TEXAS INSTRUMENTS

EXPLORER™

SYSTEM FIELD MAINTENANCE

SUPPLEMENT

WARNING: This equipment generates, uses, and can radiate radio frequency energy and if not installed and used in accordance with the instructions manual, can cause interference to radio communications. It has been tested and found to comply with the limits for a Class A computer device pursuant to Subpart J of Part 15 of FCC Rules, which are designated to provide reasonable protection against such interference when operated in a commercial environment. Operation of this equipment in a residential area is likely to cause interference; in which case, the user at the user's own expense will be required to take whatever measures necessary to correct the interference.

WARNING: Lethal high voltages are present inside the chassis of this equipment. Only qualified service personnel who are familiar with the dangers of high voltages are permitted to open the chassis of this equipment to the service access position. Read and observe all safety labels on the products in this system. User and installation safety information are contained in the individual product user manuals.

WARNING: The trimline disk cabinet weighs approximately 131 kg (288 lb) with two disk drives. When lifting this unit from the shipping container or when moving it, be sure there are at least four persons available who are in the proper physical condition to perform the lifting or moving task.

WARNING: Each 515-megabyte disk drive weighs approximately 40 kg (87 lb). When lifting this unit from the shipping container or when moving it, be sure there are two persons available who are in the proper physical condition to perform the lifting or moving task.

WARNING: The 68020-based processor board and the system interface board both contain lithium batteries. Lithium batteries can explode if the positive and negative terminals are shorted together. DO NOT place either of these boards on a conductive surface. The outside surfaces of all antistatic shipping bags are conductive; Do Not place either of these boards on an antistatic shipping bag. Return all defective and/or discharged lithium batteries to TI Field Service for disposal, or dispose of in accordance with local environmental protection codes. Always use replacement batteries of the same type or TI part number that were removed.

MANUAL REVISION HISTORY

The system-defined windows shown in this manual are examples of the software as this manual goes into production. Later changes in the software may cause the windows on your system to be different from those in the manual.

THE EXPLORER™ SYSTEM HARDWARE MANUALS

143-Megabyte Disk Drive Vendor Publications	XT-1000 Service Manual, 5 1/4-inch Fixed Disk Drive, Maxtor Corporation, part number 20005 (5 1/4-inch Winchester disk drive, 112 megabytes)	2249999-0001
	ACB-5500 Winchester Disk Controller User's Manual, Adaptec, Inc., (formatter for the 5 1/4-inch Winchester disk drive)	2249933-0001
1/4-Inch Tape Drive Vendor Publications	Series 540 Cartridge Tape Drive Product Description, Cipher Data Products, Inc., Bulletin Number 01–311–0284–1K (1/4-inch tape drive)	2249997-0001
	MT01 Tape Controller Technical Manual, Emulex Corporation, part number MT0151001 (formatter for the 1/4-inch tape drive)	2243182-0001
	Viper™ Half-High Intelligent 4 1/4-Inch Streaming Cartridge Tape Drive SCSI Models 2060S and 2125S, Archive Corporation, part number 21136-001	2551106-0001
182-Megabyte Disk/Tape Enclosure MSU II Publications	Mass Storage Unit (MSU II) General Description	2537197-0001
182-Megabyte Disk Drive Vendor Publications	Control Data® WREN™ III Disk Drive OEM Manual, part number 77738216, Magnetic Peripherals, Inc., a Control Data Company	2546867-0001
515-Megabyte Mass Storage Subsystem Publications	SMD/515-Megabyte Mass Storage Subsystem General Description (includes SMD/SCSI controller and 515-megabyte disk drive enclosure)	2537244-0001
515-Megabyte Disk Drive Vendor Publications	515-Megabyte Disk Drive Documentation Master Kit (Volumes 1, 2, and 3), Control Data Corporation	2246129-0002
	Volume 1, General Description, Operation, Installation and Checkout, and Part Data	2246125-0004
	Volume 2, Theory, General Maintenance, Trouble Analysis, Electrical Checks, and Repair Information	2246125-0005
	Volume 3, Diagrams	2246125-0006
1/2-Inch Tape Drive Publications	MT3201 1/2-Inch Tape Drive General Description	2537246-0001

1/2-Inch Tape Drive Vendor Publications	Cipher CacheTape® Documentation Manual Kit (Volumes 1 and 2 With SCSI Addendum and, Logic Diagram), Cipher Data products	2246130-0001
	1/2-Inch Tape Drive Operation and Maintenance (Volume 1), Cipher Data Products	2246126-0001
	1/2-Inch Tape Drive Theory of Operation (Volume 2), Cipher Data Products	2246126-0002
	SCSI Addendum With Logic Diagram, Cipher Data Products	2246126-0003

Printer Publications	Model 810 Printer Installation and Operation Manual	2311356-9701
	Omni 800™ Electronic Data Terminals Maintenance Manual for Model 810 Printers	0994386-9701
	Model 850 RO Printer User's Manual	2219890-0001
	Model 850 RO Printer Maintenance Manual	2219896-0001
	Model 850 XL Printer User's Manual	2243250-0001
	Model 850 XL Printer Quick Reference Guide	2243249-0001
	Model 855 Printer Operator's Manual	2225911-0001
	Model 855 Printer Technical Reference Manual	2232822-0001
	Model 855 Printer Maintenance Manual	2225914-0001
	Model 860 XL Printer User's Manual	2239401-0001
	Model 860 XL Printer Maintenance Manual	2239427-0001
	Model 860 Xl Printer Quick Reference Guide	2239402-0001
	Model 860/859 Printer Technical Reference Manual	2239407-0001
	Model 865 Printer Operator's Manual	2239405-0001
	Model 865 Printer Maintenance Manual	2239428-0001
	Model 880 Printer User's Manual	2222627-0001
	Model 880 Printer Maintenance Manual	2222628-0001
	OmniLaser™ 2015 Page Printer Operator's Manual	2539178-0001
	OmniLaser 2015 Page Printer Technical Reference	2539179-0001
	OmniLaser 2015 Page Printer Maintenance Manual	2539180-0001
	OmniLaser 2108 Page Printer Operator's Manual	2546348-0001
	OmniLaser 2108 Page Printer Technical Reference	2546349-0001
	OmniLaser 2108 Page Printer Maintenance Manual	2546350-0001
	OmniLaser 2115 Page Printer Operator's Manual	2546344-0001
	OmniLaser 2115 Page Printer Technical Reference	2546345-0001
	OmniLaser 2115 Page Printer Maintenance Manual	2546346-0001

Communications Publications	990 Family Communications Systems Field Reference	2276579-9701
	EI990 Ethernet® Interface Installation and Operation	2234392-9701
	Explorer NuBus Ethernet Controller General Description	2243161-0001
	Communications Carrier Board and Options General Description	2537242-0001

THE EXPLORER™ SYSTEM SOFTWARE MANUALS

ABOUT THIS MANUAL

Purpose

This supplement provides field maintenance information for equipment that is added or upgraded on the Texas Instruments Explorer computer systems. The information in this supplement is intended to be used with the existing *Explorer System Field Maintenance* manual and the *System 1000 Series, Model 1500 Field Maintenance* manual. The field maintenance data is a guide to help the field maintenance person isolate a fault to the lowest economically replaceable subassembly and to replace that subassembly. The intended audience for the field maintenance data is primarily field maintenance personnel.

Contents of This Supplement

This supplement is organized into eight parts that are separated by tabs. Each part contains a detailed table of contents and separate sections. A general outline of the eight parts is as follows:

Tab Title	Contents
ST—System Troubleshooting	Section 1, Explorer Systems Hardware Summary Section 2, Explorer Systems Software Summary Section 3, Explorer Systems Diagnostics Summary Section 4, Explorer Systems Troubleshooting
SE—System Enclosures	Section 1, 7-Slot Enclosure With Local Bus or NuBus-Only Backplane and 110-Ampere Power Supply
MP—Memory and Processor Boards	Section 1, 68020-Based Processor Subsystem Section 2, Explorer II Processor Section 3, Explorer 32-Megabyte Memory
MS—Mass Storage Equipment	Section 1, MT3201 1/2-Inch Tape Drive Section 2, SMD/515-Megabyte Mass Storage Subsystem Section 3, Mass Storage Unit (MSU II)
CE—Communication Equipment	Section 1, Communications Carrier/Options Subsystem Section 2, Network Terminal Concentrator Section 3, LAN Maintenance
DT—Display Terminals	Section 1, Explorer Padless Mouse Section 2, Model 924 Video Display Terminal Section 3, Color Console Subsystem
PE—Printer Equipment	Section 1, Printer Equipment
RD—Reference Documents	System 1000 Series, Model 1500 Field Maintenance manual, TI part number 2534849-0001

An index for the entire supplement is provided at the end of supplement. A tab is not provided for the index.

Parts of this supplement have only one section at present. This arrangement provides space for future additions of data for upgraded and new equipment. Theory-of-operation information similar to that provided in the existing *Explorer System Field Maintenance* manual is omitted from this supplement and is not intended to be in any future revisions or changes to this supplement. Refer to the engineering reference documents listed in each part of this supplement for theory-of-operation information on new equipment.

This *Explorer System Field Maintenance Supplement* is available as part of the Explorer System Field Maintenance Documentation Kit, TI part number 2549278-0001, which includes:

■ *Explorer System Field Maintenance Supplement*, TI part number 2537183-0001 (can be ordered separately using this part number)

■ Tabset, TI part number 2549279-0001

■ Binder, TI part number 2243168-0003

■ *System 1000 Series, Model 1500 Field Maintenance* manual, TI part number 2534849-0001

The existing *Explorer System Field Maintenance* manual is available as part of the Explorer System Field Maintenance Documentation Kit, TI part number 2243222-0001, which includes:

■ *Explorer System Field Maintenance* manual, TI part number 2243141-0001 (can be ordered separately using this part number)

■ Tabset, TI part number 2249995-0001

■ Binder, TI part number 2243168-0003

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EXPLORER SYSTEMS HARDWARE SUMMARY

Introduction

1.1 Refer to Section 2 in the Corrective Maintenance (CM) part of the existing *Explorer System Field Maintenance* manual for primary information on Explorer system troubleshooting. Additional information is included in this section for new hardware that has been added to the basic Explorer systems as shown in Figures 1-1 through 1-8. The Explorer systems hardware summary is arranged under the following topics:

- Explorer systems overview

- 7-slot system enclosure

- Mass storage systems

- Monochrome console

- Color console

- Optional equipment

Figure 1-1 Explorer 7-Slot System With a Monochrome or a Color Console

2537183-1

Explorer Systems Overview

1.2 The Explorer systems are available in several configurations. The basic Explorer 7-slot computer system with the local bus backplane (Figures 1-2 and 1-3) is an advanced, single-user workstation that supports the development of large-scale, complex programs, and research in new technologies, including artificial intelligence (AI). System features include a high-resolution, interactive video display monitor that supports high-quality graphics and high-speed symbolic processing using the Lisp (list processing) language.

The Explorer LX system (Figure 1-4) consists of a multiprocessor system that supports both the Lisp language and the TI System V operating system. The TI System V operating system is an implementation of the AT&T UNIX® System V operating system. The TI System V operating system is implemented by a 68020-based processor board that is installed in the 7-slot system enclosure. All Explorer systems can be upgraded in the field to an Explorer LX system.

The Explorer LX system (Figure 1-5) is also available with the communications carrier board and associated options. The communications carrier board and associated options provide the capability of adding multiple terminals to the operation of the TI System V operating system. Also available are other communications capabilities, such as high-speed modems, auto call units, and RS-232-C interfaces. All Explorer LX systems can be upgraded in the field to use the communications carrier board and associated options.

NOTE: To provide a more uniform terminology between the existing Explorer publications and new Explorer publications, the terms monochrome console and color console are used in this manual. The term monochrome console includes the monochrome monitor, the monochrome monitor base assembly, the keyboard, and the mouse. The term color console includes the color monitor, the color monitor pedestal, the keyboard, and the mouse. In earlier Explorer publications, the monochrome console is called the display unit. The terms display unit and display monitor are now used as generic terms to indicate all types of terminals, displays, and monitors.

The color console is used only on Explorer II systems with the NuBus-only backplane. The monochrome console can be used on all explorer systems. Do to software restrictions, the monochrome and color consoles cannot be used together on the same Explorer system. The color system interface board (CSIB) hardware, however, is presently arranged to operate with both the color monitor and the monochrome console.

The basic Explorer II system with the NuBus-only backplane is shown in Figure 1-6. Figure 1-7 shows a basic Explorer II LX system. Figure 1-8 shows an Explorer II LX system with the communications carrier board and associated options. The Explorer II systems all have the Explorer II processor and the Explorer 32-megabyte memory board. The capacity of the 32-megabyte memory board can be 8-, 16-, or 32-megabytes.

UNIX is a registered trademark of AT&T.

The Explorer II processor is a single-board assembly that replaces the Explorer processor two-board assembly (Explorer I processor) that is presently used in the Explorer systems. The Explorer II processor uses the Explorer Lisp microprocessor chip that contains most of the logic that formerly was on the Explorer I processor. The Explorer II processor operates much faster than the Explorer I processor. Additional logic is provided on the Explorer II processor board which adds many enhancements to the Explorer system. All Explorer systems, including the LX system, can use the Explorer II processor. All Explorer systems can be upgraded in the field to use the Explorer II processor.

The Explorer 32-megabyte memory board (2540835) is available in capacities of 8-, 16-, and 32-megabytes. The Explorer 32-megabyte memory board is the standard memory board for the Explorer II systems and can be used as the option memory board in slot 3 in Explorer systems with the Explorer I processor. The Explorer I processor always requires the Explorer 8-megabyte memory board (2243910) as the primary memory in slot 4.

The Explorer 32-megabyte memory board is sometimes called the Explorer II memory board in other publications. The Explorer 8-megabyte memory board is sometimes called the Explorer memory board in other publications.

The Explorer system requires minimum site preparation because it operates under normal office conditions. Installation of the system consists mainly of placing the major units where you want them and then connecting the power cords and interface cables. The locations you choose should have access to ac power circuits that have minimum line noise. For the best results, use ac power circuits that are dedicated solely to your computer system.

7-Slot System Enclosure

1.3   The free-standing low-profile system enclosure has a 7-slot backplane into which the Explorer processor and as many as six other Eurocard circuit boards are installed. The system dc power supply is also housed within the system enclosure. The system enclosure is mounted on casters so that it can be rolled easily. Because of its weight, two people are required to raise or lower the system enclosure to a different height. Refer to the *Explorer 7-Slot System Installation* manual for the dimensions and weight of the system enclosure and associated equipment.

The system enclosure can have an 80-ampere power supply or a 110-ampere power supply. The 110-ampere power supply is required for the Explorer LX and Explorer II systems, and in systems with the SMD/SCSI controller. The 110-ampere power supply can also be used on all other Explorer systems. System enclosures with the 110-ampere power supply have a circuit breaker but no auxiliary ac power receptacles. (Some early model enclosures with 80-ampere supplies have auxiliary ac power receptacles.) Therefore, the ac power for all peripheral equipment must connect to wall outlets.

MODEL CODE 420 OR 435 (EXPLORER I UPGRADED TO EXPLORER II)

Figure 1-2 Explorer System With Local Bus Backplane (Example 1)

NuBus terminator 2243885-0002

system power supply 2235505 (80 A)

Explorer I processor assembly 2243881 or Explorer II processor 2540830

system interface 2236645-0001

8-megabyte memory 2243910

8-megabyte memory 2243910 or 32-megabyte memory 2540835

NUPI 2238040

backplane 2235535 rear view slot numbers

6 5 4 3 2 1 0

NuBus terminator with clock termination 2243885-0001

NuBus P1 connectors

spare slot

local bus in backplane

I/O P2 connectors

Ethernet controller 2236400

I/O P3 connectors

on/off switch

motor power supply 2235600

fan

transformer

interlock switches

receptacles early models only

printer equipment

parallel data

fiber-optic cable adapter 2236595

peripheral cable adapter 2238045

Ethernet cable adapter 2236490

RS-232-C equipment

serial data

Ethernet cable 2239129

SCSI cable

Explorer monochrome display terminal with keyboard and mouse

fiber-optic cable 2233200

143-megabyte MSU I or 182-megabyte MSU II

network cable

Ethernet transceiver

ac power

2288099A

Figure 1-3 Explorer System With Local Bus Backplane (Example 2)
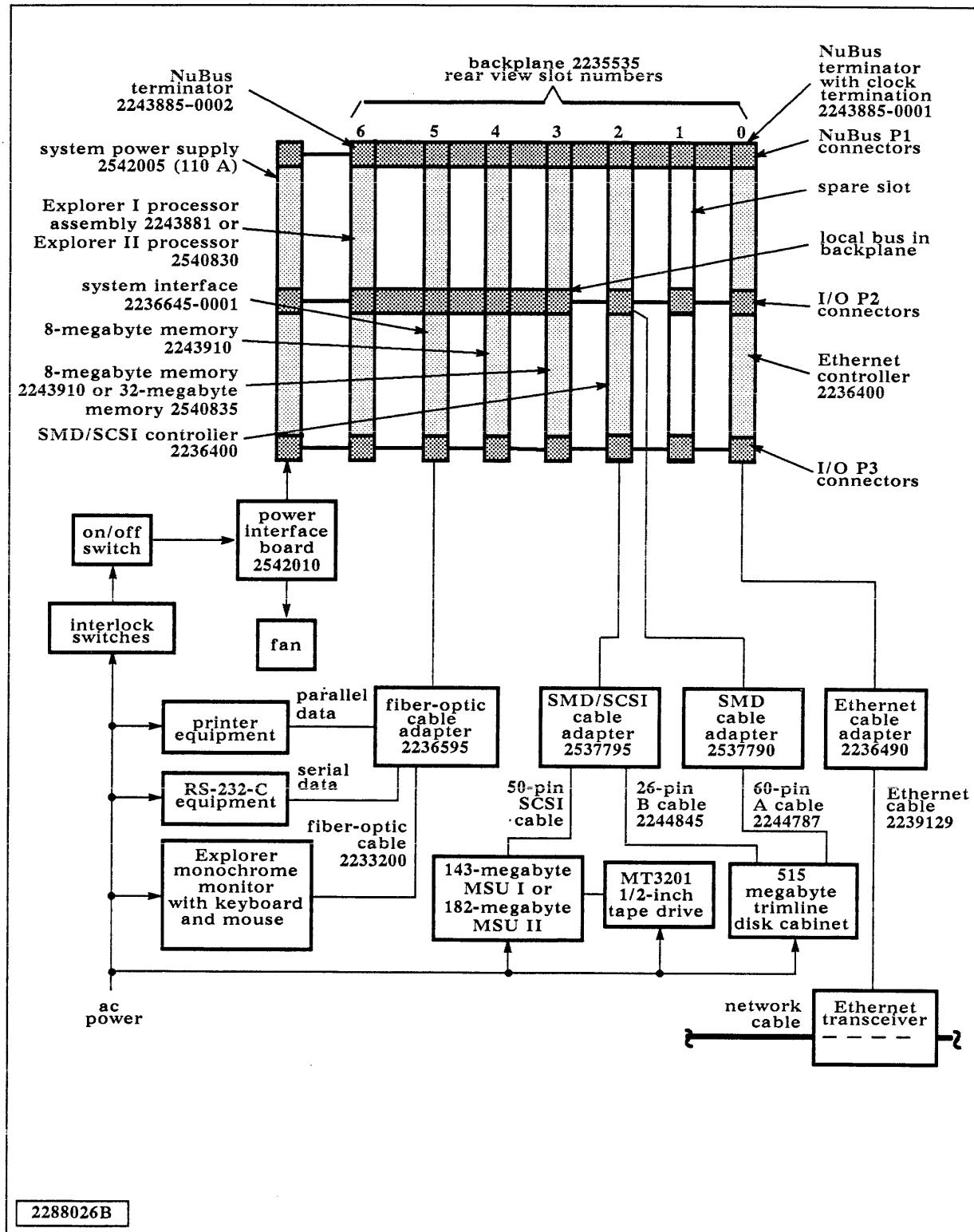
Figure 1-4 Explorer LX System With Local Bus Backplane (Example 1)

