HP 4954A
Software Demonstration Disc
User's Guide

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Preface

This manual describes how to use the demonstration programs on the HP 4954A Demonstration Disc. Each application demonstration has its own section which describes loading and using the application.

SNA Development System Demonstration

The HP 4954A Demonstration Disc supplied with your HP 4954A contains software which demonstrates the SNA Development System.

The SNA Development System consists of the HP 18360A, HP 18361A, and HP 18362A software applications.

The HP 18360A is the SNA Emulation Language.

The HP 18361A is the 3270 Device Exerciser.

The HP 18362A is the LU6.2 Node Exerciser.

To use the SNA Development System demonstration, use the following procedure.

1. Insert the Demonstration Disc into the disc drive.

2. From the Top Level Menu, press <Applic Menu> and set the buffer size to 104 kbytes.

3. Press <Load Applic> and then press <Exit Operation>. Press <Change Directory> to set the disc device and unit. Set the disc device to "Internal" and the unit to "Flexible Disc", and then press <Execute>. Press <Exit Operation>.

4. Press <Load File>, select the file name SNA, and press <Execute>.

5. After the file has loaded, press <Exit Select>, and then <Execute Applic>.

6. After the demonstration program is loaded, follow the instructions on the display.

HP 18370A X.25 Network Performance Analyzer Demonstration

The HP 4954A Demonstration Disc supplied with your HP 4954A contains software which demonstrates the HP 18370A X.25 Network Performance Analyzer application.

To use the Network Performance Analyzer demonstration, use the following procedures.

Loading the Application

1. Insert the Demonstration Disc into the disc drive.

2. From the Top Level Menu, press <Applic Menu> and set the buffer size to 16 kbytes.

3. Press <Load applic> and then press <Exit Operation>. Press <Change Directory> to set the disc device and unit. Set the disc device to "Internal" and the unit to "Flexible Disc", and then press <Execute>. Press <Exit Operation>.

4. Press <Load File>, select the file name X25_NPA, and press <Execute>.

5. After the demonstration program is loaded, the X.25 Top Level Menu is displayed. Next, load the DATA and CALLS files.

Loading the DATA and CALLS Files

The DATA file contains performance data from a previous run. The CALLS file has the call history data including channel activity information from a previous run.

1. Insert the Demonstration Disc into the disc drive.

2. From the X.25 NPA Top Level Menu, press <Mass Store>.

3. Press <Change Directory> to set the disc device and unit. Set the disc device to "Internal" and the unit to "Flexible Disc", and then press <Execute>. Press <Exit Operation>.

4. Press <Load File>, <Select File>, select the file name DATA, and press <Execute>.

5. After the file has loaded, press <Load File>, <Select File> again and select the file name CALLS. Press <Execute>.

6. The data files for the X.25 Network Performance Analyzer demonstration are now loaded.

7. Press <Exit> to return to the Top Level Menu.

Start the Demonstration

The HP 18370A X.25 Network Performance Analyzer sits on an X.25 line between a subscriber and a network and monitors all X.25 information that goes across. An example of a subscriber would be an X.25 PAD (Packet Assembler/Disassembler) or a mainframe computer with an X.25 port. A network would be an X.25 switch, or a public Packet Switching Network (PSN).

Press <Examine Graphs>

Everything you see in this demonstration would be the same whether you were running real time collecting performance data, or examining pre-collected data as in this demo. When a run is started you enter the "Channel Activity" display (Figure 1). This display shows you the state of every logical channel, organized by logical channel groups (256 channels at a time). Right now you are looking at logical channel group number 0, and the 255 channels within that group. By using the "Roll Up" and "Roll Down" keys, or "Page Up" or "Page Down" keys, you can move the window to look at different channels.

