Including/Excluding Octets

- Include/exclude octets and modify parameter values as described for automatic messages.
- Press *Exit* (until the IE Selection Menu is displayed).



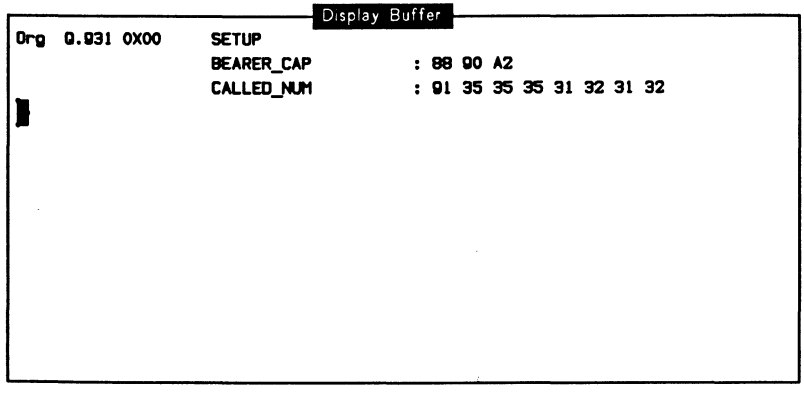
NOTE

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

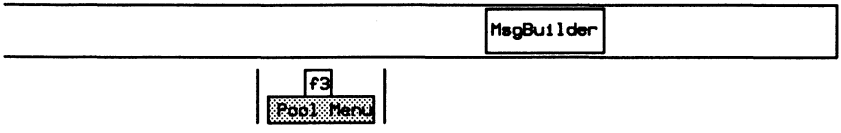
The message can be displayed from either the Message Selection Menu or the IE Selection Menu (manual mode).



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 Section 6.3).

```
Message Format Menu

→ Layer 3 Report  MNEMONIC          Character Set  ---
  Message Detail  MSG               Printer        OFF
```

Adding a Message to the Message Pool




```
Message Pool Menu

→ Entry Number   1      Entry Name  SETUP1              Msg Length  32
  Entry Comment
  Pool Name      MYPOOL             Drive  VD2          Max Entries 60
1. SETUP1
```

Pool Entry

→ *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 poll 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.

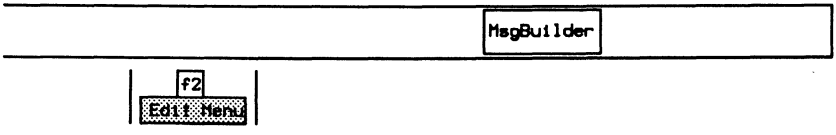
Max Entries
Displays the maximum number of message pool entries allowed in a message pool. There are 60 entries initially available. Individual entries of more than 130 bytes in length reduce the maximum number of entries by 1.

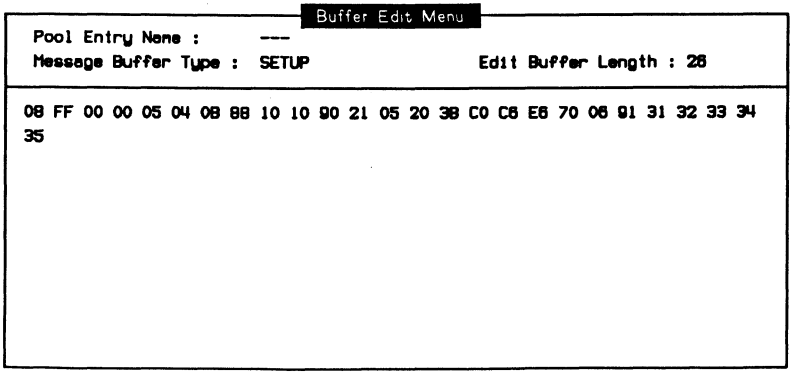
Editing Messages

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).





Insert	Inserts typed characters before the current cursor position.
Append	Inserts typed characters after the current cursor position.
Replace	Overwrites existing data at the cursor position.
Cut Byte	Deletes the byte at the current cursor position.
Clear	Deletes all data in the edit buffer.
Copy Mbuf	Copies the message from the message buffer to the edit buffer.
Copy Entry	Copies the specified pool entry to the edit buffer.
Append Mbuf	Appends the contents of the message buffer to the end of the edit buffer.
Append Entry	Appends the specified pool entry to the end of the edit buffer.

8

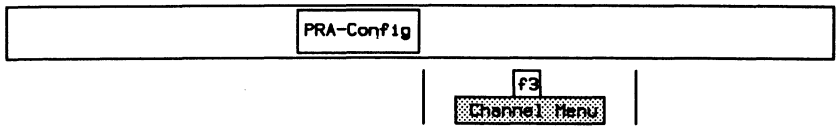
ISDN PRA DROP & INSERT

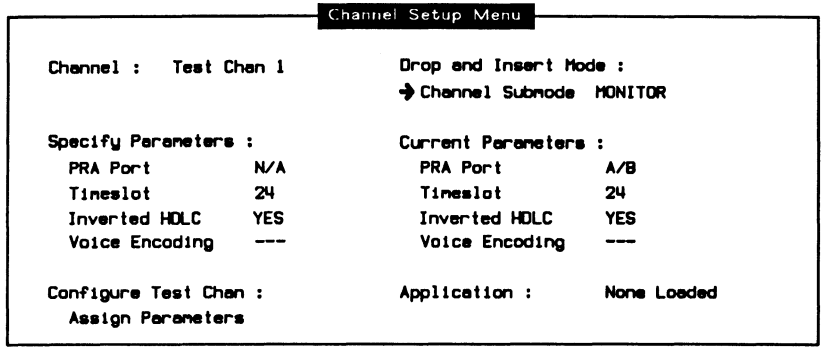
Version 2.0

8.1 Monitor Submode

To monitor in drop and insert mode, first configure the system as described in Section 3.8.

Channel Setup





→ *Channel*
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.

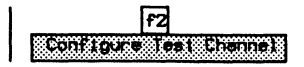
→ *Inverted HDLC*
Selects whether to invert bit values on the selected channel prior to monitoring.

→ *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'.



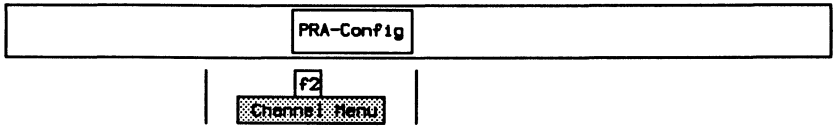
NOTE
The error message 'Channel and port have already been assigned' is displayed if the timeslot is already allocated by the other test channel or external access.

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

→ *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

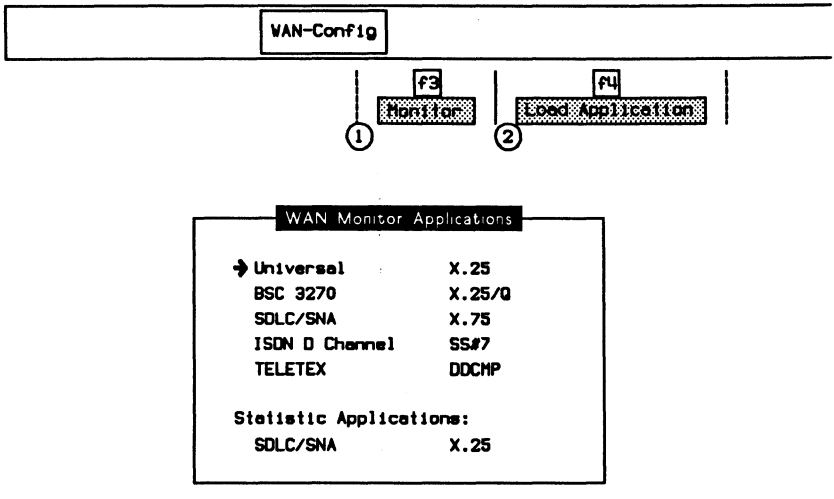
UNIVERSAL MONITOR

Version 2.0

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.

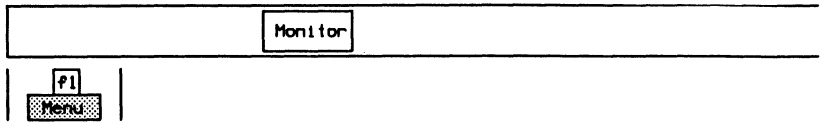
NOTE
Refer to Section 3.3 for instructions to load an application on a BRA B-Channel, and Section 3.5 to load on a PRA Test Channel.



When the application has finished loading:

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

→ Interface Type	RS232C/V.28	Interface Leads	DISABLED
Protocol Configuration:			
Framing	HDLC/SDLC	Reset Enable	---
Clocking	NRZ WITH CLOCK	Sync Reset Character	---
Bit Rate	64000	DCD Control	OFF
Bits/Character	8	CRC	CCITT
Stop Bits	---	Strip Sync	ON
Parity	NONE	Message Length	---
Sync Character	HEX 7E	Message Timeout	---
Interframe Fill	SYNC	End of Frame Character	---

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/SDLC).

→ *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.

Parameter	Description	HDLC/SDLC	CHARACTER SYNC	BISYNC EBCDIC	BISYNC ASCII	ASYNC (4)
Clocking (1)	See Below	NRZ with clock External Tx Clock NRZI NRZI with clock	NRZ with clock External Tx clock			
Bit Rate (2) (3)	Number of bits per second	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				
Bits/Character	Number of bits per character	8	5, 6, 7, 8	8	7	5, 6, 7, 8
Stop Bits	Number of stop bits					1, 1.5, 2
Parity	Check bit which makes the sum of the binary digits, including the check bit (always odd or even)	None	None Odd Even Mark Space	None	Odd	None Odd Even Mark Space
SYNC Character	Bit pattern that identifies the start and end of a block of data	Hex 7E	Hex 16, 32, 96 User-defined	Hex 32	Hex 16	
Interframe Fill	Bit pattern that is transmitted between blocks of data	SYNC Mark	Mark	Mark	Mark	Mark

Table 9-1 Universal Monitor/Simulation Parameters

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.

Parameter	Description	HDLC/SDLC	CHARACTER SYNC	BISYNC EBCDIC	BISYNC ASCII	ASYNC (3)
Reset Enable	Determines if the SYNC reset character is enabled		ON OFF			
SYNC Reset Character	Character which causes receiver to start a new sync search		Hex FF User-defined			
DCD Control (4)	While the Data Carrier Detect is 0/SPACE, the received data is ignored	ON OFF	ON OFF	ON OFF	ON OFF	OFF
CRC	Cyclic Redundance Check/ Frame Check Sequence	CRC-CCITT	None	CRC-16	VRC/LRC CRC-16	
Strip SYNC	Sync characters are not displayed or captured	ON	ON OFF	ON	ON	
Message Length	Maximum number of characters recorded or displayed in a block of data		DISABLED 1-5000 characters			DISABLED 1-5000 characters (60)
Message Timeout	Maximum elapsed time between characters before characters are recorded or displayed as a block of data					DISABLED 1-65535 msec. (17)
End of Frame Character	Specified character terminates block of data					4 separate characters can be specified

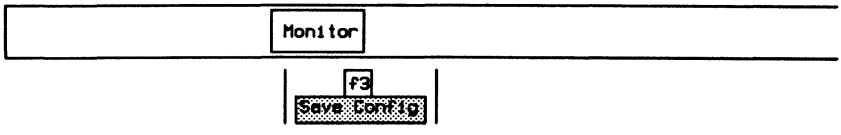
For ISDN B1 and B2 Channels:
(3) ASYNC is not supported.
(4) DCD Control is not supported.

Table 9-2 Universal Monitor/Simulation Parameters (cont'd)

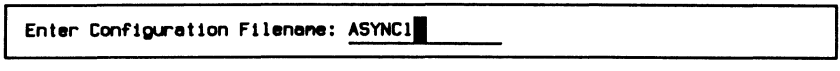
Saving Menu Configurations

Previously defined configuration settings can be saved in a disk file for future retrieval.

Example:
Save the current configuration in a file named ASYNC1.



- Enter the name of the file and press ↵ (RETURN).

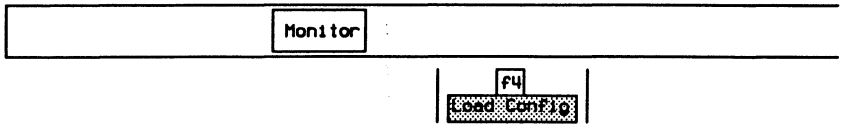


The configuration file is created and '.C' is appended to the specified name.

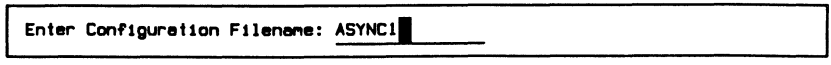
Loading Menu Configurations

Previously saved configuration settings can be retrieved from disk.

Example:
Retrieve the configuration settings saved in ASYNC1.



- Enter the name of the file, excluding the trailing '.C', and press ↵ (RETURN).



9.3 Monitoring Live Data

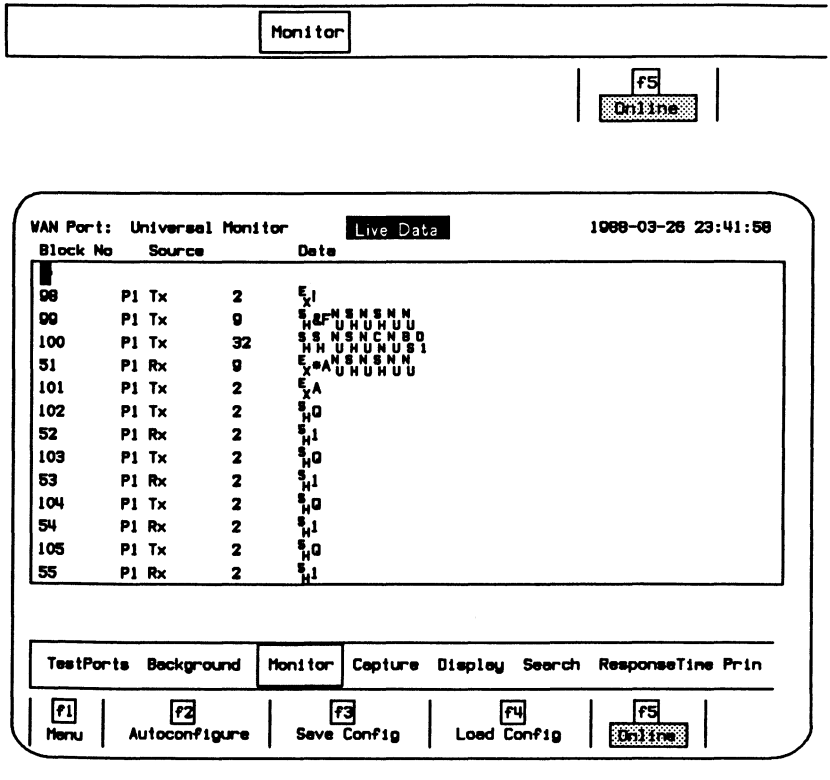
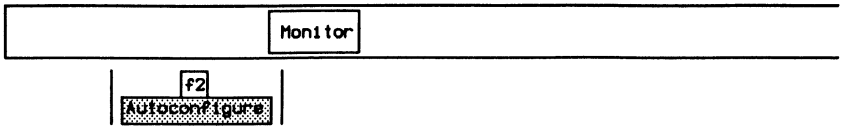


Figure 9–1 Universal Monitor Program Display

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.

Type of Protocol	Characteristics Determined
HDLC/SDLC	Baud Rate Encoding scheme (NRZ or NRZIC)
Character SYNC	Baud Rate SYNC Character (0x16, 0x32, 0x96)
BISYNC	Baud Rate Character Set (ASCII, EBCDIC)
ASYNC	Baud Rate Bits/Character (5, 6, 7, 8) Parity (NONE, ODD, EVEN)