2288027B
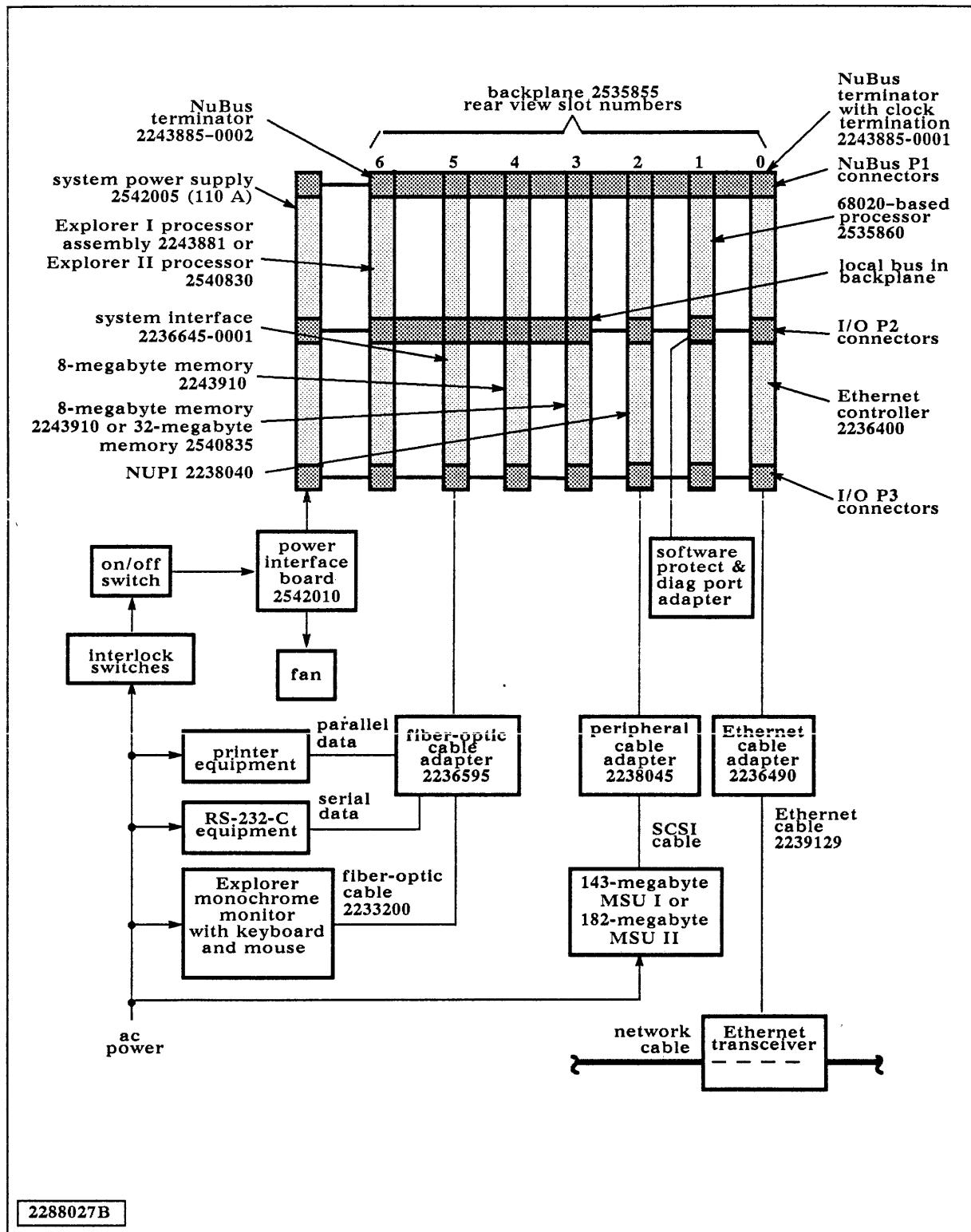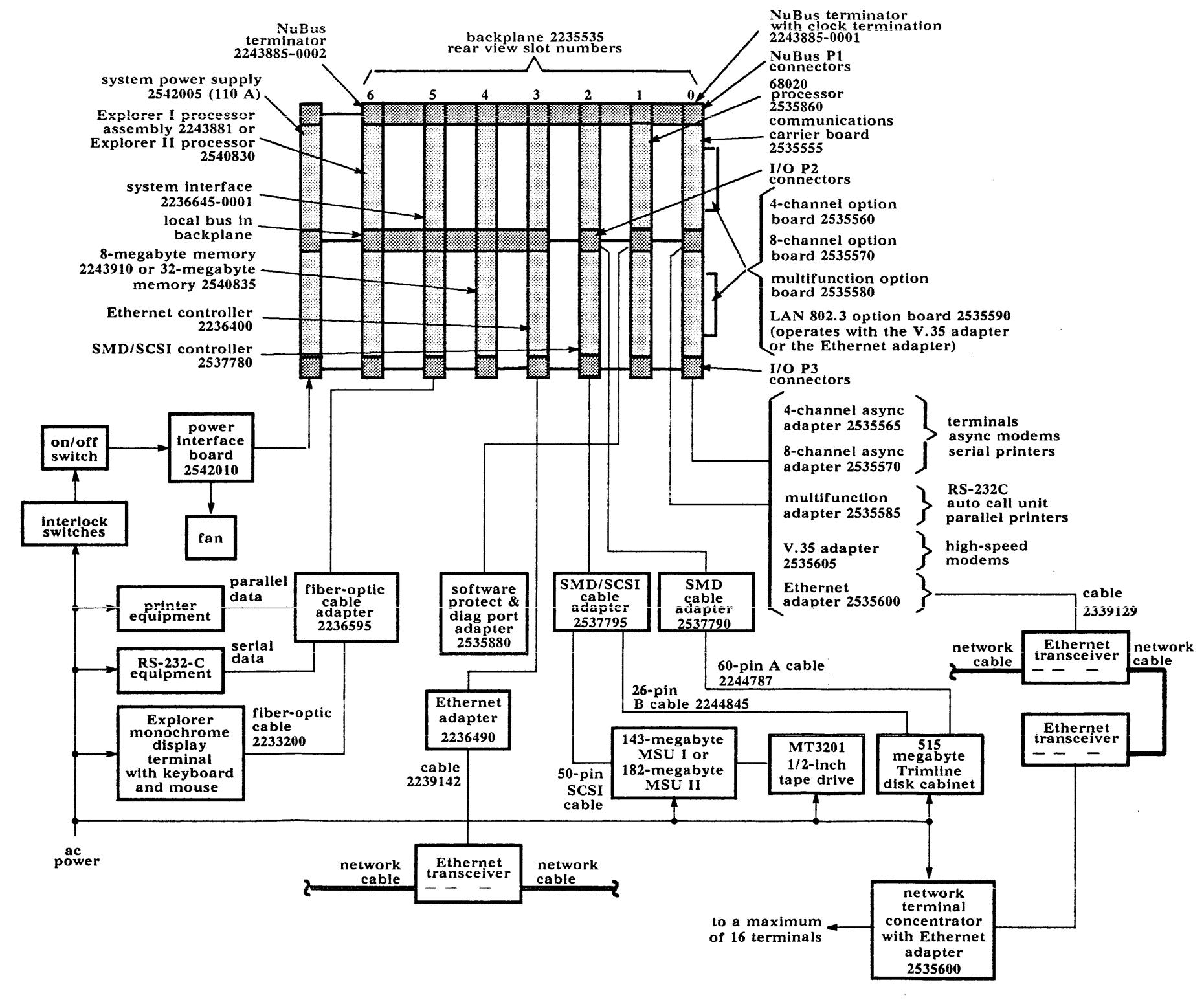
Figure 1-5 Explorer LX System With Local Bus Backplane (Example 2)

2288028B

Mass Storage Systems

1.4 The basic Explorer system can include one or more mass storage units (MSUs) and/or a Trimline disk cabinet with one or two 515-megabyte disk drives. The Trimline disk cabinet is an optional large capacity mass storage device that is shipped with some Explorer systems. An SMD/SCSI mass storage controller is required when the Trimline disk cabinet and the MSUs are used together.

The SMD/515-megabyte mass storage subsystem is discussed in the *SMD/515-Megabyte Mass Storage Subsystem General Description* manual. Since the MSUs are the primary mass storage units shipped with most Explorer systems, they are discussed here in some detail. A single MSU can contain storage devices in any of the following combinations:

■ One or two Winchester disks

■ One cartridge tape device

■ One Winchester disk and one cartridge tape device

Standard configurations of the 7-slot system include either one or two MSUs. Optionally, MSUs can be added to the system to a maximum of four MSUs (as many as eight mass storage devices). The first MSU in an Explorer system is the primary MSU and bears the word *primary* on the serial number label on the back of the MSU. Any additional MSUs are designated secondary MSUs and are denoted as such on their serial number labels. A daisy-chain cable is shipped with each secondary MSU instead of the terminator that is shipped with the primary MSU. For more detailed information on mass storage subsystem configuration, see the applicable general description manuals for your MSU.

Throughout this manual, the MSU I designation indicates an MSU with AMPMODU® connectors, and the MSU II designation indicates a mass storage unit with CHAMP® connectors. An adapter is available that allows CHAMP style cables to be used with an MSU I. The adapter plugs into the AMPMODU connector on the back of the MSU I and provides CHAMP style connectors for cabling. See Section 4 for additional information on the differences between AMPMODU and CHAMP connectors.

Another basic difference between the MSU I and MSU II is that the MSU I contains 140-megabyte disk drives while the MSU II contains 182-megabyte disk drives and a disk drive formatter based on the Enhanced Small Device Interface (ESDI) specification. The MSU I is described in the 140-megabyte disk/tape enclosure publications listed in the front of this manual. The MSU II is described in the *Mass Storage Unit (MSU II) General Description*.

A 1-meter (40-inch) Small Computer Systems Interface (SCSI) cable used to connect the MSUs to the system enclosure is the standard cable shipped with the MSUs. This cable is used to the best advantage when the MSUs are stacked on the system enclosure. You can stack as many as two MSUs on the system enclosure. An optional SCSI cable permits the MSUs to be stacked as far as 3 meters (10 feet) from the system enclosure. Refer to Table 2-1 in Section 2 for the dimensions and weight of the MSU.

AMPMODU and CHAMP are registered trademarks of AMP, Inc.

Figure 1-6 Explorer II System With NuBus-Only Backplane
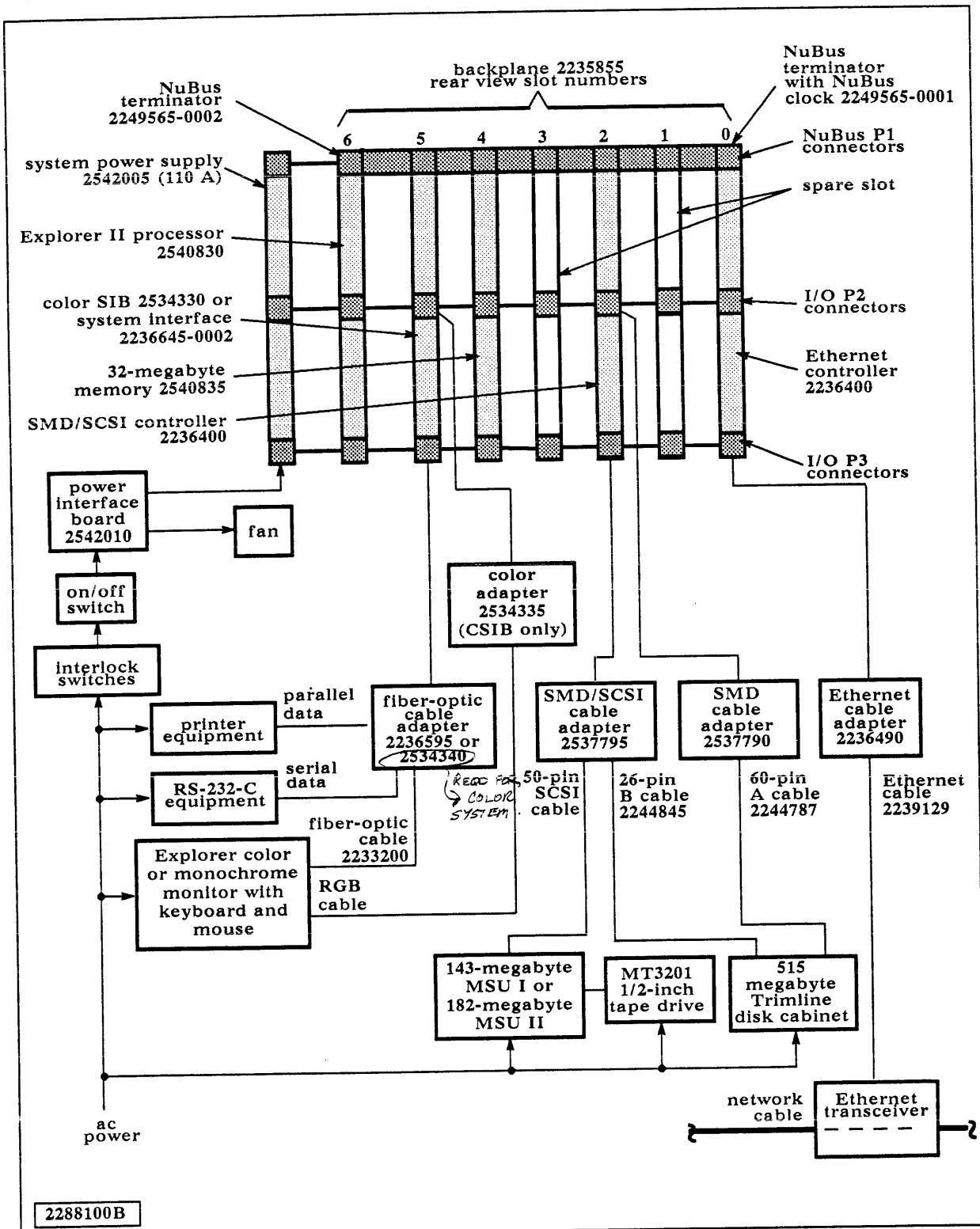
Figure 1-7   Explorer II LX System With NuBus-Only Backplane (Example 1)
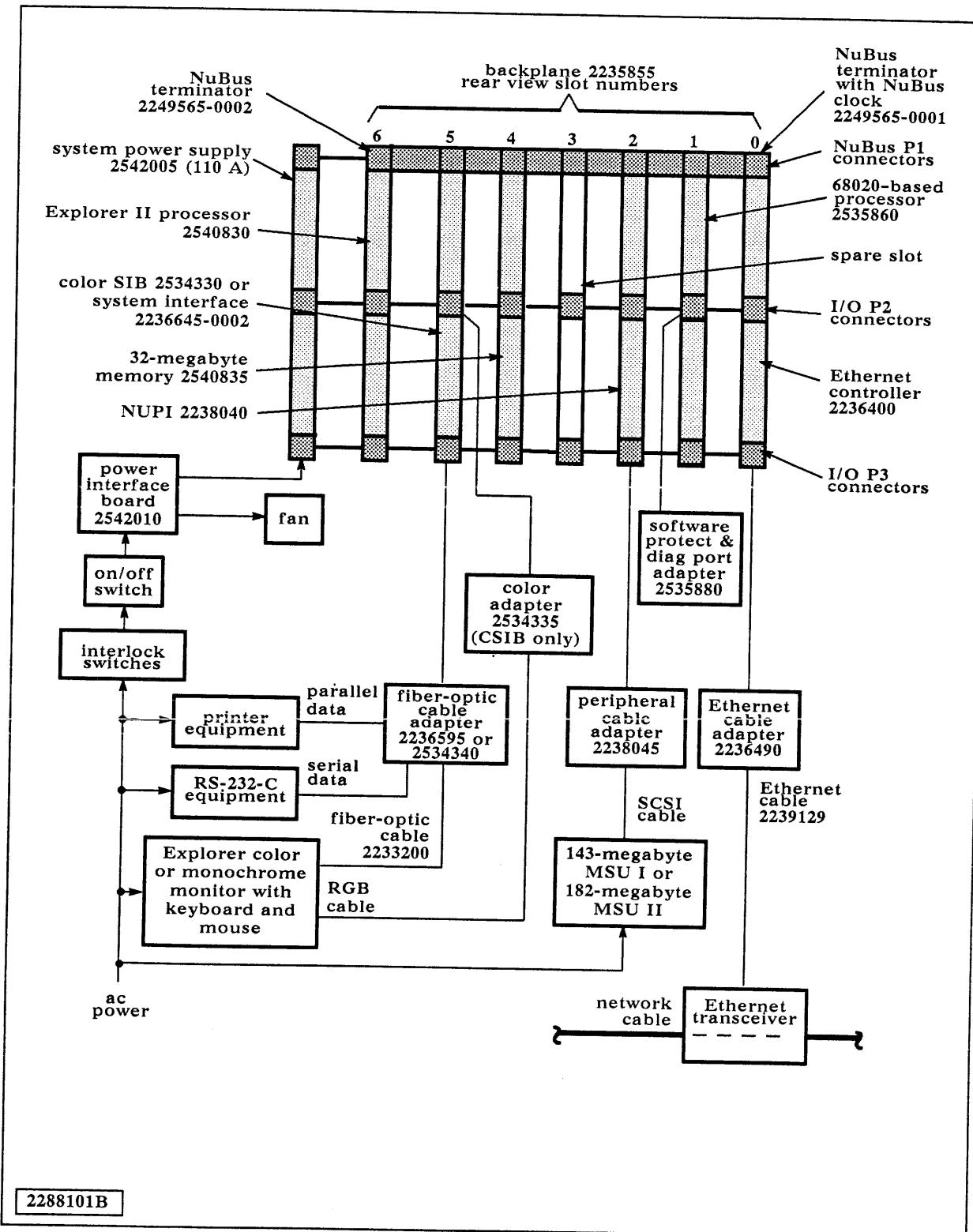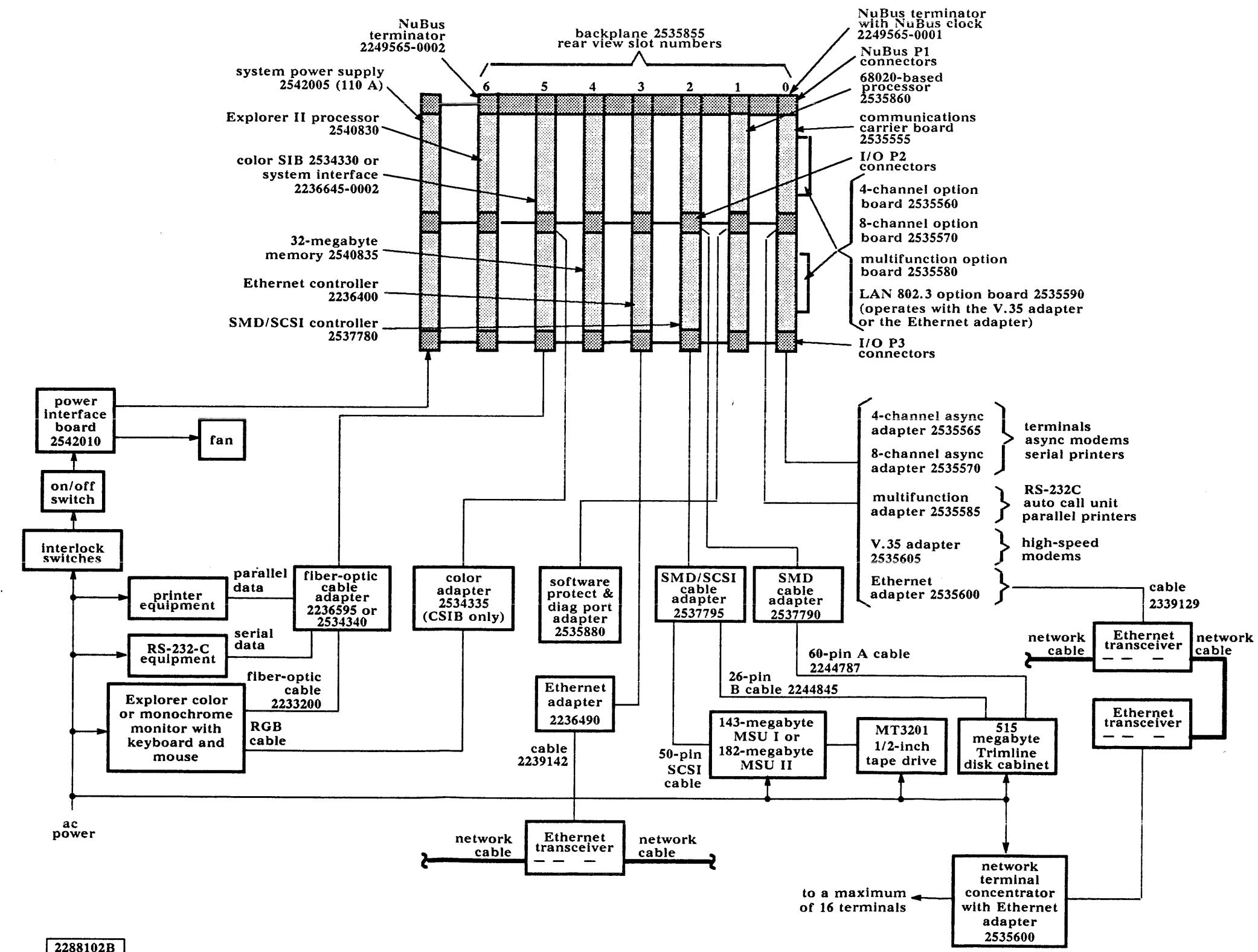
Figure 1-8 Explorer II LX System With NuBus-Only Backplane (Example 2)

CAUTION: Do not stack more than two MSUs on top of the Explorer 7-slot enclosure. When more than two units are stacked on top of the 7-slot enclosure, there is a danger of the stacked MSUs becoming top heavy and possibly sliding off and tipping over the 7-slot enclosure.

Explorer Monochrome Console

1.5 The Explorer monochrome console consists of a high-resolution monochrome cathode-ray tube (CRT) monitor on a base assembly, the mouse, and a detached keyboard. The monochrome console supports either an optical mouse with a pad (early models) or a padless mouse. The monochrome console can be located as far as 15.24 meters (50 feet) from the system enclosure using the fiber-optic cable shipped with the monochrome monitor. The system enclosure can use either the system interface board (SIB) or the color system interface board (CSIB) for the interface to the monochrome console.

The monochrome monitor base assembly requires a minimal desk space of 396.2 millimeters (15.6 inches) wide by 312.4 millimeters (12.3 inches) deep. You can adjust both the height and tilt of the monitor for a comfortable view of the screen. The keyboard is attached to the monitor with a coiled cord, permitting the keyboard to be conveniently located for easy operation. When not in use, the keyboard can be stored under the front part of the monitor. Refer to Table 2-1 in Section 2 for the dimensions and weight of the monochrome monitor and the keyboard.

Explorer Color Console

1.6 The Explorer color console consists of a high-resolution color cathode-ray tube (CRT) monitor on a pedestal, a padless mouse, and a detachable keyboard. The color console connects to the CSIB in the system enclosure over an color RGB cable and a fiber-optic cable. The color RGB cable is available in two lengths: 3 meters (10 ft) and 8.6 meters (28 ft). The minimum length of the fiber-optic cable is 15.24 meters (50 ft). The excess length of the fiber-optic cable should be carefully coiled and stored away to prevent any damage to it.
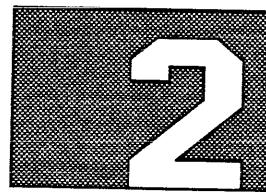
The color monitor pedestal requires a minimal desk space of 406 millimeters (16 inches) wide by 452 millimeters (17.8 inches) deep. You can adjust the tilt of the color monitor for a comfortable view of the screen. The height of the color monitor is not adjustable. The keyboard is attached to the color monitor pedestal with a coiled cord, permitting the keyboard to be moved into other positions for easy operation. Refer to the *Explorer 7-Slot System Installation* manual for the dimensions and weight of the color monitor and keyboard.

Optional Equipment

1.7 A variety of optional equipment is available for the Explorer system. For installation and operating instructions, refer to the appropriate documents listed in Table 1-1 for the optional equipment you have. Additional installation and operation instructions for optional equipment are also available in the system level software manuals.

Table 1-1 Optional Equipment

Equipment	Description
MT3201 1/2-inch tape drive	Can be used on any system that supports the SCSI bus and has the DSR software. Refer to the *MT3201 1/2-Inch Tape Drive General Description* for installation and operation instructions.
Trimline disk cabinet with 515-megabytes disk drives	Can be used only with 7-slot system enclosures that have the 110-ampere power supply. Refer to the *SMD/515-Megabyte Mass Storage Subsystem General Description* for installation and operation instructions.
Network terminal concentrator	Is normally used in the Explorer LX system. Refer to the *Communications Carrier Board and Options General Description* for installations and operation instructions.
Model 924 video display terminal	Is used in the Explorer LX system with multiple terminals. Refer to the *Model 924 Video Display Terminal User's Guide* for installation and operation instructions.
Printers	Refer to the applicable printer manual listed in the front part of this manual for installation and operation instructions.
68020-based processor subsystem	Can be used only in the Explorer LX system. Refer to the *68020-Based Processor General Description* for installation instructions.
Explorer II processor and auxiliary processor options	Can be used on any Explorer system, including the LX system. Refer to the *Explorer II Processor and Auxiliary Processor Options General Description* for installation instructions.

EXPLORER SYSTEMS
SOFTWARE SUMMARY

2

Introduction

2.1 This section provides a general summary of the software used in the Explorer systems and Explorer LX systems. The major topics of this section are:

- Explorer systems software

- Explorer LX systems software

- Explorer and Explorer LX systems operation

- Logging in to Lisp

- Converting to color

- Activating the LX console

- Ending a session

Explorer Systems Software

2.2 Refer to the software manuals for details on the the Explorer system software. You must have Explorer systems software (Release 3.2 or later) for the color system to operate properly.

Refer to the *Explorer System Software Installation Guide* for instructions on upgrading your system to the latest software.

