EXCELAN

LANalyzer

EX 5000E
Ethernet Network Analyzer

User Manual

EXCELAN "Excellence in Local Network Technology"

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RELEASE NOTES
LANalyzer EX 5000E
Ethernet Network Analyzer

The LANalyzer EX 5000E Ethernet Network Analyzer software, along with the EXOS 225 Ethernet Network Analyzer board, are designed for use on an IBM PC XT, IBM PC AT, or compatible system.

You should read these release notes as well as the manual before installing and using the EXOS 225 board and the EX 5000E software. Refer to the *LANalyzer EX 5000E Ethernet Network Analyzer User Manual* for complete information on installing and using the LANalyzer software and hardware. If you should have any questions, comments, or suggestions, please contact

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COMPONENTS

The LANalyzer EX 5000E package is shipped in two boxes. The larger box contains one COMPAQ PORTABLE 286 in which the LANalyzer hardware and software and DOS Version 3.1 have been installed. The smaller box contains the *LANalyzer User Manual*, one transceiver, and transceiver cable.

The LANalyzer EX 5000E kit is shipped in one box. This box contains one EXOS 225 board, the *LANalyzer User Manual*, one transceiver, and transceiver cable. Chapter 2 of the manual describes the procedures for installing the LANalyzer hardware and software.

As shipped, the EXOS 225 board is compatible with Ethernet Version 1.0, Ethernet Version 2.0, and IEEE 802.3 transceivers.

The EXOS 225 board has been tested in the following systems:

- IBM PC XT
- IBM PC AT
- AT&T 6300
- COMPAQ PORTABLE 286
- COMPAQ PLUS
- COMPAQ DESKPRO 286
- Wyse PC
- Sperry PC

When configured in PC-compatibility mode, the bus speed supported by the EXOS 225 board is 4.77 MHz. When configured in AT-compatibility mode, the bus speed supported by the EXOS 225 board is 6 MHz.

REMINDER

If you plan to use both the EXOS 225 and EXOS 205 boards in the same PC, you must ensure that the memory address and I/O space mappings, and the interrupt levels do not conflict. Refer to Section 2.2.3 in the User Manual.

FEEDBACK

Your feedback on this software is appreciated. An overall evaluation form, as well as a software problem report form, are included at the end of these release notes. Please complete them and return them to Excelan.

LANALYZER EX 5000E FILES

The EXOS 8051 software is distributed on two floppy disks. The contents of the hardware diagnostics and installation diskette are as follows:

File	Contents/Purpose
BINS.BAT	Installation batch file
CURFIX.EXE	Diagnostics file
D225.EXE	EXOS 225 diagnostics
INSTALL.EXE	Install program
INSTALL.INF	Control file for INSTALL program
OB.BAT	Diagnostics control file
PC225.EXE	Hosts diagnostics
RUNDIAG	Diagnostics control file

The contents of the system software diskette are as follows:

File	Contents/Purpose
BINS.BAT	Installation batch file
CMON.TPO	Object file for LANalyzer screens
COLLISIO.TPO	Object file for LANalyzer screens
DATHD.TPO	Object file for LANalyzer screens
DEFAULT.TST	DEFAULT sample test
DIN.EXE	DIN command
FILL.TPO	Object file for LANalyzer screens
HOSTNAME.TPO	Object file for LANalyzer screens
HOSTS.TST	HOSTS sample test
INSTALL.EXE	Installation command
INSTALL.INF	Control file for INSTALL program
IPATM.TPO	Object file for LANalyzer screens
IPTM.TPO	Object file for LANalyzer screens
LANZ.EXE	LANalyzer invocation command
LANZDRIV.EXE	Commands for loading the LANalyzer driver
LANZLOAD.EXE	Command for loading the EXOS 225 board code
LANZRUN.BAT	Batch file for loading the LANalyzer driver and EXOS 225 board code
LOADNET.TST	LOADNET sample test
LYNX.TST	Base-level LANalyzer test
MON.TPO	Object file for LANalyzer screens
MONITOR.86	EXOS 225 board code
PAT.TPO	Object file for LANalyzer screens
PKT.TPO	Object file for LANalyzer screens
PKTDAT.TPO	Object file for LANalyzer screens
PKTSUM.TPO	Object file for LANalyzer screens
SEARCH.TPO	Object file for LANalyzer screens
STATION.TPO	Object file for LANalyzer screens
STATUS.TPO	Object file for LANalyzer screens
STNHDR.TPO	Object file for LANalyzer screens
SUMHD.TPO	Object file for LANalyzer screens
TEST.TPO	Object file for LANalyzer screens
TIME.TPO	Object file for LANalyzer screens

A program called DIN is also included with the LANalyzer software distribution. This program displays trace files in TCP/IP format. It can also be used to print the contents of LANalyzer trace files. DIN is described in detail later in these release notes.

KNOWN BUGS AND PROBLEMS WITH THE LANALYZER EX 5000E

The following list enumerates the known bugs and problems in this release of the LANalyzer EX 5000E. Please inform Excelan if you find any additional problems.

- In the Collect Additional Packets field on the Edit Test screen, if you enter a value greater than 64K, the value used is the entered value mod 64K.
- An error message that either the trace file or the statistics file is full most likely means that the hard disk is full.
- If during installation you encounter the following error messages, you should ignore them:
  - Null pointer assignment
  - Bad command file name
  - File not found
- You should not overwrite the supplied sample tests (DEFAULT, HOSTS, and LOADNET). These tests are located in the directory \XLN\LANZ.
- On the AT&T 6300 the hardware installation procedure completes without returning the cursor to the screen. You can continue working without it or you can reboot the system to regain the cursor.

- You should not set the Transmit After/At Every Hr(s) field on the Edit Test screen to the value Transmit After Every 00:00:00 Hr(s). If this field is set to this value, the number of packets transmitted will be unpredictable and the system will probably crash (or appear to crash) and will have to be rebooted.

DIN
Command

Purpose: Displays LANalyzer trace file in Internet format.

Format: DIN [–b *n*] [–d] *filename*

Remarks: Specify the parameters:

[–b *n*] to curtail the amount of packet data displayed to a maximum of *n* bytes.

[–d] to enable debugging statements.

Description:

DIN interprets a LANalyzer trace file according to the Internet protocol standards. It recognizes Ethernet, IP, ICMP, and TCP protocol header formats. For each protocol layer, DIN prints a line or lines listing the protocol name and the header information. When DIN reaches a protocol layer it does not understand, it prints the remainder of the packet in hexadecimal/ASCII memory dump format.

For all packets, DIN displays the Ethernet header and LANalyzer trace information as in this example:

```
ether: IP  08-00-14-30-02-26 → 08-00-02-00-18-31
       82  913.931  14.645
```

If DIN recognizes the Ethernet type, it prints the type in symbolic format (IP in the above example). Ethernet addresses are printed in standard hexadecimal format, with the source address followed by the destination address. The packet's actual length, including the 4-byte CRC field, is printed in decimal format (82 in the above example). Finally, DIN prints two time values, with the decimal point between milliseconds and microseconds. The first is the time that has elapsed since the first packet in the trace file was

received. The second is the time that has elapsed since the previous packet was received.

A DIN command in the following format can be used to prepare the contents of a LANalyzer trace file to be printed:

DIN [options] *filename* > *newfile*

The file *newfile* can be printed with the appropriate command.

IP Packets

For all IP packets, DIN prints a line as in this example:

ip: TCP alaska → idaho

The protocol type and Internet addresses are shown in symbolic format, if known. DIN looks up the name corresponding to an Internet address in the HOSTS file. If the HOSTS file does not contain a corresponding name, then DIN prints the Internet address as two hexadecimal numbers separated by a period. The first number is the network number; the second number is the remainder of the address.

DIN scrutinizes each IP packet for inconsistencies and unexpected values. For each anomaly, it prints one of the following error messages:

- ip: BAD LENGTH: IHL=%d, TL=%d, PKT=%d

  The IP header length, IP packet length, and/or Ethernet packet length are inconsistent.

- ip: CKSUM ERROR: received=%x, calculated=%x

  The IP header checksum calculated by DIN is different from the observed value.

- ip: VERSION=%d

  The IP protocol version is not 4, the value required by the current specification.

- ip: TOS=%x

  The type of service field contains a nondefault value.

- ip: TTL=0

  The time to live is expired.

TCP Packets

For all TCP packets, *din* prints several lines similar to these:

```
tcp: TELNET → 1027  PUSH ACK
tcp: seq: 190536634  ack:  12971870  win: 2048
     len:   1
  0: 1b 4f 70                       ?Op          |
```

The first line shows the source and destination port values and any control bits that are set in the TCP header. The port values are shown either in decimal format or symbolically if they are a well-known application port value. The second line shows the sequence and acknowledgement numbers, the window size, and the length of data contained in the TCP packet. If the length is nonzero, DIN dumps the data in hexadecimal and in ASCII, 16 bytes per line. If a hexadecimal value has no printable ASCII definition, a question mark (?) character appears in its place.

ICMP Packets

For ICMP packets, DIN prints a line showing the ICMP type value and other information depending on the ICMP type. The ICMP type value is shown symbolically, if known. For ICMP types that use a code field, the code field value is also shown

symbolically. If the ICMP type uses identifier and sequence number fields, these are displayed in hexadecimal format. For example, a typical ICMP ECHO request packet would be shown like this:

```
icmp: ECHO      0    0    0
```

DIN calculates the ICMP checksum and prints the following line if it differs from the observed value:

```
icmp: CKSUM ERROR: received=%x,
      calculated=%x
```

If the ICMP packet contains additional information, DIN dumps it in hexadecimal/ASCII format.

Files: \XLN\TCP\HOSTS contains the HOSTS database

Bugs:

DIN does not perform IP packet re-assembly, and does not scrutinize TCP packets for consistency or proper checksum. It does not extract some useful tidbits (such as Ethernet errors) from the LANalyzer trace file.

EVALUATION OF THE LANALYZER EX 5000E

Please take a few moments to complete the following evaluation form and return it to Excelan.

Your name: _____

Organization & address: _____

_____

Model of PC machine: _____

DOS version level: _____

Did you experience installation problems? _____

_____

Comments and suggestions: _____

_____

Details: _____

_____

_____

Feature(s) you would most like to see added: _____

_____

_____

Overall evaluation: _____

_____

_____

_____

_____

_____

LANalyzer EX 5000E
Ethernet Network Analyzer
User Manual

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LANalyzer EX 5000E
User Manual

REVISION HISTORY

REVISION	DATE	SUMMARY OF CHANGES
A	2-10-86	Initial Release. LANalyzer EX 5000E Network Analyzer User Manual Publication No. 4200029-00

PREFACE

This manual provides information on how to install and use Excelan's LANalyzer EX 5000E Ethernet Network Analyzer.

The LANalyzer product consists of hardware and software components that install into an IBM PC XT, IBM PC AT, or compatible system and convert it into a powerful network monitor and analyzer system. The LANalyzer system can then be connected to an Ethernet or IEEE 802.3 compliant network to monitor, capture, and generate network traffic.

The LANalyzer EX 5000E is a useful tool for personnel associated with development, debugging, troubleshooting, and monitoring Ethernet or IEEE 802.3 networks.

The following is a list of reference and study material related to the LANalyzer EX 5000E:

[1] DEC, Intel, and Xerox Corporations, "The Ethernet: A Local Area Network: Data Link Layer and Physical Layer Specifications," Document Number T588.B/1080/15K, Intel Corp., September 1980.

[2] Institute of Electrical and Electronics Engineers, Inc., "IEEE Standards for Local Area Networks: Carrier Sense Multiple Access with Collision Detection (CSMA/CD) Access Method and Physical Layer Specifications," ANSI/IEEE Std. 802.3-1985, 1985.

DOCUMENT CONVENTIONS

The following documentation conventions are used in this manual to present various types of information. You should be familiar with these conventions before using this manual.

Numerical constants are given in decimal notation except in the following case: Hexadecimal numbers either are postfixed with an H or an h or are followed by the word (hex).

Italicized characters or words are used to represent LANalyzer commands. For example, in the statement

Press F10 (*cmd*)

cmd is the name of a command. *Italicized* characters are also used to represent descriptive names for items that the LANalyzer software replaces with appropriate parameters or values. For example, in the system message

filename.TST not found

the LANalyzer software replaces *filename* with the appropriate DOS filename.

Bold characters or words indicate the input you type as commands to the system or as responses to system prompts. These should be typed exactly as shown, unless the text indicates otherwise.

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Chapter 1
INTRODUCTION

1.1. INTRODUCTION

Excelan's LANalyzer EX 5000E Ethernet Network Analyzer is a powerful tool for monitoring, debugging, and characterizing local area networks. It is designed for use on networks based on the Ethernet (Version 1.0 or 2.0) or IEEE 802.3 standard.

The LANalyzer EX 5000E Network Analyzer has the following functions:

- Monitor network traffic. The LANalyzer EX 5000E examines all packets transmitted on the network.
- Capture, timestamp, and store packets or packet segments. The LANalyzer EX 5000E filters packets based on user-defined criteria, including packet length, packet content, errors, and time.
- Compute statistics about network activity. The LANalyzer EX 5000E computes, displays, and stores statistics about network utilization, network traffic rate, packet capture rate, packet sizes, errors, and interpacket time intervals.
- Generate network traffic. The LANalyzer EX 5000E transmits user-defined packets. The transmission rate and other transmission conditions are also under user control.

All LANalyzer functions are realized by setting up and running a test. A test is essentially a program in which the user specifies the criteria for capturing packets from and/or transmitting packets to the network. While a test is running, the status of the network is continually displayed in tables and graphs. In addition, test results are shown as the test progresses. The packets or packet segments captured during a test can be saved in the EXOS 225's buffer or to a disk file. After a test

concludes, the contents of captured packets can be displayed in hexadecimal and ASCII formats, and test statistics can be viewed as tables and graphs.

The LANalyzer EX 5000E is an indispensable tool for network administrators, field service/test engineers, and development programmers in the following applications:

- Network performance measurement
- Traffic analysis
- Network troubleshooting
- Network protocol and application debugging

The LANalyzer EX 5000E consists of three logical components: the EXOS 225 Ethernet Network Analyzer board, the LANalyzer software, and the associated hardware to connect the PC to the network. These components install on an IBM PC XT, IBM PC AT, or a compatible system. The LANalyzer components are available both as a kit and pre-installed in a COMPAQ PORTABLE 286 computer.

The EXOS 225 Ethernet Network Analyzer board is designed around an Intel 80186 CPU and an Intel 82586 LAN coprocessor; it has 1 Mbyte of RAM. The EXOS 225 performs at high speed the functions of packet collection, packet filtering, and network statistics calculation, thereby offloading this burden from the PC's CPU. The LANalyzer EX 5000E delegates to the PC's CPU the lower speed functions of user software control, screen updating, and disk I/O.

The LANalyzer software allows users to define network test conditions, to monitor network status while a test is in progress, and to view the results of the test. In addition, the LANalyzer software can collect and store statistics about network activity and test results.

As mentioned above, the LANalyzer EX 5000E is available in two forms: as a kit and as a complete system. The kit consists of the EXOS 225 Ethernet Network Analyzer board, the LANalyzer software, and the hardware needed to connect the

PC to the network. The EXOS 225 board installs in an expansion slot in the PC. The LANalyzer software runs under the DOS operating system (Version 2.0 or later). The complete system consists of a COMPAQ PORTABLE 286 computer in which the EXOS 225 board and the LANalyzer software, as well as DOS, have been pre-installed. A set of diskettes containing the LANalyzer software and DOS is also supplied with the complete system.

1.1.1. LANalyzer Features and Applications

The LANalyzer EX 5000E Network Analyzer offers the following features:

- Extensive packet filtering capabilities. Packet capture criteria can be specified on up to eight user-defined channels. One or more of these channels can be active during a test. Each channel filters network traffic, capturing only the packets that match user-defined criteria. Packet capture can be based on byte-level data patterns, error conditions, and packet size. Packets that meet Ethernet specifications, as well as those that do not, can be captured.

- Flexible triggering. When packet capture starts and stops can be based on keyboard input, packet activity on a user-defined channel, relative time, and/or absolute time.

- Traffic collection around an event of interest. The traffic immediately preceding and following a network event can be collected. Thus the pattern of network traffic prior to the event of interest and the subsequent reaction of the network to the event can be analyzed.

- Real-time display of network traffic activity. This allows rapid determination and analysis of network status.

- Statistics compilation. The LANalyzer EX 5000E computes and stores statistics on network utilization and performance. The statistics include data on network and channel utilization, packet counts, error

counts, peak packet rates, packet size distributions, and interpacket time intervals. LANalyzer statistics are displayed in tables and histograms.

- Error reporting. While a test is in progress, the LANalyzer EX 5000E continually reports the number of packets with errors that are observed, captured, and transmitted. Packets observed or captured are monitored for CRC, alignment, or size (smaller than Ethernet minimum 64 bytes) errors. Packets transmitted are monitored for collisions.

- Large on-board data buffer. The EXOS 225 Ethernet Network Analyzer board provides a 700-Kbyte packet data buffer. This allows for the capture of a large number of packet traces.

- High data capture rate. The large buffer on the EXOS 225 board allows the LANalyzer system to handle network traffic bursts of 700 Kbytes or sustained traffic of up to 1000 packets per second.

- Disk storage of packet traces and statistics for evaluation at a later time or different site. Up to 10.5 Mbytes of packet traces and up to 10.5 Mbytes of statistics can from a single test be stored in normal DOS files on the hard disk. (The actual number of packets that can be saved depends on their size.) Subject to this size limit as well as to the constraints imposed by the EXOS 225's buffer size, throughput to the hard disk, and the PC's bus speed, the LANalyzer EX 5000E can save to disk all packets that meet user-defined criteria.

- Traffic generation. The LANalyzer EX 5000E can transmit packets on the network to test specific channels. Packet contents are user-definable, and transmission errors (including CRC, collision, preamble, and backoff) can be forced.

- Network load generation. Various loads, up to 97% of full network saturation, can be induced to aid in characterizing network performance.

- Retransmission of packets collected from the network. Packets collected from a previous test can be modified, if desired, and retransmitted over the network. This allows for verifying protocol paths when debugging networking software.

- Rapid post-test analysis. The LANalyzer software searches quickly through captured packet for byte patterns, events, and/or errors. Packet contents can be viewed simultaneously in hexadecimal and ASCII formats.

- Packet numbering and timestamping. Captured packets are sequentially numbered and timestamped. This provides for easy reference when reviewing test results and aids in identifying performance problems.

- Unattended operation. Predefined tests can be run without any user interaction. For examples, a test can be run during the night or over the weekend. Test results can be saved to a DOS file and reviewed after the test completes.

- Portability. When installed in a COMPAQ portable computer or another PC-compatible portable computer, the LANalyzer EX 5000E can be transported to a remote site for use by field service personnel. In addition, since test, trace, and statistics files are normal DOS files, they can be copied to floppy diskettes and sent to remote systems, or transferred via modem.

The LANalyzer EX 5000E is a multipurpose tool for network analysis and debugging. It can be used by network administrators, field test/service engineers, and software developers in a variety of applications. These include the following:

- Troubleshooting network problems, such as system faults and random software bugs
- Isolating bugs encountered during protocol and/or network development
- Testing and integrating protocol and network application software systems
- Gathering network statistics
- Characterizing the performance and utilization of a local area network
- Monitoring the impact of new nodes on the performance of a local area network
- Characterizing local area network operation under different traffic loading conditions

1.1.2. Manual Organization

This manual is organized as follows:

Chapter 1, Introduction, provides an overview of the functions and capabilities of the LANalyzer EX 5000E Ethernet Network Analyzer.

Chapter 2, Installation, describes how to ready the LANalyzer system for use. For the kit, this chapter describes the procedures for installing the LANalyzer hardware and software. For the LANalyzer package, this chapter describes how to check the pre-installed hardware and software before use to ensure they have not been damaged in shipment.

Chapter 3, Getting Started, is a tutorial introduction to the LANalyzer software. Using a sample test that is supplied with

the system software, this chapter leads you through a hands-on session designed to familiarize you with the different facets of the LANalyzer system.

Chapter 4, User Interface, discusses the means by which you pass information to and receive information from the LANalyzer system.

Chapter 5, Creating a Test, describes how to define the criteria for running a test.

Chapter 6, Running a Test, explains how to run a previously defined test. It also explains the screens on which to observe the results of a test in progress.

Chapter 7, Displaying Packet Traces, discusses how to view the packet traces collected during a previously run test.

Chapter 8, Displaying Test Statistics, describes how to view the test statistics computed and saved by the LANalyzer system.

Chapter 9, Sample Tests, explains the sample tests provided in the LANalyzer software distribution. These general-purpose tests illustrate the capabilities of the LANalyzer system.

Appendix A, LANalyzer Specifications, gives the specifications for the various LANalyzer components.

Appendix B, Configuration File Format, describes the contents of the configuration file (\XLN\HARDWARE\EXCELAN.HDW).

An index is provided at the end of this manual for easy cross-reference.

1.2. INSTALLATION

The LANalyzer EX 5000E is available in two forms: as a kit and as a package pre-installed in a COMPAQ PORTABLE 286 computer. Both provide the same LANalyzer functionality.

The kit consists of the following hardware and software components:

- One EXOS 225 Ethernet Network Analyzer board.
- Standard 5-1/4" floppy diskettes containing the hardware diagnostics, the installation software, and the EX 5000E system software.
- One Excelan Series 1100 transceiver.
- One transceiver cable.

The LANalyzer kit installs in an IBM PC XT, an IBM PC AT, or a PC-compatible system. The LANalyzer software runs under the DOS operating system (Versions 2.0 or later). The PC requires the following minimum hardware configuration:

- One low-density (360-Kbyte) floppy disk drive
- One 10-Mbyte hard disk
- One vacant board expansion slot
- 512 Kbytes of RAM
- Power supply capable of supporting all installed boards and attached peripherals

The EXOS 225 board is installed into a vacant expansion slot in the PC. The LANalyzer INSTALL program is then run. This program sets up board configuration parameters, and runs diagnostics on both the host PC and the EXOS 225's CPU (an Intel 80186 microprocessor). Finally, the LANalyzer system software is installed.

The LANalyzer package consists of a COMPAQ PORTABLE 286 computer in which the EXOS 225 board, the LANalyzer software, and DOS Version 3.x have been pre-installed and tested. In addition, an Excelan Series 1100 transceiver and a transceiver cable are included.

1.3. GETTING STARTED

All functions of the LANalyzer EX 5000E are realized by setting up and running a test. A test is a program of user-defined criteria that specify the conditions under which to collect packets from and/or transmit packets to the network.

When a test is run, its results are continuously displayed on the screen. Packet traces (information about captured packets, as well as their data) collected during the test are temporarily stored in the EXOS 225 board's memory. They can be displayed immediately after the test concludes. Traces can optionally be saved to DOS files on the hard disk for review and analysis at a later time.

A default test is provided with the software. It serves as an example of how a LANalyzer test is set up and run, and how test results can be displayed.

1.4. USER INTERFACE

The basic user interface to the LANalyzer software consists of the PC's keyboard and screen. The keyboard provides the means for user input, while the screen provides a means for the LANalyzer software to echo input and display output.

The alphanumeric and symbol keys on the keyboard retain their standard meanings. The labeled symbol keys on the ten-key numeric keypad, sometimes in combination with other keyboard keys, control cursor movement. The function keys are redefined to correspond to LANalyzer commands: most commands are entered by simply pressing a function key. The commands corresponding to the function keys are displayed on the lower portion of the screen.

Input to and output from the LANalyzer software is done on screens shown on the display. A typical screen identifies the task with which it is associated and contains parameter identifiers, current settings for these parameters, and a list of commands associated with each of the function keys.

The LANalyzer software is organized into four main groups of screens. Each group consists of several screens.

- Edit Screens. These screens allow the user to specify test criteria.
- Run Screens. These screens display the results of a test in progress.
- Trace Screens. These screens show information about and the contents of packets collected during a test.
- Statistics Screens. These screens display the statistics about the packets collected and/or transmitted during a test.

1.5. CREATING A TEST

LANalyzer functions are realized by creating and running a test. When creating a test, the conditions under which packets will be collected and/or transmitted are defined on the Edit screens.

Incoming packets can be filtered on up to eight separate, user-defined channels to match eight different sets of specific criteria. Match criteria include packet length and content, and the types of errors the packet contains. The entire packet or a segment (slice) of it can be collected. Start and stop triggers for packet collection are user-definable and can be specified in terms of absolute time, time elapsed since the test began, and/or packet activity. Packet traces and test statistics (compiled by the LANalyzer software) can be saved to DOS files for future reference.

Six channels are available for defining transmission packets. The contents of a packet to be transmitted are user-definable, with the exception of the preamble and CRC fields, which the LANalyzer software supplies. Packets that do and do not conform to Ethernet specifications can be defined for transmission. In addition, the interval between the transmission of successive packets can be controlled and a packet being transmitted can be forced to collide with network traffic.

1.6. RUNNING A TEST

Once the conditions of a test have been defined, the test can be run. While a test is in progress, the Run screens display the results of the test. The results include counts of packets observed on the network, packets collected on user-defined channels, and packets transmitted. Graphs of network and channel utilization are also shown. Tests results are displayed in real time, so network status can be continually monitored.

1.7. DISPLAYING PACKET TRACES

The LANalyzer EX 5000E collects traces of all packets or packet segments that meet user-defined criteria. A trace, or packet trace, is a record of the packet or packet segment. Each packet trace includes information about when the test was run, how many traces were collected during the test, the packet's length, and the packet's contents.

Packet traces can be stored in the EXOS 225 buffer, which can hold up to 700 Kbytes of packet data. (The actual number of packets saved depends on the packet size.) Optionally, traces can be saved to several disk files, which can hold a maximum of 10.5 Mbytes. Packets are numbered sequentially and timestamped when collected for easy identification.

Packet traces are viewed on the Trace screens. Traces stored in the board's memory can be viewed immediately following completion of the test, while those stored to disk files can be viewed any time after the test completes.

The Trace screens display summary information and the data contents of packets or packet slices. Summary information includes the sequential packet number and the time the packet was captured, the packet size, which channel(s) it was received on, and what types of errors it contains, if any. The packet's data are displayed simultaneously in hexadecimal and ASCII formats. A search function allows rapid location and display of individual captured packets.

Packets collected during a test can be retransmitted over the network in a subsequent test.

1.8. DISPLAYING TEST STATISTICS

On request, the LANalyzer software can compute statistics about a test. Statistics are saved to a DOS file and can be viewed on the Statistics screens. The primary function of the LANalyzer statistics is to allow a user to step through an entire test moment by moment. In this way, a test performed unattended can be re-created and analyzed.

Statistics are displayed both numerically and in graphical format. They report information on all packets observed on the network, packets received and transmitted at various times, and network utilization during the test.

1.9. SAMPLE TESTS

The LANalyzer software distribution includes several sample tests. These illustrate the capabilities of the software, and demonstrate how to create and run a test, and how to view and interpret test results. The samples are general-purpose and can usually be used with little or no modification to monitor a network at any site.

The sample tests provided with the software perform the following functions:

- Collect all packets transmitted and all packets broadcast on the network
- Place a load on the network by rapidly transmitting large numbers of packets
- Monitor communication between two hosts on the network

Chapter 2
INSTALLATION

2.1. INTRODUCTION

The LANalyzer EX 5000E system hardware and software are supplied in two forms: as a kit and as a complete package. You will need to install the kit in an IBM PC XT, IBM PC AT, COMPAQ PLUS, COMPAQ PORTABLE 286, or a compatible personal computer. To use the LANalyzer kit, your PC must have a diskette driver, a 10-Mbyte hard disk, and 512 Kbyte of RAM. The LANalyzer package requires no installation: it is a ready-to-use system.

This chapter describes the installation of LANalyzer kit hardware and software in an IBM PC XT. The installation process is quite similar for IBM PC AT. For other PCs, the process may vary considerably. This chapter also describes the preparations that you should make before using the LANalyzer package.

The LANalyzer kit includes the following:

- One EXOS 225 Ethernet Network Analyzer board
- Standard 5-1/4" floppy diskettes (inside the LANalyzer User Manual)
- One LANalyzer User Manual
- One EXOS 1100 Series transceiver (AMP-style transceiver with SQE)
- Twenty feet of transceiver cable

Before you can start using the LANalyzer software on your PC, you will need to install the supplied EXOS 225 board, connect the PC to the network using the supplied Ethernet cable and transceiver, and then install the LANalyzer software. Section 2.2 describes the hardware installation, and Section 2.3 describes the software installation.

The LANalyzer package consists of a COMPAQ PORTABLE 286 computer in which the LANalyzer software and the EXOS 225 board, as well as DOS Version 3.x, have been pre-installed. After a few short checks to ensure nothing has been damaged during shipment, your LANalyzer package should be ready to use. Section 2.4 describes how to prepare the package for use.

2.2. HARDWARE INSTALLATION

The EXOS 225 Ethernet Network Analyzer board, which is supplied as part of the LANalyzer kit, installs into one of the vacant full-length expansion slots of the IBM PC XT, IBM PC AT, or a compatible personal computer.

Before you begin installing the board into your PC, you need to understand the board's configuration, which is described below.

As shipped from the factory, the EXOS 225 is configured to utilize the following addresses and interrupt level on the PC. These values are used by the LANalyzer INSTALL program (on the hardware installation and diagnostics diskette) as well as by the LANalyzer software. If necessary, these settings can be jumper-reconfigured.

Memory: A0000 – AFFFF (hex)

I/O space: 310 – 317 (hex)

Interrupt: Level 2

Normally, you will not need to change the above configuration. However, it will be necessary to change it if the values listed above are used for any other purpose. For example, a PC using a graphics display card may already be using some of the above addresses. In such cases, the default values can be changed by reconfiguring the jumpers on the board. Refer to Section 2.2.3 for jumpering information. The newly configured values must then be written to the configuration file – either by directly editing the file or by running the LANalyzer INSTALL program and supplying these values interactively. Refer to Sections 2.3 and 2.4 for details.

The physical installation of the EXOS 225 board into the PC is described in Section 2.2.1. After installing the board, you will need to run the INSTALL program which resides on the EXOS 225 hardware installation and diagnostics diskette. This program lets you specify various configuration data for the EXOS 225 board, which the program then writes to the configuration file. The INSTALL program then runs diagnostics, which exercise various components on the board. The INSTALL program and the diagnostics are described in Section 2.2.2.

Once the EXOS 225 is installed and the diagnostics run successfully, you can install and use the LANalyzer software.

2.2.1. Installing the EXOS 225

The following equipment and tools are required to install the EXOS 225 board into the PC and then to connect the PC to an Ethernet network:

- Your PC – IBM PC XT, IBM PC AT, COMPAQ PLUS, COMPAQ DESKTOP 286, COMPAQ PORTABLE 286, or a compatible PC. The PC must have a hard disk.
- An EXOS 225 Ethernet Network Analyzer board
- A plastic card guide
- A transceiver drop cable
- An Ethernet Version 1.0 or 2.0 transceiver or an IEEE 802.3 transceiver
- A medium-size, flat-head screwdriver (or a 1/4" and a 3/16" nutdriver) and/or other tools required to install an expansion board. Refer to the user manual for your PC.

All the items listed above except the first and last are supplied as part of the LANalyzer kit.

NOTE

Ensure that the PC's power supply is capable of supporting all the boards installed in and all the peripherals attached to the PC. The power supply's specifications are listed in your PC's user manual. The power requirements of the EXOS 225 board are listed in Appendix A of this manual. The power requirements of other boards and peripherals should be listed in their operations manuals.

Installation Procedure

The following is the step-by-step procedure for installing the EXOS 225 into a PC. Specifically, this procedure is applicable for IBM PC XT systems only. For other systems, refer to the manufacturer's expansion board installation guide or manual.

1. Determine if the default configuration of the EXOS 225 is suitable for your system. If suitable, continue with Step 2. Otherwise, reconfigure the board as described in Section 2.4, note the new configuration information, and then continue with Step 2. (The new configuration information is used when the diagnostics are run. Refer to Section 2.3.)

2. Turn off the power to the PC.

3. Place your PC on firm flat surface, such as a table or a desk top, with ample work space around it.

4. Disconnect and remove the following cables from the back panel of the system unit. See Figure 2-1 for system unit identification and Figure 2-2 for identification of the various cables.

   - Main power cable
   - Monitor power cable
   - Keyboard cable
   - Monitor cable

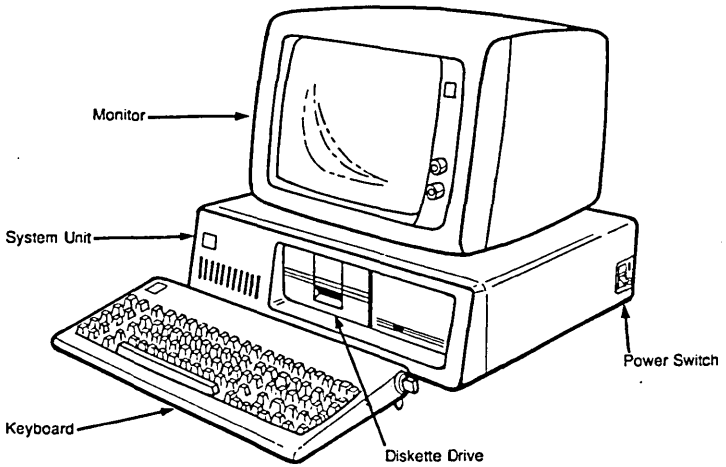


Figure 2-1: An IBM PC XT System

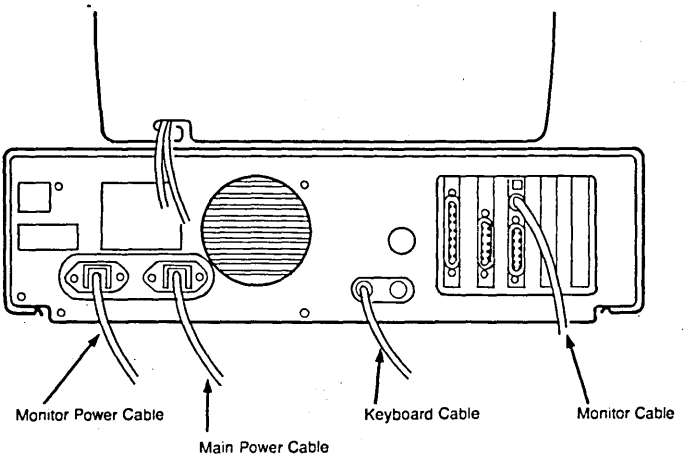


Figure 2-2: Removing the Cables

5. Put aside the keyboard and the monitor.

6. Remove the five screws that hold the system unit shell and the components chassis together. See Figure 2-3.

7. Hold the shell from the front and slide it out as illustrated in Figure 2-4.

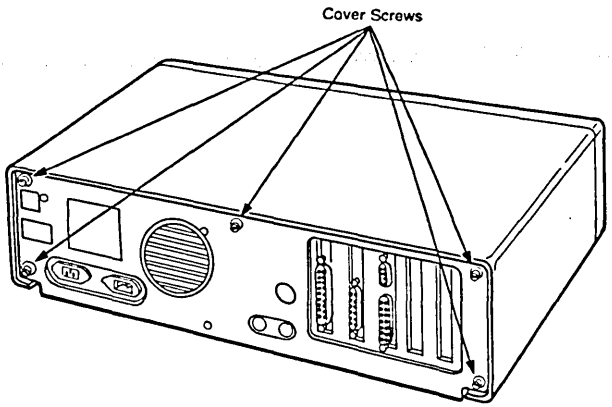


Figure 2-3: Removing/Replacing the Shell Screws

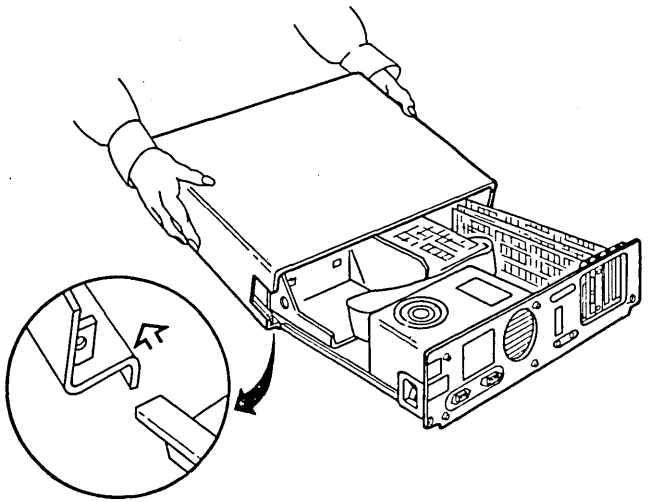


Figure 2-4: Removing the System Unit Shell

8. Locate an unused full-length expansion slot in the chassis. (Note that when installing the board into an IBM PC AT, the expansion slot must be a 16-bit slot.) Unscrew the cover plate at the rear of that slot. See Figure 2-5.