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.
```

Framing	Autoconfiguration Time		
	300 bps	200–2400 bps	4800–64000 bps
SYNC	30 sec.	15 sec.	12 sec.
ASYNC	25 sec.	20 sec.	12 sec.

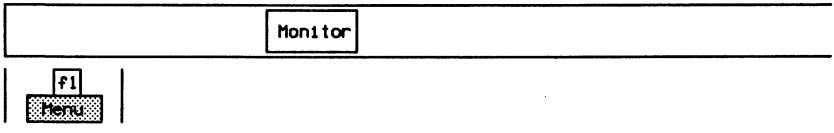
Autoconfiguration might fail to determine the configuration if:

- 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).

Monitor Configuration Menu

Interface Type	RS232C/V.28	Interface Leads	DISABLED
Protocol Configuration:			
Framing	ASYNC	Reset Enable	---
Clocking	---	Sync Reset Character	---
Bit Rate	200	DCD Control	OFF
Bits/Character	7	CRC	---
Stop Bits	1	Strip Sync	---
Parity	ODD	Message Length	80
Sync Character	---	Message Timeout	20
Interframe Fill	MARK	→ End of Frame Character	DISABLED

f1
Menu

End of Frame Character Menu

	Character	Status
➔ 1.	NOT SPECIFIED	DISABLED
2.	NOT SPECIFIED	DISABLED
3.	NOT SPECIFIED	DISABLED
4.	NOT SPECIFIED	DISABLED

f1
Specify Character

- Enter the end of frame character and press ↵ (RETURN).

Enter End of Frame Character (hexadecimal): 0D

f2
ENABLED

To receive data:

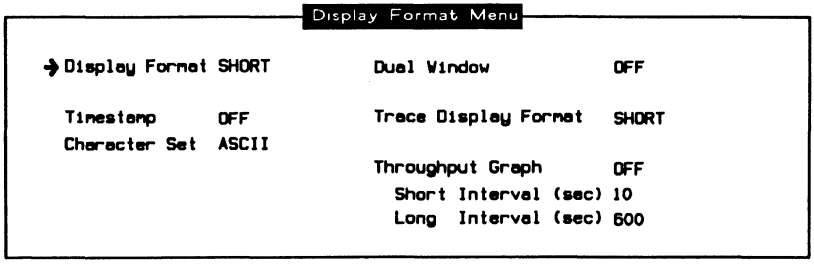
Monitor

f5
Online

NOTE
Ensure that the Online function key is highlighted.

9.6 Universal Display Formats

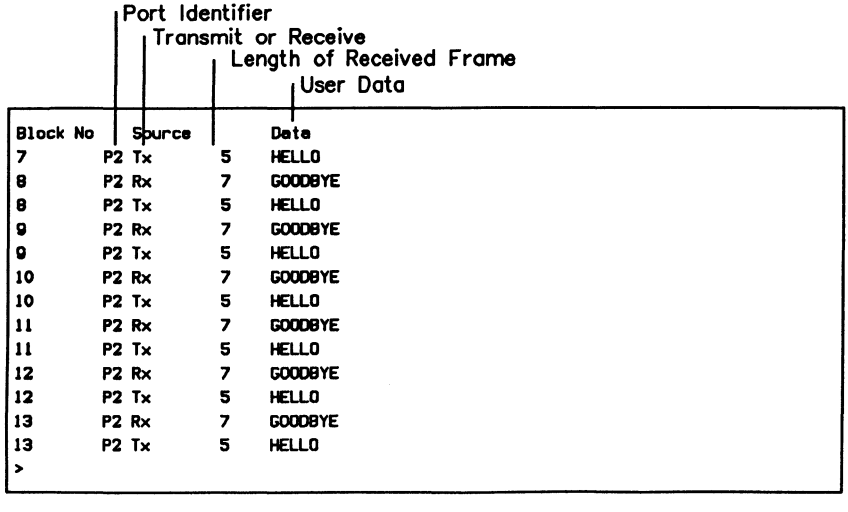
Refer to Section 18.5 in the 'General Application Topics' section for general display format setup information.



→ *Character Set*

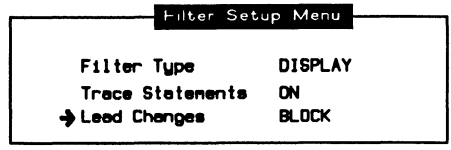
BAUDOT Specifies the Baudot character set for data display (only available in ASYNC, 5 bits/character).

The following display is an example using short display format.



9.7 Universal Filters

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

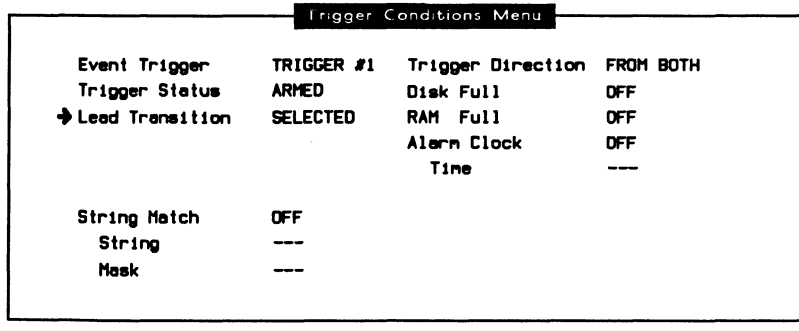


NOTE

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

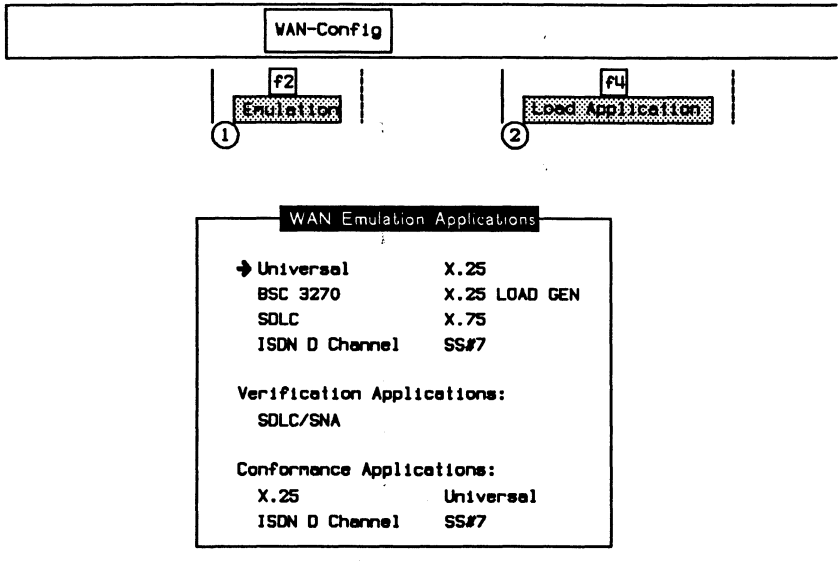
UNIVERSAL SIMULATION

Version 2.0

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.

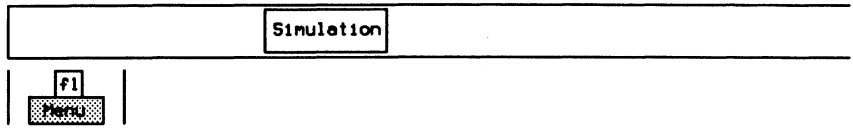


When the application has finished loading:

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.



Simulation Configuration Menu

→ Interface Type	RS232C/V.28	Interface Leads	DISABLED
Simulation Mode	TO DCE		
Protocol Configuration:			
Framing	HDLC/SDLC	Reset Enable	---
Clocking	NRZ WITH CLOCK	Sync Reset Character	---
Bit Rate	64000	DCD Control	OFF
Bits/Character	8	CRC	CCITT
Stop Bits	---	Strip Sync	ON
Parity	NONE	Message Length	---
Sync Character	HEX 7E	Message Timeout	---
Interframe Fill	SYNC	End of Frame Character	---

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.

	TO DCE			
Clocking	**HDLC/SDLC**	**CHARACTER SYNC**	**BISYNC EBCDIC**	**BISYNC ASCII**
NRZ WITH CLOCK	Measure	Measure	Measure	Measure
EXTERNAL TX CLOCK	Select	Select	Select	Select
NRZI	Select	---	---	---
NRZI WITH CLOCK	Measure	---	---	---

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 10-1 Universal Monitor/Simulation Parameters

Parameter	Description	HDLC/SDLC	CHARACTER SYNC	BISYNC EBCDIC	BISYNC ASCII	ASYNC (4)
Clocking (1)	See Below	NRZ with clock External Tx Clock NRZI NRZI with clock	NRZ with clock External Tx clock			
Bit Rate (2) (3)	Number of bits per second	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				
Bits/Character	Number of bits per character	8	5, 6, 7, 8	8	7	5, 6, 7, 8
Stop Bits	Number of stop bits					1, 1.5, 2
Parity	Check bit which makes the sum of the binary digits, including the check bit (always odd or even)	None	None Odd Even Mark Space	None	Odd	None Odd Even Mark Space
SYNC Character	Bit pattern that identifies the start and end of a block of data	Hex 7E	Hex 16, 32, 96 User-defined	Hex 32	Hex 16	
Interframe Fill	Bit pattern that is transmitted between blocks of data	SYNC Mark	Mark	Mark	Mark	Mark

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.

Parameter	Description	HDLC/SDLC	CHARACTER SYNC	BISYNC EBCDIC	BISYNC ASCII	ASYNC (3)
Reset Enable	Determines if the SYNC reset character is enabled		ON OFF			
SYNC Reset Character	Character which causes receiver to start a new sync search		Hex FF User-defined			
DCD Control (4)	While the Data Carrier Detect is 0/SPACE, the received data is ignored	ON OFF	ON OFF	ON OFF	ON OFF	OFF
CRC	Cyclic Redundance Check/ Frame Check Sequence	CRC-CCITT	None	CRC-16	VRC/LRC CRC-16	
Strip SYNC	Sync characters are not displayed or captured	ON	ON OFF	ON	ON	
Message Length	Maximum number of characters recorded or displayed in a block of data		DISABLED 1-5000 characters			DISABLED 1-5000 characters (60)
Message Timeout	Maximum elapsed time between characters before characters are recorded or displayed as a block of data					DISABLED 1-65535 msec. (17)
End of Frame Character	Specified character terminates block of data					4 separate characters can be specified

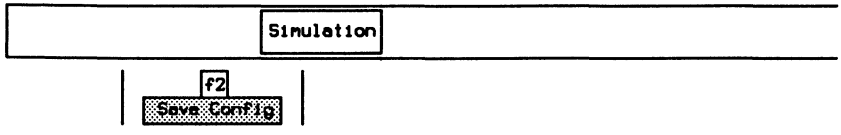
For ISDN B1 and B2 Channels:
(3) ASYNC is not supported.
(4) DCD Control is not supported.

Table 10-2 Universal Monitor/Simulation Parameters (cont'd)

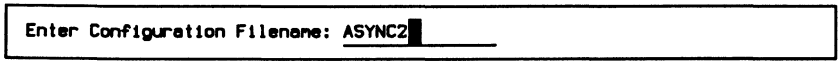
Saving Menu Configurations

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).

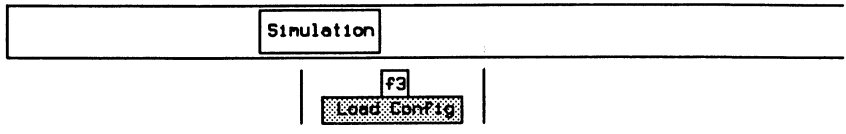


The configuration file is created and '.C' is appended to the specified name.

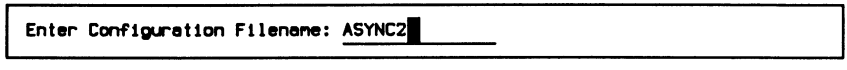
Loading Menu Configurations

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).



10.3 Receiving Data

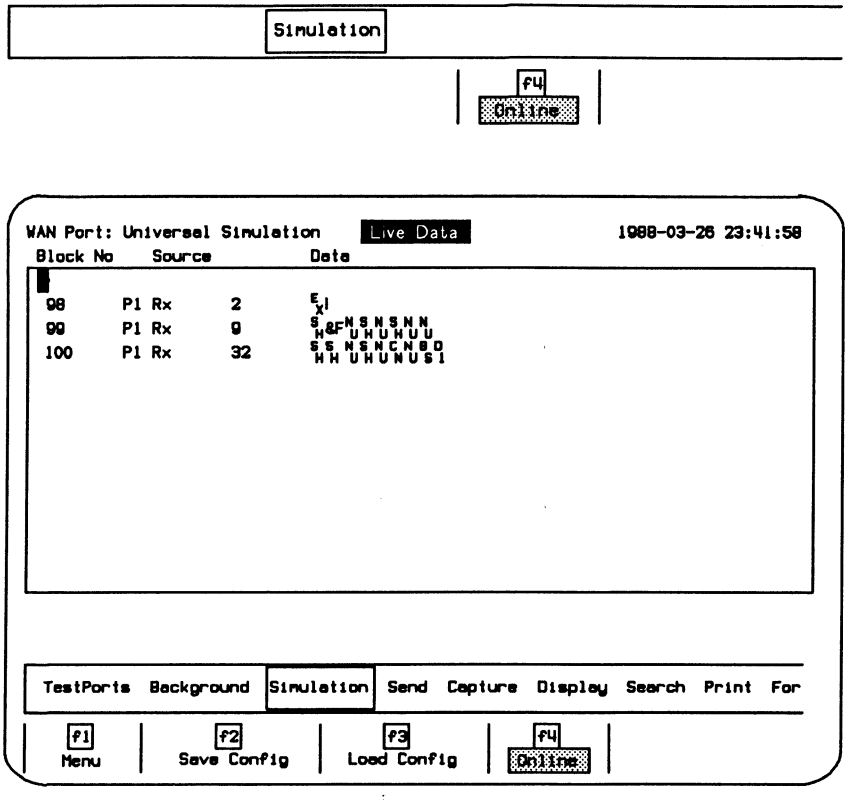


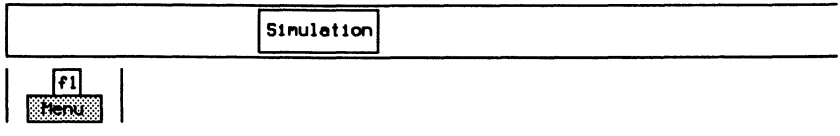
Figure 10-1 Universal Simulation Program Display

Data is captured to RAM, decoded, and displayed as shown above.

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 0D).

Simulation Configuration Menu

Interface Type	RS232C/V.28	Interface Leads	DISABLED
Simulation Mode	TO DCE		
Protocol Configuration:			
Framing	ASYNC	Reset Enable	---
Clocking	---	Sync Reset Character	---
Bit Rate	200	DCD Control	OFF
Bits/Character	7	CRC	---
Stop Bits	1	Strip Sync	---
Parity	ODD	Message Length	80
Sync Character	---	Message Timeout	20
Interframe Fill	MARK	→ End of Frame Character	DISABLED

f1
Menu

End of Frame Character Menu

	Character	Status
→ 1.	NOT SPECIFIED	DISABLED
2.	NOT SPECIFIED	DISABLED
3.	NOT SPECIFIED	DISABLED
4.	NOT SPECIFIED	DISABLED

f1
Specify Character

- Enter the end of frame character and press ↵ (RETURN).

Enter End of Frame Character (hexadecimal): 0D

f2
ENABLED

To receive or send data:

Simulation

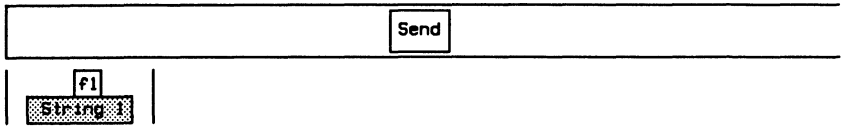
f4
Online

NOTE
Ensure that the Online function key is highlighted.

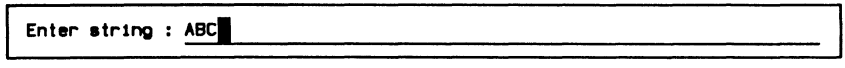
10.5 Sending Strings

Four user-defined strings can be transmitted.

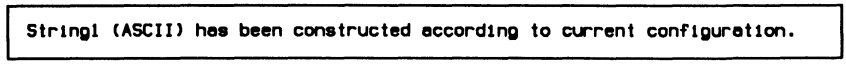
Example:
Define the string as 'ABC' and send it.



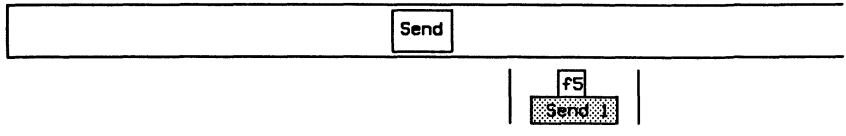
- Enter the string and press ↵ (RETURN).



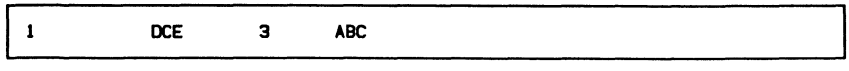
The following message indicates that the string has been converted to 7 bit ASCII with odd parity.



To transmit the string:



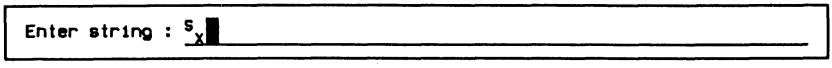
The string is then displayed on the screen.



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 $^{S}_{X}$ in a string, type '\' immediately followed by Control B.



11

X.25 MONITOR

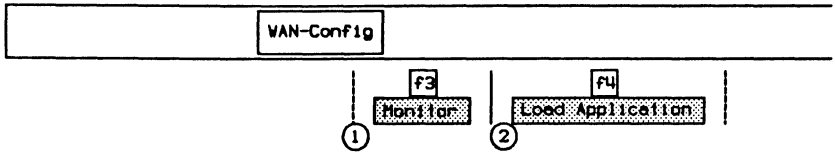
Version 2.1

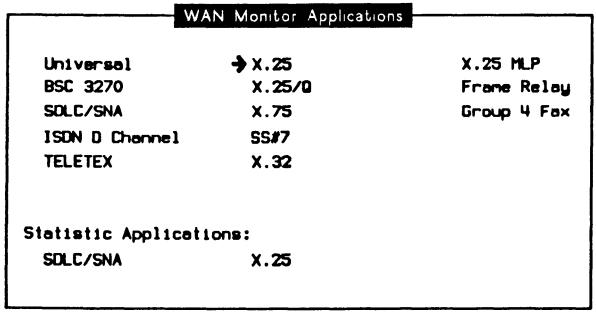
11.1 Loading the X.25 Monitor Program

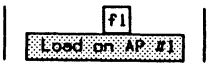
The X.25 Monitor program can be loaded on a WAN interface, a BRA B-Channel, or a PRA Test Channel. This section uses the WAN interface as an example.

NOTE

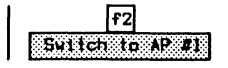
Refer to Section 3.3 for instructions to load an application on a BRA B-Channel, and Section 3.5 to load on a PRA Test Channel.







When the application has finished loading:



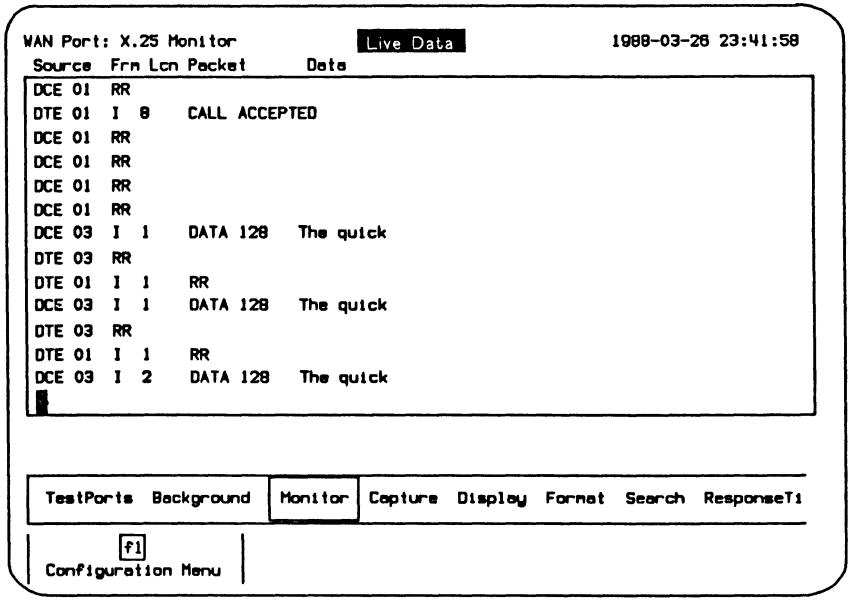


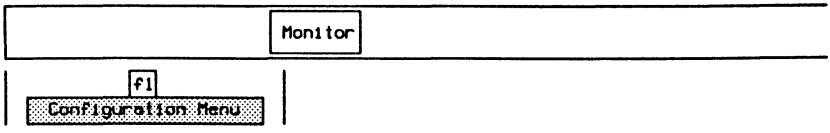
Figure 11-1 X.25 Monitor Program Display

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.



Monitor Configuration Menu

Protocol Standard	X.25(1988)
→ Interface Type	RS232C/V.28
Interface Leads	DISABLED
Bit Rate	UNKNOWN
Modulo Detection	AUTOMATIC
Link Access Procedure	LAPB
Frame Sequence Number Modulo	MOD 8
Link Procedure	SINGLE LINK

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).

X.25(1984) — Decodes received frames according to the CCITT Recommendation X.25 (1984).

X.25(1988) (default) — 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.

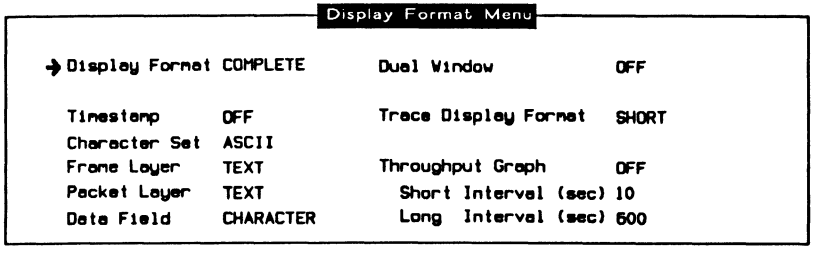
→ *Link Procedure*

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.



→ *Frame Layer*

→ *Packet Layer*

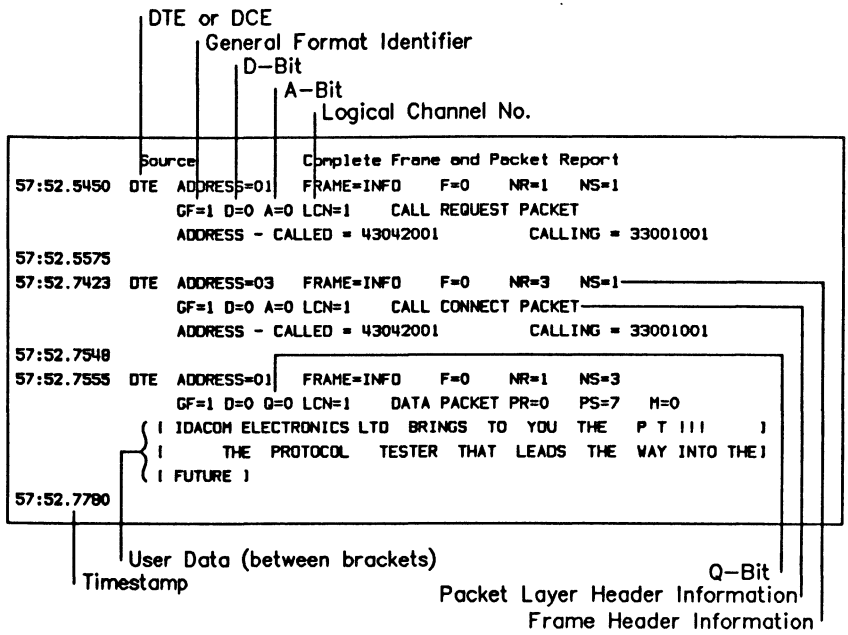
OFF Data on the corresponding layer is not displayed.

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.

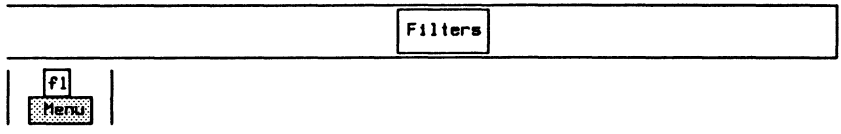
The following display is an example in complete display format.

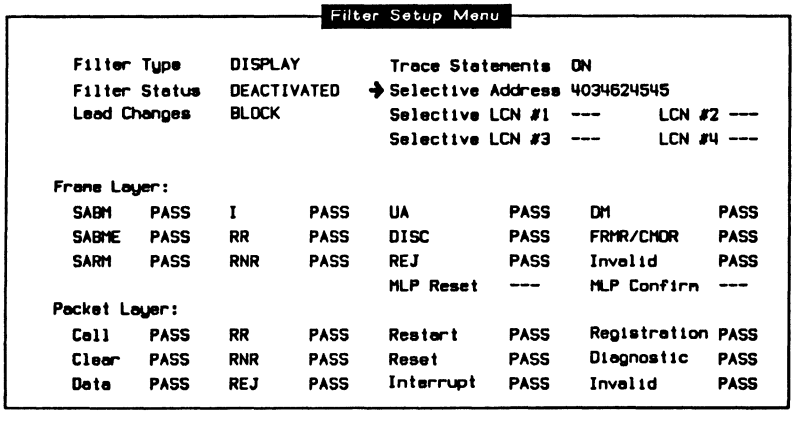


11.4 X.25 Filters

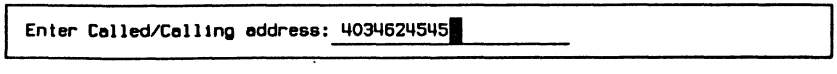
Refer to Section 18.9 in the 'General Application Topics' section for filter setup information.

Example 1:
Program a filter to display data from a specific calling or called address.





- Enter either the called *or* calling address and press ↵ (RETURN).

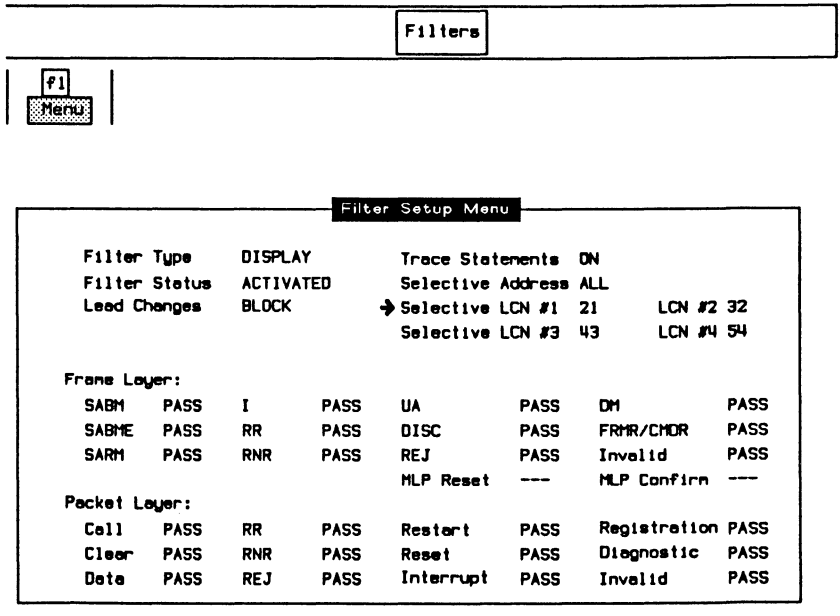


The display is turned off. When a call request is received containing the specified address, traffic on that LCN only is displayed until a clear confirmation on that LCN is received.

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 ↵ (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.

NOTE
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.

NOTE
I frames must be enabled to pass packets.

Move the cursor to the required parameters and use the *PASS* and *BLOCK* function keys to display (pass) only required frames/packets.

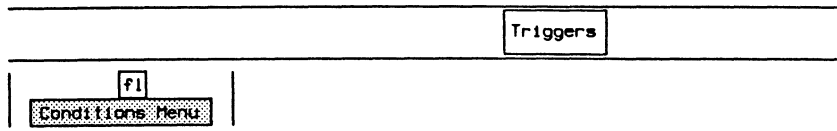
```
                    Filter Setup Menu

   Filter Type     DISPLAY        Trace Statements  ON
   Filter Status   ACTIVATED      Selective Address ALL
   Lead Changes    BLOCK          Selective LCN #1  ALL     LCN #2 ALL
                                  Selective LCN #3  ALL     LCN #4 ALL

Frame Layer:
→ SABM    BLOCK  I     PASS   UA          BLOCK  DM           BLOCK
  SABME   BLOCK  RR    BLOCK  DISC        BLOCK  FRMR/CMDR    PASS
  SARM    BLOCK  RNR   BLOCK  REJ         PASS   Invalid      PASS
                               MLP Reset   ---    MLP Confirm  ---
Packet Layer:
  Call    BLOCK  RR    BLOCK  Restart     BLOCK  Registration BLOCK
  Clear   BLOCK  RNR   BLOCK  Reset       BLOCK  Diagnostic   PASS
  Data    BLOCK  REJ   PASS   Interrupt   PASS   Invalid      PASS
```

11.5 X.25 Triggers

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

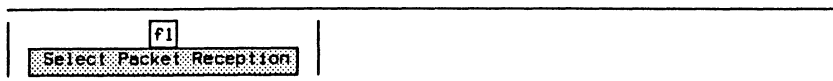
Example:
Ten frames after receipt of an invalid packet, set up a trigger to:

- stop the display and capture RAM; and
- display a message in the Data Window.



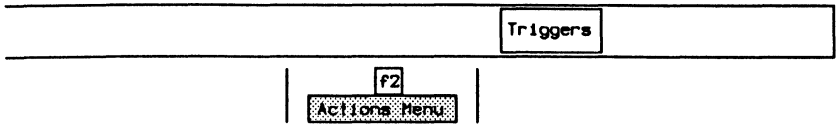
Trigger Conditions Menu

Event Trigger	TRIGGER #1	Trigger Direction	FROM BOTH
Trigger Status	ARMED	Disk Full	OFF
Lead Transition	NONE	RAM Full	OFF
Frame Reception	NONE	Alarm Clock	OFF
→ Packet Reception	SELECTED	Time	---
String Match	OFF		
String	---		
Mask	---		



Packet Reception Triggers

Call	OFF	RR	OFF	Restart	OFF	Registration	OFF
Clear	OFF	RNR	OFF	Reset	OFF	Diagnostic	OFF
Data	OFF	REJ	ON	Interrupt	OFF	→ Invalid	ON



Trigger Action Menu

Event Trigger	TRIGGER #1		
Trigger Status	ARMED	Display	TURN OFF
Beep	NO EFFECT	RAM Recording	TURN OFF
Highlight	NO EFFECT	Disk Recording	NO EFFECT
Trigger Delay	ON		
#Frames	10		
→ 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

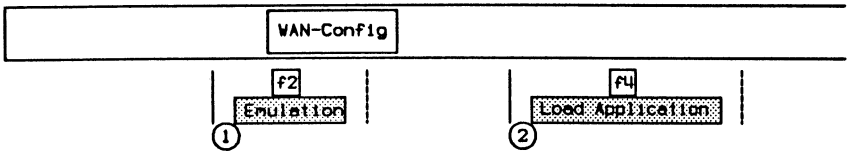
X.25 EMULATION

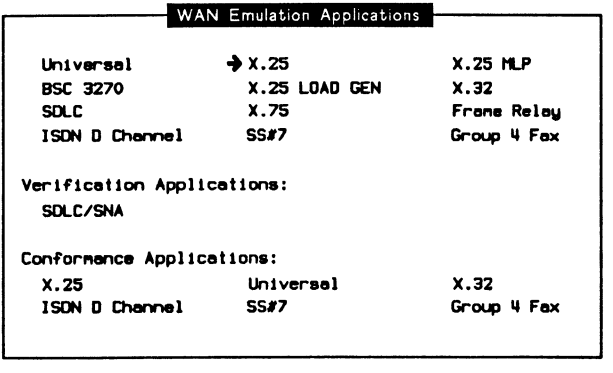
Version 2.1

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:

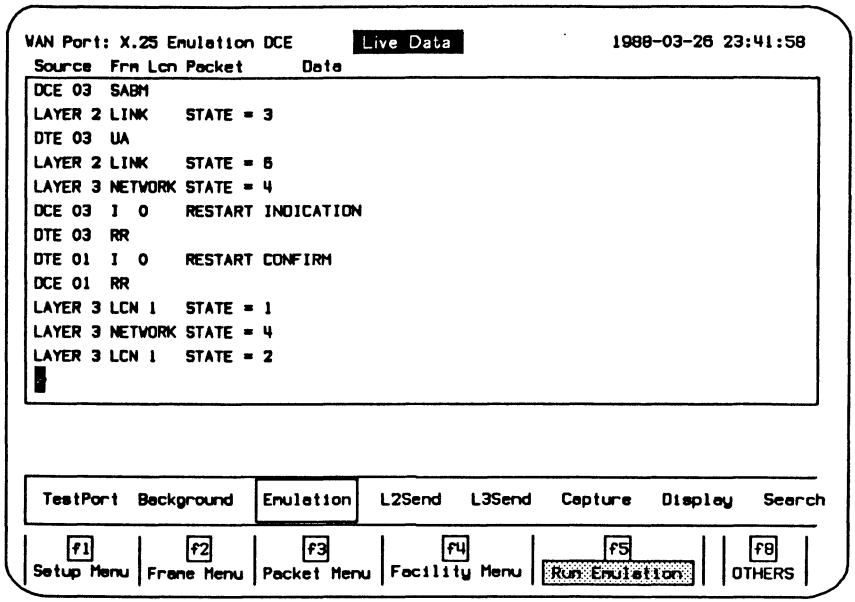


Figure 12-1 X.25 Emulation Program Display

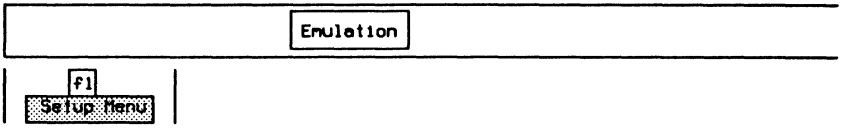
Assuming that the unit is connected to an X.25 link which corresponds to the configuration, it will respond automatically to any incoming data. In the default configuration, data is captured to RAM, decoded, and displayed.

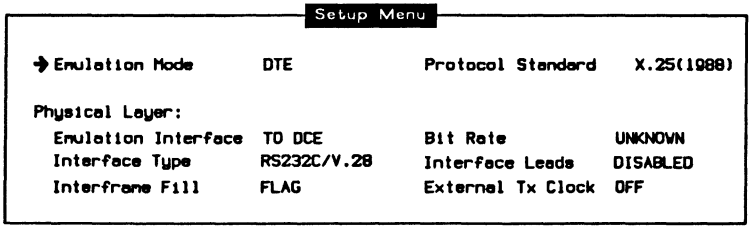
12.2 Configuration

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





→ *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(1980) — Conforms to CCITT Recommendation X.25 (1980).

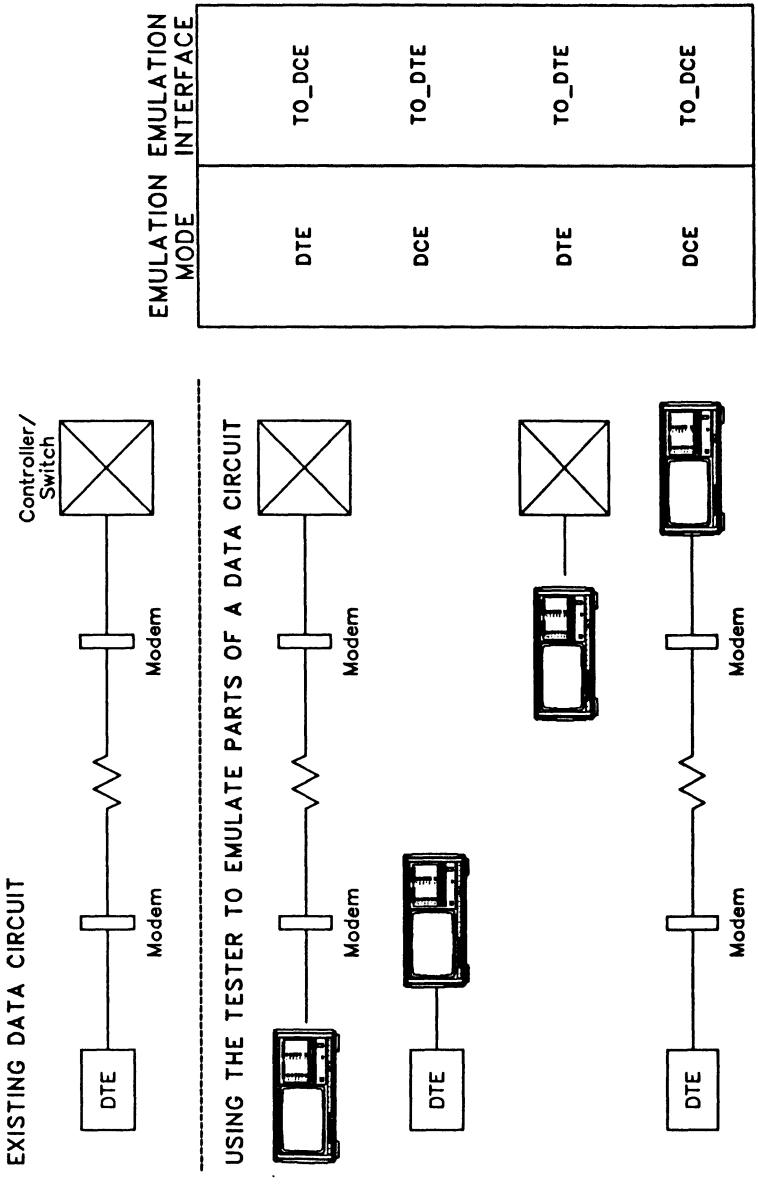
X.25(1984) — Conforms to CCITT Recommendation X.25 (1984).

X.25(1988) (default)	Conforms to CCITT Recommendation X.25 (1988).

→ *Emulation Mode*

DTE (default)	Selects a logical DTE emulation mode.
DCE	Selects a logical DCE emulation mode.

NOTE
The relationship between emulation mode and the network is shown in the following figure.


EMULATION MODE
EMULATION INTERFACE
DTE
TO_DCE
DCE
TO_DTE
DTE
TO_DTE
DCE
TO_DCE
EXISTING DATA CIRCUIT
Controller/ Switch
Modem
Modem
DTE
USING THE TESTER TO EMULATE PARTS OF A DATA CIRCUIT
Modem
Modem
DTE
Modem
Modem
DTE

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.

External Tx Clock	TO DTE	TO DCE
OFF	Select	Measure
ON	Measure	Select

NOTE

The bit rate status is UNKNOWN if there is no physical connection.

NOTE

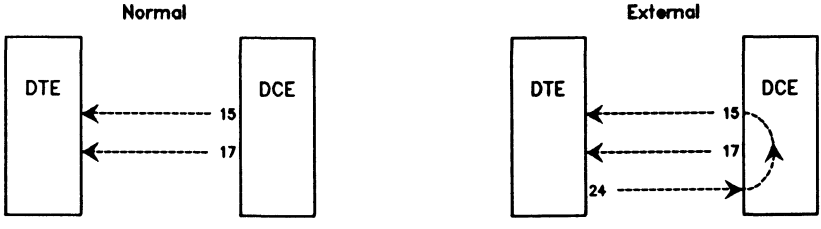
Clocking is provided by the attached equipment when the bit rate can be selected.

→ *Interface Leads*
Interface leads can be enabled or disabled (default).

→ *External Tx Clock*
There are two clocking modes:

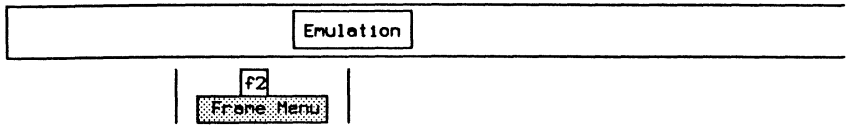
- *OFF* (Normal)
- *ON* (External)

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.



15 Transmit clock from DCE (DCE provided)
17 Receive clock from DCE (DCE provided)
24 Transmit clock to DCE (DTE provided)

Frame Layer



Frame Layer Menu