Explorer LX Systems Software

2.3 The Explorer I LX systems require their own microcode, and they will not operate with the standard Explorer microcode. The following software is required to run Explorer LX:

- Explorer system code

- TI System V system code

- Explorer LX microcode (Explorer I processor only)

- Explorer LX system code
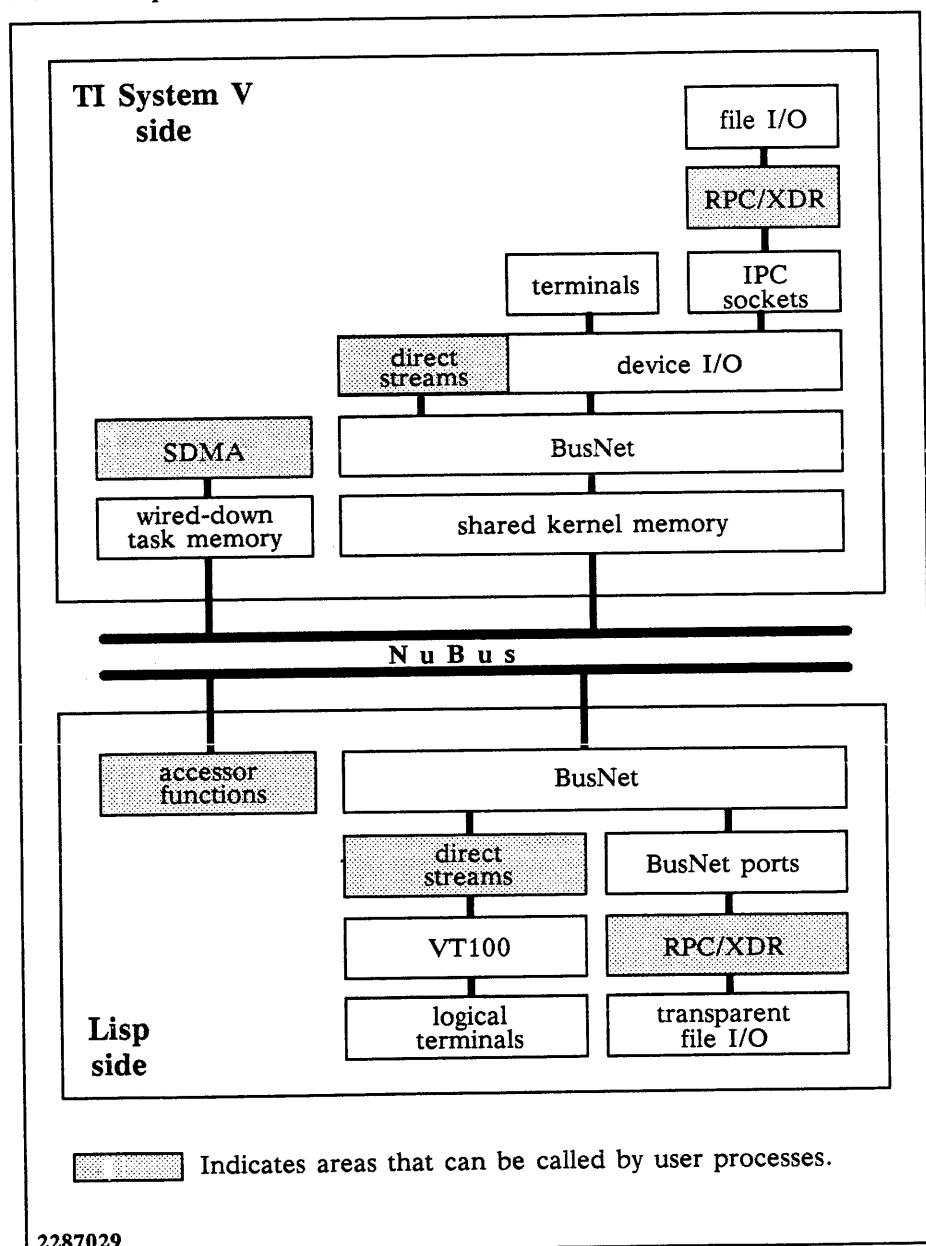
Note that Explorer I LX requires its own microcode; it will not operate with the standard Explorer I microcode. In addition, TI Prolog will not operate with Explorer I LX microcode.

Explorer II LX uses the standard Explorer II microcode.

LX Software Primitives

2.3.1 The LX software can be seen as a collection of primitives for building applications that require communication between the Explorer Lisp processor and the 68020-based processor. These primitives, as shown in Figure 2-1, include the following:

Figure 2-1

Relationship Between Lisp, TI System V, and the LX Software

2287029

■ Logical terminals — Allow you to call up and use windows that emulate System 1000 Series, Model 1500 VT100™ terminals.

VT100 is a trademark of Digital Equipment Corporation.

■ Direct streams — Provide byte-level data communication between the processors. This communication can be ASCII-translated if required. Direct streams also provide access to the shell server and enable you to send commands to the TI System V operating system from the Lisp environment.

■ Shared direct memory access (SDMA) — Allows Explorer system processes to read from and write to System 1500 task memory.

■ External Data Representation (XDR) protocol — Provides an operand stream device that translates between the *big-endian* and *little-endian* numerical representations in different processors.

■ Remote Procedure Call (RPC) protocol — Allows procedure calls between Lisp and the TI System V operating system.

In addition to the preceding primitives, LX software also provides the following tools:

■ Transparent file I/O using NFS

■ Diagnostic window interface

Transparent File I/O Tools

2.3.2 The Explorer LX allows a one-way transparent file I/O; that is, you can access a TI System V file residing on a disk associated with your Explorer LX by using the Explorer directory editor (Dired) or any of the Lisp functions available in the Explorer system software. You cannot, however, use TI System V utilities to transparently access files on an Explorer file band. You first have to copy the file to the TI System V file system and then access it in the normal manner.

NOTE: Machines on the same network as your Explorer LX cannot access its TI System V side. However, the TI System V side of your Explorer LX can access not only the Lisp side of your LX machine, but also any other Explorer host on the network that is accessible to the Lisp side of your Explorer LX using the **rcp** function (see Section 9 of the *Explorer LX User's Guide*).

Pathname requirements (see UNIX pathname parsing in the *Explorer Input/ Output Reference* manual, TI part number 2549281-0001) resemble those of the TI System V environment. Two differences do exist. First, you must add a final slash character (/) to a pathname to indicate that the pathname represents a directory.

The other difference is with the host component of TI System V pathnames. You can specify the TI System V host component two ways:

■ lxm: — Just as you use lm (local machine) to refer to your local Explorer host, you specify lxm to refer to your local TI System V host.

■ *your-host*-lx: — You can also specify the TI System V host portion of the pathname by adding a hyphen (-) and lx to the regular host name.

Therefore, if the host computer name is jrr, you could obtain a directory listing for all the files in the TI System V /etc directory by supplying Dired with either of the following pathnames:

■ lxm:/etc/*

■ jrr-lx:/etc/*

As you notice, you can use wild cards.

To use transparent file I/O, the TI System V side must be in multiuser mode.

The TI System V side has two servers that must be started before the I/O can be accessed. These servers are started from /etc/inittab when the TI System V side goes into multiuser mode.

Diagnostic Window Interface Tools **2.3.3** The LX software provides an easy-to-use diagnostic window interface for reading from and writing to System 1500 memory locations. This interface allows you to monitor certain memory locations as an aid to interactive application debugging.

CAUTION: Use extreme care when writing to System 1500 memory space; you can destroy existing memory or possibly crash the system if you make a mistake.

Resetting LX **2.3.4** Should the Explorer LX environment (the TI System V software and LX logical terminals) become too unstable in the course of usage, you can always reboot your machine. However, this procedure starts a new environment for Lisp as well as for Explorer LX. You may prefer to use the following function before resorting to a cold boot.

lx:reset &optional *enable*   Function

The **lx:reset** function clears the entire LX environment without changing the Lisp environment. You can use **lx:reset** to clear an LX environment that may be in a questionable state because of multiple starts and stops during a debugging session. The **lx:reset** function kills all instances of logical terminals, direct streams, and BusNet ports (used by RPC).

If the *enable* argument is set to **nil** (the default), this function shuts down LX totally. If the *enable* argument is non-**nil** (as in the Lisp form that follows), the function shuts down and then restarts it as would a cold boot.

```
(lx:reset t)
```

Typical Disk
Labels

2.3.5 Tables 2-1 through 2-4 show sample Lisp disk configurations for two-
and three-disk systems. However, the actual content of specific disks can
differ considerably. For example, disks may have no diagnostic partitions, or
they may have an additional load band.

CAUTION: Use extreme care when modifying any of the generic partitions,
as you can destroy existing data or possibly crash the system if you make a
mistake.

Table 2-1

Explorer LX Disk Label for Two-Disk Configuration, Disk 0

Partition Name	Partition Type	Beginning Block	Length in Blocks	CPU/OS Type
* LABL	Volume Label	0	2	Generic
* PTBL	Partition Table	2	3	Generic
SAVE	System Save Area	5	3	Generic
FMT	Format Parameters	8	9	Generic
TZON	Test Zone	17	122	Generic
BOOT	Microcode	139	64	Explorer
* PRIM	Microcode	203	64	Explorer
* CFG1	Configuration Band	267	17	Generic
GDOS	Microcode	287	300	Explorer
DIAG	File Band	587	2048	System V
EXPT	Microcode	2635	150	Explorer
MCR1	Microcode	2785	154	Explorer
MCR2	Microcode	2939	154	Explorer
* LOD1	Load Band	3093	32000	Explorer
LOG	System Log	35093	30	Explorer
* FILE	File Band	35123	30000	Explorer
PAGE	Page Band	65123	44686	Explorer

* indicates a default partition

Table 2-2

Explorer LX Disk Label for Three-Disk Configuration, Disk 0

Partition Name	Partition Type	Beginning Block	Length in Blocks	CPU/OS Type
* LABL	Volume Label	0	2	Generic
* PTBL	Partition Table	2	3	Generic
SAVE	System Save Area	5	3	Generic
FMT	Format Parameters	8	9	Generic
TZON	Test Zone	17	122	Generic
BOOT	Microcode	139	64	Explorer
* PRIM	Microcode	203	64	Explorer
* CFG1	Configuration Band	267	17	Generic
GDOS	Load Band	287	300	Explorer
DIAG	File Band	587	2048	System V
EXPT	Microcode	2635	150	Explorer
MCR1	Microcode	2785	154	Explorer
MCR2	Microcode	2939	154	Explorer
MCR3	Microcode	3093	154	Explorer
LOG	System Log	3247	30	Explorer
* LOD1	Load Band	3277	35000	Explorer
LOD2	Load Band	38277	35000	Explorer
PAGE	Page Band	73277	36532	Explorer

* indicates a default partition

Table 2-3

Explorer LX Disk Label for Three-Disk Configuration, Disk 1

Partition Name	Partition Type	Beginning Block	Length in Blocks	CPU/OS Type
FMT	Format Parameters	8	9	Generic
TZON	Test Zone	17	122	Generic
BOOT	Microcode	139	148	Explorer
GDOS	Load Band	287	300	Explorer
DIAG	File Band	587	2048	System V
EXPT	Microcode	2635	150	Explorer
* FILE	File Band	2785	30000	Explorer
PAGE	Page band	32785	77024	Explorer

* indicates a default partition

Table 2-4

	TI System V Disk Label for Two- and Three-Disk Configurations			
Partition Name	Partition Type	Beginning Block	Length in Blocks	CPU/OS Type
*LABL	Volume Label	0	2	Generic
*PTBL	Partition Table	2	3	Generic
SAVE	System Save Area	5	3	Generic
FMT	Format Parameters	8	9	Generic
TZON	Test Zone	17	122	Generic
DIAG	File Band	139	2048	System V
GDOS	Load Band	2187	300	System 1500
S15A	Load Band	2487	150	System 1500
GDCF	Configuration Band	2637	17	Generic
EXCF	Configuration Band	2654	17	Generic
GBUS	Configuration Band	2671	17	Generic
*unx1	Load Band	2688	1024	System 1500
unx2	Load Band	3712	1024	System 1500
unx3	Load Band	4736	1024	System 1500
*cfg1	Configuration Band	5760	17	Generic
cfg2	Configuration Band	5777	17	Generic
cfg3	Configuration Band	5794	17	Generic
*root	File Band	5811	12288	System V
usr	File Band	18099	32768	System V
src	Page Band	50867	32000	System V
*swap	Page Band	82867	26942	System 1500

* indicates a default partition

Reference **2.3.6** Table 2-5 lists all the reference documents and other information for
Information the Explorer LX system.

Table 2-5 Reference Information

Category	Document	Part Number
Primary Documents	Explorer Diagnostics	2533554-0001
	Explorer LX User's Guide	2537225-0001
	Explorer LX System Installation	2537227-0001
	System 1000 Series, Model 1500	
	Diagnostics User's Guide	2534850-0001
	NuBus System Architecture Specification	2536702-0001
	Explorer System Field Maintenance manual	2243141-0001
	System 1000 Series, Model 1500 Field	
	Maintenance manual	2534849-0001
LX Software Package (2537212-0001)	Package Inventory	2537216-9901
	Release information	2537251-9901
	Explorer LX system bootable (format) tape	2537217-0001
	Explorer LX system distribution tape	2537217-0002
	Explorer LX User's Guide manual	2537225-0001
	Explorer LX System Installation manual	2537227-0001
Network file system (NFS) package	Explorer NFS User's Guide	2546890-0001
	Release and Installation Information	2546889-0001
	Explorer NFS Source Tape	2546893-0001
TI System V Licensed Software (2540576-0003)	Package Inventory	2540579-9901
	Release Information	2540705-9901
	TI System V tape	2540590-0001
	TI System V Software Installation and	
	Configuration manual	2544356-0001
	TI System V User's Reference manual	2540558-0001
	TI System V Programmer's Reference manual	2540543-0001
	TI System V Administrator's Reference manual	2540540-0001
	TI System V User's Guide	2540542-0001
	TI System V Programmer's Guide	2540545-0001
	TI System V Administrator's Guide	2540539-0001
	TI System V Support Tools Guide	2540546-0001
	TI System V 68020 Assembler manual	2540559-0001
	TI System V Software Update Tape	2544381-0001
	TI System V Software Patch Release	
	Information Manual	2544384-9901
Diagnostics	Explorer diagnostics bootable tape	2537711-0001
	System 1500 diagnostics tape	2540570-0001

Explorer and Explorer LX Systems Operation

2.4   The following paragraphs provide general operation instructions for the Explorer and Explorer LX systems. These instructions tell you how to start the system, how to log in, and how to end a session. Differences between the operation of the Explorer and the Explorer LX systems are noted where applicable. When the operation of both systems is the same, no comment is made.

Powering Up the System

2.4.1   The system can remain powered up at all times. If your system is not powered up, follow these steps to power up the system:

1. Push the power button on the back of each mass storage enclosure to the ON (in) position.

2. Push the power button on the front of the monitor to the ON position.

3. Push the power button on the front of the system enclosure to the ON position. You should hear the fan start inside the enclosure.

CAUTION: **Do not attempt to operate the system if the fan is not working; report the trouble to a technician.**

4. Finally, turn on any additional equipment, such as printers.

Booting the System

2.4.2   Each time you power up the system, the system performs a series of operations called a *system reset*. You can also invoke a system reset by pressing META-CTRL-META-CTRL-ABORT. This keystroke sequence is also known as the *cold-boot sequence*. The list that follows shows the steps in the system reset sequence. The system does the following:

1. Performs hardware self-tests and identifies any faults detected.

2. Sounds a tone to indicate that all self-tests are complete and displays a menu. If all system boards have passed their tests, the system waits several seconds for you to choose a boot option; then it continues the booting process. If any system boards fail their tests, the system stops at the menu and waits for your reply.

3. Depending on the current default setting, you may see no prompt or the system may prompt you to specify the system partition (load band) and microload partition (microload band) to be loaded, and the device on which to load them.

4. Loads the microcode contained in the selected microcode band into the processor board's control memory.

5. Loads the contents of the load band into memory.

6. Boots a file partition and displays a message that describes it.

7. Performs other tasks that are defined on the initialization lists.

8. Invokes the Lisp Listener (the default program).

Suggestions for Correcting Errors During Booting

2.4.3 Errors may sometimes occur during hardware tests, initial menu, and menu boot operations. To correct these errors, try one of the following suggestions:

■ If the display freezes during any part of the boot process, the system has encountered a fatal error. Press META-CTRL-META-CTRL-ABORT to reset the system. If the problem is a temporary one, the system may boot properly.

■ If you choose an option incorrectly, press ABORT to return to the previous prompt or menu. You can also reset the system by pressing META-CTRL-META-CTRL-ABORT.

■ If you select a device that is offline or not available, the system continues to wait for the device to become ready. The system displays a Waiting message and a series of periods after the word. After you verify that the device is powered up and correctly connected, the system should work properly. If not, repeatedly press the ABORT key to return to the initial menu. If you prefer, you can reset the system by pressing META-CTRL-META-CTRL-ABORT.

■ If you select a microload band that does not work with the specified load band, the video display freezes during the boot process. Reset the system by pressing META-CTRL-META-CTRL-ABORT and make a different selection.

■ If the system displays the message ERROR: BAD MICROLOAD FORMAT, the selected microload band contains an unusable format. The system displays the initial boot options. Boot again, selecting a different microload band.

Hardware Tests

2.4.4 During system testing, each board that contains a processor performs its own self-tests and presents the results to one processor that is designated as the *system test and boot master (STBM)*. The STBM prints its slot number and a message on the video display; this message indicates that the processor is beginning to test the system. After each logic board in the system enclosure is tested, the processor lists the results on the video display. Figures 2-2 and 2-3 show typical displays for Explorer systems and Explorer LX systems.

Figure 2-2

Typical Results of Explorer Systems Hardware Self-Tests

```
Slot 6   TESTING SYSTEM

Slot 0   passed
Slot 2   passed
Slot 3   passed
Slot 4   passed
Slot 5   passed
Slot 6   passed

D=Default load, M=Menu load, R=Retest, E=Extended tests  :
```

Figure 2-3   **Typical Results of Explorer LX Systems Hardware Self-Tests**

```
Slot 1   CPU TESTING SYSTEM

Slot 0   NEC passed
Slot 1   CPU passed
Slot 2   NPI passed
Slot 4   MEM passed
Slot 5   CSI passed
Slot 6   CPU passed

D=Default load, M=Menu load, R=Retest, E=Extended tests  :
```

Initial Boot   **2.4.5** After all self-tests are complete, the processor sounds a tone and
Menu   displays the following initial menu:

`D=Default load, M=Menu load, R=Retest, E=Extended tests :`

One of the following occurs, depending on the results of the tests:

■   If all boards pass their self-tests, you can choose from the menu within 15
seconds; otherwise, the processor uses the default values for booting the
system to perform the default load.

■   If any boards fail their self-tests, both the test results and the menu
remain on the video display until you choose an option. Even if some of
the tests are unsuccessful, you can still attempt to boot the system.

If you want to use the default load device and the default load and microcode
bands to boot the system, you can press D or RETURN immediately after the
menu is displayed.

After the system completes its hardware self-tests, you can specify how to
continue. In general, you can either load a system, perform additional tests,
or load a diagnostic operating system. To specify your choice, press one of
the letters shown on the bottom line of the system self-test display (Figures
2-2 and 2-3) or one of the other choices described in the paragraphs that
follow.

System Utility   **2.4.5.1** Most of the boot choices select a system to load and run. Several
Load Choices   choices (Select Device, Factory, and Named Options) are not listed in the
system self-test menu.

Default Load Choice Press D. The system loads from the default device
specified by the system nonvolatile RAM (NVRAM) and from the default
partitions specified in the disk partition table of the default device. This
choice is the default choice for this menu; if you press RETURN or if you do
not press a valid letter within 15 seconds, this choice is automatically
executed.

Select Device Choice Press S. The processor scans the slots in the system enclosure for possible load devices and then displays a menu of the devices. (An asterisk indicates the default choice.) After you choose a device from the menu by specifying one of the letters in the left column, the system loads from the default partitions specified on the device. The menu is similar to the following one:

```
AVAILABLE LOAD DEVICES

 A=  Slot   0   Enet   00
*B=  Slot   2   Disk   00
 C=  Slot   2   Disk   01

Select   load   device  :
```

Menu Load Choice Press M. (Not available on LX systems.) The processor displays a menu of the available load devices, identical to that shown for the Select Device choice. After you choose a device from the menu, the system loads a boot utility (called *menu boot*) from a partition named BOOT on that device. This boot utility displays a menu similar to the following one:

```
L=Lisp load, M=Multi-unit load, D=Diagnostic load, P=Print device label:
C=Configuration Boot
```

General Diagnostic Operating System Choice Press G. The system prompts you to choose a device from a menu, then loads the General Diagnostic Operating System (GDOS) from the specified device. Diagnostic programs that run under control of GDOS are useful for locating hardware problems that are not found by extended testing. The *Explorer Diagnostics* provides detailed information about GDOS.

Named Options Choice Press N. The system prompts you for the names of the microcode band and the load band, in that order. On an LX system the prompts are as follows:

```
System load band name:


Configuration band name:
```

You must type the names exactly as they appear in the disk label, then press RETURN; if the name appears in uppercase letters, you must type uppercase letters. If you make an error while typing, you can either press RUBOUT to correct the error or ABORT to return to the previous prompt or menu. After you supply the partition names, the system asks you to choose a device from a menu. If possible, the system loads from the specified partitions. If you specify invalid partitions, the system displays a message and the initial menu again.

Factory GDOS Choice Press F. This puts you into FDOS, which is either a factory version of GDOS or any microcode partition that you want to name FDOS in order that the partition be easily loaded. This option is only available with the Explorer II processor, and is not available on LX systems.

Testing Choices **2.4.5.2** After a system reset, you can choose from two levels of system testing by pressing the appropriate letter.

Retest Choice Press R. The system re-executes the hardware tests and displays the results. Retesting is usually done if you suspect an intermittent problem on a logic board. After retesting, a display appears similar to that shown in Figures 2-2 and 2-3.

Extended Tests Choice Press E. The system performs more extensive hardware tests and displays the results. Figure 2-4 shows the messages displayed by a typical system after extended test completion. Notice that no message appears for an empty slot. Extended testing, which can take up to five minutes per board, is usually done in the following cases:

■ When the system or a logic board is first installed

■ When standard power-up testing has indicated a problem

■ When you suspect that a hardware fault is causing system problems

■ Before you execute diagnostic programs

Different information will appear in Figure 2-4 for different type boards. The color system interface (CSI) will display the following typical extended test information:

```
Slot    5   CSI   (TIAU   00002534330-0001   *C)
   COLOR SYSTEM INTERFACE TEST              :    passed
        MC68010 Kernal section selftests    :    passed
        MC68901 MFP section selftests       :    passed
        MC68230 PI/T section selftests      :    passed
        Miscellaneous section selftests     :    passed
   VIDEO SECTION SELFTESTS                  :    passed
        MC68010 memory (1-3)                :    123 passed
        Graphics memory (1-6)               :    123456 passed
passed
```

Maintenance Submenu Choice (Explorer II processor only; not available on LX systems.) Press ! (exclamation point). This option gives you access to the following submenu of testing mode controls and utilities:

■ N=NuBus — Read and write to any physical address on the NuBus.