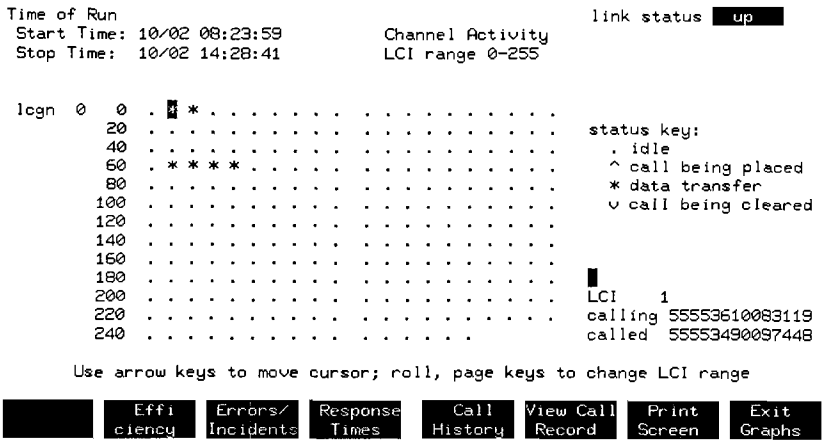

Figure 1. Channel Activity Display

There is a character representing each logical channel that shows the state of the channel. A period means that the channel is idle. An asterisk means that a call is in progress on the channel. In addition, an arrow up means a call is being placed, and an arrow down means that a call is being cleared. The display (and Figure 1) shows that there were six calls active when the run stopped. This is evident by the six asterisks. This performance analyzer can keep all pertinent information on up to 256 simultaneously active calls. If you position the cursor on top of one of the channels with an active call (channel 64 for example), notice that the calling and called addresses appear in the bottom right corner of the display. You can roam around through active calls and see who's talking to whom. You can see more information about a call by pressing <View Call Record> while the cursor is in the call position.

Position the cursor on LCI 64 and press <View Call Record>

The view call record display expands an active call and displays all information related to that call.

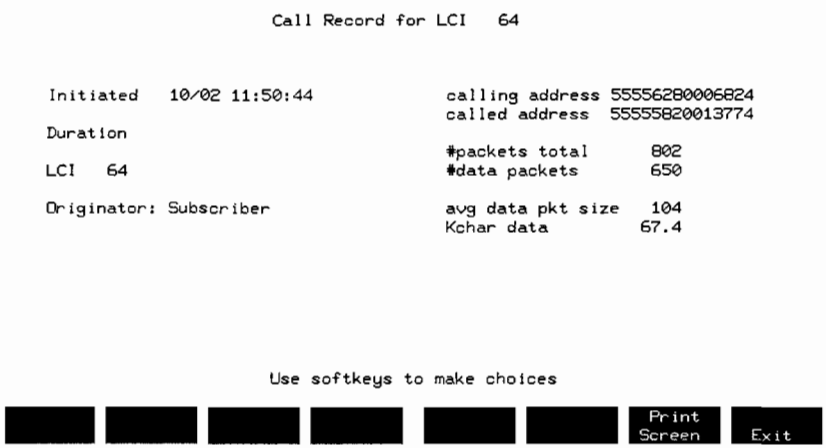

Figure 2. View Call Record

Figure 2 shows the "Call Record" for the call that was active on LCI 64. In addition to the calling and called addresses and logical channel number, it shows the date and time the call was initiated, the originator of the call (network or subscriber), the number of total packets and data packets for that call, and the average data packet size and kcharacters of data. If you are more interested in the calls that have gone across the line, you can exit back to the "Channel Activity" display and enter the "Call History" display.

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Press <Exit> to return to Channel Activity
Press <Call History>, followed by <Active/Cleared>

You are now looking at all information about the last (maximum of) 1500 calls that have gone across the line (Figure 3). This display includes the information just seen in view call record in addition to clearing information. This includes terminated time, duration, which side cleared the call, with what type of packet and for what reason (the Cause Code and Diagnostic Code in English).

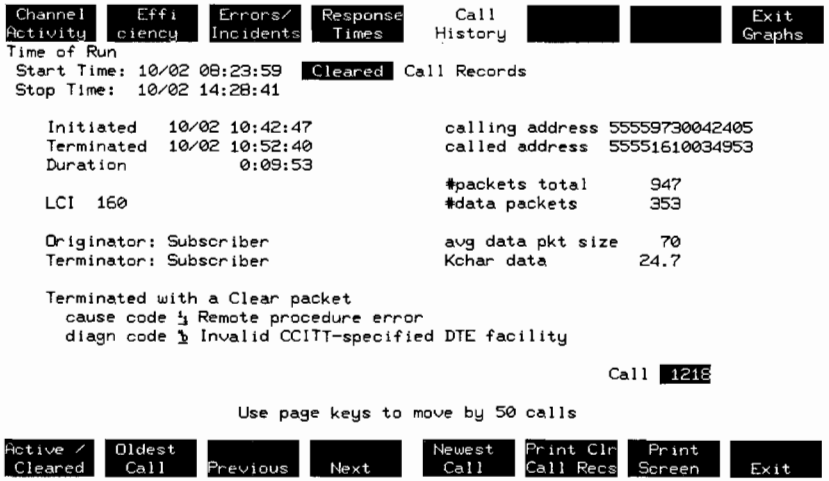


Figure 3. Call History--Cleared Call Records

By using the roll-up and roll-down keys, you can move through these calls to find a particular one. Notice that the calls are numbered in the bottom right corner. To move in bigger steps, press the next and previous page keys to jump by 50 calls. Now return to the "Channel Activity" display and prepare to view the performance parts of this package.

Press <Exit> to return to Channel Activity

Performance is measured in three different categories: Efficiency, Errors and Incidents, and Response Times. First, look at Efficiency Summary.