```
Frame Layer:
  Emulation              AUTOMATIC     T1 Timer (Sec)      3.0
→ Modulo Detection       AUTOMATIC     Idle Timer (Sec)    30.0
  Max Tx Frame Size      261           N2 Retry Counter    10
  Max Rx Frame Size      261           Window Size         7
  Sequence Numbering     MOD 8         Initial Poll        P=1
```

→ *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).

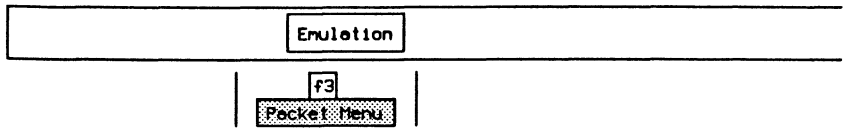
→ *Window Size*
Specifies the frame window size (maximum number of unacknowledged I frames). Valid values are 1 through 7 for modulo 8, and 1 through 127 for modulo 128 (default is 7).

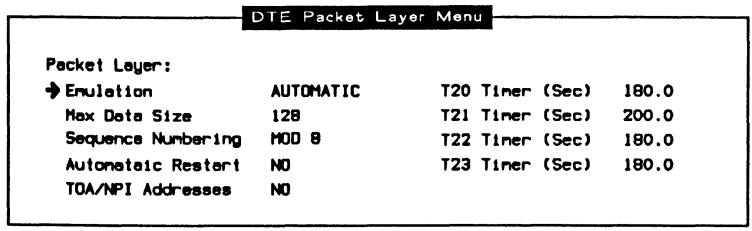
→ *Initial Poll*
Transmits the first supervisory or unnumbered command frame with the poll bit set to 0 or 1 (default).

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.

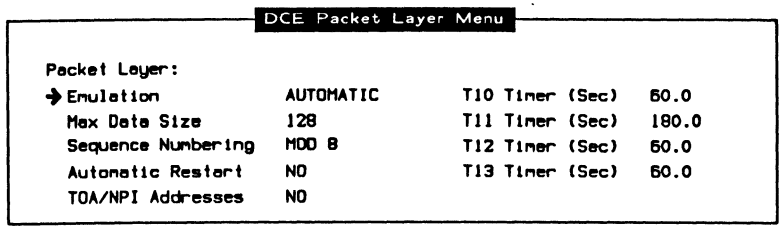
The following timers are used for DTE emulation.

→ *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.

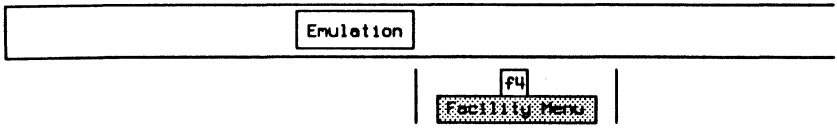
→ *T10 Timer (Sec)*
Specifies the duration, in tenths of seconds, the tester waits for a restart request packet or restart confirmation packet after transmitting a restart indication packet (default is 60 seconds).

→ *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).

→ *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).

→ *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




```
                    Facility Menu

 → Call Request Facility      NONE
   User Defined Facility      ---

   Call Accept/Connect        USE ADDRESS
   Call Accept Facility       ECHO
   User Defined Facility      ---

   Call User Data             NONE
   Clear User Data            NONE
```

→ *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.

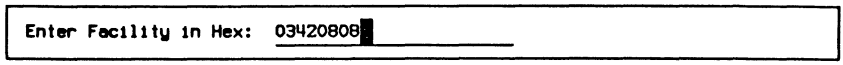
NEGOTIATE — Automatically negotiates data packet size, packet window size, throughput class, and fast select facilities.

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).



→ *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.

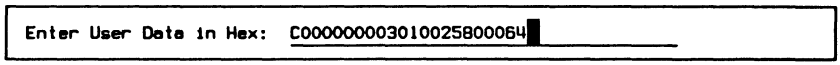
NOTE
See the example used in defining facilities for call request/incoming call packets.

→ *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.

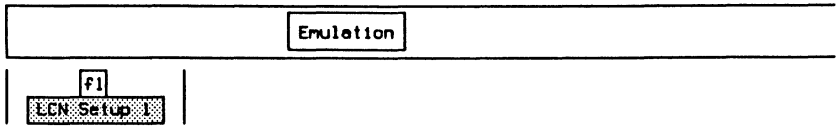
→ *Clear User Data*
Specifies the contents of the user data for the clear request/clear indication packet. A hex string of up to 54 characters can be entered. If there is no clear user data, NONE will be displayed as the status.

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

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



LCN Setup



LCN Setup Menu 1

	LCN	TYPE	Called Address	Calling Address	Window	Echo
→ CH1	1	SVC	43042001	33001001	2	OFF
CH2	2	SVC	43042002	33001002	2	OFF
CH3	3	SVC	43042003	33001003	2	OFF
CH4	4	SVC	43042004	33001004	2	OFF
CH5	5	SVC	43042005	33001005	2	OFF
CH6	6	SVC	43042006	33001006	2	OFF
CH7	7	SVC	43042007	33001007	2	OFF
CH8	8	SVC	43042008	33001008	2	OFF
CH9	9	SVC	43042009	33001009	2	OFF
CH10	10	SVC	43042010	33001010	2	OFF

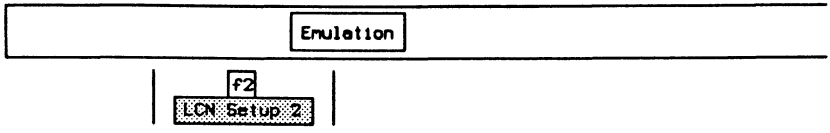
The X.25 Emulation supports 255 logical channels which can be set to any of 4095 LCN's (logical channel numbers). For each of these channels, the user can specify:

- 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.



LCN Setup Menu 2

	LCN	Fast Select	Clear Request	Clear Confirm
→ CH1	1	OFF	Not Extended	Not Extended
CH2	2	OFF	Not Extended	Not Extended
CH3	3	OFF	Not Extended	Not Extended
CH4	4	OFF	Not Extended	Not Extended
CH5	5	OFF	Not Extended	Not Extended
CH6	6	OFF	Not Extended	Not Extended
CH7	7	OFF	Not Extended	Not Extended
CH8	8	OFF	Not Extended	Not Extended
CH9	9	OFF	Not Extended	Not Extended
CH10	10	OFF	Not Extended	Not Extended

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.

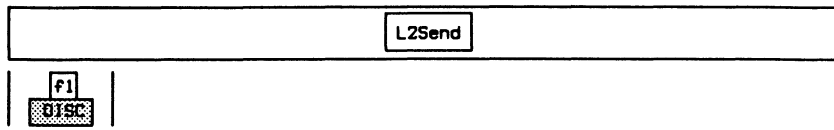
NOTE

Clear request and clear confirm extended format are not supported by X.25(1980).

12.3 Sending X.25 Frames and Packets

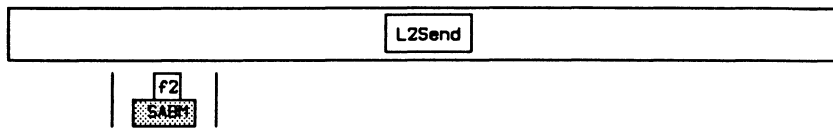
If the X.25 connection is in a state which allows transmission of a particular frame or packet, pressing the corresponding function key will transmit the frame/packet (eg. no packets are sent if the link is down).

12.4 Establishing a Link

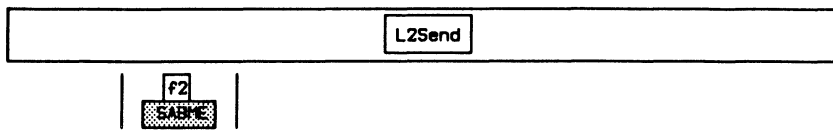


Wait for a UA or DM response.

For modulo 8:

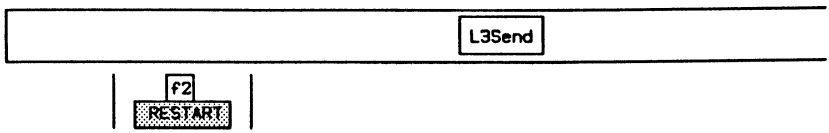


For modulo 128:



Wait for a UA response.

12.5 Restarting the Link



- Enter the restart cause and diagnostic and press ↵ (RETURN).

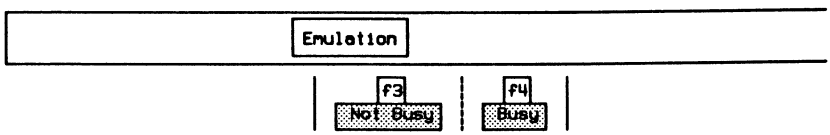
```
The RESTART packet contains (HEX) cause 0_ and diagnostic 0_
```

Refer to the CCITT Recommendation X.25 for valid values.

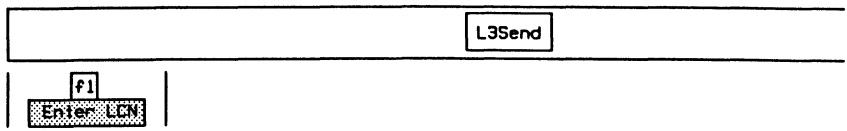
Wait for an acknowledgement.

12.6 Busy Conditions

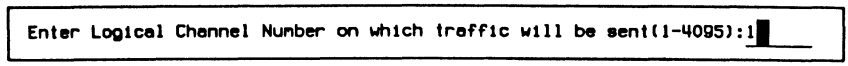
The following function keys are used to set the layer 2 link into a not busy/busy condition, respectively.



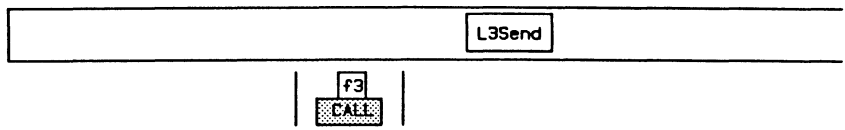
12.7 Selecting a Logical Channel for an X.25 Call



- Enter the logical channel number and press ↵ (RETURN).

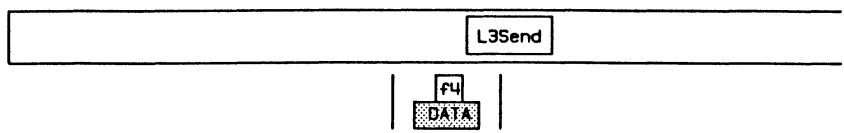


12.8 Setting up an X.25 Call



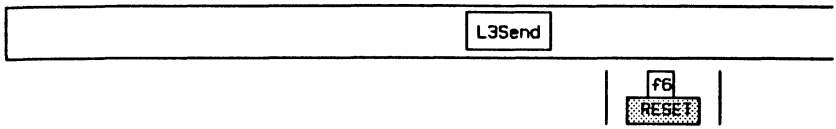
Wait for call accept.

12.9 Sending a Data Packet



Wait for an acknowledgement.

12.10 Resetting the Layer 3 Connection



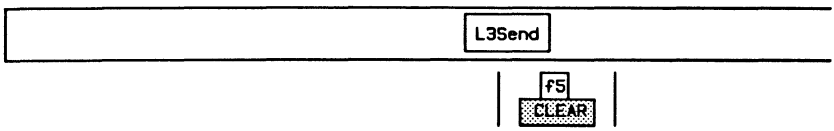
- Enter the reset cause and diagnostic and press ↵ (RETURN).

```
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



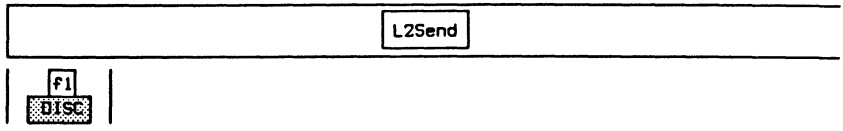
- Enter the clearing cause and diagnostic and press ↵ (RETURN).

```
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

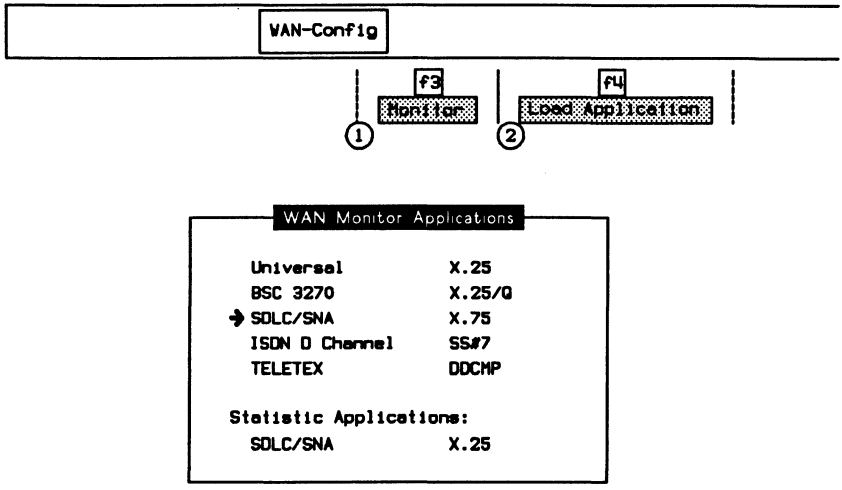
SNA MONITOR

Version 2.0

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.

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:

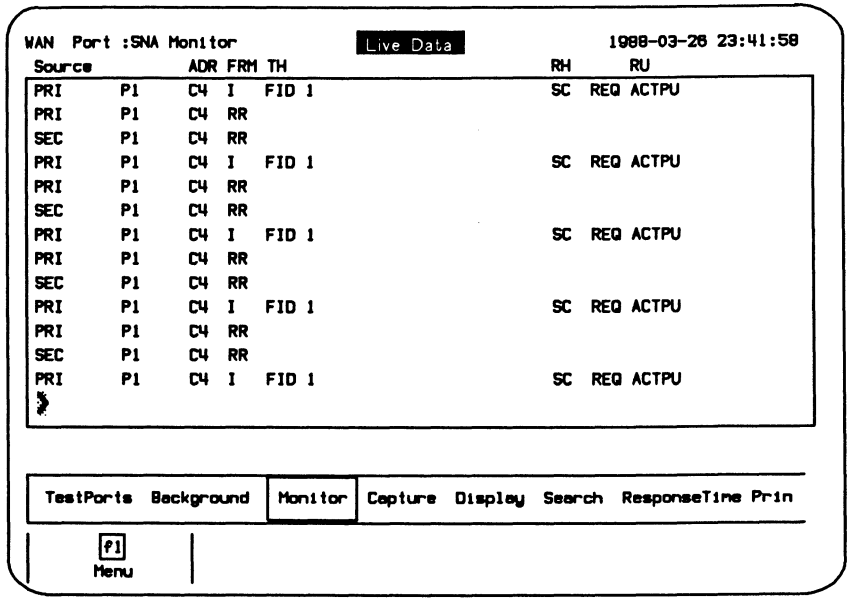
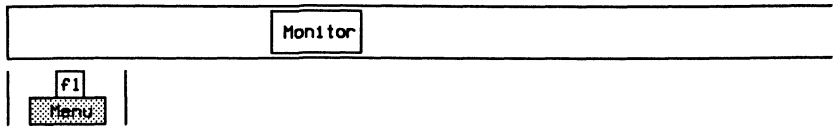


Figure 13–1 SNA Monitor Program Display

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



Monitor Configuration Menu

→ Interface Type	RS232C/V.28
Interface Leads	DISABLED
Bit Rate	UNKNOWN
Clocking	NRZ WITH CLOCK
Frame Sequence Number Modulo	MOD 8

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).

→ *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*

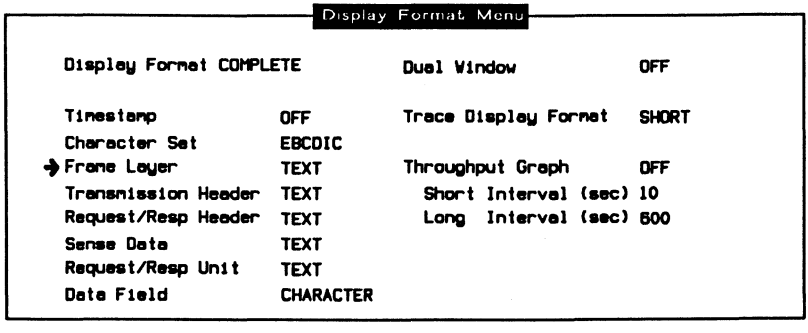
NRZ WITH CLOCK (default)	Selects standard non-return to zero line encoding with DCE provided clocks.
EXTERNAL TX CLOCK	Selects a DTE provided transmit clock on pin 24 of an RS-232C connector.
NRZI	Selects the non-return to zero-inverted method of encoding with timing information extracted from the data 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

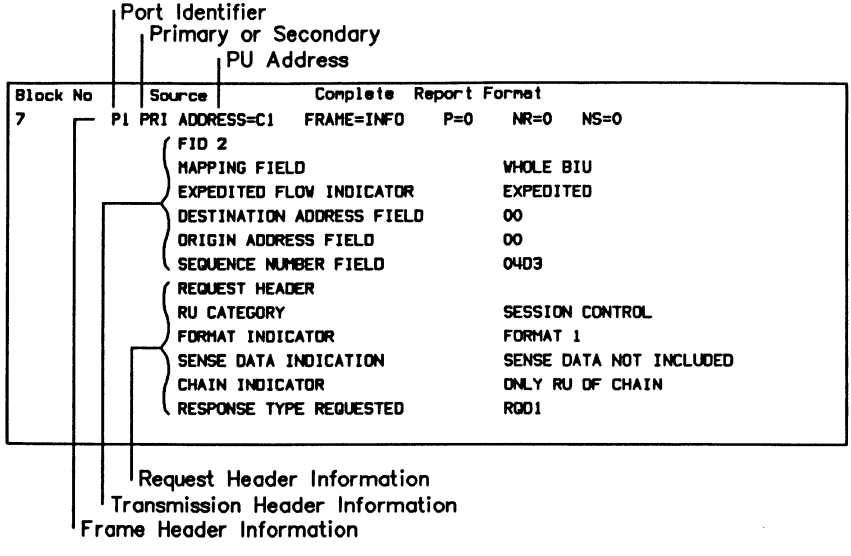
Refer to Section 18.5 in the 'General Application Topics' section for general display format setup information.



→ *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.

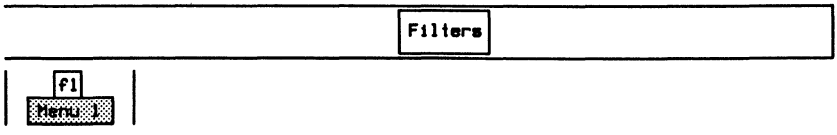
The following display is an example in complete display format.

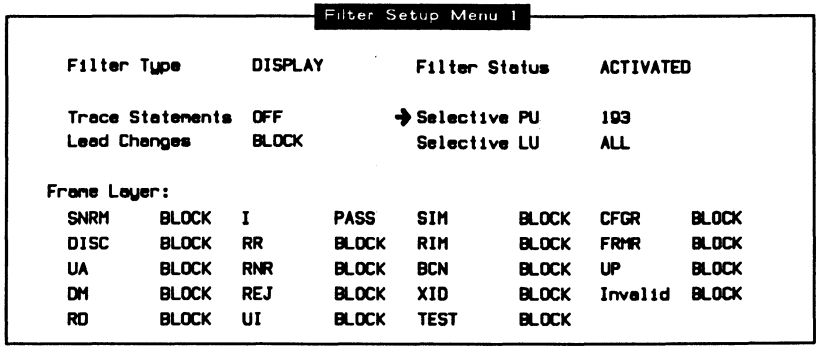


13.4 SNA Filters

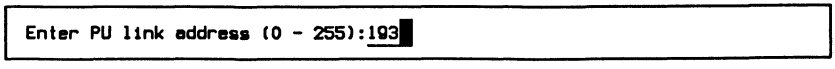
Refer to Section 18.9 in the 'General Application Topics' section for filter setup information.

Example 1:
Program a filter to display only I frames from a specific PU (physical unit).





- Enter the PU link address and press ↵ (RETURN).



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

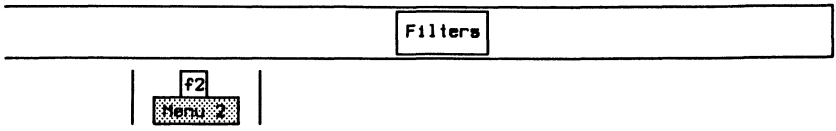
Filter Type	DISPLAY	Filter Status	ACTIVATED
Trace Statements	ON	Selective PU	ALL
Load Changes	BLOCK	Selective LU	ALL

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
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.



Filter Setup Menu 2

```
  Filter Type   DISPLAY                Filter Status   DEACTIVATED

Transmission Header:
→ FID 0     BLOCK   FID 1       BLOCK   FID 2    PASS    FID 3   BLOCK
  FID 4     BLOCK   FID F       BLOCK

Request/Response Header:
  FMD       PASS    NC          BLOCK   DFC      BLOCK   SC      BLOCK
  Invalid   BLOCK

Sense Data:
  REQ REJ   PASS    USER        PASS    REQ ERR  PASS    ST ERR  PASS
  RH USAGE  PASS    PATH ERROR  PASS    Invalid  PASS
```

NOTE

A transmission header must be enabled to pass request/response headers or sense data.

14

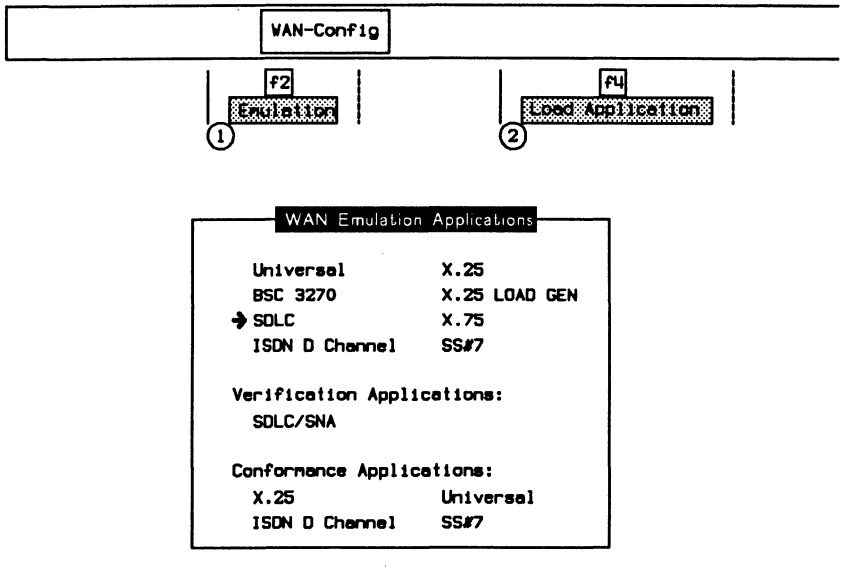
SDLC EMULATION

Version 2.0

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:

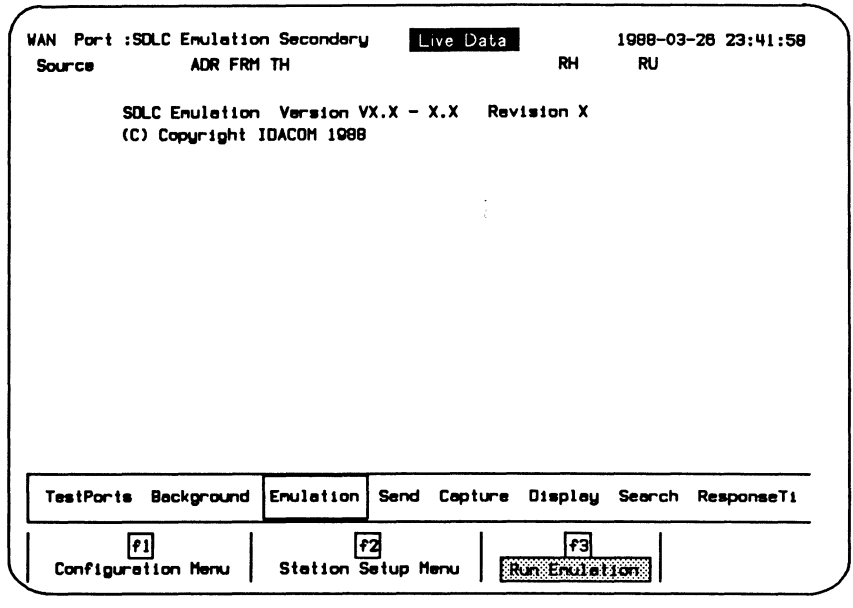
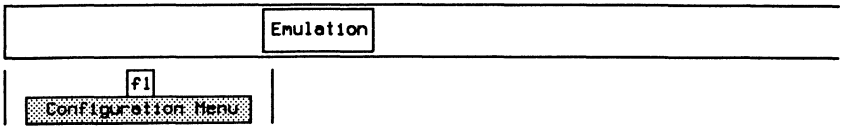


Figure 14–1 SDLC Emulation Program Display

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



Emulation Configuration Menu

```
→ Emulation Mode  SECONDARY

Physical Layer:
  Emulation Interface  TO DCE          Bit Rate          UNKNOWN
  Interface Type       RS232C/V.28     Clocking          NRZ WITH CLOCK
  Interface Leads      DISABLED        Interframe Fill   FLAG

Frame Layer:
  Emulation            AUTOMATIC       Multipoint        ---
  Max Frame Size       4096            Two Way Mode      ALTERNATE
  Secondary Stations   32              Poll Timer (Sec)  1.0
```

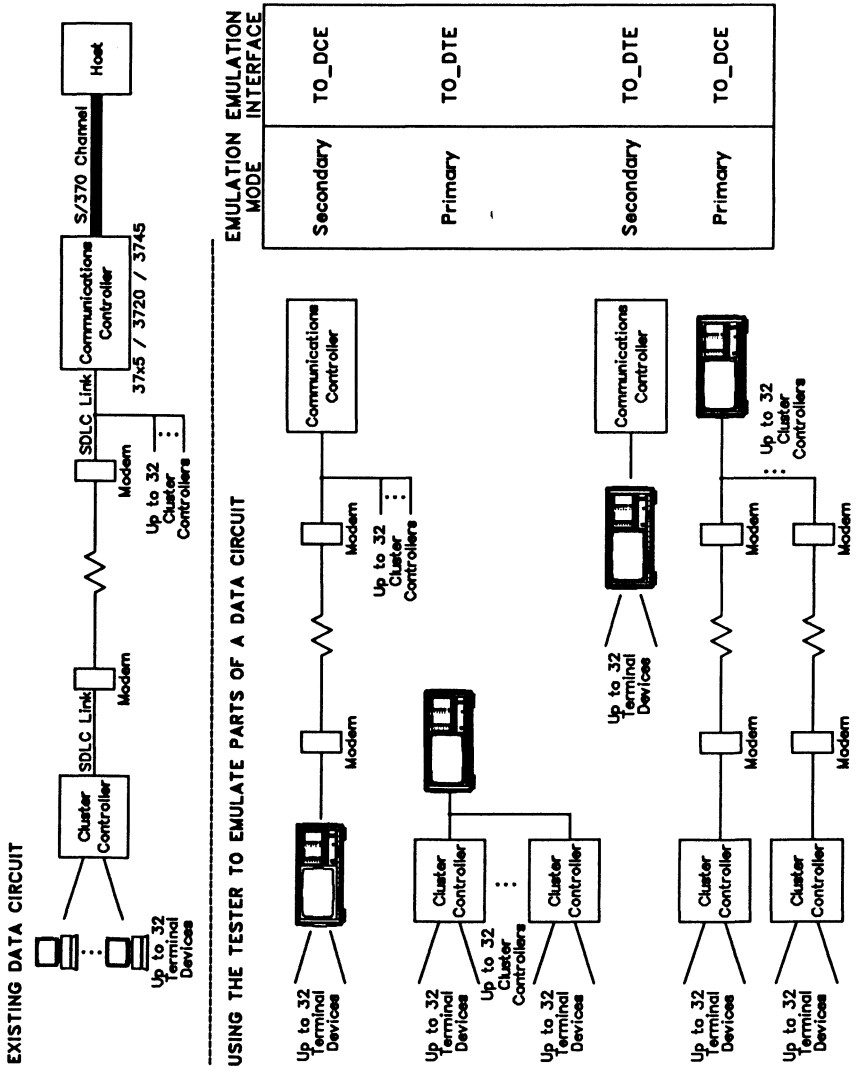
NOTE
Some field values cannot be modified when running on a B-Channel.

→ *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
Cluster Controller
SDLC Link
Modem
Modem
SDLC Link
Communications Controller
37x5 / 3720 / 3745
S/370 Channel
Host
Up to 32 Cluster Controllers
Up to 32 Terminal Devices
USING THE TESTER TO EMULATE PARTS OF A DATA CIRCUIT
EMULATION MODE
EMULATION INTERFACE
Secondary
TO_DCE
Primary
TO_DTE
Secondary
TO_DTE
Primary
TO_DCE
Communications Controller
Modem
Modem
Up to 32 Cluster Controllers
Up to 32 Terminal Devices
Cluster Controller
Up to 32 Terminal Devices
Up to 32 Cluster Controllers
Cluster Controller
Up to 32 Terminal Devices
Communications Controller
Up to 32 Terminal Devices
Up to 32 Cluster Controllers
Modem
Modem
Cluster Controller
Up to 32 Terminal Devices
Cluster Controller
Up to 32 Terminal Devices

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.

Emulation Interface Clocking	TO DTE	TO DCE
NRZ WITH CLOCK	Select	Measure
EXTERNAL TX CLOCK	Select	Select
NRZI	Select	Select
NRZI WITH CLOCK	Select	Measure

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 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).

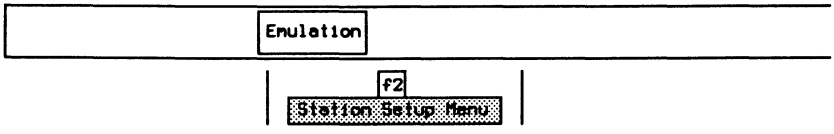
14.3 Station Setup

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).

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.



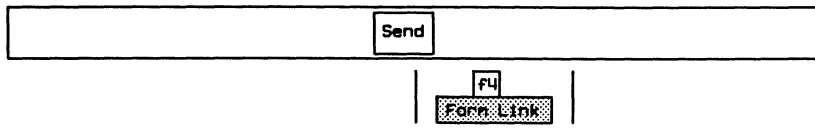
Station Setup Menu

Secondary Station	Address	Window	Timeout(Sec)	Retries
→ Secondary 0	20	4	3.0	20
Secondary 1	2	4	3.0	20
Secondary 2	3	4	3.0	20
Secondary 3	4	4	3.0	20
Secondary 4	5	4	3.0	20
Secondary 5	6	4	3.0	20
Secondary 6	7	4	3.0	20
Secondary 7	8	4	3.0	20
Secondary 8	9	4	3.0	20
Secondary 9	A	4	3.0	20

- 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



14.5 Sending SDLC Frames

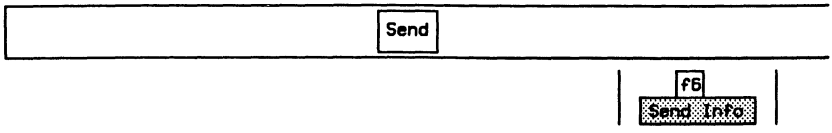
- Press the **ESC** key to display the command line.
- Enter in the command from the following list that corresponds to the desired frame type and press ↵ (RETURN).