■ S=Single — Toggle between the single and All slots choices for RETEST/EXTENDED. If the current choice is single, you are then prompted for the slot to test.

■ X=eXecute — Execute processor self-test(s). You are then prompted for the number of the self-test.

■ **F=Flags** — Displays current state of the test mode flags

  ■ **L=Loop** — Toggles loop-on-tests flag. A value of 1 means to loop on the selected test(s).

  ■ **H=Halt** — Toggles halt-on-error flag. A value of 1 means to halt the test(s) if any error is detected.

  ■ **I=Ignore** — Toggles ignore-errors flag. A value of 1 means to ignore test errors while looping on the selected self-test(s).

Figure 2-4   **Typical Messages Displayed After Extended Test Completion**

```
Slot  6  TESTING  SYSTEM

Slot  0  NEC  (TIAU  00002236400-0001  *P)
   ETHERNET  BOARD  TEST
       E'net  memory      :  passed
       Initialization     :  passed
       SCB  commands       :  passed
       Diagnose            :  passed
       IA  setup           :  passed
       Configure           :  passed
       82586  int  lpbk    :  passed
       Serial  int  lpbk   :  passed
       Network presence    :  passed
passed

Slot  2  NPI  (TIAU  00002238040-0001  *L)  passed

Slot  3  MEM  (TIAU  00002243910-0003  *H)
   EXTENDED  MEMORY  TEST
       Interface  test          :  passed
       Parity test              :  passed
       Modified  addr  test     :  passed
       Pattern  test  (1-8)2345678 passed
       Chip  hit  test     :  >>ERROR
Diagnostic  TESTS  FAILED

Slot  4  MEM  (TIAU  00002236415-0001  *G)
   EXTENDED  MEMORY  TEST
       Interface  test          :  passed
       Parity  test             :  passed
       Modified  addr  test     :  passed
       Pattern  test  (1-8)2345678  passed
       Chip  hit  test          :  passed
passed

Slot  5  SIB  (TIAU  00002236645-0001  *J)
   SYSTEM  INTERFACE  TEST
       Initialization               :  passed
       Event  generation  vectors   :  passed
       RTC  and  long  interval  timers :  passed
       Bit  map  memory  address  lines :  passed
       Graphics  operations         :  passed
       Mouse  registers             :  passed
       Local  keyboard  USART  check :  passed
       Monitor  presence            :  passed
       Keyboard  presence           :  passed
       Mouse  loopback  circuitry   :  passed
       Voice  loopback  circuitry   :  passed
       Parallel  port  data  loopback :  passed
       Battery  backup              :  passed
       Non-volatile  RAM            :  passed
passed

Slot  6  passed

D=Default  load,  M=Menu  load,  R=Retest,  E=Extended  tests:
```

Menu Boot Choices **2.4.5.3** The *menu boot choices* are shown in the following menu:

```
L=Lisp load, M=Multi-unit load, D=Diagnostic load, P=Print device label:
C=Configuration Boot
```

You can press a letter to select one of the choices or press RETURN to select the default choice (Lisp load). (Menu boot choices are not available on LX systems.)

Lisp Load Choice (Not available on LX systems.) Press L. The system does the following:

1. Displays a menu of available system partitions. You can press a letter to select a particular partition, RETURN to accept the default partition (the letter indicated by an asterisk), or ABORT to go to the previous menu.

2. Displays the version number of the microcode band preferred by the selected load band and a menu of microcode bands. You can select a particular band, accept the default, or return to the previous menu.

3. Attempts to load from the specified load and microcode bands. If the system cannot successfully load from the specified bands, it displays a message followed by the initial menu of options.

Multi-Unit Load Choice (Not available on LX systems.) This option enables you to boot from a load band on one device and a microcode band on another. Press M. The system does the following:

1. Displays a menu of devices that may contain load bands. You can press a letter to select a particular device, RETURN to accept the default device (the letter indicated by an asterisk), or ABORT to return to the previous menu.

2. Displays a menu of load bands. You can select a particular band, accept the default, or return to the previous menu.

3. Displays a menu of devices that may contain microcode bands. You can select a particular band, accept the default, or return to the previous menu.

4. Displays the version of the microcode preferred by the selected load band and a menu of microcode bands. You can select a particular band, accept the default, or return to the previous menu.

5. Attempts to load from the specified load and microcode bands. If the system cannot successfully load from the specified bands, it displays a message, followed by the initial menu of options.

Diagnostic Load Choice (Not available on LX systems.) Press D. The system does the following:

1. Displays a list of devices that may contain diagnostic bands. You can press a letter to select a particular device, RETURN to accept the default device (the letter indicated by an asterisk), or ABORT to return to the previous menu.

2. Displays a menu of diagnostic bands. You can select a particular band, accept the default, or go to the previous menu.

3. Attempts to load from the specified band. If the system cannot successfully load from that band, it displays a message followed by the menu boot options.

Print Device Label Choice (Not available on LX systems.) This option enables you to see the disk label for a specified device. Press P. The system does the following:

1. Displays a list of devices. You can press a letter to choose a particular device, RETURN to choose the default device, or ABORT to return to the previous menu.

2. Displays the volume name.

3. Displays the name and comment of each partition on the device label.

4. Displays the partition type and CPU/user type for each partition.

5. Displays the initial menu of user options.

Configuration Boot Choice (Not available on LX systems.) This option allows you to display a menu of devices that may contain configuration partitions. Press RETURN to accept the default device. You then see a menu of configuration partitions (if they exist on that device). Press RETURN to accept the default partition.

File Systems **2.4.6** Your system can include several file bands, but only one band can be booted at a given time. The system uses certain conventions to determine which file band to boot. To use a file system that spans several partitions, you must set the partition properties and create the file system.

Determining **2.4.6.1** Your system uses the following algorithm to determine which file
the File Band band to use during the boot operation:

1. Searching from the lowest through the highest unit number, the system chooses the first file partition marked as the default that is not also a diagnostic partition.

2. If the first search does not find a suitable partition, the system again searches from the lowest through the highest unit number and chooses the first file partition named FILE.

3. If this second search does not find a suitable partition, the system does not boot a file partition.

You can boot a different file system after the system is initialized. Refer to the *Explorer Input/Output Reference* manual.

Using Several **2.4.6.2** In a file system that crosses several disks, the first partition in the
File Partitions system contains a map of the locations of the other partitions. Each file partition in the file system should have its logical partition property set. The first partition should also have the default property set to indicate that it is the beginning of the system.

You create a file system that contains more than one partition by allocating the file partitions and then by executing the **fs:initialize-file-system** function. Refer to the *Explorer Input/Output Reference* manual.

Page Partitions   2.4.7   During the boot process, the system may find several page partitions. The system uses all partitions with the page partition attribute set as virtual memory storage. A table is created in microcode to list the available page partitions.

Setting Date   2.4.8   If you need to supply the time, the system prompts you for the current
and Time   date and time with the following message:

```
Please type the date and time:
```

If you press RETURN, the system displays the following message:

```
Do you want to specify the time or not? (Y or N)
```

If you answer N (no), the system returns **nil** and the boot operation continues without placing the time in the status line. If you answer Y (yes), the system displays the `Please type the date and time:` message again.

If you respond to the `Please type the date and time:` message by entering a date and time, the system verifies that the correct format has been used. If the format is incorrect, the system displays the following message:

```
Unrecognized date/time format, starting with token 12347982.
Please type the date and time:
```

For example, an acceptable format is 10/05/88, 14:30:22. The system returns the following message:

```
Time is Wednesday the fifth of October, 1988; 14:30:22, OK? (Y or N)
```

If you answer N (no) in response to the question, the system again displays the `Please type the date and time:` message.

Lisp Listener   2.4.9   Each time you perform a boot operation on the Explorer system or the Explorer LX system, the Lisp Listener utility is automatically invoked. Above the Listener menu in the lower left corner of the large window, the words Lisp Listener 1 appear. This label indicates that the system is now active in the Lisp Listener, the interactive Lisp interpreter.
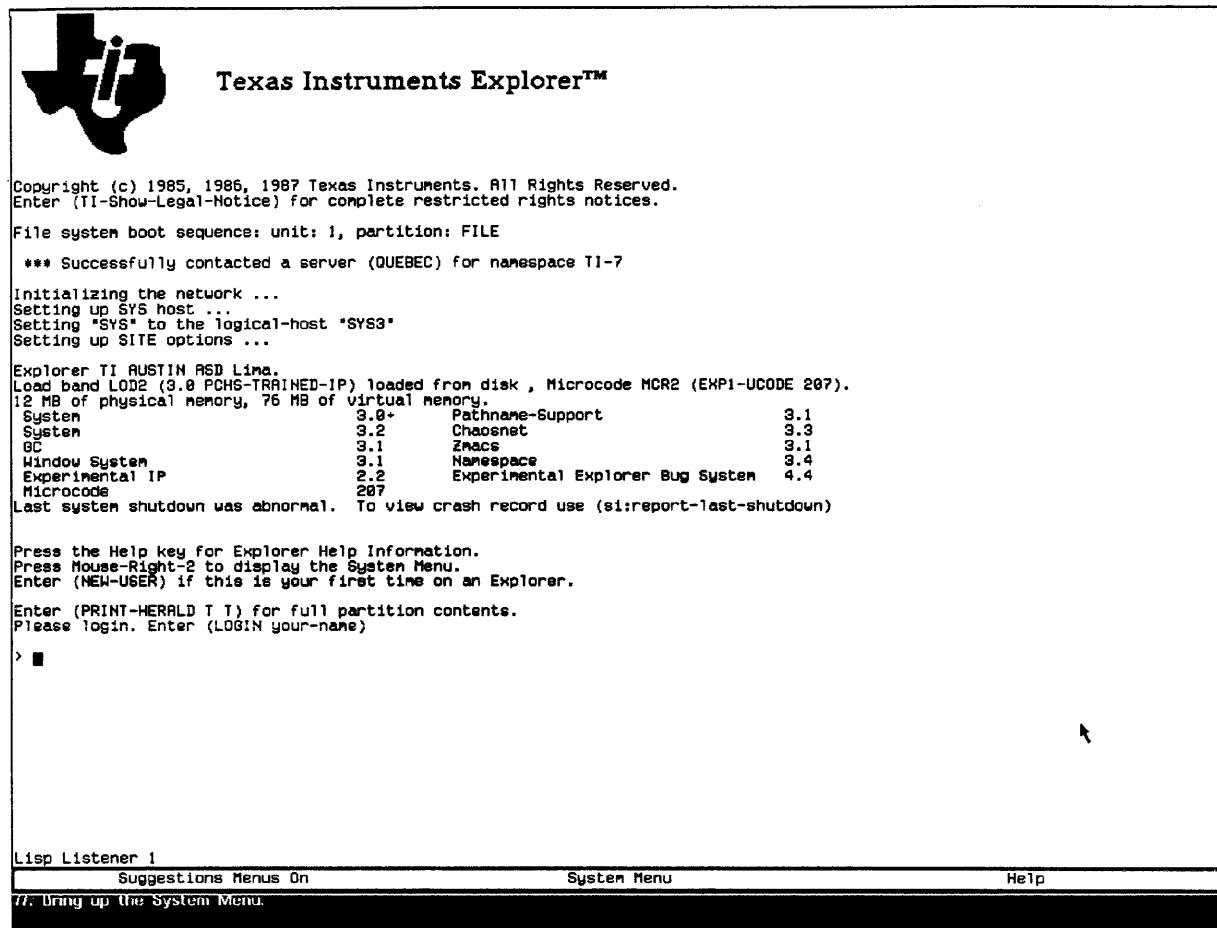
Listener Menu   2.4.9.1   The line just above the mouse documentation window is a menu of commands available in the Lisp Listener. The use of menus is discussed later in this section.

Initial Screen   2.4.9.2   At the completion of the cold boot operation, the Lisp Listener displays the *initial screen*, which lists the name of your system, the memory available in your system, and the names and version numbers of the software available on your system. Figure 2-5 shows a typical initial screen.

Figure 2-5 Typical Lisp Listener Initial Screen

```
         Texas Instruments Explorer™




Copyright (c) 1985, 1986, 1987 Texas Instruments. All Rights Reserved.
Enter (TI-Show-Legal-Notice) for complete restricted rights notices.

File system boot sequence: unit: 1, partition: FILE

 *** Successfully contacted a server (QUEBEC) for namespace TI-7

Initializing the network ...
Setting up SYS host ...
Setting "SYS" to the logical-host "SYS3"
Setting up SITE options ...

Explorer TI AUSTIN ASD Lima.
Load band LOD2 (3.0 PCHS-TRAINED-IP) loaded from disk , Microcode MCR2 (EXP1-UCODE 207).
12 MB of physical memory, 76 MB of virtual memory.
 System               3.0+     Pathname-Support        3.1
 System               3.2      Chaosnet                3.3
 GC                   3.1      Zmacs                   3.1
 Window System        3.1      Namespace               3.4
 Experimental IP      2.2      Experimental Explorer Bug System  4.4
 Microcode            207
Last system shutdown was abnormal.  To view crash record use (si:report-last-shutdown)


Press the Help key for Explorer Help Information.
Press Mouse-Right-2 to display the System Menu.
Enter (NEW-USER) if this is your first time on an Explorer.

Enter (PRINT-HERALD T T) for full partition contents.
Please login. Enter (LOGIN your-name)

> ■




Lisp Listener 1
```
| Suggestions Menus On | System Menu | Help |

Ti: Bring up the System Menu.

05/20/87 06:56:24AM   USER: Keyboard

Prompt Symbol **2.4.9.3** After the initial screen is shown, the system displays a blank line and the prompt symbol (>) at the left margin. This prompt symbol, with the status message of Keyboard, indicates that the Lisp Listener is now ready to evaluate the functions you type. The blinking keyboard cursor (■) indicates where the typed characters are represented on the video display.

Lisp Top Level **2.4.9.4** Usually on the Explorer, a user interacts with the Lisp language through a top-level loop called the read-eval-print loop. This loop continuously monitors the Lisp Listener for input of Lisp expressions. When input is detected, the loop reads and evaluates the expression, then prints the result on the display.

Logging In to Lisp **2.5** You can perform many operations on your system without logging in. However, to set up the system environment with your preferences and gain access to files and printers, you must log in; that is, you must execute the **login** function.

The **login** function is a Lisp function that identifies you and provides access to the system.

login *user-name* &optional *host inhibit-init-file-p*   Function

The **login** function provides access to the file system and to the Mail utility.

Arguments: *user-name* — Provides a logical address for electronic mail or messages and specifies your default directory. The *user-name* argument can be either a symbol, such as ´name or a string such as "name". If you use a symbol, the letters are changed to all lowercase or all uppercase letters, depending on certain system variables. If you use a string, the case of the letters remains the same.

host — Specifies which host's file system to use. The specified *host* becomes your default file server; all references to files that do not specify another host use files in that system. The default value is the local machine (lm). In particular, this is where your login-initialization file (login-init file) comes from. If host is specified as T, then **login** assumes that *host* equals lm and *inhibit-init-file-p* equals true.

inhibit-init-file-p — Specifies whether to use a login-init file. If *inhibit-init-file-p* is nil, the system attempts to find a file called LOGIN-INIT.LISP or PROFILE-LISPM.INIT saved under a directory of the same name as *user-name* on host. If the system cannot find a login-init file, it simply returns the Lisp Listener prompt. The default value of *inhibit-init-file-p* is nil, which means to use a login-init file if one exists.

To execute the **login** function, type the function in the Lisp Listener window that appears when you boot the system. If you have never logged in to the system before, you should use the following specific form:

```
(login ´user-name t)
```

You can specify any name as user-name. The apostrophe, or single quote (´), indicates that the characters following it should be treated as a literal value and should not be evaluated. The letter t tells the system to ignore any login-init file. This prevents the possible use of a login-init file that someone else may have created under the specified *user-name*.

As you type the **login** function, the system reacts as follows:

1.   The opening parenthesis may initiate system activity.

2.   If you type rapidly, the video display may not immediately repeat what you type. The characters are stored in a buffer until the machine displays them.

3.   When you type the closing parenthesis, the system executes the function, the run bars flicker, and the status message changes to Run.

4.   The system displays the specified *user-name* on the status line between the time and the package name.

5.   When execution is complete, the system displays a T (the returned value of the function) and moves the cursor and the system prompt to the beginning of a new line.

Converting to Color

2.6 To convert your system from monochrom to color, enter the following form: (w:convert-to-color)

Activating the LX Console

2.7 After you have logged in to Lisp, press the SYSTEM and the U keys to activate the LX console. At this point the system checks to see if the password in the password file and the ID of the Software Protection Adapter (SPA) match. If the password file has no password in it, the following message is displayed:

```
Password verification failure!!
SPA ID # = xxxx
Enter correct password:
```

Enter the password that is on the label of the TI System V cartridge tape. In addition, once the system is booted, the password file has to be updated with the correct password. When you have correctly entered the password, the following messages are displayed:

```
Please update /etc/softpwd with the correct password

INIT: SINGLE USER MODE
```

NOTE: Anytime you anticipate system problems (such as a crash) or you want to power down the system (especially while in single-user mode) be sure that you first execute a **sync** command. The **sync** command finds any volatile data structures that are currently in system memory and stores them safely out to disk. In multiuser mode, the **shutdown** command performs this function.

When the system prompt (#) returns, you can initiate the multiuser mode by entering the following TI System V command and pressing RETURN:

```
init 2
```

A series of messages, such as correct time and date and check the file system, now appear. After these messages, the following login prompt appears:

```
:login:
```

Log in to the LX console using root as your user ID. Root requires no password.

For further information on the operation of the LX system, refer to the following manuals:

■ *Explorer LX User's Guide*

■ *TI System V User's Reference* manual

■ *TI System V Administrator's Reference* manual

**Ending
a Session**

2.8 If your system is shared among several users, you may need to end a session by logging out when you are finished with your work. However, if you are the only user of your system, you will probably not need to log out except when you reboot or power down your machine. If you are ending a session with the system, save any editing buffers that you want to keep before you log out.

If you are in an LX system, in single-user mode, you should first execute a sync command. The sync command finds any volatile data structures that are currently in system memory and stores them safely out to disk. In multi-user mode, the **shutdown** command performs this function.

Logging Out

2.8.1 Logging out cancels your association with the machine. It does not change the environment, destroy the contents of buffers, or kill or bury windows. To log out, follow these steps:
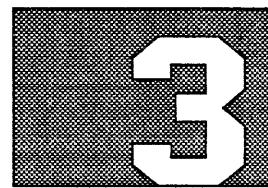
1. Select a Lisp Listener window. If you are not in a Lisp Listener window, select one by pressing SYSTEM L or by selecting the Lisp Listener item from the System menu.

2. Type the Lisp function (logout). The system evaluates the function (logs you out); in some cases, it resets the values of variables set using an initialization list. Then the system returns the value **t**.

Powering Down

2.8.2 Because the system is often part of a network, powering down an Explorer system requires more than simply turning off the components of the system. If your Explorer station is part of a network and provides a file system or a printer for other stations on the network, you should leave your station powered up while other stations require it.

Typically, a system remains powered up at all times. A situation may arise, however, that forces you to power down the system. To ensure that all operations within the system are completed before you power down the system, follow these steps:

1. Log out as described in paragraph 2.7.1, Logging Out.

2. Wait until the run bars disappear and the status line does not report any file activity, such as the message `File Serving C15` or the name of a pathname being transferred to another file system.

3. Type the Lisp function (fs:dismount-file-system). (This function, as its name implies, makes the file system unavailable to anyone.) The system completes all output to disk and prevents anyone from writing to the file system.

4. Type the Lisp function (sys:shutdown). The system completes any current activity and shuts down the processor. The keyboard cursor in the selected window stops blinking.

5. Turn off the power to the monitor, the mass storage enclosures, the system enclosure, and any peripheral devices.

EXPLORER SYSTEMS
DIAGNOSTICS SUMMARY

Introduction

3.1 This section provides a summary of the diagnostics for all Explorer systems. This summary is intended to help the user get a high-level picture of the entire diagnostic structure. These diagnostics are grouped under the following topics:

■ Diagnostic software

■ System Test Boot Master (STBM) discussion

■ Power-up diagnostics

■ Loading and using the General Diagnostics Operating System (GDOS)

■ Loading and using the standalone diagnostics

Refer to the following reference documents for additional details on running the diagnostics:

■ *Explorer Diagnostics*, TI part number 2533554-0001

■ *System 1500 Diagnostic User's Guide*, TI part number 2534850-0001

■ *Explorer LX User's Guide*, TI part number 2537225-0001

■ *Explorer LX System Installation*, TI part number 2537227-0001

Diagnostic Software

3.2 There are two sets of diagnostic software: the Explorer diagnostics and the System 1500 diagnostics. The Explorer diagnostics are used in Explorer systems and Explorer II systems. Both the Explorer diagnostics and the System 1500 diagnostics are used in the Explorer LX systems. The diagnostics disk and tape media have the same diagnostic software partitions. The tape diagnostic partitions for the Explorer diagnostics and the System 1500 diagnostics are listed as follows:

■ *Explorer Diagnostics Bootable Master Tape*, Release 1.4.0, TI part number 2249964-1301, with the following partitions:

- DIAG — Contains all the GDOS loadable diagnostics

- GDOS — GDOS type 0000 is used with the Explorer I processor

- GDOS — GDOS type 0005 is used with the Explorer II processor

- EXPT — Contains the Explorer I processor standalone diagnostics

- EXP2 — Contains the Explorer II processor standalone diagnostics

■ *System 1500 Diagnostics Tape*, Release 1.4.0, TI part number 2540570-0001, with the following partitions:

  ■ DIAG — Contains all the GDOS loadable diagnostics

  ■ GDOS — GDOS type 0002 is used with the System 1500 68020-based processor

  ■ S15A — Contains the 68020-based processor standalone diagnostics

  ■ GBUS — Is used to load GDOS in multiprocessor mode

  ■ GDCF — Is used to load GDOS on the secondary processor

  ■ EXCF — Is used to load EXPT or EXP2 onto a secondary processor

---

STBM Discussion

3.3 The STBM is code that controls testing of the other boards in the chassis and performs the initial program load. The STBM software is therefore responsible for loading diagnostics. All Lisp and 68020-based processor boards contain the ROM-resident STBM software. When an LX system is first booted, the processor board occupying the lowest-numbered slot in the chassis has its STBM software activated. Only that board's STBM software is activated. In the LX system, the board that has its STBM software activated is the 68020-based processor board, which must reside in slot 1. The Explorer processor board has its STBM software activated only if the 68020-based processor board is faulty.

The STBM software first executes an interface test with each board in the system and reports the test results to the Explorer terminal. After the interface tests run, you are prompted to select a load option. If you select the G load option, you are then prompted to select the load partition.

When you select a partition, the STBM first decides whether that partition resides on the Lisp disk or on the TI System V disk. When it has identified the proper disk, the STBM loads the partition from disk into LX memory and transfers control to that partition so that execution can begin.

The 68020-based processor board's STBM software loads *whichever* band is selected at boot-time, regardless of whether that band is for the default system load, System 1500 GDOS, Explorer GDOS, Explorer standalone diagnostics, or the NuBus and multiprocessor diagnostics.