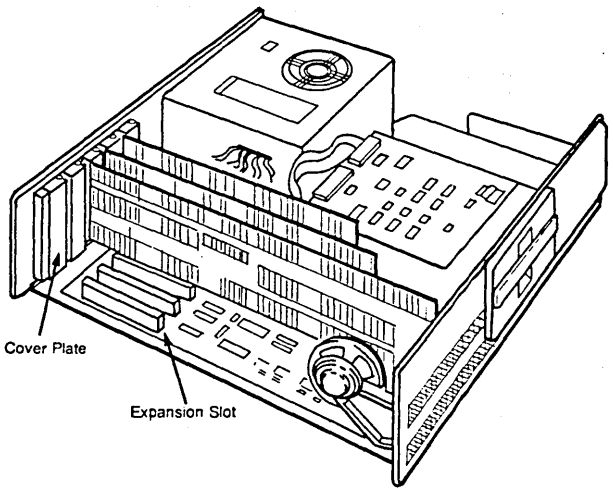


Figure 2-5: The Expansion Slots

9. If not already present, install the card guide by inserting it into the holes in the front panel. Make sure the plastic arrows in the guide point downwards. See Figure 2-6.

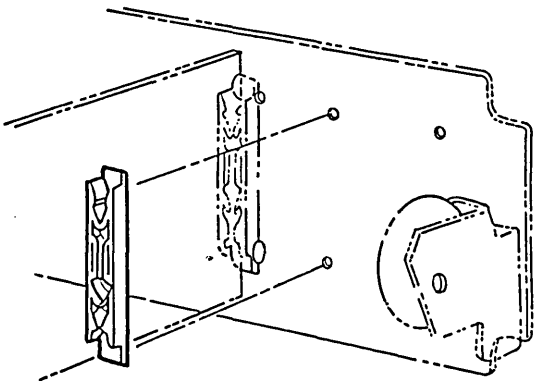


Figure 2-6: Installing the Card Guide

10. Install the EXOS 225 board in the system unit: Gently slide the board into the plastic guide on the front panel and along the side slot uncovered in Step 8. Press the board firmly into the expansion slot, making sure that the board's edge connector mates securely with the motherboard's connector. Screw down the panel slot bracket, making sure the D-connector is centered in the panel slot. See Figure 2-7.

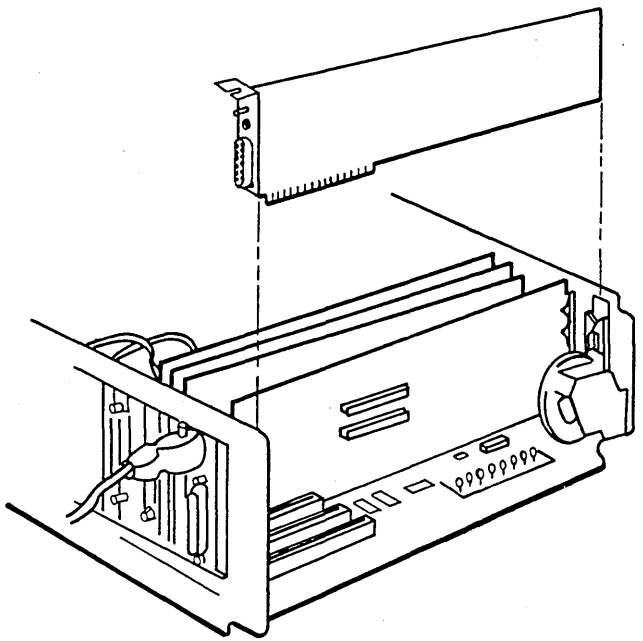


Figure 2-7: Installing the EXOS 225 Board

11. Replace the system unit shell by positioning the cover under the runners on the base with the front of the shell tilting upwards. Slide the shell over the base towards the rear of the unit until seated. See Figure 2-8.

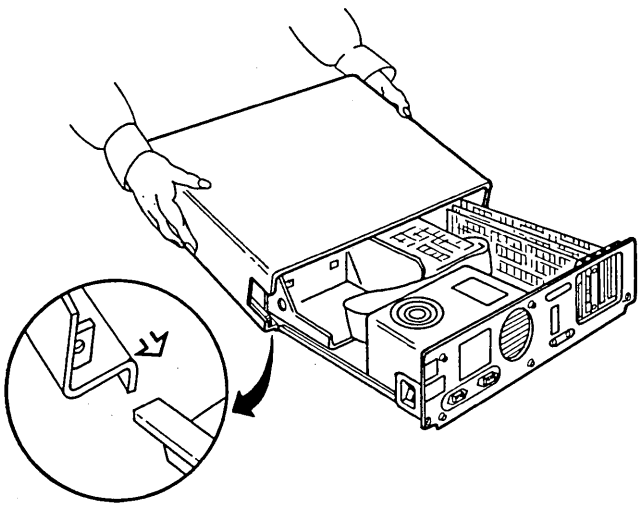


Figure 2-8: Replacing the System Unit Shell

12. Replace the five cover screws. See Figure 2-3.

13. Replace the following cables that were removed in Step 4:

    - Main power cable
    - Monitor power cable
    - Keyboard cable
    - Monitor cable

14. Attach the male end (the end with locking posts) of the transceiver drop cable to the D-connector of the EXOS 225 (which is now accessible from the outside of the PC) and secure it by moving the slide latch as shown in Figure 2-9.

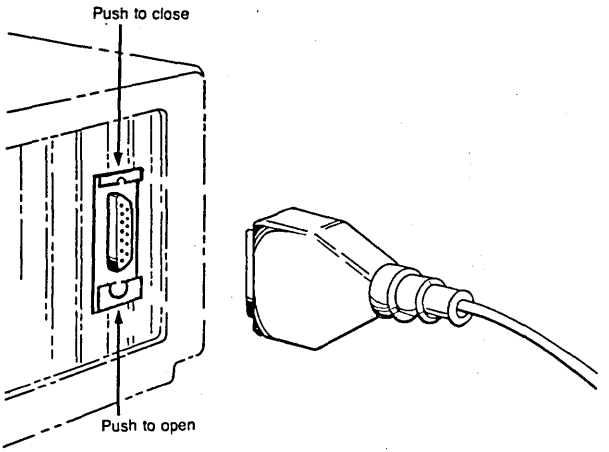


Figure 2-9: Attaching the Transceiver Drop Cable

15. Attach the female end (the end with slide latch) of the transceiver drop cable to the transceiver on the network.

Following Step 15, the installation of the EXOS 225 Ethernet Network Analyzer board into the PC and its connection to the network are complete. You are now ready to run the diagnostics, which are described in the next section.

2.2.2. Running the INSTALL Program and Diagnostics

The EXOS 225 hardware diagnostics and installation diskette contains the INSTALL program and diagnostics. The INSTALL program sets up various board configuration parameters by reading data from the configuration file; you can also supply these parameter values interactively. The program also runs diagnostics, which are divided into two sets: one set is executed by the host PC; the other is executed by the 80186 CPU on the EXOS 225. The diagnostics exercise the on-board RAM, the 82586 Ethernet controller, the Ethernet serial interface chip, the connected transceiver, and the on-board Ethernet PROM. In addition, the diagnostics run three interrupt tests.

Note that as supplied from Excelan, the hardware diagnostics and installation diskette is write-protected. You should not remove the write protection.

The step-by-step procedure for running the diagnostics is given below. Naturally, before running the diagnostics, the EXOS 225 must have been installed as described in Section 2.2. Also, the EXOS 225 must be connected to the network through a transceiver and transceiver cable; otherwise, the diagnostics will fail.

1. Boot your system from DOS. (The LANalyzer software operates under DOS Version 2.0 or later.)

2. Check to see if your hard disk has the system file CONFIG.SYS with the entry DEVICE=ANSI.SYS. If this file is present, skip to Step 3.

If not already present, create the system file CONFIG.SYS with the following entry and then reboot the system.

```
DEVICE=ANSI.SYS
```

3. Insert the EXOS 225 hardware diagnostics and installation diskette into drive A.

4. Enter the following command to input configuration information prior to running the diagnostics. Note that following Step 7, the configuration information is saved to the configuration file on the currently logged drive (drive C, the hard disk).

   C> **A:INSTALL**

   You will be prompted for the directory path (refer to Step 5) and for configuration information (refer to Step 6) if you have not previously installed the board and entered this information. If you have already entered some of the information, you will be prompted only for what the system needs.

5. If the configuration file is not already present on the hard disk, you will be prompted to enter the directory path as follows. Enter "\xln" as shown and then press Return.

   ```
   Please enter the directory path where you wish the
   Excelan support software to be located: \xln
   ```

   You will then be prompted to confirm your entry, as follows. Enter a "y" response, as shown, and then press Return.

   ```
   The path for Excelan software will be : \xln
   Is this Ok (yes or no)? y
   ```

6. You are then prompted for the board configuration values, as follows. To enter the default values, simply press Return after each prompt. The default values are for the board as shipped from the factory. If you have changed the board, you will need to enter the

proper values. Note that the values for IOBASE and MEMBASE are given in hexadecimal. If you enter numbers for these values, you must append an "h" to the number (for example, 302h). Refer to Section 2.2.3 for information on entering other values.

Please enter monitor type
(M for monochrome, C for color):

Please enter the value for IOBASE
(default [310h]):

Please enter the value for MEMBASE
(default [A000h]):

Please enter the value for SIGNAL (default [2]):

7. At this point, the system displays the following messages:

   Checking the installation of the EXOS 225 board.
   EXOS 225 diagnostics started

   The system then begins running the diagnostics.

   When the diagnostics are running, the screen shows various test names, associated parameters, and a zero error count for each test. For each test, the test data and status flash in the lower part of the screen.

   Finally, one of the following messages appears at the bottom of the screen:

   Tests completed: PASSED

   Tests completed: FAILED

   This message is followed by the DOS prompt, indicating that control has returned to the operating system.

If the diagnostics fail, you should re-examine the configuration file data and run the procedure again. If the diagnostics still fail, you should contact your LANalyzer supplier for assistance.

If the diagnostics pass, the EXOS 225 is healthy and has been installed correctly. You can now install the LANalyzer software, as described in Section 2.3.

At the conclusion of Step 7, the configuration information entered in Step 6 is written to the file \XLN\HARDWARE\EXCELAN.HDW on the currently logged drive, that is, the hard disk. A detailed description of the configuration file is provided in Appendix B.

2.2.3. Reconfiguring the EXOS 225

As shipped from the factory, the EXOS 225 is configured for use in the PC you ordered it for. The following default values are set for all boards, regardless of the PC type. These defaults can be changed as described in Sections 2.2.3.1 through 2.2.3.4. (Note that the parameters discussed in these sections are the only ones that can be changed while maintaining compatibility with the LANalyzer software supplied by Excelan.)

Memory: A0000 – AFFFF (hex)

I/O space: 310 – 317 (hex)

Interrupt: Level 2

In addition, the EXOS 225 board can be configured to operate with either an Ethernet Version 1.0 transceiver or and Ethernet Version 2.0/IEEE 802.3 transceiver. Configuring the board in this way is described in Section 2.2.3.5.

CAUTION

If you plan to use both the EXOS 225 and EXOS 205 boards in the same PC, you must ensure that the memory address and I/O space mappings, and the interrupt levels do not conflict. You should also ensure that line containing the DISPLAY keyword is the last entry in the configuration file.

2.2.3.1. Changing the Host

If the board is to be installed in a different host from the one for which you ordered the LANalyzer kit, the board should be jumper-reconfigured as described in Table 2-1. Then the configuration file modified either by editing or by running the INSTALL program.

Table 2-1: Jumper Configuration for Different Hosts

Host PC	Jumper Configuration	
IBM PC XT or	J6-1 through J6-8	In
COMPAQ PLUS	J7	Out
	J10 (2-3)	In
	J14, J15, J16	In
	J17, J18, J19	In
IBM PC AT or	J6-1 through J6-8	Out
COMPAQ 286	J7	In
	J10 (1-2)	In
	J14, J15, J16	Out
	J17, J18, J19	Out

2.2.3.2. Changing the Memory

The EXOS 225 uses a 64-Kbyte block of the PC's memory address space. The default block is A0000-AFFFF (hex). The memory block, which must be on a 64K boundary, can be changed by reconfiguring jumpers J8 and J9 (refer to Table 2-2). The configuration file should then be modified either by editing or by running the INSTALL program.

Table 2-2: Jumper Configuration for Different Memory Blocks

Memory Block (Hex)	Jumper Configuration J8	J9
80000-8FFFF	In	In
90000-9FFFF	Out	In
A0000-AFFFF*	In	Out
B0000-BFFFF	Out	Out

* Default setting

2.2.3.3. Changing the I/O Space

The EXOS 225 uses a block of eight addresses in the PC's I/O space. The default block is 310-317 (hex). If necessary, a different I/O block can be selected by reconfiguring the jumpers in J11 as shown in Table 2-3. The configuration file should then be modified either by editing or by running the INSTALL program.

Table 2-3: Jumpers for I/O Address Configuration

I/O Block (Hex)	Jumpers J11-1	J11-2	J11-3	J11-4	J11-5
300-307	In	In	In	In	In
308-30F	In	In	In	In	Out
310-317*	In	In	In	Out	In
318-31F	In	In	In	Out	Out
320-327	In	In	Out	In	In
328-32F	In	In	Out	In	Out
330-337	In	In	Out	Out	In
338-33F	In	In	Out	Out	Out
340-347	In	Out	In	In	In
348-34F	In	Out	In	In	Out
350-357	In	Out	In	Out	In
358-35F	In	Out	In	Out	Out
360-367	In	Out	Out	In	In
368-36F	In	Out	Out	In	Out
370-377	In	Out	Out	Out	In
378-37F	In	Out	Out	Out	Out

* Default

2.2.3.4. Changing the Interrupt Level

The EXOS 225 uses one interrupt level on the PC. The factory setting is interrupt level 2, which is set by the presence of jumper J12-6. If this causes any conflict with the PC's configuration, the interrupt level can be changed to any level from 2 to 7. To change the interrupt level, install the applicable jumper as shown in Table 2-4. The configuration file should then be modified to reflect the change.

Table 2-4: Jumpers for Selecting the Interrupt Level

To Select Interrupt Level	Install Jumper
2*	J12-6
3	J12-1
4	J12-2
5	J12-3
6	J12-4
7	J12-5

* Default

2.2.3.5. Selecting the Transceiver Type

As shipped from the factory the board is configured to run with an Ethernet Version 1.0 transceiver. The EXOS 225 board can also be configured to operate with an Ethernet Version 2.0 or IEEE 802.3 transceiver.

When configured to operate with a Version 1.0 transceiver, the board does not check the SQE (Signal Quality Error, or heartbeat) test. (This test is performed after every transmission by an IEEE 802.3 or Ethernet Version 2.0 transceiver. It checks whether the collision detection circuitry in the transceiver is functional.) Also, when configured in the Version 1.0 mode, the output is DC-coupled; that is, the idle voltage is nonzero.

When configured to operate with a Version 2.0 or IEEE 802.3 transceiver, the SQE test is enabled. Also, when in this mode, the output is AC-coupled; that is, the idle voltage is zero.

The transceiver configuration is defined by jumper J5. If this jumper is present, the board is in Version 1.0 mode (the factory setting). If this jumper is absent, the board is in Version 2.0/IEEE 802.3 mode.

2.3. LANALYZER SOFTWARE INSTALLATION

After the EXOS 225 board has been installed in the PC and the PC connected to the network as described above, the LANalyzer software is installed. The LANalyzer software is found on the system software diskette.

Note that your PC must be running DOS Version 2.0 or later in order to install and use the LANalyzer software.

Also note that as supplied from Excelan, the system software diskette is write-protected. You should not remove the write protection.

2.3.1. Installation Procedure

The following is a step-by-step procedure for installing the LANalyzer software on your PC. (In the description of the procedure, it is assumed that no problems are encountered. If any problem is encountered, the system displays an error message. Refer to Section 2.3.2 for details.)

1. Make sure that the EXOS 225 board has been installed in your PC and that the PC has been connected to the network, as described in Section 2.2.

2. Ensure that no floppy diskette is installed in drive A (or drive B, if present) so that the system boots from the hard disk (drive C).

3. Power up the PC.

4. Insert the LANalyzer system software diskette into drive A of your PC.

5. Type the following command:

   C> **A:INSTALL**

   This initiates execution of the INSTALL program, which installs the system software on the hard disk.

   After some time, the system displays the following message:

   ```
   Please enter the directory path where you wish the
   command files to be placed.
   This directory path should be included in the
   MS-DOS PATH command.
   ```

6. Enter the directory path as prompted.

   The system then prompts you to confirm the directory pathname:

   ```
   The path for the command files will be: directory_name
   Is this Ok (yes or no)?
   ```

   Type **y** if *directory_name* is correct. Type **n** if it is incorrect; the system then reprompts you for the directory path.

   After several moments, the system may display the following two lines, which you should ignore.

   ```
   C>ECHO OFF
   Unable to create directory
   ```

   After about a minute, the system displays the following message and then returns to DOS (indicated by the prompt C>).

   ```
   EX5000E software installation is complete.
   C>
   ```

7. Include the directory path specified in Step 6 in the directory search path. Refer to your DOS manual for information about the PATH command.

8. Append the file \XLN\LANZ\LANZRUN.BAT, which is supplied on the LANalyzer software diskette, to the AUTOEXEC.BAT system file so that the LANalyzer driver and EXOS 225 board code are loaded each time the PC is booted. This can also be accomplished by editing the AUTOEXEC.BAT system file to include the following two command lines:

   LANZDRIV
   LANZLOAD

Following Step 8, you can begin using the LANalyzer software, as described in Chapter 3, Getting Started.

2.3.2. Error Messages

During the LANalyzer software installation process, you may encounter the following two error messages. Both may be displayed after you try to execute Step 5 above. The cause and cure for each problem is also indicated in the message.

- Cannot install software from an invalid software diskette. Please insert valid diskette and retype the INSTALL command.

- The Configuration File is not created/present on the system hard disk. Please install the hardware as described in the user manual; this will also create/update the Configuration file.

2.4. LANALYZER PACKAGE SETUP

The LANalyzer package consists of a COMPAQ PORTABLE 286 computer in which the EXOS 225 board, the LANalyzer software, and DOS Version 3.x have been pre-installed and tested. The package also includes a transceiver and transceiver cable.

As shipped from the factory, the LANalyzer package is ready to use. However, you may want to change the DOS environment

under which the LANalyzer software runs. Also, you may encounter problems in using your LANalyzer package at first because the hardware and/or software may have been damaged during shipping. This section describes the modifications you can make to DOS. This section also explains the steps to take if the LANalyzer hardware and/or software do not appear to be working properly.

Before using the LANalyzer software, you may want to check that the factory-supplied AUTOEXEC.BAT file and the path are suitable for your needs. If they are not, you can modify them.

The AUTOEXEC.BAT file provided with LANalyzer contains the following commands. (This list also explains the purpose of each command.)

ECHO OFF	*Disable screen echoing*
PATH= C:;C:\DOS;C:\LOCAL	*Set command search path*
MODE SPEED=COMMON	*Set operating speed for COMPAQ 286*
EXCELAN=\XLN	*Set directory for Excelan support software*
LANZDRIV	*Load LANalyzer driver*
LANZLOAD	*Load EXOS 225 board code*
LANZ	*Invoke LANalyzer software*

You can modify this file as necessary to meet your needs. However, if you want the LANalyzer software to be loaded and invoked each time the system is booted, the following lines must remain in the AUTOEXEC.BAT file:

```
PATH= C:;C:\DOS
MODE SPEED=COMMON
EXCELAN=\XLN
LANZDRIV
LANZLOAD
```

In addition to the directories specified by the PATH command shown above, you should include the directory path in which the LANalyzer commands files are located. (This is the same directory path specified in Step 6 of the software installation; refer to Section 2.3.1.) You can also include additional

directories in the PATH command. Refer to your DOS manual for information about the PATH command.

The directory specified in the command line "EXCELAN=*directory_name*" is the one that contains the Excelan support software. (The support software includes the object files for the LANalyzer screens [files with the extension .TPO] and the file MONITOR.86, which contains the EXOS 205 board code.) Actually, the support software resides in the directory *directory_name*\LANZ. If you move this software to a different directory, you should modify this line in the AUTOEXEC.BAT file accordingly.

If any problem arises while using the LANalyzer system for the first time, you can attempt to correct it by performing one or more of the following steps, depending on the nature of the problem:

1. If you cannot invoke the LANalyzer software properly, check that the files CONFIG.SYS and ANSI.SYS are both present on drive C.

2. If you suspect a problem with the disk drive(s), run the DOS CHKDSK command. Refer to your DOS manual for information on this command.

3. If you suspect a problem with the EXOS 225 board, run the LANalyzer diagnostics. These are described in Section 2.2.2.

4. If the above steps are unsuccessful, re-install the LANalyzer software. This is described in Section 2.3.

If the problem persists, contact your LANalyzer supplier for assistance.

Chapter 3
GETTING STARTED

3.1. INTRODUCTION

The LANalyzer EX 5000E system hardware and software are normally supplied in a kit form, which you must install into an IBM PC AT, IBM PC XT, or compatible PC. Once you have installed the hardware and software, as described in Chapter 2, you are ready to get started using the LANalyzer system.

As has been mentioned in Chapter 1, the main functions of the LANalyzer EX 5000E are to monitor traffic on a local area network, to generate traffic on the network, to capture and store packets (or packet segments), and to compile and save statistics about various network activities. These functions are realized by setting up and running tests.

A test is a program in which various control parameters are specified. The test parameters can be saved to a normal DOS file. (The LANalyzer software supplies the extension ".TST" to the test filename before saving it.) When a test is run, its results are displayed in real time on the screen. The packets collected during a test reside in the EXOS 225 board memory and can be displayed immediately after a test concludes. Optionally, the collected packets can be saved to a DOS file.

This chapter, as the name suggests, is intended to get you started using the LANalyzer system. It provides a hands-on session which runs a test that is supplied as part of the system software. The chapter provides annotation at various stages of test execution.

Most LANalyzer commands are executed by pressing function keys on the PC's keyboard. In this chapter and throughout this

manual, the following documentation convention is used to indicate execution of a command:

Press function key F*n* (*command*)

or

Press F*n* (*command*)

Both mean that you execute the command *command* by pressing function key F*n*, where *n* is the number of the function key. For example, "Press function key F2 (*run*)" means that you should execute the *run* command by pressing function key F2. "Press F2 (*run*)" has the same meaning.

3.2. RUNNING THE DEFAULT TEST

A default test is provided as part of the LANalyzer system software. This test resides in the file \XLN\LANZ\DEFAULT. The test accomplishes the following:

- Observes all packet traffic activity on the network
- Collects all packets transmitted on the network
- Determines and displays the following on the screen:
  - Total number of packets transmitted over the network
  - Total number of bytes of packet data transmitted over the network
  - Total number of packets broadcast (packets receivable by all hosts on the network)
  - Individual totals of packets observed with CRC, alignment, or length (short packet) errors
  - Percent utilization of the network capacity
  - Packet size distribution
- Saves traces of collected packets in the EXOS 225 board's memory.

3.2.1. Starting the Test

The following is a step-by-step procedure for running the default test.

1. Ascertain that the LANalyzer hardware and software have been correctly installed in the PC and that the PC has been correctly connected to the network. Ensure that the AUTOEXEC.BAT file has been updated, as described in Step 8 of the software installation (refer to Section 2.3.1).

2. Ensure that no floppy diskette is inserted in drive A (and drive B, if present). Then power up the PC.

3. When the prompt "C>" appears, invoke the LANalyzer software by entering the following command. Refer to Section 3.6 for a detailed description of all forms of invoking the LANalyzer software.

   C> **LANZ**

   After a few moments the system displays the Edit Test screen (see Figure 3-1). Note that only the called-out items in this figure are of interest at this time.

   The following list explains the items called out in Figure 3-1.

   (1) "promiscu" (short for promiscuous) is the name assigned to the first receive channel. The other parameters specified on this line provide the criteria for accepting packets on this channel. As defined in this test, the "promiscu" channel accepts any and all packets.

   Section 3.4 describes the various channel control parameters.

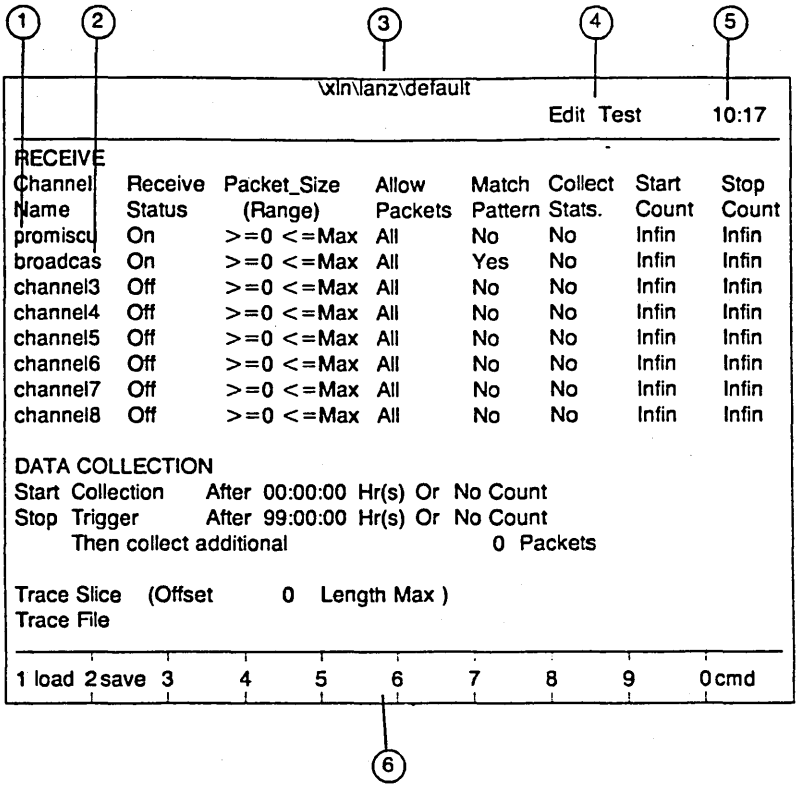


Figure 3-1: The Edit Test Screen

(2) "broadcas" (short for broadcast) is the name assigned to the second receive channel. The other parameters specified on this line provide the criteria for accepting packets for this channel. As defined in this test, the "broadcas" channel accepts only those packets that are broadcast to (that is, receivable by) all hosts on the network.

Section 3.4 describes various channel control parameters.

Note that all other channels are disabled for this test.

(3) Name of the file that contains the test currently loaded.

(4) The screen name.

(5) The current time.

(6) The Commands Window for this screen.

4. Press function key F10 (*cmd*).

   The system displays a changed Commands Window.

5. Press function key F2 (*run*).

   The system displays the Run Counter screen (see Figure 3-2). Note that only the called-out items in this figure are of interest at this time.

   The following list explains the items called out in Figure 3-2.

   (1) Relative time in the format *hh:mm:ss*. This indicates how much time has elapsed since the test began. It increments every second.

   (2) Total number of packets observed on the network since the test began.

   (3) Total number of packets collected on the "promiscu" channel. Note that this count is equal to the the total number of packets observed on the network. This is because the "promiscu" channel is set to accept all packets.

   (4) Message area. "Collecting" indicates that the test is running and network traffic data are being collected.

   (5) Bar graphs showing distribution (percent) by channel of captured packets. Note that the sum of distribution does not add up to 100%, because a single packet can meet the acceptance criteria for both channels and thus can be captured by both channels.

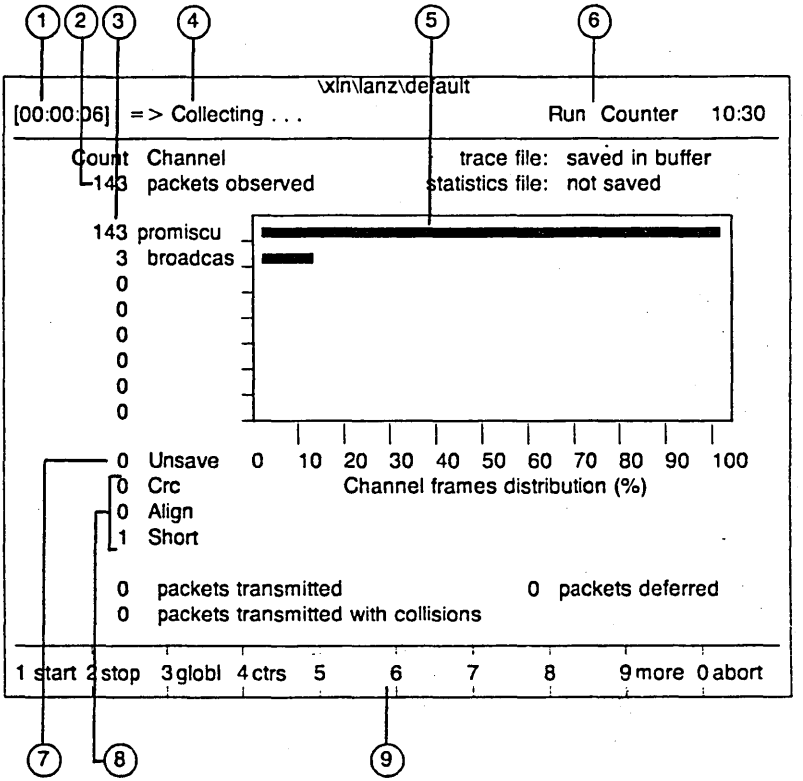


Figure 3-2: The Run Counter Screen

(6) The screen name.

(7) Count of "unsaved" packets. The collected packets are continuously saved to a circular buffer. This means that once the buffer is full, packets are saved (overwritten) at the beginning of the buffer. The "unsaved" counter shows the number of packets lost because of overwriting.

(8) Counts of packets observed with the indicated error.

(9) The Commands Window for this screen.

5. Press function key F3 (*globl*).

   The system displays the Run Global screen, which shows data for all the traffic observed on the network. (Note that the DEFAULT test is still running.) Figure 3-3 shows the Run Global screen. Note that only the called-out items are of interest at this time.

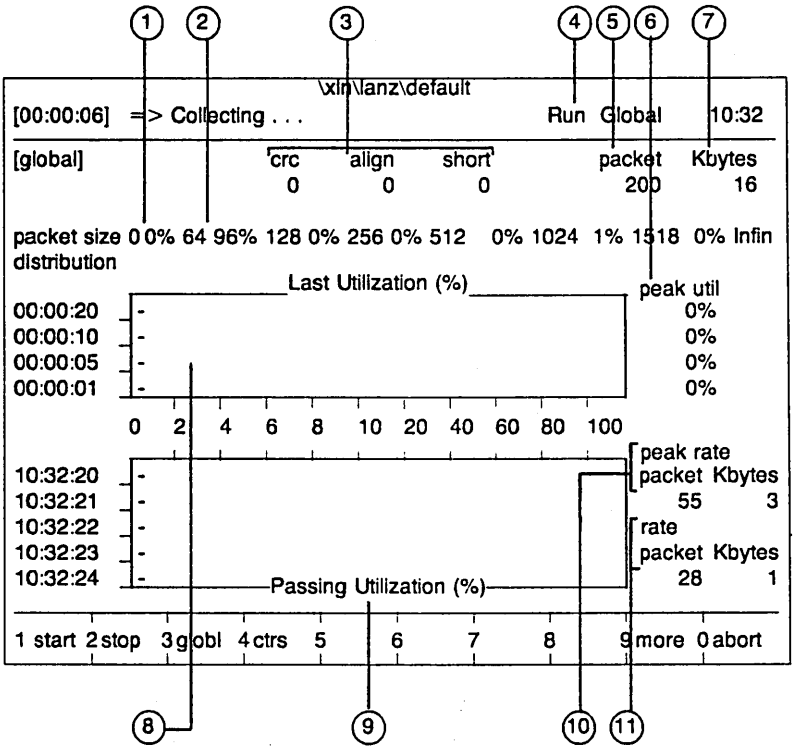


Figure 3-3: The Run Global Screen

The following list describes the items called out in Figure 3-3.

(1) Percentage packet size distribution: percentage of packets in size range 0-63 bytes.

(2) Percentage packet size distribution: percentage of packets in size range 64-127 bytes.

Additional distributions are shown in the succeeding fields.

(3) Counts of packets observed with the indicated error.

(4) The screen name.

(5) Total number of packets observed.

(6) Peak network utilization during the last 20-second, 10-second, 5-second, and 1-second time intervals.

(7) Total number of kilobytes of packet data observed.

(8) Last Utilization (%). Average network utilization (percent) during the last 20-second, 10-second, 5-second, and 1-second time intervals. A dash (–) in the field indicates a utilization of less than 1%; a blank field indicates no utilization at all.

