

P R I M E S W I T C H TM 1 0 0 / 5 0 0
P A P
U S E R G U I D E



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➔ **Note:** In this manual, any reference to PrimeSwitch refers to the PrimeSwitch 100 Series product line, unless specified differently.

Contents

Introduction

About this user guide, 1-2

Audience, 1-2

Using this guide, 1-3

Overview, 1-4

Filtering, 1-4

Buffering, 1-4

Display, 1-5

Basic Rate access, 1-5

Installation

Installing PAP, 2-2

Local, 2-2

Remote via ADLM, 2-2

Remote via modem, 2-3

Connecting PAP to an ISDN interface module, 2-4

BRMN, BRMT and early IPMN and IPMT, 2-4

Later IPMN and IPMT, 2-4

QBRM and DTM, 2-4

Connecting PAP to a PC, 2-5

Software installation, 2-7

Starting PAP, 2-8

The PAP screen

Screen display, 3-2

Display colors, 3-4

Status line, 3-5

Layer 1 status line, 3-7

Primary Rate, 3-7

Basic Rate, 3-7

Examples, 3-9

Layer 1 status change, 3-9

Layer 2 frame, 3-9

Layer 3 message, 3-10

Item sources, 3-10

Commands

Entering commands, 4-2

Keys, 4-3

Commands, 4-4

Introduction

About this user guide

This user guide describes the Protocol Analyzer Package (PAP). It covers the installation and operation of the PrimeSwitch 100 Series Integrated Services Digital Network (ISDN) PAP.

PAP is available for both Primary Rate and Basic Rate in a number of protocol variations.



The PrimeSwitch PAPTS14 is an ISDN Primary Rate monitor conforming to Austel Specification TS14.



The PrimeSwitch PAPTS13 is an ISDN Basic Rate monitor conforming to Austel Specification TS13.



The PrimeSwitch PAPETSI is an ISDN Primary Rate monitor conforming to the ETSI ISDN Specification.



The PrimeSwitch PAPETSIB is an ISDN Basic Rate monitor conforming to the ETSI ISDN Specification.



The PrimeSwitch PAPDASS2 is an ISDN Primary Rate monitor conforming to British Telecom Specification BTNR190.



The PrimeSwitch PAPDPNSS is a PABX signaling monitor conforming to British Telecom Specification BTNR188.

Audience

This user guide is intended for people with a general knowledge of personal computers and a good understanding of ISDN, particularly layer 2 and layer 3 signaling protocols.

Using this guide

The guide contains the following sections:

Overview describes how PAP processes network traffic.

The PAP screen describes the main screen and illustrates how PAP displays messages.

Commands describes how to control PAP with function keys and typed commands.

Installation describes how to install PAP and connect PAP to a PC.

Technical assistance information

If there is a problem using the N.E.T. products, call the N.E.T. Technical Assistance Center (TAC) for assistance. The toll-free number for the United States is:

1-800-800-4638

The contact number for the UK and other European countries is:

(44)1293 600703

Customers outside the United States, and Europe may use the following toll number:

(703) 724 7999

TAC personnel are available by telephone 24 hours a day, 7 days a week. Warranty and contract customers receive first consideration in the scheduling of technical resources.

Before contacting TAC for help, review and verify the provisions contained in your warranty or contract. Depending on those provisions, there may be a charge for service.

When authorized, TAC Engineers can diagnose most network problems remotely, using dial-up connections. When a service technician is required, TAC will dispatch the nearest N.E.T. or third-party service engineer.

Overview

The PrimeSwitch ISDN Protocol Analyzer Package (PAP) monitors and displays layer 1, layer 2 and layer 3 protocol activity on a PrimeSwitch ISDN interface.

PAP uses COM ports on the PC to transfer information to and from a PrimeSwitch ISDN module. PAP can monitor multiple ISDN interfaces on PrimeSwitch 100 Series modules which have more than one (for example, the DTM or QBRM), and can use either COM1, COM2 or BOTH at the same time on the PC.

When PAP is operating, all traffic entering the analyzer system, either from the ISDN or from a captured file, is filtered, buffered and displayed.