For more information about the STBM, see **boot** in Section 8 of the *TI System V Administrator's Reference* manual.

Power-Up Diagnostics

3.4 The power-up diagnostics consist of power-up self-tests and interface diagnostic tests. The power-up self-tests are ROM-based tests that are executed automatically by each of the installed intelligent boards when the system is powered up. Each power-up self-test is internal to a specific intelligent board and does not interact with other boards. The following boards are considered intelligent boards:

■ Explorer I processor board

■ Explorer II processor board

■ 68020-based processor board

■ NuBus Peripheral Interface (NUPI) board

■ SMD/SCSI controller board

■ Communications carrier board

The interface diagnostic tests are additional ROM-based tests that are executed from the System Test Boot Master (STBM) rather than from a specific intelligent board. Some of these tests interact with the board self-tests on certain intelligent boards. The interface diagnostic tests consist of the normal mode tests and the extended mode tests. These two modes are discussed in the paragraphs that follow.

Normal Mode Tests

3.4.1 In this mode, the interface diagnostic tests are executed automatically during power up after the power-up self-tests have run. The following messages appear for the Explorer systems or the Explorer LX systems:

Explorer systems power-up messages:

```
Slot 6 TESTING SYSTEM:

Slot 0 passed
Slot 1 passed
Slot 2 passed
Slot 4 passed
Slot 5 passed
Slot 6 passed

D=Default load, M=Menu load, R=Restart, E=Extended tests:
```

Explorer LX systems power-up messages:

```
Slot 1 CPU TESTING SYSTEM:

Slot 0 NEC passed
Slot 1 CPU passed
Slot 2 NPI passed
Slot 4 MEM passed
Slot 5 SIB passed
Slot 6 CPU passed

D=Default load, M=Menu load, R=Restart, E=Extended tests:
```

On successful completion of the power-up self-tests and the normal mode system tests, you are prompted to specify the next software to be loaded. You have 15 seconds to respond to the prompts before the system performs the default system initialization procedure. In most cases the default procedure consists of loading the appropriate operating system. You can suspend the 15-second time-out by pressing the space bar or any key or by typing any character except a command character that specifies a load procedure. Command characters are D, M, R, E, G, or N.

G is the GDOS load command.

N is the name load command.

If any boards fail to pass the power-up self-tests or the interface diagnostic system tests, you can retest the system by entering an E to select the extended mode system tests to further define the source of the problem.

Extended Mode **Tests**	**3.4.2** In this mode, the interface diagnostic routines perform additional testing and provide status and error reports similar to that shown in Figure 3-1.

Figure 3-1	**Typical Messages Displayed After Extended Test Completion**

```
Slot  6  TESTING  SYSTEM

Slot  0  NEC  (TIAU  00002236400-0001  *P)
    ETHERNET  BOARD  TEST
            E'net  memory      :  passed
            Initialization     :  passed
            SCB  commands       :  passed
            Diagnose           :  passed
            IA  setup          :  passed
            Configure          :  passed
            82586  int  lpbk    :  passed
            Serial  int  lpbk  :  passed
            Network presence   :  passed
passed

Slot  2  NPI  (TIAU  00002238040-0001  *L)  passed

Slot  3  MEM  (TIAU  00002243910-0003  *H)
    EXTENDED  MEMORY  TEST
            Interface  test           :  passed
            Parity test               :  passed
            Modified  addr  test      :  passed
            Pattern  test  (1-8)2345678 passed
            Chip  hit  test   :  >>ERROR
Diagnostic  TESTS  FAILED

Slot  4  MEM  (TIAU  00002236415-0001  *G)
    EXTENDED  MEMORY  TEST
            Interface  test           :  passed
            Parity  test              :  passed
            Modified  addr  test      :  passed
            Pattern  test  (1-8)2345678  passed
            Chip  hit  test           :  passed
passed

Slot  5  SIB  (TIAU  00002236845-0001  *J)
    SYSTEM  INTERFACE  TEST
            Initialization                   :  passed
            Event  generation  vectors       :  passed
            RTC  and  long  interval  timers :  passed
            Bit  map  memory  address  lines :  passed
            Graphics  operations             :  passed
            Mouse  registers                 :  passed
            Local  keyboard  USART  check    :  passed
            Monitor  presence                :  passed
            Keyboard  presence               :  passed
            Mouse  loopback  circuitry       :  passed
            Voice  loopback  circuitry       :  passed
            Parallel  port  data  loopback   :  passed
            Battery  backup                  :  passed
            Non-volatile  RAM                :  passed
passed

Slot  6  passed

D=Default  load,  M=Menu  load,  R=Retest,  E=Extended  tests:
```

Different information will appear in Figure 3-1 for different type boards. The color system interface (CSI) will display the following typical extended test information:

```
Slot     5   CSI   (TIAU  00002534330-0001   *C)
        COLOR SYSTEM INTERFACE TEST              :    passed
              MC68010 Kernal section selftests   :    passed
              MC68901 MFP section selftests      :    passed
              MC68230 PI/T section selftests     :    passed
              Miscellaneous section selftests    :    passed
        VIDEO SECTION SELFTESTS                  :    passed
              MC68010 memory (1-3)               :    123 passed
              Graphics memory (1-6)              :    123456 passed
passed
```

Loading and Using GDOS	**3.5** GDOS is a self-contained operating system that resides on a disk or a tape. A separate GDOS is associated with each type of processor. The following procedure presents a brief introduction on how to load and use the applicable GDOS.

1. Reboot the system as indicated in one of the following steps:

    a. If you are on an Explorer system, reboot the system by turning the power off then on, or by pressing META-CTRL-META-CTRL-ABORT on the Explorer keyboard. The STBM on the Explorer I processor or the Explorer II processor now runs a series of system self-tests and interface diagnostic system tests. As these tests complete, messages containing the test results scroll onto the video display with a line of load prompts.

    b. If you are on an Explorer LX system, you must shutdown the TI System V side using the shutdown command, and shutdown the Lisp side using si:shutdown. Reboot the LX system by pressing META-CTRL-META-CTRL-ABORT on the Explorer keyboard. The STBM on the 68020-based processor now runs a series of system self-tests and interface diagnostic system tests. As these tests complete, messages containing the test results scroll onto the video display with a line of load prompts.

2. Press the G key to display a list of available load devices similar to the one that follows. The controller slot number and logical unit number for each device are also shown.

    ```
    Available load devices:

    A=  Slot 0 Enet 00
    B=  Slot 2 Disk 00
    C=  Slot 2 Disk 01
    *D= Slot 2 Disk 04
    E=  Slot 2 Tape 06

    Select load device:
    ```
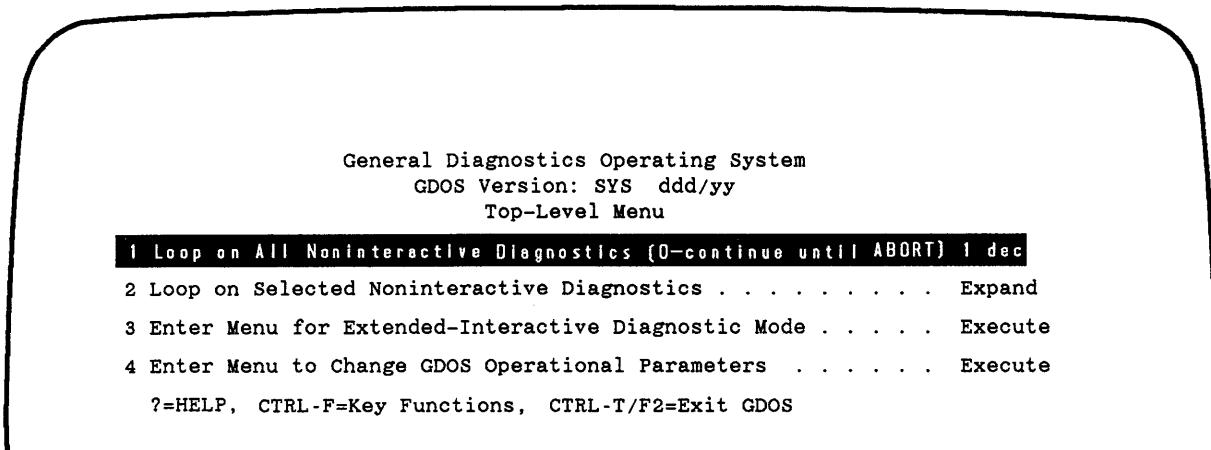
    Each available load device is also identified by an associated letter. An asterisk marks the default load device.

3. If you are booting from the disk, choose the letter of the device associated with the disk that has GDOS. Press RETURN to accept the default. If you are booting from magnetic cartridge tape, choose the letter of the device associated with the tape. When GDOS has loaded, a restricted rights legend appears. After a delay, you see a menu similar to the one in Figure 3-2.
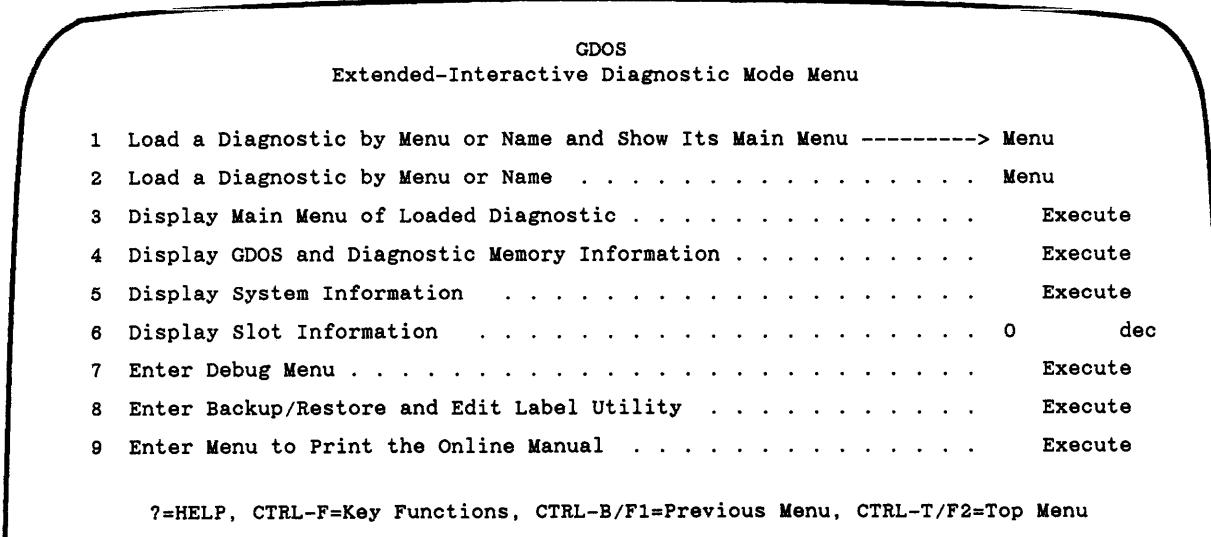
Figure 3-2 GDOS Top-Level Menu

```
                        General Diagnostics Operating System
                              GDOS Version: SYS  ddd/yy
                                    Top-Level Menu

   1 Loop on All Noninteractive Diagnostics (0-continue until ABORT)  1 dec

   2 Loop on Selected Noninteractive Diagnostics . . . . . . . . .  Expand

   3 Enter Menu for Extended-Interactive Diagnostic Mode . . . . .  Execute

   4 Enter Menu to Change GDOS Operational Parameters  . . . . . .  Execute

      ?=HELP,  CTRL-F=Key Functions,  CTRL-T/F2=Exit GDOS
```

You can now execute either the noninteractive or the extended-interactive diagnostics, or change the diagnostic parameters. Our diagnostic summary continues with the extended-interactive diagnostic mode.

4. From the GDOS Top-Level menu, move the cursor to menu entry number 3 — Enter Menu for Extended-Interactive Diagnostic Mode — and press RETURN. The Extended-Interactive Diagnostic Mode menu is displayed in Figure 3-3.

Figure 3-3 GDOS Extended-Interactive Diagnostic Mode Menu

```
                                      GDOS
                     Extended-Interactive Diagnostic Mode Menu

   1  Load a Diagnostic by Menu or Name and Show Its Main Menu ---------> Menu

   2  Load a Diagnostic by Menu or Name  . . . . . . . . . . . . . . . .  Menu

   3  Display Main Menu of Loaded Diagnostic . . . . . . . . . . . . .      Execute

   4  Display GDOS and Diagnostic Memory Information . . . . . . . . . .    Execute

   5  Display System Information  . . . . . . . . . . . . . . . . . . .     Execute

   6  Display Slot Information  . . . . . . . . . . . . . . . . . . . . 0         dec

   7  Enter Debug Menu . . . . . . . . . . . . . . . . . . . . . . . .      Execute

   8  Enter Backup/Restore and Edit Label Utility  . . . . . . . . . .      Execute

   9  Enter Menu to Print the Online Manual  . . . . . . . . . . . . .      Execute


       ?=HELP, CTRL-F=Key Functions, CTRL-B/F1=Previous Menu, CTRL-T/F2=Top Menu
```

NOTE: For information about specific GDOS diagnostic menus and menu entries, use the online help facility. Online help messages are available for every entry in all GDOS diagnostic menus. For more information about accessing the online help messages, refer to the *Explorer Diagnostics*.

---

5. In an Explorer system, you can select the diagnostic you want to run by placing the cursor on menu entry 1 — Load a Diagnostic by Menu or Name and Show Its Main Menu — and press RETURN. The Diagnostic Load menu appears with a list of the diagnostic programs that are available for your system.

   The following sample list may differ from what appears on your screen, depending on your particular system configuration:

   ```
   1  Disk Diagnostic ----------------------------------->   Execute
   2  System Interface Board Diagnostic . . . . . . . . .   Execute
   3  Color System Interface Board Diagnostic . . . . . .   Execute
   4  NuBus Ethernet Controller Diagnostic. . . . . . . .   Execute
   5  Tape Diagnostic . . . . . . . . . . . . . . . . . .   Execute
   6  Monitor and Mouse Diagnostic . . . . . . . . . . .   Execute
   7  Disk Surface Analysis, Format/Verify Utility. . . .   Execute
   ```

   Place the cursor on the applicable menu entry and press RETURN. The system loads that particular diagnostic and then displays its main menu.

6. In an Explorer LX system, GDOS needs to be loaded in multiprocessor mode with the GBUS configuration partition to get the NuBus and multiprocessor diagnostics entry into the menu. You can select the NuBus and multiprocessor diagnostics in one of the following four ways when you are in the Extended-Interactive Diagnostic Mode menu:

   a. In the first method, place the cursor on menu entry 1 — Load a Diagnostic by Menu or Name and Show Its Main Menu — and press RETURN. The Diagnostic Load menu appears with a list of the diagnostic programs that are available for your system.
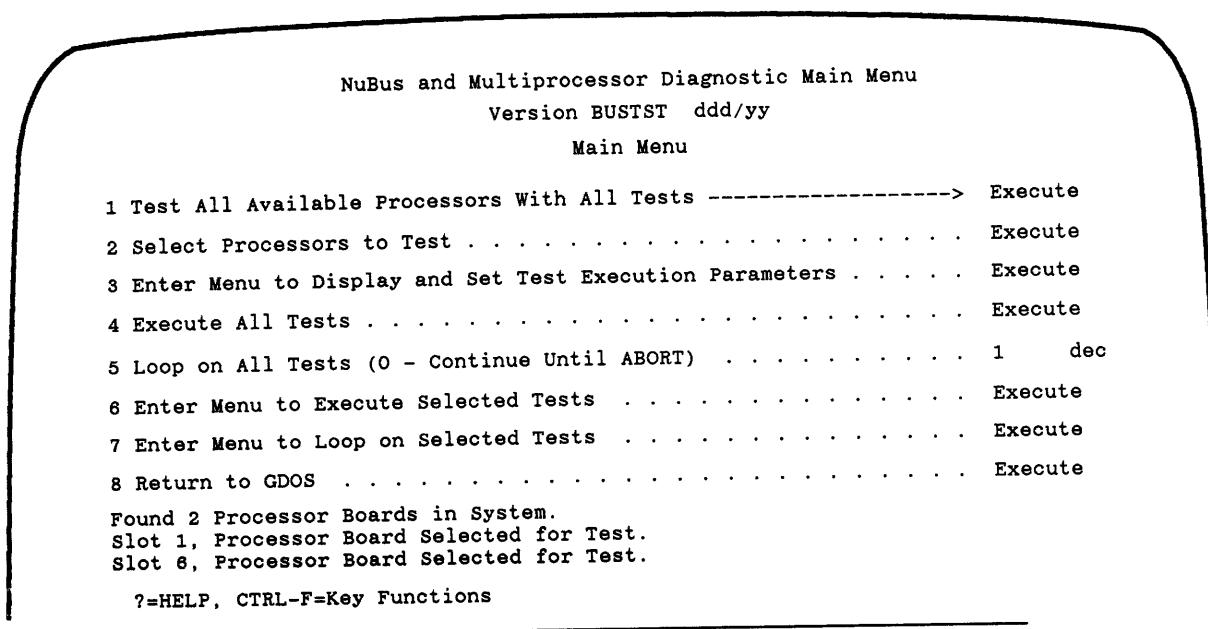
      The following sample list may differ from what appears on your screen, depending on your particular system configuration:

      ```
      1  Disk Diagnostic ------------------------------->   Execute
      2  System Interface Board Diagnostic. . . . . . . .   Execute
      3  Color System Interface Board Diagnostic. . . . .   Execute
      4  NuBus Ethernet Controller Diagnostic . . . . . .   Execute
      5  Tape Diagnostic. . . . . . . . . . . . . . . . .   Execute
      6  NuBus and Multiprocessor Diagnostic. . . . . . .   Execute
      7  Monitor and Mouse Diagnostic . . . . . . . . . .   Execute
      8  Disk Surface Analysis, Format/Verify Utility . .   Execute
      ```

      Place the cursor on the NuBus and Multiprocessor Diagnostic menu entry and press RETURN. The system loads the NuBus and multiprocessor diagnostic and then displays its main menu (Figure 3-4).

   b. In the second method, place the cursor on menu entry 1 — Load a Diagnostic by Menu or Name and Show Its Main Menu. Use the TAB key to change the selection option from Menu to Name and press RETURN. A prompt appears requesting the name of the diagnostic program to load. Type bustst and press RETURN. The system loads the NuBus and multiprocessor diagnostic and then displays its main menu (Figure 3-4).

Figure 3-4 NuBus and Multiprocessor Diagnostic Main Menu

```
                    NuBus and Multiprocessor Diagnostic Main Menu
                            Version BUSTST   ddd/yy
                                   Main Menu

    1 Test All Available Processors With All Tests -------------------> Execute

    2 Select Processors to Test . . . . . . . . . . . . . . . . . . . . Execute

    3 Enter Menu to Display and Set Test Execution Parameters . . . . . Execute

    4 Execute All Tests . . . . . . . . . . . . . . . . . . . . . . . . Execute

    5 Loop on All Tests (0 - Continue Until ABORT) . . . . . . . . . . 1     dec

    6 Enter Menu to Execute Selected Tests . . . . . . . . . . . . . . . Execute

    7 Enter Menu to Loop on Selected Tests . . . . . . . . . . . . . . . Execute

    8 Return to GDOS . . . . . . . . . . . . . . . . . . . . . . . . . Execute

    Found 2 Processor Boards in System.
    Slot 1, Processor Board Selected for Test.
    Slot 6, Processor Board Selected for Test.

     ?=HELP, CTRL-F=Key Functions
```

c. In the third method, place the cursor on menu entry 2 — Load a Diagnostic by Menu or Name — and press RETURN. The Diagnostic Load menu appears with a list of the diagnostic programs that are available for your system. Place the cursor on the NuBus and Multiprocessor Diagnostic menu entry and press RETURN. The system loads the NuBus and multiprocessor diagnostics and then redisplays the Extended-Interactive Diagnostic Mode menu (Figure 3-3). You can now perform other tasks from the Extended-Interactive Diagnostic Mode menu, or you can display the NuBus and Multiprocessor Diagnostic Main menu by selecting menu entry 3 — Display Main Menu of Loaded Diagnostic. When you press RETURN, the main menu for the loaded diagnostics is displayed (Figure 3-3).

d. In the fourth method, place the cursor on menu entry 2 — Load a Diagnostic by Menu or Name. Use the TAB key to change the selection option from Menu to Name and press RETURN. A prompt appears requesting the name of the diagnostic program to load. Type bustst and press RETURN. The system loads the NuBus and multiprocessor diagnostics and then redisplays the Extended-Interactive Diagnostic Mode menu (Figure 3-3).

7. You can now perform other tasks from the Extended-Interactive Diagnostic mode. Refer to the following GDOS menu structures for information on the available diagnostics.