```
COMMAND: SNRM
```

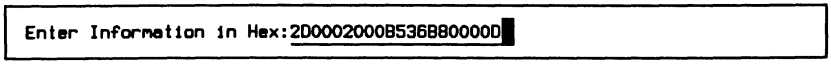
- SNRM
- RD
- DISC
- RIM
- SIM
- XID

Refer to the SDLC/SNA Programmer's Manual for an explanation of these commands.

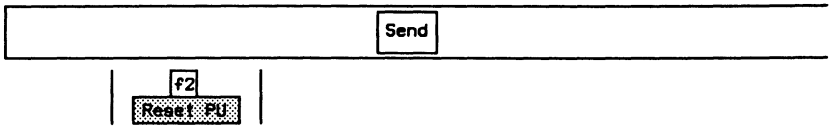
14.6 Sending SNA Information



- To send an ACTLU request, enter the information in hex and press ↵ (RETURN).



14.7 Resetting the Link



Polling action stops.

15

BSC 3270 MONITOR

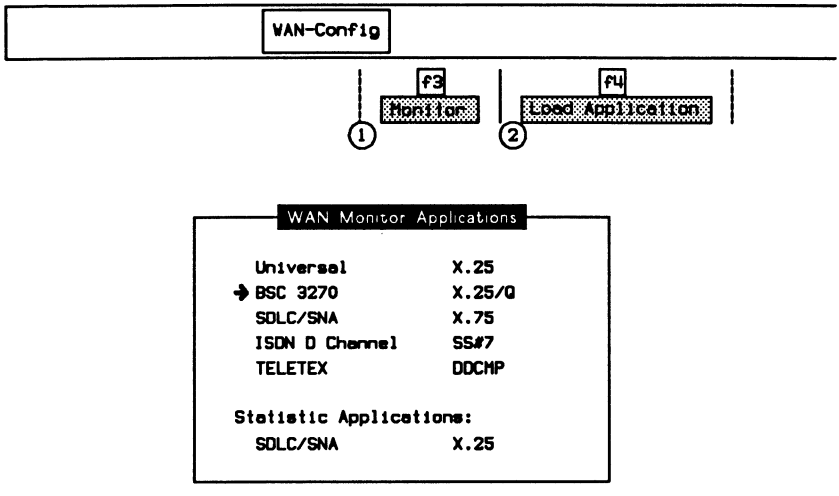
Version 2.0

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:

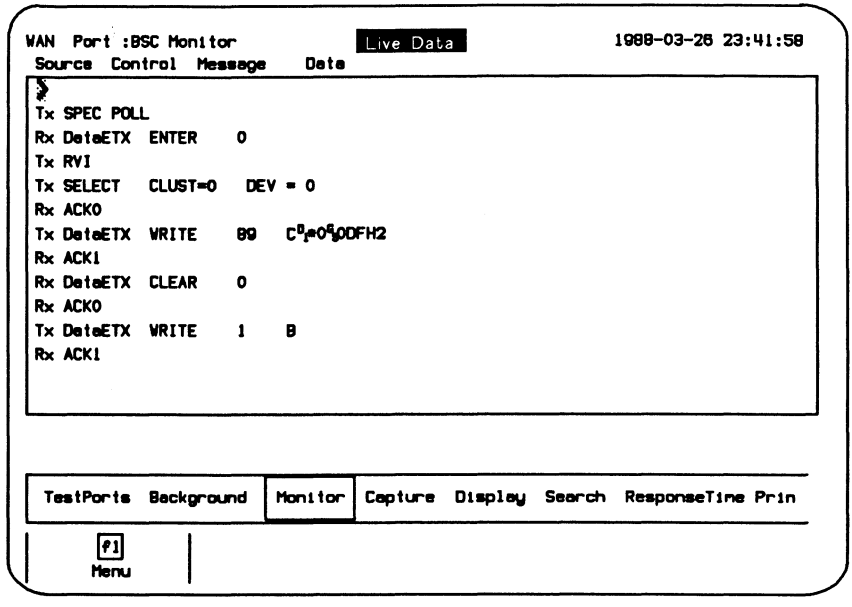
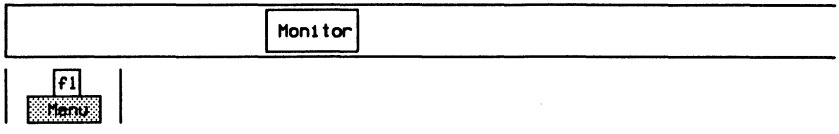


Figure 15–1 BSC 3270 Monitor Program Display

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



Monitor Configuration Menu

→ Framing	EBCDIC
Interface Type	RS232C/V.28
Interface Leads	DISABLED
Bit Rate	UNKNOWN

→ *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*

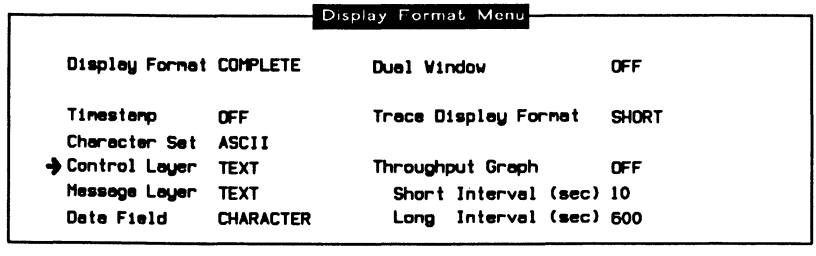
The interface speed is measured, in bits per second, directly from the physical line.

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.



→ *Control Layer*
→ *Message Layer*

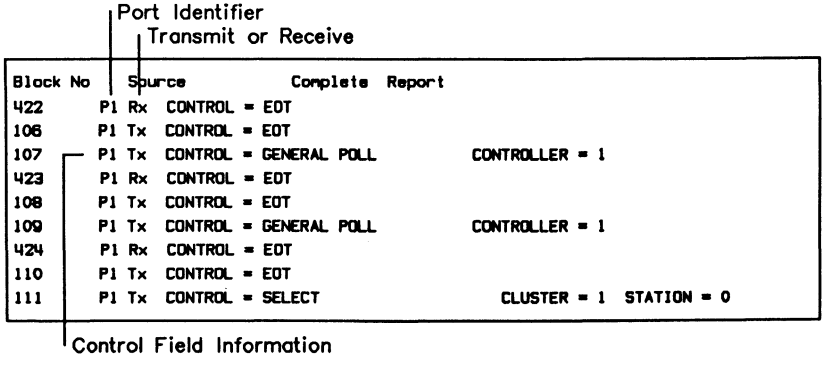
OFF — Data on the corresponding layer is not displayed.

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.

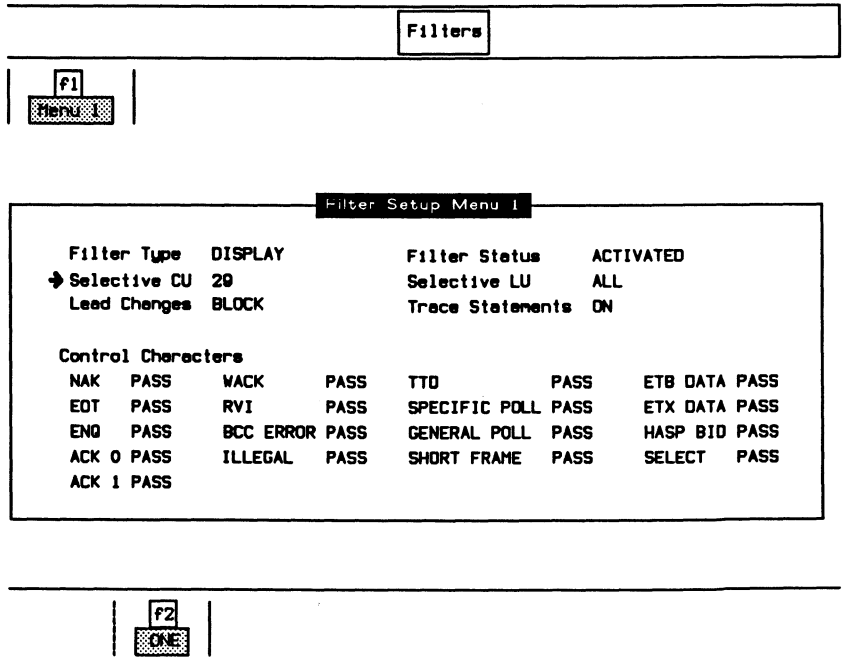
The following display is an example in complete display format.



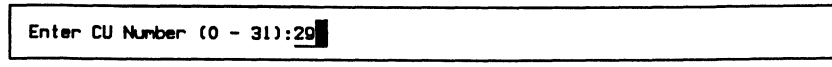
15.4 Bisync Filters

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.



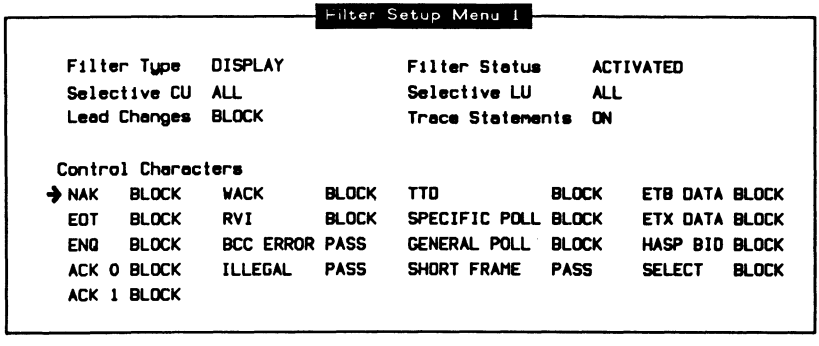
- Enter in the Cluster ID and press ↵ (RETURN).



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.



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

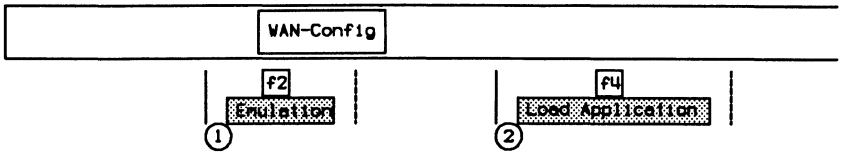
Version 2.0

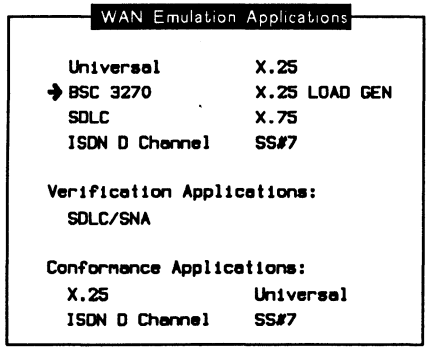
16.1 Loading the BSC 3270 Emulation Program

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:

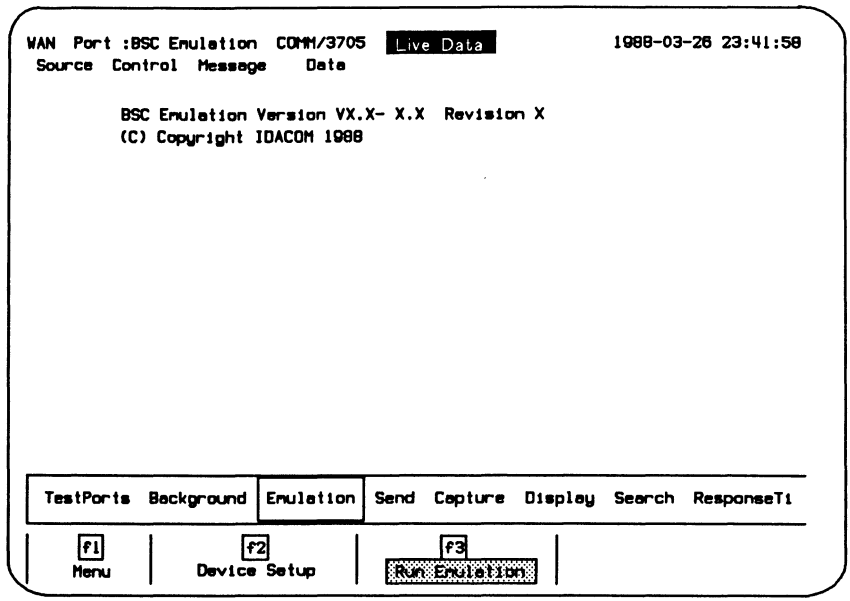
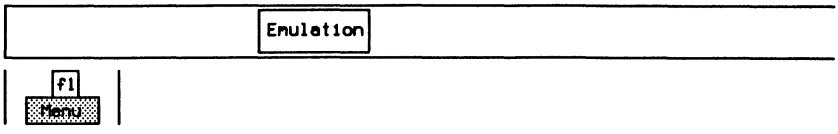


Figure 16-1 BSC 3270 Emulation Program Display

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	COMM/3705	Emulation	AUTOMATIC
Emulation Interface	TO DTE	Bit Rate	UNKNOWN
Interface Type	RS232C/V.28	Framing	EBCDIC
Interface Leads	ENABLED	External Tx Clock	OFF
Carrier Detect Control	OFF		
RTS/CTS Control	OFF		

→ *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).

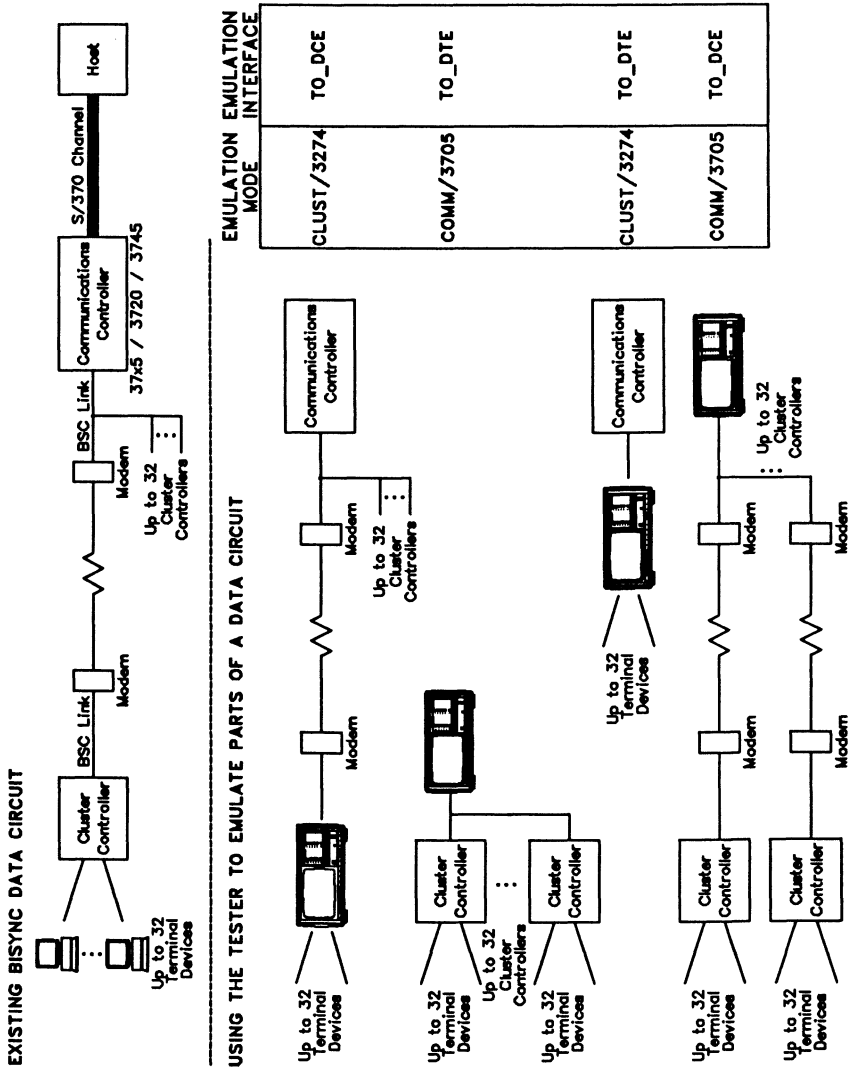
→ *Emulation Interface*

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
Cluster Controller
BSC Link
Modem
Modem
BSC Link
Communications Controller
S/370 Channel
Host
37x5 / 3720 / 3745
Up to 32 Cluster Controllers
Up to 32 Terminal Devices
USING THE TESTER TO EMULATE PARTS OF A DATA CIRCUIT
EMULATION MODE
EMULATION INTERFACE
CLUST/3274
TO_DCE
COMM/3705
TO_DTE
CLUST/3274
TO_DTE
COMM/3705
TO_DCE
Communications Controller
Modem
Modem
Up to 32 Cluster Controllers
Up to 32 Terminal Devices
Cluster Controller
Up to 32 Terminal Devices
Up to 32 Cluster Controllers
Cluster Controller
Up to 32 Terminal Devices
Communications Controller
Up to 32 Terminal Devices
Up to 32 Cluster Controllers
Modem
Modem
Cluster Controller
Up to 32 Terminal Devices
Cluster Controller
Up to 32 Terminal Devices

→ *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.

External Tx Clock	TO DTE	TO DCE
OFF	Select	Measure
ON	Measure	Select

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*

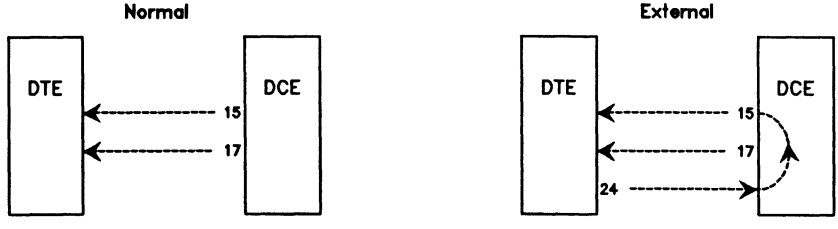
EBCDIC — Uses EBCDIC control characters and a SYNC character of hex 32.

ASCII — Uses ASCII control characters and a SYNC character of hex 16.

→ *External Tx Clock*
There are two clocking modes:

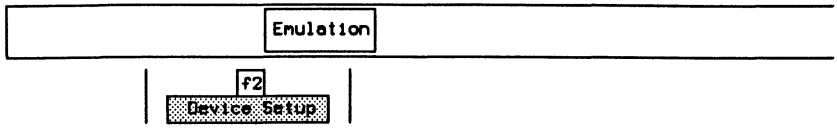
- *OFF* (Normal)
- *ON* (External)

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)

Device Setup



Device Setup Menu

```
→ Cluster Controller :   0
  Controller Status  :   ON

  Device# 0 ON      Device#  8 ON      Device# 16 OFF     Device# 24 OFF
  Device# 1 ON      Device#  9 ON      Device# 17 OFF     Device# 25 OFF
  Device# 2 ON      Device# 10 OFF     Device# 18 OFF     Device# 26 OFF
  Device# 3 ON      Device# 11 OFF     Device# 19 OFF     Device# 27 OFF
  Device# 4 ON      Device# 12 OFF     Device# 20 OFF     Device# 28 OFF
  Device# 5 ON      Device# 13 OFF     Device# 21 OFF     Device# 29 OFF
  Device# 6 ON      Device# 14 OFF     Device# 22 OFF     Device# 30 OFF
  Device# 7 ON      Device# 15 OFF     Device# 23 OFF     Device# 31 OFF
```

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.

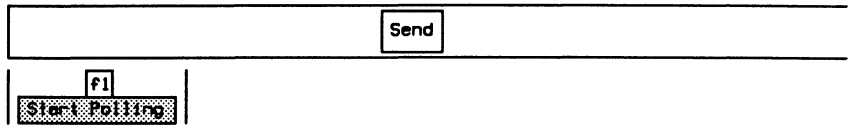
The CLST/3274 Bisync Emulation can emulate up to 32 cluster controllers simultaneously. Selecting a cluster and device ensures a response to a specific poll to that device. The selected cluster responds to a general poll if it is activated and not busy.

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:

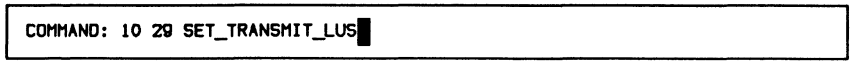


Selecting a Cluster Controller and Device

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).



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
```

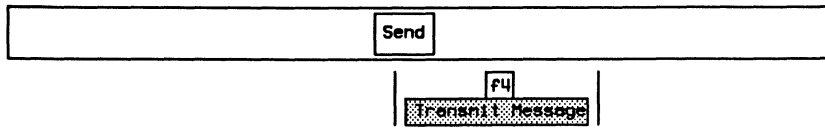
- Enter the device ID followed by the SET_TRANSMIT_LU command and press ↵ (RETURN).

```
COMMAND:  29 SET_TRANSMIT_LU
```

Refer to the Bisync Programmer's Manual for an explanation of SET_TRANSMIT_LU and CLUST_LU.

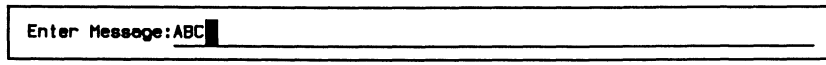
NOTE
SET_TRANSMIT_LUS works for a communications controller setting both cluster controller ID and device ID. SET_TRANSMIT_LU works for a cluster controller and sets device ID only.

Sending a Message



Example:
Transmit the text 'ABC'.

- Enter the desired message and press *Execute* to send the message.

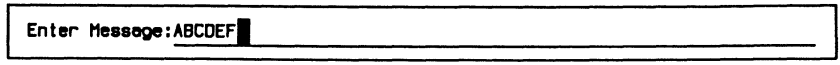


NOTE
The entered text is automatically bound by STX and ETX characters before transmission. The text is 8 bit no parity ASCII and no conversion to EBCDIC or 7 bit odd parity ASCII takes place.

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:

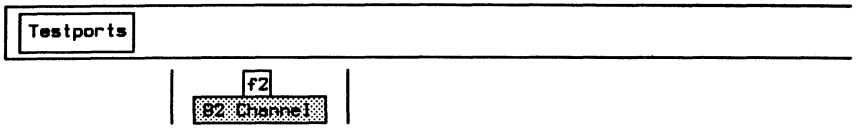
17
GENERAL HOME PROCESSOR TOPICS

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).



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.

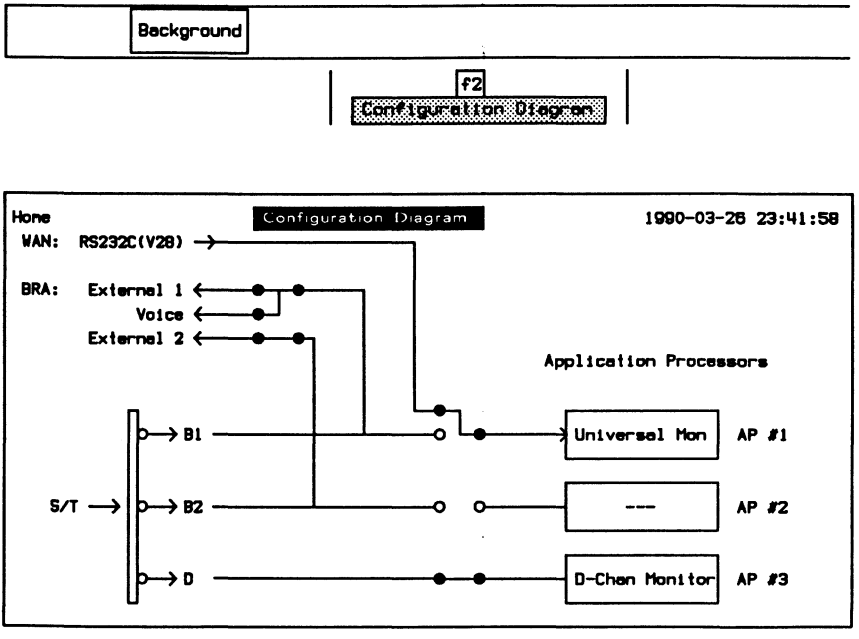


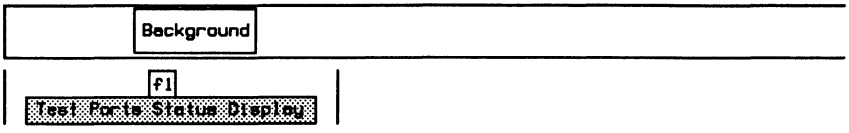
Figure 17-1 BRA/WAN Configuration Diagram

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

	WAN Interface	B2 Channel	D Channel
Application	Universal Mon	---	D-Chan Monitor
Interface	RS232-C (V.28)	---	ISDN BRA S BUS
Live Data	Off	---	On
Recording:			
Capture RAM	On	---	On
Data File	Off	---	Off
Filters:			
Display	---	---	Deactivated
RAM	---	---	Deactivated
Disk	---	---	---
Triggers	Off	---	Off

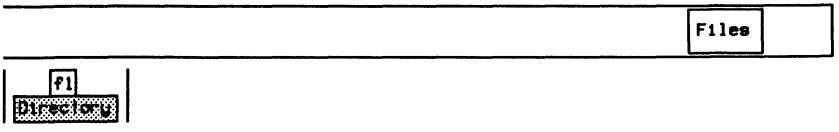
Figure 17-2 BRA/WAN Test Port Status Display

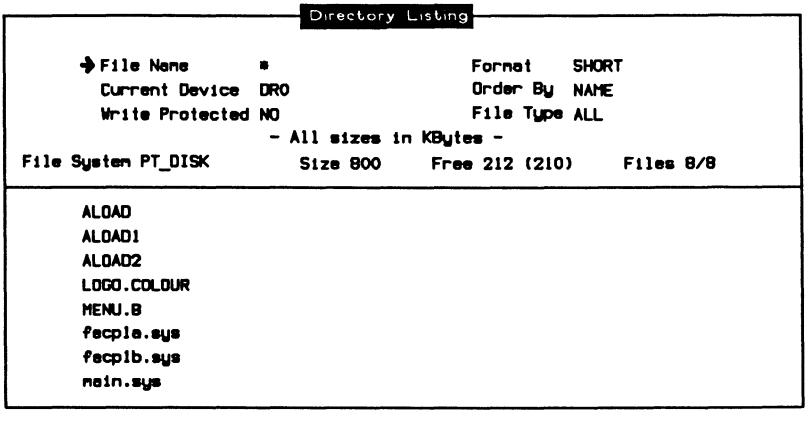
NOTE
The function keys vary depending on the machine configuration.

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.

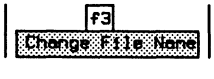
Listing a Directory



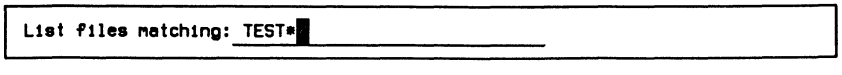


→ *File Name*
Specifies the filename to match. If the filename is specified as * (wildcard character), any filename will be matched.

Example:
List only files starting with the word 'TEST'.



- Enter the filename (TEST*) and press ↵ (RETURN).