Filtering

When you enable a filter, every message passing through the analyzer passes through the filter. Traffic that is selected by the filter enters the buffer. Traffic that is not selected is lost. Filters select or reject system, layer 1, layer 2 and layer 3 as follows:

- System messages are information from other system modules. They can be on or off, but are generally not of concern to users.
- Layer 1 status change messages can be on or off.
- Layer 2 is filtered on frame type, for example, SABME and RR. They can be on, off, enabled for all except a defined list or enabled for a defined list only.
- Layer 3 is filtered on message type, for example, SETUP and RELease. They can be on, off, enabled for all except a defined list or enabled for a defined list only.

You create a filter with the **MakeF** command and display the current filter with the **ShowF** command (see *Chapter 4 — Commands* for more information). You can store several filters on disk but only one filter can be enabled at a time.

Buffering

After passing through the filter, messages are stored in the internal 'first in first out' (FIFO) buffer. Messages are also written to disk if you have enabled capturing. The full contents of each traffic item are stored irrespective of the current decoding and display settings. When the display is paused, traffic continues to be written to the buffer.

Items in the buffer are numbered sequentially from zero until the buffer is full, then from zero again. This number appears alongside the message when it is displayed.

Use the **Save** command to write the contents of the buffer to disk (see *Chapter 4 — Commands* for more information).

The buffer is dynamically allocated from the PC's memory. The default is to use Extended or Expanded memory, if it is available, and to use up all but 80 Kbytes of conventional memory if the Extended or Expanded memory is not available.

This default can be overridden from the command line as follows:

PAPXXXX REAL	forces the PAP software to use conventional memory and will not operate if insufficient conventional memory is available.
PAPXXXX VIRTUAL	forces the PAP software to use Extended or Expanded memory and will not operate if memory is not available.

These overrides should not be used unless problems are experienced with the default.

The size of the buffer therefore depends on the amount of memory (RAM) available in the computer, and the amount used by other programs. The buffer size is displayed on the startup screen. Multiply this by four to determine the number of traffic items that can be stored.

Display

Traffic is displayed on the screen according to the current settings of layer 2 and layer 3 decoding and display (**L2**, **L3**, **Long**, **Med**, and **Short** commands). You can pause the display to examine messages and scroll the display backwards and forwards. See *Chapter 4 — Commands* for more information.

Basic Rate interface

To understand the information displayed by the Basic Rate PAP you must understand Service Access Point Identifiers (SAPIs), Terminal Endpoint Identifiers (TEIs) and Connection Endpoint Suffices (CESSs). A data link connection is identified by a SAPI and a TEI. The SAPI defines which part of the bit within a terminal is talking and can have three different values:

0	LAPD link for ISDN calls
16	LAPB link for X.25 calls
63	management bit which manages TEIs

The TEI is a unique address (for a particular ISDN connection) assigned to a terminal. The analyzer displays two types of TEI:

Fixed	set physically on a terminal, usually by DIP switches or non-volatile storage. You must ensure that each fixed TEI terminal has a unique address; if two terminals have the same address, neither will work.
Automatic	worked out dynamically by negotiation between network and terminal.

The TEI and SAPI combine to make a physical address that is encoded into layer 2 frames.

Layer 3 refers to this combination by a CES. This is a number between 0 and 255 which at any time uniquely identifies a particular SAPI/TEI combination.

Figure 1 shows the relationship between CES, SAPI and TEI.