■   Figure 3-5, Explorer GDOS menu structure

■   Figure 3-6, System 1500 GDOS menu structure

■   Figure 3-7, Explorer LX GDOS menu structure

Figure 3-5   Explorer GDOS Menu Structure

GDOS Top-Level Menu

- Loop on All Noninteractive Diagnostics
- Loop on Selected Noninteractive Diagnostics
- Enter Menu for Extended-Interactive Diagnostic Mode
- Enter Menu to Change GDOS Operational Parameters

Under Enter Menu for Extended-Interactive Diagnostic Mode:

- Diagnostic Load Menu
- Display GDOS and Diagnostic Memory Information
- Display System Information
- Display Slot Information
- Enter Debug Menu
- Enter Backup/Restore And Edit Label Menu
- Enter Menu to Print the Online Manual

Disk Diagnostic

Test All Available Drives
Select Drives to Test
Execute Selected Tests
Loop on Selected Tests

Tape Diagnostic

Select Tape Drives to Test
Set Execution Parameters
Execute Non-I, I, or All Tests
Loop on Noninteractive Tests
Execute Selected Tests
Loop on Selected Tests
Utility Verbs Menu

SIB Diagnostic

Test All Available SIBs
Select SIBs to Test
Set Execution Parameters
Execute Non-I, I, or All Tests
Loop on Noninteractive Tests
Execute Selected Tests
Loop on Selected Tests

CSI Diagnostic

Test All Available CSIs
Select CSIBs to Test
Set Execution Parameters
Execute Non-I, I, or All Tests
Loop on Noninteractive Tests
Execute Selected Tests
Loop on Selected Tests

NEC Diagnostic

Test All Ethernet Controllers
Select NECs to Test
Execute All Tests
Loop on All Tests
Execute Selected Tests
Loop on Selected Tests

Disk Media Utilities

Format/Verify Utility
Surface Analysis Utility
Reset the Interface
Set Execution Parameters

Monitor/Mouse Diagnostic

Select SIBs With Monitor/Mouse
Set Execution Parameters
Execute All Interactive Tests
Execute Selected Tests

* **NuBus and Multiprocessor Diagnostic**

Test All Available Processors
Select Processors to Test
Set Execution Parameters
Execute Non-I, I, or All Tests
Loop on All Tests
Execute Selected Tests
Loop on Selected Tests

* *The NuBus and Multiprocessor Diagnostic runs only on the Explorer LX system.*

Figure 3-6 System 1500 GDOS Menu Structure

GDOS Top-Level Menu

- Loop on All Noninteractive Diagnostics
- Loop on Selected Noninteractive Diagnostics
- Enter Menu for Extended-Interactive Diagnostics Mode
- Change Operational Parameters Menu

Under Enter Menu for Extended-Interactive Diagnostics Mode:

- Diagnostic Load Menu
- Display GDOS and Diagnostic Memory Information
- Display System Information
- Display Slot Information
- Enter Debug Menu
- Enter Backup/Restore and Edit Label Menu
- Enter Menu to Print the Online Manual

Disk Diagnostic
- Test All Available Drives
- Select Drives to Test
- Execute Selected Tests
- Loop on Selected Tests

Tape Diagnostic
- Select Drives to Test
- Set Execution Parameters
- Execute Noninteractive Tests
- Loop on Noninteractive Tests
- Execute Selected Tests
- Loop on Selected Tests
- Utility Verbs Menu

CCB Diagnostic
- Test All Available CCBs
- Select CCBs to Test
- Execute All Tests
- Loop on All Tests
- Execute Selected Tests
- Loop on Selected Tests

LAN Board Diagnostic
- Test All Available LANS
- Select CCBs to Test
- Select Devices to Test
- Execute Noninteractive Tests
- Loop on Noninteractive Tests
- Execute Selected Tests
- Loop on Selected Tests

Asynchronous Board Diagnostic
- Test All Available ASYNCs
- Select CCBs to Test
- Select Devices to Test
- Execute Noninteractive Tests
- Loop on Noninteractive Tests
- Execute Selected Tests
- Loop on Selected Tests

Synchronous Board Diagnostic
- Test All Available SYNCs
- Select CCBs to Test
- Select Devices to Test
- Execute Noninteractive Tests
- Loop on Noninteractive Tests
- Execute Selected Tests
- Loop on Selected Tests

Disk Media Utility
- Format/Verify Utility
- Surface Analysis Utility
- Reset the Interface
- Set Execution Parameters

NuBus and Multi-processor Diagnostic *
- Test All Available Processors
- Select Processors to Test
- Set Execution Parameters
- Execute Non-I, I, All Tests
- Loop on All Tests
- Execute Selected Tests
- Loop on Selected Tests

* The NuBus and Multiprocessor Diagnostic runs only on units with multiple processor boards

Figure 3-7 Explorer LX GDOS Menu Structure

GDOS Top-Level Menu

Loop on All
Noninteractive Diagnostics

Loop on Selected
Noninteractive Diagnostics

Enter Menu for Extended-
Interactive Diagnostic Mode

Enter Menu to Change
GDOS Operational Parameters

Diagnostic
Load Menu

Display GDOS and Diagnostic
Memory Information

Display System
Information

Display Slot
Information

Enter Debug
Menu

Enter Backup/Restore
and Edit Label Menu

Enter Menu to Print
the Online Manual

- Disk Diagnostic
- Tape Diagnostic

- SIB Diagnostic
- CSI Diagnostic
- Monitor/Mouse Diagnostic
- CCB Diagnostic
- LAN Diagnostic

- NEC Diagnostics
- Disk Media Utilities
- Asynchronous Board Diagnostic
- Synchronous Board Diagnostic

- Disk Media Utilities
- NuBus and Multiprocessor Diagnostic *

* Runs only on units with multiple processor boards

Loading and Using Standalone Diagnostics

3.6 The standalone diagnostics do not run under GDOS; therefore, they must be loaded and run separately from the diagnostics under GDOS. The standalone diagnostics consist of the following types:

■ Explorer systems standalone diagnostics

■ Explorer LX systems standalone diagnostics

Explorer Systems Standalone Diagnostics

3.6.1 The Explorer systems standalone diagnostics consist of the following diagnostic programs:

■ Explorer I processor and Explorer memory standalone diagnostics (EXPT)

■ Explorer II processor standalone diagnostics (EXP2)

The following procedure presents a brief introduction on how to load and use the applicable Explorer system standalone diagnostics:

1. Boot the system. The system load menu appears:

```
D = Default load, M = Menu load, R = Retest, E = Extended test :
```

If you are already in GDOS, you can exit from the GDOS Top-Level menu by pressing the F2 key. If you exit from GDOS in this way, omit steps 2 and 3 below. Follow the instructions in step 4 to select the D=Diagnostic load option.

2. Type M to select the Menu load option. The system displays a list of the available load devices along with a select device prompt similar to the following:

```
AVAILABLE LOAD DEVICES:

 A=  Slot 0 Enet 00
*B=  Slot 2 Disk 00
 C=  Slot 2 Tape 06

Select load device :
```

3. Type the letter associated with the device containing the menu load instructions for the standalone diagnostics. In most cases you will select the default load device (the device with an asterisk in front of it) by just pressing RETURN. The following prompt appears for Explorer software Release 2.2 or earlier:

```
L=Lisp load, M=Multi-unit load, D=Diagnostic load, P=Print device label :
```

The following prompt appears for Explorer software Release 3.0 or later:

```
L=Lisp Load, M=Multi-unit Load, D=Diagnostic Load, P=Print Device Label,
C=Configuration Boot :
```

4. Type D to select Diagnostic load. The list of available load devices is redisplayed along with the following prompt:

```
Select microcode load device :
```

5. Type the letter associated with the device that contains the standalone diagnostics partition. If the standalone diagnostics partition is on the default load device, simply press RETURN. A prompt similar to the following appears:
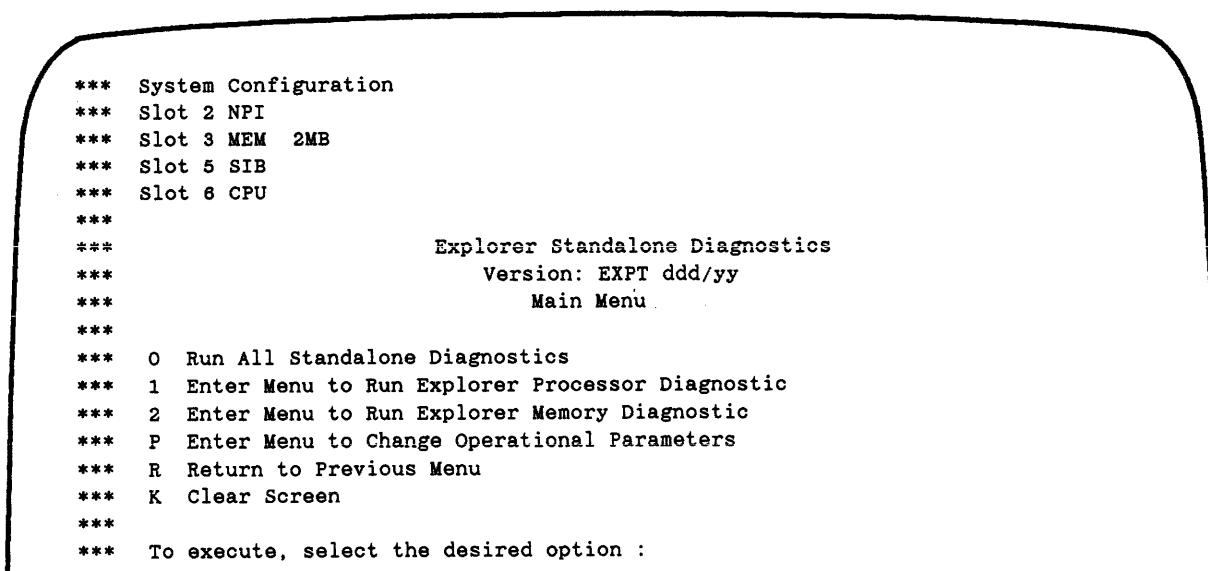
```
AVAILABLE MICROCODE PARTITIONS

A= GDOS     GDOS Expl I ddd/yy Rel x.x.x
B= EXPT     EXPT ddd/yy Rel x.x.x

Select partition :
```

- For Explorer GDOS, type the letter A.

- For Explorer I processor standalone diagnostics, type the letter associated with EXPT.

- For Explorer II processor standalone diagnostics, type the letter associated with EXP2.
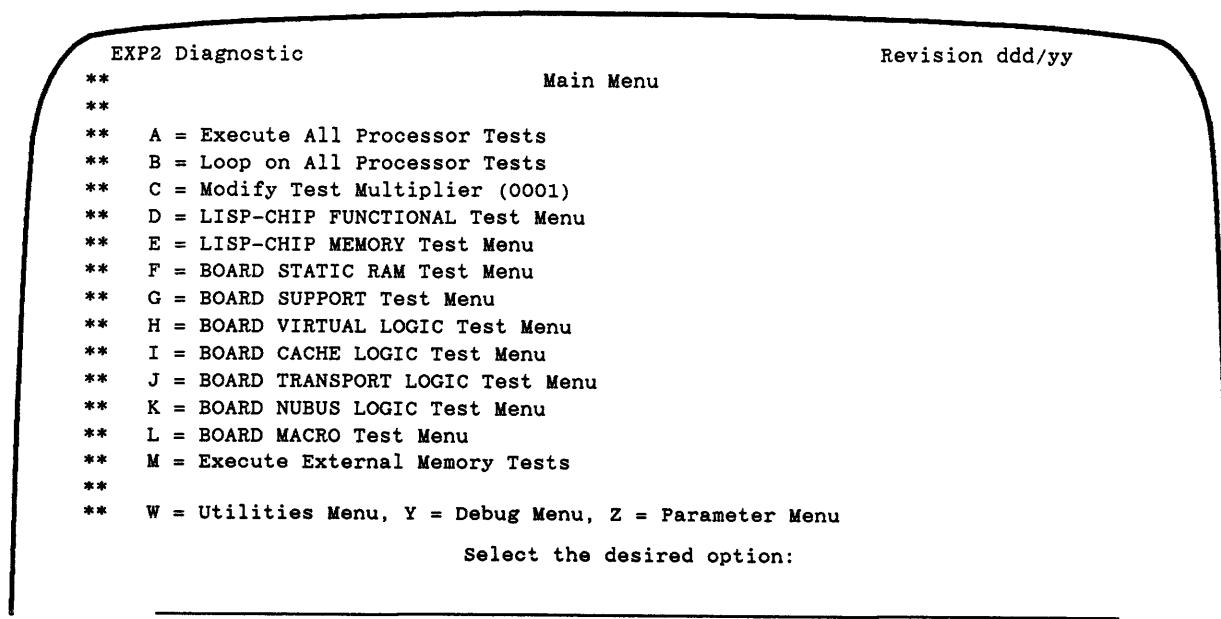
6. In this example you would type B to select the EXPT partition. The EXPT partition contains the standalone diagnostics for the Explorer I processor. After you perform these steps, a system configuration display and the Explorer Standalone Diagnostics Main menu (Figure 3-8) appears. The Standalone Diagnostics Main menu for the Explorer II processor is shown in Figure 3-9.

Figure 3-8 Explorer I Processor Standalone Diagnostics Main Menu

```
***   System Configuration
***   Slot 2 NPI
***   Slot 3 MEM   2MB
***   Slot 5 SIB
***   Slot 6 CPU
***
***                      Explorer Standalone Diagnostics
***                           Version: EXPT ddd/yy
***                                Main Menu
***
***   0  Run All Standalone Diagnostics
***   1  Enter Menu to Run Explorer Processor Diagnostic
***   2  Enter Menu to Run Explorer Memory Diagnostic
***   P  Enter Menu to Change Operational Parameters
***   R  Return to Previous Menu
***   K  Clear Screen
***
***   To execute, select the desired option :
```

Figure 3-9 Explorer II Processor Standalone Diagnostics Main Menu

```
EXP2 Diagnostic                                    Revision ddd/yy
**                          Main Menu
**
**    A = Execute All Processor Tests
**    B = Loop on All Processor Tests
**    C = Modify Test Multiplier (0001)
**    D = LISP-CHIP FUNCTIONAL Test Menu
**    E = LISP-CHIP MEMORY Test Menu
**    F = BOARD STATIC RAM Test Menu
**    G = BOARD SUPPORT Test Menu
**    H = BOARD VIRTUAL LOGIC Test Menu
**    I = BOARD CACHE LOGIC Test Menu
**    J = BOARD TRANSPORT LOGIC Test Menu
**    K = BOARD NUBUS LOGIC Test Menu
**    L = BOARD MACRO Test Menu
**    M = Execute External Memory Tests
**
**    W = Utilities Menu, Y = Debug Menu, Z = Parameter Menu
                     Select the desired option:
```

7. To execute a menu entry in the Explorer Standalone Diagnostics Main menu for the Explorer I processor or the Explorer II processor, type the number or letter that corresponds to the desired entry.

8. To stop execution of the standalone diagnostics, press and hold the ABORT key. Pressing ABORT does not interrupt the test in progress. Test execution stops after the current test completes, unless the action of the abort key was out of synchronization with the test. If the diagnostic does not stop between tests, press ABORT again. Another way to stop the test is to reboot.

9. Refer to the following standalone diagnostics menu structures for information on the available standalone diagnostics:

   ■ Figure 3-10, Explorer standalone processor and memory diagnostics (EXPT) menu structure

   ■ Figure 3-11, Explorer II standalone diagnostics (EXP2) menu structure

Figure 3-10 Explorer Standalone Processor and Memory Diagnostics (EXPT)

Explorer Standalone Diagnostics Main Memory

| Run All Standalone Diagnostics | Run Explorer Processor Diagnostic | Run Explorer Memory Diagnostic | Change Operational Parameters Menu |

Execute All Tests
Execute Selected Tests
Change Operational Parameters

Execute Memory Diagnostics With These Parameters
    Memory Intervals   1
    Starting RAM Address   FS000000
    Number of Words   00100000
    RAM Test Type   All Ram Tests
    Ram Access Mode   Word
Reset Memory Diagnostic Default Parameters
Execute Memory Utilities
Change Operational Parameters

Execute All Tests
Execute Selected Tests Only
Loop
Pause on Error
Abort on Error

Figure 3-11 Explorer II Processor Standalone Diagnostics (EXP2)

Standalone Diagnostics Main Menu

Execute All Processor Tests
Loop on All Processor Tests
Modify Test Multiplier

Utilities Menu
Display System Configuration
MANDELBROT Demonstration Menu
Return to Menu Boot

Debug Menu
Write NuBus Block with Verify
Read NuBus Block
Search NuBus Block
Verify NuBus Block
Modify NuBus Location
Execute I/O Scope Loop
Execute NuBus Scope Loop

Operational Parameters Menu
(OFF) Enable Test Parameter Selection
(OFF) Enable Test Looping
(ON) Enable Test Loop Aborting
(ON) Enable Pause on Error
(ON) Enable 'Ring Bell' on Error
(ON) Enable Header Messages
(ON) Enable Error Messages
(ON) Enable Error Count Messages
(ON) Enable Loop Count Messages
(OFF) Enable Ignore All Errors Option

LISP-CHIP FUNCTIONAL Test Menu
Functional Operations Test
Memory Refresh Test
Internal Macro Test
Tag RAM Abbreviated-Jump Test

LISP-CHIP MEMORY Test Menu
M Memory Test
A Memory Test
UPCS Memory Test
T Memory Test
D Memory Test
PDL Memory Test

BOARD STATIC RAM Test Menu
Right Virtual Memory Map RAM
Left Virtual Memory Map RAM
Least Significant VMM Status RAM
Most Significant VMM Status RAM
Left Cache Data RAM
Right Cache Data RAM
Left Cache Tag RAM
Right Cache Tag RAM
Transport RAM
Least Recently Used RAM
Address Space Map RAM
Instruction RAM Low
Instruction RAM High

BOARD SUPPORT Test Menu
Bus Error Logic Test
NuBus Configuration Register
NuBus Test Register
NuBus Flag Register
LED Pattern Test
External Control Register
Event Posting Registers
Event Timer
Micro Second Timer
EPROM Integrity Check
Zeros and Ones Test
Exchange Register Test

BOARD VIRTUAL LOGIC Test Menu
Page Fault Test
Address Space Map Functions
VMM NuBus Address Test
VMM NuBus Data Test
Virtual Memory Onboard Test
Offboard Virtual Memory Mapping

BOARD CACHE LOGIC Test Menu
Cache XCRTFILLRD Path Test
Cache Unmapped Test
Cache Mapped Test
Cache Tag Addr Comparator Test
Cache Function & Retention Test

BOARD TRANSPORT LOGIC Test Menu
Auto-Transport Test with Cache
Auto-Transport Test with NuBus

BOARD NUBUS LOGIC Test Menu
NuBus Access Enable Test
NuBus Access IDLE Status Test
NuBus Access TESTNUACK Test
NuBus Access IDLE Addr Test
NuBus Access DATA Test
NuBus Access FIFO DATA Test
NuBus Access Byte Mode Test
NuBus Access Buffer Write Test
NuBus Access NuBus Lock Test
NuBus Unmapped Cycles
NuBus Virtual Memory Cycles
NuBus Block Memory Cycles
NuBus Buffered Block Writes
NuBus Cache Memory Cycles

BOARD MACRO Test Menu
External Macro Test with Cache
External Macro Test with NuBus

FLOATING POINT BOARD Test Menu
FP ALU Register Test
FP ALU Test
FP Multiplier Test

Execute External Memory Tests

Explorer LX System Standalone Diagnostics

3.6.2 The Explorer LX systems standalone diagnostics include System 1500 GDOS in addition to the following Explorer diagnostics:

- Explorer I processor standalone diagnostics (EXPT)

- Explorer II processor standalone diagnostics (EXP2)

- System 1500 multiple 68020-based processor standalone diagnostics (S15A)

NOTE: The S15A standalone diagnostics execute only on a System 1500 system with multiple 68020-based processors and will not execute on an Explorer LX system.

The following procedure presents a brief introduction on how to load and use the applicable Explorer LX system standalone diagnostics:

1. Reboot the system by pressing META-CTRL-META-CTRL-ABORT on the Explorer keyboard. The STBM now runs self-tests. As the self-tests complete, messages containing the test results scroll onto the video display with the following load prompts:

   `D=Default load, M=Menu load, R=Restart, E=Extended tests:`

   You have 15 seconds to respond to the prompts:

2. Press the N key, to specify the `Name` load. The `Name` load allows you to name the diagnostics band that you want to load.

3. A series of prompts now appear. The first prompt requests the name of your system load band. Specify the name of your TI System V load band (unx1). Although neither Explorer GDOS nor Explorer standalone diagnostics use this band, they will not load without this information. If the defaults are correct, just press RETURN.

4. The next prompt requests the name of your configuration band. At this point, you can specify a diagnostics band by one of the following names:

   - For Explorer GDOS, enter `GDCF`.

   - For Explorer I processor standalone diagnostics (EXPT) or Explorer II processor standalone diagnostics, enter `EXCF`.

5. The system now displays a list of disk drives or tape drives that are available and a prompt requesting that you select a load device. The following example illustrates a display that might appear on your screen, depending upon the configuration of your system:

```
Available load devices:

 A=  Slot O Enet OO
 B=  Slot 2 Disk OO
 C=  Slot 2 Disk O1
*D=  Slot 2 Disk O4
 E=  Slot 2 Tape O6


Select load device :
```

If one of the disk or tape drives is not listed as an available load device, check the power switch on the drive, and check all cables and connections. You may have to reboot.

6. The Explorer GDOS (GDCF) or standalone diagnostic configuration bands (EXCF) reside on the TI System V disk in a normal LX configuration. Because it is normally the default drive, the TI System V disk is usually denoted by an asterisk (*). The TI System V disk is load device D in the previous example.

If you wish to accept the default drive, simply press RETURN. The system attempts to find Explorer GDOS (GDCF) or standalone diagnostic configuration bands (EXCF) on the default drive. If the diagnostics are stored on a different drive, type the letter associated with that drive. If you do not know where the configuration bands are stored, try the default drive first.

If you select a drive that does not have the diagnostic files on it, the following message is displayed:

```
Program not found

D=Default load, M=Menu load, R=Retest, E=Extended tests :
```

Press the N key again and proceed through the same steps until you can enter an alternate load device by typing the letter associated with that device.

If the error message continues to appear with each listed load device you try, then the loadable diagnostics are not installed. Refer to the *Explorer LX System Installation* manual for instructions on how to install Explorer GDOS and the standalone diagnostics on your disk.

After you select a drive on which the diagnostics are installed, one of the following menus appears depending on which configuration band name you typed in step 4.
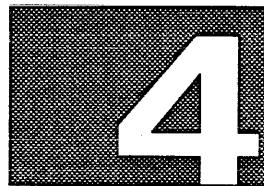
■ GDOS Top-Level menu (Figure 3-2)

■ Explorer I Processor Standalone Diagnostics Main menu (Figure 3-8)

■ Explorer II Processor Standalone Diagnostics Main menu (Figure 3-9)

Refer to the following standalone diagnostics menu structures for information on the available standalone diagnostics:

■ Figure 3-10, Explorer standalone processor and memory diagnostics (EXPT) menu structure

■ Figure 3-11, Explorer II standalone diagnostics (EXP2) menu structure

For additional information on Explorer LX standalone diagnostics, refer to the following documents:

■ *Explorer Diagnostics*

■ *Explorer LX User's Guide*

■ *Explorer LX System Installation*

EXPLORER SYSTEMS TROUBLESHOOTING

4

Introduction

4.1 Refer to Section 2 in the Corrective Maintenance (CM) part of the existing *Explorer System Field Maintenance* manual for primary information on Explorer system troubleshooting. Additional information is included in this section for new hardware that has been added to the basic Explorer systems.

Error codes for the new hardware are included in the associated general description manuals listed under reference documents. Component maintenance information for the new hardware is included in the associated tabbed division of this supplement.

■ Reference information

■ LX system hardware information

■ Checking for the 110-ampere power-supply

■ System testing during power-up

■ Reading boot error codes

■ Reading fault indicator LEDs

■ Explorer II processor standalone diagnostics test descriptions

■ Color system diagnostic tests

■ General testing information

Reference Information

4.2 The following reference documents provide additional technical information on Explorer system troubleshooting:

■ *Explorer System Field Maintenance* manual, TI part number 2243141-0001

■ *System 1000 Series, Model 1500 Field Maintenance* manual, TI part number 2534849-0001

■ *Mass Storage Unit (MSU II) General Description*, TI part number 2537197-0001

■ *SMD/515-Megabyte Mass Storage Subsystem General Description*, TI part number 2537244-0001

■ *MT3201 1/2-Inch Tape Drive General Description*, TI part number 2537246-0001

LX System Hardware Information

4.3 The Explorer LX system hardware, all with the local bus, must satisfy the following requirements:

■ The power supply must be the 110-ampere version, TI part number 2542005-0001.

■ The standard NuBus peripheral interface (NUPI) board, TI part number 2238040-0001, must be at revision level P (or later).

■ The memory board, TI part number 2236415-0001, must be at revision level N (or later).

■ The memory board, TI part number 2243910-0003 or -0004, must be at revision level L (or later).

■ The Ethernet board, TI part number 2236400-0001, must be at revision level AA (or later).

■ The 68020-based processor, TI part number 2535860-0001, can have a jumper, a surface mounted zero-ohm resistor, or a switch between pins 1 and 2 at board location AB080. For LX systems in 7-slot enclosures with a local bus backplane, the jumper must be cut, or the switch open (up position). The surface-mounted, zero-ohm resistor should be removed only at the factory. The reason for this operation is to remove the chassis ground at pin 87 on connector P1, which disables the power failure warning (PFW–) signal at the processor.