(9) Passing Utilization (%). Average network utilization (percent) for each of the preceding 5 seconds (shown as the actual clock time). A dash (–) in the field indicates a utilization of less than 1%; a blank field indicates no utilization at all.

(10) Peak network traffic rate in terms of packets per second and kilobytes of packet data per second since the test started.

(11) Average network traffic rate in terms of packets per second and kilobytes of packet data per second for the current second.

You can switch between the Run Counter and Run Global screens as often as you wish by alternately pressing function keys F3 (*globl*) and F4 (*ctrs*).

3.2.2. Examining the Trace Buffer

As mentioned earlier, the default test saves traces of captured packets in the EXOS 225 board's memory. Optionally, the traces can be saved to a regular DOS file. The trace buffer can be examined any time after stopping a test in progress (but before running another test or returning to DOS). The trace file can be examined any time after terminating the test.

After some time, you may want to stop the test and examine the trace buffer. The following is a step-by-step procedure for examining the trace buffer:

1. While the test is still running, press function key F2 (*stop*) or F10 (*abort*).

   The system displays a changed Commands Window.

2. Press function key F10 (*cmd*).

   The system displays a changed Commands Window.

3. Press function key F3 (*trace*).

   The system displays the Trace Buffer screen (see Figure 3-4). Note that only the called-out items in the figure are of interest at this time.

   The following list explains the items called out in Figure 3-4.

   (1) Number. Sequential number of the packet.

   (2) Len. Packet length, in bytes.

   (3) Absolut Timestmp. The absolute clock time when the packet was captured.

   (4) Summary Subwindow.

   (5) Dest Addr. The packet's destination address.

   (6) Elapsed time. The amount of time that has passed since the test began.

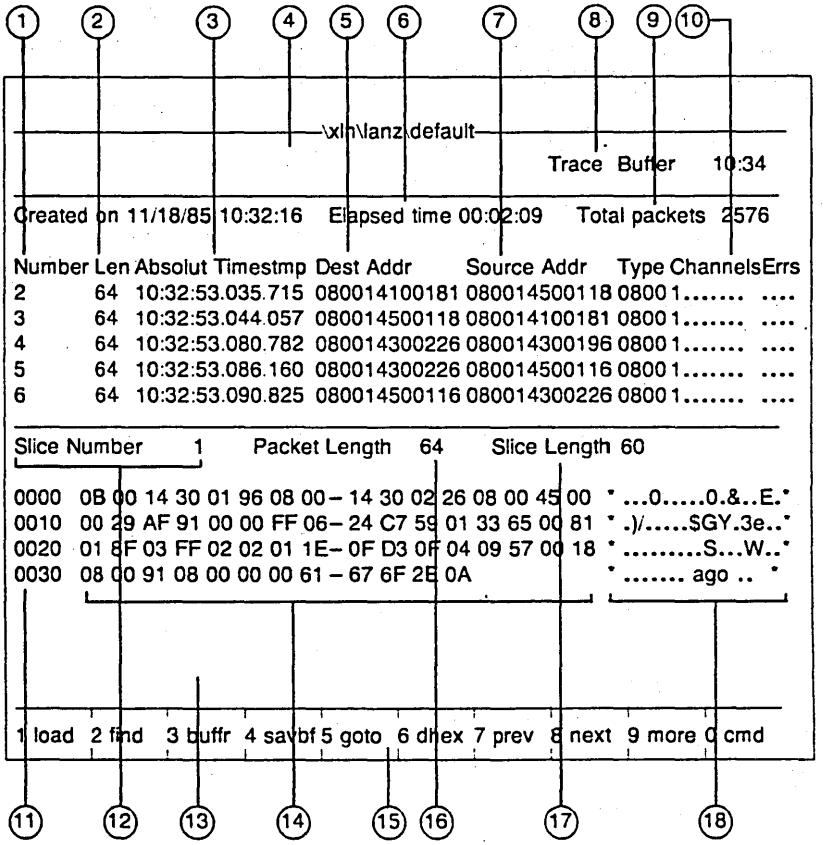


Figure 3-4: The Trace Buffer Screen

(7) Source Addr. The packet's source address.

(8) The screen name.

(9) Total Packets. Total number of packets in the trace buffer.

(10) Channels. The channel(s) on which the packet was collected.

(11) Offset in the slice. Values are hexadecimal.

(12) Slice Number. The sequential number of the packet whose data slice is displayed.

(13) Packet Slice Data Subwindow.

(14) Slice data in hexadecimal.

(15) Commands Window.

(16) Packet Length. Length of the whole packet.

(17) Slice Length. Length of the packet slice that has been saved in the trace.

(18) Slice data in ASCII.

Once the Trace Buffer screen has been displayed, the contents of the trace buffer can be viewed by using the various cursor control and function keys. Specifically, you can do the following:

- Vary the size of the Summary and Packet Slice Data Subwindows. If you increase the size of one window, you decrease the size of the other. A larger Summary Subwindow can display information for up to 12 packets. A larger Packet Slice Data Subwindow can display a greater amount of packet slice data.

- Display contents of a slice in hexadecimal and ASCII simultaneously.

3.2.2.1. Changing the Sizes of the Subwindows

To increase the size of the Summary Subwindow (or to decrease the size of the Packet Slice Data Subwindow), first press F9 (*more*) and then press function key F3 (+*top*) repeatedly. To decrease the size of the Summary Subwindow size (or to increase the size of the Packet Slice Data Subwindow), first press F9 (*more*) and then press function key F4 (+*bot*) repeatedly.

The smallest Summary Subwindow contains information about one packet; the largest contains information about 12. The smallest Packet Slice Data Subwindow contains one line of packet data; the largest contains about 12.

3.2.2.2. Selecting a Packet and Displaying Its Slice Data

When you first display the Trace Buffer screen, one of the lines in the Summary Subwindow is displayed in reverse video. This is the selected packet. The Packet Slice Data Subwindow normally displays the contents of the slice associated with the selected packet. You can change the selection to another packet by using the up arrow (↑), the down arrow (↓), or the Return key. The up arrow key moves the selection up one line; the down-arrow key and the Return key move the selection down one line. (Selection is indicated by the reverse video display.) You can also change the selection to a specfic packet by using the *goto* (F5) command and specifying the packet's sequential number.

You will notice, however, that changing the selection does not automatically display the contents of the selected packet. To do this, you need to press function key F6 (*dhex*).

You can also display the data of the next or previous slice by pressing function key F8 (*next*) and F7 (*prev*), respectively. Notice that the Slice Number field changes.

3.2.3. Exiting from the LANalyzer Software

After some time, you may want to stop the test, exit from the LANalyzer software, and return to DOS. The following steps accomplish this.

1. Press function key F10 (*cmd*).

   The system displays a changed Commands Window.

2. Press function key F10 (*exit*).

   The system clears the Commands Window and displays the following message

   Exit to DOS (y/n):

3. Enter **y** and press RETURN.

   The system returns to DOS, which is indicated by the presence of the prompt "C>" at the top of the screen.

3.3. RECEIVE CHANNEL CONTROL PARAMETERS

All control parameters for a test's receive channel are specified on the Edit Test and Edit Pattern screens. The Edit Pattern screen is accessed through the Edit Test screen.

This section discusses the receive channel control parameters in general and describes their role in the DEFAULT test. The channel control parameters that are discussed are listed below. Detailed descriptions of all the control parameters for a test are provided in Chapter 4.

- Channel Name
- Receive Status
- Packet_Size (Range)
- Allow Packets
- Match Pattern
- Collect Stats.
- Start Count
- Stop Count

3.3.1. Channel Name

The channel name is an alphanumeric string that identifies a channel. The name can be up to eight characters long.

The channel name is used when displaying data and statistics for an individual channel.

Note that in the default test, only the first two channels are named; these are "promiscu" and "broadcas," respectively.

3.3.2. Receive Status

This parameter specifies whether the channel is enabled to collect packets.

The parameter can have two values: On and Off. On indicates the channel is enabled; Off indicates it is disabled. A channel can collect packets only if the Receive Status is On, irrespective of the values of other control parameters. Then the packet must satisfy all specified receive parameters in order to be collected.

Note that the Receive Status is On for both the "promiscu" and "broadcas" channels. This means that these channels will collect packets that meet the other specified criteria.

3.3.3. Packet Size (Range)

This parameter specifies the acceptable packet length range. The valid range is from 0 to 9999. This parameter allows you to specifiy a minimum and maximum acceptable packet length.

In the default test, for both the "promiscu" and "broadcas" channels this parameter is set to the range ">=0 to <=Max," which is equal to 0-1518 bytes. This means that all packets up to 1518 bytes long will be accepted. Note that when the upper limit of 1518 is specified, LANalyzer displays it as the word "Max."

3.3.4. Allow Packets

This parameter specifies what type of errors a packet must contain to be accepted. The permissible values are All, No-error, Crc, Align, Short, and Error. These values are selected by toggling.

"All" specifies that all packets – with or without errors – will be collected.

"No-error" specifies that only error-free packets will be collected.

"Crc" specifies that only packets having a CRC error will be collected.

"Align" specifies that only packets having an alignment error will be collected. These packets are not multiples of eight bits in length.

"Short" specifies that only packets shorter than 64 bytes will be collected.

"Error" specifies that only packets containing error(s) will be collected.

3.3.5. Match Pattern

This parameter specfies whether the acceptance criteria include a data match pattern. The field can have either a Yes or a No value. These values are selected by toggling.

A Yes value indicates that a match pattern is specified. The match pattern can be displayed (and then edited) by placing the cursor in this field and then executing the *open* (F3) command. A No value indicates that there is no match pattern specified.

Note that for the channel "promiscu" this parameter is set to No, which means that packets do not have to match a data pattern in order to be collected.

For the channel "broadcas" this parameter is set to Yes, which indicates that the packet acceptance criteria include a Match Pattern. You can display the match pattern for this channel by moving the cursor to its Match Pattern field and then executing the *open* (F3) command. In the display, note that the Dest_Address field is set to FF–FF–FF–FF–FF–FF, which is the broadcast address. Any packets sent to this address are received by all hosts on the network.

3.3.6. Collect Stats.

This parameter specifies whether network traffic statistics are to be compiled. The field can have two values: No and Yes. A No specifies that statistics are not to be compiled; a Yes specifies that statistics are to be compiled. When set to Yes, the name of the file in which statistics are to be stored must also be specified in the Statistics File field. This field appears when you scroll the Edit Test screen.

In the default test, this field is set to No for both active channels. This means that statistics will not be compiled.

3.3.7. Start Count

This parameter contains an integer value that specifies the number of packets that must be received before a "Channel Count" can be satisfied.

In the default test, this parameter is set to "Infin" for both the active channels. This value disables the use of this parameter.

3.3.8. Stop Count

This field contains an integer value that specifies the number of packets that must be received before a "Channel Count" can be satisfied.

In the default test, this parameter is set to "Infin" for both the active channels. This value disables the use of this field.

3.4. CREATING NEW TESTS

LANalyzer test parameters are saved to regular DOS files. This means that you can copy the file containing a test using the usual DOS commands. You can then load the copy and edit it on the Edit Test screen to create a new test. The various screens and editing methods are described in Chapter 4. Creating new tests is described in Chapter 5.

3.5. INVOKING THE LANALYZER EX 5000E SOFTWARE

You can invoke the LANalyzer software in three different ways. You can invoke it such that it

- Loads the default test and places you in the Edit Test screen.
- Loads a specified test and places you in the Edit Test screen.
- Loads a specified test, places you in the Run Test screen, and begins running the test.

The type of invocation is selected either by omitting any switch or by using the /E or /R switch in the command line. The following three command lines illustrate this. These command lines are explained in detail in the sections that follow.

C> **LANZ**

C> **LANZ** /E*filename*

C> **LANZ** /R*filename*

3.5.1. Loading the Default Test

The first type of LANalyzer invocation loads the default test (which resides in the file \XLN\LANZ\DEFAULT) and places you in the Edit Test screen so you can edit the test. In the command line, you do not specify any switches or a filename:

C> **LANZ**

You can use this invocation to load and edit the default test. You can also use it simply to enter the LANalyzer EX 5000E software in order to access any of the LANalyzer screens.

3.5.2. Loading and Editing a Test

The second type of invocation shown above loads a previously created test and places you in the Edit Test screen so you can edit that test. In the command line, you specify the /E switch and a filename:

C> **LANZ /E** *filename*

filename is the name of the previously created test. It is stored on the disk as *filename*.TST; however, you do not have to type the filename extension.

You can use this form of invocation to load and edit any test that you may have previously created.

3.5.3. Loading and Running a Test

The final type of invocation shown above loads a previously created test, places you in the Run Counter screen, and begins running that test. In the command line, you specify the /R switch and a filename:

C> **LANZ /R** *filename*

filename is the name of the previously created test. It is stored on the disk as *filename*.TST; however, you do not have to type the filename extension.

You can use this form of invocation to load a test and begin running it immediately, without having to first display the Edit screens.

Chapter 4
USER INTERFACE

4.1. INTRODUCTION

The LANalyzer EX 5000E software operates on an IBM PC XT, IBM PC AT, or compatible computer. Accordingly, it uses the basic user interface provided by the PC, namely the keyboard and the CRT display. The keyboard provides a means for user input, while the screen provides a means for the LANalyzer software to echo input and display output.

The functions of some of the PC keyboard keys and key combinations are redefined. While the alphanumeric keys, some special character keys, and some command keys retain their standard functions, others are redefined. Particularly, all commands are passed to the LANalyzer software by pressing one of the function keys (F1-F10) or by pressing the shift, control (Ctrl), or alternate (Alt) key in combination with one or two additional keys.

The LANalyzer software, once it has been loaded into the PC, uses the CRT display to communicate with you through "screens." A typical screen provides identification about the task it is associated with, parameter identifiers, current settings for various parameters, and a list of commands that can be executed by pressing different function keys. A screen may also show test results or file contents.

The LANalyzer software communicates through four groups of screens. Each group of screens consists of several individual screens.

- Edit Screen
- Run Screen
- Trace Screen
- Statistics Screen

Before you can use the LANalyzer software, you need to understand how information is organized on the screen. Section 4.2 defines the structure of a screen. Section 4.3 explains the functions of the keys that you use to input information to the LANalyzer software. Chapters 5 through 8 describe each group of LANalyzer screens.

4.2. THE LANALYZER SCREEN

As shown in Figure 4-1, each LANalyzer screen is divided into three windows:

- Status Window
- Data Window
- Commands Window

4.2.1. Status Window

The Status Window is at the top of the LANalyzer screen. It consists of several fields, whose presence and contents vary depending on which screen you are currently viewing and the task in progress. However, three fields are always present on the Status Window:

- Filename
- Screen name
- Current time

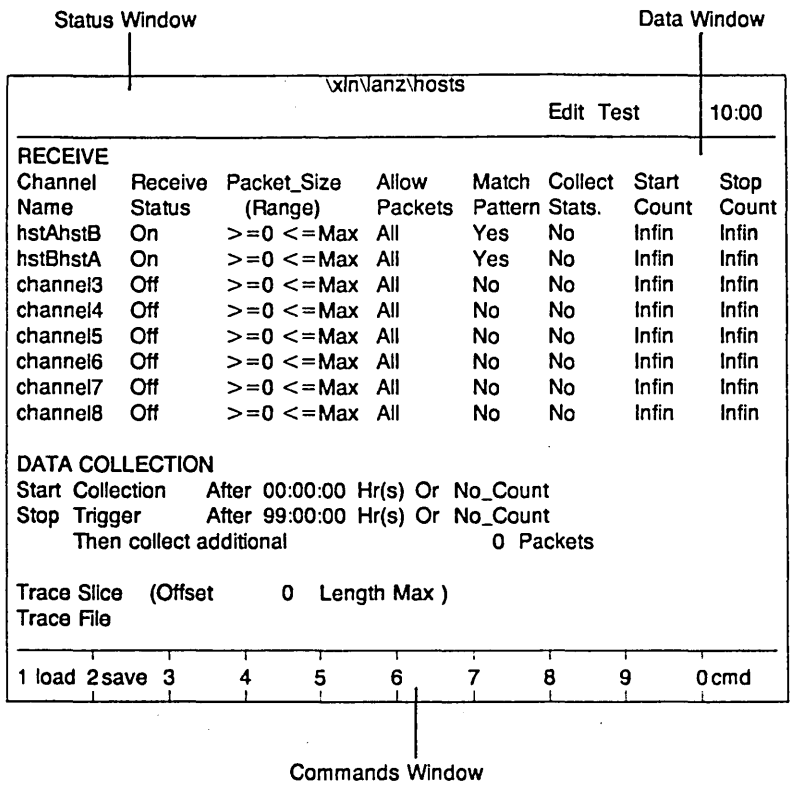


Figure 4-1: The LANalyzer Screen

The filename is shown at the center top of the Status Window. It is the name of the DOS file that contains the test, packet traces, or statistics that are currently displayed on the screen. In Figure 4-1 the filename is \XLN\LANZ\HOSTS.

The screen name is shown on the right side of the Status Window. In Figure 4-1 the screen name is Edit Test.

The current time is shown to the right of the screen name. The time is given in the format *hh:mm*, where *hh* is the hour (based on a 24-hour clock) and *mm* is the minute.

The other entries in the Status Window vary depending on which screen you are currently viewing and what you are doing. They are explained under the discussion of each individual screen.

4.2.2. Data Window

The Data Window is in the middle of the LANalyzer screen. It displays LANalyzer fields, data, and graphs.

On some screens, a single Data Window is too large to fit on the display. In these cases, only the portion of the Data Window that fits is shown; the window can be scrolled up and down so that all portions of it can be viewed. On other screens, the Data Window is split into two discrete subwindows, each of which is too large to fit on its portion of the display. In these cases, each subwindow can be scrolled up and down independently of the other. Scrolling the Data Window does not affect the position or size of the Status and Commands Windows.

The contents of the Data Window depend on the screen displayed. Some screens present the current settings of various parameters, which are used by the LANalyzer software to run tests. Other screens show the results of tests.

On screens that present current parameter settings, you can change the settings either by toggling through preset values or by entering data from the keyboard. These screens are divided into fields, which are of two basic types: noneditable fields and editable fields.

Noneditable fields contain fixed data, such as the name of an editable field that follows it. On monochrome screens these fields are shown in normal video; on color screens they are usually shown in gold, but may also be black letters on a blue background.

Editable fields contain data whose values you can alter. On monochrome screens these fields are shown in reverse video, or are underlined or in dim video (depending on the computer); on color screens they are shown in magenta or in black on a

blue background. There are two types of editable fields: toggle and alphanumeric. These are explained in Table 4-1.

Table 4-1: Editable Field Types

Field Type	Explanation
Toggle	These fields toggle between two or more preset values. On monochrome screens toggle fields are shown in reverse video; on color screens they are shown in magenta. Pressing the "+" key forwards through the value options; pressing the "–" key toggles backwards through them. When the cursor is positioned on a toggle field, the left side of the Status Window shows a "+–" to remind you which keys to use to toggle the values.
Alphanumeric	These fields can contain letters, digits, and certain special keyboard characters. (Special characters may include @, #, $, %, ^, &, (,), –, _, +, =, ~, `, ', ", punctuation marks, slashes, and brackets, depending on the field.) Some alphanumeric fields can contain only digits. On monochrome screens alphanumeric fields are either underlined or shown in dim video; on color screens they are shown in black letters on a blue background.

4.2.3. Commands Window

The Commands Window contains the function key identifiers and their associated commands for the screen currently displayed. The command corresponding to the indicated function key is executed when you press that function key. The contents of the Commands Window vary depending on the screen and the task in progress.

This window is divided into ten boxes. Each box is numbered and may contain the name of a command. Figure 4-2 shows a sample Commands Window.

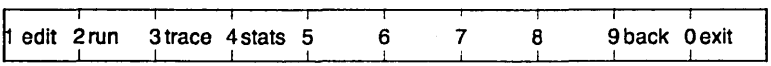


Figure 4-2: Sample Commands Window

The box number is on the left side of the box. It corresponds to one of the ten function keys on the keyboard. For example, the number "1" corresponds to function key F1, "2" to F2, and so on. Note that the number "0" corresponds to function key F10.

Within each box is the name of the command that is executed when you press the corresponding function key. When a box does not contain any command name, the associated function key is a "no-op;" that is, nothing happens when you press that function key.

Some LANalyzer screens require more than ten commands and hence may have two or three Commands Windows. On these screens the function key F9 corresponds to the command *more*. Pressing F9 displays the next set of commands in the Commands Window. When you reach the last set of commands, pressing F9 redisplays the commands that were originally shown in the window. You can display any of the Commands Windows by pressing F9 as many times as necessary until that window appears.

Some commands prompt you for additional information, such as the name of a file, whether you want to exit to DOS, and further parameters.

Commands that ask for a filename or whether you want to exit to DOS place the prompt immediately over the Commands Window. After you enter the requested information, you press the Return key to pass the information to the LANalyzer software. If you do not want to enter any information or want the system to ignore what you have typed, you press the Escape key. In either case, the function key identifiers are then redisplayed in the Commands Window.

Commands that request further parameters place the prompt at the bottom of the Data Window. After you enter the requested information in the additional fields, you usually execute the command corresponding to the F10 function key (typically *exit*) to pass the information to the LANalyzer software. If you do not want to enter any information or the system to ignore the parameters you have set, you press the Escape key. In either

case, the prompt is then removed from the Data Window and any information that was under the prompt is redisplayed.

4.3. KEYBOARD

The LANalyzer software uses the standard IBM PC keyboard, including all the function keys and the special keys on the numeric pad. The section discusses the keyboard keys and their functions as implemented by the LANalyzer software.

The keyboard keys are divided into the following categories:

- Cursor Control Keys
- Field Editing Command Keys
- Function Keys
- Miscellaneous Keys and Key Combinations

4.3.1. Cursor Control Keys

The cursor control keys move the cursor from field to field in the Data Window. The cursor control keys are the arrow keys and labeled keys on the keyboard's ten-key numeric keypad. (The labeled keys are Home, End, Page Up, and Page Down.)

The cursor appears as a blinking underscore. On monochrome screens the field the cursor is in is usually shown in reverse video. (Since some fields are always shown in reverse video, as explained in Section 4.2.2, only those that are normally in dim video or underlined are changed to reverse video when the cursor moves to that field.) On color screens, the field the cursor is in is shown in black characters on a white background. No other fields on color screens are normally depicted with this color scheme.

On some screens you can move the cursor only to editable fields. On other screens, you can highlight certain noneditable fields for easy reference by placing the cursor in that field. On

monochrome screens highlighted noneditable fields are shown in reverse video; on color screens they are shown in black characters on a white background.

Tables 4-2, 4-3, and 4-4 list and explain the cursor control keys and key combinations. Most of these perform the same operation regardless of the screen you are viewing. The keys that work differently are so indicated.

Note that in these tables the following terminology is used. A field is considered to be one that can be edited or highlighted. A line is considered to be one that contains one or more fields that can be edited or highlighted.

Table 4-2: Cursor Control Keys – Line/Field Movement

Key Label	Key Name/ Combination	Explanation
↓	Down Arrow	Moves the cursor down one line. If the cursor is on the bottom line of the Data Window, the screen scrolls down one line if possible.
↑	Up Arrow	Moves the cursor up one line. If the cursor is on the top line of the Data Window, the screen scrolls up one line if possible.
→	Right Arrow	Moves the cursor to the next field. If the cursor is on the last field of a line, it moves to the first field on the next line.
←	Left Arrow	Moves the cursor to the previous field. If the cursor is on the first field of a line, it moves to the last field on the previous line.
Enter	Return	Moves the cursor to the next field. If the cursor is on the last field of a line, it moves to the first field on the next line. If you are editing an alphanumeric field and press Return, all characters to the right of the cursor are deleted from the field.
–	Ctrl-Enter	Moves the cursor to the next field. If you are editing an alphanumeric field and press Ctrl-Enter, any characters to the right of the cursor are not deleted from the field.
–	Ctrl-Home	Moves the cursor to the beginning of an alphanumeric field.
–	Ctrl-End	Moves the cursor to the end of an alphanumeric field.

Table 4-3: Cursor Control Keys – Rapid Line/Field Movement

Key Label	Key Name/ Combination	Explanation
–	Shift plus ↑	Moves the cursor up four lines. If the cursor is within three lines of the top of the Data Window and the screen is larger than the window, the screen scrolls up if possible.
–	Shift plus ↓	Moves the cursor down four lines. If the cursor is within three lines of the bottom of the Data Window and the screen is larger than the window, the screen scrolls down if possible.
–	Shift plus ←	Moves the cursor back four fields. If the cursor is within three fields of the beginning of a line, it moves to end of the previous line.
–	Shift plus →	Moves the cursor forward four fields. If the cursor is within three fields of the end of a line, it moves to the beginning of the next line.
End	End	Moves the cursor to the first field on the last line in the Data Window.
Home	Home	Moves the cursor to the first field in the Data Window.
–	Shift plus End	Moves the cursor to end of a logical Data Window.
–	Shift plus Home	Moves the cursor to beginning of a logical Data Window.
–	Shift plus Page Up	Moves the cursor back two pages.
–	Shift plus Page Down	Moves the cursor forward two pages.

Table 4-4: Cursor Control Keys – Scrolling

Key Label	Key Name/ Combination	Explanation
Page Up	Page Up	Scrolls the screen up an entire Data Window, if possible, and displays the next page of the screen, if there is one.
Page Down	Page Down	Scrolls the screen down an entire Data Window, if possible, and displays the previous page of the screen, if there is one.
–	↑ plus Scroll Lock	Scrolls the window up. During scrolling, the cursor remains on the same line and in the same position. When the line containing the cursor reaches the top of the Data Window, the cursor remains on the line at the top of the window.
–	↓ plus Scroll Lock	Scrolls the window down. During scrolling, the cursor remains on the same line and in the same position. When the line containing the cursor reaches the bottom of the Data Window, the cursor remains on the line at the bottom of the window.
–	Ctrl-Page Up	Scrolls the Data Window up one half window, if possible, and displays the previous page of the screen display, if there is one.
–	Ctrl-Page Down	Scrolls the Data Window down one half window, if possible, and displays the next page of the screen display, if there is one.

4.3.2. Field Editing Command Keys

You enter or change values for alphanumeric fields in the Data Window by typing input from the keyboard.

Some of these fields will be empty initially. To enter information in them you simply move the cursor to that field and type. Use the backspace key (←) to correct any typing errors.

Other fields may already contain values. These values are either ones you previously entered or default system values. If you want to overwrite an existing value, move the cursor to that field and type over it. However, if you want to modify an existing entry, use the field editing commands listed in

Table 4-5. When you move the cursor from a field you have just edited, the value in the field is saved.

If you type an illegal value in any field, the system will not let you move the cursor from the field. Instead, the following error message is displayed in the Status Window:

Unacceptable value, please correct before proceeding

You must type a legal value before you will be able to move the cursor from the field.

Most field editing commands are executed by holding down the Ctrl (control) key and pressing a letter key simultaneously. The letter key can be uppercase or lowercase.

Table 4-5: Field Editing Commands

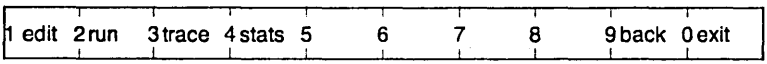
Editing Command	Explanation
Ctrl-A	Inserts a single character immediately preceding the character under the cursor.
Ctrl-B	Moves the cursor to the beginning of the current field.
Ctrl-D	Erases the contents of the current field and places the cursor at the beginning of that field.
Ctrl-E	Moves the cursor to the end of the current field.
Ctrl-F	Moves the cursor forward one character or space in the field.
Ctrl-G	Deletes the character under the cursor.
Ctrl-H	Deletes the character immediately preceding the cursor.
Ctrl-R	Restores the previous value of the current field. This is the value the field had when you moved the cursor into it and began editing.
Backspace ←	Deletes the character immediately preceding the cursor.
Ctrl-Enter	Moves the cursor to the next field. If you are editing an alphanumeric field and press Ctrl-Enter, any characters to the right of the cursor are not deleted from the field.

4.3.3. Function Keys

The Commands Window is at the bottom of the LANalyzer screen. It contains the function key identifiers and their associated commands for the screen currently displayed. Each identifier consists of a numbered box (the box's number is on the left side of the box). The number corresponds to the function keys on the left side of the keyboard. The number "1" corresponds to function key F1, the number "2" corresponds to function key F2, and so on. Note that the number "0" corresponds to function key F10.

Each box contains the name of commands that is executed when you press the corresponding function key. Different function keys may execute different commands on different screens; some may not execute any command at all. The function key commands for each LANalyzer screen are explained in Chapters 5 through 8 when the individual screens are discussed.

Function key F10 provides a somewhat special function. It usually corresponds to the command *cmd*. When you press F10 to execute the *cmd* command, the following subcommands and their associated function key identifiers are displayed:



The commands executed by these function keys allow you to display different LANalyzer screens or to exit to DOS. Table 4-6 explains the individual commands.

Table 4-6: *cmd* Subcommands

Key Label	Key Name	Explanation
F1	edit	Displays the Edit screen. This screen is discussed in Chapter 5.
F2	run	Displays the Run screen. This screen is discussed in Chapter 6.
F3	trace	Displays the Trace screen. This screen is discussed in Chapter 7.
F4	stats	Displays the Statistics screen. This screen is discussed in Chapter 8.
F5-F8	–	Not used.
F9	back	Returns to the previously displayed screen.
F10	exit	Exits from LANalyzer and returns to DOS. If you press F10, you are prompted as follows: Exit to DOS (Y/N): Type **Y** followed by Return to exit from the LANalyzer software. Type **N** followed by Return to remain in the LANalyzer software and to redisplay to the previous screen.

4.3.4. Miscellaneous Keys and Key Combinations

Table 4-7 lists additional keys and key combinations that have special meaning to the LANalyzer software.

Table 4-7: Miscellaneous Key Commands

Key Label	Key Name/ Combination	Explanation
–	Alt-D	Exits the LANalyzer software temporarily and returns to DOS. To return to the LANalyzer software type **exit**. What was on the screen when you exited to DOS is redisplayed.
–	Alt-V	Displays the LANalyzer software version number in the Status Window.
–	Alt-W	Switches between subwindows on a single Data Window.
Esc	Escape	Exits from a command that prompts you for additional information without passing any of the information you typed to the LANalyzer software.

Chapter 5
CREATING A TEST

5.1. INTRODUCTION

All LANalyzer functions are realized by setting up and running a test. A test is essentially a program in which you specify the criteria for capturing packets from and/or transmitting packets to the network.

The Edit screens define the conditions under which you want to run a test. In a single test you can capture packets, transmit packets, or both capture and transmit them.

You can define up to eight receive channels and six transmit channels. Each receive channel filters network traffic, capturing only the packets that match criteria you have defined for that channel. On each transmit channel you can construct a packet to be transmitted; packet transmission by each channel proceeds according to criteria you define. Only channels that are enabled collect or transmit packets when you run a test. In this way you can define different receive and transmit parameters on different channels and can enable channels selectively during a test.

You can also define whether packets captured during a test are to be saved to the EXOS 225's buffer, to the fixed disk, or not saved at all. The LANalyzer EX 5000E can capture packets to the board's buffer at a rate of 1000 packets per second. On an IBM PC AT (16-bit bus), packets can be transferred from the buffer to the disk at a rate of 100 packets per second. On an IBM PC XT (8-bit bus), the transfer rate is 30-50 packets per second. The difference between the capture rate and the board-to-disk transfer rate means that at the end of a test, there may be a delay while the LANalyzer system finishes transferring packet traces to disk files.

In addition, you can define whether test statistics will be compiled and saved to a disk file.

Invoking the LANalyzer EX 5000E software and displaying the Edit Test screen for a given test is described in detail in Section 3.5.2.

LANalyzer test criteria are defined on the four Edit screens:

- Edit Test Screen. This screen is displayed when you first start editing a test. On the Edit Test screen you define parameters for receive and transmit channels and specify whether they are enabled or disabled. You also indicate when a test should start and stop, whether trace and statistics information from the test should be saved to the EXOS 225's buffer and or to disk files, and the conditions for packet transmission.

- Edit Pattern Screen. On this screen you define data match patterns that packets must match in order to be collected on a receive channel.

- Edit Packet Screen. On this screen you construct packets to be transmitted during a test. You can specify the destination and source addresses, the type field, and the data field. The LANalyzer software prepends the preamble field and appends the CRC field to the packet. You specify the criteria for transmitting the packets on the Edit Test screen.

- Edit Name Screen. On this screen you can enter a name, or alias, to be associated with a station on the network. The name is matched with the station's Ethernet address.

This chapter describes the Edit screens and explains how to use them to create LANalyzer tests.

The following steps outline the general procedure for using the Edit screens to define LANalyzer test criteria. Refer to the sections that follow for detailed information about how to set up a test and about the meanings of the function keys and fields on the Edit screens.

1. Display the Edit Test screen:

   - If you are in the LANalyzer software, press function key F10 (*cmd*) and then press F1 (*edit*).
   - Otherwise, invoke the LANalyzer EX 5000E software from DOS as described in Section 3.5.2.

2. To edit an existing test, press F1 (*load*) and type the name of the DOS file containing the test.

3. Define the criteria for individual receive channels. This includes the following information:

   - Channel name
   - Whether channel is enabled; that is, whether it will be collecting packets during the test
   - Size range of packets to be collected
   - Types of errors packets may contain
   - Pattern packets are to match
   - Whether packet traces will be saved
   - Whether statistics will be compiled and saved
   - Start and stop triggers
   - Names of files in which to save trace and statistics data

4. If you want the incoming packets on a receive channel to match a particular data pattern, define the match pattern on the Edit Pattern screen.

5. Enable the desired receive channels for the test.

6. Define the criteria for the individual transmit channels. This includes the following information:

   - Channel name
   - Whether channel is enabled; that is, whether it will be transmitting packets during the test
   - Contents of the packets
   - How many times the packet will be transmitted and the delay between each transmission
   - What types of errors should be forced to occur during transmission
   - Time at which transmission starts

7. Specify the transmit packet contents on the Edit Packet Screen.

8. Enable the desired transmit channels for this test.

9. To save the test to a DOS file, press F2 (*save*) and type the name of the file in which to store the test. (Do not include a filename extension.)

10. Press F10 (*cmd*) and then F2 (*run*) to run the test. Refer to Chapter 6 for more information on running LANalyzer tests.

5.2. EDIT TEST SCREEN

The Edit Test screen (see Figures 5-1 and 5-2) allows you to define the criteria for a test. This screen contains fields pertaining to all components of a test: receive channels, start and stop triggers, transmit channels, and names of files in which to save test results.