Press <Efficiency>

In this category, the application measures four different things:

- "Throughput" is the number of bits per second that went across the line.
- "Utilization" is how much of the line was utilized, or the throughput divided by the bandwidth of the line (maximum bit rate).
- "Packets per Second" shows how many packets are transmitted across the line in a one second period.
- "Data Packet Size" shows the efficiency of the data packets--how many bytes are in each one.

[Channel Activity] [Effi ciency] [Errors/ Incidents] [Response Times] [Call History] [ ] [ ] [Exit Graphs]

Time of Summary
Start Time: 02/18 00:00:18
Stop Time: data log file

Efficiency Summary

	Avg.	Min (day/time)	Max (day/time)	Last Value
Throughput-				(25/23:59)
frame (bits/sec)	11032	0 (24/04:05)	19200 (24/14:00)	8457
packet (bits/sec)	9604	0 (24/04:05)	18624 (25/14:00)	7692
data (bits/sec)	9004	0 (25/04:18)	18432 (25/11:20)	7208
Utilization-				
frame (%)	57	0 (24/04:05)	100 (24/14:00)	44
packet (%)	50	0 (24/04:05)	97 (25/14:00)	40
data (%)	47	0 (25/04:18)	96 (25/11:20)	38
Packets/Second	40	0 (25/03:35)	134 (24/15:22)	24
Data Packet Size-				(25/23:59)
(bytes)	95	1 (25/23:59)	128 (25/23:59)	60

Use shift-softkeys or softkeys to make choices

[ ] [Through put] [Utiliza tion] [Packets/ Second] [Data Pkt Size] [ ] [Print Screen] [Exit]

Figure 4. Efficiency Summary Display

For each area in this category, measurements are displayed with the minimum, maximum, average, and last value and next to each is the date and time of that measurement.

For both Utilization and Throughput, the measurement is broken up into each OSI layer (as related to X.25):

- Frame level is all bits that go across the line (everything between start and end flag)
- Packet level is all the bits within an information frame
- Data level is every bit within a data packet

So, as an example, frame level minus packet level will give us frame level overhead. These measurements in the summary screen are cumulative measurements; they are from the start of run to the current time. During a run, the summary can be reinitialized by pressing the <Re-init Summary> softkey that appears only during a run. If this is done, the Start Time in the top left of the screen will be set to that time for that summary. Pressing this key affects only the summary currently being viewed.

By pressing <Utilization> , you can view the utilization for all three levels measured (frame, packet and data) over time.

Press <Utilization>

In this example (Figure 5), you are viewing utilization (with % on the y-axis) over the last 24 hours (time on the x-axis). For all the graphs, measurements are shown over the last 24 "time intervals." A time interval can range from ten seconds to one hour, therefore displaying data over the last four minutes (TI=ten seconds) to one day (TI=one hour). The time interval is set prior to a run.

By displaying these measurements over time, you can easily observe trends throughout a day, thus easing the task of planning certain activities. For example, a manager may need to set up a job that runs once a day and retrieves data from a remote database. The only way to accurately schedule this event is to view the activity of the network in relation to the time of day.

The Utilization graph is in a "stacked" format. The solid portion of each bar shows the utilization of the line for just data. The vertical lines (above the solid portion) show packet level overhead. And the horizontal lines show frame level overhead. Therefore, all three sections combined result in the overall line utilization for that time interval. By displaying in this format, you can quickly see how much of the line is actually being used for data and how much is being used for overhead.

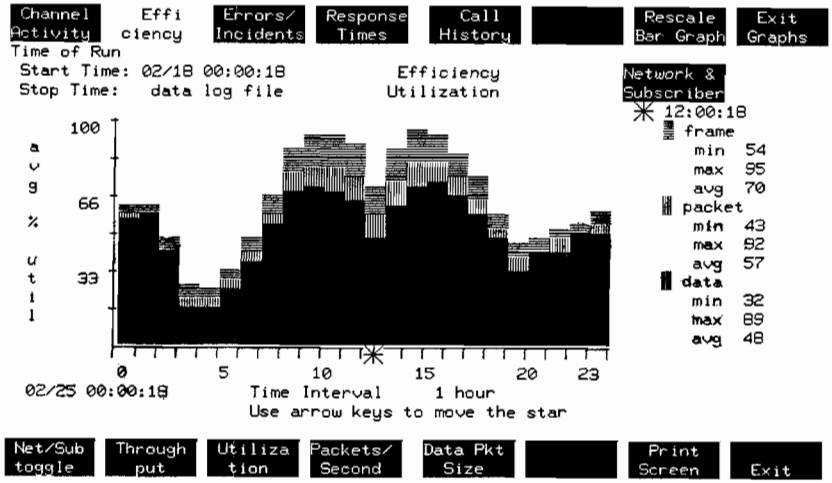


Figure 5. Efficiency--Utilization Bar Graph

In this example, monitoring was started a little after midnight on February 18th (notice the Start Time in the top left corner of the display). The file being examined is part of the entire run. It is one that was automatically stored out by the program during the run (more on "data logging" later). The start time of this graph is shown at the lower left corner of the graph (2/25 at 18 seconds after midnight). In this run, the time interval was set to one hour so the graph is showing data over an entire day. During the early hours of the morning there was moderate traffic, with very low overhead. This is primarily job traffic--efficient system-to-system communication. As the day progressed, terminal traffic started--users connected through PADs. Here there is much more overhead because of smaller data packets generated by the PADs.