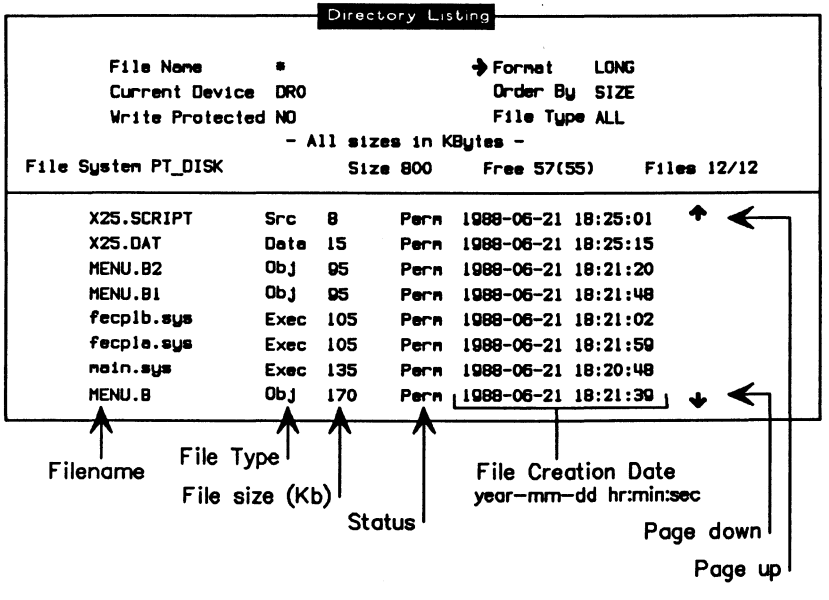


→ *Current Device*
The directory listing corresponds to the currently selected device.

→ *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.



→ *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).

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.

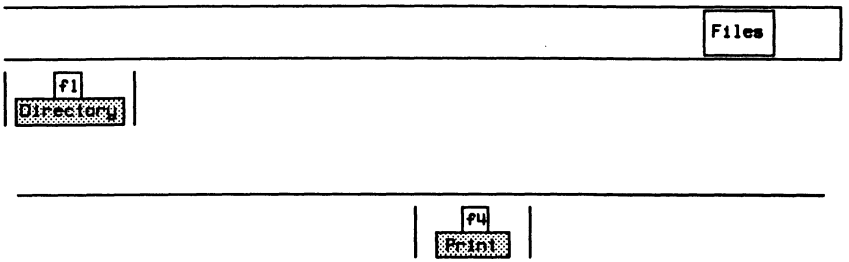
Free (eg. 314/312)
The first number represents the total available free space and the second number, the largest contiguous area of free space.

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

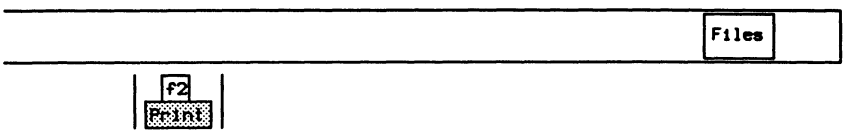
NOTE
Before printing, connect a serial or parallel printer to the back of the tester and configure the printer as described in the 'Configuring the Printer Port' section on page 17-24.

WARNING
Do not move to another topic while printing!

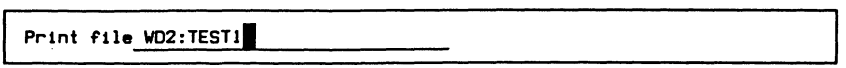


NOTE
The location of the Print function key varies depending on the position of the cursor on the Directory Listing Menu.

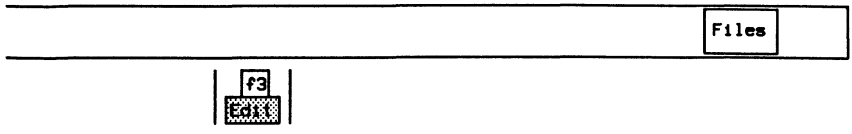
Printing a Source File



- Specify the device and filename (eg. WD2:TEST1) and press ↵ (RETURN).



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.

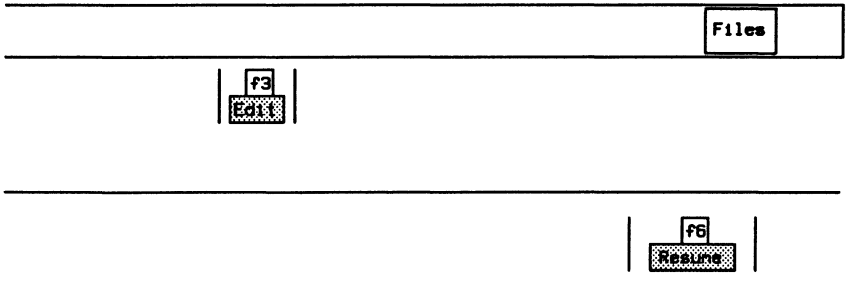
```
Edit script: WD1:TEST1
```

```
                              Script Editor
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 COUTNER15
        0 COUNTER16 | 0 COUNTER17 | 0 COUNTER18 | 0 COUNTER19 | 0 COUNTER20
```

Editor Functions

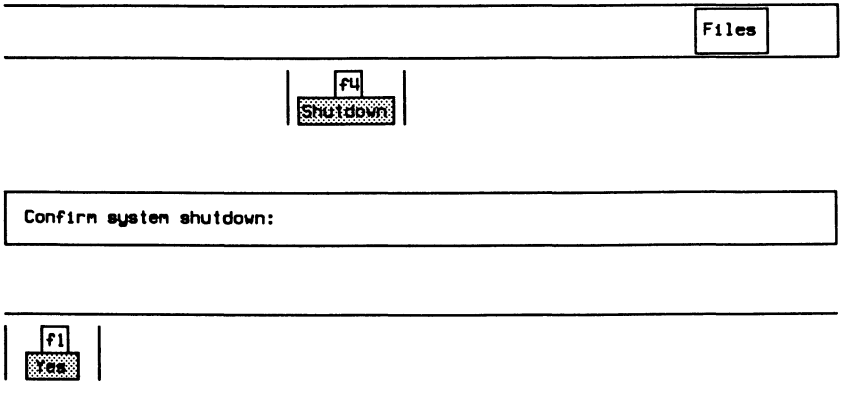
Overwrite	Overwrites existing text with new characters. The default is to insert new text at the current position.
Edit	Edits a new file.
Delete	Deletes the character under the edit cursor.
Cut Line	Deletes the line on which the edit cursor is positioned.
Paste Line	Copies the last deleted line to the 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

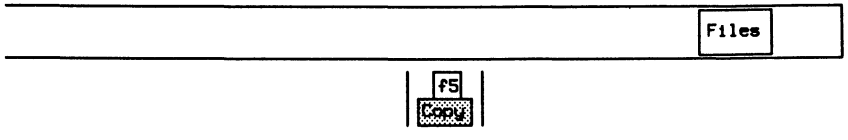
To park the head of the hard disk drive:



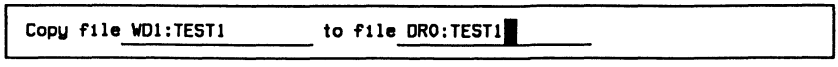
- Remove the disk from the floppy disk drive.
- Turn off the power.

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.

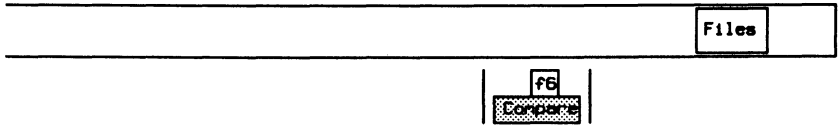


NOTE
Ensure that the Verify function key is highlighted to verify the copy against the original after copying is complete, and that the Pause on Error function key is highlighted to pause if an error occurs.

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.



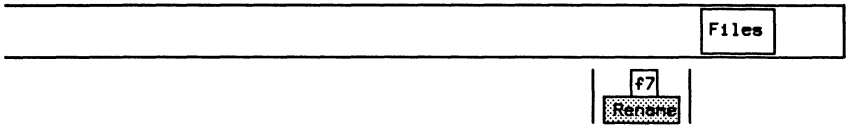
- Specify the device and filename for the first field (WD0:DATA1), then press the *Next Field* function key and specify the device and filename (WD1:DATA2).
- Press ↵ (RETURN) to start comparing.

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

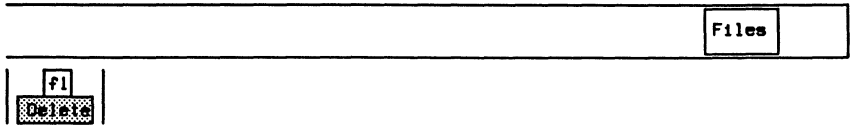
Example:
Rename file 'ABC' on WD0 to 'XYZ'.



- Specify the device and filename for the first field (WD0:ABC), then press the *Next Field* function key and specify the device and filename (WD0:XYZ).
- Press ↵ (RETURN) to rename the file.

Deleting Files

Example:
Delete file 'XYZ' from DR0.



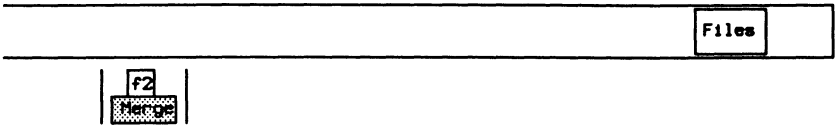
- Specify the device and filename (DR0:XYZ) to delete and press ↵ (RETURN).

```
Delete file DR0:XYZ
```

NOTE
*The * (wildcard character) cannot be used to delete files.*

Merging Files

Example:
Merge files 'ABC' and 'DEF' on DR0 into file 'XYZ'.

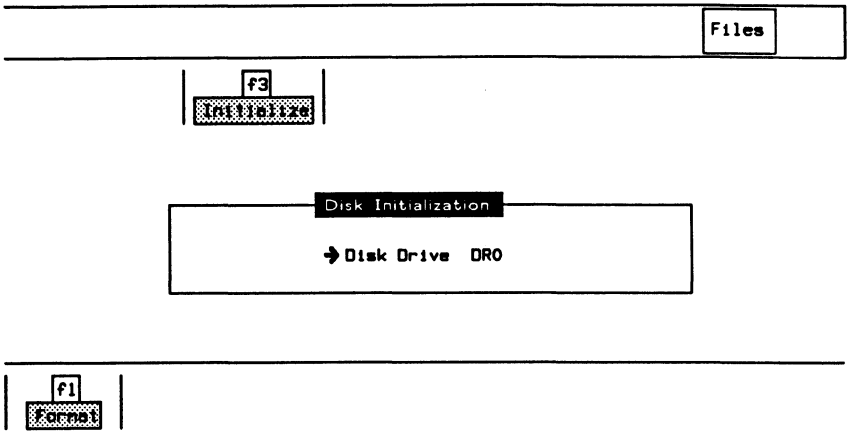


- Specify the device and filenames for the first field (DR0:ABC), the second field (DR0:DEF), and the merged filename in the third field (DR0:XYZ). Use the *Next Field* function key to advance to the next field.
- Press ↵ (RETURN) to merge the files.

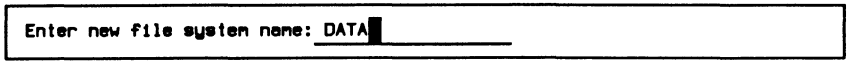
```
Merge DR0:ABC          and DR0:DEF          into DR0:XYZ
```

Formatting a Floppy Disk

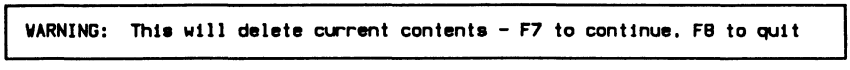
The floppy disk must be formatted before recording data or creating a test script.



- Enter the new file system name (eg. DATA) and press ↵ (RETURN).



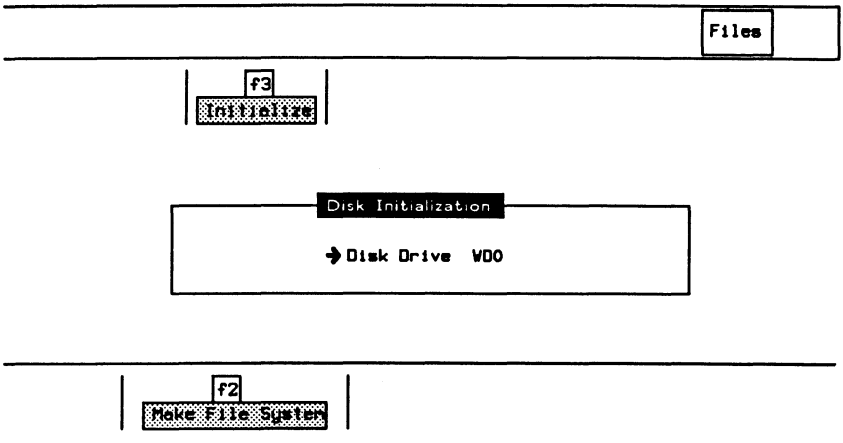
The following warning message is displayed:



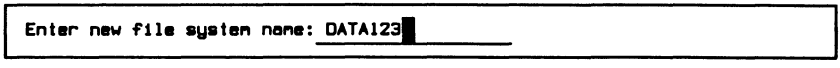
- Press f7 to continue or f8 to quit.

Creating a New File System

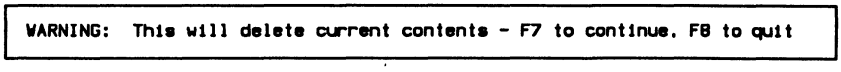
In order to quickly clear a formatted disk or a hard disk partition of all files, create a new file system.



- Enter the new file system name (eg. DATA123) and press ↵ (RETURN).



The following warning message is displayed:



- 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.

Partition	File System	Size	Contents
WD0	SYSTEM	2000	Operating System and Home Processor Software
WD1	APPLICATIONS	7500	Universal Simulation/Monitor X.25 Monitor/Emulation SDLC/SNA Emulation/Monitor BSC 3270 Monitor/Emulation ISDN Monitor/Emulation
WD2	PROGRAMS	2000	User Test Scripts
WD3	DATA		Data files and general purpose

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

f1  Format Hard Disk
f2  Display Bad Block Map
f3  Hard Disk Read Test
f4  Hard Disk Write/Read Test
f5  Edit Bad Block Map
f6  Quit Format Utility
```

- 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
```

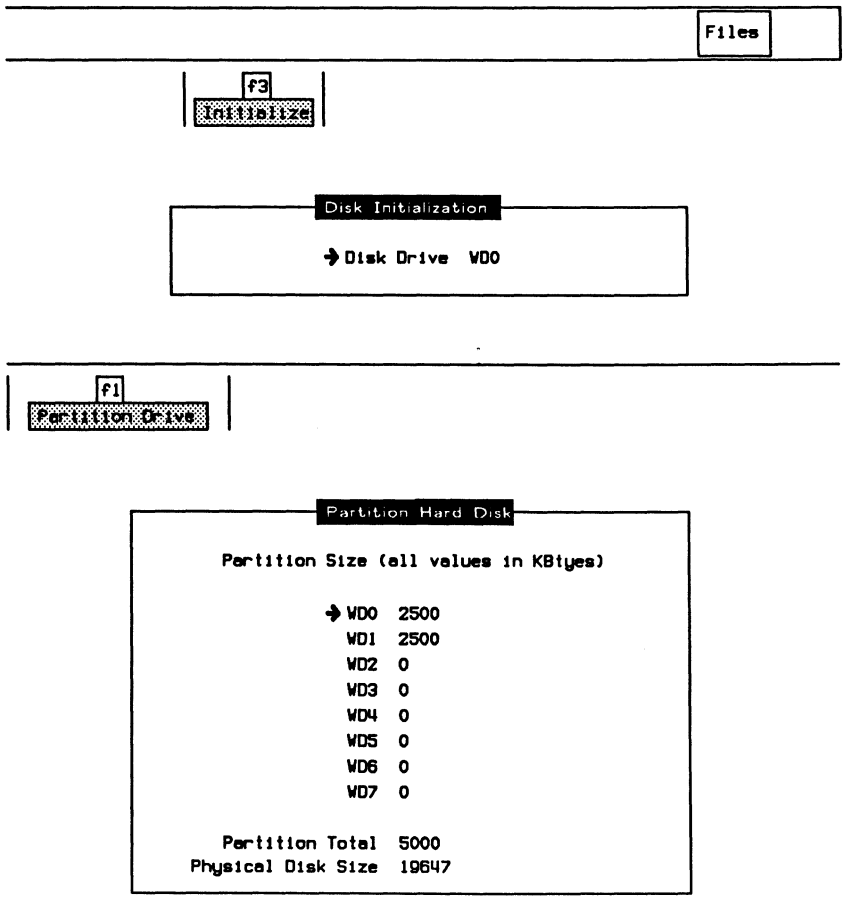
Partitioning the Hard Disk

WARNING
Partitioning the hard disk erases all data on the hard disk.

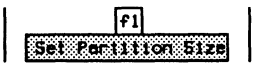
After the disk has been formatted, it is necessary to divide the disk into partitions. When partitioning the hard disk drive, use IDACOM's recommended partitions or customize the disk for your own requirements.

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.

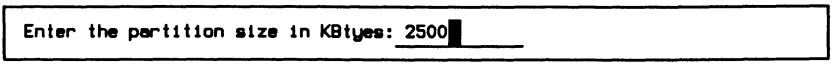
- Insert the disk(s) labelled 'OPERATING SYSTEM' into the floppy disk drive DR0.
- Turn on the power switch or press the RESET button.



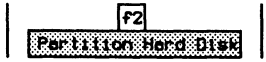
- Move the cursor to each partition WD0 to WD7.



- Enter the new partition size and press ↵ (RETURN).



After all the partition sizes are set:



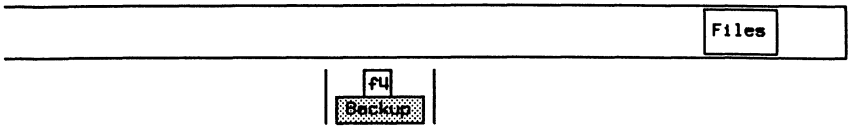
The following warning message is displayed:

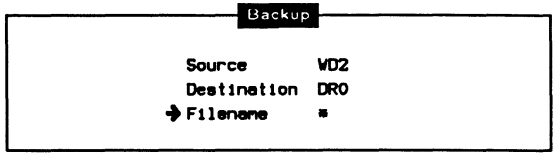
- Press f7 to continue or f8 to quit.

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).



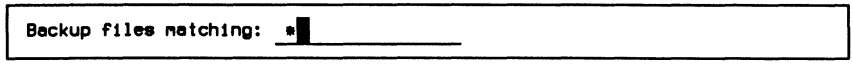


→ *Filename*
Specifies a single filename or wildcard.

Example 1:
Back up all files (default).

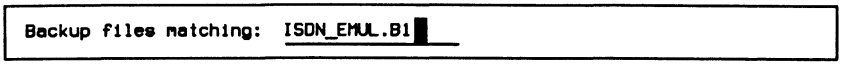
NOTE
*If the filename is specified as * (wildcard character), all files will be backed up.*

- Enter * to back up all files and press ↵ (RETURN).



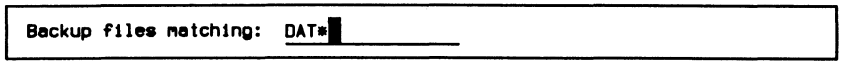
Example 2:
Back up the file 'ISDN_EMUL.B1'.

- Enter the filename and press ↵ (RETURN).



Example 3:
Back up all files with 'DAT' as the first three characters in the filename.

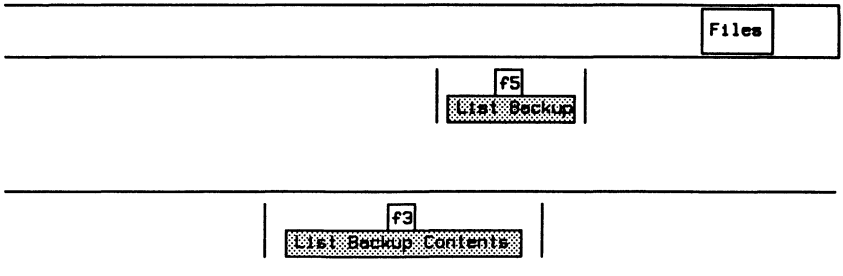
- Enter DAT and * and press ↵ (RETURN).



NOTE
Ensure that the Verify function key is highlighted to automatically compare the files with the backup.

To start copying:

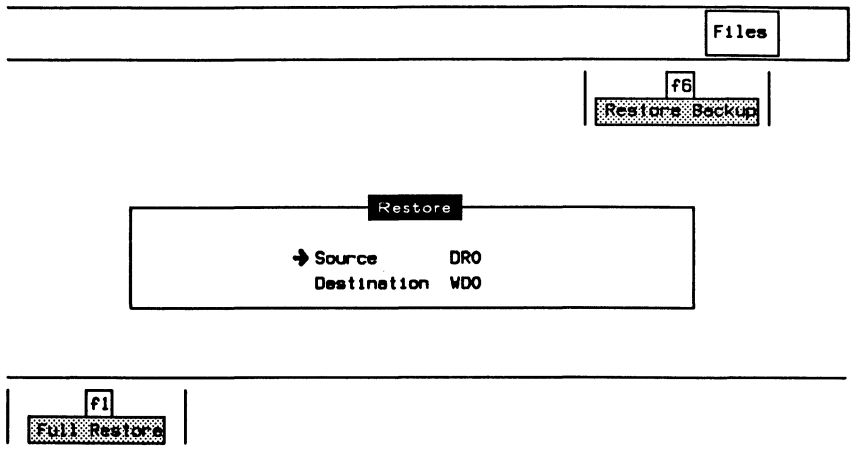
To list the files on the backup disk:



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 DR0.
- Turn on the power switch or press the RESET button.



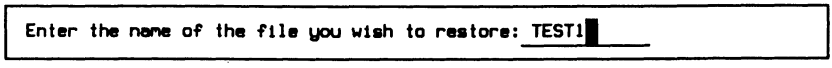
The following warning message is displayed:

```
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:

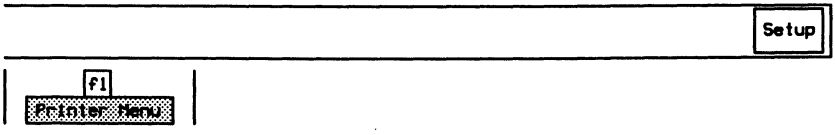
- Enter the filename you wish to restore (eg. TEST1) and press ↵ (RETURN).

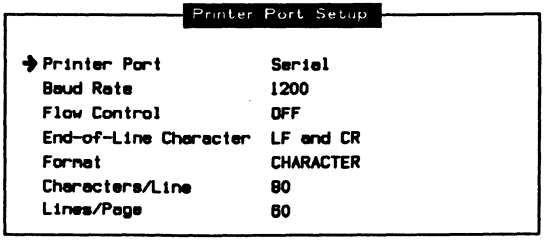


17.4 Setup

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	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*

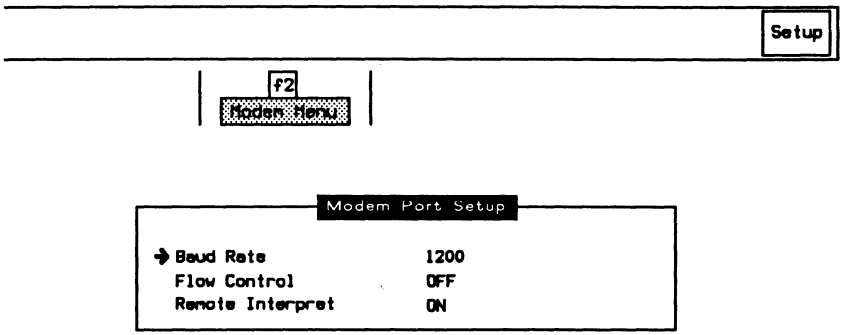
RAW	Outputs all characters without conversion.
CHARACTER	Translates all non-printable characters into hex.
HEX	Translates all characters into hex.

NOTE
Characters translated into hex are enclosed in angle brackets (i.e. 'AB$^{S}_{H}$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*

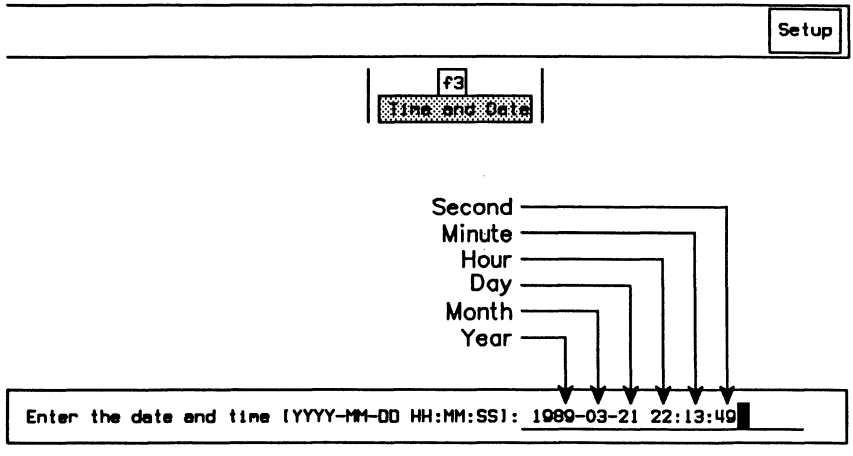
OFF	Flow control is not used.
XON/XOFF	Starts/stops transmission to the modem upon reception of XON (hex 13) and XOFF (hex 11), respectively.

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

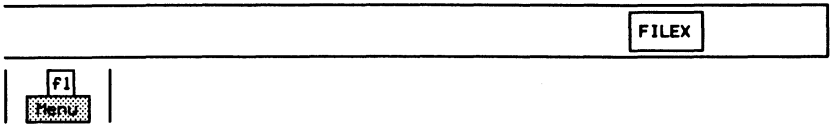


- Enter the values for each of the six fields using the *Next Field* function key, and press ↵ (RETURN).

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        Receive Timeout Value  8.0
   Error Correction    CRC        Send Timeout Value     80.0
   Translate           OFF        Retry Counter          10
   Control-Z Is EOF    YES
```

→ *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

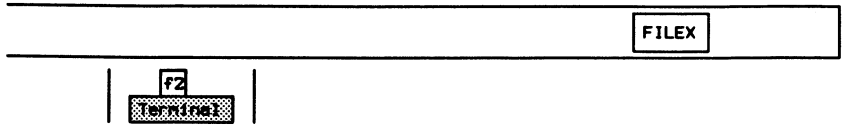
The following termcap file entry is required to use the IDACOM FILEX terminal emulator with a UNIX* system. This termcap entry must be invoked and the number of rows set to 15 (refer to UNIX* man pages tset and termcap).

```
i0|ida-pt|idacom pt vt100 terminal emulator:\
        :do=^J:co#80:li#15:cl=\E[;H\E[2J:sf=\ED:\
        :le=^H: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/E>:\
        :ku=\EOA:kd=\EOB:kr=\EOC:kl=\EOD:kb=^H:\
        :ho=\E[H:pt:sr=\EM:\
        :sc=\E7:rc=\E8:cs=\E[%i%d;%dr:
```

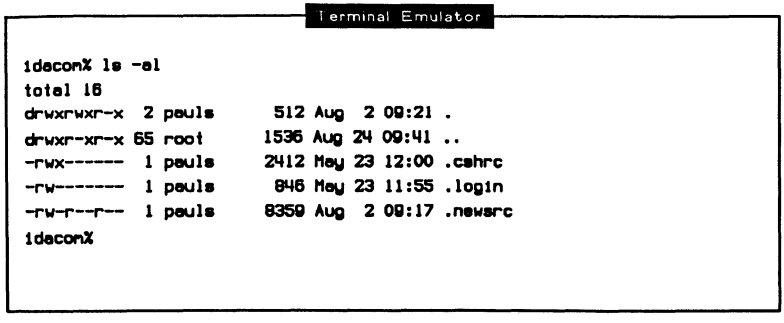
Starting the Terminal Emulator

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

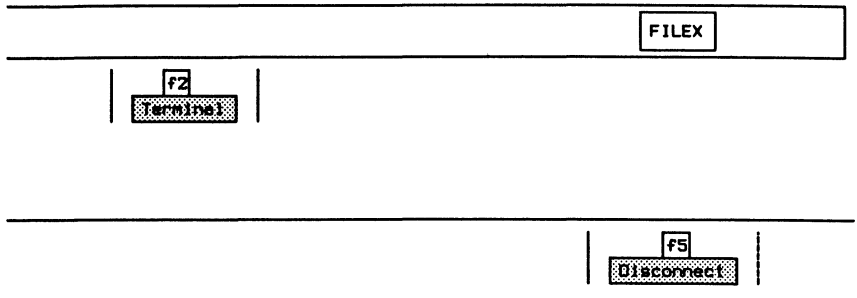


All keyboard entries except the ESC and HOME keys, are processed and displayed on the Terminal Emulator screen. Enter '\' followed by the ESC key to transmit an ESC character.

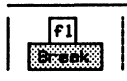
If the HOME key or the *Exit* function key is pressed, the Home menu will be displayed and terminal emulation will continue in the background. Entries received from the remote port will still be treated as terminal input; local keyboard entries will not.