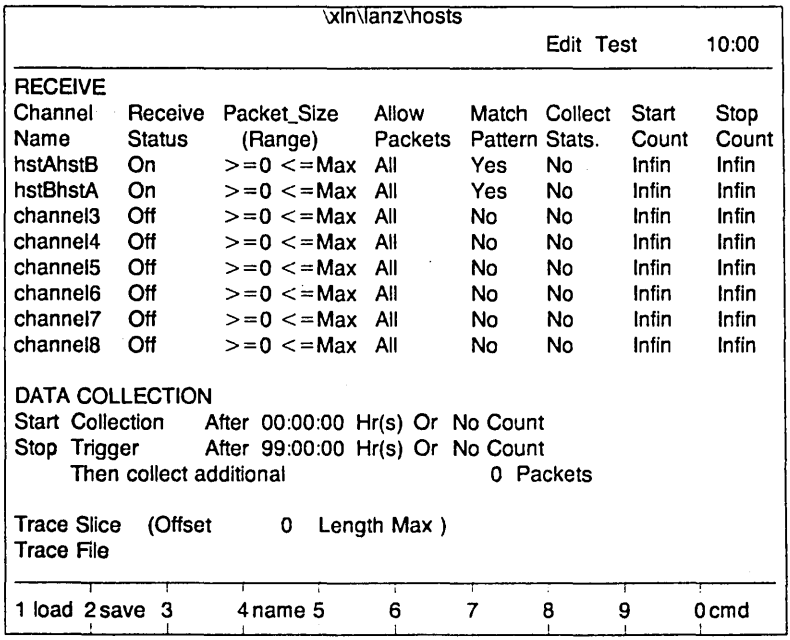


Figure 5-1: Edit Test Screen (Upper Portion)

```
                                    \xln\lanz\hosts
                                                          Edit Test        10:00

Trace Slice  (Offset      0  Length Max )
Trace File
Statistics File                                      Station Monitor  Off
Collect Statistics Every          1 Second(s)

TRANSMIT
Transmit Statistics  Off
                                                  ------Transmission Errors------
Xmt   Xmt            Delay      Forced  Abnormal          Forced          No
Name  Status Count   (ms)  Crc  Collis  Preamble          Packet  Gap     Backoff
      Off    1       0     Off  Off     Off  Preamble-4   Off  0  0.1us   Off
      Off    1       0     Off  Off     Off  Preamble-4   Off  0  0.1us   Off
      Off    1       0     Off  Off     Off  Preamble-4   Off  0  0.1us   Off
      Off    1       0     Off  Off     Off  Preamble-4   Off  0  0.1us   Off
      Off    1       0     Off  Off     Off  Preamble-4   Off  0  0.1us   Off
      Off    1       0     Off  Off     Off  Preamble-4   Off  0  0.1us   Off

Transmit After every  99:00:00  Hr(s)

1 load  2 save  3      4 name  5      6      7      8      9      0 cmd
```

Figure 5-2: Edit Test Screen (Lower Portion)

If you specify no switches or the /E switch when you invoke the LANalyzer software, the Edit Test screen is the screen displayed initially. The name of the file loaded via the /E switch, or the name of the default file (\XLN\LANZ\DEFAULT) if you did not specify a switch, is displayed at the top of the Status Window.

The logical Data Window of the Edit Test screen is larger than can be displayed in the physical window. The cursor control keys listed in Table 4-4 allow you to scroll the Data Window.

5.2.1. Edit Test Screen Commands

Table 5-1 lists and explains the commands executed by the functions keys in the Commands Window of the Edit Test screen. Any function key can be used at any time, unless otherwise indicated.

5.2.2. Edit Test Screen Fields

The fields on the Edit Test screen allow you to define various test criteria.

This screen can be divided into three parts:

- Receive Channel
- Data Collection
- Transmit Channel

5.2.2.1. Receive Channel

The Receive Channel portion of the Edit Test screen consists of the fields following the label RECEIVE on the screen. It defines the conditions under which to collect packets during a LANalyzer test. You can define the size of the packets to collect, the type of errors that are allowed, and the byte-level data pattern the packets must match.

You can define up to eight separate receive channels. Thus you can collect packets having up to eight different sets of attributes.

Packets are collected only on channels that are enabled. For each enabled channel packets must satisfy all the criteria you define for that channel in order to be collected.

Table 5-1: Edit Test Screen Commands

Key Label	Command	Explanation
F1	load	Loads a test file from disk. You are prompted for the name of the file in the Commands Window: Test filename: The filename or file specifier must be a valid DOS name. The system appends the extension ".TST" to the name of the file. If the file does not exist, you are prompted as follows: *filename*.tst not found! You are then prompted again for the filename.
F2	save	Saves the test on the Edit Test screen to a DOS file. In the Commands Window, you are prompted for the name of the file: Save to test file: The filename or file specifier must be a valid DOS name. The system automatically appends the extension ".TST" to the name of the file. If the file already exists, you are prompted as follows: File already exists, Overwrite (Y/N)? If you type Y followed by Return, the existing file is overwritten. If you type N followed by Return, you are prompted again for the name of a file.
F3	open	(Available only when the cursor is in the Match Pattern or Xmt Name field.) Enters the Edit Pattern screen (if the cursor is in the Match Pattern field) or the Edit Packet screen (if the cursor is in the Xmt Name field). The Edit Pattern screen is discussed in Section 5.3. The Edit Packet screen is discussed in Section 5.4.
F4	name	Displays the Edit Name screen. This screen is discussed in Section 5.5.
F5-F9	–	Not used.
F10	cmd	Executes the *cmd* command, which allows execution of its subcommands. These are described in Table 4-6.

The following paragraphs explain the fields on the Receive Channel portion of the Edit Test screen. The field editing commands listed in Table 4-5 can be used to modify alphanumeric fields. The "+" and "–" keys can be used to change the values of toggle fields.

Channel Name (Alphanumeric)
Each channel can have a name to identify it. However, the name is optional. The name can be up to eight characters long, consisting of letters, digits, and special characters. To name a channel, place the cursor on the appropriate line of the field and type the name.

Receive Status (Toggle: On, Off)
This field indicates whether a receive channel is enabled. With this field you can enable only the channels of interest for a particular test. The value of the Receive Status field toggles between On and Off. On indicates the channel is enabled to collect packets during a test. Off indicates the channel is disabled. The default receive status is Off.

Packet_Size (Range) (Alphanumeric)
This field defines the acceptable packet size range, in bytes. Packets within this size range will be collected on this channel. The default packet size range is from ≥ 0 to $\leq$ Max. (Max is equivalent to 1518 bytes.) The valid range is 0 to 9999 bytes. Hence you can capture packets that are shorter than the standard Ethernet packet minimum size of 64 bytes or longer than the maximum size of 1518 bytes.

To enter the maximum value, you can type either "1518" or the word "Max" (in any combination of uppercase and lowercase letters). The system then displays the word "Max" in the field. To enter the minimum value, you can type either "64" or the word "Min" (in any combination of uppercase and lowercase letters). The system then displays the word "Min" in the field.

Allow Packet (Toggle: All, No-error, Crc, Align, Short, Error)
This field defines whether packets containing link-level errors will be accepted and, if so, which type of error it can be. The value in this field toggles between the following:

- **All.** All packets will be accepted whether they contain errors or not (default).
- **No-error.** No packets containing link-level errors will be accepted.
- **Crc.** Only packets with CRC (cyclic redundancy check) errors will be accepted.
- **Align.** Only packets with alignment errors will be accepted. Alignment errors occur when a packet length is not a multiple of eight bits.
- **Short.** Short packets are acceptable. A short packet is one that, including the CRC field, is less than 64 bytes long.
- **Error.** Only packets that contain one or more of the above errors will be accepted.

Match Pattern (Toggle: Yes, No)
This field indicates whether the packet must match a byte-level pattern. The value of the Match Pattern field toggles between Yes and No. Yes indicates that a pattern must be matched. No indicates that there is no pattern to match. The default is No.

When the cursor is in the Match Pattern field, the command name *open* appears in the Commands Window in the box associated with function key F3. Pressing F3 switches to the Edit Pattern screen, in which you can define the match pattern for the channel. The Edit Pattern screen is discussed in Section 5.3.

Collect Stats. (Toggle: Yes, No)
This field specifies whether statistics will be compiled and saved for this receive channel. The value of this field toggles between Yes and No. Yes indicates that statistics

are to be compiled and saved for the channel. No indicates that statistics will not be kept. The default value is No.

If the Collect Stats. field for a channel is On, statistics are compiled as often as specified in the Collect Statistics Every field and are saved in the file specified in the Statistics File field. Both of these fields are in the Data Collection portion of the Edit Test screen display. If no filename is specified, statistics are not saved.

Statistics are a record of the packets received. If you save statistics, you will be able to review them at a later time. Otherwise, they are not compiled. You can view the statistics on the Statistics screens, which are discussed in Chapter 8.

Start Count (Alphanumeric)
This field is used in conjunction with the Start Collection field, which is in the Data Collection portion of the Edit Test screen. It specifies the number of packets matching this channel's criteria to ignore before the start trigger is fired and packet collection commences. The Start Count field can have a value in the range 0 to 64K. To enter the value 0, you can type either "0" or "Infin" (in any combination of uppercase and lowercase letters). The system then displays the word "Infin" in the field. Infin (0) means that there is no start event.

The value in this field is only meaningful if the value Channel Count in the Start Collection field is selected.

Stop Count (Alphanumeric)
This field is used in conjunction with the Stop Collection field, which is in the Data Collection portion of the Edit Test screen. It specifies the number of packets that must be collected before the stop trigger fires. The value can be a number in the range 0 to 64K. To enter the value 0, you can type either "0" or "Infin" (in any combination of

uppercase and lowercase letters). The system then displays the word "Infin" in the field. Infin (0) means that there is no stop event.

The value in this field is only meaningful if the value Channel Count in the Stop Collection field is selected.

5.2.2.2. Data Collection

The Data Collection portion of the Edit Test screen consists of the fields following the label DATA COLLECTION on the screen. It occupies the middle of the screen. In this portion of the screen you specify the time conditions under which data are to be collected on the receive channels. Specifically, you define the start and stop triggers in terms of time or total packets, the names of files in which to save packet traces and statistics, and some criteria for the collecting traces and statistics.

Before continuing, the terms "start trigger," "stop trigger," and "trace" need to be defined. The start trigger is the stimulus – either time or channel event – that initiates packet and/or statistics collection. The stop trigger is the stimulus that halts packet and/or statistics collection. A trace, or packet trace, is a record of a collected packet or packet segment. It includes the time the packet was captured, its source and destination addresses, and its data (all the data if the entire packet is collected or a portion of the data if only a packet segment is collected).

The following paragraphs explain the fields in the Data Collection portion of the display. The field editing commands listed in Table 4-5 can be used to modify alphanumeric fields. The + and – keys can be used to change the values of toggle fields.

Start Collection
Stop Trigger
The Start Collection field defines the start trigger, which specifies when packet collection is to begin. The Stop Trigger field defines the stop trigger. Packet collection may or may not terminate when the stop trigger fires, depending

on the value in the Then Collect Additional Packets field (the next field on the screen). Both the Start Collection and Stop Trigger fields are divided into the following subfields: After/At, Time Hr(s), Then/Or, and No Count/ Channel Count.

After/At (Toggle: After, At). This subfield specifies when collection is to start or stop. It toggles between two values: After and At. After indicates that the start or stop trigger should fire when the amount of time specified in the Time subfield has elapsed. At indicates that the start or stop trigger should fire at the absolute time specified in the Time subfield. The default value is After.

Time Hr(s) (Alphanumeric). This subfield, which is unlabeled, specifies the time After or At which the start or stop trigger should fire. The time is given in the format *hh:mm:ss*, where *hh* is the hour (based on a 24-hour clock), *mm* is the minute, and *ss* is the second.

To enter or change a time, use the editing commands listed in Table 4-5. The system inserts colons between each pair of digits, so you do not have to type them. With After, the time can have a value from 00:00:00 to 99:00:00. With At, the time can have a value from 00:00:00 (midnight) to 23:59:59.

The default value for the Start Collection time is 00:00:00. When used with After, this means that the start trigger should fire immediately when the test begins running. When used with At, it means that the start trigger should fire at midnight.

The default value for the Stop Collection time is 99:00:00. When used with After, this means the stop trigger will fire 99 hours after packet collection begins. In practice, a value of 99:00:00 means that the test will run until halted manually. When used with At, the value 99:00:00 is invalid; the maximum allowable value with At is 23:59:59.

Then/Or and **No Count/Channel Count** (Toggles). These two subfields, taken together, indicate the logical relationship between the time (specified in the previous subfield) and the counters for each receive channel's packet collection (specified in the Start Count and Stop Count fields). The value Or, which is the default, means that the condition specified by the No Count/Channel Count subfield is evaluated concurrently with the condition in the Time subfield. The value Then means that the condition specified by the No Count/Channel Count subfield is not evaluated until the condition in the Time subfield is satisfied.

The meanings of the Then/Or and No Count/Channel Count subfields, when evaluated together, are explained in Table 5-2.

The following examples serve to illustrate how the Then/Or and No Count/Channel Count fields work together.

Example 1: Let us say you want to collect packets for one hour beginning at 9 a.m. The Start and Stop Collection fields would be set as follows:

Start Collection At 09:00:00 Hr(s) Or No Count
Stop Collection After 01:00:00 Hr(s) Or No Count

Example 2: Let us say you want to begin collecting packets at 8 p.m. and want to collect 100 packets after the stop trigger is fired at 9 p.m. The Start Collection, Stop Collection, and Then Collect Additional Packets fields would be set as follows:

Start Collection At 20:00:00 Hr(s) Or No Count
Stop Collection At 21:00:00 Hr(s) Or No Count
Then Collect 100 Additional Packets

Table 5-2: Then/Or and No Count/Channel Count Subfields

Subfield Values	Explanation
Start Collection Subfields	
Or No Count	The start trigger fires when the Time subfield is satisfied, because any value in the Start Count field is ignored.
Or Channel Count	Collection starts when either the Time subfield is satisfied or the number of packets defined in the Start Count field are received, whichever occurs first.
Then No Count	After the Time subfield is satisfied, any value in the Start Count field is ignored and the start trigger fires immediately.
Then Channel Count	Collection begins only when the Time subfield is satisfied and the number of packets specified in the Start Count field are received.
Stop Trigger Subfields	
Or No Count	The stop trigger fires when the Time subfield is satisfied, ignoring any value in the Start Count field. Additional packets are collected only if so specified in the Then Collect Additional Packets field.
Or Channel Count	The stop trigger fires when either the Time subfield is satisfied or the number of packets defined in the Stop Count field are received, whichever occurs first.
Then No Count	After the Time field is satisfied, any value in the Stop Count field is ignored and the stop trigger fires immediately. Additional packets are collected only if so specified in the Then Collect Additional Packets field.
Then Channel Count	The stop trigger fires only when the Time subfield is satisfied and the number of packets defined in the Stop Count field are received. Additional packets are collected only if so specified in the Then Collect Additional Packets field.

Example 3: If you want to begin observing network traffic immediately but want to begin collecting packets only after 100 packets have matched a channel's match criteria, the Start Count field for that channel and the Start Collection field would be set as follows:

Start Count 100
Start Collection After 00:00:00 Hr(s) Then Channel Count

Example 4: If you want to collect packets for two hours, beginning at 3 a.m. or when 50 packets have been received, whichever comes first, the Start Count, Start Collection, and Stop Collection would be set as follows:

Start Count 50
Start Collection At 03:00:00 Or Channel Count
Stop Collection After 02:00:00 Or No Count

Then Collect Additional Packets (Alphanumeric)
This field specifies the number of packets to collect after the stop trigger fires. This value can be a number from –2 to (64K – 3). The default value is 0. Specifying the value –1 or "Buffer Full of" collects packets until the board's buffer is full. Specifying the value –2 or "Buffer Half Full of" collects packets until the board's buffer is half full. If you type the words instead of the negative numbers, note that they are case-insensitive.

Using this field in conjunction with the Stop Trigger field, you can collect packets up to a certain time or quantity and then collect the packets immediately following this time or quantity. For instance, if you know that a packet error occurs at a certain time, you can collect the packets on the network prior to this time to see the state of the network before the error, and you can collect packets after this time to observe how the network recovers from the error. The packet that fires the stop trigger is marked so that it can be easily located later when you display the packet trace on the Trace screen (discussed in Chapter 7).

Trace Slice (Offset Length) (Alphanumeric)
This field specifies the segment, or slice, of a packet to be saved. If the packets you are capturing are long, you may want to collect only a specified slice so that you do not fill the EXOS 225 buffer or the disk trace file before the test completes. Note that the capture rate to disk is higher if the slice size is smaller. This field has two subfields: Offset and Length.

The Offset subfield specifies the starting byte location of the packet slice.

The Length subfield specifies the length of the slice, in bytes.

Trace File (Alphanumeric)
This field specifies the name of the file in which to place the packet traces collected on the enabled receive channels. The name must be a valid DOS filename or file specifier. The system appends the extension ".TR*n*" to the filename, where *n* is a letter or number that corresponds to the file number. Packet traces are stored in 300-Kbyte files. (This file length allows trace files to be copied to low-density 5-1/4" floppy disks for storage or transfer to another LANalyzer system.) The trace packets from a single test can occupy a maximum of 35 files (with *n* from "1" to "9" and then "a" to "z"), for a total of 10.5 Mbytes.

If you do not specify a trace filename and the Station Monitor field (discussed below) is set to Off, the trace information is placed in the circular buffer on the EXOS 225 board. When the buffer is full, the oldest record is discarded to make room for the newest one. The EXOS board's buffer can hold 700 Kbytes, which is equivalent to somewhere between 2700 256-byte (or smaller) packets and 450 packets of maximum size (usually 1518 bytes). An indication that the buffer is full is when the number of packets reported in the Unsave field on the Run Counter screen increases regularly (refer to Section 6.2.2).

You can view the traces in the buffer after the test completes by pressing F10 (*cmd*) and then F3 (*trace*) to switch to the Trace screen before running another test or

terminating the LANalyzer session. You can view the traces saved to a trace file any time after the test completes. Refer to Chapter 7 for a discussion of the Trace screen.

Note that if the Station Monitor field is set to On and no trace file is specified, packet traces are not saved.

Statistics File (Alphanumeric)
This field specifies the name of the file in which to place statistics information. The name must be a valid DOS filename or file specifier. The system appends the extension ".ST*n*" to the filename, where *n* is a letter or number that corresponds to the file number. Statistics are stored in 300-Kbyte files. (This file length allows statistics files to be copied to low-density 5-1/4" floppy disks for storage or transfer to another LANalyzer system.) The statistics from a single test can occupy a maximum of 35 files (with *n* from "1" to "9" and then "a" to "z"), for a total of 10.5 Mbytes. If you do not specify a statistics filename, statistics information is not compiled.

Statistics information is collected only for receive channels whose Collect Stats. field is On; it is collected for transmit channels only when the Transmit Statistics field is On.

Collect Statistics Every (Alphanumeric)
This field specifies the sampling interval, in seconds, at which statistics are to be compiled. The default interval is 1 second. The maximum value is 9999 seconds, or about 160 minutes. The statistics are stored in the file named in the Statistics File field.

Station Monitor (Toggle: On, Off)
This field specifies whether the Run Station screen will be accessible when running the test. The Run Station screen allows you to monitor network traffic station by station. (Refer to Section 6.6 for a discussion of this screen.) The value of the Station Monitor field toggles between On and Off. On means that the Run Station screen will be accessible during a test. In addition, the Trace Slice Offset must be 0 (zero) and the Trace Slice Length must be

greater than or equal to 12. Off means that the Run Station screen will not be accessible.

Note that when the Station Monitor field is On, packet traces are not saved in the EXOS 225's buffer. However, they can be saved to a disk file if a filename is specified in the Trace File field.

5.2.2.3. Transmit Channel

The Transmit Channel portion of the Edit Test screen consists of the fields following the label TRANSMIT on the screen. It is at the bottom of this screen. The fields in the Transmit Channel portion define the criteria for transmitting test packets.

There are six transmit channels, thus allowing you to define and transmit packets with six different attributes during a single test.

The following paragraphs explain the fields in the Transmit Channel portion of the display. The field editing commands listed in Table 4-5 can be used to modify alphanumeric fields. The "+" and "–" keys can be used to change the values of toggle fields.

Transmit Statistics (Toggle: On, Off)
This field indicates whether statistics on packet transmissions are to be compiled. The value of this field toggles between On and Off. On indicates that transmission statistics will be compiled and saved. Off indicates that they will not be saved.

Transmission statistics are saved in the file named in the Statistics File field, which is in the Data Collection portion of the screen.

Xmt Name (Alphanumeric)
Each channel can have a name to identify it. However, the name is optional. The name can be up to five characters long, consisting of letters, digits, and special characters. To name a channel, place the cursor on the appropriate line and type the name.

When the cursor is in the Xmt Name field, the command name *open* appears in the Commands Window in the box associated with function key F3. Pressing F3 switches to the Edit Packet screen, in which you can define the packet for the transmit channel. The Edit Packet screen is discussed in Section 5.4.

Xmt Status (Toggle: On, Off)
This field indicates whether a transmit channel is enabled. You can define criteria for several channels but enable only the channels of interest for a particular test. The value of the Xmt Status field toggles between On and Off. On indicates the channel is enabled to transmit packets. Off indicates the channel is disabled. The default transmit status is Off.

Count (Alphanumeric)
This field specifies the number of times the packet is to be transmitted. It can be a value from 0 to 64K. The default is 1. To enter the value 0, you can type either "0" or "Infin" (in any combination of uppercase and lowercase letters). The system then displays the word "Infin" in the field. Infin (0) means that the packet will be transmitted indefinitely or until you manually halt transmission or the test.

Packet Delay (Alphanumeric)
This field sets the time interval between the transmission of successive packets, in milliseconds. It can be a value from 0 to 64K. The default is 0, which means that there is no delay between transmission of successive packets.

Transmission Errors
The fields under this heading specify the types of errors to be introduced into the packet or induced during transmission. The errors can be of the following types:

- Crc
- Forced Collision
- Abnormal Preamble

- Forced Packet Gap
- No Backoff

Crc (Toggle: On, Off). The CRC, or cyclic redundancy check, is a 32-bit field that is computed and appended to each packet before transmission. The CRC is checked by the receiving node; if incorrect, it indicates that the packet was damaged during transmission. The Crc field on the Edit Test screen toggles between the values On and Off. On means a CRC error is deliberately introduced into the packet. Off means no CRC error is deliberately introduced.

Forced Collis (Toggle: On, Off). Normally, a packet is not transmitted if traffic (carrier sense) is detected on the network, that is, if the packet will collide with other packets already on the network. When the Forced Collis field is On, the packet is not transmitted until traffic is detected on the network. This forces a collision to occur. A packet transmitted in this way is received by the remote station with either a CRC or an alignment error. When this field is Off, the packet is not transmitted until the possibility of a collision is minimal.

Abnormal Preamble (Toggles: On/Off, Preamble-4/ Preamble-16). The legal Ethernet preamble is an eight-byte synchronization pattern that contains alternating 1's and 0's, ending with two consecutive 1's. This field allows the inclusion of an illegal preamble in the packet.

This field contains two values. The first toggles between the values On and Off; the second toggles between two illegal preamble lengths.

When the first value in the Abnormal Preamble field is toggled On, a preamble of the length specified in the second half of this field is prepended to the packet. When this field is toggled Off, a preamble of the standard Ethernet length (eight bytes) is used regardless of any value that might be specified in the second half of this field.

The second value in the Abnormal Preamble field specifies the length of the preamble. It can be one of two illegal

lengths – either four bytes (Preamble-4) or sixteen bytes (Preamble-16).

Forced Packet Gap (Toggle/Alphanumeric). The standard Ethernet packet spacing is 9.6 μs, which is the minimum time that must elapse between the time one transmission over the network ends and another transmission can begin. The Forced Packet Gap field allows you to vary the packet spacing.

This field contains two values. The first value toggles between On and Off; the second value is a user-entered numeric value in the range 3.2 to 25.5 (microseconds).

When the first value in the Packet Gap field is toggled On, the interpacket gap specified in the second half of the field is enabled. When this field is toggled Off, the standard Ethernet packet gap is used regardless of any value that might be specified in the second half of this field.

The second value in the Packet Gap field specifies the delay between packet transmission, in microseconds. The interpacket gap can be in the range 3.2 μs to 25.5 μs. (Values outside this range will cause unpredictable packet gaps.) You can use only digits to specify the packet gap; you cannot use decimal points. Hence the value you enter is actually ten times greater than the desired gap. For example, to specify 5.5 μs, you would enter 55.

No Backoff (Toggle: On, Off). When a channel attempts a transmission and detects traffic (carrier sense) on the network, there is a delay before attempting a retransmission. This retransmission delay is called backoff. The No Backoff field allows you to dispense with backoff. When this field is toggled On, packets are retransmitted with no delay; this may cause collisions on the network. When Off, packets are retransmitted according to the standard Ethernet backoff algorithm.

Transmit After/At Every Hr(s)
This field defines how often packets are to be transmitted. It consists of the following subfields: At/After and Time.

At/After (Toggle). Packets can be transmitted At an absolute clock time, or they can be transmitted a specified amount of time After the start trigger fires.

Time Hr(s) (Alphanumeric). This subfield, which is unlabeled, specifies the time After or At which transmission will begin. The time is specified in the format *hh:mm:ss*, where *hh* is the hour, *mm* is the minute, and *ss* is the second. To enter or change a time, use the editing commands listed in Table 4-5. The system inserts colons between each pair of digits, so you do not have to type them.

With At, the time is the absolute clock time at which transmission will begin. It can have a value from 00:00:00 (midnight) to 23:59:59. With After, the time is the amount of time that must elapse after the start trigger fires before transmission will begin. It can have a value from 00:00:00 to 99:00:00. With At or After, the default time value is 99:00:00.

Unlike receive channels, transmit channels do not have time-based stop triggers. Instead, transmission by a channel continues until the number of packets specified in the Count field have been transmitted, until you execute the *xabrt* (F7) command to halt transmission by this channel, or until you execute the *stop* (F2) or *abort* (F10) command to halt the test.

5.3. EDIT PATTERN SCREEN

The Edit Pattern screen (see Figure 5-3) is displayed by placing the cursor on one line in the Match Pattern field on the Edit Test screen and pressing function key F3, which executes the *open* command.

This screen allows you to specify a data pattern that the packets on each receive channel must match in order to be captured. If the Match Pattern field for a channel is toggled On, only those packets that match the pattern are collected. (Note that packets

must also match the other criteria specified for that receive channel in order to be collected.) Packets that do not match are ignored.

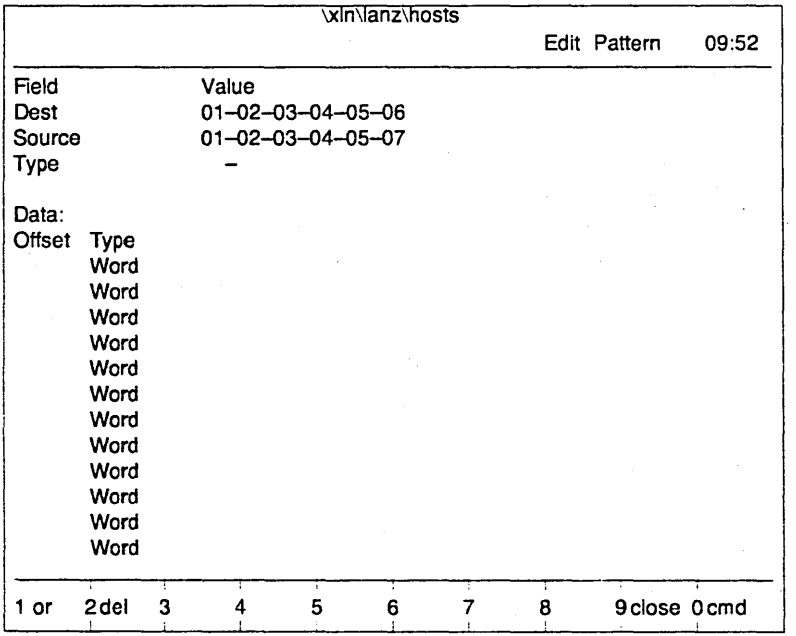


Figure 5-3: Edit Pattern Screen

5.3.1. Edit Pattern Commands

Table 5-3 lists and explains the commands executed by the function keys in the Commands Window of the Edit Pattern Screen. Any command can be used at any time, unless otherwise indicated.

Table 5-3: Edit Pattern Screen Function Key Identifiers

Key Label	Command	Explanation
F1	or	(Works only in Data portion of screen.) Permits definition of multiple patterns at a single offset position. This command opens a blank line immediately following the current line on which you can enter an alternate pattern. This process can be repeated as often as necessary.
F2	del	(Works only in Data portion of screen.) Deletes a pattern entry. If the pattern is the second or later one at the same offset, the entire line containing the pattern is deleted. Otherwise, only the pattern is erased.
F4-F8	–	Not used.
F9	close	Closes the Edit Pattern display and returns to the Edit Test screen.
F10	cmd	Executes the *cmd* commands, which allows execution of its subcommands. These are described in Table 4-6.

5.3.2. Edit Pattern Screen Fields

The fields in the Edit Pattern screen define a byte-level data pattern for a particular receive channel. Only packets that satisfy the match pattern (as well as the other receive criteria defined for the channel) are collected on this channel.

The match pattern can be up to 128 contiguous bytes long. Several different patterns can be specified at different offsets within this 128-byte range. Multiple patterns can be specified at the same offset.

The following paragraphs explain the fields in the Edit Pattern screen. The field editing commands listed in Table 4-5 can be used to modify alphanumeric fields. The "+" and "–" keys can be used to change the values of toggle fields.

Dest (Alphanumeric)
This field specifies the destination address of the packet. The address can be given in two ways: in the standard Ethernet format or as the host name.

The standard Ethernet address format is six bytes separated by hyphens.

If a name for the destination host is listed in the Edit Name screen (refer to Section 5.5), that name can be given instead of the Ethernet address. The full host name must be specified, but it is case-insensitive.

If an Ethernet address is specified for a host that has an entry in the Edit Name screen, the host name is displayed instead of the Ethernet address.

Source (Alphanumeric)
This field specifies the source address of the packet. The address can be given in two ways: in the standard Ethernet format or as the host name.

The standard Ethernet address format is six bytes separated by hyphens.

If a name for the source host is listed in the Edit Name screen (refer to Section 5.5), that name can be given instead of the Ethernet address. The full host name must be specified, but it is case-insensitive.

If an Ethernet address is specified for a host that has an entry in the Edit Name screen, the host name is displayed instead of the Ethernet address.

Type (Alphanumeric)
This field specifies the Ethernet Type field, which is a two-byte field that identifies the higher-level protocol associated with the packet. It is specified in the standard Ethernet format of two bytes separated by a hyphen. The system inserts a single space between each byte, so you do not have to type the hyphen.

Data
This field specifies the byte-level data pattern that packets to be captured on this channel must match. It consists of three subfields: Offset, Type, and Pattern.

Offset (Alphanumeric). This subfield specifies the location in the packet of the pattern given in this line. The location

is defined in terms of its offset, in hexadecimal bytes, from the beginning of the packet. Note that the first byte of a packet is at offset 0. The offset can have a maximum value of 9999, though realistically it should not be longer than the packet itself. If no offset is specified, any pattern specified is ignored.

Type (Toggle: Byte, Word, Long, Cstr). This subfield defines how the data pattern on this line is specified. It can toggle between the following values:

- Byte: A one-byte hexadecimal pattern
- Word: A two-byte hexadecimal pattern (default)
- Long: A four-byte hexadecimal pattern
- Cstr: A character string

If more than one pattern is specified at the same offset, each pattern must be of the same type.

Note that the LANalyzer EX 5000E expects to receive packets in Intel 8086 data order. For words, this order is high byte–low byte. For longwords, this order is high word–low word. You need to take this into account when defining match patterns if any hosts on your network transmit data in a different order and if you are specifying match patterns in terms of words or longwords. You can avoid any problem by always specifying the match pattern in bytes.

Pattern (Alphanumeric). (This subfield is unlabeled; it is to the right of the Type subfield.) This subfield specifies the data match pattern. The match pattern can consist of one or more bytes, words, longwords, or character strings. Each byte, word, or longword must be separated by a space.

You can enter multiple patterns for a single offset. Executing the *or* (F1) command inserts additional lines on which you can specify the patterns. Executing the *del* (F2) command deletes unwanted additional lines. If multiple patterns are specified, a packet matching any one of them will be collected.

How you enter the pattern depends on the data type specified in the previous field, as follows:

- For Byte types, you enter one or more one-byte hexadecimal patterns.
- For Word types, you enter one or more two-byte hexadecimal patterns.
- For Long types, you enter one or more longwords (four-byte hexadecimal patterns).
- For Cstr types, you enter one or more ASCII characters.

For Byte, Word, Long types, leading zeros are prepended to the pattern if it is shorter than the maximum byte length.

5.4. EDIT PACKET SCREEN

The Edit Packet screen (see Figure 5-4) is displayed by placing the cursor on the line in the Xmt Status field on the Edit Test screen and pressing function key F3, which executes the *open* command.

This screen allows you to define the Ethernet packets to be transmitted on a transmit channel. Packets can be a maximum of 2044 bytes long, including 14 bytes for the destination, source, and type fields. If the Xmt Status field for a channel is toggled On, the defined packet can be transmitted during a test.

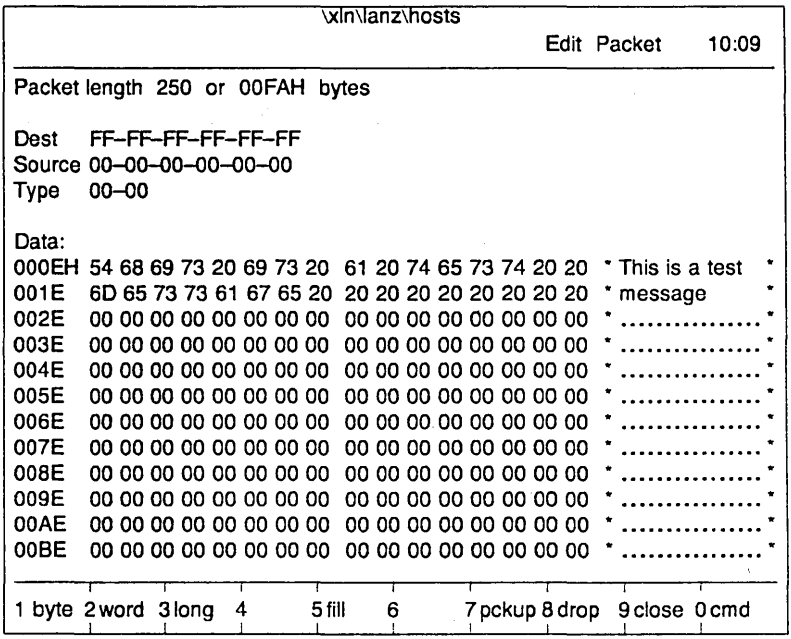


Figure 5-4: Edit Packet Screen

5.4.1. Edit Packet Screen Commands

Table 5-4 lists and explains the commands executed by the function keys in the Commands Window of the Edit Packet screen. Any command can be used at any time, unless otherwise indicated.