By using the cursor keys (left and right arrows), you can position the cursor (the star located beneath the x-axis) under a time interval of interest. By doing this, the minimum, maximum, and average values for that time interval are displayed on the right side of the display.

Press <Net/Sub toggle>

The graph in Figure 5 shows the utilization of the line for both the network and subscriber combined. By pressing <Net/Sub toggle>, you can change to viewing just the network, just the subscriber, or back to both combined. Pressing this key affects only the display, not the actual collection of data.

Select <Rescale Bar Graph> by pressing SHIFT and Softkey 7

All graphs are automatically rescaled when a new bar exceeds the y-axis. In this case, the top of the y-axis will be set to 10% over this new value. The autoscale feature can be temporarily overridden by pressing <Rescale Bar Graph> . If this is done, while either running or examining graphs, you would be prompted for a new maximum y-axis value.

Now look at the second category--Errors and Incidents.

Select <Errors/Incidents> by pressing SHIFT and Softkey 3

Figure 6 shows the summary of this category. Here the network performance analyzer counts certain events and displays the totals. Graphs are available for all measurements in this category. Along with the total is the date and time the last event occurred. Totals are accumulated for many different events--link setups and disconnects, bad and aborted frames, FRMRs, REJs, and, on the packet level, Resets, Restarts, successful calls, and unsuccessful calls.

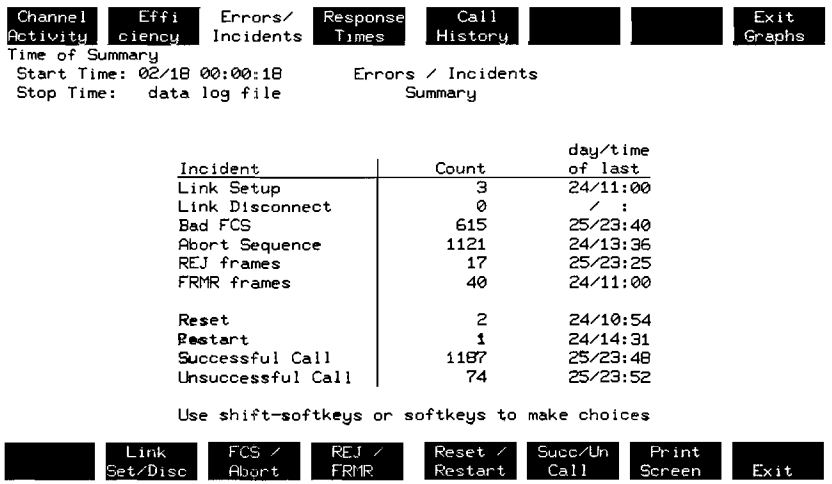


Figure 6. Errors and Incidents Summary Display

An event is usually not just a certain frame going across the line. It is actually a sequence of frames that indicate an event has occurred. For example, a link setup is one side sending an SABM, and the other side responding with a UA. Collisions are handled as well.

The third and last category is Response Times (Figure 7).

Select <Response Times> by pressing SHIFT and Softkey 4

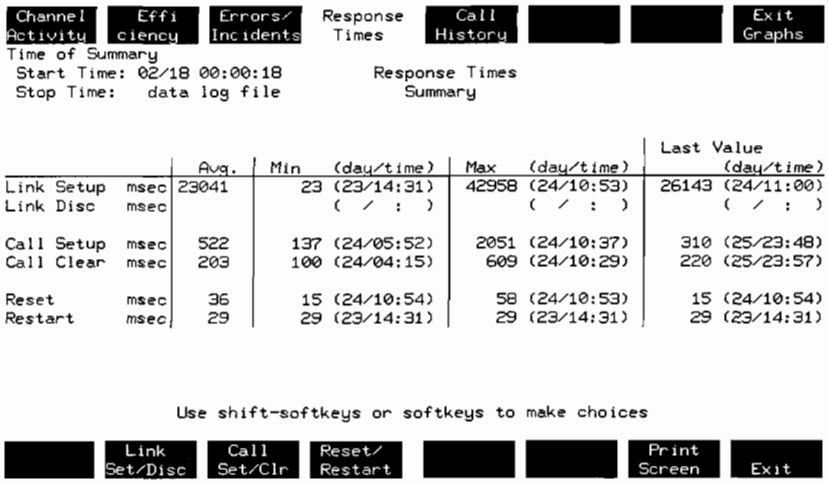


Figure 7. Response Times Summary Display

As in the Efficiency Summary, the Response Times Summary shows the minimum, maximum, average, and last value of each event measured, as well as the date and time of each measurement. These measurements consist of link setups and disconnects, call setups and clears, and Resets and Restarts.