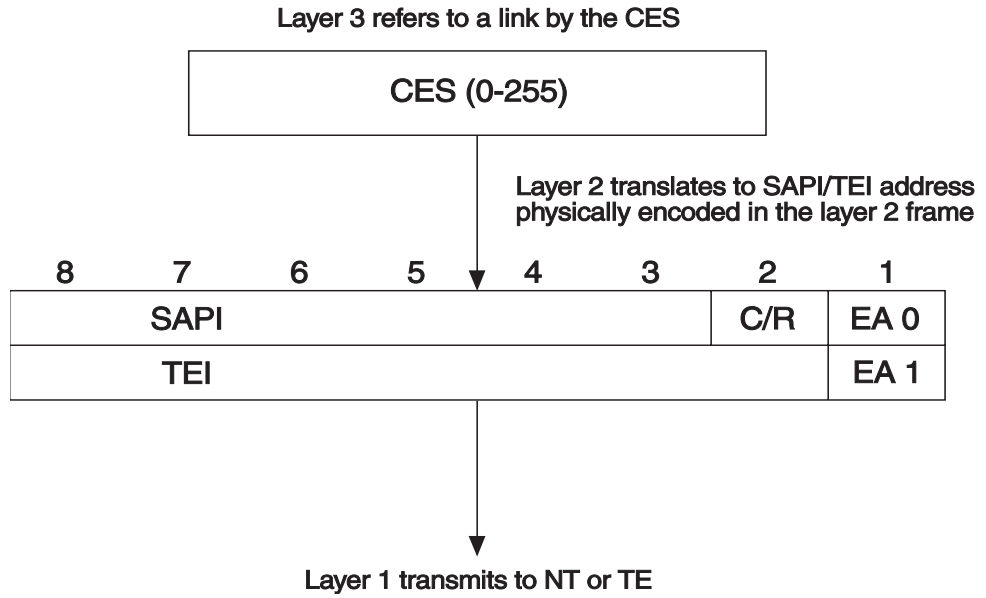


Figure 1: CES, SAPI and TEI

Installation

Installing PAP

PAP can be used to monitor traffic on either a local or a remote PrimeSwitch.

Local

To monitor local traffic connect the PC to the PrimeSwitch PAP connector, as in the following diagram:

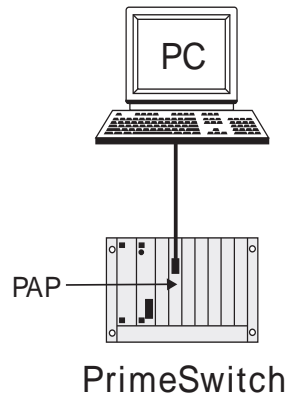


Figure 2: Local connection

Remote via ADLM

To monitor remote traffic, a V.24 ADLM must be installed in both the local and remote PrimeSwitches. Connect the PAP connector to an ADLM V.24 port on the remote PrimeSwitch, and connect the PC to an ADLM V.24 port on a local PrimeSwitch, as in Figure 3:

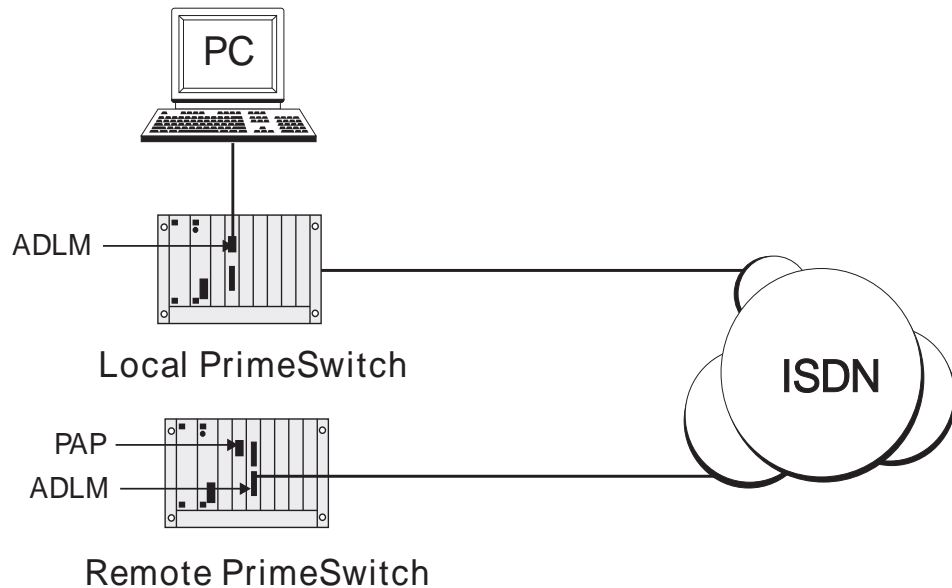


Figure 3: Remote connection

Remote via modem

You can also use a modem to monitor traffic on remote PrimeSwitches, as shown in *Figure 4*.