Table 5-4: Edit Packet Screen Function Key Identifiers

Key Label	Command	Explanation
F1	byte	Displays the data pattern in bytes (default).
F2	word	Displays the data pattern in words (two bytes). Words are shown in the data order high byte–low byte.
F3	long	Displays the data pattern in longwords (four bytes). Longwords are shown in the data order high word–low word.
F4	–	Not used.
F5	fill	Fills a segment of the transmit data with a single, repeating pattern. You are prompted at the bottom of the Data Window for three values: Offset, Count, and Value. **Offset** (Alphanumeric): The number of bytes from the beginning of the packet (in hexadecimal) at which to begin the repeating pattern. **Count** (Alphanumeric): The number of bytes (in decimal) to repeat the pattern. **Value**: (Alphanumeric) The hexadecimal value of the pattern to repeat. The standard field editing commands and cursor control keys can be used to enter these values. After you have entered the pattern information, press function key F10 (*exit*). If you want to exit from this prompt without entering any information, press Escape.
F6	–	Not used.
F7	pckup	Copies this transmit channel's packet data to another transmit channel. This is discussed in more detail in Section 7.6.
F8	drop	Inserts into this transmit packet the packet data from a trace file, the trace buffer, or another transmit channel. This is discussed in more detail in Section 7.6.
F9	close	Closes the Edit Packet screen and returns to the Edit Test screen.
F10	cmd	Executes the *cmd* command, which allows execution of its subcommands. These are described in Table 4-6.

5.4.2. Edit Packet Screen Fields

The fields on the Edit Packet screen allow you to define the contents of an Ethernet packet to be transmitted. You specify the destination address, source address, type, and data fields. These four fields can be up to 2044 bytes long. The system prepends the preamble field and appends the CRC field to the packet before transmission.

The following paragraphs explain the fields on the Edit Packet screen. The field editing commands listed in Table 4-5 can be used to modify alphanumeric fields. There are no toggle fields on this screen.

Packet Length (Alphanumeric)
This field specifies the total length of the packet to be transmitted, in bytes. The length can be given in hexadecimal or decimal. If you enter a value in hexadecimal, its equivalent is shown in decimal, and vice versa. You should not transmit packets that are shorter than four bytes. If you are transmitting a packet to another LANalyzer system, note that a LANalyzer system cannot collect packets shorter than two bytes.

Note that if the packet length is 0 (zero) when you exit from the Edit Packet screen (by pressing function key F9 [*close*]), any data you have entered in the Data field will be lost.

Dest (Alphanumeric)
This field specifies the address of the host to receive this packet. The address can be given in two ways: in the standard Ethernet format or as the host name.

The standard Ethernet address format is six bytes separated by hyphens.

If a name for the destination host is listed in the Edit Name screen (refer to Section 5.5), that name can be given instead of the Ethernet address. The full host name must be specified, but it is case-insensitive.

If an Ethernet address is specified for a host that has an entry in the Edit Name screen, the host name is displayed instead of the Ethernet address.

Source (Alphanumeric)
In a normal packet this field specifies the address of the local host transmitting the packet. In this case, the packet is transmitted as if it were from this local host. The address can be given in two ways: in the standard Ethernet format or as the host name.

The standard Ethernet address format is six bytes separated by hyphens.

If a name for the source host is listed in the Edit Name screen (refer to Section 5.5), that name can be given instead of the Ethernet address. The full host name must be specified, but it is case-insensitive.

If an Ethernet address is specified for a host that has an entry in the Edit Name screen, the host name is displayed instead of the Ethernet address.

Type (Alphanumeric)
This specifies the Ethernet Type field, which is a two-byte field that identifies the higher-level protocol type associated with the packet. The Type determines how the data (which you specify below) are interpreted. It is given in the standard Ethernet format of two bytes separated by a hyphen. The system inserts a single space between each byte, so you do not have to type the hyphen.

Data (Alphanumeric)
This field, which consists of several lines on the lower portion of the Data Window, specifies the data portion of the Ethernet packet. You can specify one contiguous data string, beginning at any offset in the packet. The data can be up to 2030 bytes long. However, you can display only 304 bytes at a time.

The Data field is divided into three unlabeled subfields: Offset, Hexadecimal Data, and ASCII Data. The Offset subfield is on the left side of the screen, the Hexadecimal Data subfield is in the middle, and the ASCII Data subfield is on the right.

Offset (Alphanumeric). This subfield specifies the location of the data in the packet. The offset is given in bytes (in hexadecimal) from the beginning of the packet. (Note that the first byte of a packet is at offset 0.) The first valid offset for data is 000E, because the first 14 bytes of the packet are required for the destination address, source address, and type fields.

You can change the offset value on the first line of the Data field only. Then when you move the cursor from this line, the system updates the rest of the values in this column so that they sequentially follow the specified offset. If you are editing a packet longer than 304 bytes, you scroll through the packet by changing the offset, increasing or decreasing the value depending on which direction you want to scroll.

Hexadecimal Data (Alphanumeric). This subfield specifies the packet's data in bytes, words, or longwords. You enter the packet's data in hexadecimal; the ASCII equivalent of the data is then shown in the ASCII Data subfield, which is on the right side of each line. All the hexadecimal data are displayed in the same type (byte, word, or longword). However, you can switch from one type to another as you are entering the data.

The default value for the data type – the value in effect when you first enter an Edit Packet screen display – is bytes. Correspondingly, this area shows sixteen bytes with a hyphen between the first eight and the second eight bytes:

nn nn nn nn nn nn nn nn – nn nn nn nn nn nn nn nn

To enter data in words (two bytes each), press function key F2 (*word*). The data display changes to the following format:

nnnn nnnn nnnn nnnn – nnnn nnnn nnnn nnnn

Note that the high byte of each word precedes its low byte.

To enter data in longwords (four bytes each), press F3 (*long*). The data display changes to the following format:

nnnnnnnn nnnnnnnn – nnnnnnnn nnnnnnnn

Note that the high word of each longword precedes its low word.

To redisplay the data in bytes, press F1 (*byte*).

You must type a space between each byte, word, or longword of data. Zeros are prepended to any byte, word, or longword that is shorter than the maximum length.

ASCII Data (Alphanumeric). This subfield specifies the packet's data in ASCII characters. When you move the cursor from the field or line, the hexadecimal equivalent of the data (in bytes, words, or longwords) are displayed in the Hexadecimal Data subfield, which is in the middle of the line.

5.5. EDIT NAME SCREEN

The Edit Name screen (see Figure 5-5) is displayed by pressing function key F4 on the Edit Test screen, which executes the *name* command.

This screen allows you to assign a name to each station on the network. The station's name is then displayed instead of its Ethernet address in the address fields on the various LANalzyer screens. In addition, you can enter the station's name instead of its Ethernet address in any address fields on the Edit screens. This method of aliasing the station's Ethernet address to an alphanumeric name simplifies the tasks of entering and interpreting station addresses.

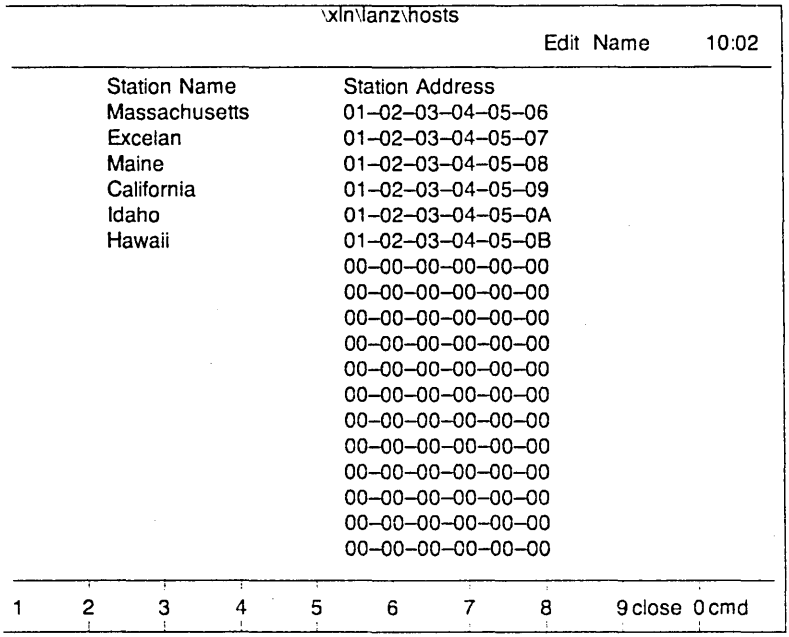


Figure 5-5: Edit Name Screen

5.5.1. Edit Name Screen Commands

Table 5-5 lists and explains the commands executed by the function keys in the Commands Window of the Edit Name screen. Any command can be used at any time, unless otherwise indicated.

Table 5-5: Edit Name Screen Function Key Identifiers

Key Label	Command	Explanation
F1-F8	–	Not used.
F9	close	Closes the Edit Name screen, savings its contents to disk, and returns to the Edit Test screen.
F10	cmd	Executes the *cmd* command, which allows execution of its subcommands. These are described in Table 4-6.

5.5.2. Edit Name Screen Fields

The fields on the Edit Name screen allow you to assign a name, or alias, for each station on the network. You do this by assigning a name that corresponds with the station's Ethernet address. Names can be assigned to a maximum of 50 stations.

The following paragraphs explain the fields on the Edit Name screen. The field editing commands listed in Table 4-5 can be used to modify alphanumeric fields. There are no toggle fields on this screen.

Station Name (Alphanumeric)
This field allows you to name the station. The name can be up to 17 characters long, including letters, digits, and most of the special characters on the keyboard. Trailing blanks are ignored, but blanks can be embedded or prepended to the name.

Station Address (Alphanumeric)
This field specifies the Ethernet address of the station. The Ethernet address format is six bytes separated by hyphens. The system inserts a single space between each byte, so you do not have to type the hyphen.

Chapter 6
RUNNING A TEST

6.1. INTRODUCTION

The LANalyzer EX 5000E displays in real time the results of a test in progress. It provides information about all packets observed on the network, packets captured on user-defined channels, and packets transmitted. This information includes data on the total number of packets observed, the number of packets captured, the number of packets transmitted, the number of packets containing errors, network and channel utilization, packet size distribution, and peak traffic rates.

You can begin running the test displayed on the Edit Test screen or a previously created test by pressing F10 (*cmd*) followed by F2 (*run*) to display the Run Counter screen. The F1 (*load*) command on the Run Counter screen lets you load a previously created test. The test begins collecting data as soon as the start trigger fires. In addition, you can invoke the LANalyzer EX 5000E software such that a test begins running immediately. This is described in detail in Section 3.5.3.

While a test is running, you can save the test results to a DOS file and you can save the packet traces to a DOS file or to the EXOS 225's buffer. After the test completes, you can review test results on the Statistics screens (refer to Chapter 8) and the packet traces on the Trace screens (refer to Chapter 7).

The results of a LANalyzer test in progress are displayed on the five Run screens:

- Run Counter Screen. This screen is displayed when you invoke the LANalyzer software with the /R switch or when you press function key F2 (*run*) from the *cmd* subcommands (refer to Table 4-5). It shows real-time test data for all enabled receive channels, as well as data on packets observed on the network and packets transmitted.

- Run Global Screen. This screen displays information about all network traffic observed during a test.
- Run Channel Screen. This screen displays information about packets received on enabled user-defined channels.
- Run Transmit Screen. This screen displays the results of packet transmissions.
- Run Station Screen. This screen monitors the packet traffic between stations on enabled user-defined channels.

The Status Window on all Run screens contains a timer and test status information in addition to the test name, screen name, and current time. The timer, which is on the left side of the window, indicates how long the test has been running. The time is given in the format *hh:mm:ss*, where *hh* is the hours, *mm* is the minutes, and *ss*, is the seconds. The test status message is displayed just to the right of the time. It indicates whether the start trigger has fired, the test is running, or the test has been stopped or aborted.

The following steps outline the general procedure for using the Run screens to run a test and display test data. Refer to the sections that follow for detailed information about how to run a test and about the meanings of the function keys and fields on the screens.

1. Begin running the test:
   - If you are in the LANalyzer software, press function key F10 (*cmd*) to display the *cmd* subcommands and then press F2 (*run*).
   - Otherwise, invoke the LANalyzer EX 5000E software from DOS as described in Section 3.5.3.
2. If keyboard input is required to fire the start trigger and begin packet collection/transmission, press function key F1 (*start*). Otherwise, wait until the start trigger fires.

3. Press F3 (*globl*) to display the Run Global screen. This screen lets you monitor all traffic on the network. You can return to the Run Counter screen by pressing F4 (*ctrs*).

4. Press F9 (*more*) once and then press one of the function keys F1 to F8 to display the Run Channel screen for the corresponding enabled receive channel. Function key F1 corresponds to channel 1, function key F2 corresponds to channel 2, and so on. Each Run Channel screen lets you monitor packet collection on that channel.

   You can return to the Run Global screen by executing the *more* (F9) command once or twice, if necessary, and then executing the *globl* (F3) command. You can return to the Run Counters screen by pressing F9 (*more*) once or twice, if necessary, and then pressing F4 (*ctrs*).

5. Press F9 (*more*) once or twice from the Run Global screen to display the transmit commands. If input is required to transmit a packet, press one of the function keys F1 to F6 that corresponds to the transmit channel. Press F7 (*xabrt*) to halt transmission on that channel.

6. If the stop trigger has not yet fired, you can halt the test by pressing F2 (*stop*) of F10 (*abort*). When the test stops, the timer in the Status Window stops counting.

7. Press F10 to execute the *cmd* command and display its subcommands. Then press F1 (*edit*) to return to the Edit Test screen to change the test criteria, press F3 (*trace*) to display the packet traces just collected, if traces were saved, or press F4 (*stats*) to display statistics for the packets just collected, if statistics were compiled.

6.2. RUN COUNTER SCREEN

The Run Counter screen (see Figure 6-1) reports general test results about all traffic observed on the network, all enabled receive channels, and packet transmissions. More detailed test results for all network traffic are given on the Run Global screen (refer to Section 6.3); those for enabled receive channels are given on the Run Channel screens (refer to Section 6.4); and those for packet transmissions are given on the Run Transmit screen (refer to Section 6.5).

If you specify the /R switch when you invoke the LANalyzer software from DOS, the Run Counter screen is the screen displayed initially. The name of the test file loaded by the /R switch is shown at the top of the Status Window.

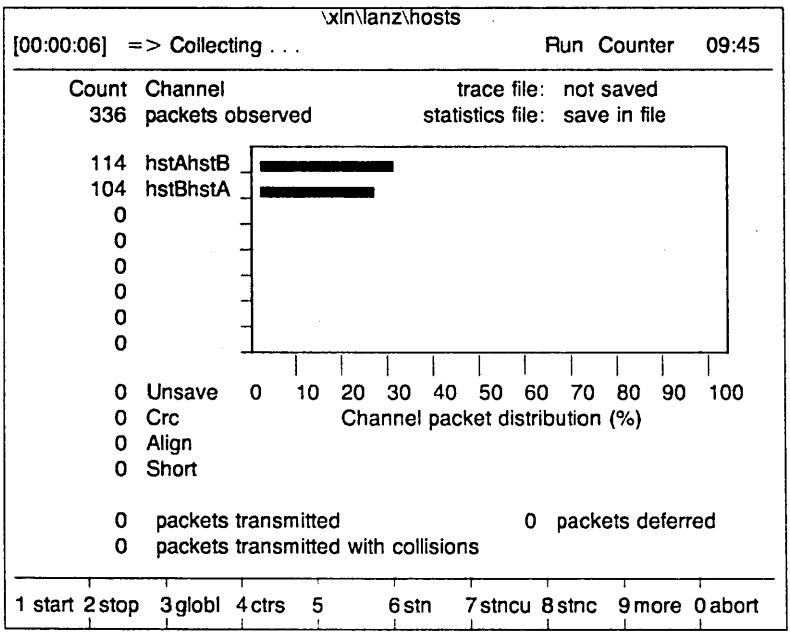


Figure 6-1: Run Counter Screen

6.2.1. Run Counter Screen Commands

The Run Counter screen has three groups of commands that can be displayed one at a time in the Commands Window. Tables 6-1, 6-2, and 6-3 list and explain these commands. Any function key shown in the current Commands Window can be used at any time, unless otherwise indicated in the tables. Executing the *more* (F9) command switches between Commands Windows.

Table 6-1: Run Counter Screen Commands (Group 1)

Key Label	Command	Explanation
F1	start	Begins running the test if the start trigger has not fired yet. The following messages are displayed, one after the other, in the Status Window: Waiting for start trigger Collecting ...
F2	stop	Fires the stop trigger to stop a test in progress. The following message is displayed in the Status Window: Collection stopped Any packets that are to be collected after the stop trigger has fired (as specified in the Then Collect Additional Packets field on the Edit Test screen) are then collected.
F3	globl	Switches to the Run Global screen. This screen is discussed in Section 6.3.
F4	ctrs	Switches to the Run Counter screen from other Run screens.
F5	–	Not used.
F6	stn	(Available only if, on the Edit Test screen, the Station Monitor field is On, the Trace Slice Offset is 0, and the Trace Slice Length is greater than or equal to 12.) Displays the Run Station screen. This screen is discussed in Section 6.6.
F7	stncu	(Available only if, on the Edit Test screen, the Station Monitor field is On, the Trace Slice Offset is 0, and the Trace Slice Length is greater than or equal to 12.) Refer to Table 6-10 for an explanation of this command.
F8	stnc	(Available only if, on the Edit Test screen, the Station Monitor field is On, the Trace Slice Offset is 0, and the Trace Slice Length is greater than or equal to 12.) Refer to Table 6-10 for an explanation of this command.

Table 6-1: Run Counter Screen Commands (Group 1) (Continued)

Key Label	Command	Explanation
F9	more	Toggles to the next group of Run Counter commands. Pressing F9 once switches to the commands listed in Table 6-2. Pressing F9 a second time switches to the commands listed in Table 6-3. Pressing F9 a third time returns to the commands listed in this table.
F10	abort	Aborts a test in progress without firing the stop trigger. The following message is displayed in the Status Window: Collection stopped, test aborted When a test is aborted, the criteria specified in the Then Collect Additional Packets field (on the Edit Test screen) are ignored and no additional packets are collected.

Table 6-2: Run Counter Screen Commands (Group 2)

Key Label	Command	Explanation
F1 F2 F3 F4 F5 F6 F7 F8	Channel 1 Channel 2 Channel 3 Channel 4 Channel 5 Channel 6 Channel 7 Channel 8	Each box shows the name of the associated receive channel if a name was assigned and the channel is enabled. Function key F1 corresponds to channel 1, F2 to channel 2, and so on. Pressing one of these function keys switches to the Run Channel screen for that channel. This screen is discussed in Section 6.4. If no name was assigned to an enabled receive channel, the associated box is empty but pressing the corresponding function key displays the Run Channel screen for that channel. For disabled channels, the associated box is empty and pressing the corresponding function key is a "no-op;" that is, nothing happens.
F9	more	Toggles to the next group of Run Counter commands. Pressing F9 once switches to the commands listed in Table 6-3. Pressing F9 a second time switches to the commands listed in Table 6-1. Pressing F9 a third time returns to the commands listed in this table.
F10	abort	Aborts a test in progress without firing the stop trigger. The following message is displayed in the Status Window: Collection stopped, test aborted When a test is aborted, the criteria specified in the Then Collect Additional Packets field (on the Edit Test screen) are ignored and no additional packets are collected.

Table 6-3: Run Counter Screen Commands (Group 3)

Key Label	Command	Explanation
F1 F2 F3 F4 F5 F6	Channel 1 Channel 2 Channel 3 Channel 4 Channel 5 Channel 6	Each box shows the name of the associated transmit channel if a name was assigned and the channel is enabled. Function key F1 corresponds to channel 1, F2 to channel 2, and so on. Pressing one of these function keys begins transmission by that channel. If no name was assigned to an enabled transmit channel, the associated box is empty but pressing the corresponding function key begins transmission by that channel. For disabled channels, the associated box is empty and pressing the corresponding function key is a "no-op;" that is, nothing happens.
F7	xabrt	Aborts the transmission in progress.
F8	xstat	Displays the Run Transmit screen. This screen is discussed in Section 6.5.
F9	more	Toggles to the next group of Run Counter commands. Pressing F9 once switches to the commands listed in Table 6-1. Pressing F9 a second time switches to the commands listed in Table 6-2. Pressing F9 a third time returns to the commands listed in this table.
F10	abort	Aborts a test in progress without firing the stop trigger. The following message is displayed in the Status Window: Collection stopped, test aborted When a test is aborted, the criteria specified in the Then Collect Additional Packets field (on the Edit Test screen) are ignored and no additional packets are collected.

6.2.2. Run Counter Screen Fields

The fields on the Run Counter screen report in real time the results of a test in progress. Specifically, this screen reports the following information:

- Whether packets are being saved in a trace file and whether statistics are being compiled and saved in a statistics file
- Total number of packets observed on the network
- Number of packets collected on each user-defined channel
- Buffer overflow
- Number of packets observed with errors
- Number of packets transmitted

The following paragraphs explain the fields on the Run Counter screen. All fields are noneditable. Note that how often the screen is updated is a function of how often test statistics are collected. The time interval at which statistics are collected is specified in the Collect Statistics Every *time* Second(s) field on the Edit Test screen. The default value of *time* is 1.

Count
This is a column heading. The numbers in this column indicate the number of packets observed on the network, the number of packets collected on the listed channels, the number of packets not saved to the board's buffer because of buffer overflow, and the number of packets observed with errors.

Channel
This is a column heading. The entry immediately below the column heading reports the total number of packets that have been observed on the network since the start trigger fired. The next eight entries are reserved for the names of the eight receive channels. Only the names of enabled channels are shown.

Trace File
This field indicates whether the packet traces collected during this test are being saved. It can contain three values: save in file, save in buffer, and not saved.

"save in file" means the traces are being saved to the disk file named in the Trace File field on the Edit Test screen. You can view the traces any time after the test completes by pressing F10 (*cmd*) followed by F3 (*trace*) to switch to the Trace screen (discussed in Chapter 7).

"save in buffer" means that the traces are being saved to the EXOS 225's buffer. This is done when no trace filename is specified and the Station Monitor field is Off. You can view the traces after the test completes and before running another test or terminating the LANalyzer session by pressing F10 (*cmd*) followed by F3 (*trace*) to switch to the Trace screen (discussed in Chapter 7).

"not saved" means no packet traces are being saved at all. Packet traces are not saved when no trace filename is specified and the Station Monitor field is On.

Statistics File
This field indicates whether statistics for packets collected during this test are being compiled and saved to a disk file. "save in file" means statistics are being compiled and saved; "not saved" means they are not being compiled and saved.

Unsave
This field lists the number of packets that have been collected by the LANalyzer system but have not been saved to the board's buffer and/or to a disk file because of buffer overflow. The board's buffer can hold a maximum of 700 Kbytes of packet data. This is equivalent to somewhere between 2700 256-byte (or smaller) packets and 450 packets of maximum size (usually 1518 bytes). Buffer overflow has two interrelated causes: limited buffer space and packet capture rate. The first 700 Kbytes of packet data will be captured from the network with no loss of data, regardless of the network traffic rate. The fate of

additional packets captured depends on whether they are being saved to the buffer or to a DOS file.

For packets being saved to the board's buffer, any packets collected beyond the first 700 Kbytes will overwrite previously collected packets. The buffer is circular, so the newest packets overwrite the oldest ones. The Unsave field reports the number of overwritten packets.

Packets being saved to a DOS file are temporarily stored in the buffer until they can be transferred to disk. The LANalyzer board can capture 1000 packets per second during continuous traffic or a single burst of 700 Kbytes of packet data (approximately 2000 packets) per second without any loss of data. However, the rate of data transfer from the board to the disk is much slower – 100 packets per second on IBM PC ATs (16-bit bus) or 30-50 packets per second on IBM PC XTs (8-bit bus). Packets captured to the board's buffer and waiting to be transferred to disk will be overwritten if the amount of incoming packet data exceeds the available buffer space. The buffer is circular, so the newest packets overwrite the oldest ones. The Unsave field reports the number of packets overwritten.

To minimize the number of packets that are overwritten, and hence lost, you can decrease the number of enabled receive channels or decrease the length of time that the test runs. Collecting a smaller packet slice will not save buffer space, because the buffer holds the entire packet as captured from the network; only when the PC transfers the packet to disk is the specified slice extracted.

Crc
This field reports the number of packets observed on the network with a CRC error.

Align
This field reports the number of packets observed on the network with an alignment error.

Short
This field reports the number of short packets (shorter than 64 bytes) observed on the network.

Channel packet distribution (%)
The bar graph to the right of the Channel column depicts the number of packets that have been collected on each enabled receive channel as a percentage of the total number of packets observed on the network.

Packets transmitted
The field reports the number of packets that have been transmitted during the test.

Packets transmitted with collisions
This field reports the number of packets for which one or more collisions have been detected during transmission.

Packets Deferred
This field reports the number of packets whose transmission was delayed because the network was busy (carrier sense detected).

6.3. RUN GLOBAL SCREEN

The Run Global screen (see Figure 6-2) is displayed by pressing function key F3 (*globl*) from the Run Counters screen. This screen reports information on all packets observed on the network while the test is running, whether or not they are collected on any channel.

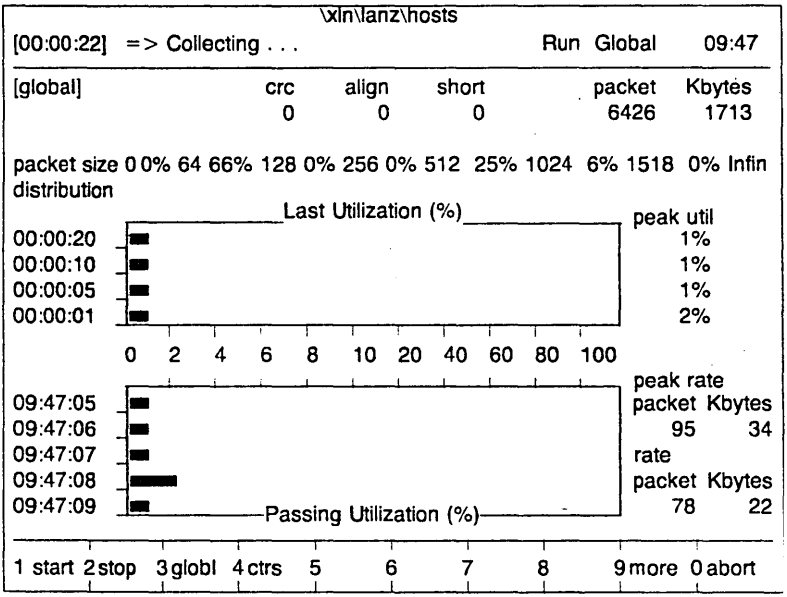


Figure 6-2: Run Global Screen

6.3.1. Run Global Screen Commands

The Run Global screen has three groups of commands that can be displayed one at a time in the Commands Window. Tables 6-4, 6-5, and 6-6 list and explain these commands. Any key shown in the current Commands Window can be used at any time, unless otherwise indicated. Executing the *more* (F9) command switches between Commands Windows.

Table 6-4: Run Global Screen Commands (Group 1)

Key Label	Command	Explanation
F1	start	Begins running the test if the start trigger has not fired yet. The following messages are displayed, one after the other, in the Status Window: Waiting for start trigger Collecting ...
F2	stop	Fires the stop trigger to stop a test in progress. The following message is displayed in the Status Window: Collection stopped Any packets that are to be collected after the stop trigger has fired (as specified in the Then Collect Additional Packets field on the Edit Test screen) are then collected.
F3	globl	Switches to the Run Global screen from other Run screens.
F4	ctrs	Switches to the Run Counter screen. This screen is discussed in Section 6.2.
F5	–	Not used.
F6	stn	(Available only if, on the Edit Test screen, the Station Monitor field is On, the Trace Slice Offset is 0, and the Trace Slice Length is greater than or equal to 12.) Displays the Run Station screen. This screen is discussed in Section 6.6.
F7	stncu	(Available only if, on the Edit Test screen, the Station Monitor field is On, the Trace Slice Offset is 0, and the Trace Slice Length is greater than or equal to 12.) Refer to Table 6-10 for an explanation of this command.
F8	stnc	(Available only if, on the Edit Test screen, the Station Monitor field is On, the Trace Slice Offset is 0, and the Trace Slice Length is greater than or equal to 12.) Refer to Table 6-10 for an explanation of this command.

Table 6-4: Run Global Screen Commands (Group 1) (Continued)

Key Label	Command	Explanation
F9	more	Toggles to the next group of Run Global commands. Pressing F9 once switches to the commands listed in Table 6-5. Pressing F9 a second time switches to the commands listed in Table 6-6. Pressing F9 a third time returns to the commands listed in this table.
F10	abort	Aborts a test in progress without firing the stop trigger. The following message is displayed in the Status Window: Collection stopped, test aborted When a test is aborted, the criteria specified in the Then Collect Additional Packets field (on the Edit Test screen) are ignored and no additional packets are collected.

Table 6-5: Run Global Screen Commands (Group 2)

Key Label	Command	Explanation
F1 F2 F3 F4 F5 F6 F7 F8	Channel 1 Channel 2 Channel 3 Channel 4 Channel 5 Channel 6 Channel 7 Channel 8	Each box shows the name of the associated receive channel if a name was assigned and the channel is enabled. Function key F1 corresponds to channel 1, F2 to channel 2, and so on. Pressing one of these function keys switches to the Run Channel screen for that channel. This screen is discussed in Section 6.4. If no name was assigned to an enabled receive channel, the associated box is empty but pressing the corresponding function key displays the Run Channel screen for that channel. For disabled channels, the associated box is empty and pressing the corresponding function key is a "no-op;" that is, nothing happens.
F9	more	Toggles to the next group of Run Global commands. Pressing F9 once switches to the commands listed in Table 6-6. Pressing F9 a second time switches to the commands listed in Table 6-4. Pressing F9 a third time returns to the commands listed in this table.
F10	abort	Aborts a test in progress without firing the stop trigger. The following message is displayed in the Status Window: Collection stopped, test aborted When a test is aborted, the criteria specified in the Then Collect Additional Packets field (on the Edit Test screen) are ignored and no additional packets are collected.

Table 6-6: Run Global Screen Commands (Group 3)

Key Label	Command	Explanation
F1 F2 F3 F4 F5 F6	Channel 1 Channel 2 Channel 3 Channel 4 Channel 5 Channel 6	Each box shows the name of the associated transmit channel if a name was assigned and the channel is enabled. Function key F1 corresponds to channel 1, F2 to channel 2, and so on. Pressing one of these function keys begins transmission by that channel. If no name was assigned to an enabled transmit channel, the associated box is empty but pressing the corresponding function key begins transmission by that channel. For disabled channels, the associated box is empty and pressing the corresponding function key is a "no-op;" that is, nothing happens.
F7	xabrt	Aborts packet transmission by the channel currently transmitting. However, the test in progress continues.
F8	xstat	Displays the Run Transmit screen, which is discussed in Section 6.5.
F9	more	Toggles to the next group of Run Global commands. Pressing F9 once switches to the commands listed in Table 6-3. Pressing F9 a second time switches to the commands listed in Table 6-4. Pressing F9 a third time returns to the commands listed in this table.
F10	abort	Aborts a test in progress without firing the stop trigger. The following message is displayed in the Status Window: Collection stopped, test aborted For aborted tests, the criteria specified in the Then Collect Additional Packets field (on the Edit Test screen) are ignored and no additional packets are collected.

6.3.2. Run Global Screen Fields

The fields on the Run Global screen report, in real time, the number of packets that have been observed on the network during the test.

The following paragraphs explain the fields on this screen. All fields are noneditable. Note that how often the data in some fields are collected and how often the screen is updated are a function of how often test statistics are collected. The time

nterval at which statistics are collected is specified in the Collect Statistics Every *time* Second(s) field, which is on the Edit Test screen. The default value of *time* is 1 (second).

Crc
This field reports the number of packets observed with a CRC error.

Align
This field reports the number of packets observed with an alignment error.

Short
This field reports the number of short packets (shorter than 64 bytes) observed.

Packet
This field shows the total number of packets observed during the test.

Kbytes
This field shows the total size, in kilobytes, of the packets observed during this test.

Packet size distribution
This field shows the number of packets of different sizes as a percentage of the total number of packets observed. The packet sizes are broken down as follows:

- 64 – packets smaller than 64 bytes
- 128 – packets from 64 to 127 bytes
- 256 – packets from 128 to 255 bytes
- 512 – packets from 256 to 511 bytes
- 1024 – packets from 512 to 1023 bytes
- 1518 – packets from 1024 to 1518 bytes
- Infin – packets larger than 1518 bytes

Last Utilization (%)
This graph comprises four bars that display channel utilization as a percentage of the maximum Ethernet channel utilization (10 Mbits per second). Channel

utilization is shown for the last n, $5n$, $10n$, and $20n$ seconds, where n is the time interval. A hyphen (–) shown instead of a bar indicates that the number of packets observed constituted less than 1% channel utilization. A solid diamond marks the peak utilization value, whose numeric equivalent is shown in the Peak Util field (to the right of this graph).

Peak Util
The peak channel utilization, shown to the right of each bar on the Last Utilization graph, numerically reports the channel utilization as a percentage of the maximum Ethernet channel utilization for the corresponding time interval.

Passing Utilization (%)
This graph comprises five bars that display channel utilization as a percentage of the maximum Ethernet channel utilization (10 Mbits per second). Channel utilization is shown for the current time interval and the four immediately preceding time intervals.

Peak rate packet
This field lists the greatest number of packets observed in any single second during the test.

Peak rate Kbytes
This field reports the largest amount of packet data, in kilobytes, observed in any single second during the test.

Rate packet
This field shows the total number of packets observed in the last second.

Rate Kbytes
This field shows the total size, in kilobytes, of all packets observed in the last second.

6.4. RUN CHANNEL SCREEN

The Run Channel screen (see Figure 6-3) for an enabled receive channel is displayed by pressing the corresponding function key from either the Run Counter or Run Global screens, or from the Run Channel screen for another channel. Group 2 of these screens' commands (refer to Tables 6-2, 6-5, and 6-8) lists the enabled channels in the boxes corresponding to function keys F1 to F8. Function key F1 corresponds to receive channel 1, F2 to receive channel 2, and so on.

The information displayed on the Run Channel screen is similar to that shown on the Run Global screen except that it is for packets collected on a specific channel rather than for all packets observed on the network.