As discussed with "Errors and Incidents," an event is not simply the occurrence of a particular frame. This also applies to the "Response Times" category. A call setup is actually one side sending a Call Request on a particular logical channel, and the acceptance of that call from the other side. If a call collision occurs, times are measured between the appropriate Call Request and Call Accept.

Press <Call Set/Clr>

Figure 8 shows a graph of one of the Response Times measurements--Call Setup and Clear. The Response Times graphs are similar to the utilization graph shown earlier in that it is graphed over the last 24 time intervals (in this example TI=one hour). Here, however, they are in a "side-by-side" format instead of stacked. The solid bars represent the average time it took during that time interval to establish a call. The vertical line bars represent the average time it took to clear a call. In this figure, you can see how call establishment time varies according to the time of day. During the day when there are many users, it takes much more time than in the middle of the night. However, it also shows that call clearing time is somewhat constant through the day. This is because clearing a call is a local action; establishing a call causes the call packet to progress through the entire network.

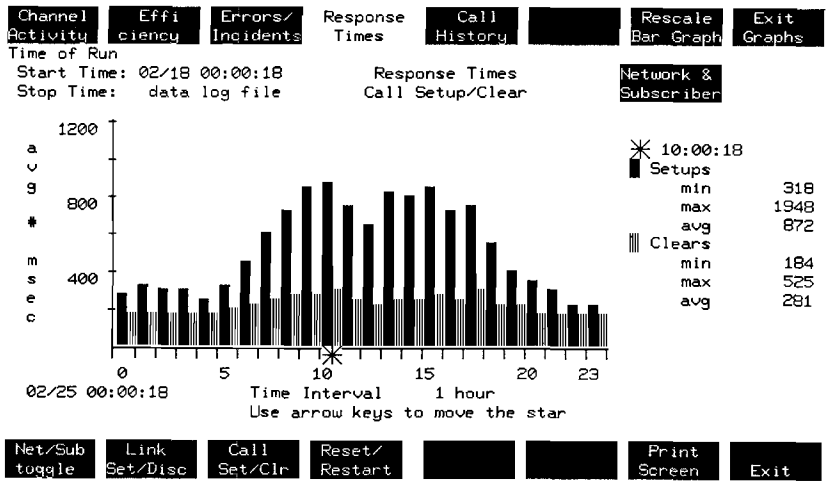
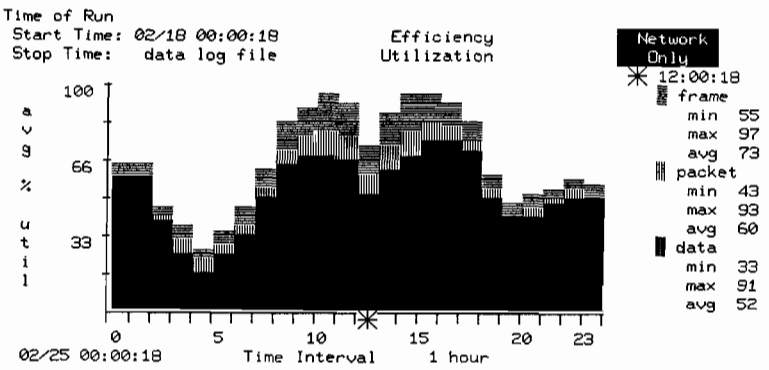


Figure 8. Response Times--Call Setup and Clear Bar Graph

For all the displays within the network performance analyzer, there is a key labeled <Print Screen> . If this key is pressed, while running or examining graphs, the display is frozen and copied into the background print spooler. Depending on the traffic level, this typically takes between seven and twenty seconds. This varies with traffic level because while the display is frozen, data collection is still in progress. This means that you can print any display while collecting data and be assured that you will not miss a byte on the line.

A printout of a graph also contains an annotation table--a printout appended to the display showing the minimum, maximum and average for every time interval. A printout of the utilization graph is shown in Figure 9.