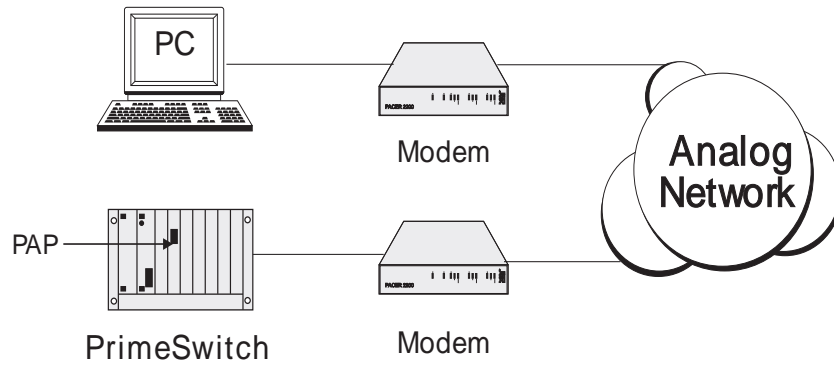


Figure 4: Local connection via modem

Connecting PAP to an ISDN interface module

BRMN, BRMT and early IPMN and IPMT

You must place the PrimeSwitch PAP Module panel in the slot immediately to the right of the ISDN interface module that you want to monitor, with the connector located at the top. If necessary, rearrange the modules in the PrimeSwitch to clear the slot on the right hand side of the ISDN interface module. Note that you must update the configuration of the PrimeSwitch to reflect the new arrangement of modules.

Connect the 10-way IDC connector on the PrimeSwitch PAP Module panel to the 10-way header located just above the RJ-45 socket on the ISDN interface module. The red conductor of the ribbon cable must be on the top.

Place the panel into the vacant slot and tighten the screws located on the top and bottom of the panel.

Later IPMN and IPMT

These modules have a 9-way socket on the front panel to connect to PAP.

QBRM and DTM

The QBRM and DTM have a 9-way socket on the front panel to connect to PAP. This PAP connection services all 4 interfaces.

Connecting PAP to a PC

Connect the PrimeSwitch PAP protection device to a parallel port of the PC.

To monitor local traffic:

- 1 Connect COM1 or COM2 on the PC to the 25-way D type connector on the PrimeSwitch PAP panel using a straight through cable constructed according to *Figure 5*.

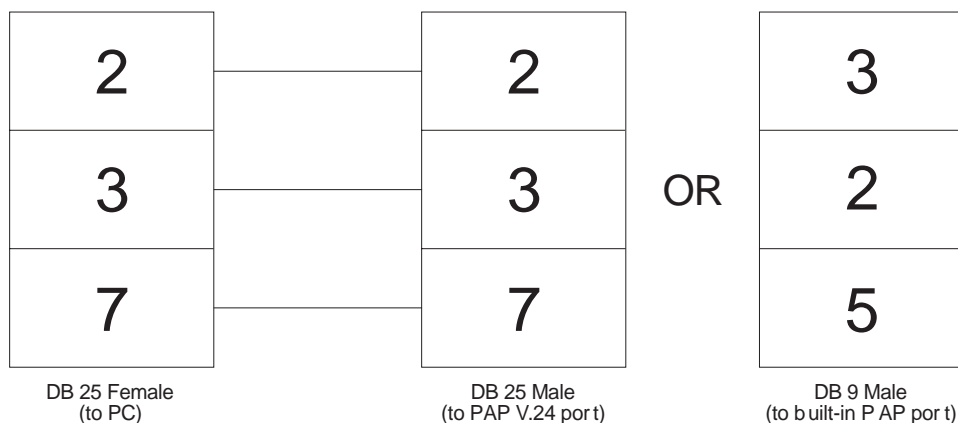


Figure 5: Local cable construction

To monitor remote traffic:

- 1 Connect the PC to an ADLM V.24 port on the local PrimeSwitch using a cable constructed according to *Figure 6*.