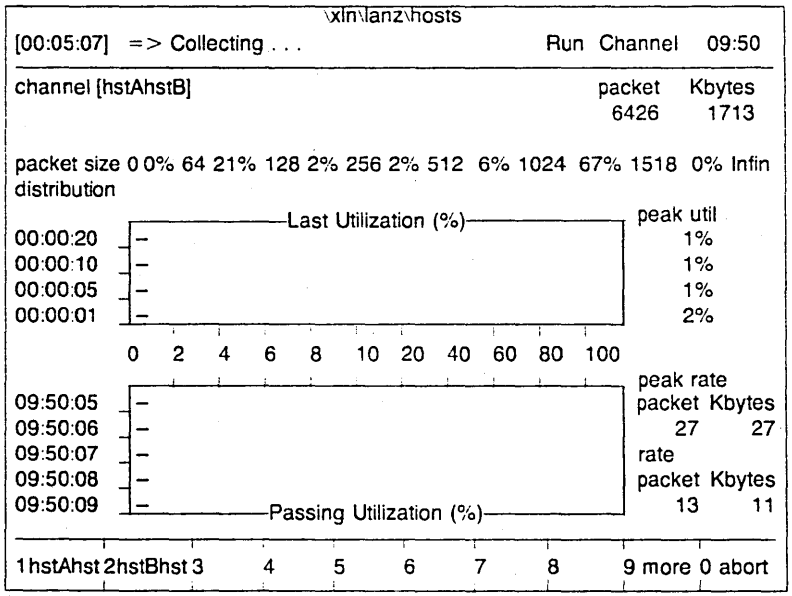


Figure 6-3: Run Channel Screen

6.4.1. Run Channel Screen Commands

The Run Channel screen has three groups of commands that can be displayed one at a time in the Commands Window. Tables 6-7, 6-8, and 6-9 list and explain these commands. Any key shown in the current Commands Window can be used at any time, unless otherwise indicated. Executing the *more* (F9) command switches between Commands Windows.

Table 6-7: Run Channel Screen Commands (Group 1)

Key Label	Command	Explanation
F1	start	Begins running the test if the start trigger has not fired yet. The following messages are displayed, one after the other, in the Status Window: Waiting for start trigger Collecting ...
F2	stop	Fires the stop trigger to stop a test in progress. The following message is displayed in the Status Window: Collection stopped Any packets that are to be collected after the stop trigger has fired (as specified in the Then Collect Additional Packets field on the Edit Test screen) are then collected.
F3	globl	Switches to the Run Global screen. This screen is discussed in Section 6.3.
F4	ctrs	Switches to the Run Counter screen. This screen is discussed in Section 6.2.
F5	–	Not used.
F6	stn	(Available only if, on the Edit Test screen, the Station Monitor field is On, the Trace Slice Offset is 0, and the Trace Slice Length is greater than or equal to 12.) Displays the Run Station screen. This screen is discussed in Section 6.6.
F7	stncu	(Available only if, on the Edit Test screen, the Station Monitor field is On, the Trace Slice Offset is 0, and the Trace Slice Length is greater than or equal to 12.) Refer to Table 6-10 for an explanation of this command.
F8	stnc	(Available only if, on the Edit Test screen, the Station Monitor field is On, the Trace Slice Offset is 0, and the Trace Slice Length is greater than or equal to 12.) Refer to Table 6-10 for an explanation of this command.

Table 6-7: Run Channel Screen Commands (Group 1) (Continued)

Key Label	Command	Explanation
F9	more	Toggles to the next group of Run Channel commands. Pressing F9 once switches to the commands listed in Table 6-8. Pressing F9 a second time switches to the commands listed in Table 6-9. Pressing F9 a third time returns to the commands listed in this table.
F10	abort	Aborts a test in progress without firing the stop trigger. The following message is displayed in the Status Window: Collection stopped, test aborted When a test is aborted, the criteria specified in the Then Collect Additional Packets field (on the Edit Test screen) are ignored and no additional packets are collected.

Table 6-8: Run Channel Screen Commands (Group 2)

Key Label	Command	Explanation
F1 F2 F3 F4 F5 F6 F7 F8	Channel 1 Channel 2 Channel 3 Channel 4 Channel 5 Channel 6 Channel 7 Channel 8	Each box shows the name of the associated receive channel if a name was assigned and the channel is enabled. Function key F1 corresponds to channel 1, F2 to channel 2, and so on. Pressing one of these function keys switches to the Run Channel screen for that channel. If no name was assigned to an enabled receive channel, the associated box is empty but pressing the corresponding function key displays the Run Channel screen for that channel. For disabled channels, the associated box is also empty and pressing the corresponding function key is a "no-op;" that is, nothing happens.
F9	more	Toggles to the next group of Run Channel commands. Pressing F9 once switches to the commands listed in Table 6-9. Pressing F9 a second time switches to the commands listed in Table 6-7. Pressing F9 a third time returns to the commands listed in this table.
F10	abort	Aborts a test in progress without firing the stop trigger. The following message is displayed in the Status Window: Collection stopped, test aborted When a test is aborted, the criteria specified in the Then Collect Additional Packets field (on the Edit Test screen) are ignored and no additional packets are collected.

Table 6-9: Run Channel Screen Commands (Group 3)

Key Label	Command	Explanation
F1 F2 F3 F4 F5 F6	Channel 1 Channel 2 Channel 3 Channel 4 Channel 5 Channel 6	Each box shows the name of the associated transmit channel if a name was assigned and the channel is enabled. Function key F1 corresponds to channel 1, F2 to channel 2, and so on. Pressing one of these function keys begins transmission by that channel. If no name was assigned to an enabled transmit channel, the associated box is empty but pressing the corresponding function key begins transmission by that channel. For disabled channels, the associated box is empty and pressing the corresponding function key is a "no-op;" that is, nothing happens.
F7	xabrt	Aborts packet transmission by the channel currently transmitting. However, the test in progress continues.
F8	xstat	Displays the Run Transmit screen, which is discussed in Section 6.5.
F9	more	Toggles to the next group of Run Channel commands. Pressing F9 once switches to the commands listed in Table 6-7. Pressing F9 a second time switches to the commands listed in Table 6-8. Pressing F9 a third time returns to the commands listed in this table.
F10	abort	Aborts a test in progress without firing the stop trigger. The following message is displayed in the Status Window: Collection stopped, test aborted When a test is aborted, the criteria specified in the Then Collect Additional Packets field on the Edit Test screen are ignored and no additional packets are collected.

6.4.2. Run Channel Screen Fields

The fields on the Run Channel screen report, in real time, the number of packets that have been collected on a user-defined receive channel.

The following paragraphs explain the fields on this screen. All fields are noneditable. Note that how often the data in some fields are collected and how often the screen is updated are a function of how often test statistics are collected. The time

interval at which statistics are collected is specified in the Collect Statistics Every *time* Second(s) field on the Edit Test screen. The default value of *time* is 1.

Channel
This field shows the name of the receive channel, if one was assigned.

Packet
This field shows the total number of packets observed on the network during this test.

Kbytes
This field shows the total size, in kilobytes, of all packets observed during this test.

Packet size distribution
This field shows the number of packets of different sizes as a percentage of the total number of packets observed on the network. The packet sizes are broken down as follows:

- 64 – packets smaller than 64 bytes
- 128 – packets from 64 to 127 bytes
- 256 – packets from 128 to 255 bytes
- 512 – packets from 256 to 511 bytes
- 1024 – packets from 512 to 1023 bytes
- 1518 – packets from 1024 to 1518 bytes
- Infin – packets larger than 1518 bytes

Last Utilization (%)
This graph comprises four bars that display channel utilization as a percentage of the maximum Ethernet channel utilization (10 Mbits per second). Channel utilization during a test is shown for the last n, $5n$, $10n$, and $20n$ seconds, where n is the time interval. A hyphen (–) shown instead of a bar indicates that the number of packets observed constituted less than 1% channel utilization. A solid diamond marks the highest channel utilization utilization. The numeric value corresponding to the diamond is shown in the Peak Util field (to the right of this graph).

Peak Util
The peak channel utilization, shown to the right of each bar on the Last Utilization graph, numerically reports the channel utilization as a percentage of the maximum channel utilization for the corresponding time interval.

Passing Utilization (%)
This graph comprises five bars that display channel utilization as a percentage of the maximum Ethernet channel utilization (10 Mbits per second). Channel utilization during the test is shown for the current time interval and the four immediately preceding time intervals.

Peak rate packet
This field reports the greatest number of packets collected on this channel in any single second during the test.

Peak rate Kbytes
This field reports the largest amount of packet data, in kilobytes, collected on this channel in any single second during the test.

Rate packet
This field reports the total number of packets collected on this channel in the last second.

Rate Kbytes
This field reports the total size, in kilobytes, of the packets collected in the last second.

6.5. RUN TRANSMIT SCREEN

The Run Transmit screen (see Figure 6-4) is displayed by pressing function key F8 (*xstat*) from the Run Counter, Run Global, or Run Channel screen. This screen shows a graph of the distribution of packets transmitted with and without collisions.

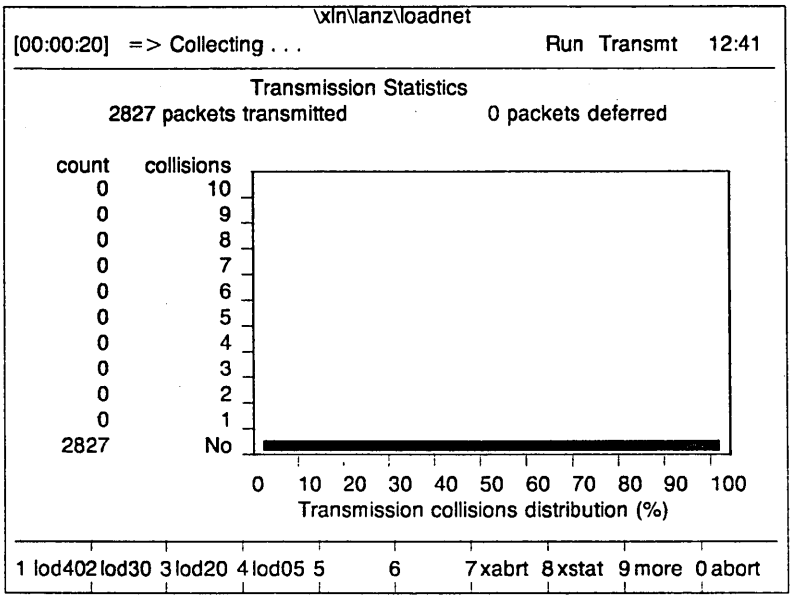


Figure 6-4: Run Transmit Screen

The meanings of the function keys in the Commands Window do not change when you display the Run Transmit screen from another Run screen.

The following paragraphs explain the fields on this screen. All fields are noneditable.

Packets transmitted
This field reports the total number of packets that have been transmitted during the test.

Packets deferred
This field reports the total number of packets whose transmission was delayed because carrier sense (traffic) was detected on the network.

Count
This is a column heading. The figures beneath it indicate the number of packets that have experienced the number of collisions listed in the next column.

Collisions
This is a column heading. Each value in this column indicates the number of collisions experienced by the number of packets listed in the previous column. These values range from No, which means that no collisions have occurred, to 15, the maximum number of collisions allowed before attempts to transmit that packet are halted.

Graph
The bar graph depicts the distribution of packets transmitted with and without the specified number of collisions as a percentage of the total number of packets transmitted.

6.6. RUN STATION SCREEN

The Run Station screen (see Figure 6-5) is displayed by pressing function key F6 (*stn*) from the Run Counter, Run Global, or Run Channel screen. The *stn* command is available only if the Station Monitor field is enabled (On), the offset in the Trace Slice field is set to 0, and the length in the Trace Slice field is greater than or equal to 12. (All these fields are on the Edit Test screen.)

This screens allows you to monitor, by station, the packet traffic between stations on the network. Specifically, you can monitor traffic between all stations whose packets are collected on one (or more) of the enabled receive channels. If you want to monitor traffic between all stations on the network, you need to define a promiscuous receive channel, that is, a channel that captures all network traffic.

For each station, the Run Station screen includes the following information:

- Number of packets received and transmitted
- Average size of packets received and transmitted
- Number of packets received and transmitted that contained errors

The Data Window on the Run Station screen may be too large to fit on the display. You can use the cursor control keys described in Table 4-4 to scroll through the window.

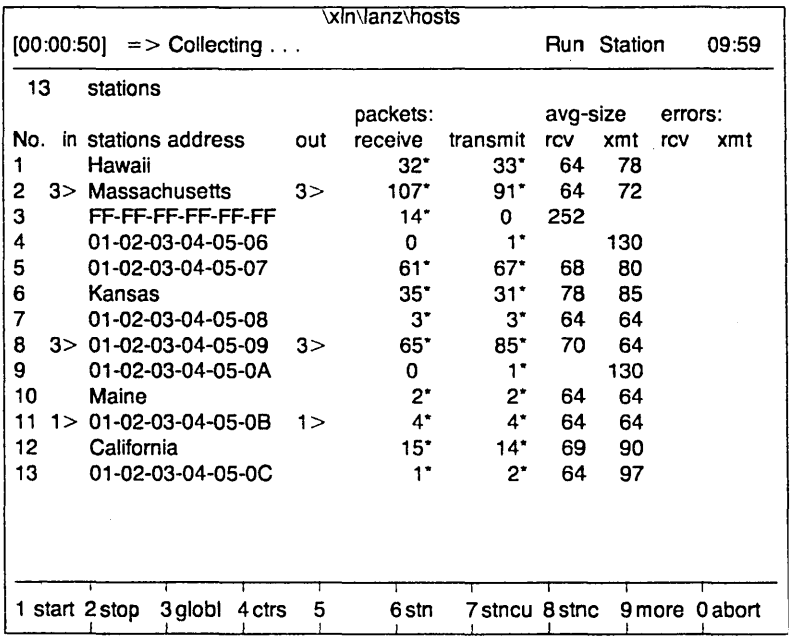


Figure 6-5: Run Station Screen

6.6.1. Run Station Screen Commands

The meanings of the function keys in the Commands Window do not change when you display the Run Station screen from another Run screen. However, two of the commands shown work only on the Run Station screen. These are listed and explained in Table 6-10, along with the other commands that remain in the Commands Window.

Table 6-10: Run Station Screen Commands

Key Label	Command	Explanation
F1-F5	–	These commands do not change when the Run Station screen is displayed from another Run screen. Refer to Table 6-1, 6-4, or 6-7 for an explanation of their meanings.
F6	stn	Displays the Run Station screen.
F7	stncu	Clears all station usage indicators (asterisks) from the screen, but does not reset any values.
F8	stnc	Clears all station usage indicators (asterisks) from the screen and resets all values to 0 (zero).
F9-F10	–	These commands do not change when the Run Station screen is displayed from another Run screen. Refer to Table 6-1, 6-4, or 6-7 for an explanation of their meanings.

6.6.2. Run Station Screen Fields

The fields on the Run Station screen report on the packet traffic between stations on the network. Specifically, they report on the traffic between all stations whose packets are collected on one (or more) of the enabled receive channels.

The following paragraphs explain the fields on this screen. All fields are noneditable. However, you can use the cursor control keys described in Tables 4-2 and 4-3 to highlight a line of interest on the screen.

How often data are collected and the screen updated is a function of how often test statistics are collected. The interval at which statistics are collected is specified in the Collect Statistics Every *time* Second(s) field on the Edit Test screen. The default value of *time* is 1.

In the following field descriptions it is important to remember the following: The only packets reported on the Run Station screen are those that match the criteria of one (or more) of the enabled receive channels. This means that the traffic reported between two stations may not necessarily be *all* the traffic between these stations; it is only the traffic that meets the test criteria and hence is captured by the LANalyzer system.

Stations
This field reports the total number of stations that have transmitted or received packets during the test.

No.
This field lists the sequential station number. Stations are added to the list on the Run Station screen as they become active, that is, when they transmit or receive a packet.

In
This field lists, for each station, the number of packets received in the last time interval. The number is followed by a right angle bracket (>).

Station Address
This field lists the Ethernet address of the station. If the station address is aliased on the Edit Name screen, the name is shown instead of the address.

Out
This field lists, for each station, the number of packets transmitted in the last time interval. The number is followed by a right angle bracket (>).

Packets Receive
This field lists the total number of packets received by the station since the test began or since all values on the Run Station screen were reset by pressing function key F8 (*stnc*), whichever occurred last.

An asterisk (*) following the number is the station usage (activity) indicator. It indicates that the count was incremented because one or more packets were received on the channel since the test began or since all station usage indicators were cleared, whichever occurred last. All station usage indicators (asterisks) on the Run Station screen can be cleared by pressing F7 (*stncu*).

Packets Transmit
This field lists the total number of packets transmitted by the station since the test began or since all values on the Run Station screen were reset by pressing function key F8 (*stnc*), whichever occurred last.

An asterisk (*) following the number is the station usage (activity) indicator. It indicates that the count was incremented because one or more packets were transmitted by the channel since the test began or since all station usage indicators were cleared, whichever occurred last. All station usage indicators (asterisks) on the Run Station screen can be cleared by pressing F7 (*stncu*).

Avg-Size Rcv
This field lists the average size of the packets received by this station since the test began or since all values on the Run Station screen were reset by pressing function key F8 (*stnc*), whichever occurred last.

Avg-Size Xmt
This field lists the average size of the packets transmitted by this station since the test began or since all values on the Run Station screen were reset by pressing function key F8 (*stnc*), whichever occurred last.

Errors Rcv
This field lists the number of packets containing errors that have been received by this station since the test began or since all values on the Run Station screen were reset by pressing function key F8 (*stnc*), whichever occurred last.

Errors Xmt
This field lists the number of packets containing errors that have been transmitted by this station since the test began or since all values on the Run Station screen were reset by pressing function key F8 (*stnc*), whichever occurred last.

Chapter 7
DISPLAYING PACKET TRACES

7.1. INTRODUCTION

A trace, or packet trace, is a record of a packet or packet segment (slice) collected during a test according to the user-defined criteria specified on the Edit screens. Each packet trace contains the following information about the packet:

- Test date and time
- Total number of traces collected during the test
- Packet's sequential number and timestamp
- Packet length
- Packet's destination and source addresses
- Packet's type field value
- Channel(s) on which packet was collected
- Types of errors packet contained
- Packet's data

While a test is running, packet traces can be stored in the EXOS 225's buffer or to a disk file. After a test completes, the collected packet traces can be displayed on the Trace screen (see Figure 7-1).

This chapter discusses how to display and understand the Trace screen, how to save packet traces that are in the EXOS 225 board's buffer to a disk file, and how to copy a packet trace to a transmit packet for retransmission on the network.

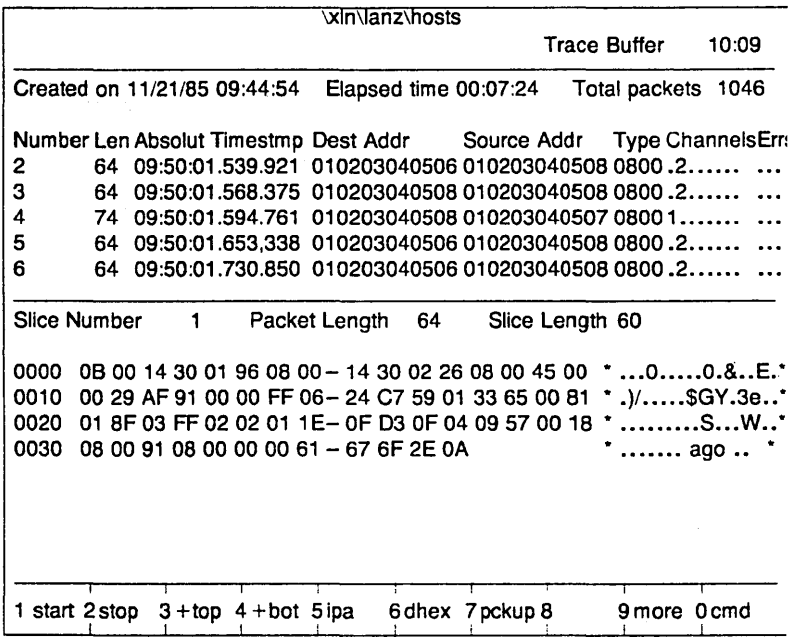


Figure 7-1: Trace Screen

Packet traces are displayed on one of two Trace screens:

- Trace Buffer Screen. This screen displays the packet traces that are stored in the EXOS 225's buffer.
- Trace File Screen. This screen displays the packet traces that are stored in a disk file.

The fields on the Trace Buffer and Trace File screens, as well as the commands listed in their Commands Windows, are identical. The only difference between these two screens is the location of the packet traces: those displayed by the Trace Buffer screen are in the EXOS 225's buffer, while those displayed by the Trace File are in the disk file named at the top

of the Status Window. In this chapter and throughout this manual, the term "Trace screen" is used to refer to both these screens.

Packet traces saved to disk files are stored in one or more 300-Kbyte files. (This file length allows trace files to be copied to low-density 5-1/4" floppy disks for storage or transfer to other LANalyzer systems.) These files have the filename assigned in the Trace File field on the Edit Test screen. The system appends the filename extension ".TR*n*," where *n* is a number or letter that corresponds to the file number. The traces can occupy a maximum of 35 files, with *n* from "1" to "9" and then "a" to "z." Thus a maximum of 10.5 Mbytes of trace data can be saved from a single test.

The Data Window on the Trace screen is split into two discrete subwindows:

- Summary Subwindow
- Packet Slice Data Subwindow

The Summary Subwindow is the upper subwindow. It reports general information about each packet (such as size and time collected) so that packets of interest can be identified easily.

The Packet Slice Data Subwindow is the lower subwindow. It displays the data contained in the packet or packet slice.

Only one subwindow in the Data Window can be active at a time. An arrow on the right border of the screen points to the window that is currently active. You switch to the other window by typing Alt-W. Alt-W actually toggles between three areas on the screen: the Summary Subwindow, the Packet Slice Data Subwindow, and the line containing the column headings in the Summary Subwindow.

The following steps outline the general procedure for using the Trace screen. Refer to the sections that follow for detailed information on the meanings of the function key commands and fields on this screen.

1. Display the Trace screen by pressing F10 (*cmd*) followed by F3 (*trace*).

2. Use the cursor control keys described in Tables 4-2, 4-3, and 4-4 to scroll through the Summary Subwindow (the upper portion of the Data Window) and select a packet of interest. The selected packet is highlighted.

3. Press function key F6 (*dhex*) to display the hexadecimal and ASCII contents of the packet slice highlighted in the Summary Subwindow.

4. Switch to the Packet Slice Data Subwindow by pressing Alt-W. You can now scroll through the packet's contents using the cursor control keys described in Table 4-4.

5. Return to the Summary Subwindow from the Packet Slice Data Subwindow by pressing Alt-W twice.

7.2. TRACE SCREEN COMMANDS

The Trace screen has two groups of commands that can be displayed one at a time in the Commands Window. Tables 7-1 and 7-2 list and explain the commands executed by these commands. Any function key shown in the current Commands Window can be used at any time, unless otherwise indicated. Executing the *more* (F9) command switches between Commands Windows.

Table 7-1: Trace Screen Commands (Group 1)

Key Label	Command	Explanation
F1	load	Loads a trace file from disk. In the Commands Window you are prompted for the name of the file: Trace file name: The filename or file specifier must be a valid DOS name. The system appends the extension ".TR*n*" to the name of the file, where *n* is a number or letter that corresponds to the file number. If the specified file is not found, the following message is displayed in the Status Window: *filename* not found! You are then propmted again for the filename.
F2	find	Searches for a packet trace. At the bottom of the Data Window, The system prompts you for the search parameters. Figure 7-2 shows the *find* command prompts superimposed on the Trace screen. Using the *find* command is explained in Section 7.4.
F3	buffr	Displays the traces in the EXOS 225's buffer.
F4	savbf	Saves the traces in the EXOS 225's buffer to a disk file. In the Commands Window, you are propmted for the name of the file: Save to trace file: The filename or file specifier must be a valid DOS name. The system appends the extension ".TR*n*" to the name of the file, where *n* is a number or letter that corresponds to the file number.
F5	goto	Moves the Summary Subwindow to the specified packet number in the trace file and highlights that line. In the Commands Window, you are prompted for the packet number: Packet Number: The number specified cannot be larger than the number of packets in the trace file.
F6	dhex	Displays the contents of the currently selected packet in hexadecimal and ASCII. The currently selected packet is the one highlighted in the Summary Subwindow. The packet contents are shown in the Packet Slice Data Subwindow.

Table 7-1: Trace Screen Commands (Group 1) (Continued)

Key Label	Command	Explanation
F7	prev	Displays in hexadecimal and ASCII the contents of the trace packet immediately preceding the one currently shown in the Packet Slice Data Subwindow.
F8	next	Displays in hexadecimal and ASCII the contents of the trace packet immediately following the one currently shown in the Packet Slice Data Subwindow.
F9	more	Toggles to the next group of Trace commands. Pressing F9 once switches to the commands listed in Table 7-2. Pressing F9 a second time returns to the commands listed in this table.
F10	cmd	Executes the *cmd* command, which allows execution of its subcommands. These are described in Table 4-6.

Table 7-2: Trace Screen Commands (Group 2)

Key Label	Command	Explanation
F1	start	Searches for the packet that fired the start trigger. This commands works only if the start trigger was defined in terms of number of packets collected, not in terms of elapsed time. If found, this packet is highlighted in the Summary Subwindow and a down arrow (↓) is placed to the right of the packet number field. If not found, the following message is displayed in the Status Window: Packet request not found!
F2	stop	Searches for the packet that fired the stop trigger. This commands works only if the stop trigger was defined in terms of number of packets collected, not in terms of elapsed time. If found, this packet is highlighted in the Summary Subwindow and an up arrow (↑) is placed to the right of the packet number field. If not found, the following message is displayed in the Status Window: Packet request not found!
F3	+top	Increases the size of the Summary Subwindow one line. By default, the Summary Subwindow shows entries for five packets. It can be enlarged to show a maximum of 12 entries. Increasing the size of the Summary Subwindow decreases the size of the Packet Slice Data Subwindow correspondingly.
F4	+bot	Increases the size of the Packet Slice Data Subwindow one line. By default, the Packet Slice Data Subwindow shows eight lines of trace data. It can be enlarged to show a maximum of 12 lines. Increasing the size of the Packet Slice Data Subwindow decreases the size of the Summary Subwindow correspondingly.
F5	ipa	Displays the Interpacket Arrival screen. This screen is discussed in Section 7.5

Table 7-2: Trace Screen Commands (Group 2) (Continued)

Key Label	Command	Explanation
F6	dhex	Displays the contents of the currently selected packet in hexadecimal and ASCII formats. The currently selected packet is the one highlighted in the Summary Subwindow. The contents are shown in the Packet Slice Data Subwindow.
F7	pckup	Places in a buffer a trace that is to be copied to a transmit channel. Refer to Section 7.6 for more information on using this command.
F8	–	Not used.
F9	more	Toggles to the next group of Trace commands. Pressing F9 once switches to the commands listed in Table 7-1. Pressing F9 a second time returns to the commands listed in this table.
F10	cmd	Executes the *cmd* command, which allows execution of its subcommands. These are described in Table 4-6.

7.3. TRACE SCREEN FIELDS

The fields on the Summary Subwindow (the upper portion of the Data Window) of the Trace screen provide a summary of the packets in a trace file or the trace buffer. The fields on the Packet Slice Data Window (the lower portion of the Data Window) display the contents of the traces collected during a test. This section describes the fields on each of these subwindows.

7.3.1. Summary Subwindow

The Summary Subwindow on the Trace screen is a scrollable window that shows information concerning the trace file and gives a brief description of each packet so you can determine if its contents might be of interest. Packets are stored in the trace file in the order in which they were received; they are numbered sequentially from 1.

This subwindow also indicates if packets were "unsaved;" that is, if they were lost because of buffer overflow. The packet immediately following a lost packet or packets is flagged with the symbol ☹ to the right of the packet number field.

You use the cursor control keys listed in Tables 4-2, 4-3, and 4-4 to select a packet of interest. The packet currently selected is highlighted in the Summary Subwindow. Pressing F6 (*dhex*) displays the contents of the selected packet.

The following paragraphs explain the fields on the Summary Subwindow of the Trace screen. The "+" and "–" keys can be used to change the values of the toggle fields.

Created On
This field shows the date and time at which the trace file was created or the trace buffer began filling. The date is given in the format *mm/dd/yy*, where *mm* is the month, *dd* is the date, and *yy* is the year. The time is given in the format *hh:mm:ss*, where *hh* is the hour (based on a 24-hour clock), *mm* is the minute, and *ss* is the second.

Elapsed Time
This field shows the total amount of time the test ran. The time is given in the format *hh:mm:ss*, where *hh* is the number of hours, *mm* is the number of minutes, and *ss* is the number of seconds.

Total Packets
This field indicates the total number of packets in the trace file or buffer.

Number
This column shows the packet number. Packets are saved in the order received; they are numbered sequentially from 1.

Len
This column shows the length of the packet, in bytes.

Timestamp (Toggle: Absolut Timestmp, Relativ Timestmp, Inter Pkt Tmestp)
This is a column heading. The column displays a time value for the packet to indicate when during the test it was collected.

The timestamp is given in the format *hh:mm:ss.sss.sss*, where *hh* is the hour, *mm* is the minute, and *ss.sss.sss* is the second. The seconds are shown in microseconds.

The column heading itself can be edited. To enter this field, press Alt-W one or two times and then use the cursor control keys until this field is highlighted. The timestamp value toggles between the following three options:

- **Absolut Timestmp** (default): The clock time.
- **Relativ Timestmp**: The relative time elapsed since the beginning of the test.
- **Inter Pkt Tmestp**: The time elapsed since the previous packet was collected.

When you move the cursor from this field, the column entries then display the timestamp values in the selected format.

Dest Addr (Alphanumeric)
This is a column heading. The column shows the packet's destination address. If the host name corresponding to the destination address is listed in the Edit Name screen, its name is shown instead of its Ethernet address.

The column heading itself can be edited. To enter this field, press Alt-W one or two times and then use the cursor control keys until this field is highlighted. You can replace

the heading with a decimal number that corresponds to a packet offset value. When you move the cursor from this field, the column entries then display for each packet trace the six bytes of data beginning at that offset, in hexadecimal. Entering a value of 0 (zero) redisplays the column heading and the destination addresses for the traces.

By setting the offset values in the Dest Addr, Source Addr, and Type fields to contiguous values, you can display 14 contiguous bytes of data for each packet trace.

Source Addr (Alphanumeric)
This is a column heading. The column shows the packet's source address. If the host name corresponding to the source address is listed in the Edit Name screen, its name is shown instead of its Ethernet address.

The column heading itself can be edited. To enter this field, press Alt-W one or two times and then use the cursor control keys until this field is highlighted. You can replace the heading with a decimal number that corresponds to a packet offset value. When you move the cursor from this field, the column entries then display for eachp acket trace the six bytes of data beginning at that offset, in hexadecimal. Entering a value of 6 redisplays the column heading and the source addresses for the traces.

By setting the offset values in the Dest Addr, Source Addr, and Type fields to contiguous values, you can display 14 contiguous bytes of data for each packet trace.

Type (Alphanumeric)
This is a column heading. The column shows the packet's type field value.

The column heading itself can be edited. To enter this field, press Alt-W one or two times and then use the cursor control keys until this field is highlighted. You can replace the heading with a decimal number that corresponds to a packet offset value. When you move the cursor from this field, the column entries then display for each packet trace the two bytes of data beginning at that offset, in

hexadecimal. Entering a value of 12 redisplays the column heading and the type values for the traces.

By setting the offset values in the Dest Addr, Source Addr, and Type fields to contiguous values, you can display 14 contiguous bytes of data for each packet trace.

Channels
This column indicates on which channels the packet was collected. Each entry consists of eight values. A 1 as the first value indicates the packet was collected on channel 1, a 2 as the second value indicates the packet was collected on channel 2, and so on. A period indicates that the packet was not received on the corresponding channel. For example, if the packet was received on channels 2, 7, and 8, the entry would look as follows:

.2....78

Errs
This column indicates what errors this packet contains, if any. Each entry consists of four values. If the packet contains no errors, the field would look as follows:

....

If the packet contains a CRC error, a C is shown in place of the first period.

If the packet contains an alignment error, an A is shown in place of the second period.

If the packet shorter than 64 bytes, an S is shown in place of the third period.

If a collision occurred when transmitting or attempting to transmit the packet, an X is shown in place of the last period.

7.3.2. Packet Slice Data Subwindow

The Packet Slice Data Subwindow on the Trace screen is a scrollable window that shows the data contents of an individual packet or packet slice. The data are shown in hexadecimal and ASCII formats simultaneously.

The following paragraphs explain the fields on the Packet Slice Data Subwindow. All fields are noneditable.

Slice Number
This field shows the sequential number of the packet or packet slice.

Packet Length
This field shows the length of the entire packet, in bytes.

Slice Length
This field shows the length of the packet slice collected, in bytes.

Byte number
(This is an unlabeled field.) This field, which is on the left side of the screen, indicates the offset of the first byte on the line, in hexadecimal. Note that the first byte in a packet is at offset 0.

Slice in hexadecimal
(This is an unlabeled field.) This field, which is in the middle of the screen, shows the contents of the packet slice, in hexadecimal. Each line shows two group of eight bytes separated by a hyphen (–). The contents of this field are the hexadecimal equivalent of the ASCII values shown in the next field.

Slice in ASCII
(This is an unlabeled field.) This field, which is on the right side of the screen, shows the contents of the packet slice in ASCII. The field is set off from the rest of the screen by two asterisks, one at the beginning and the other at the end of the field. The contents of this field are the ASCII equivalent of the hexadecimal values shown in the previous field.

7.4. FIND COMMAND FIELDS

The *find* command (refer to Table 7-1) searches for packets in the trace buffer or in a trace file according to one or more of the following criteria:

- Channel(s) on which packet was captured
- Error(s) that the packet contains
- Packet data

The search begins at the packet whose contents are currently shown in the Packet Slice Data Subwindow and continues to the end of the trace buffer or file. It does not wrap around to the beginning of the buffer or file.

This command displays the following fields at the bottom of the Data Window (see Figure 7-2). Some of these fields are labeled, while others are not.