Annotation Table

	frame			packet			data		
	min	max	avg	min	max	avg	min	max	avg
0:00:18	42	71	64	38	66	59	36	64	58
1:00:18	44	72	64	40	68	59	38	66	58
2:00:18	5	60	46	4	56	41	3	54	40
3:00:18	3	60	36	2	55	31	1	54	31
4:00:18	1	42	27	1	38	22	0	36	21
5:00:18	6	75	35	5	53	30	2	51	29
6:00:18	8	64	45	5	60	38	1	58	35
7:00:18	30	75	63	22	71	54	16	69	49
8:00:18	73	98	82	63	94	71	55	92	64
9:00:18	68	100	90	56	96	77	46	94	68
10:00:18	80	100	95	66	97	80	54	94	69
11:00:18	83	100	92	69	96	77	57	96	66
12:00:18	55	97	73	43	93	60	33	91	52
13:00:18	72	100	88	58	96	73	46	94	62
14:00:18	84	100	95	70	95	80	58	94	69
15:00:18	74	99	96	62	95	83	52	93	74
16:00:18	65	98	92	55	93	81	47	92	74
17:00:18	68	95	84	60	91	75	54	89	70
18:00:18	44	72	60	38	68	53	34	66	50
19:00:18	36	58	48	32	54	43	30	52	42
20:00:18	35	64	51	31	60	46	29	58	45
21:00:18	39	77	54	35	74	49	33	71	48
22:00:18	34	77	59	30	73	54	28	71	53
23:00:18	47	83	56	43	79	51	41	77	50

Figure 9. Printout of Utilization Bar Graph with Annotation Table

Select <Exit Graphs> by pressing SHIFT and Softkey 8
Press <Alert Menu>

Another feature of the network performance analyzer is the ability to setup alert conditions. An alert condition is a threshold value for a particular measurement that, when exceeded, will set off an alarm and log the occurrence. In the case of the X.25 NPA, when an alert condition is triggered, four things happen:

- The display begins to flash
- The analyzer beeps continuously
- A message at the bottom of the display shows which alert condition occurred
- A report is generated on the printer, logging the occurrence of the alarm.

These alarms continue until a key on the keyboard is pressed.

Figure 10 shows the alert condition display with several alerts selected. An alert condition is available for every measurement that the X.25 NPA makes. For each alert, when selected, you can enter any threshold value and specify whether this applies to the network, the subscriber or both. In some cases the choice "either" appears instead of "both." An example of this is an alert condition on five bad FCSs occurring on either side, as opposed to the total line utilization exceeding 60% for both sides combined. Up to six alert conditions can be set simultaneously.

```
Time Interval    10 seconds       ALERT CONDITIONS            Beep   Enabled
                                                     Call Records    Printed

RESPONSE TIMES                               ERRORS/INCIDENTS
         Link Setup                                  Link Setups
         Link Disconnect                             Link Disconnects
 DTE     Call Setup        msec> 5000        either  FCS Errors          count>  5
         Call Clear                                  Abort Sequences
         Reset                                       REJs
         Restart                             either  FRMRs               count>  1
                                                     Resets
                                                     Restarts
                                                     Unsuccessful Calls
CALL HISTORY
         Restart cause code
         Restart diag. code                  EFFICIENCY
         Clear cause  code                    total  frame utilization   rate>60%
         Clear diag.  code                           packet utilization
 #calls to address   55556540022356 >   1            data utilization
 #calls from address                          total  packets/second      rate>160

                      Use softkeys to make choices

 Beep    Call Recs            Select  Deselect   Clear    Print
 Toggle  Toggle                                  All      Screen    Exit
```

Figure 10. Alert Setup Display

An alert condition is not simply a certain number of events occurring. It is actually many events occurring during a certain period of time. It would not make sense to have an alert condition set to go off for more than five bad FCSs because on most lines, given enough time, there will be more than five bad FCSs. The way to set a bad FCS alert condition would be to trigger on more than five bad FCSs during a time interval. This way the X.25 NPA will count occurrences of each event during a time interval and reset the counts at the end of the time interval.

Press <Beep Toggle>

Within the alert condition setup display, you can do two other things. First you can tell the X.25 NPA whether it should beep when an alert condition occurs. This is controlled by <Beep Toggle>. When <Beep Toggle> is pressed, the beep field in the top right corner of the display toggles between enabled and disabled. Pressing this key affects only the audible part of the alerts. When disabled, the display still flashes and the printout and message are still generated.