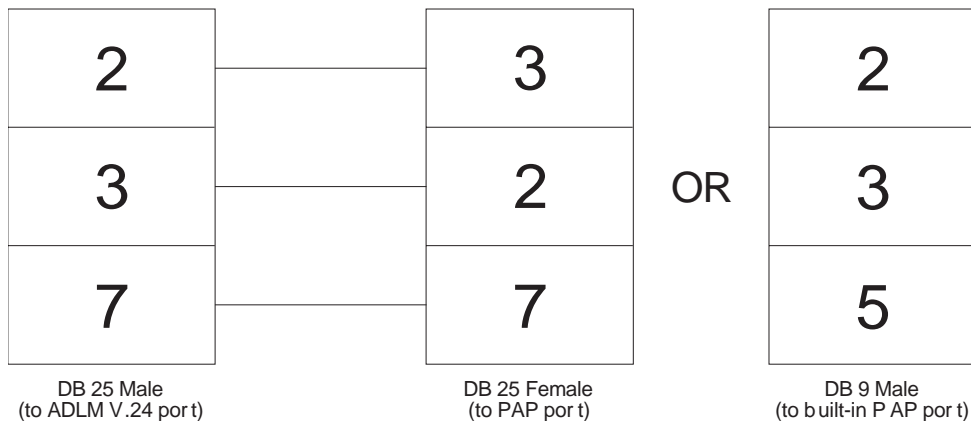


Figure 6: Remote cable construction

2 Configure the ADLM V.24 as follows:

Remote

Auto answer	ON
--------------------	----

Remote and local

AT call control	ON
Bit rate	19 200
Parity	No
Stop bits	1
Number of bits	8

Software installation

The PAP software is installed as part of the PrimeSwitch Manager—NCS (Net Center Software) installation process.

To install individual versions:

- 1 Create a directory for the PAP software. Type:

```
MD \PAP <Enter>
```

- 2 Change to this directory. Type:

```
CD \PAP <Enter>
```

- 3 Insert the PAP disk (PM-NCS Disk 3) into the floppy drive and change to the PAP subdirectory. Type:

```
CD A:\PAP <Enter>
```

- 4 Expand the required file. Type:

TS14

```
expand A:PAPTS14.EXE <Enter>
```

TS13

```
expand A:PAPTS13.EXE <Enter>
```

ETSI

```
expand A:PAPETSI.EXE <Enter>
```

ETSIB

```
expand A:PAPETSIB.EXE <Enter>
```

DASS2

```
expand A:PAPDASS2.EXE <Enter>
```

DPNSS

```
expand A:PAPDPNSS.EXE <Enter>
```

Starting PAP

To start the program:

1 Either:

- from Program Manager, double-click on the icon; or
- from MS-DOS, change to the PAP directory and type one of the following:

TS14

PAPTS14 <Enter>

TS13

PAPTS13 <Enter>

ETSI

PAPETSI <Enter>

ETSIB

PAPETSIB <Enter>

DASS2

PAPDASS2 <Enter>

DPNSS

PAPDPNSS <Enter>

To change the COM port or baud rate settings, use the **Port** and/or **Rate** commands (see *Chapter 4 — Commands*). Changes are saved when the program exits and will be used each time the program starts.

The PAP screen

Screen display

```

NET 1195-PLAY-LOC-B=06-00001-MED-E2-L3
0108 NETWORK 12/03 17:36:10.00 Q931 SETUP C/Ref 00b3 Org
Bearer Capability : 90 90 A3
Channel Identification : A1 83 06
Progress Indicator : 82 81
Calling Party Number : 21 A3
Called Party Number : C1 33 36 34 30 30 36 32
0110 USER 12/03 17:36:10.00 Q931 RELEase COMplete C/Ref 00b3 Dest
Cause : 80 81
0130 USER 12/03 17:37:40.00 Q931 SETUP C/Ref 000a Org
Bearer Capability : 90 90 A3
Channel Identification : A3
Keypad : 2A 41 4F 43 33 2A 30 31 23
Calling Party Number : A1 32 33 36 34 30 30 35 35
Called Party Number : 81 38 39 33 38 39 37 37
0132 NETWORK 12/03 17:37:40.00 Q931 CALL PROceeding C/Ref 000a Dest
Channel Identification : A9 83 1E
0134 NETWORK 12/03 17:37:40.00 Q931 DISConnect C/Ref 000a Dest
-Netuk- User
Invalid Captured Data
*play Captured File to Playback ->cap\link2204
*play Captured File to Playback ->a:temp
*
F1-----F2-----F3-----F4-----F5-----F6-----F7-----F8-----F9-----F10
HELP || Stop || || Long || Med || Short || L2 || L3 || MORE || QUIT
    
```

Figure 7: Screen display for Primary Rate Access

The PAP screen, an example of which is shown in *Figure 7*, contains the following elements:

- Status line** displays the status of the PrimeSwitch, including operation state, link status, level of layer 2 and layer 3 decoding, and other information. For Basic Rate access, the current CES is displayed at the far right of the status line.
See *Status line* later in this chapter.
- Display window** displays traffic sent and received, and lists the contents of the message pool and other information.
When the program starts it shows a block diagram with credits, software version, connection information and buffer size.
Use the cursor keys to scroll through a display that is longer than the window.
See *Keys in Chapter 4 — Commands*.
- Layer 1 status line** displays the network and user layer 1 states. These are only updated during monitoring. See *Layer 1 status line* later in this chapter.
- Command window** displays entered commands. See *Commands in Chapter 4 — Commands*.
- Command line** displays function key definitions of commands. Available commands depend on the current operation.
- Help window (not shown)** temporary window displayed over the rest of the screen.