- Satisfies any/all searches for each packet
- Search any/all on-channels
- Channel names
- Search any/all on-errors
- Error names (crc, align, short)
- Data search
- Data values (Offset, Type, Value)

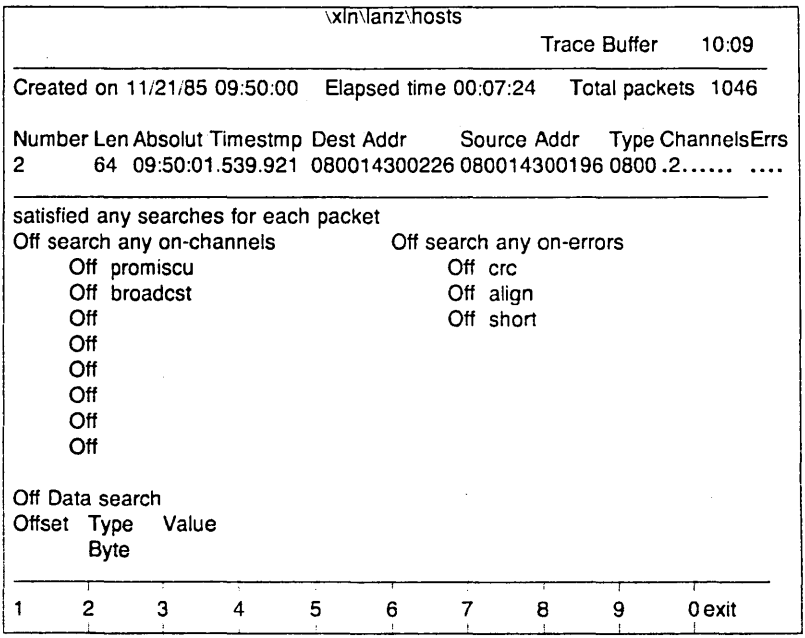


Figure 7-2: Find Command Superimposed on Trace Screen

The following steps outline the general procedure for using the *find* command. Refer to the paragraphs that follow these steps for detailed information on the meanings of the function key commands and fields on this screen.

1. Press function key F2 (*find*) on the Trace screen to display the *find* command screen.

2. Set the "Satisfies any/all searches for each packet" field to define whether the packet must satisfy any one or all of the search conditions defined on this screen.

3. Set the "Search any/all on-channels" field to On to search for packets collected on certain channels. Then specify the channel search condition (whether

the packets satisfying the search were captured on any single channel or on all the channels) and which channels to search.

4. Set the "Search any/all on-errors" field to On to search for packets containing certain errors. Then specify the error search condition (whether the packets satisfying the search contained any one of the listed errors or all of the listed errors) and which errors to search for.

5. Set the "Data search" field to On to search for packets containing a certain data pattern. Then specify the offset of the data pattern and the data itself.

6. Press F10 (*exit*) to commence the search.

Table 7-3 lists and explains the commands executed by the function keys in the commands Window of the *find* screen.

Table 7-3: *find* Commands

Key Label	Command	Explanation
F1-F9	–	Not used.
F10	exit	Exits the *find* command screen and begins the defined search. If a packet matching the specified criteria is found, it is displayed and highlighted in the Summary Subwindow and its data are shown in the Packet Slice Data Subwindow. Then in the Commands Window you are propmted as follows: Again (y/n)? Type **y** followed by Return to search for the next packet matching the *find* criteria. Type **n** followed by Return to terminate the search. If a packet matching the *find* criteria cannot be located, the following message is displayed in the Status Window: Request packet not found! To exit the *find* screen without commencing the search, press Escape.

The following paragraphs explain the *find* command fields. The field editing commands listed in Table 4-5 can be used to modify alphanumeric fields. The "+" and "–" keys can be used to change the values of toggle fields.

Satisfies any/all searches for each packet (Toggle: any, all)
This field specifies the general conditions under which the packet search will be made. It toggles between two values: any and all. "Any" means that if any one of the find criteria (channel, errors, data) is met, the search will be satisfied. This is the default value. "All" means that every one of the find criteria must be met before the search will be satisfied.

Search any/all on-channels (Toggles: On/Off, any/all)
This field specifies whether the channel(s) on which the packet was captured will be a search condition and, if so, how the channel(s) will be searched.

The On/Off toggle specifies whether the channel will be a search condition. On indicates that the channel will be a search parameter. The search will be done only on the enabled (On) channels in the Channel Names field. Off means that the channel will not be a search parameter; any enabled channels in the Channel Names field will be ignored.

The "any/all" toggle specifies how the on-channels (the channels in the Channel Names field that are enabled, or toggled On) will be searched. "Any" means that this search field will be satisfied if the packet was received on any one of the enabled channels in the Channel Names field. "All" means that this search field will be satisfied only if the packet was captured on all enabled channels.

Channel Names (Toggle: On, Off)
The eight lines immediately following the "search any/all on-channels" field comprise the Channel Names field. Each line consists of an On/Off toggle followed by the channel name. The first line of the Channel Names field corresponds to channel 1, the second line to channel 2, and so on. If a name was assigned to a channel on the

Edit Test screen, that name is shown. Otherwise, no name is shown.

The On/Off toggle indicates whether that channel will be searched. The value "On" on a channel name line enables the search on that channel. Off disables the search on that channel.

Search any/all on-errors (Toggles: On/Off, any/all)
This field specifies whether packet errors will be a search condition and, if so, how the error search will be conducted.

The On/Off toggle specifies whether packet errors will be a search condition. On indicates that packet errors will be a search parameter. The search will be done only for packets containing the errors types enabled (On) in the Error Names field. Off means that packet errors will not be a search parameter; any enabled error types in the Error Names field will be ignored.

The "any/all" toggle specifies how the on-errors (the channels in the Error Names field that are enabled, or On) will be searched. "Any" means that this search field will be satisfied if the packet contains any one of the enabled errors listed in the Error Names field. "All" means that this search field will be satisfied only if the packet contains all enabled errors.

Error Names (Toggle: On, Off)
The three lines immediately following the "search any/all on-errors" field comprise the Error Names field. Each line consists of an On/Off toggle followed by an error name. Three types of errors can be searched for: CRC, alignment (packets whose length was not a multiple of eight bits), and short packets (smaller than 64 bytes).

The On/Off toggle indicates whether that error will be a search parameter. The value "On" on an error name line enables the search on that error. Off disables the search on that error.

Data search (Toggle: On, Off)
This field specifies whether the packet's data will be a search parameter. On means that the search will look for packets containing the specified data pattern. Off means that the packet's data will not be a search parameter; any values specified in the Data Values fields will be ignored.

Data Values
This field specifies the search data pattern. The field comprises three values: Offset, Type, and Value.

Offset (Alphanumeric): The offset, in hexadecimal bytes, of the pattern from the beginning of the packet slice.

Type (Toggle: Byte, Word, Long, Cstr): The method in which the pattern is being specified. The type toggles between the following values:

Byte – a one-byte hexadecimal pattern

Word – a two-byte hexadecimal pattern (data order is high byte–low byte)

Long – a four-byte hexadecimal pattern (data order is high word–low word)

Cstr – an ASCII character string

Value (Alphanumeric): The match pattern, which can be one or more bytes, words, longwords, or ASCII character strings. Each pattern must be separated by a space.

7.5. INTERPACKET ARRIVAL SCREEN

Executing the *ipa* (F5) command on the Trace screen displays the Interpacket Arrival screen (see Figure 7-3). This screen calculates and displays information on the minimum, maximum, and average time between packets, and shows a graph of the interpacket time distribution.

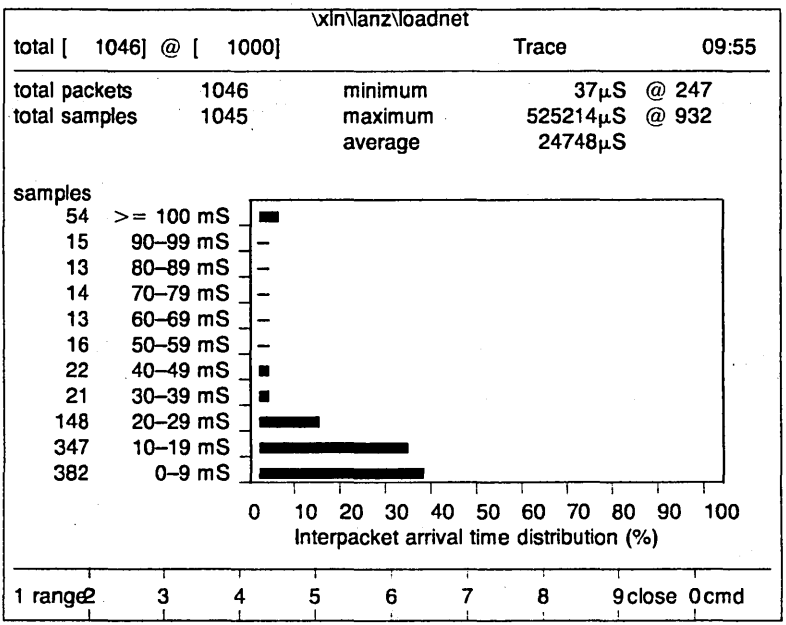


Figure 7-3: Interpacket Arrival Screen

On the left side of the Status Window is a counter that is similar to this:

total [1046] @ [1000]

The first entry, total [*nnnn*], indicates the total number of packets in the trace file or buffer. The second entry, @ [*nnnn*], is the counter itself. The LANalyzer software calculates the interpacket arrival distances beginning with the first packet in the file or buffer and working sequentially through the file to the last packet. The number (*nnnn*) in the second entry increments in multiples of 100 to indicate the software's location in the file as it is calculating.

The following steps outline the general procedure for using the Interpacket Arrival screen. Refer to the paragraphs that follow for detailed information on the meanings of the function key commands and fields on this screen.

1. Press function key F5 (*ipa*) on the Trace screen to display the Interpacket Arrival screen.

2. Press F1 (*range*) to specify the time interval to use to determine packet distribution. You specify a time value and a time unit.

3. Press F10 (*exit*) to calculate the packet distribution. The LANalyzer software begins calculating from the first packet trace. As it is calculating, it displays a counter on the left side of the Status Window indicating how far along in the file it is. When the calculations are complete, the counter stops and the interpacket arrival data and graph are displayed.

Table 7-4 lists and explains the commands executed by the function keys in the Commands Window of the Interpacket Arrival screen.

Table 7-4: Interpacket Arrival Screen Commands

Key Label	Command	Explanation
F1	range	Specifies the time interval used to determine packet distribution. At the bottom of the Data Window, you are prompted for the following information: **Time** (Alphanumeric; unlabeled field): The time interval between packets. This can be a number from 0 to 9999. **S** (Toggle: μS, mS, S): The time units. The units can be specified in microseconds (μS), milliseconds (mS), or seconds (S). The standard field editing commands and cursor control keys can be used to enter these values. When you have completed entering the time interval information, press function key F10 (*exit*). To exit from this prompt without entering any information, press Escape.
F9	close	(Available only after completion of the interpacket arrival distribution calculation.) Closes the Interpacket Arrival screen and returns to the Trace screen.
F10	cmd	Executes the *cmd* command, which allows execution of its subcommands. These are described in Table 4-6.

The fields on the Interpacket Arrival screen show information about the time interval between packets. This information is shown both numerically and graphically. The following paragraphs explain the fields on this display. All fields are noneditable.

Total Packets
This field reports the total number of packets in the trace buffer or file.

Total Samples
This field reports the total number of traces used to calculate the interpacket arrival data. Only contiguously received packets are used; that is, packets adjacent to "unsaved" packets (those lost because of buffer overflow)

are not included in the calculations. Also, since the first packet is the base point for the calculations, it is never counted in this field.

Minimum
This field reports the shortest interpacket time interval, in microseconds, and at which packet it occurred.

Maximum
This field reports the longest interpacket time interval, in microseconds, and at which packet it occurred.

Average
This field reports the average interpacket time interval.

Samples
This field lists the number of packets that fall in the time interval categories shown to the right of it.

Graph
The graph shows the distribution of interpacket arrival times as a percentage of the total number of packets received. The graph comprises 11 bars, which represent 11 time intervals. The time interval is based on the value you entered in the Time field when you entered values for the *range* (F1) command. For example, if you specified a range of 10, the time intervals would be as follows:

```
  0-9  10-19  20-29  30-39  40-49  50-59
60-69  70-79  80-89  90-99 >=100
```

If you specified a range of 5, the time intervals would be as follows:

```
  0-4   5-9  10-14  15-19  20-24  25-29
30-34 35-39  40-44  45-50  >=50
```

The time unit, which was specified when you defined the range (refer to Table 7-4), is shown to the right of the time interval.

7.6. COPYING PACKET SLICES

You can copy a packet slice received during a test, modify it if necessary, and then transmit it during a subsequent test. You can also copy a packet slice from one transmit packet to another. These are both done with the *pckup* and *drop* commands, which are shown on the Trace screen (refer to Table 7-2) and Edit Packet screen (refer to Table 5-4).

The following steps explain how to copy a packet slice from the trace buffer or a trace file to a transmit packet:

1. Display the Trace screen, and load the desired trace file or display the trace file.

2. In the Summary Subwindow, locate the packet slice you want to copy. Move the cursor to this packet slice so that it is highlighted.

3. Press function key F7 (*pckup*). A copy of the packet slice is placed in a buffer and a message similar to the following is displayed in the Status Window:

   Packet slice *n* copied to scrap!

   n is the number of the trace, which is listed in the first column of the Summary Subwindow.

4. Press F10 (*cmd*) and then F1 (*edit*) to display the Edit Test screen.

5. Move the cursor to the line in the Xmt Name field that corresponds to the transmit channel you want to copy the packet slice to.

6. Press F3 (*open*) to display the Edit Packet screen for that transmit channel.

7. Press F8 (*drop*) to copy the packet slice from the buffer to the Edit Packet screen. The following message is displayed in the Status Window:

   Slice dropped!

   You can then modify the packet slice if desired, as described in Section 5.4.2.

   Note that the packet slice retains its same offset value. Thus, any data that were already at this offset in the transmit packet are overwritten.

The following steps explain how to copy a packet slice from one transmit channel to another:

1. Press function key F10 (*cmd*) and then F1 (*edit*) to display the Edit Test screen.

2. Move the cursor to the line in the Xmt Name field that corresponds to the transmit channel you want to copy the packet slice from.

3. Press F3 (*open*) to display the Edit Packet screen for that transmit channel.

4. Press F7 (*pckup*). A copy of the packet slice is placed in a buffer and displays the following message in the Status Window:

   Packet copied to scrap

5. Press F9 (*close*) to exit the Edit Packet screen and return to the Edit Test screen.

6. Move the cursor to the line in the Xmt Name field that corresponds to the transmit channel you want to copy the packet slice to.

7. Press F3 (*open*) to display the Edit Packet screen for that transmit channel.

8. Press F6 (*drop*) to copy the packet slice from the buffer to the Edit Packet screen. The following message is displayed in the Status Window:

   Packet dropped!

   You can then modify the packet slice, if desired, as described in Section 5.4.2.

Chapter 8
DISPLAYING TEST STATISTICS

8.1. INTRODUCTION

While a test is running, test results are displayed as they occur on the various Run screens (refer to Chapter 6). By saving the test results to a statistics file on the fixed disk, you can review them at a later time on the Statistics screens.

The conditions for compiling and saving test statistics are defined in several fields on the Edit Test screen. Test statistics are saved for enabled receive channels if a filename is specified in the Statistics File field and if the Collect Stats. field for that receive channel is enabled (On). Test statistics are saved for transmit channels if a filename is specified in the Statistics File field and if the Transmit Statistics field is enabled.

This chapter discusses how to display and understand the Statistics screens.

LANalyzer statistics are displayed on three screens:

- Global Statistics Screen. This screen is displayed when you press function key F4 (*stats*) from the *cmd* subcommands (refer to Table 4-5). It shows data for all traffic observed on the network during the test.
- Channel Statistics Screen. This screen shows test data about packets collected on enabled user-defined receive channels.
- Transmit Statistics Screen. This screen shows test results for all packet transmissions.

Statistics are saved in one or more 300-Kbyte files. (This file length allows statistics files to be copied to low-density 5-1/4" floppy disks for storage or transfer to other LANalyzer systems.) These files have the filename assigned in the Statistics File field. The system appends the filename extension ".ST*n*," where *n* is a number or letter that corresponds to the file number. The statistics can occupy a maximum of 35 files, with

n from "1" to "9" and then "a" to "z." Thus a maximum of 10.5 Mbytes of statistics data can be saved from a single test (provided, of course, that disk space is available).

The following steps outline the general procedure for using the Statistics screens to review the results of a test. Refer to the sections that follow for details on the meanings of the function keys and fields on the screens.

1. Display the Global Statistics screen by pressing function key F10 (*cmd*) followed by F4 (*stats*).

2. Press F1 (*load*) to load a statistics file.

3. Press F2 (*next*) to step through the statistics file entries one by one.

4. Press F9 (*more*) twice and then press one of the function keys F1 through F8 to display the Channel Statistics screen for a particular receive channel.

5. Press F9 (*more*) once followed by F3 (*globl*) to return to the Global Statistics screen.

6. Press F8 (*xstat*) to display the Transmit Statistics screen.

8.2. GLOBAL STATISTICS SCREEN

The Global Statistics screen (see Figure 8-1) displays information on all packets observed on the network during a test. The information displayed on the Global Statistics screen is similar to that shown on the Run Global screen (discussed in Section 6.3). The major difference between these two screens is that the Global Statistics screen shows the results of a previously run test, while the Run Global screen shows the real-time results of a test in progress.

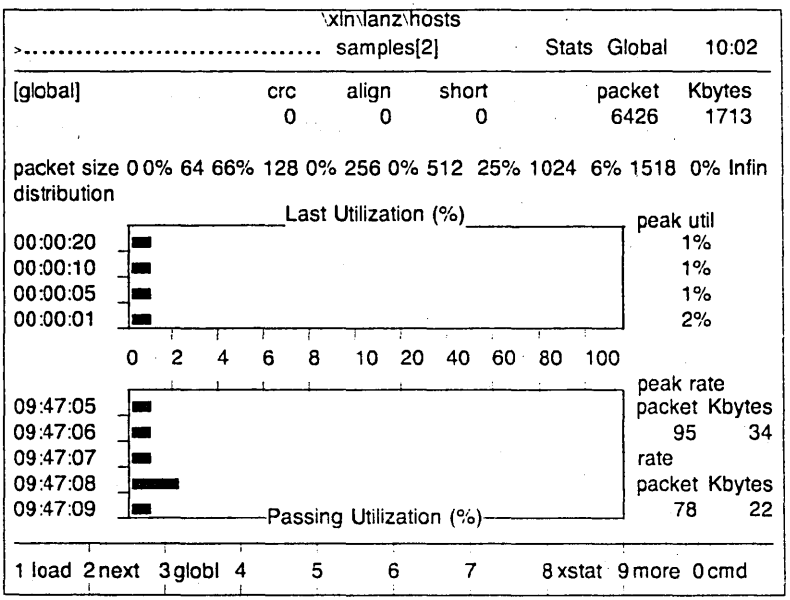


Figure 8-1: Global Statistics Screen

The left side of the Status Window shows a string of periods preceded by one or more right angle brackets (>) and followed by the sample number. The angle brackets and periods represent your relative position in the statistics file. When you are at the beginning of a statistics file, this part of the Status Window might look as follows:

>..... Sample[0]

As you scroll through the statistics file, the sample number changes, and the number of right angle brackets increases while the number of periods decreases. The relative number of brackets represents your current location in the statistics file. For instance, if you are near the midpoint of the file, the right angle brackets will extend to the middle of the line:

>>>>>>>>>>>>>>>>..... Sample[507]

Note that if the statistics file is very short, more than one right angle bracket may be used to represent your position at the beginning of the file.

8.2.1. Global Statistics Screen Commands

The Global Statistics screen has three groups of commands that can be displayed one at a time in the Commands Window. Tables 8-1, 8-2, and 8-3 list and explain these commands. Any function key shown in the current Commands Window can be used at any time, unless otherwise indicated. Executing the *more* (F9) command switches between Commands Windows.

Table 8-1: Global Statistics Screen Commands (Group 1)

Key Label	Command	Explanation
F1	load	Loads a statistics file from disk. You are prompted for the name of the file in the Command window: Statistics filename: The filename or file specifier must be a valid DOS name. The system appends the extension ".SF*n*" to the name of the file, where *n* is a number or letter corresponding to the file number. After the file is loaded, its first entry is displayed. If the specified file cannot be found, the following message is displayed in the Status Window: *filename* not found! You are then prompted again for the filename.
F2	next	Displays the next entry in the statistics file.
F3	globl	Switches to the Global Statistics screen from other statistics screens.
F4-F7	–	Not used.
F8	xstat	Displays the Transmit Statistics screen. This screen is discussed in Section 8.4.
F9	more	Toggles to the next group of Global Statistics commands. Pressing F9 once switches to the commands listed in Table 8-2. Pressing F9 a second time switches to the commands listed in Table 8-3. Pressing F9 a third time returns to the commands listed in this table.
F10	cmd	Executes the *cmd* command, which allows execution of its subcommands. These are described in Table 4-6.

Table 8-2: Global Statistics Screen Commands (Group 2)

Key Label	Command	Explanation
F1	beg	Displays the first entry in the statistics file.
F2	next	Displays the next entry in the statistics file.
F3	from	Moves to the specified location in the statistics file and zeros all cumulative statistics on the screen. The location is given in terms of time. At the bottom of the Data Window, you are prompted for two time-related values: After/At and Time. **After/At** (Toggle): At indicates the absolute clock time. After indicates the amount of time elapsed since the beginning of the test. **Time** (Alphanumeric): This field specifies the time to be used with the After/At field. The time is specified in the format *hh:mm:ss*, where *hh* is the hour (based on a 24-hour clock), *mm* is the minute, and *ss* is the second. The standard field editing commands and cursor control keys can be used to enter these values. When you have completed entering the time information, press function key F10 (*exit*). If you want to exit from this prompt without entering any information, press Escape.
F4	to	Moves to the specified location in the statistics file and displays cumulative statistics from either the point specified by the *from* (F3) command, if one was given, or the beginning of the statistics file. The location is given in terms of time. At the bottom of the Data Window, you are prompted for the following time-related values: After/At and Time. These values have the same meanings as those described above under F3.
F5	end	Displays the last entry in the statistics file. The values then shown on the screen are the cumulative ones for all the entries from the starting point to the end of the file.
F6	clear	Clears all cumulative values and graphs from the screen.
F7	–	Not used.

Table 8-2: Global Statistics Screen Commands (Group 2) (Continued)

Key Label	Command	Explanation
F8	sum	Displays the following information about the test in the Status Window: Started *mm/dd/yy* at *hh:mm:ss* Samples [*nnnn*] *mm/dd/yy* is the date on which the test started, where *mm* is the month, *dd* is the date, and *yy* is the year. *hh:mm:ss* is the time at which the test started, where *hh* is the hour, *mm* is the minute, and *ss* is the second. *nnnn* is the total number of samples in the statistics file.
F9	more	Toggles to the next group of Global Statistics commands. Pressing F9 once switches to the commands listed in Table 8-3. Pressing F9 a second time switches to the commands listed in Table 8-1. Pressing F9 a third time returns to the commands listed in this table.
F10	cmd	Executes the *cmd* command, which allows execution of its subcommands. These are described in Table 4-6.

Table 8-3: Global Statistics Screen Commands (Group 3)

Key Label	Command	Explanation
F1 F2 F3 F4 F5 F6 F7 F8	Channel 1 Channel 2 Channel 3 Channel 4 Channel 5 Channel 6 Channel 7 Channel 8	Pressing one of these function keys switches to the Channel Statistics screen for that receive channel. Each box in the Commands Window shows the name of the associated receive channel if a name was assigned and the channel was enabled during the test. Function key F1 corresponds to channel 1, F2 to channel 2, and so on. The Channel Statistics screen is discussed in Section 8.3. If no name was assigned to an enabled receive channel, the associated box is empty but pressing the corresponding function key displays the Run Channel screen for that channel. For disabled channels, the associated box is empty and pressing the corresponding function key is a "no-op;" that is, nothing happens.
F9	more	Toggles to the next group of Global Statistics commands. Pressing F9 once switches to the commands listed in Table 8-1. Pressing F9 a second time switches to the commands listed in Table 8-2. Pressing F9 a third time returns to the commands listed in this table.
F10	cmd	Executes the *cmd* command, which allows execution of its subcommands. These are described in Table 4-6.

8.2.2. Global Statistics Screen Fields

The fields on the Global Statistics screen give a historical report of the packets that were observed on the network during a test.

The following paragraphs explain the fields on this screen. All fields are noneditable. Note that the data in some fields are a function of how often test statistics were collected. The time interval at which the statistics were collected is specified in the Collect Statistics Every *time* Second(s) on the Edit Test screen. The default value of *time* is 1 (second).

Crc
This field reports the number of packets observed with a CRC error.

Align
This field reports the number of packets observed with an alignment error.

Short
This field reports the number of short packets (shorter than 64 bytes) observed.

Packet
This field shows the total number of packets observed during the test.

Kbytes
This field shows the total size, in kilobytes, of the packets observed during this test.

Packet size distribution
This field shows the number of packets of different sizes observed as a percentage of the total number of packets observed. The packet sizes are broken down as follows:

- 64 – packets smaller than 64 bytes
- 128 – packets from 64 to 127 bytes
- 256 – packets from 128 to 255 bytes
- 512 – packets from 256 to 511 bytes
- 1024 – packets from 512 to 1023 bytes
- 1518 – packets from 1024 to 1518 bytes
- Infin – packets larger than 1518 bytes

Last Utilization (%)
This graph comprises four bars that display channel utilization as a percentage of the maximum Ethernet channel utilization (10 Mbits per second). Channel utilization is shown for the last n, $5n$, $10n$, and $20n$ seconds, where n is the time interval. A hyphen (–) shown instead of a bar indicates that the number of packets observed constituted less than 1% channel utilization. A solid diamond marks the highest channel utilization. The numeric value corresponding to the diamond is shown in the Peak Util field (to the right of this graph).

Peak Util
The peak channel utilization, shown to the right of each bar on the Last Utilization graph, numerically reports the channel utilization as a percentage of the maximum channel utilization for the corresponding time interval.

Passing Utilization (%)
This graph comprises five bars that display channel utilization as a percentage of the maximum Ethernet channel utilization (10 Mbits per second). Channel utilization is shown for the current time interval and the four immediately preceding time intervals.

Peak rate packet
This field lists the greatest number of packets observed in any single time interval during the test.

Peak rate Kbytes
This field reports the largest amount of packet data, in kilobytes, observed in any single time interval during the test.

Rate packet
This field shows the total number of packets observed in the most recent time interval.

Rate Kbytes
This field shows the total size, in kilobytes, of all packets observed in the last time interval.

8.3. CHANNEL STATISTICS SCREEN

The Channel Statistics screen (see Figure 8-2) displays test data about each enabled receive channel. The information displayed on the Channel Statistics screen is similar to that shown on the Run Channel screen (discussed in Section 6.4). The major difference between these two screens is that the Channel Statistics screen shows the results of a previously run test while the Run Channel screen shows the real-time results of a test in progress.

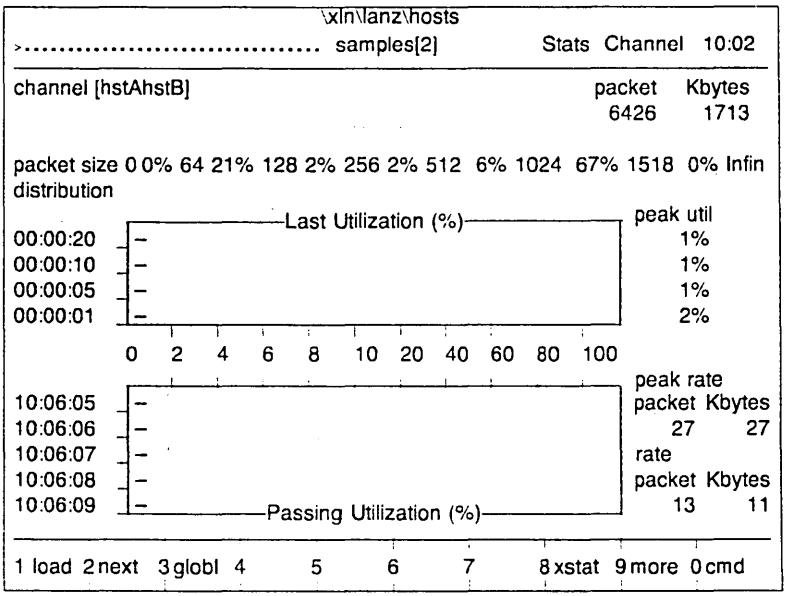


Figure 8-2: Channel Statistics Screen

The left side of the Status Window shows a string of periods preceded by one or more right angle brackets (>) and followed by the sample number. The angle brackets and periods represent your relative position in the statistics file. When you are at the beginning of a statistics file, this part of the Status Window might look as follows:

>..... Sample[0]

As you scroll through the statistics file, the sample number changes, and the number of right angle brackets increases while the number of periods decreases. The relative number of brackets represents your current location in the statistics file. For instance, if you are near the midpoint of the file, the right angle brackets will extend to the middle of the line:

>>>>>>>>>>>>>>>>>..... Sample[609]

Note that if the statistics file is very short, more than one right angle bracket may be used to represent your position at the beginning of the file.

8.3.1. Channel Statistics Screen Commands

The Channel Statistics screen has three groups of commands that can be displayed one at a time in the Commands Window. Tables 8-4, 8-5, and 8-6 list and explain these commands. Any function key shown in the current Commands Window can be used at any time, unless otherwise indicated. Executing the *more* (F9) command switches between Commands Windows.

Table 8-4: Channel Statistics Screen Commands (Group 1)

Key Label	Command	Explanation
F1	load	Loads a statistics file from disk. You are prompted for the name of the file in the Commands Window: Statistics filename: The filename or file specifier must be a valid DOS name. The system appends the extension ".SF*n*" to the name of the file, where *n* is a number or letter corresponding to the file number. After the file is loaded, its first entry is displayed. If the specified file cannot be found, the following message is displayed in the Status Window: *filename* not found! You are then prompted again for the filename.
F2	next	Displays the next entry in the statistics file.
F3	globl	Switches to the Global Statistics screen from any other statistics screen.
F4-F7	–	Not used.
F8	xstat	Displays the Transmit Statistics screen. This screen is discussed in Section 8.4.
F9	more	Toggles to the next group of Channel Statistics commands. Pressing F9 once switches to the commands listed in Table 8-5. Pressing F9 a second time switches to the commands listed in Table 8-6. Pressing F9 a third time returns to the commands listed in this table.
F10	cmd	Executes the *cmd* command, which allows execution of its subcommands. These are described in Table 4-6.

Table 8-5: Channel Statistics Screen Commands (Group 2)

Key Label	Command	Explanation
F1	beg	Displays the first entry in the statistics file.
F2	next	Displays the next entry in the statistics file.
F3	from	Moves to the specified location in the statistics file and zeros all cumulative statistics on the screen. The location is given in terms of time. At the bottom of the Data Window, you are prompted for two time-related values: After/At and Time. **After/At** (Toggle): At indicates the absolute clock time. After indicates the amount of time elapsed since the beginning of the test. **Time** (Alphanumeric): This field specifies the time to be used with the After/At field. The time is specified in the format *hh:mm:ss*, where *hh* is the hour (based on a 24-hour clock), *mm* is the minute, and *ss* is the second. The standard field editing commands and cursor control keys can be used to enter these values. When you have completed entering the time information, press function key F10 (*exit*). If you want to exit from this prompt without entering any information, press Escape.
F4	to	Moves to the specified location in the statistics file and displays cumulative statistics from either th point specified by the *from* (F3) command, if one was given, or the beginning of the statistics file. The location is given in terms of time. At the bottom of the Data Window, you are prompted for the following time-related values: After/At and Time. These fields have the same meanings as those described above under F3.
F5	end	Displays the last entry in the statistics file. The values then shown on the screen are the cumulative ones for all the entries from the starting point to the file.
F6	clear	Clears all cumulative values and graphs from the screen.
F7	–	Not used.

Table 8-5: Channel Statistics Screen Commands (Group 2) (Continued)

Key Label	Command	Explanation
F8	sum	Displays the following information about the test in the Status Window: Started *mm/dd/yy* at *hh:mm:ss* Samples [*nnnn*] *mm/dd/yy* is the date on which the test started, where *mm* is the month, *dd* is the date, and *yy* is the year. *hh:mm:ss* is the time at which the test started, where *hh* is the hour, *mm* is the minute, and *ss* is the second. *nnnn* is the total number of samples in the statistics file.
F9	more	Toggles to the next group of Channel Statistics commands. Pressing F9 once switches to the commands listed in Table 8-6. Pressing F9 a second time switches to the commands listed in Table 8-4. Pressing F9 a third time returns to the commands listed in this table.
F10	cmd	Executes the *cmd* command, which allows execution of its subcommands. These are described in Table 4-6.

Table 8-6: Channel Statistics Screen Commands (Group 3)

Key Label	Command	Explanation
F1 F2 F3 F4 F5 F6 F7 F8	Channel 1 Channel 2 Channel 3 Channel 4 Channel 5 Channel 6 Channel 7 Channel 8	Pressing one of these function keys displays the statistics for that receive channel. Each box in the Commands Window shows the name of the associated receive channel if a name was assigned and the channel was enabled during the test. Function key F1 corresponds to channel 1, F2 to channel 2, and so on. If no name was assigned to an enabled receive channel, the associated box is empty but pressing the corresponding function key displays the Run Channel screen for that channel. For disabled channels, the associated box is empty and pressing the corresponding function key is a "no-op;" that is, nothing happens.
F9	more	Toggles to the next group of Channel Statistics commands. Pressing F9 once switches to the commands listed in Table 8-4. Pressing F9 a second time switches to the commands listed in Table 8-5. Pressing F9 a third time returns to the commands listed in this table.
F10	cmd	Executes the *cmd* command, which allows execution of its subcommands. These are described in Table 4-6.

8.3.2. Channel Statistics Screen Fields

The fields on the Channel Statistics screen give a historical report of the packets collected on a user-defined receive channel during a test.

The following paragraphs explain the fields on these screens. All fields are noneditable. Note that the data in some fields are a function of how often test statistics were collected. The time interval at which the statistics were collected is specified in the Collect Statistics Every *time* Second(s) on the Edit Test screen. The default value of *time* is 1 (second).

Crc
This field reports the number of packets collected with a CRC error.

Align
This field reports the number of packets collected with an alignment error.

Short
This field reports the number of short packets (shorter than 64 bytes) collected.

Packet
This field shows the total number of packets collected during this test.

Kbytes
This field shows the total size, in kilobytes, of the packets collected during this test.

Packet size distribution
This field shows the number of packets of different sizes collected as a percentage of the total number of packets collected. The packet sizes are broken down as follows:

- 64 – packets smaller than 64 bytes
- 128 – packets from 64 to 127 bytes
- 256 – packets from 128 to 255 bytes
- 512 – packets from 256 to 511 bytes
- 1024 – packets from 512 to 1023 bytes
- 1518 – packets from 1024 to 1518 bytes
- Infin – packets larger than 1518 bytes

Last Utilization (%)
This graph comprises four bars that display channel utilization as a percentage of the maximum Ethernet channel utilization (10 Mbits per second). Channel utilization is shown for the last n, $5n$, $10n$, and $20n$ seconds, where n is the time interval. A hyphen (–) shown instead of a bar indicates that the number of packets observed constituted less than 1% channel utilization. A solid diamond marks the highest channel utilization. The numeric value corresponding to the diamond is shown in the Peak Util field (to the right of this graph).