Checking for the 110-Ampere Power Supply

4.4 You must have a 110-amp power supply for an LX system to operate. An 80-amp power supply does not provide sufficient power for an LX system. Ensure that your system has a 110-amp power supply by performing the following steps:

1. Power off the system enclosure and all peripherals.

2. Open the rear system enclosure door, taking care not to touch the internal portions of the system enclosure.

3. Observe the power supply in the bottom left portion of the system enclosure. If the power supply has fuses and electrical sockets for plugging in the power cables from peripheral units, it is an 80-ampere power supply. If the power supply has a circuit breaker and no outlets, you already have the 110-ampere power supply. You can also refer to Figure 1-3 in the System Enclosure (SE) part of this supplement to see the layout of the 110-ampere power supply.

4. Securely close the rear system enclosure door.

5. Apply power to the system enclosure and all peripherals. The Explorer automatically reboots when power is reapplied.

System Testing During Power-Up

4.5 If a board fails its self-test, a message is displayed during system startup, and you may not be able to proceed until that board is repaired or replaced.

Initial program loading and execution of the diagnostics under GDOS can proceed even if the following failures occur:

- The NuBus Ethernet controller board can fail and still permit GDOS operation because GDOS does not use the network.

- The memory board in slot 4 can fail and still permit GDOS operation, because you can temporarily replace it with the memory board from slot 3. When you have the Explorer I processor in the system, slot 4 must contain a good memory board (2243910) for the system to operate. When you have the Explorer II processor in the system, the memory boards can be in any slot.

- The memory board in slot 3 can fail because it provides extra memory for the system. You can run GDOS without this extra memory.

- The System Interface Board (SIB) can have failures that alone would not prevent system operation.

A system self-test failure on either the NUPI board or a processor board usually inhibits system operation until that board is replaced. Run the extended self-tests to further define the source of the problem. Instructions for running the extended self-tests are in Section 3 of System Troubleshooting.

Reading Boot Error Codes

4.6 During boot operations, most errors are reported by one or more self-explanatory messages such as:

No online device

Program not found

In some cases, however, the processor is not able to relate an error to an appropriate textual message. Instead, it returns numeric error codes. Numeric error codes generally are displayed in the following form, where *nnnnnnnn* is a hexadecimal error number listed in Table 4-1:

DEVICE ERROR: *nnnnnnnn*

Table 4-1 Boot Error Codes

Error ID	Description
00000002	Load device offline or not responding. The device is probably powered down or not connected.
00000003	Load device error. The load device experienced an unrecoverable error.
00000004	Memory board unavailable. The processor cannot find a memory board that passes all tests.

Table 4-1 Boot Error Codes (Continued)

Error ID	Description
00000005	NuBus error. The processor received a NuBus error while executing DE code in a device driver.
00000006	Command time-out. The NUPI did not complete a specified command block operation before the maximum time elapsed.
00000009	Network down. The Ethernet is disconnected or otherwise disabled.
0000000A	Invalid unit number for the load device.
0000000B	Ethernet board failed to initialize properly.
00000010	Bad DE instruction header. The processor found a board with a valid configuration ROM, but with a diagnostic offset or device driver offset pointing to DE code with an invalid header. (For more information about the configuration ROM, refer to the *Explorer NuBus System Architecture General Description*.)
00000011	Invalid DE request. A request was made that a particular device could not handle, such as a boot request issued to the monitor. The contents of the NVRAM are probably invalid. To correct this error, use menu boot to specify the boot unit. After the system boots, execute the **sys:setup-nvram** function. For more information about the NVRAM, refer to the *Introduction to the Explorer System* and the *Explorer NuBus System Architecture General Description*.
00000012	DE instruction space problems. The processor found an invalid instruction while trying to interpret DE code contained in the ROM on a logic board. This error can occur when the processor is interpreting either a diagnostic or a device driver. The ROM on the logic board may be faulty.
00000013	DE internal data space problem. While the processor was interpreting DE code, it found either an internal data stack overflow or underflow, or a data space variable out of range. This error can occur when the processor is interpreting either a diagnostic or a device driver. The ROM may be bad, or the code being executed may be faulty.
00000014	Device access error. The boot device returned bad status. Refer to the manual for the particular device for more information about the status.
00000015	Invalid volume label. The first word of block 0 did not contain the string LABL.
00000016	Invalid volume partition table. The first word of the partition table did not contain the string PRTN.
6nnnnnnn	NUPI command status. These error codes are returned by the NUPI device driver as a copy of the status field of the NUPI command block. For more information about these error codes, refer to the *Explorer NuBus Peripheral Interface General Description*.

Reading Fault Indicator LEDs

4.7 Fault indicator LEDs supplement the standard boot error messages that the system displays during the boot procedure. The boot utility switches on the LEDs for each board during power-up. Then, the subsequent ROM-based power-up tests, if successful, switch off the LEDs.
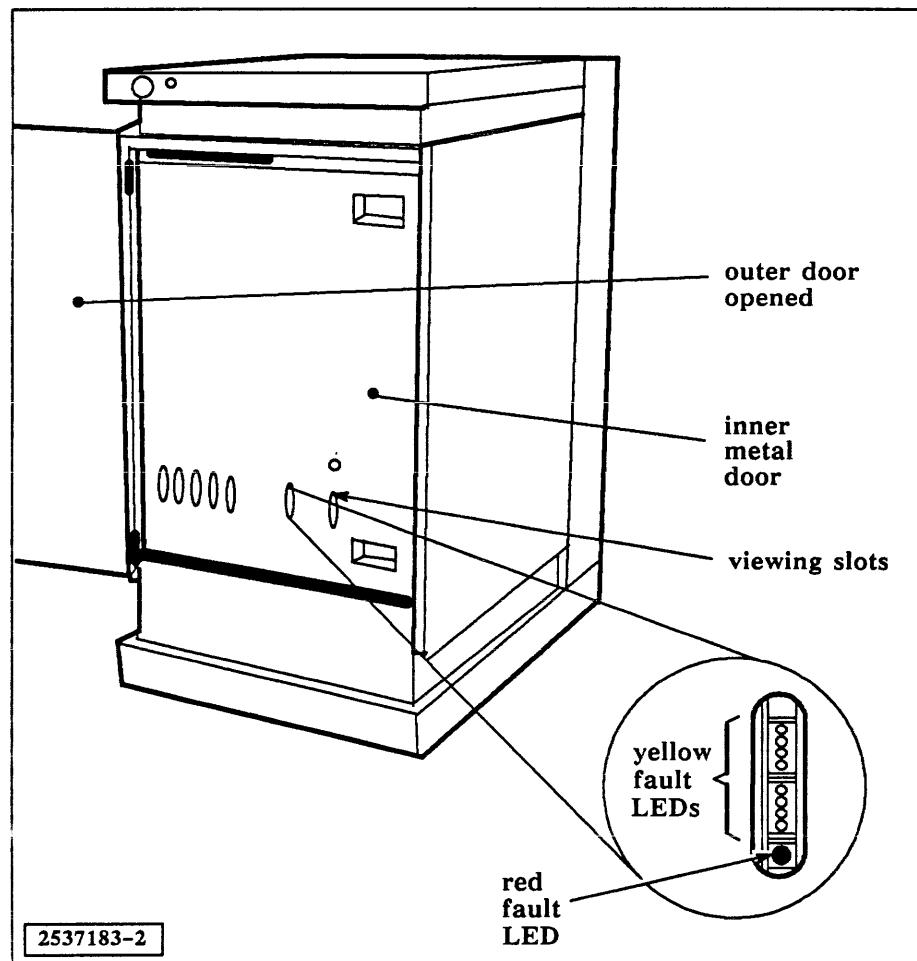
These LED indications are particularly useful in cases where the system circuit boards are unable to display text or hexadecimal messages. For example, should a faulty connection exist between the processor board and the system maintenance terminal, thus making it impossible for the processor to print an error message to the monitor, the red fault indicator LED would confirm the existence of the error. The fault indicator LEDs are located near the bottom of each board.

Explorer I Processor Fault LEDs

4.7.1 To view the fault indicator LEDs on the Explorer I processor, open the outer front door on the system enclosure and look through the appropriate slot on the inner door as shown in Figure 4-1.
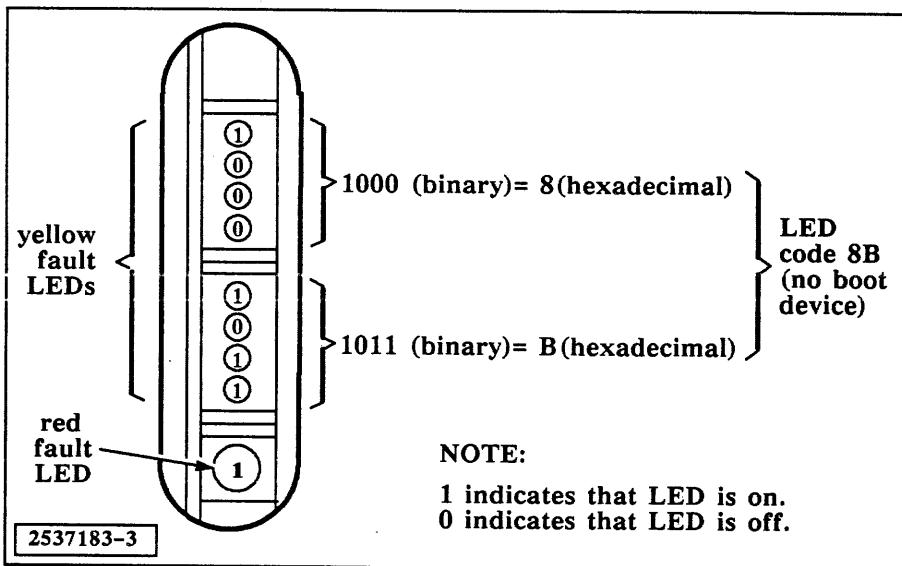
Figure 4-1 **Location of Explorer I Processor Fault Indicator LEDs**

2537183-2

outer door opened

inner metal door

viewing slots

yellow fault LEDs

red fault LED

WARNING: Do not open the inner door; safety interlocks on the door power down the enclosure when the door is opened.

An example of how to read these indicator lights is shown in Figure 4-2 for the Explorer I processor. To determine the fault code, read the yellow LEDs as an 8-bit binary number with the topmost yellow LED as the most significant bit. Convert the code to a hexadecimal number and find the appropriate error number in Table 4-2.

Figure 4-2   **Reading Explorer I Processor Fault Indicator LEDs**

Table 4-2 Explorer I Processor Fault Indicator LED Codes
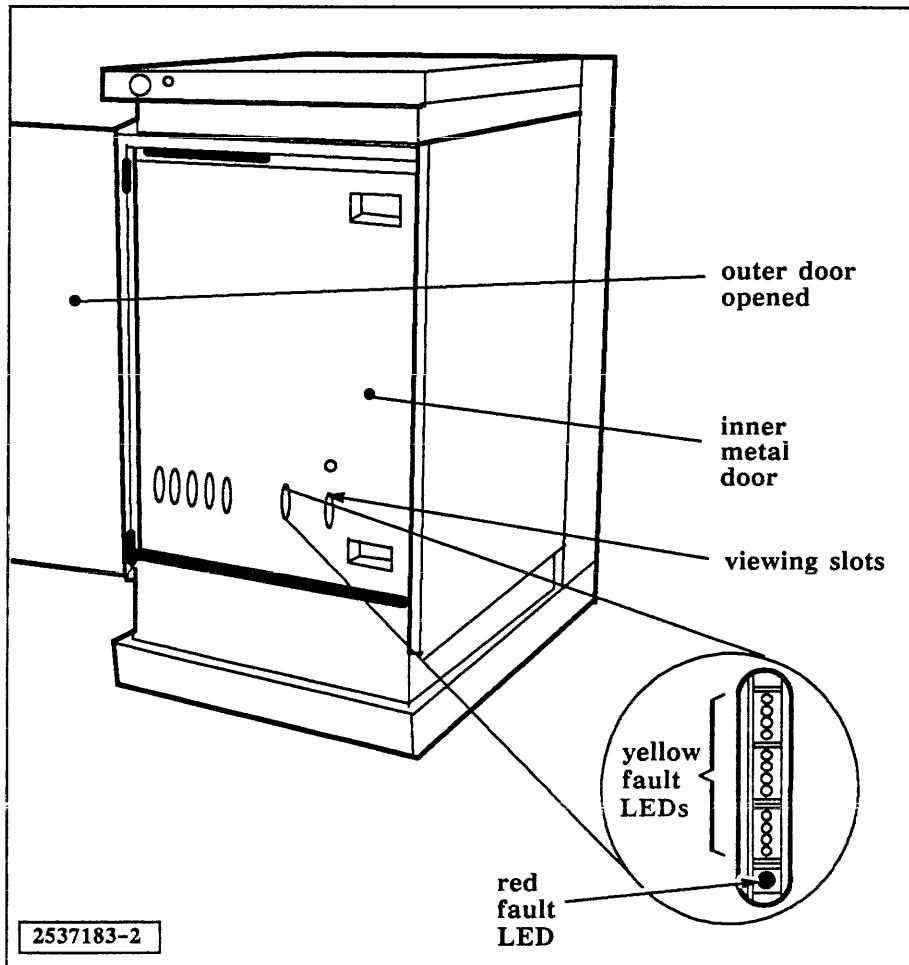
Error Code	Explanation
81	Power failure. The processor took the power failure hardware trap.
82	The processor took the control store parity error trap. This code may indicate a faulty writable control store on the processor board.
88	The processor received a NuBus error.
89	The processor failed its internal self-test.
8B	No boot device. This error occurs if the processor cannot find either a boot device or a monitor on which to display a message.
8C	Microload problems. This error occurs if the processor cannot find a monitor on which to display the message Bad Microload Format.
8D	DE problems. This error occurs if the processor cannot find a monitor on which to display device errors 10 through 13 described in Table A-1, Error Code Messages.

Table 4-2 Explorer I Processor Fault Indicator LED Codes (Continued)

Error Code	Explanation
8E	Monitor device driver problems. The processor received a nonzero completion code on a call to the monitor device driver.
8F	Unable to initialize monitor. The monitor device driver returned a nonzero completion code as a result of a call to initialize the monitor.
90	Unable to initialize keyboard. The keyboard device driver returned a nonzero completion code as a result of a call to initialize the keyboard.

Explorer II Processor Fault LEDs

4.7.2 To view the fault indicator LEDs on the Explorer II processor, open the outer front door on the system enclosure and look through the appropriate slot on the inner door as shown in Figure 4-3.

Figure 4-3   **Location of Explorer II Processor Fault Indicator LEDs**

2537183-2

outer door opened

inner metal door

viewing slots

yellow fault LEDs

red fault LED

WARNING: Do not open the inner door; safety interlocks on the door power down the enclosure when the door is opened.

An example of how to read these indicator lights for the Explorer II processor is shown in Figure 4-4. To determine the fault code, read the yellow LEDs as an 8-bit binary number with the topmost yellow LED as the most significant bit. Convert the code to a hexadecimal number and find the appropriate error number in Tables 4-3 and 4-4.

Figure 4-4   **Reading Fault Indicator LEDs on the Explorer II Processor**

2537183-4
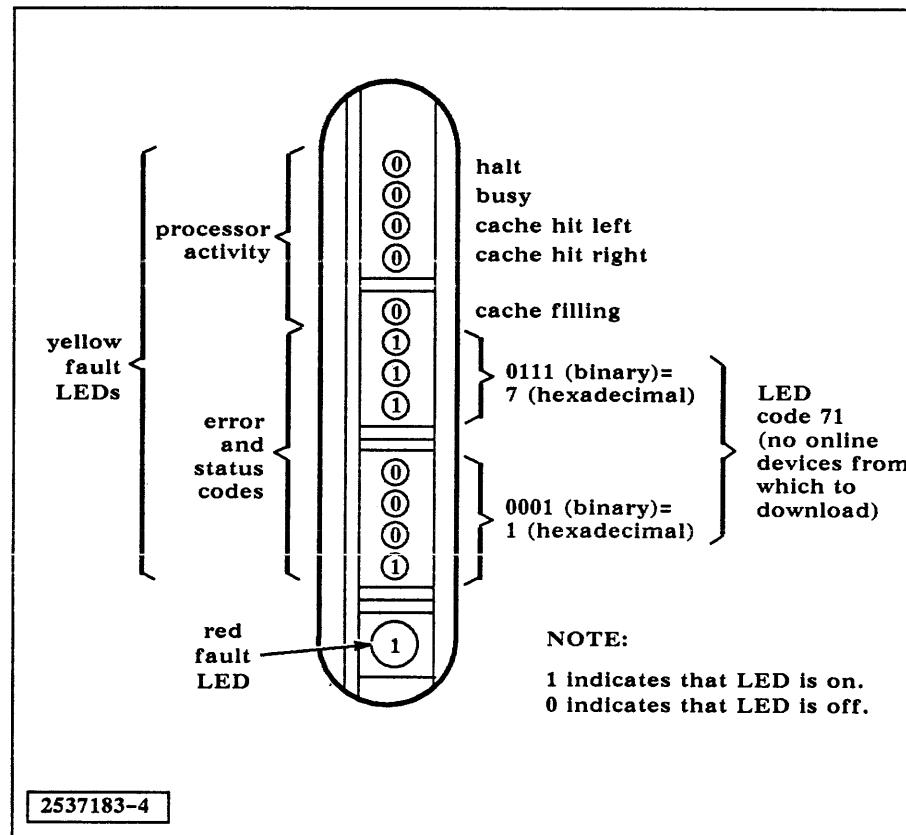
Table 4-3 Explorer II Processor Fault Indicator LED Codes With Fault LED On

Error Number	Paragraph Reference	Explanation
01	4.8.4	LED Pattern test failed.
02		Lisp-Chip Signature Analyzer test failed. This test verifies that the signature-analyzer values generated during the Lisp microprocessor internal ROM test and left in M memory are correct.
03	4.8.4	Zeros and Ones test failed.
04	4.8.4	EPROM Integrity Check test failed.
05		Writable Control Store RAM Low test failed. This test runs the following subtests on the low 16K (0 to #x4000) of microinstruction RAM:

CLS-PATH — Performs read and write checks of the data path from the Lisp microprocessor to the control store RAM even and odd banks.

CLS-ADR-BRD — Performs an addressing test of even and odd banks.

CLS-SIMPLE — Performs writes and reads of pattern generator values to all locations.

CLS-ADR-CHIP — Performs writes and reads of patterns built from the address in each 0-4000 location. |
06		Kernel self-tests passed. Error occurred while attempting to load remainder of tests (07-3C) and STBM.
07	4.8.1	LISP-CHIP Functional Operations test failed.
08	4.8.2	LISP-CHIP M Memory test failed.
09	4.8.2	LISP-CHIP A Memory test failed.
0A	4.8.2	LISP-CHIP UPCS Memory test failed.
0B	4.8.2	LISP-CHIP T Memory test failed.
0C	4.8.2	LISP-CHIP D Memory test failed.
0D	4.8.2	LISP-CHIP PDL Memory test failed.
0E		Writable Control Store RAM High test failed. Checks the writable control store high RAM (#x2000-7FFF) using patterns from the pattern generator.
0F	4.8.1	LISP-CHIP Internal Macro test failed.
10	4.8.4	External Control Register test failed.

BOARD FAILURE - PROCESSOR

Table 4-3 Explorer II Processor Fault Indicator LED Codes With Fault LED On (Continued)

Error Number	Paragraph Reference	Explanation
11	4.8.4	Exchange Register test failed.
12	4.8.4	Event Posting Registers test failed.
13	4.8.4	NuBus Test Register test failed.
14	4.8.4	NuBus Configuration Register test failed.
15	4.8.4	NuBus Flag Register test failed.
16	4.8.4	Micro Second Timer test failed.
17	4.8.4	Event Timer test failed.
18	4.8.3	Left Virtual Memory Map RAM test failed.
19	4.8.3	Right Virtual Memory Map RAM test failed.
1A	4.8.3	Least Significant VMM Status RAM test failed.
1B	4.8.3	Most Significant VMM Status RAM test failed.
1C	4.8.3	Left Cache Data RAM test failed.
1D	4.8.3	Right Cache Data RAM test failed.
1E	4.8.3	Left Cache Tag RAM test failed.
1F	4.8.3	Right Cache Tag RAM test failed.
20	4.8.3	Least Recently Used RAM test failed.
21	4.8.3	Transport RAM test failed.
22	4.8.3	Address Space Map RAM test failed.
23	4.8.4	Bus Error Logic test failed.
24	4.8.8	NuBus Access Enable test failed.
25	4.8.8	NuBus Access IDLE Status test failed.
26	4.8.8	NuBus Access TESTNUACK test failed.
27	4.8.8	NuBus Access IDLE Addr test failed.
28	4.8.8	NuBus Access DATA test failed.
29	4.8.8	NuBus Access FIFO DATA test failed.
2A	4.8.8	NuBus Access Byte Mode test failed.
2B	4.8.8	NuBus Access Buffer Write test failed.