The Basic Rate screen differs from the Primary Rate screen in the following ways:

- the Call Reference Indicator has two digits, not four;
- the current CES indicator is at the far right of the status line;
- there is a different set of layer 1 state indicators;
- the startup display shows different connection ports.

Display colors

On a color monitor, traffic is displayed in the following colors:

Green Network side, layers 2 and 3.

Purple User side, layers 2 and 3.

Yellow Layer 1.

Status line

The following diagram is a sample status line with each field numbered. Fields are described in detail below.

--PAUSE-COM1--LOC----- . . --B=01--O0001-LONG--E2-CAPT-241									
1	2	3	4	5	6	7	8	9	10

1 Operation state

STOP	stopped
MON	monitoring
PLAY	playing back captured file
PAUSE	display paused

2 Communication port

COM1	using COM1 port
COM2	using COM2 port

3 Local or remote, or bit rate

LOC	monitoring the local PrimeSwitch
REM	monitoring a remote PrimeSwitch
2400	data rate is 2400 bit/s
4800	data rate is 4800 bit/s
9600	data rate is 9600 bit/s
19.2	data rate is 19.2 kbit/s

4 Not used

5 B-Channel

B=XX	B-channel set to XX
-------------	---------------------

6 Call reference

OXXXX	call reference originating (Basic Rate OXX)
DXXXX	call reference destination (Basic Rate DXX)

7 Layer 3 decode

SHORT	display message type only
MED	display message type and information elements
LONG	display message type, information elements and full decode of information elements

8 Layer enable

--	alarms displayed; layers 2 and 3 suppressed
L2	layer 2 displayed in full; layer 3 suppressed
E2	only Exception Conditions are shown on layer 2; layer 3 suppressed. This displays SABME, UA, DISC, REJ, FRMR and RNR frames but suppresses RR and INFO frames
L3	layer 3 displayed; layer 2 suppressed
L2 L3	layers 2 and 3 displayed in full
E2 L3	(default) layer 2 exception conditions and layer 3 displayed
HEX	all messages displayed in hex

9 Capture and filter status

--	traffic not filtered or captured
FILT	traffic filtered
CAPT	all traffic captured to disk
CA-FI	traffic filtered before capture

10 CES (BRI only)

C XXX	CES of active data link
--------------	-------------------------

Layer 1 status line

Layer 1 status indicators are decoded from the value at the end of the displayed line, which is the sum of the individual hexadecimal values shown in the tables below. For example, simultaneous Primary Rate SYNC (08) and SES (02) errors are displayed as:

```
Layer 1 Status Change 0A
```

The left half of the layer 1 status line displays network side indicators, the right half displays user side indicators.

There are different indicators for Primary Rate and Basic Rate.

Primary Rate

```
--Netwk--ES--SES--DM--SYNC--REM--AIS-----User-----SES--- ...
```

The indicators are the same for both network and user sides, as shown below.

Value	Indicator	Description
00	--	normal operation
01	ES	Errored Second
02	SES	Severely Errored Second
04	DM	Degraded Minute
08	SYNC	frame synchronisation lost
10	REM	remote alarm
20	AIS	Alarm Indication Signal (binary ones)

Basic Rate

```
--Netwk--Activated-----User--Activated---- ., .
```

The indicators are different for user and network sides, as shown in the tables over the page.

Network side

Value	Indicator
00	deactivated
01	pending deactivation
02	pending activation
03	activated

User side

Value	Indicator
00	deactivated
01	synchronized
02	activation request
03	activated

Examples

PAP displays layer 1, layer 2 and layer 3 traffic as shown in the examples below.