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

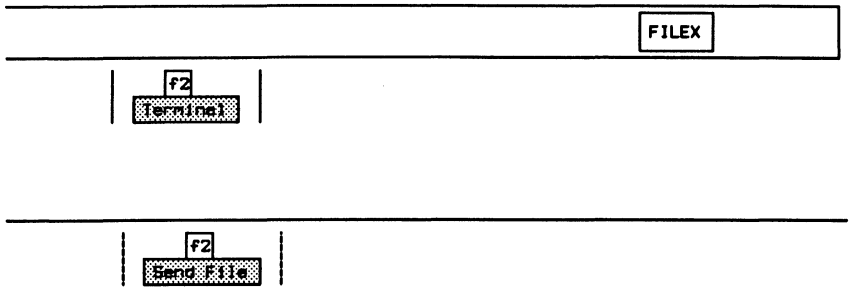


NOTE
The effect of a BREAK signal varies depending on the connected computer.

Sending Files

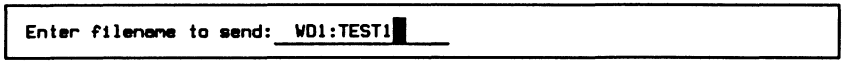
Disk files can be transmitted from the tester through the remote port to a remote computer.

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.

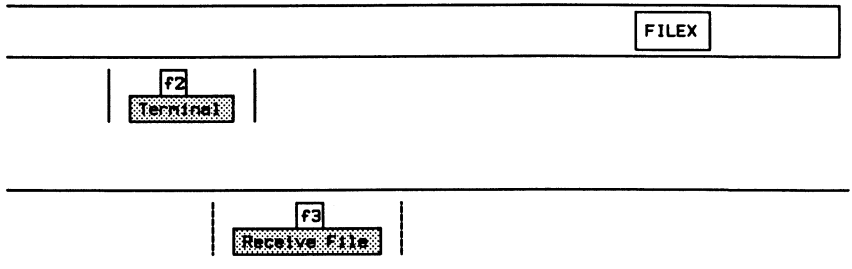
- Specify the device and filename (WD1:TEST1) and press ↵ (RETURN).



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 ↵ (RETURN).

If the specified file already exists on the destination drive, the old file will be overwritten.

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.

18
GENERAL APPLICATION TOPICS

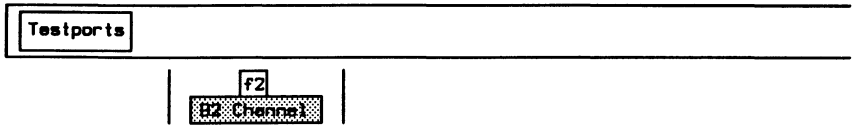
Each application processor tests one data channel using protocol dependent application software.

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 (eg. the B2-Channel):



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).

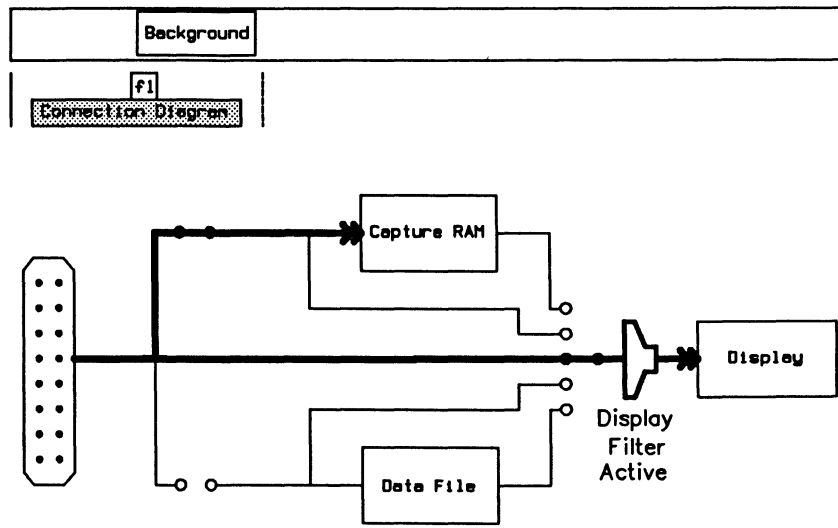
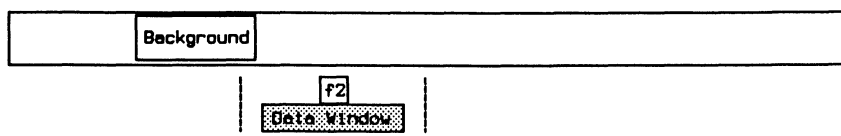


Figure 18-1 Connection Diagram

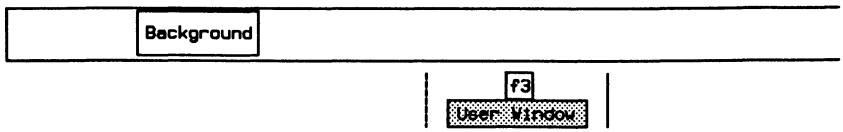
Data Window

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

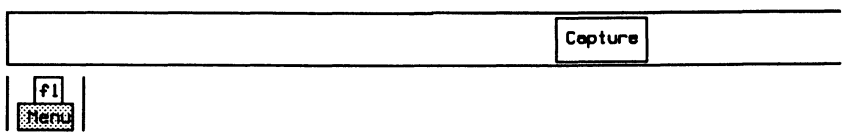
The User Window is a 16 line blank screen area dedicated for test script use. Simple messages, detailed statistics, or graphics can be displayed in this window under the control of a user program (see the Programmer's Reference Manual).

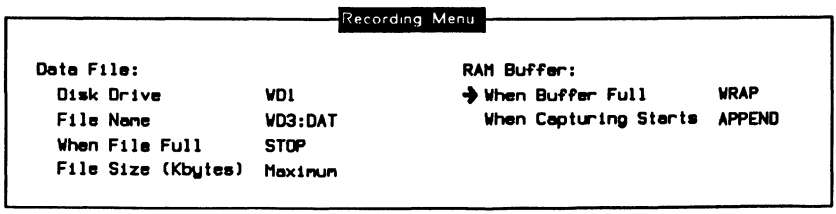


18.3 Capture

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





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:

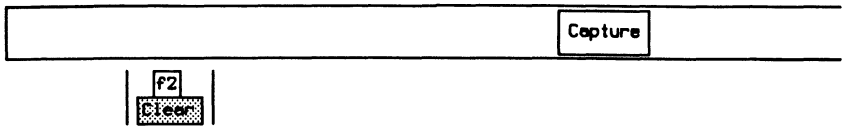
→ *When Buffer Full*

WRAP	Performs an 'endless loop' recording to capture RAM.
STOP	Halts capture to RAM once the buffer is full.

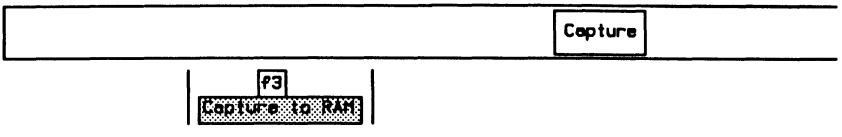
→ *When Capturing Starts*

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

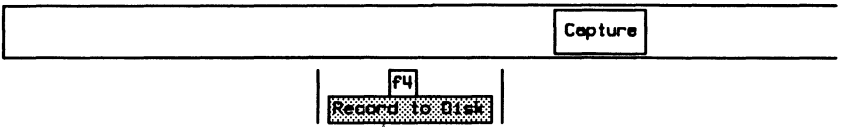


Capturing to RAM



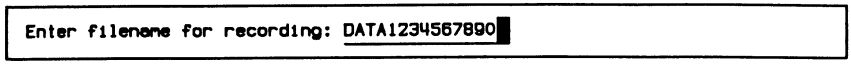
NOTE
Ensure that this function key is highlighted to capture data in the RAM buffer.

Recording Live Data to Disk

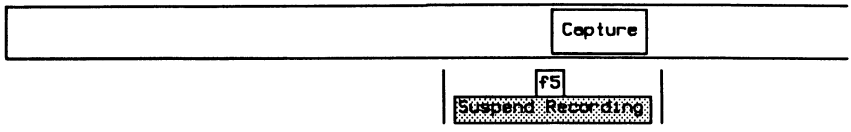


NOTE
Ensure that this function key is highlighted to open a file for disk recording.

- Enter the filename (eg. DATA1234567890) and press ↵ (RETURN). The maximum length of the filename is 14 characters.



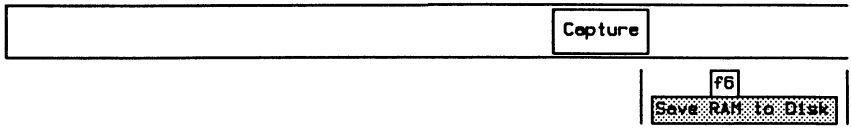
Data recording to disk can be suspended without closing the data file.



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



- Enter the filename (eg. DATA1234567890) and press ↵ (RETURN). The maximum length of the filename is 14 characters.

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.

Transfer Data from Start to End
```

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.

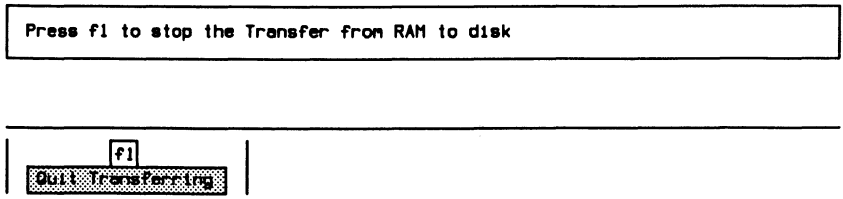
- Use the cursor to move to the last block to be transferred.

- Press the *Execute* function key to start transferring data.

The following message indicates the transfer is complete:

```
End of RAM Buffer
```

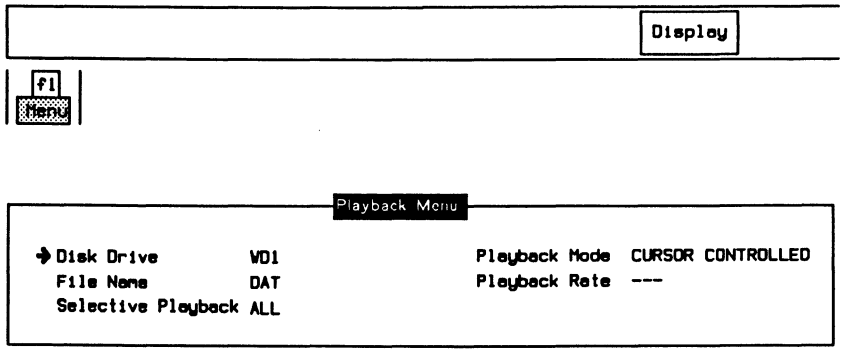
To stop the transfer:



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.



→ *Disk Drive*
Specifies the default disk drive for data playback.

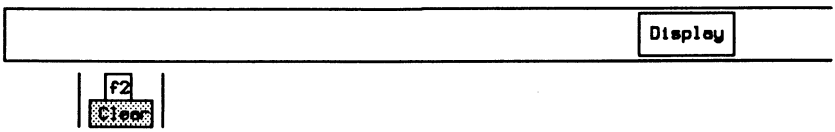
→ *File Name*
Specifies the default filename for data playback. The maximum length of the filename is 14 characters.

→ *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:

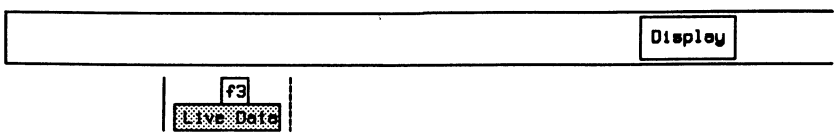


This has no effect on the capture buffer or disk files. To change the format of the screen display and to vary the degree of decoding, refer to Section 18.5.

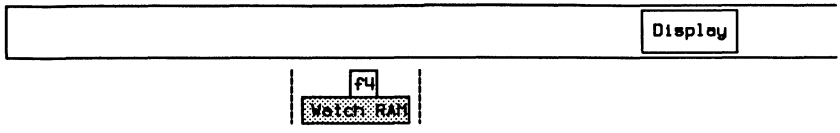
Live Data

The next three display functions are best illustrated by displaying the Connection Diagram (see page 18-3).

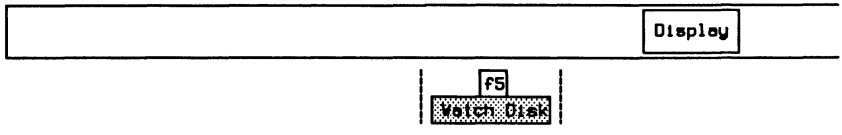
The path from the test port (connector) to the display is highlighted, eg. the display shows Live Data (unless a display filter is activated).



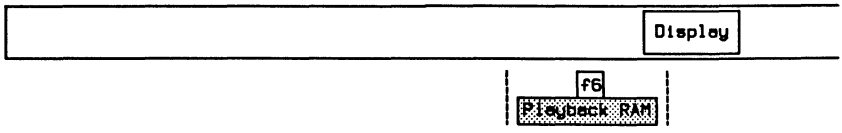
The data which is actually captured to RAM (after a possible RAM filter) is displayed.



The data which is actually recorded to disk (after a possible disk filter) is displayed.



Playing Back Data from Capture RAM

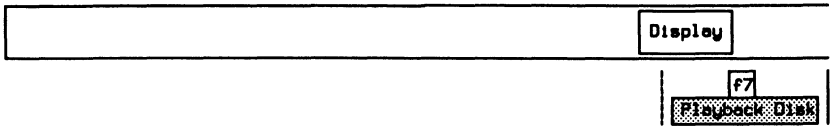


- Press the ↑ or ↓ cursor keys to scroll line by line.
- Hold down the **CTRL** key and press the ↑ or ↓ cursor keys to scroll page by page.
- Hold down the **CTRL** and **SHIFT** keys and press the ↑ or ↓ cursor keys to go to the beginning or end of the capture buffer, respectively.
- Use the *START/STOP* 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

Enter filename for playback: DATA1234567890
```

If the data file is located, the data is displayed on the screen.

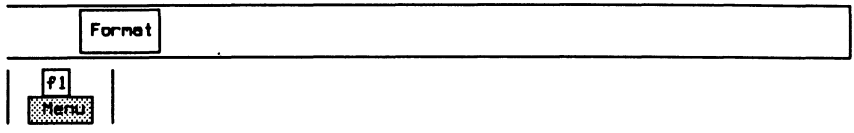
- Press the ↑ or ↓ cursor keys to scroll line by line.
- Hold down the **CTRL** key and press the ↑ or ↓ cursor keys to scroll page by page.
- Hold down the **CTRL** and **SHIFT** keys and press the ↑ or ↓ cursor keys to go to the beginning or end of the data file, respectively.
- Use the *START/STOP* 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 (eg. 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.



Display Format Menu

→ Display Format	COMPLETE	Dual Window	OFF
Timestamp	OFF	Trace Display Format	SHORT
Character Set	ASCII		
Frame Layer	TEXT	Throughput Graph	OFF
Packet Layer	TEXT	Short Interval (sec)	10
Data Field	CHARACTER	Long Interval (sec)	600

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.

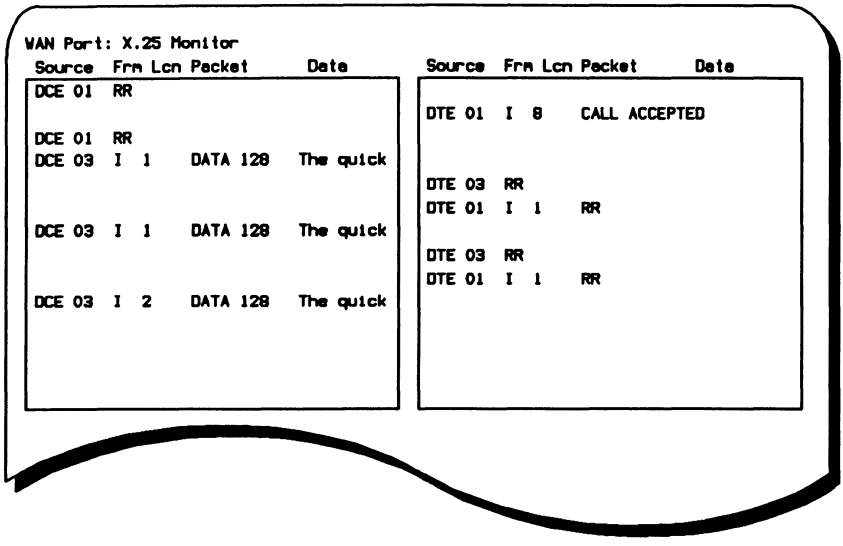


Figure 18-2 Split Screen Display

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.

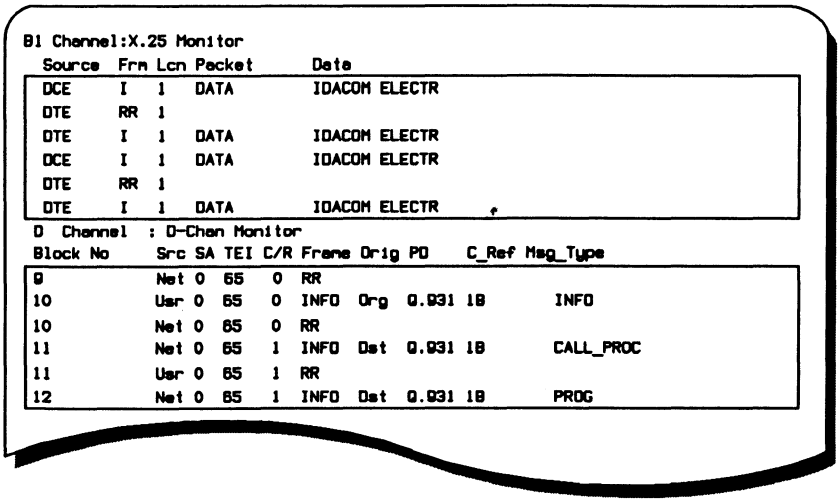


Figure 18-3 Dual Window Display

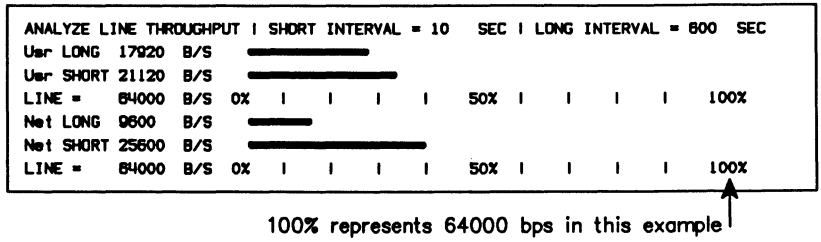
→ *Trace Display Format*
Selects the display format for trace reports.

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.



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.

```
Block No     Source          Complete Frame and Packet Report
18       P2 DTE  ADDRESS=03   FRAME=RR      F=0    NR=1
19       P2 DTE  ADDRESS=01   FRAME=INFO    P=0    NR=1   NS=0
                 GF=1 D=0 Q=0 LCN=1    RR   PACKET PR=7
19       P2 DCE  ADDRESS=01   FRAME=RR      F=0    NR=1
20       P2 DCE  ADDRESS=03   FRAME=INFO    P=0    NR=1   NS=1
                 GF=1 D=0 Q=0 LCN=1    DATA PACKET PR=0   PS=7   M=0
               | IDACOM ELECTRONICS LTD  BRINGS  TO  YOU  THE   P T !!!     |
               |      THE  PROTOCOL   TESTER  THAT  LEADS  THE  WAY INTO THE|
               | FUTURE |
20       P2 DTE  ADDRESS=03   FRAME=RR      F=0    NR=2
21       P2 DTE  ADDRESS=01   FRAME=INFO    P=0    NR=2   NS=1
                 GF=1 D=0 Q=0 LCN=1    RR   PACKET PR=0
21       P2 DCE  ADDRESS=01   FRAME=RR      F=0    NR=2
>
```

NOTE

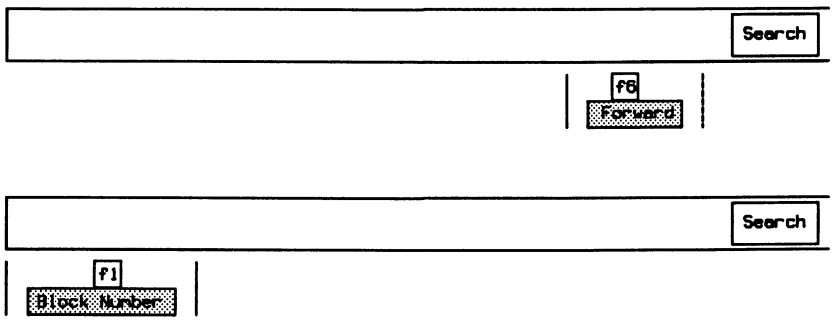
Block sequence numbers for trace and data are numbered independently.

18.6 Search

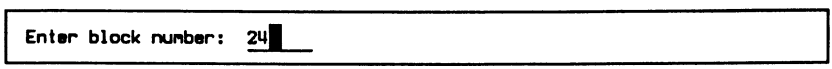
The contents of either capture RAM or a disk file can be searched for a block number, a timestamp, or a specified string . Before searching, choose the search direction (forward or backward).

Block Number

Example:
Search forward in trace statements or transmitted/received data for block number 24.

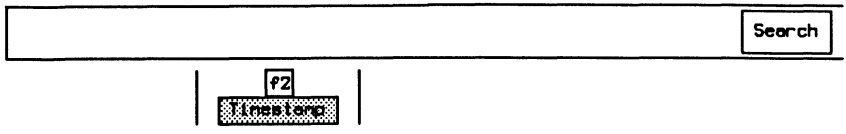


- Enter the block number and press ↵ (RETURN).

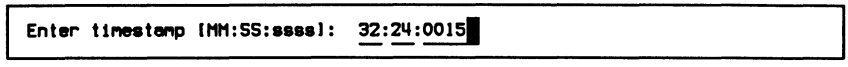


Timestamp

Example:
Search in trace statements or transmitted/received data for the timestamp 32:24:0015.



- Enter the timestamp and press ↵ (RETURN).



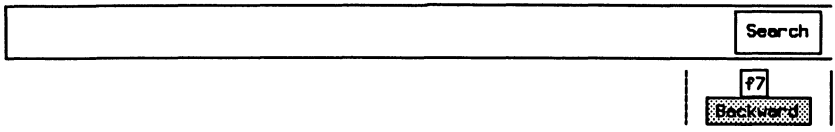
NOTE
The prompt displayed is dependent on the timestamp format selected on the Display Format Menu (MM:SS:ssss or DD HH:MM:SS).

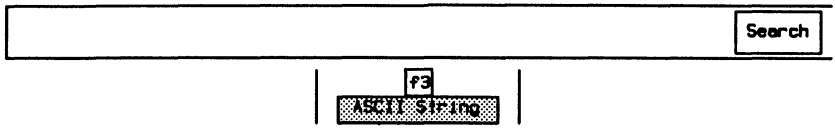
NOTE
A timestamp search finds the first frame with a value equal to or greater than the specified value when searching forward. When searching backward, a timestamp search finds the first frame with a timestamp equal to or less than the specified value.

String

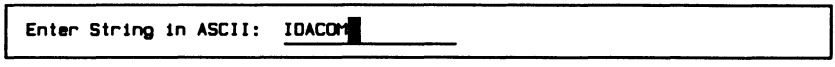
Transmitted/received data can be searched for an ASCII, HEX, or EBCDIC string.

Example:
Search backward in transmitted/received data for the ASCII string 'IDACOM'.





- Enter the string in ASCII and press ↵ (RETURN).



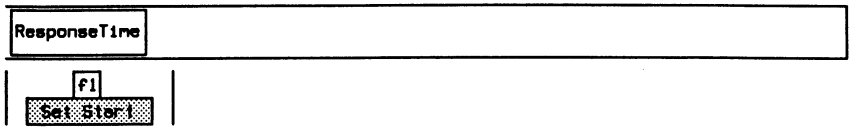
NOTE
The specified hex string is left justified (i.e. the hex string 123 searches for hex 1230)

NOTE
The actual string might not be displayed if in short format (see Section 18.5 to change the display format).

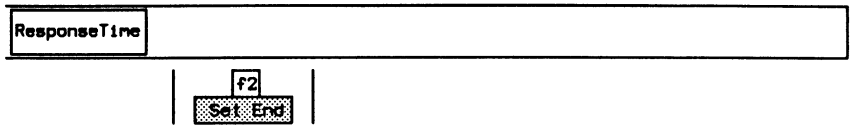
18.7 ResponseTime

To calculate the time between two frames:

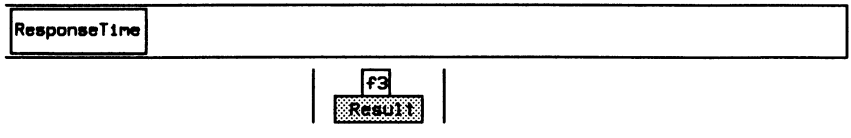
- Use the cursor keys to move through the capture RAM buffer or data file to identify the first block.