Peak Util
The peak channel utilization, shown to the right of each bar on the Last Utilization graph, numerically reports the channel utilization as a percentage of the maximum channel utilization for the corresponding time interval.

Passing Utilization (%)
This graph comprises five bars that display channel utilization as a percentage of the maximum Ethernet channel utilization (10 Mbits per second). Channel utilization is shown for the current time interval and the four immediately preceding time intervals.

Peak rate packet
This field lists the greatest number of packets received in any single time interval during the test.

Peak rate Kbytes
This field reports the largest amount of packet data, in kilobytes, observed in any single time interval during the test.

Rate packet
This field shows the total number of packets received in the most recent time interval.

Rate Kbytes
This field shows the total size, in kilobytes, of all packets received in the last time interval.

8.4. TRANSMIT STATISTICS SCREEN

The Transmit Statistics screen (see Figure 8-3) is displayed by executing the *xstat* (F8) command from the Global Statistics or Channel Statistics screens (refer to Tables 8-2 and 8-5, respectively). This screen displays the results of packet transmission during a previously run test.

The information displayed on the Transmit Statistics screen is similar to that shown on the Run Transmit screen (discussed in Section 6.5). The major difference between these two screens

is that the Transmit Statistics screens shows the results of a previous test, while the Run Transmit screen shows the real-time results of a test in progress.

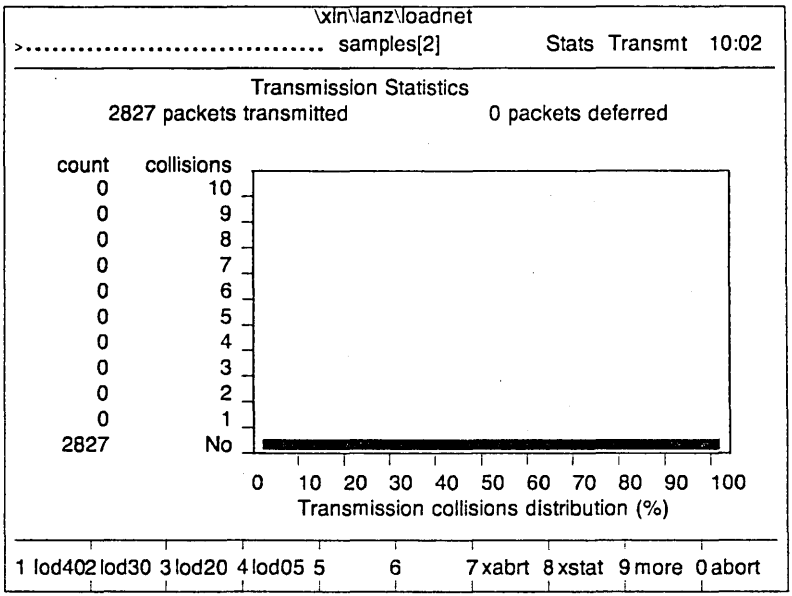


Figure 8-3: Transmit Statistics Screen

The left side of the Status Window shows a string of periods preceded by one or more right angle brackets (>) and followed by the sample number. The angle brackets and periods represent your relative position in the statistics file. When you are at the beginning of a statistics file, this part of the Status Window might look as follows:

>..... Sample[0]

As you scroll through the statistics file, the sample number changes, and the number of right angle brackets increases while the number of periods decreases. The relative number of brackets represents your current location in the statistics file.

For instance, if you are near the midpoint of the file, the right angle brackets will extend to the middle of the line:

```
>>>>>>>>>>>>>>>>>..................... Sample[973]
```

Note that if the statistics file is very short, more than one right angle bracket may be used to represent your position at the beginning of the file.

The meanings of the function keys do not change from their current values when you display the Transmit Statistics screen.

The following paragraphs explain the fields on this screen. All fields are noneditable.

Packets transmitted
This field reports the total number of packets that were transmitted up to the point in the test.

Packets deferred
This field reports the total number of packets delayed because of traffic (carrier sense) on the network.

Count
This is a column heading. The figures beneath it indicate the number of packets that experienced the number of collisions listed in the next column.

Collisions
This is a column heading. Each value in this column indicates the number of collisions experienced by the number of packets listed in the previous column. These values range from No, which means that no collisions occurred, to 15, the maximum number of collisions allowed before transmission attempts were halted.

Graph
The bar graph depicts the distribution of packets that were transmitted with and without the specified number of collisions as a percentage of the total number of packets transmitted.

Chapter 9
SAMPLE TESTS

9.1. INTRODUCTION

Several sample tests are provided as part of the LANalyzer software. These tests monitor various aspects of network packet traffic. The sample tests are of general interest, and you will probably find that you can use some of them to test your network with no modification. Others you may want to change slightly before using.

The purpose of explaining the sample tests is twofold: to illustrate the procedure for creating tests on the Edit screens, and to explain how to run a test and how to view test results. To these ends, the discussion of each sample test is organized as follows:

- Test Name and Introduction. This briefly describes the functions that the test is designed to perform.
- Setting Test Parameters. This describes how to specify values for the parameters relevant to the test. Parameters are set on the Edit Test, Edit Pattern, and Edit Packet screens. All parameters on these screens that are not discussed are assumed to be set to values that disable their functioning during the running of the test.
- Running the Test. This is a step-by-step explanation of how to invoke and run the test. It also explains on what screens you can view the test results.

This chapter describes in detail the following sample tests:

- LOADNET – This test stresses the network by generating an excessive load on it.
- HOSTS – This test collects packets sent during normal network usage between two hosts.

In addition, this chapter elaborates on the DEFAULT sample test, which is discussed in Chapter 3.

9.2. DEFAULT SAMPLE TEST

The DEFAULT sample test, which is found in the file \XLN\LANZ\DEFAULT, has two user-defined receive channels. On one, all network traffic is collected. On the other, all broadcast packets are collected. (A broadcast packet is one that can be received by all hosts on the network.)

The procedures for setting the test parameters, running the test, and viewing the captured packet traces are described in Chapter 3. In addition to these procedures, you may also want to use the *find* command (F2) to locate a particular captured packet in the trace buffer. Most of the packets collected by the DEFAULT test will be collected on the "promiscu" channel; only a few will be collected on the "broadcas" channel. To locate packets collected on the "broadcas" channel, follow these steps:

1. Immediately after the DEFAULT test concludes, display the Trace Buffer screen by pressing F10 (*cmd*) followed by F3 (*trace*).

2. Execute the *find* command by pressing F2. This superimposes the *find* command screen on the Trace Buffer screen.

3. Set the "Satisfies any/all searches for each packet" field to "any."

4. Toggle the "Search any/all on-channels" field to On and set its value to "any."

5. In the lines below the "Search any/all on-channels" field, toggle the "broadcas" line to On.

6. Press F10 (*exit*) to commence the search. The *find* screen is removed from the Trace Buffer screen. Note that the search begins from the packet whose data are currently displayed in the Packet Slice Data Subwindow.

7. If no packets were collected on the "broadcas" channel, the following message is displayed in the Status Window:

   Request packet not found!

   However, if a packet collected on this channel is located, its summary line is highlighted in the Summary Subwindow and its data are shown in the Packet Slice Data Subwindow. In the Commands Window you are prompted as follows:

   Again (y/n)?

   Type **y** followed by Return to search for the next packet collected on the "broadcas" channel. Type **n** followed by Return to terminate the search.

   The search can continue until the end of the Trace Buffer is reached. To wrap around to the beginning of the Trace Buffer, press F5 (*goto*), enter the value 1, and then press F2 (*search*) followed by F10 (*exit*) to start the search again.

9.3. LOADNET SAMPLE TEST

The LOADNET sample test, which is found in the file \XLN\LANZ\LOADNET, creates a load on the network by transmitting a large number of packets very rapidly. The primary purpose of generating a network load is to observe how the hosts on the network react under stress.

This sample test, as provided with the LANalyzer software, can generate the following loads on the network: 40%, 30%, 20%, and 5%. The parameters that are set to realize any of these loads are identical except for three fields: Channel Name and Delay (both on the Edit Test screen) and Packet Length (on the Edit Packet screen). The Channel Name field provides a unique identifier for each channel. The values in the Delay and Packet Length fields, taken together, determine the exact load generated.

Section 9.2.1 describes the parameters that are set to realize the functions of the LOADNET sample test. This section also explains how modifying some parameters may affect the functions performed by the test. Section 9.2.2 gives a step-by-step procedure for invoking and running the LOADNET test, and explains how to observe the test results.

9.3.1. Setting Parameters for the LOADNET Test

The functions of the LOADNET test are established by setting parameters on the Edit Test and Edit Packet screens. The fields on each screen that are relevant to the functions performed by this test are listed in Table 9-1 and highlighted in Figures 9-1 and 9-2. An explanation of each parameter follows. Only the parameters relevant to this test are described; the remainder are assumed to be preset to values that disable their functioning during the test.

Table 9-1: LOADNET Test Fields

Screen	Field
Edit Test	Xmt Name
	Xmt Status
	Count
	Delay
	Transmit After Every
Edit Packet	Packet Length
	Dest
	Source
	Data

```
                                    \xln\lanz\loadnet
                                                          Edit  Test          10:00
-------------------------------------------------------------------------------

Trace Slice    (Offset        0   Length Max )
Trace File
Statistics File                                          Station Monitor  Off
Collect Statistics Every              1 Second(s)

TRANSMIT
Transmit Statistics  Off

                                                  ----------Transmission Errors----------
Xmt    Xmt          Delay      Forced  Abnormal          Forced              No
Name   Status Count (ms)  Crc  Collis  Preamble          Packet  Gap         Backoff
lod40  On     Infin    1    Off  Off     Off  Preamble-4   Off  0  0.1us    Off
lod30  On     Infin    1    Off  Off     Off  Preamble-4   Off  0  0.1us    Off
lod20  On     Infin    2    Off  Off     Off  Preamble-4   Off  0  0.1us    Off
lod05  On     Infin    6    Off  Off     Off  Preamble-4   Off  0  0.1us    Off
       Off        1    0    Off  Off     Off  Preamble-4   Off  0  0.1us    Off
       Off        1    0    Off  Off     Off  Preamble-4   Off  0  0.1us    Off

Transmit After every  99:00:00  Hr(s)

-------------------------------------------------------------------------------
1 load  2 save  3       4       5       6       7       8       9       0 cmd
```

Figure 9-1: Edit Test Screen (Lower Portion) for the LOADNET Test

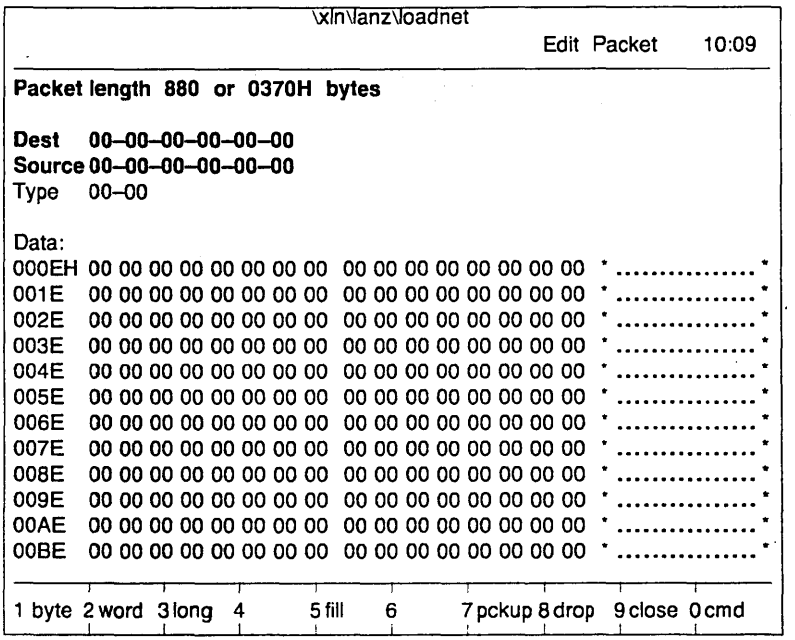


Figure 9-2: Edit Packet Screen for the LOADNET Test (Channel 1)

Xmt Name (Channel 1): lod40
Xmt Name (Channel 2): lod30
Xmt Name (Channel 3): lod20
Xmt Name (Channel 4): lod05

The name of each transmit channel reflects the percentage load generated by that channel.

Xmt Status: On

Each channel's transmit status is On. This means that the channel is enabled to transmit packets during the test.

Count: Infin

Each channel will transmit packets indefinitely or until transmission is halted manually. Changing this value to an integer directs the channel to transmit the packet that number of times and then stop.

Delay (Channel 1): 1
Delay (Channel 2): 1
Delay (Channel 3): 2
Delay (Channel 4): 6

The delay between successive packet transmissions is specified in milliseconds. The delay and the length of the packet (specified in the Packet Length field) are the parameters that establish the actual load. The values for these two parameters are determined empirically. Changing one or both of these values will probably alter the network load that is generated. The maximum load that the LANalyzer system can generate is about 95%; for all practical purposes, this is equivalent to network saturation.

Transmit After Every 99:00:00 Hr(s)

The value "After 99:00:00" (which is the transmit start trigger) says literally that packet transmisisoin will begin 99 hours after the start of the test. What it really means it that packet transmission will be initiated manually by pressing the function key corresponding to the transmit channel on the Run Counter, Run Global, or Run Channel screen (refer to Tables 6-3, 6-6, and 6-9, respectively). In this way, you can enable all transmit channels on the Edit Test screen. Then while running the test, you can select which channel is actively transmitting and can control when transmission starts and stops. You can also switch from channel to channel without having to return to the Edit Test screen to change the test parameters.

Changing this value to After 00:00:00 begins transmission by any active channel(s) immediately when the test begins running. Since only one channel can transmit at a time, you should also change the Xmt Status field so that only one transmit channel is enabled (On). The other three channels should be disabled (Off). If more than one channel is enabled, the transmission sequence cannot be predicted. For this reason, it is recommended that under these circumstances only one channel be enabled.

Packet Length (Channel 1): 880 or 0370H bytes
Packet Length (Channel 2): 576 or 0240H bytes
Packet Length (Channel 3): 629 or 0275H bytes
Packet Length (Channel 4): 389 or 0185H bytes

The packet length for each channel and the value given in the Delay field determine the load placed on the network when the packets are transmitted. The values in these two fields are determined empirically. Changing one or both of these values will probably alter the load generated.

Dest: 00–00–00–00–00–00
Source: 00–00–00–00–00–00

Specifying all zeros as the source address means that no hosts on the network will receive and attempt to process this packet. Since the purpose of this test is to overload the network, it is not necessary that any host or hosts receive the packet. The destination address should be any nonexistent address on the network.

Data: all zeros

Again, since the purpose of the test is to overload the network, the actual data in the packet are immaterial and have no effect on the load placed in the network. By default, the data in the packet are all zeros. However, any values are acceptable.

9.3.2. Running the LOADNET Test

After the parameters on the Edit Test and Edit Packet screens have been set as described in the previous section, you are ready to run the LOADNET test. If you have not modified any of the preset values for this sample test and want to run the test as provided, simply follow all the steps given below. If you have modified any of the preset values, you may want to alter the following sequence of steps.

Procedure

1. You can invoke the LOADNET test with the /R switch to start the test running immediately:

   C> **LANZ /R\XLN\LANZ\LOADNET**

   Then skip to Step 3.

   However, if you want to review or modify the preset parameter values for this test, you should invoke the test with the /E switch:

   C> **LANZ /E\XLN\LANZ\LOADNET**

2. If you invoked the LOADNET test with the /E switch, the Edit Test screen is displayed. You can now make any desired changes to the test parameters before running the LOADNET test. Refer to the discussion in Section 9.2.1.

   When you are ready to run the test, press function key F10 (*cmd*) and then press F2 (*run*).

3. The results of the LOADNET test are best viewed from the Run Global screen. To switch to this screen, press function key F3 (*globl*).

4. The commands that initialize packet transmission are listed on the third group of the Run Global commands (refer to Table 6-6). If these commands are not already displayed, press F9 (*more*) once or twice until they are.

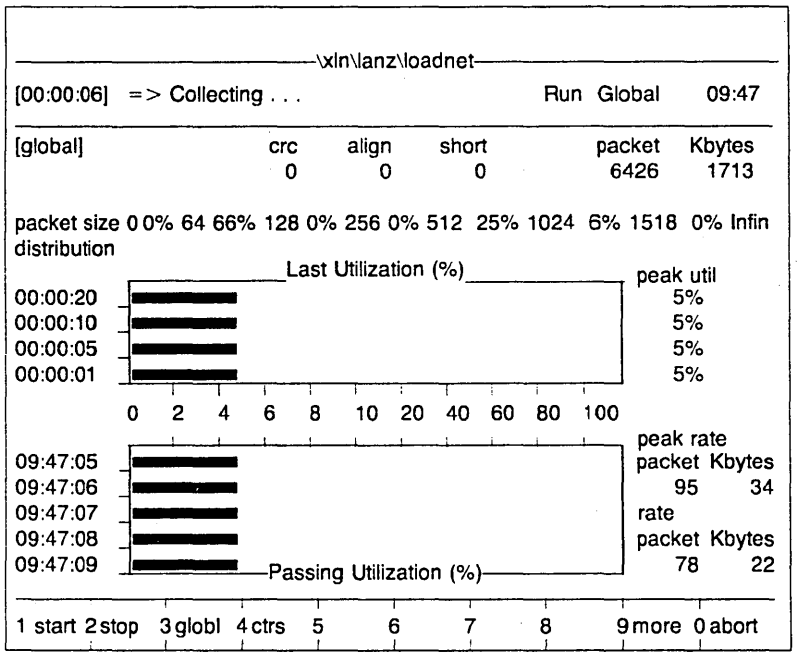
5. The boxes corresponding to function keys F1-F4 now contain the names of the transmit channels:

1 lod40	2 lod30	3 lod20	4 lod05	5	6	7 xabrt	8 xstat	9 more	0 abort

   As suggested by their names, channel 1 generates a 40% load, channel 2 a 30% load, channel 3 a 20% load, and channel 4 a 5% load.

6. Press one of the function keys F1-F4 that corresponds to the load you want to generate on the network.

7. The Last Utilization and Passing Utilization graphs on the Run Global screen depict the load on the network. The Peak Util field reports numerically the load percentage. For example, if you pressed F4 to transmit packets such that a 5% load is being placed on the network, the Run Global screen would look something like this:



8. At any time during the test, you can abort transmission by a particular transmit channel by pressing F7 (*xabrt*). Then you can press one of the function keys F1-F4 to begin transmitting on another channel.

9. The test will continue until you press F2 (*stop*) or F10 (*abort*). Either one of these commands halts the LOADNET test. You can restart the test by pressing F10 (*cmd*) followed by F2 (*run*).

9.4. HOSTS SAMPLE TEST

The HOSTS sample test, which is found in the file \XLN\LANZ\HOSTS, monitors the traffic between two hosts on the network. One use of this test is to determine why a new host on the network will not communicate properly with another host already on the network.

The HOSTS sample test, as provided with the LANalyzer software, contains names for the receive channels that monitor the flow of traffic between the two hosts. However, the addresses of these hosts in the distribution file are dummy values; you must provide the Ethernet addresses of the hosts you are actually monitoring.

Section 9.3.1 describes the parameters that are set to realize the functions of the HOSTS sample test. This section also explains how modifying some parameters may affect the functions performed by the test. Section 9.3.2 gives a step-by-step procedure for invoking and running the HOSTS test, and explains how to observe the test results.

9.4.1. Setting Parameters for the HOSTS Test

The functions of the HOSTS test are established by setting parameters on the Edit Test and Edit Pattern screens. The fields on each screen that are relevant to the functions performed by this test are listed in Table 9-2 and highlighted in Figures 9-3 and 9-4. An explanation of each parameter follows. Only the parameters relevant to this test are described; the

remainder are assumed to be preset to values that disable their functioning during the test.

Note that in this test the captured packet traces are saved to the EXOS 225's buffer. If you want to save them to a trace file, you should provide a filename in the Trace File field on the Edit Test screen.

Table 9-2: HOSTS Test Fields

Screen	Field
Edit Test	Xmt Name
	Channel Name
	Receive Status
	Match Pattern
Edit Pattern	Packet Length
	Dest
	Source
	Data

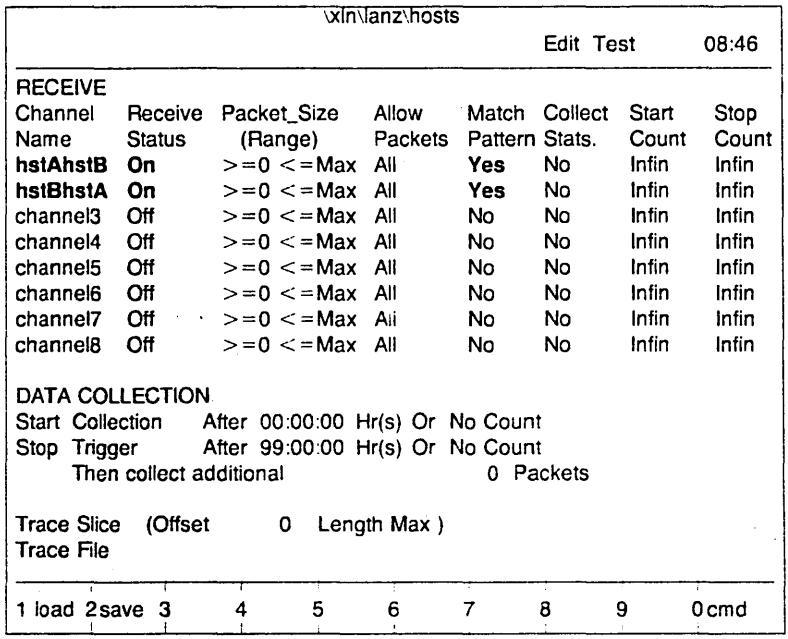


Figure 9-3: Edit Test Screen (Upper Portion) for the HOSTS Test

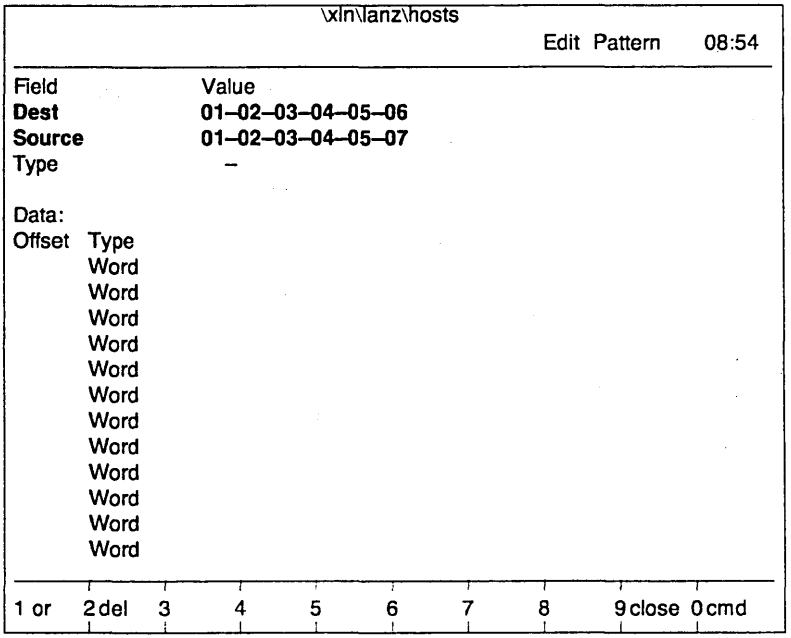


Figure 9-4: Edit Pattern Screen for the HOSTS Test

Channel Name (Channel 1): hstAhstB
Channel Name (Channel 2): hstBhstA

Two receive channels are defined in this test. One collects packets sent from the first host to the second host. The other collects packets sent from the second host to the first. These names are merely for identification purposes; if desired, you can change them so they are more meaningful for your situation.

Receive Status: On

The receive status for both channels is On. This means that they will both collect packets during the test.

Match Pattern: Yes

This field is set to Yes for both channels. This means that the packets collected by each channel must match the pattern specified in its Edit Pattern screen.

Dest: Address of receiving host

This is the destination address the packet must contain in order to be collected on this channel. For packets being transmitted from host A to host B, this would be the address of host B. For packets being transmitted from host B to host A, this would be the address of host A. You should change this value so it is appropriate for running the test on your network.

Source: Address of transmitting host

This is the source address the packet must contain in order to be collected on this channel. For packets being transmitted from host A to host B, this would be the address of host A. For packets being transmitted from host B to host A, this would be the address of host B. You should change this value so it is appropriate for running the test on your network.

Data: None

The purpose of this test is to collect all packets sent between two hosts regardless of their contents. Hence the Data field should be blank.

9.4.2. Running the HOSTS Test

The following steps describe how to invoke the HOSTS test, make the necessary modifications to it, run it, and view its results.

Procedure

1. If you are in DOS, invoke the LANalyzer software with the /E switch:

   C> **LANZ /E\XLN\LANZ\HOSTS**

If you are already in the LANalyzer software, return to the Edit Test screen by pressing F10 (*cmd*) followed by F1 (*edit*). To load the HOSTS file, press F1 (*load*). In response to the *load* prompt, type the name of the test file followed by RETURN:

\XLN\LANZ\HOSTS

2. The Edit Test screen is displayed. You can now make any desired changes to the test parameters before running the HOSTS test. Refer to the discussion in Section 9.3.1.

   Note that before running the test, you must modify the Dest and Source fields on the Edit Pattern screen to reflect the actual addresses of the two hosts on your network. Otherwise, the HOSTS test results will be meaningless.

3. When you are ready to run the test, press function key F10 (*cmd*) and then press F2 (*run*).

4. The results of the HOSTS test are best viewed from the Run Counter and the Run Channel screens. The Run Counter screen is displayed when you begin running the test. To switch to the Run Channel screen, press F9 (*more*) followed by the function key corresponding to the channel. To return to the Run Counter screen, press F4 (*ctrs*).

5. The test will continue until you press F2 (*stop*) or F10 (*abort*). Either one of these commands halts the HOSTS test. You can restart the test by pressing F10 (*cmd*) followed by F2 (*run*).

6. After halting the test, you can display the packet traces on the Trace Buffer screen by pressing F10 (*cmd*) followed by F2 (*run*).

7. If you are interested in checking the time interval between individual packets, press Alt-W twice and then use the cursor control keys to position the cursor in the

Timestamp field. Then toggle it to the Inter Pkt Tmestmp option. The time values displayed in this column show how long it is taking the responses to travel across the network from one host to the other. This gives you an idea of how long it is taking Host B to respond to Host A's messages, and vice versa.

8. If you are interested in the distribution of interpacket time intervals, press F3 (*ipa*) to display the Interpacket Arrival screen. Set the range value based on the times you observed in the Inter Pkt Tmestmp field. (For a first try, you might use a range of 10 milliseconds.) You can change the range value until the Interpacket Arrival graph shows the best distribution for your purposes.

   Press F9 (*close*) to exit from the Interpacket Arrival screen and return to the Trace Buffer screen.

9. If you want to save the contents of the Trace Buffer to a DOS file, press F4 (*savbf*). In response to the prompt, enter the name of the file in which to store the traces and press Return.

Appendix A
LANALYZER SPECIFICATIONS

A.1. INTRODUCTION

The LANalyzer EX 5000E Ethernet Network Analyzer is supplied as a kit that can be installed in an IBM PC XT, IBM PC AT, or PC-compatible and as a ready-to-use package, with all components pre-installed in a COMPAQ PORTABLE 286 computer. This appendix gives the specifications for the LANalyzer kit and its components and for the LANalyzer package.

A.2. LANALYZER KIT COMPONENTS

The LANalyzer EX 5000E kit consists of the following components:

- One EXOS 225 Ethernet Network Analyzer Controller board
- Standard low-density 5-1/4" floppy diskettes containing the hardware diagnostics, the installation software, and the EX 5000E system software.
- One LANalyzer User Manual
- One Excelan Series 1100 transceiver
- One transceiver cable

A.3. LANALYZER PACKAGE COMPONENTS

The LANalyzer EX 5000E package consists of the following components:

- One COMPAQ PORTABLE 286 personal computer (with 640 Kbyte of RAM and a 20-Mbyte hard disk) with the following hardware and software pre-installed in it:
  - One EXOS 225 Ethernet Network Analyzer Controller board
  - Diagnostics, installation software, and EX 5000E system software.
- Standard 5-1/4" floppy diskettes containing hardware diagnostics, installation software, and EX 5000E system software.
- One set of COMPAQ PORTABLE 286 and DOS manuals
- One LANalyzer User Manual
- One Excelan Series 1100 transceiver
- One transceiver cable

Note that the following environmental specifications are applicable for the LANalyzer package. These differ from those listed in the COMPAQ PORTABLE 286 manual:

Temperature:	Operating:	+50°F to +95°F (+10°C to +35°C)
	Nonoperating:	+50°F to +113°F (10°C to +45°C)
	Packaged:	–22°F to +113°F (–30°C to +45°C)

A.4. EXOS 225 ETHERNET NETWORK ANALYZER CONTROLLER

The following are the specifications for the EXOS 225 Ethernet Network Analyzer board:

CPU:	Intel 80186, 8 MHz	
Data paths:	Internal:	16-bit
	External:	Jumperable for 8-bit PC bus or 16-bit PC bus
RAM:	1 Mbyte, dual-ported, zero wait states	
Host memory map:	Jumperable for 80000H, 90000H, A0000H, or B0000H	
Host I/O map:	Jumperable at 8-bit boundaries between 300H and 378H, inclusive	
Host interrupts:	Programmable 2, 3, 4, 5, 6, or 7	
Host CPU speed:	IBM PC XT:	4.77 MHz
	IBM PC AT:	6 MHz
LAN coprocessor:	Intel 82586	
Dimensions:	13" x 3.9" (33 cm x 9.9 cm), standard IBM PC form factor	
Transceiver connector:	15-pin D-Sub with slide latch	
Ethernet compatibility:	Ethernet Versions 1.0 and 2.0 compatible	
IEEE 802.3 compliance:	Full compliance	
Power requirements:	2.4A @ +5 V 0.5A @ +12 V	
Operating environment:	Temperature:	41°F to 131°F (+5°C to +55°C)
	Humidity:	0% to 90% noncondensing

A.5. MINIMUM SYSTEM CONFIGURATION

The following is a list of the minimum hardware and software required to install the LANalyzer EX 5000E kit into a personal computer:

- IBM PC XT, IBM PC AT, or compatible system
- DOS Version 2.0 or later
- One 360-Kbyte or 1.2-Mbyte 5-1/4"diskette drive
- 512 Kbyte RAM
- One vacant board expansion slot
- Power supply to support all installed boards and peripherals

A.6. ORDERING INFORMATION

The following information is useful when ordering the LANalyzer system:

Model	Description
EX 5000E	LANalyzer Kit
EX 5000EP	LANalyzer Package

Appendix B
CONFIGURATION FILE FORMAT

B.1. INTRODUCTION

The file \XLN\HARDWARE\EXCELAN.HDW is the configuration file for DOS systems. It is created when you run the INSTALL program after installing the EXOS 225 Ethernet Network Analyzer board. This file contains configuration information about each Excelan board installed in the PC, including the EXOS 225.

The configuration information for each board consists of several single-line entries. Each line contains three fields: a keyword field, a value field, and an optional comments field. On any one line, each field must be separated from its neighbor by one or more spaces or tabs. The keywords and values cannot have any embedded spaces or tabs. Comments must begin with a semicolon (;).

Numeric values without any suffix are decimal values; those suffixed with the letter "H" are hexadecimal values. Uppercase and lowercase letters are not differentiated.

The set of entries for any one board must begin with the board identification line (for example, B225 1) and end with the host identification line (for example, HOST IBM_PC).

Table B-1 describes each keyword in the configuration file and the legal values it can have in the value field.

Table B-1: Configuration File Keywords

Keyword	Explanation
B205	The board is an EXOS 205. Legal values are the integers 1 to 4. Each board must have a unique value. Note that currently the only value supported is 1.
B225	The board is an EXOS 225. Legal values are the integers 1 to 4. Each board must have a unique value. Note that currently the only value supported is 1.
IOBASE	The base I/O block address for the board. Consult your PC's technical reference manual for legal values.
MEMBASE	The base address for the board. This is a segmented memory address. For the EXOS 205 board, this must be a 16-Kbyte boundary in the PC's address space.
WINDOW	The EXOS 205 window size, in kilobytes. Legal values are 16 and 128. This keyword is not used for the EXOS 225 board.
SIGNAL	The host interrupt level. Legal values are the integers 2 to 7.
DISPLAY	The monitor display type. Legal values are as follows: MONOCHROME: Hosts that have a monochrome monitor adaptor board COLOR: Hosts that have a color or graphics monitor adaptor board MIX: Hosts that have a color or graphics board and a monochrome monitor
HOST	The host PC type. Legal values are IBM_PC, IBM_AT, and OTHER. IBM_PC type applies to IBM PC, IBM PC XT, and compatibles that handle expansion memory parity in a way similar to the IBM PC. IBM_AT type applies to IBM PC AT and compatibles that handle expansion memory parity in a way similar to the IBM PC AT. OTHER type applies to COMPAQs and other PC compatibles that do not handle parity.

EXAMPLE

An example of an entry in the configuration file is shown below. This entry is for one EXOS 225 board with an I/O base address of 310H, and a memory base address of 0A000H, and it uses an interrupt level 2. The board is installed in an IBM PC XT.

```
B225        1
IOBASE      310H
MEMBASE     A000H
SIGNAL      2
DISPLAY     MONOCHROME
HOST        IBM_PC
```

INDEX

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	Excellent	**Good**	**Adequate**	**Fair**	**Poor**
Fulfills needs	☐	☐	☐	☐	☐
Readability (style)	☐	☐	☐	☐	☐
Organization	☐	☐	☐	☐	☐
Technical accuracy	☐	☐	☐	☐	☐
Presentation (format)	☐	☐	☐	☐	☐
Overall quality	☐	☐	☐	☐	☐

You Name _____ Date _____

Title _____ Phone _____

Company/Department _____

Address _____

City _____ State _____ Zip _____

Your network configuration _____

_____

Do you require a written reply? Yes ☐ No ☐

Comments: _____

_____

_____

_____

_____

_____

_____

_____

_____

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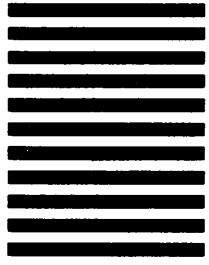

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