Layer 1 status change

```
001  USER  Jan 03 06:14:10  G821  INFO  Layer 1 Status Line 00
```

001	number of traffic item in the buffer
USER	source of item
Jan 03	date and time of item
G821	ITU-T layer 1 protocol recommendation
00	status change type, for values see <i>Layer 1 status line</i>

Layer 2 frame

```
030  USER  Jan 03 06:14:11 Q921  INFO  CR0  PF0  Ns=11  Nr=59  Len=13
```

030	position of traffic item in the buffer (note that this differs from layers 1 and 3)
USER	source of item
Jan 03	date and time of item
Q921	ITU-T layer 2 protocol recommendation
INFO	frame type
CR0	Command/Response bit setting
PF0	Poll/Final bit setting
Ns=11	sending sequence number
Nr=59	receiving sequence number
Len=13	length of frame
00 01	hexadecimal contents of frame, including layer 3 message

Layer 2 frames can be displayed in alphanumeric or hexadecimal format. For details see the *L2* command in *Chapter 4 — Commands*.

Layer 3 message

```
031 USER Jan 03 06:14:11 Q931 INfOrMation C/Ref 0001e Org
```

031	number of traffic item in the buffer
USER	source of item
Jan 03	date and time of item
Q931	ITU-T layer 3 protocol recommendation
INfOrMation	message type
C/Ref 0001e	call reference number, unique for duration of call
Org	originating or destination side of call

The first line of a layer 3 message always has the same format, although the amount of information displayed depends on the level of decoding (see *Long*, *Med* and *Short* commands in *Chapter 4 — Commands*).

Item sources

When monitoring one ISDN interface from one COM port (the default), the item source is either **USER** or **NETWORK**.

If monitoring one ISDN interface from two COM ports, the source is either:

USER(n) or **NETWORK(n)**

where n = 1 or 2 (for COM1 or COM2).

If monitoring multiple ISDN interfaces from one COM port, the source is either:

USER Pm or **NET Pm**

where m = 1 to 4 (for the ISDN interface).

If monitoring multiple ISDN interfaces from two COM ports, the source is either:

U(n) Pm or **N(n) Pm**

where n = 1 or 2 (for COM1 or COM2) and m = 1 to 4 (for the ISDN interface).

Commands

Entering commands

To enter a command:

- press a Function key, or
- type the command name and press **Enter** or the space bar.

Some commands prompt for a yes/no response. Type **y** or **Y** and press **Enter** for yes, **n** or any other key for no.

Some commands prompt with a list of choices. Type the first letter of a word to select that option.

Some commands display a list. Use the **Page Up**, **Page Down** and arrow keys to scroll through the list, then type a choice from the list.

To cancel the command prompt, press **Esc**.

Keys

Key functions are shown below.

Key	Context	Function
Function keys	all	executes command
Up arrow ↑	monitoring	pauses display
	paused display or list	scrolls up one line
Down arrow ↓	paused display or list	scrolls down one line
	end of paused display	continues display
PgUp	monitoring	pauses display
	paused display or list	scrolls up one screen
PgDn	paused display or list	scrolls down one screen
	end of paused display	continues display
Home	paused display	goes to start of display
End	paused display	goes to end of display
Enter	command prompt	executes command
Spacebar	command prompt	executes command
Esc	command prompt	cancels command
	Help window	closes window

Commands

This section describes the available commands. You should note that not all commands are available in every analyser state. You can display a complete list of the commands available in the current state using the MORE key.

Capt

Toggles capture to disk. If capture is OFF, you must supply a filename for the capture file. This should be a legal DOS filename, for example, **CAPTURED.OUT**. All transmitted and received messages are stored in this file. Files can be played back using the **Play** command.

All messages that pass through the Filter (see **Filt**) are stored regardless of the settings of L2, L3 and LONG, MEDIUM and SHORT. To end capture, either press **Capt** again or press **Stop**. If the disk fills up capture terminates.

When capture is ON, CAPT is displayed in field 9.

Cause

Displays a list of causes and their values.

Cont

Continues display after the display has been paused to examine data. The display can also be continued using the down arrow (↓) or Page Down keys to move past the end of the display.

Dial

Dials a remote number before monitoring starts. Requires an AT modem, or a QDLM or ADLM.

Filt

Enables or disables a filter. If a filter is not enabled, you must supply the name of a filter that you want to use to select messages for display. If a filter is enabled, it is removed and all messages are displayed. The status line indicates FILT when filtering is enabled in the Filter/Capture field. If both filtering and capturing are on, CA-FI is displayed.

You must define a filter before you can use the **Filt** command (see **MakeF**).