- 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
```

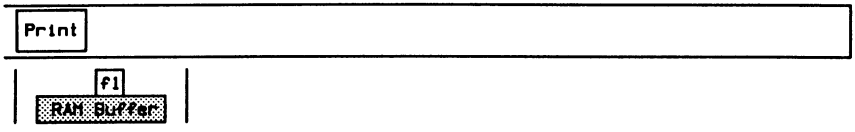
18.8 Print

The contents of capture RAM, data files, test scripts, or the screen display, can be printed.

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).

WARNING
Do not move to another topic while printing.

Printing the Capture RAM Buffer



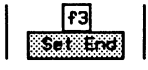

```
Printing will start when the Execute key is pressed

Print RAM Buffer from Start to End
```

To print all data:

To print only a portion of the data:

- Use the cursor keys to move to the first block to be printed.

- Use the cursor keys to move to the last block to be printed.

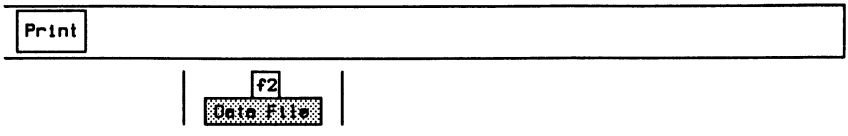


- Press the *Execute* function key to start printing.

To stop printing:

NOTE
Printing must be completed or stopped to access other topics.

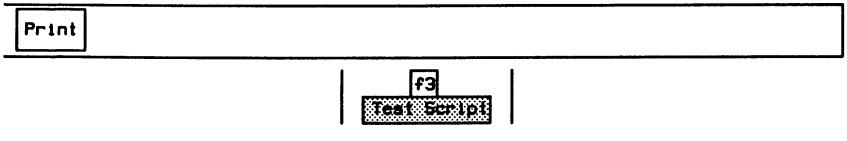
Printing a Data File



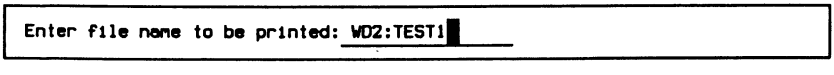
- Enter the filename (eg. WD2:DATA1) and press ↵ (RETURN).

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

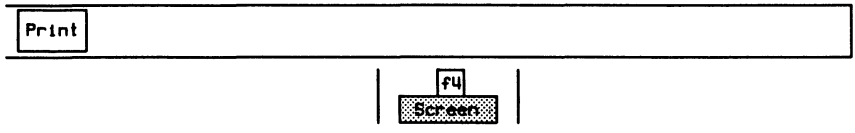


- Enter the filename (eg. WD2:TEST1) and press ↵ (RETURN).



Printing a Screen Image

To print an exact image of the screen, including the status line and function key labels:



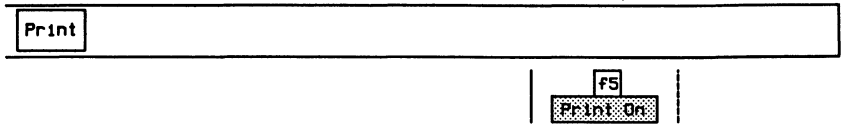
NOTE
An image of the screen can also be printed by pressing the SHIFT and CTRL keys simultaneously and then pressing the f1 function key.

Manually Printing a Data File/Capture RAM

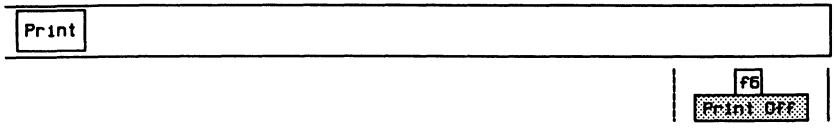
The contents of capture RAM or a data file can be printed line-by-line starting at the current cursor position. Each line is printed as it is displayed.

Example:
Print line 4 through line 7 of a data file.

- Position the cursor before line 4.



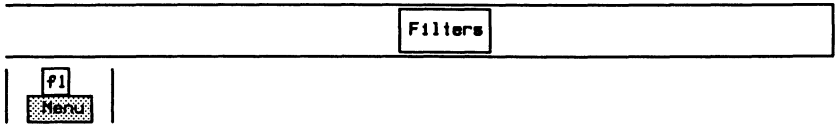
- Position the cursor after line 7.



NOTE
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.



Filter Setup Menu

Filter Type	DISPLAY			Trace Statements	ON		
Filter Status	DEACTIVATED			→ Selective Address	4034624545		
Lead Changes	BLOCK			Selective LCN #1	---	LCN #2	---
				Selective LCN #3	---	LCN #4	---
Frame Layer:							
SABM	PASS	I	PASS	UA	PASS	DM	PASS
SABME	PASS	RR	PASS	DISC	PASS	FRMR/CMDR	PASS
SARM	PASS	RNR	PASS	REJ	PASS	Invalid	PASS
Packet Layer:							
Call	PASS	RR	PASS	Restart	PASS	Registration	PASS
Clear	PASS	RNR	PASS	Reset	PASS	Diagnostic	PASS
Data	PASS	REJ	PASS	Interrupt	PASS	Invalid	PASS

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.

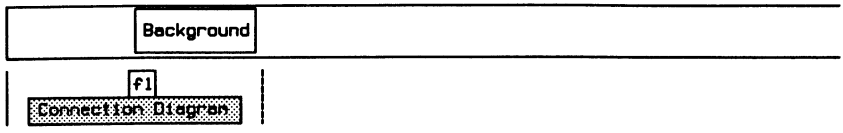
→ *Filter Status*
Selects whether the filter mechanism is activated or deactivated (default).

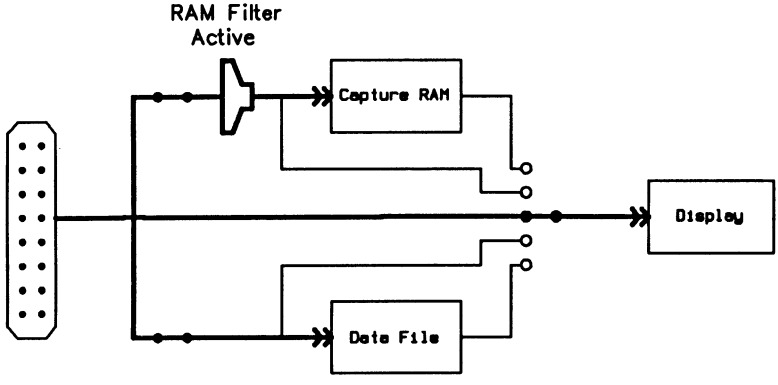
→ *Lead Changes*
Lead changes can be passed or blocked (default) when filters are active.

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:

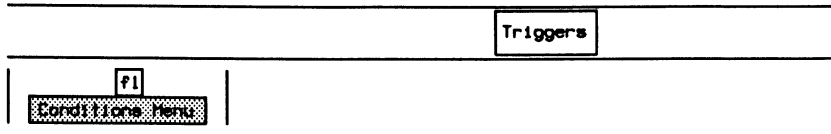




18.10 Triggers

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

→ Event Trigger	TRIGGER #1	Trigger Direction	FROM BOTH
Trigger Status	ARMED	Disk Full	OFF
Lead Transition	NONE	RAM Full	OFF
Frame Reception	NONE	Alarm Clock	OFF
Packet Reception	SELECTED	Time	---
String Match	OFF		
String	---		
Mask	---		

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.

V.28 Lead Transition Triggers

ON to OFF Transitions:				OFF to ON Transition:			
→ RTS	ON	DTR	OFF	RTS	OFF	DTR	OFF
DRS	OFF	SRTS	OFF	DRS	OFF	SRTS	OFF
LL	OFF	SS	OFF	LL	OFF	SS	OFF
CTS	OFF	SQ	OFF	CTS	OFF	SQ	OFF
DSR	OFF	RI	OFF	DSR	OFF	RI	OFF
CD	OFF	TM	OFF	CD	OFF	TM	OFF

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.

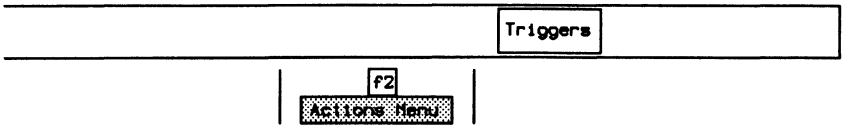
→ *Transition*

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



Trigger Action Menu

→ Event Trigger	TRIGGER #1	Display	NO EFFECT
Trigger Status	ARMED	RAM Recording	TURN OFF
Beep	ON	Disk Recording	TURN ON
Highlight	NO EFFECT		
Trigger Delay	OFF		
#Frames	---		
Date Display Message	"TRIGGER NO1 HAS FIRED"		
User Window Message	""		

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.

→ *Highlight*
When a trigger condition is met, the next received frame can be displayed in blue or red.

→ *Display*

NO EFFECT (default)	Screen display is not affected when trigger condition is met.
TURN ON	Turns on screen display when a trigger condition is met.
TURN OFF	Turns off screen display when a trigger condition is met.

→ *RAM Recording*

NO EFFECT (default)	Capture to RAM is not affected when a trigger condition is met.
TURN ON	Turns on capture to RAM when a trigger condition is met.
TURN OFF	Turns off capture to RAM when a trigger condition is met.

→ *Disk Recording*

NO EFFECT (default)	Disk recording is not affected when a trigger condition is met.
TURN ON	Turns on disk recording when a trigger condition is met.
TURN OFF	Turns off disk recording when a trigger condition is met.

→ *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.

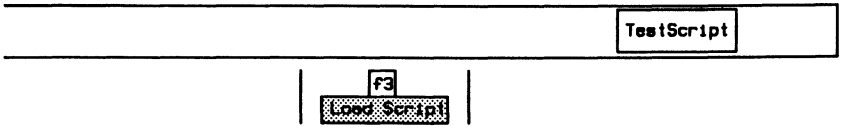
18.11 TestScript

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.

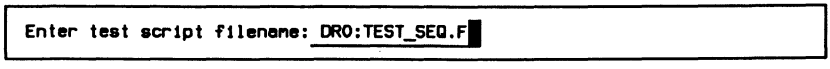
NOTE
To create or modify a test script, see the 'Editing a File' section on page 17-9 or refer to the Programmer's Manual.

Loading a Test Script

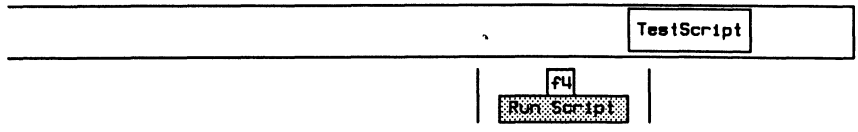
The test script must be loaded from the floppy or hard disk and run on an application processor.



- Enter the test script filename (eg. DR0:TEST_SEQ.F) and press ↵ (RETURN) to load the test script.



Running a Test Script

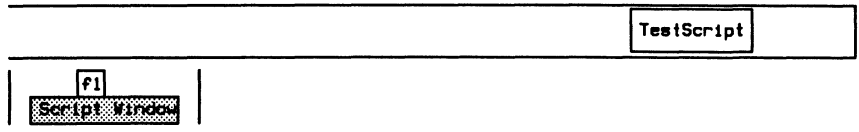


NOTE
Ensure that this function key is highlighted to run a test script.

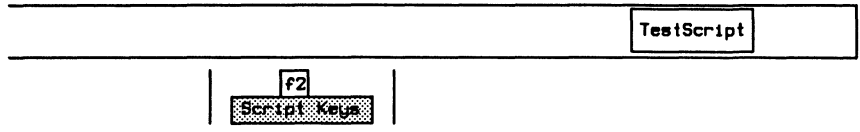
Displaying Test Script Messages

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:

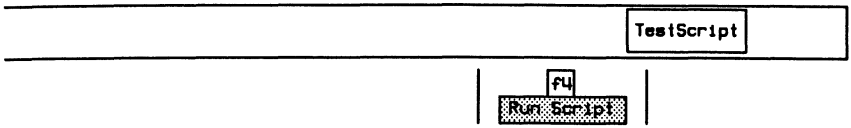


If the test script expects string input for the ?KEYBOARD command (see the Programmer's Reference Manual):



NOTE
Ensure that the Script Window and Script Keys function keys are highlighted.

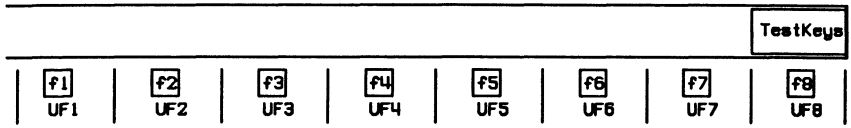
Stopping a Test Script



NOTE
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)?

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 ↵ (RETURN).
- System responds with 'OK–x' (x = number of current processor).
- Type MENU and press ↵ (RETURN) to initialize the application software.

20
SERVICE

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.

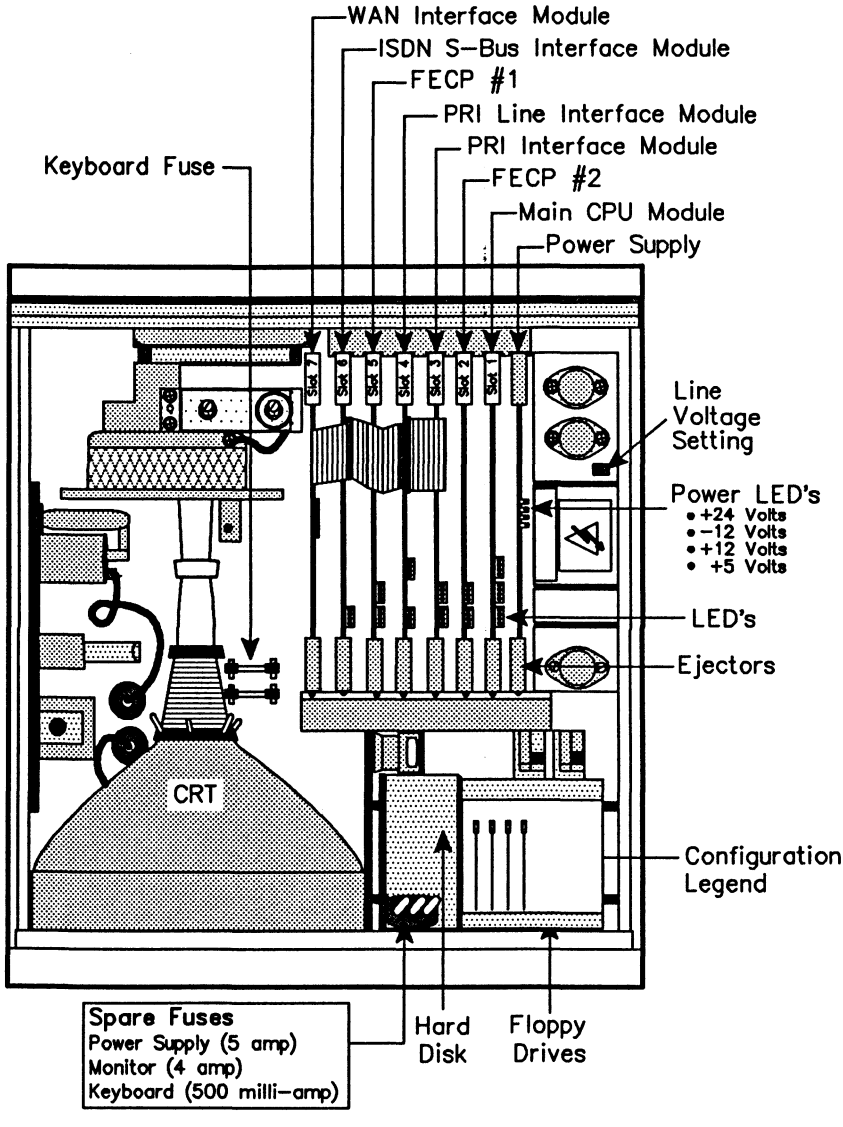


Figure 20-1 Top View - PT500 PRA/BRA/WAN Tester

Model	Slot #			
	1	2	3	4
WAN	Main CPU Module	FECP#1		WAN Interface Module
WAN/WAN	Main CPU2 Module	FECP#1	WAN Interface Module	WAN Interface Module
PRA	Main CPU Module	FECP#2	PRI Interface Module	PRI Line Interface Module
BRA/WAN	Main CPU Module	FECP#1	ISDN S-Bus Interface Module	WAN Interface Module
BRA		FECP#1	ISDN S-Bus Interface Module	WAN Blank Interface Module
D-Channel			ISDN S-Bus Interface Module	WAN Blank Interface Module

Table 20-1 Physical Configuration

A
DATA FORMATS

Figures A-1 through A-5 show the general data formats for BOP, COP, BISYNC, and ASYNC transmissions.

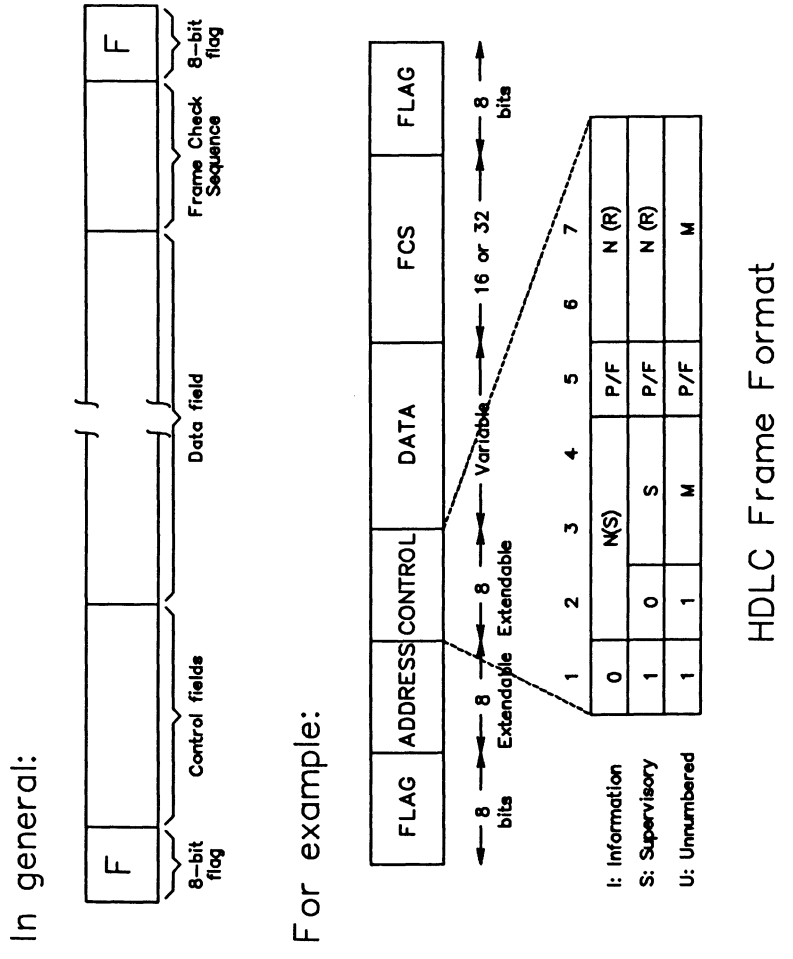
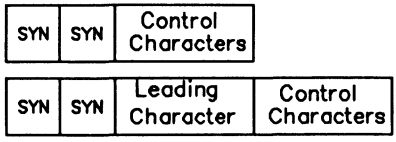


Figure A-1 Bit-Oriented Protocol Frame Format (BOP)

Control/response formats:



Text/header formats:

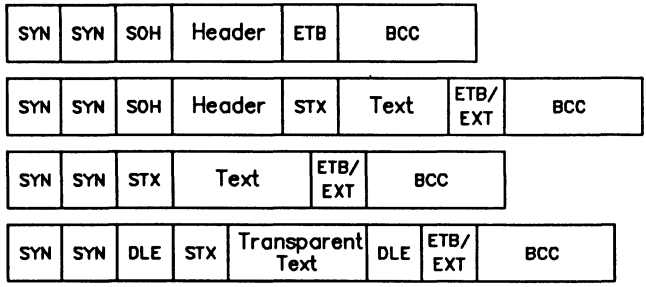


Figure A-2 BISYNC Frame Formats

Mnemonic	Name	ASCII HEX	EBCDIC HEX
SYN	Synchronous Idle	16	32
SOH	Start of Heading	01	01
STX	Start of Text	02	02
ETX	End of Text	03	03
ETB	End of Transmission Block	17	26
DLE	Data Link Escape	10	10
BCC	Block Check Character		
EOT	End of Transmission	04	37
ENQ	Enquiry	05	2D

Mnemonic	Name	ASCII HEX	EBCDIC HEX
NAK	Negative Acknowledgement	15	3D
ITB	End of Intermediate Block Transmission	1F	1F
ACK 0	Acknowledgement 0	1000	1070
ACK 1	Acknowledgement 1	1001	1061
WACK	Wait for positive acknowledgement	103B	106B
RVI	Reverse Interrupt	103C	107C
TTD	Temporary Text Delay	0205	022D

Figure A-3 Control Character Descriptions

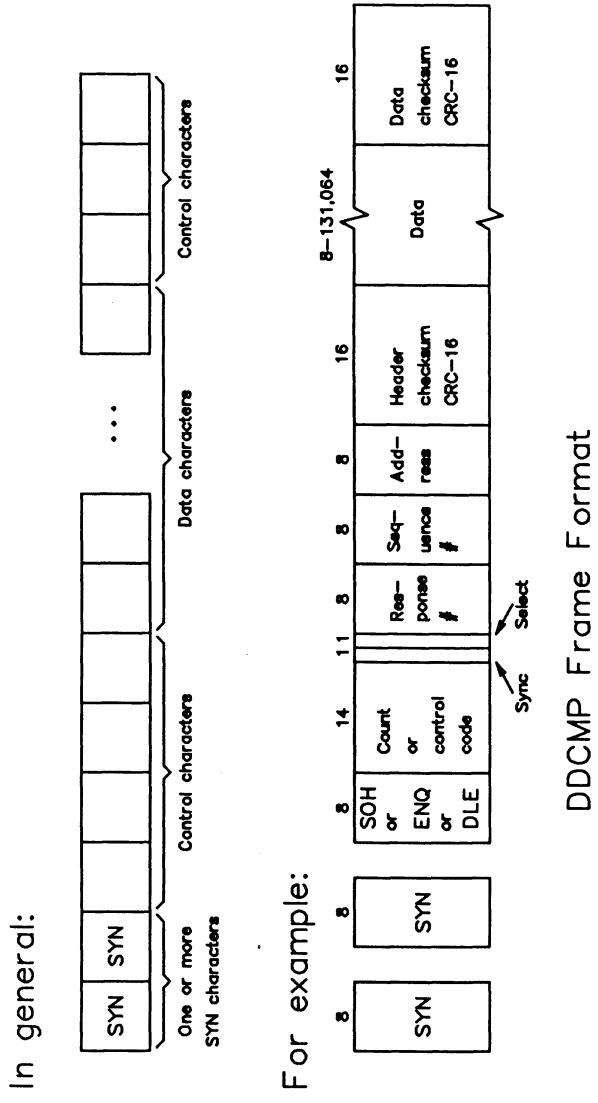


Figure A-4 Character-Oriented Protocol Transmission (COP)

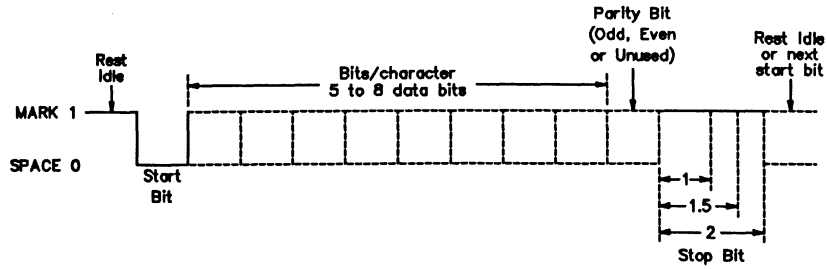


Figure A-5 ASYNC Data Character Format

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.

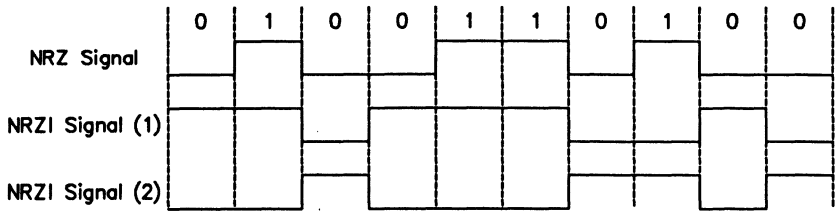
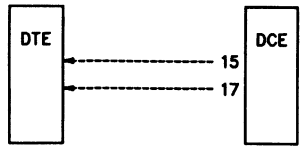
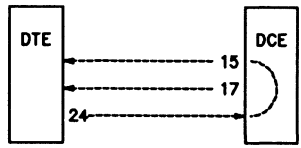
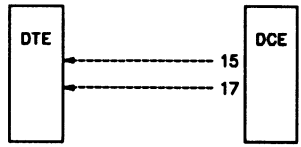


Figure A-6 NRZ and NRZI Data Encoding

The tester supports four different clocking modes:

CLOCKING MODE	ENCODING SCHEME	CLOCK SOURCE
NRZ With Clock	NRZ	
External Tx Clock	NRZ	
NRZI With Clock	NRZI	
NRZI	NRZI	Clock speed is extracted from the data signal

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

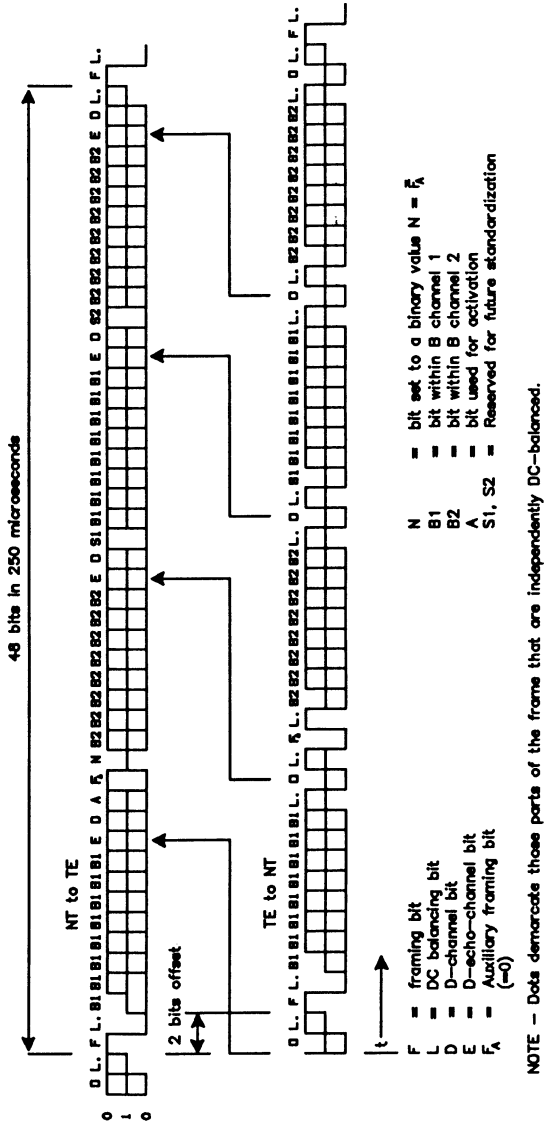


Figure A-8 ISDN Frame Format

B

ISDN REFERENCES

B.1 Implemented ISDN Standards

Layer 2 is implemented in accordance with the following standards:

- TEI ASSIGNMENT PROCEDURE:
  CCITT Rec. Q.921 COM XI CONTRIBUTION 40-E, July 1985 (BOULDER, CO).
- XID PROCEDURE:
  CCITT Rec. Q.921 COM XI Report R12-E, Dec. 1985, APPENDIX IV.
- LINK ESTABLISH: LINK RELEASE: & DATA TRANSFER PHASES:
  CCITT Rec. Q.921 Red Book, Oct 1984.
- DL-ESTABLISH-CONFIRM and DL-RELEASE-CONFIRM primitives:
  CCITT Rec. Q.921 COM XI CONTRIBUTION 40-E, July 1985 (BOULDER, CO).

B.2 Layer 2 State Machine

IDACOM	CCITT	State Definition
1	1	TEI Unassigned
2	2	TEI Being Assigned
3	3	Awaiting TEI & Establishment
4	4	TEI Assigned
5	5	Awaiting Establishment
6	6	Awaiting Release
		Normal States
70	7.0	Normal
71	7.1	Reject
72	7.2	Own Receiver Busy
73	7.3	Own Receiver Busy & Reject
74	7.4	Peer Receiver Busy
75	7.5	Peer Receiver Busy & Reject
76	7.6	Peer Receiver & Own Receiver Busy
77	7.7	Peer Receiver & Own Receiver Busy & Reject
		Timer Recovery States
80	8.0	Normal
81	8.1	Reject
82	8.2	Own Receiver Busy
83	8.3	Own Receiver Busy & Reject
84	8.4	Peer Receiver Busy
85	8.5	Peer Receiver Busy & Reject
86	8.6	Peer Receiver & Own Receiver Busy
87	8.7	Peer Receiver & Own Receiver Busy & Reject
		ASP States
1	1	Idle
2	2	TEI Being Assigned
3	3	TEI Checking
		ML States
1	1	TEI Unassigned
2	2	TEI Being Assigned
3	3	XID Response Waiting
4	4	TEI Assigned

Table B-1 Layer 2 State Numbers

C
CONNECTOR PINOUTS

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

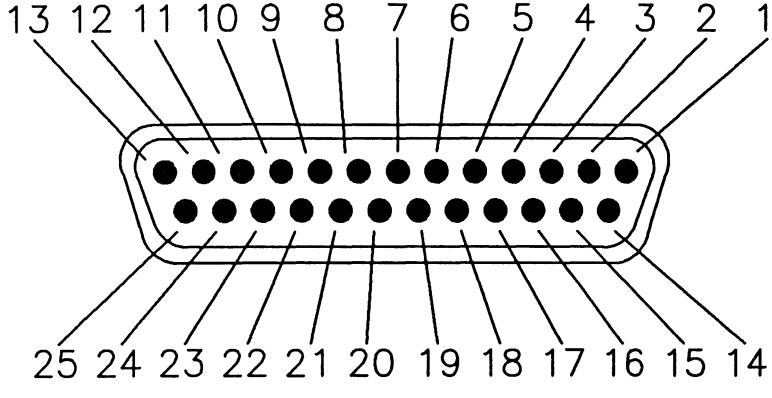


Figure C-1 RS-232C/V.28 Female Connector

CCITT Circuit	Pin #	Mnemonic	Description
	1	PG	Protective Ground
103	2	SD	Send Data
104	3	RD	Receive Data
105	4	RTS	Request to Send
106	5	CTS	Clear to Send
107	6	DSR	Data Set Ready
	7	SG	Signal Ground
109	8	CD	Carrier Detect
116	11	SS	Select Standby
	12	SCD	Secondary Carrier Detect *
	13	SCTS	Secondary Clear to Send *
	14	SSD	Secondary Send Data *
114	15	SCT	Transmit Clock from DCE
	16	SRD	Secondary Receive Data *
115	17	SCR	Receive Clock from DCE
141	18	LL	Local Loopback
120	19	SRTS	Secondary Request to Send
108	20	DTR	Data Terminal Ready
110	21	SQD	Signal Quality
125	22	RI	Ring Indicate
111	23	DRS	Data Signal Rate Select
113	24	SCTE	Transmit Clock to DCE
142	25	TM	Test Indicator

* 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.

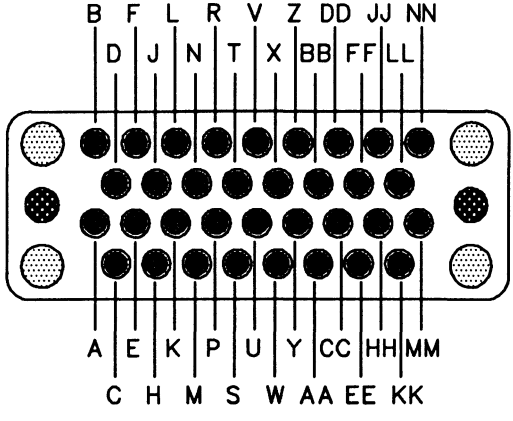


Figure C-2 V.35 Female Connector

CCITT Circuit	Pin #	Mnemonic	Description
	A	PG	Protective Ground
	B	SG	Signal Ground
105	C	RTS	Request to Send
106	D	CTS	Clear to Send
107	E	DSR	Data Set Ready
109	F	CD	Carrier Detect
108	H	DTR	Data Terminal Ready
125	J	RI	Ring Indicate
104	R	RD	Received Data A-Wire
104	T	RD	Received Data B-Wire
115	V	SCR	Receiver Signal Element Timing A-Wire
115	X	SCR	Receiver Signal Element Timing B-Wire
114	Y	SCT	Transmitter Signal Element Timing A-Wire (From DCE)
114	AA	SCT	Transmitter Signal Element Timing B-Wire (From DCE)
103	P	SD	Transmitted Data A-Wire
103	S	SD	Transmitted Data B-Wire
113	U	SCTE	Transmitter Signal Element Timing A-Wire (To DCE)
113	W	SCTE	Transmitter Signal Element Timing B-Wire (To DCE)

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.

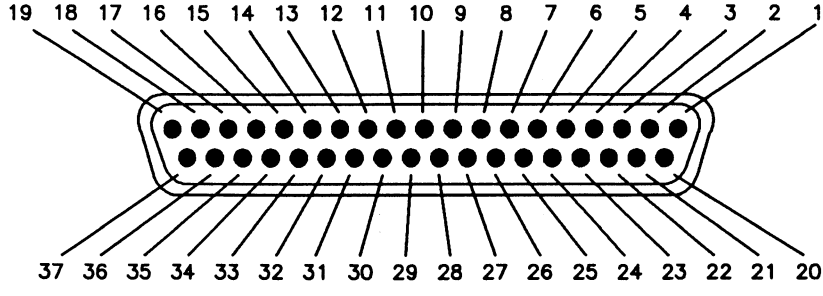


Figure C-3 V.36/RS-449 Female Connector

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.

CCITT Circuit	Pin #	Mnemonic	Description
	1	PG / SG	Protective or Signal Ground
	2	SI	Data Signal Rate Select *
103	4	SD	Transmitted Data (A)
114	5	ST	Transmitted Signal Element Timing From DCE (A)
104	6	RD	Received Data (A)
105	7	RS	Request to Send (A)
115	8	RT	Receiver Signal Element Timing From DCE (A)
106	9	CS	Clear to Send (A)
141	10	LL	Local Loopback (A)
107	11	DM	Data Set Ready (A)
108	12	TR	Data Terminal Ready (A)
109	13	RR	Data Channel Received Line Signal Detector (A)
140	14	RL	Remote Loopback
125	15	IC	Calling Indicator
111	16	SR / SF	Data Signal Rate Select to DCE or Select Tx Frequency to DCE
113	17	TT	Transmit Signal Element Timing From DTE (A)
142	18	TM	Test Indicator
	19	SG	Signal Ground
	20	RC	DCE Circuit Ground
103	22	SD	Transmitted Data (B or C)
114	23	ST	Transmitted Signal Element Timing From DCE (B or C)
104	24	RD	Received Data (B or C)