Press <Call Recs Toggle>

The second thing you can do is enable and disable the printing of call records. This is controlled by the <Call Recs Toggle> softkey. When enabled, a report will be generated (to the printer) at the termination of every call. The report contains the date and start time, the duration, the data size and the number of data packets, the direction of the call (incoming or outgoing), the calling and called addresses, the type of packet it was cleared with, and the cause and diagnostic code in that packet. All this information is on one line. Figure 11 shows a sample call log.

```
HP18370A  Network Performance Analyzer                          Hewlett-Packard Co.

                                                                        Unsuc
                          Data  Data in/                                Rstrt  C  D
Start Time     Duration   Size  Pkts out Calling addr   Called addr     Clr codes
 4/03  8:26:09    0:01:36    33   186 i 55552990041709  55556900099873  C 09 2D
 4/03  8:26:57    0:00:48    65   399 o 55555220086652  55552570099875  C 03 11
 4/03  8:24:55    0:03:01    40   325 i 55552960068107  55552920033819  C 09 4A
 4/03  8:24:52    0:03:04    10   499 o 55556080029365  55550120097263  C 05 2C
 4/03  8:27:35    0:00:28    15   232 i 55550280087767  55555640089704  C 00 01
 4/03  8:27:15    0:00:53    71   261 o 55559530083434  55557440010213  C 13 78
Alert  Either  Clear cause  code 13H count>=1 at  8:28:08
 4/03  8:26:12    0:02:03     8   461 i 55555140098775  55551790056160  C 19 00
 4/03  8:24:10    0:04:16    50   292 o 55557410023805  55557960046688  C 13 34
 4/03  8:27:02    0:01:25    27   372 i 55557970066669  55552900047139  C 15 10

----------------  5 minutes   time interval  ending at  4/03  8:28:35 ----------
 Either  Clear cause  code 13H count>=1  total count=2
                                                last at  8:28:26
-------------------------------------------------------------------------------

 4/03  8:26:29    0:02:12    46   499 o 55553040074656  55551420087580  C 15 15
 4/03  8:25:39    0:03:02    52   443 i 55558960057729  55558480046476  C 15 2B
 4/03  8:26:44    0:02:01    22   113 i 55553430049857  55558370088026  C 11 48
 4/03  8:25:04    0:03:54    55   364 o 55558850011832  55557710056984  C 0D 50
 4/03  8:27:28    0:01:38    93   447 i 55552680017234  55557370054166  C 00 01
 4/03  8:25:19    0:03:50    26   484 o 55552460013392  55555550096173  C 01 28
 4/03  8:25:02    0:04:09     2   225 i 55554280045320  55555650061540  C 03 30
 4/03  8:26:54    0:02:26    41   128 o 55558270058087  55550320013238  C 0D 10
 4/03  8:26:40    0:02:41    46   212 i 55555910019188  55557520020647  C 0B 26
 4/03  8:24:52    0:04:46    92   273 i 55552910041014  55554550005885  C 15 22
 4/03  8:25:16    0:04:22    72   347 o 55551870033255  55558870017989  C 0B 75
 4/03  8:25:32    0:04:20    30   394 i 55555010092597  55559590056803  C 0B 1A
 4/03  8:26:07    0:03:46    21   369 o 55552810052584  55555990005673  C 29 2C
 4/03  8:25:23    0:04:31    88   108 i 55553210090990  55559170005989  C 0B 34
 4/03  8:26:35    0:03:27    87   131 o 55555560002899  55551010098598  C 01 1D
 4/03  8:24:07    0:06:05    96   120 o 55559410016513  55555650075026  C 29 70
```

Figure 11. Sample Call Log with Alert Condition Occurrences

If an alert condition threshold is exceeded while call logging is enabled, the alert condition report and summary are printed with the call log. During the call logging in Figure 11, some alert conditions occurred.

The last area of this X.25 NPA demonstration is the Setup Menu.

Press <Exit>
Press <Setup Menu>

From within this display you configure the X.25 NPA to match the configuration of the X.25 line. For example, the line speed (bits/second) must match the true line speed or else the utilization calculations could be inaccurate. This display is very similar to the Setup Menu on the HP 4954A with the addition of a couple features (Figure 12).

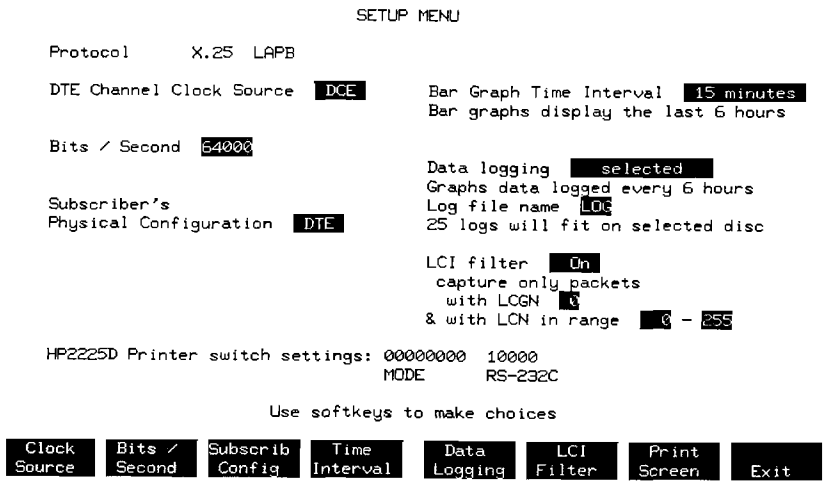


Figure 12. Setup Menu

The first new feature is the LCI data filter. If this is enabled, only certain information (that matching the filter specifications) will enter the X.25 NPA and be counted in the measurements. When enabling the data filter, you specify a range of logical channels within a logical channel group (the range can be as small as one logical channel) to be monitored. All packets not matching this filter, with the exception of Restart packets, will not count in any of the performance measurements; they will be ignored.