Hang

Disconnects a remote monitoring call.

Help

Displays information relevant to the currently selected command or operation.

To get more help, press **C** to display a list of commands or **T** to display a list of topics. Move the pointer with the cursor keys and press **Enter** to select.

Press **Esc** or **Q** to return to normal operation.

Info

Displays a list of Information Elements and their values.

L2

Changes the display of layer 2 protocol activity. The display level (as indicated on the top line) has four settings:

---	no display of layer 2
E2	only exception conditions are shown; RR and INFRO frames are suppressed
L2	full display of layer 2
HEX	display in hexadecimal

All layer 2 activity is buffered/captured at all times regardless of this setting.

L3

Changes the display of layer 3 protocol activity. The display level (as indicated on the top line) has two settings:

--	no display of layer 3
L3	display of layer 3

All layer 3 activity is buffered/captured at all times regardless of this setting.

Long

Selects long display of layer 3. The display includes Message Type, each Information Element and the full interpretation of each octet within the Information Elements. **LONG** appears on the status line.

MakeF

Creates a filter. You must supply a name and then answer a series of yes/no questions to define the filter. You can choose whether to select **All**, **Only** the listed ones or all **Except** the listed ones. If you select **Only** or **Except**, you can enter a list of Frame Types or Message Types. When the list contains all of your selections, press **Enter** on a blank line to finish.

You can enable the filter immediately.

The filter is stored in a disk file named **NAME.FLT** where **NAME** is the name you give to the filter.

Med

Selects medium display of layer 3. The display includes Message Type, Information Elements and the contents of Information Elements in hexadecimal, but not the interpretation of the element contents. MED is displayed on the status line.

Mnem

Displays a list of message mnemonics and their values.

Mon

Monitors traffic in both directions. MON appears on the status line.

Some PrimeSwitch modules have multiple ports. You can choose to have one or more of these ports monitored.

For single port modules (for example, the IPM or BRM), leave this set to its default value, which is port 1.

For multiple port modules (for example, the DTM or QBRM), enter 1, 2, 3 or 4, or multiples such as:

1 3 to monitor ports 1 and 3

1 2 3 4 to monitor all 4 ports, and so on.

MSDOS

Loads a copy of the MS-DOS command processor. The MS-DOS prompt is displayed and you can run most DOS commands. There is only a limited amount of memory available, so you may find that larger programs do not run.

To return to the analyser, type **Exit** and press **Enter**.

Pause

Suspends the display of information during monitoring. Pressing the up arrow (↑) or **Page Up** key also pauses the display.

While the display is paused, information received by PAP is buffered and captured to disk. Press **Cont** to continue display.

Play

Plays back a file that has been created using the **Capt** or **Save** commands.

When you supply the filename of a legal capture file, the sequence in the file is played back and the status line indicates PLAY in field 1.

The first page is displayed and you can view subsequent lines by using the **Page Up**, **Page Down** and arrow keys. The **L2**, **L3**, **Long**, **Med** and **Short** commands control the display level. Playback is ended at the end of the file, or when you press **STOP**.

Port

Selects which COM port to use. Choose **1** or **2**. If you have a PC with two COM ports, you can monitor two different PrimeSwitch modules at the same time; in this case, select **BOTH** as the value.

This value is saved for use the next time the software is opened.

Print

Prints a file of transactions that has been captured on disk. You can print the file to a disk file by selecting **Disk**, rather than **Printer**, as the print destination. Messages are decoded and displayed according to the current settings of the **L2**, **L3**, **Long**, **Med** and **Short** commands. The print file is standard ASCII text.

Quit

Exits from PAP and returns to the MS-DOS prompt.

Save

Saves the current contents of the PAP internal buffers to a disk file. The file is in the same format as a Capture file and can be read using the **Play** command.

Short

Selects short display of layer 3. Disassembly of messages is restricted to type only. **SHORT** is displayed on the status line.

ShowF

If filtering is enabled, the current filter settings are shown.

Speed

Selects which data rate to use. The value can be **2400**, **4800**, **9600** or **19200**. This value is saved for use the next time the software is opened.

State

Displays a list of states and their values.

Stop

Terminates the current activity as shown in the table below.

Operation state	Effect
Monitor mode	Returns to stopped state
Playing back	File closed, returns to stopped state

Tele

Displays a list of teleservice types and their values.