105	25	RS	Request to Send (B or C)
115	26	RT	Receiver Signal Element Timing From DCE (B or C)
106	27	CS	Clear to Send (B or C)
107	29	DM	Data Set Ready (B or C)
108	30	TR	Data Terminal Ready (B or C)
109	31	RR	Data Channel Received Line Signal Detector (B or C)
	32	SS	Select Standby *
	33	SQ	Signal Quality Detector *
113	35	TT	Transmit Signal Element Timing From DTE (B or C)
	36	SB	Response to SS *
	37	SC	DTE Circuit Ground

* Not supported by IDACOM

Pins 3, 21, 28, and 34 are unassigned.

Table C-3 V.36/RS-449 Pin Designations

V.11/X.21

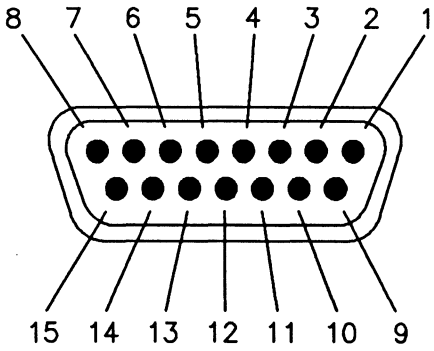


Figure C-4 V.11/X.21 Female Connector

NOTE
For balanced circuits, the associated pairs are designated A and B.

CCITT Circuit	Pin #	Mnemonic	Description
	1	PG	Protection Ground
103	2	T	Transmit (A)
105	3	C	Control (A)
104	4	R	Receive (A)
106	5	I	Indicate (A)
114	6	S	Signal Element Timing (A)
	7	F	Frame Start Indication (X.20) (B)
	8	SG	Signal Ground
103	9	T	Transmit (B)
105	10	C	Control (B)
104	11	R	Receive (B)
106	12	I	Indicate (B)
114	13	S	Signal Element Timing (B)
	14	F	Frame Start Indication (X.20)

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.

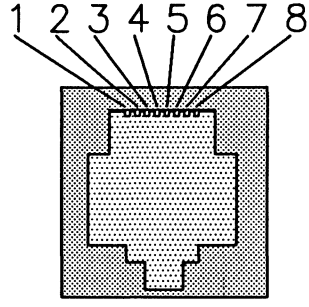


Figure C-5 S/T Bus RJ-45 Female Connector

Pin #	Mnemonic	Description
1	PS_3+	Power Supply 3*
2	PS_3-	Power Supply 3*
3	TE_NT+	TE to NT Pair, Power Supply 1+
4	NT_TE+	NT to TE Pair, Power Supply 1-
5	NT_TE-	NT to TE Pair, Power Supply 1-
6	TE_NT-	TE to NT Pair, Power Supply 1+
7	PS_2-	Power Supply 2
8	PS_2+	Power Supply 2

* 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.

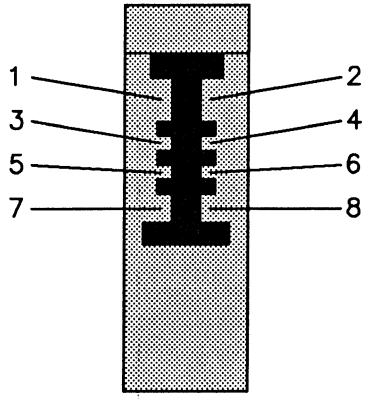


Figure C-6 S/T Bus TAE8+4C Female Connector

Pin #	Mnemonic	Description
3	NT_TE+	NT to TE Pair, Power Supply 1-
4	NT_TE-	NT to TE Pair, Power Supply 1-
5	TE_NT-	TE to NT Pair, Power Supply 1+
6	TE_NT+	TE to NT Pair, Power Supply 1+
7	PS_2+	Power Supply 2
8	PS_2-	Power Supply 2

Table C-6 S/T Bus TAE8+4C Pin Designations

RJ-14 External Voice Access

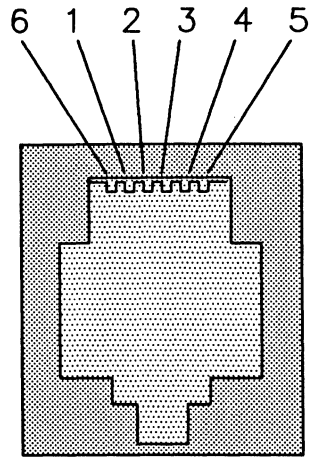


Figure C-7 RJ-14 External Voice Access Female Connector

Pin #	Mnemonic	Description
2	TX	Phone Transmit/Receive
3	GND	Phone Ground

Table C-7 RJ-14 External Voice Access Pin Designations

External B-Channel Access

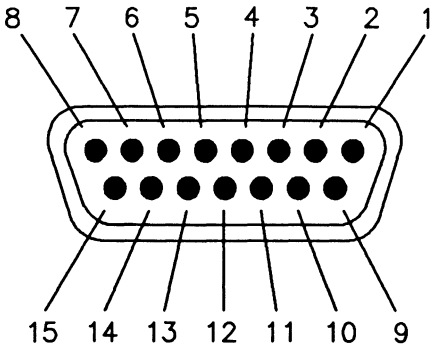


Figure C-8 External B-Channel Female Connector

Pin #	Mnemonic	Description	Direction
1	ME1	Monitor, External 1 Rx	Output
2	GND	Ground	
3	TRE2	Transceiver, External 2 Rx	Output
4	TTE2	Transceiver, External 2 Tx	Input
5	GND	Ground	
6	E1 RxC	External 1 Clock	Output
7	E1 SYNC	External 1 Sync	Output
8	E2 SYNC	External 2 Sync	Output
9	ME2	Monitor External 2 Rx	Output
10	TRE1	Transceiver, External 1 Rx	Output
11	GND	Ground	
12	TTE1	Transceiver, External 1 Tx	Input
13	E2 RxC	External 2 Clock	Output
14	FRM SYNC	Internal PT Frame Sync Clock	Input/Output
15	BIT CLK	Internal PT Bit Clock	Input/Output

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

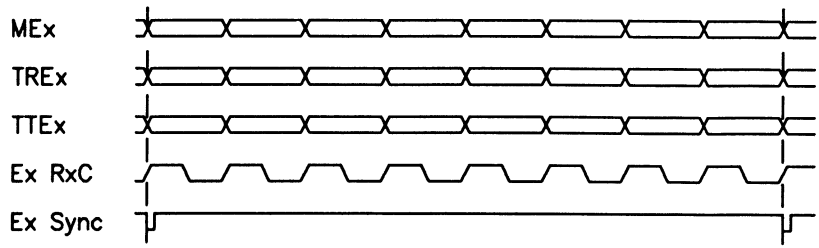
Each external access consists of the following signals:

External 1	External 2	Traffic Direction	
		Monitor Mode	Emulation Mode
EB1	ME2	TE->NT	Not applicable
TRE1	TRE2	NT->TE	B-Channel data received DUT-> tester
TTE1	TTE2	Not applicable	B-Channel data transmit tester ->DUT
E1 RxC	E2 RxC		
E1 Sync	E2 Sync		

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.



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)

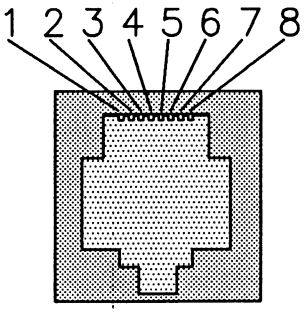


Figure C-9 RJ-45 Female Connector

Emulation and Drop & Insert Modes

Pin #	NTT Pin #	Mnemonic	Description
1	4	RX+	Receive Positive
4	3	TX+	Transmit Positive
5	6	TX-	Transmit Negative
8	5	RX-	Receive Negative

Table C-10 RJ-45 Pin Designations - User (Port A - Default)

Pin #	NTT Pin #	Mnemonic	Description
1	4	TX+	Transmit Positive
4	3	RX+	Receive Positive
5	6	RX-	Receive Negative
8	5	TX-	Transmit Negative

Table C-11 RJ-45 Pin Designations - Network (Port B - Default)

Monitor Mode

Pin #	NTT Pin #	Mnemonic	Description
1	4	RXA+	Receive Port A Positive
4	3	RXB+	Receive Port B Positive
5	6	RXB-	Receive Port B Negative
8	5	RXA-	Receive Port A Negative

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.

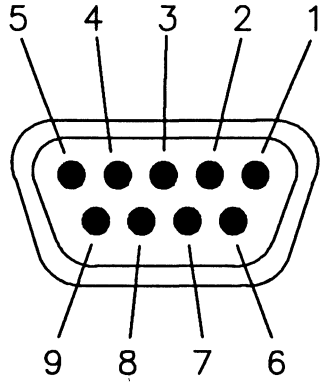


Figure C-10 DB-9 (CEPT) Female Connector

Emulation and Drop & Insert Modes

Pin #	Mnemonic	Description
1	RX-	Receive Negative
5	TX-	Transmit Negative
6	RX+	Receive Positive
9	TX+	Transmit Positive
2,3,4	GND	Ground

Table C-13 DB-9 Pin Designations - User (Port A - Default)

Pin #	Mnemonic	Description
1	TX-	Transmit Negative
5	RX-	Receive Negative
6	TX+	Transmit Positive
9	RX+	Receive Positive
2,3,4	GND	Ground

Table C-14 DB-9 Pin Designations - Network (Port B - Default)

Monitor Mode

Pin #	Mnemonic	Description
1	RXA-	Receive Port A Negative
5	RXB-	Receive Port B Negative
6	RXA+	Receive Port A Positive
9	RXB+	Receive Port B Positive
2,3,4	GND	Ground

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-Channel Access

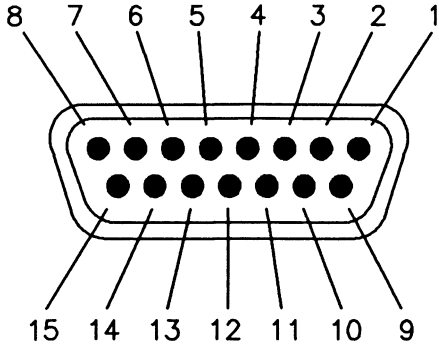


Figure C-11 External B-Channel Female Connector

Pin #	Mnemonic	Description	Direction
6	RXDCKEX	Receive Data Clock	Output
7	RXDFRMEX	Receive Frame Clock	Output
8	TXDFRMEX	Transmit Frame Clock	Output
10	RXDEX	Receive Data	Output
12	M/TXDEX	Monitor/Transmit Data	Output/Input
13	TXDCKEX	Transmit Data Clock	Output
2,11,5,14 15,1,9,3,4	GND	Ground	

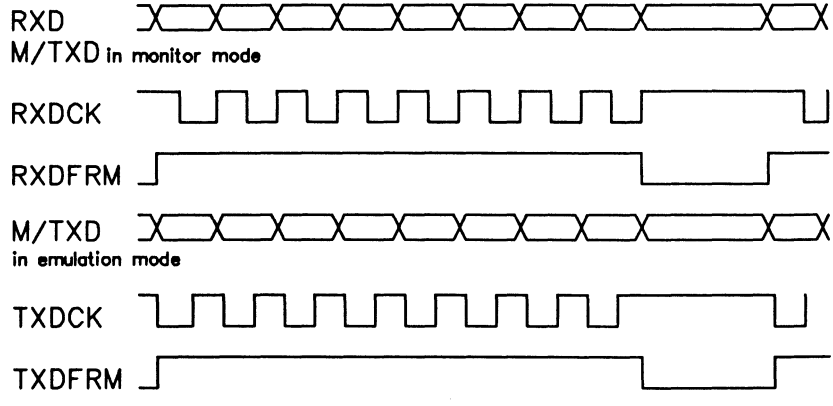
Table C-16 External B-Channel Pin Designations

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).



External Clock In and Out BNC Connectors

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 (CLK.OUT) = F(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)

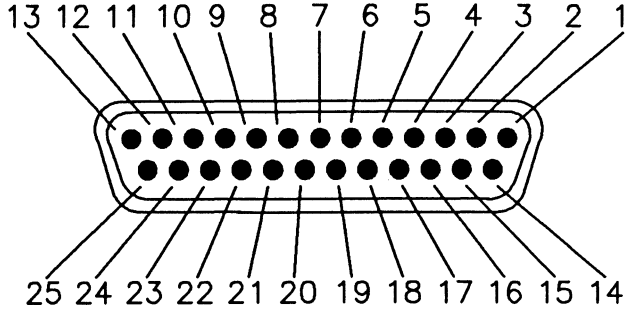


Figure C-13 External B-Channel Female Connector (PRA/BRA/WAN)

Pin #	Interface	Mnemonic	Description	Direction
1	PRA	RXDCKEX	Receive Data Clock	Output
2	PRA	RXDFRMEX	Receive Frame Clock	Output
3	PRA	TXDCKEX	Transmit Data Clock	Output
4	PRA	TXDFRMEX	Transmit Frame Clock	Output
5	**BRA**	E2 RxC	External 2 Clock	Output
6	**BRA**	E1 RxC	External 1 Clock	Output
7	**BRA**	ME2	Monitor External 2 Rx	Output
8	**BRA**	TRE2	Transceiver, External 2 Rx	Output
9	**BRA**	FRM SYNC	Internal PT Frame Sync Clock	Input/Output
10	**BRA**	TTE2	Transceiver, External 2 Tx	Input
11	**BRA**	E1 SYNC	External 1 Sync	Output
12	**BRA**	E2 SYNC	External 2 Sync	Output
13	**BRA**	BIT CLK	Internal PT Bit Clock	Input/Output
15	PRA	RXDEX	Receive Data	Output
17	PRA	M/TXDEX	Monitor/Transmit Data	Input/Output
20	**BRA**	ME1	Monitor, External 1 Rx	Output
21	**BRA**	TRE1	Transceiver, External 1 Rx	Output
23	**BRA**	TTE1	Transceiver, External 1 Tx	Input

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.

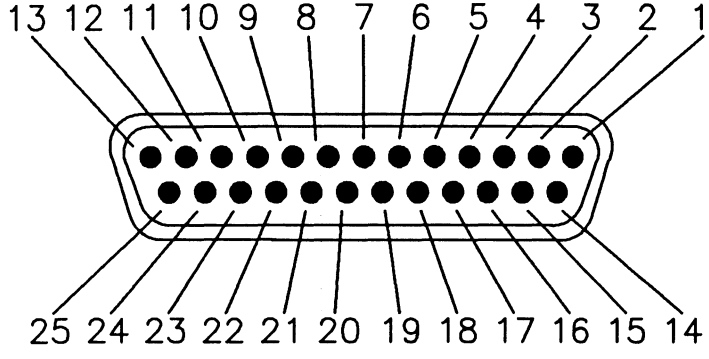


Figure C-14 Serial Printer Port Female Connector

Pin #	Direction	Description
1		Protective Ground
2	From Printer	Receive Data
3	To Printer	Send Data
5		+ 12 volt pull up
6		+ 12 volt pull up
7		Signal Ground
8		+ 12 volt pull up
20	From Printer	Data Terminal Ready

Table C-18 Serial Printer Port Pin Designations

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.

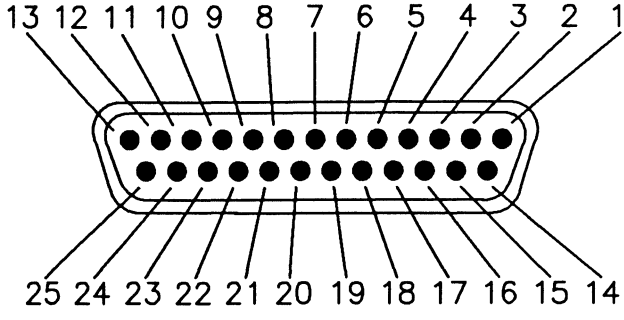


Figure C-15 DB-25 Printer Port Female Connector

Pin #	Direction	Description
1	To Printer	Active Low (DATA STROBE)
2-9	To Printer	Send Data (DATA0-DATA7)
11	From Printer	Printer Busy (BUSY)
12	From Printer	Out of Paper (PAPER END)
13	From Printer	Printer On-Line (SELECT)
14, 18-25		Signal Ground

Table C-19 DB-25 Printer Port Pin Designations

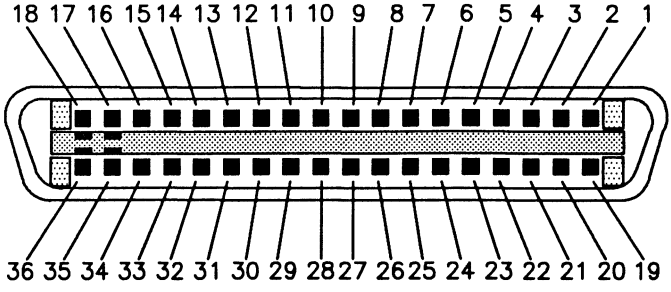


Figure C-16 Centronics Printer Port Female Connector

Pin #	Direction	Description
1	To Printer	Active Low (DATA STROBE)
2-9	To Printer	Send Data (DATA0-DATA7)
11	From Printer	Printer Busy (BUSY)
12	From Printer	Out of Paper (PAPER END)
13	From Printer	Printer On-Line (SELECT)
14, 16,		Signal Ground
19-30, 33		Signal Ground
35		VCC Reference

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.

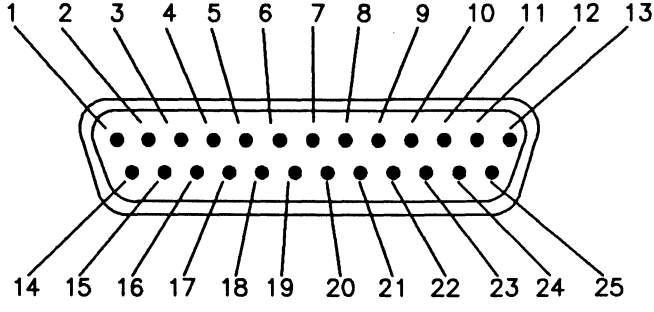


Figure C-17 Remote Control Port Male Connector

Pin #	Direction	Description
1		Protective Ground
2	To Remote	Send Data
3	To PT	Receive Data
4	To Remote	Request to Send
5	To PT	Clear to Send
6	To PT	Data Set Ready
7		Signal Ground
20	To Remote	Data Terminal Ready

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.

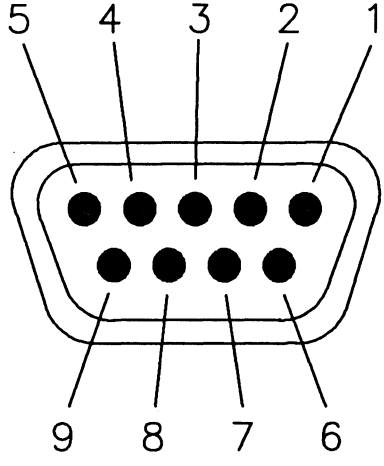


Figure C-18 DB-9 External Color CRT Connector

Pin #	Description
1	Ground
2	Ground
3	Red
4	Green
5	Blue
6	Intensity (pull up resistor)
8	Horizontal Sync
9	Vertical Sync

Table C-22 External Color CRT Pin Designations

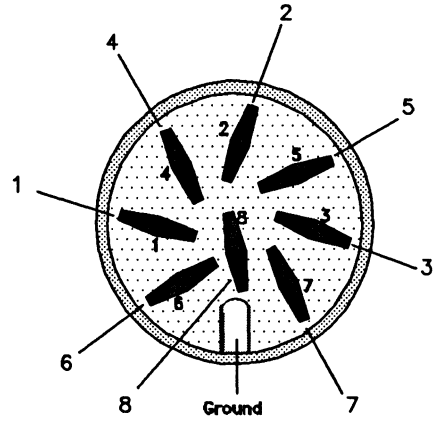


Figure C-19 External Color CRT Connector

Pin #	Description
1	Ground
2	Ground
3	Ground
4	Horizontal Sync
5	Vertical Sync
6	Red
7	Green
8	Blue

Table C-23 External Color CRT Pin Designations

D

ASCII/EBCDIC/HEX CONVERSION TABLE

HEX	DEC	OCT	ASCII	EBCDIC	HEX	DEC	OCT	ASCII	EBCDIC
00	0	00	NUL	NUL	30	48	60	0	
01	1	01	SOH	SOH	31	49	61	1	
02	2	02	STX	STX	32	50	62	2	SYN
03	3	03	ETX	ETX	33	51	63	3	IR
04	4	04	EOT	PF	34	52	64	4	PP
05	5	05	ENQ	HT	35	53	65	5	TRN
06	6	06	ACK	LC	36	54	66	6	NBS
07	7	07	BEL	DEL	37	55	67	7	EOT
08	8	10	BS	GE	38	56	70	8	SBS
09	9	11	HT	SPS	39	57	71	9	IT
0A	10	12	LF	RPT	3A	58	72	:	RFF
0B	11	13	VT	VT	3B	59	73	;	CU3
0C	12	14	FF	FF	3C	60	74	<	DC4
0D	13	15	CR	CR	3D	61	75	=	NAK
0E	14	16	SO	SO	3E	62	76	>	
0F	15	17	SI	SI	3F	63	77	?	SUB
10	16	20	DLE	DLE	40	64	100	@	SP
11	17	21	DC1	DC1	41	65	101	A	
12	18	22	DC2	DC2	42	66	102	B	
13	19	23	DC3	DC3	43	67	103	C	
14	20	24	DC4	RES	44	68	104	D	
15	21	25	NAK	NL	45	69	105	E	
16	22	26	SYN	BS	46	70	106	F	
17	23	27	ETB	POC	47	71	107	G	
18	24	30	CAN	CAN	48	72	110	H	
19	25	31	EM	EM	49	73	111	I	
1A	26	32	SUB	UBS	4A	74	112	J	cent
1B	27	33	ESC	CUI	4B	75	113	K	.
1C	28	34	FS	IFS	4C	76	114	L	<
1D	29	35	GS	IGS	4D	77	115	M	(
1E	30	36	RS	IRS	4E	78	116	N	+
1F	31	37	US	IUS	4F	79	117	O	|
20	32	40	SP	DS	50	80	120	P	&
21	33	41	!	SOS	51	81	121	Q	
22	34	42	"	FS	52	82	122	R	
23	35	43	#	WUS	53	83	123	S	
24	36	44	$	BYP	54	84	124	T	
25	37	45	%	LF	55	85	125	U	
26	38	46	&	ETB	56	86	126	V	
27	39	47	'	ESC	57	87	127	W	
28	40	50	(	SA	58	88	130	X	
29	41	51	)	SFE	59	89	131	Y	
2A	42	52	*	SM/SW	5A	90	132	Z	!
2B	43	53	+	CSP	5B	91	133	[	$
2C	44	54	,	MFA	5C	92	134	\	*
2D	45	55	-	ENQ	5D	93	135	]	)
2E	46	56	.	ACK	5E	94	136	^	;
2F	47	57	/	BEL	5F	95	137	_	¬

HEX	DEC	OCT	ASCII	EBCDIC	H75EX	DEC	OCT	ASCII	EBCDIC
60	96	140	`	–	90	144	220		
61	97	141	a	/	91	145	221		j
62	98	142	b		92	146	222		k
63	99	143	c		93	147	223		l
64	100	144	d		94	148	224		m
65	101	145	e		95	149	225		n
66	102	146	f		96	150	226		o
67	103	147	g		97	151	227		p
68	104	150	h		98	152	230		q
69	105	151	i		99	153	231		r
6A	106	152	j	|	9A	154	232		
6B	107	153	k	,	9B	155	233		}
6C	108	154	l	%	9C	156	234		□
6D	109	155	m	_	9D	157	235		)
6E	110	156	n	>	9E	158	236		+
6F	111	157	o	?	9F	159	237		■
70	112	160	p		A0	160	240		–
71	113	161	q	^	A1	161	241		o
72	114	162	r		A2	162	242		s
73	115	163	s		A3	163	243		t
74	116	164	t		A4	164	244		u
75	117	165	u		A5	165	245		v
76	118	166	v		A6	166	246		w
77	119	167	w		A7	167	247		x
78	120	170	x		A8	168	250		y
79	121	171	y	\	A9	169	251		z
7A	122	172	z	:	AA	170	252		
7B	123	173	{	#	AB	171	253		L
7C	124	174	|	@	AC	172	254		┌
7D	125	175	}	'	AD	173	255		[
7E	126	176	~	=	AE	174	256		≥
7F	127	177	DEL	"	AF	175	257		•
80	128	200			B0	176	260		0
81	129	201		a	B1	177	261		1
82	130	202		b	B2	178	262		2
83	131	203		c	B3	179	263		3
84	132	204		d	B4	180	264		4
85	133	205		e	B5	181	265		5
86	134	206		f	B6	182	266		6
87	135	207		g	B7	183	267		7
88	136	210		h	B8	184	270		8
89	137	211		i	B9	185	271		9
8A	138	212			BA	186	272		
8B	139	213		{	BB	187	273		┘
8C	140	214		≤	BC	188	274		┐
8D	141	215		(	BD	189	275		]
8E	142	216		+	BE	190	276		≠
8F	143	217		↑	BF	191	277		–

HEX	DEC	OCT	ASCII	EBCDIC	HEX	DEC	OCT	ASCII	EBCDIC
C0	192	300		{	F0	240	360		0
C1	193	3011		A	F1	241	361		1
C2	194	3022		B	F2	242	362		2
C3	195	3033		C	F4	244	364		4
C4	196	3044		D	F3	243	363		3
C5	197	3055		E	F5	245	365		5
C6	198	3066		F	F6	246	366		6
C7	199	3077		G	F7	247	367		7
C8	200	3310		H	F8	248	370		8
C9	201	311		I	F9	249	371		9
CA	202	312			FA	250	372		
CB	203	313			FB	251	373		
CC	204	314			FC	252	374		
CD	205	315			FD	253	375		
CE	206	316			FE	254	376		
CF	207	317			FF	255	377		
D0	208	320		}					
D1	209	321		J					
D2	210	322		K					
D3	211	323		L					
D4	212	324		M					
D5	213	325		N					
D6	214	326		O					
D7	215	327		P					
D8	216	330		Q					
D9	217	331		R					
DA	218	332							
DB	219	333							
DC	220	334							
DD	221	335							
DE	222	336							
DF	223	337							
E0	224	340		\					
E1	225	341							
E2	226	342		S					
E3	227	343		T					
E4	228	344		U					
E5	229	345		V					
E6	230	346		W					
E7	231	347		X					
E8	232	350		Y					
E9	233	351		Z					
EA	234	352							
EB	235	353							
EC	236	354							
ED	237	355							
EE	238	356							
EF	239	357							

INDEX

INDEX [continued]

INDEX [continued]

INDEX [continued]

INDEX [continued]

INDEX [continued]

INDEX [continued]