The second new feature is data logging. When you enable data logging, you specify a three letter filename prefix (for example, "LOG"). After this is enabled, when a time window (a graph--24 time intervals) fills up, before it shifts left and drops the left-most bar, all performance data will be stored out to a sequentially numbered file beginning with LOG_0001. The next time a time window fills up (24 time intervals later) all data will be stored out to LOG_0002.

An empty subdirectory on the HP 4954A hard disc can hold 112 of these log files. An empty floppy disc can hold 25 log files; therefore, you could set up the X.25 NPA with the time interval set to one hour, let it run for 25 days, and come back to find all the performance data over those 25 days with one hour resolution.

That's the end of this demonstration. To see this application in action on your own X.25 line, give your Hewlett-Packard representative a call.

Put yourself in control of your network.

18352A X.21 State Simulator Demonstration

The HP 4954A Demonstration Disc supplied with your HP 4954A contains software which demonstrates the HP 18352A X.21 State Simulator application.

To use the X.21 State Simulator demonstration, use the following procedures.

Loading the Application

1. Insert the Demonstration Disc into the disc drive.

2. From the Top Level Menu, press <Applic Menu> and set the buffer size to 200 kbytes.

3. Press <Load Applic> and then press <Exit Operation>. Press <Change Directory> to set the disc device and unit. Set the disc device to "Internal" and the unit to "Flexible Disc", and then press <Execute>. Press <Exit Operation>.

4. Press <Load File>, select the file name X21_STATE, and press <Execute>.

5. After the file has loaded, press <Exit Select>, and then <Execute Applic>.

6. After the demonstration program is loaded, the DEMOCALL file must be loaded.

Loading the DEMOCALL File

The DEMOCALL file contains buffer data and menus from a previous run.

1. Insert the Demonstration Disc into the disc drive.

2. From the Top Level Menu, press <Mass Store>.

3. Press <Change Directory> to set the disc device and unit. Set the disc device to "Internal" and the unit to "Flexible Disc", and then press <Execute>. Press <Exit Operation>.

4. Press <Load File>, select the file name DEMOCALL, and press <Execute>.

5. The data files for the X.21 State Simulator demonstration are now loaded.

6. Press <Exit> to return to the Top Level Menu.

Start the Demonstration

Once the X.21 STATE and DEMOCALL files have been loaded, press <Applic Menu> and then <Execute Applic> to start the demonstration. The following steps describe the X.21 demonstration.

1. From the Top Level Menu, press <Examine Data> to view the captured data. You are now in the Data and State Display. Notice the 5 lines: T (transmit), C (control), R (receive), I (Indication) and St (State). The Data and State Display not only shows you the status of the interface leads but also the current CCITT X.21 state of the interface. This state number directly correlates to the CCITT X.21 definition. (See the X.21 quick reference card.)

2. Press <Other Choices>, <Display Format>, <Other Choices> and <X21 State Sequence> to view the same data in another display format. This is the X.21 State Sequence Display. It shows the sequence in which the CCITT X.21 states occurred and the time spent in each state.

3. Press the <Exit> key until the Top Level Menu is found.

4. Press <Setup Menu>. Note that you have two setup menus: one for call control and another for data transfer.

5. Press <Call Cntl Setup>. This is where the call control parameters are established.

6. Press <Exit> and <Data Xfer Setup>. Now you are in the Data Transfer Setup Menu. This is very similar to the normal Setup Menu. The HP 18352A will use the parameters defined here to decode the data transfer information.

7. Press <Exit>, <Simulate> and then <Call Cntl>. Now you are in the Call Control Simulate Menu. This is the program used to generate one side of the stored buffer data.

8. Key items to notice:

   High level "state" commands to isolate the user from the details of implementing the X.21 protocol

   Global triggers to respond to asynchronous events

9. Inside of the Call Control Simulate Menu press the down arrow several times until the cursor is positioned at the beginning of an empty block. Now press <Other Choices> until the <Establish Call> and <Clear Call> labels occur on softkeys 4 and 5. These keys automatically enter the correct CCITT sequences for establishing or clearing a call. You will find this extremely beneficial.

10. Press <Establish Call>. Notice that any of four standard call establishment sequences can be selected. Select <to DCE addressed>. Notice how a sequence of states was entered for you automatically. Even the comment field! Of course, if you want to you can edit this sequence to deviate from CCITT.

11. Press the <Exit> key until the Top Level Menu is found. Press <Monitor Menu>. This is a sample monitor program that counts the number of state 1 occurrences and DTE data transfer frames.

12. You can run this program by entering into the <Run Menu> and then pressing <Execute>. You will see messages written to the display during runtime. This is an example of the DISPLAY COMMENT command. It allows real time display of messages. See block 2 in the Monitor Menu for an example of how it works.