Table 4-3 Explorer II Processor Fault Indicator LED Codes With Fault LED On (Continued)

Error Number	Paragraph Reference	Explanation
2C	4.8.8	NuBus Access NuBus Lock test failed.
2D	4.8.5	Page Fault test failed.
2E	4.8.5	Virtual Memory Onboard test failed.
2F	4.8.5	VMM NuBus Address test failed.
30	4.8.5	VMM NuBus Data test failed.
31	4.8.5	Address Space Map Functions test failed.
32	4.8.6	Cache XCRTFILLRD Path test failed.
33	4.8.6	Cache Unmapped test failed.
34	4.8.6	Cache Mapped test failed.
35	4.8.6	Cache Tag Addr Comparator test failed.
36	4.8.9	External Macro Test with Cache test failed.
37	4.8.9	External Macro Test with NuBus test failed.
38	4.8.7	Auto-Transport Test with Cache test failed.
39	4.8.7	Auto-Transport Test with NuBus test failed.
3A	4.8.10	FP ALU Register test failed.
3B	4.8.10	FP ALU test failed.
3C	4.8.10	FP Multiplier test failed.
44		NuBus test failed when the STBM was testing itself.
71		No online devices from which to download are specified.
72		A bad microcode format was found during an attempted download.
73		A device error occurred during an attempted download.
74		No good system memory was found.
75		A NuBus error occurred during download from the NuBus memory to internal memories.
76		An MCR partition requires the floating point board, which is not present.
7F		The processor was unable to load code from the EPROM.
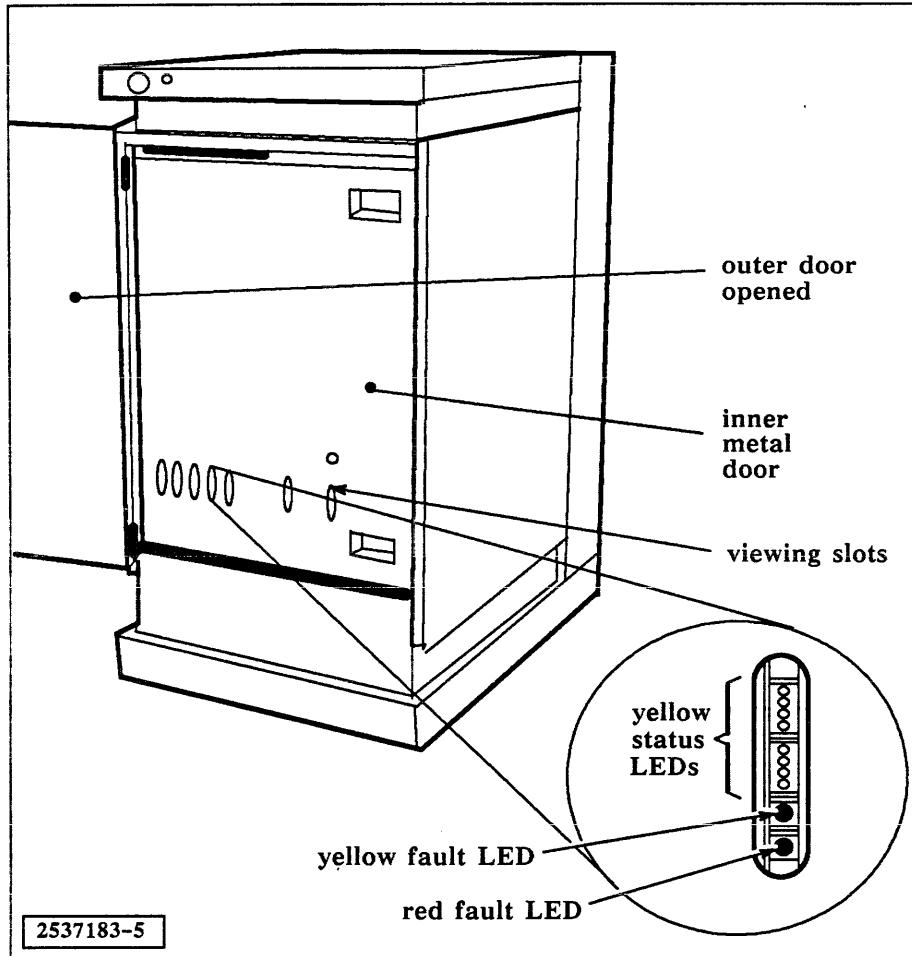
STATUS INDICATOR w/ NORMAL OPERATION

Table 4-4 Explorer II Processor Fault Indicator LED Codes With Fault LED Off

Status Code	Description
0n	STBM arbitration phase for slot n.
1n	NVRAM search phase for slot n.
2n	Monitor search phase for slot n.
3n	Memory search phase for slot n.
4x	STBM testing chassis slot with fault LED on, or specifying the test in progress as follows:
	41 — ROM test (C3, format version, CRC)
	42 — Self-test
	44 — NuBus test
	48 — Interface diagnostic
5n	Keyboard search phase for slot n.
60	At top level of the STBM menu.
61	Attempting default boot.
62	Building device menu.
63	Waiting for load device to become ready.
64	Reading partition from load source.
65	Processing MCR sections, except last section.
66	Loading WCS, PDL to A type/M type, and entering new code.
70	Waiting for first Secondary event.
71	Processing first Secondary event.
72	Waiting for second Secondary event.
73	Processor booting quietly.
78	Waiting for RAM download (P3, mode 5).

CSIB Fault and Status LEDs

4.7.3 To view the fault and status LEDs on the CSIB, open the outer front door on the system enclosure and look through the appropriate slot on the inner door as shown in Figure 4-5.

Figure 4-5

Typical Location of the CSIB Fault and Status LEDs

2537183-5

WARNING: Do not open the inner door; safety interlocks on the door power down the enclosure when the door is opened.

The status and fault LEDs on the edge of the CSIB are provided for operator and maintenance information. The red fault LED is on during the self-test, then turns off when the self-test passes. If the red fault LED stays on, it indicates a fault in the CSIB. When the yellow fault LED is on, it indicates a fault in the color console, the RGB cable, or the fiber-optic cable. The yellow fault LED is on when either the LINKDOWN- signal or the ALOSYNC- signal is true.

An example of how to read the status LEDs is shown in Figure 4-6. To determine the error number, read the yellow status LEDs as an 8-bit binary number with the topmost yellow LED as the most significant bit. Convert the code to a hexadecimal number and find the appropriate error number in Table 4-5.

Figure 4-6   **Reading the CSIB Fault and Status LEDs**
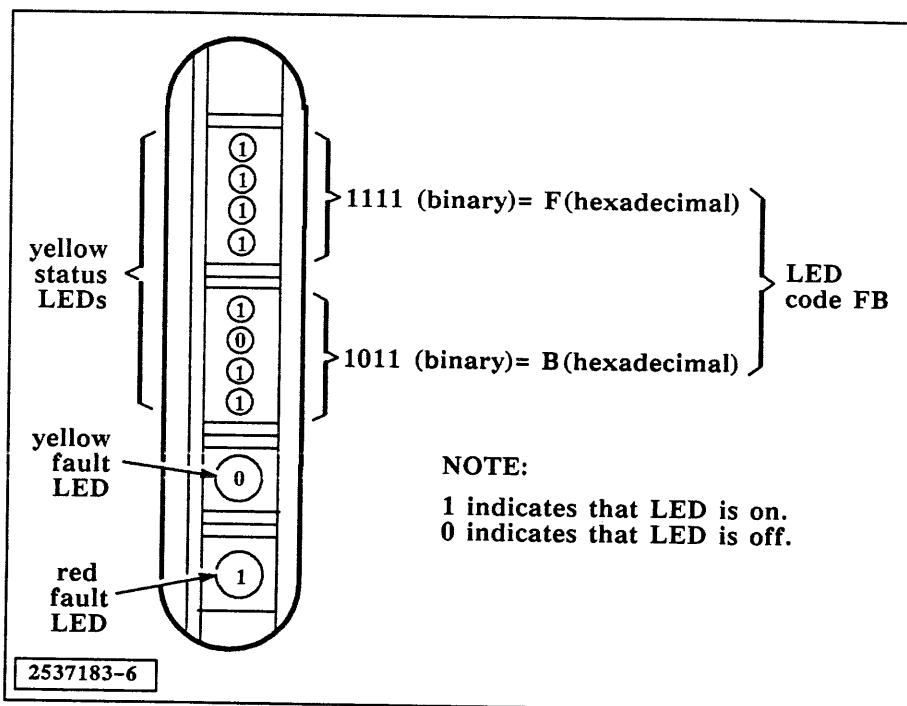
Table 4-5   Color System Status LED Trace Register Codes

Trace Value Category	Error Number	Explanation
Power-up sequence	FF	Start of power-up sequence
	FE	Start MC68010 RAM interface
	FD	Failure from MC68010 RAM
	FC	Start MC68010 CSICR inteface
	FB	Failure from MC68010 CSICR
	FA	Test pattern for FTR
	F9	Move vector tables to MCRAM
	F8	Start MC68230 BAR interface
	F7	Failure in MC68230 BAR
	F6	MC68010 processor trap failure
	F5	Test pattern for FTR
	F4 through F1	Not assigned
	F0	Test pattern for FTR
Self-test part 1	EF	Start MC68010 MPU interface
	EE	Start MC68010 ROM interface
	ED	Start MC68010 RAM interface
	EC	Start MC68230 CR interface
	EB	Start address map interface

Table 4-5 Color System Status LED Trace Register Codes (Continued)

Trace Value Category	Error Number	Explanation
Self-test part 1 (continued)	EA	Start MC68230 FR interface
	E9	Start MC68901 MFP 7 interface
	E8	Start MC68901 MFP 6 interface
	E7	Start MC68901 MFP 5 interface
	E6	Start MC68901 MFP 4 interface
	E5	Start MC68901 MFP 3 interface
	E4	Start TMS34061 VSC interface
	E3	Start NuBus events interface
	E2	Start MC68230 PP inteface
	E1	Start MC68230 VR interface
	E0	Start Z8530 SCC interface
	DF	Start MM58167A RTC interface
	DE	Start 8253 PIT interface
	DD	Start fiber-optic (Sparrow) chip interface
	DC	Start conguration ROM interface
	DB	Start NVRAM interface
	DA	Start CBIF chip interface
	D9	Start transceiver register interface
	D8	Start FG register interface
	D7	Start BG register interface
	D6	Start PLM register interface
	D5	Start PXM register interface
	D4	Start video RAM interface
	D3	Start color palette interface
	D2	Start DAC CLUT interface
	D1	Start video test register interface
	D0	Start video DAC register interface
Self-test part 2	CF	Start self-test MSG interface
	CE	Start final register interface
	CD	Start pixel mask interface
	CC	Start foreground interface
	CB	Start background interface
	CA	Start color transparency interface
	C9	Start plane mask interface
	C8 through C0	Not assigned
Self-test part 3	BF	PCBI – write test interface
	BE through A0	Not assigned
Initialization	9F	Start MC68010 RAM interface
	9E	Start MC68230 CR interface
	9D	Start address map interface
	9C	Start MC68230 FR interface
	9B	Start MC68901 MFP 7 interface
	9A	Start MC68901 MFP 6 interface
	99	Start MC68901 MFP 5 interface
	98	Start MC68901 MFP 4 interface
	97	Start MC68901 MFP 3 interface
	96	Start TMS34061 VSC interface
	95	Start MC68230 PP interface
	94	Start MC68230 VR interface

Table 4-5 Color System Status LED Trace Register Codes (Continued)

Trace Value Category	Error Number	Explanation
Initialization (continued)	93	Start Z8530 SCC interface
	92	Start MM58167A RTC interface
	91	Start 8253 PIT interface
	90	Start fiber-optic (Sparrow) chip interface
	8F	Start transceiver register interface
	8E	Start FG register interface
	8D	Start BG register interface
	8C	Start PLM register interface
	8B	Start PXM register interface
	8A	Start video RAM interface
	89	Start color palette interface
	88	Start video DAC interface
	87 through 80	Not assigned
CSI operation	7F	Start CSI operation interface
	7E	Start CSI initialization interface
	7D	Start PCBI block interface
	7C	Start PCBI self-test interface
	7B	Start self-test interface
	7A	Start extended self-test interface
	70	Not assigned
	6F	Not assigned
	77	Start PCBI keyboard interface
	76	Start PCBI monitor interface
	75	Start PCBI emitter character interface
	74	Start PCBI component interface
	73	Start NuBus test interface
	62	Start keyboard SR interface
	63	Start NuBus write interface
	79	Start keyboard chord reset interface
	78	Start NuBus write interface
	64	Execute patch interface
	61	Continue CSI board operations
	60	CSIB MC68010 idle cycle
	6B	Start CSI F/W debug screen
	6A	PCIB self-test message out wait loop
	60 and 61	Not assigned
	65 through 69	Not assigned
Interrupt part 1	5F	Start PFWP interface
	5E	Start NuBus write interface
	5D	Start NuBus event 7 interface
	5C	Start level 7 timer A interface
	5B	Start level 7 timer B interface
	5A	Start timer A signal interface
	59	Start timer B signal interface
	58	Start level 7 timer C interface
	57	Start level 7 timer D interface
	56	Start timer C signal interface
	55	Start CBIF chip interface
	54	Start mouse keyswitch interface
	53	Start NuBus write interface

Table 4-5 Color System Status LED Trace Register Codes (Continued)

Trace Value Category	Error Number	Explanation
Interrupt part 1 (continued)	52	Start level 6 timer A interface
	51	Start keyboard RCV interface
	50	Start keyboard transmit empty interface
	4F	Start NuBus write interface
	4E	Start level 6 timer B interface
	4D	Start level 6 timer C interface
	4C	Start level 6 timer D interface
	4B	Start mouse motion interface
	4A	Start NuBus write interface
	49	Start voice present interface
	48	Start NuBus write interface
	47	Start RS-232-C interface
	46	Start NuBus write interface
	45	Start level 5 timer A interface
	44	Start level 5 timer B interface
	43	Start color table interface
	42	Start level 5 timer C interface
	41	Start level 5 timer D interface
	40	Start parallel port interface
Interrupt part 2	3F	Start NuBus write interface
	3E	Start NuBus event 6 interface
	3D	Start NuBus event 5 interface
	3C	Start video control interface
	3B	Start NuBus write interface
	3A	Start RTC alarm interface
	39	Start NuBus write interface
	38	Start level 4 timer A interface
	37	Start level 4 timer B interface
	36	Start short timer interface
	35	Start NuBus write interface
	34	Start long timer interface
	33	Start NuBus write interface
	32	Start level 4 timer C interface
	31	Start level 4 timer D interface
	30	Start NuBus event 4 interface
	2F	Start NuBus event 3 interface
	2E	Start NuBus event 2 interface
	2D	Start NuBus event 1 interface
	2C	Start level 3 timer A interface
	2B	Start level 3 timer B interface
	2A	Start NuBus event 0 interface
	29	Start level 3 timer C interface
	28	Start level 3 timer D interface
	27	Start sound parity interface
	26	Start NuBus write interface
	25	Start overtemperature interface
	24	Start NuBus write interface
	23	Start data link interface
	22	Start NuBus write interface
	21	Start interrupt error interface
	20	Not assigned
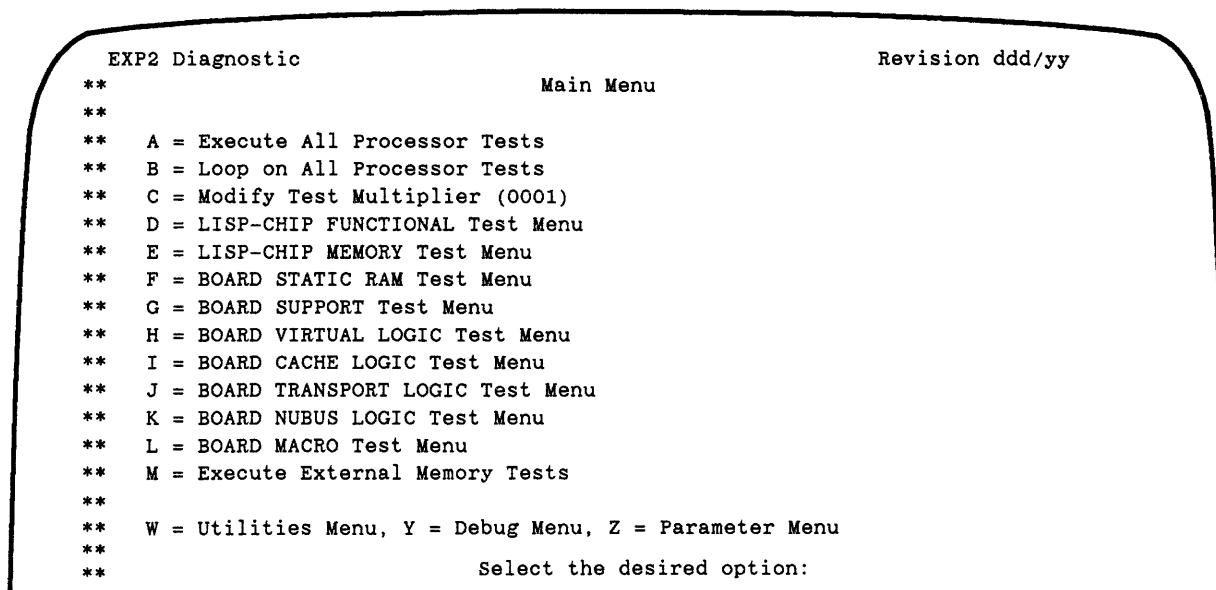
Table 4-5 Color System Status LED Trace Register Codes (Continued)

Trace Value Category	Error Number	Explanation
Interrupt part 3	1F through 10	Not assigned
	0F	Test pattern for FTR
	0E through 0B	Not assigned
	0A	Test pattern for FTR
	09 through 06	Not assigned
	05	Test pattern for FTR
	04 through 01	Not assigned
	00	Test pattern for FTR

Explorer II Processor Standalone Diagnostics Test Descriptions

4.8 This section provides brief descriptions of the Explorer II processor standalone diagnostics tests. You can access these tests through menus from the Standalone Diagnostics Main Menu shown in Figure 4-7.
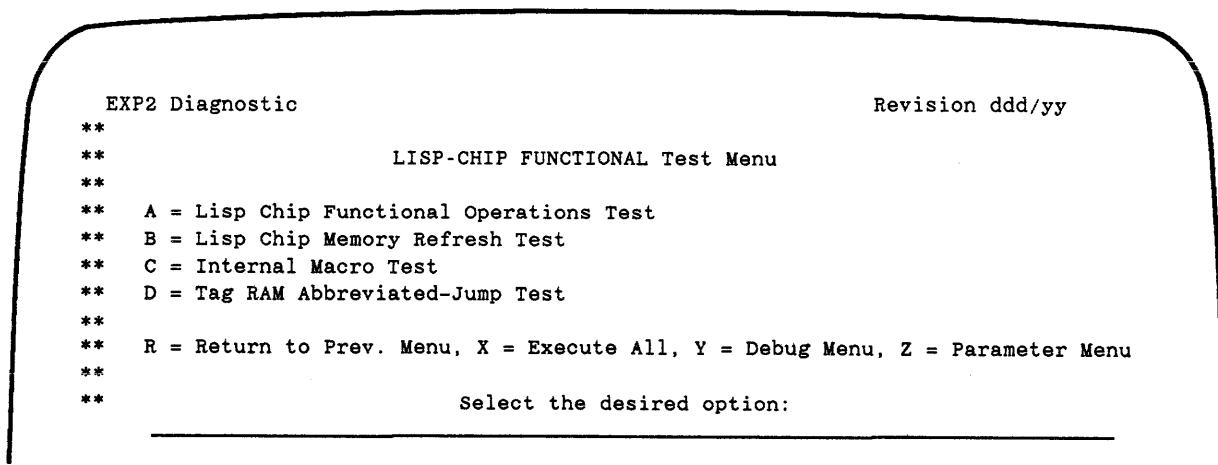
NOTE: Refer to the *Explorer Diagnostics* manual for information on the Standalone Diagnostics Main Menu, the Utilities Menu, the Debug Menu, and the Parameter Menu. The Execute All Processor Tests, the Loop on All Processor Tests, and the Modify Test Multiplier entries on the Standalone Diagnostics Main Menu are also discussed in the *Explorer Diagnostics* manual.

Figure 4-7 Explorer II Processor Standalone Diagnostics Main Menu

```
   EXP2 Diagnostic                                    Revision ddd/yy
   **                          Main Menu
   **
   **    A = Execute All Processor Tests
   **    B = Loop on All Processor Tests
   **    C = Modify Test Multiplier (0001)
   **    D = LISP-CHIP FUNCTIONAL Test Menu
   **    E = LISP-CHIP MEMORY Test Menu
   **    F = BOARD STATIC RAM Test Menu
   **    G = BOARD SUPPORT Test Menu
   **    H = BOARD VIRTUAL LOGIC Test Menu
   **    I = BOARD CACHE LOGIC Test Menu
   **    J = BOARD TRANSPORT LOGIC Test Menu
   **    K = BOARD NUBUS LOGIC Test Menu
   **    L = BOARD MACRO Test Menu
   **    M = Execute External Memory Tests
   **
   **    W = Utilities Menu, Y = Debug Menu, Z = Parameter Menu
   **
   **                          Select the desired option:
```

LISP-CHIP FUNCTIONAL Tests

4.8.1 The tests on the LISP-CHIP FUNCTIONAL Test Menu (Figure 4-8) check the internal operations and processing functions of the Lisp microprocessor.

Figure 4-8 LISP-CHIP FUNCTIONAL Test Menu

```
   EXP2 Diagnostic                                    Revision ddd/yy
**
**                     LISP-CHIP FUNCTIONAL Test Menu
**
**    A = Lisp Chip Functional Operations Test
**    B = Lisp Chip Memory Refresh Test
**    C = Internal Macro Test
**    D = Tag RAM Abbreviated-Jump Test
**
**    R = Return to Prev. Menu, X = Execute All, Y = Debug Menu, Z = Parameter Menu
**
**                     Select the desired option:
```

The following descriptions briefly explain each test listed on the LISP-CHIP FUNCTIONAL Test Menu:

- Lisp Chip Functional Operations Test — Contains several subtests that check the following logical functions:

  - Conditional logic
  - Minimum Micro-program Stack (UPCS) functions
  - Jump, call, pop functions
  - Abbreviated jump functions
  - M, A, and Push Down List (PDL) cache writes
  - Barrel shifter and masker
  - Instruction Modify (IMODing) function
  - Machine Control Register (MCR) bits
  - Writable Control Storage (WCS) parity and Abort logic
  - Functional registers with data patterns
  - ALU operations
  - O-bus multiplexer modes
  - Q register operations

- PDL operations

- UPCS abort level and inhibit-next

- M source stripper

- A-type/M-type comparator

- Tag classifier

- Dispatch operations

■ Lisp Chip Memory Refresh Test — Tests that all four memory refresh rates can be selected and verifies memory retention for each refresh rate.

■ Internal Macro Test — Tests macro instruction processing functions internal to the Lisp microprocessor. Executes as many macro mode data paths and control functions as possible, without going off-chip. Verifies all instruction stream registers, instruction fetch control logic, and instruction execution logic.

■ Tag RAM Abbreviated-Jump Test — Tests the capability of the Lisp microprocessor to correctly perform abbreviated jumps that use the tag classifier RAM.

■ Return to Prev. Menu — Displays the Standalone Diagnostics Main Menu.

■ Execute All — Executes all the tests listed on this menu.

■ Debug Menu — Displays the Debug Menu.

■ Parameter Menu — Displays the Operational Parameters Menu.

LISP-CHIP
MEMORY Tests

4.8.2 The tests on the LISP-CHIP MEMORY Test Menu (Figure 4-9) check the on-chip memory logic of the Lisp microprocessor.

Figure 4-9 LISP-CHIP MEMORY Test Menu

```
EXP2 Diagnostic                                         Revision ddd/yy
**
**                      LISP-CHIP MEMORY Test Menu
**
**    A = Lisp Chip M Memory Test
**    B = Lisp Chip A Memory Test
**    C = Lisp Chip UPCS Memory Test
**    D = Lisp Chip T Memory Test
**    E = Lisp Chip D Memory Test
**    F = Lisp Chip PDL Memory Test
**
**    R = Return to Prev. Menu, X = Execute All, Y = Debug Menu, Z = Parameter Menu
**
**                        Select the desired option:
```

The following descriptions briefly explain each test listed on the LISP-CHIP MEMORY Test Menu:

■ Lisp Chip M Memory Test — Tests M memory using test patterns from the pattern generator. Tests all but the lowest addresses, saving the memory contents before testing and restoring the memory contents after successful test completion.

■ Lisp Chip A Memory Test — Tests A memory using test patterns from the pattern generator. Tests all but the lowest addresses, saving the memory contents before testing and restoring the memory contents after successful test completion.

■ Lisp Chip UPCS Memory Test — Tests the micro-program stack (UPCS) functions using test patterns from the pattern generator.

■ Lisp Chip T Memory Test — Tests tag (T) classifier RAM using test patterns from the pattern generator.

■ Lisp Chip D Memory Test — Tests dispatch (D) RAM using test patterns from the pattern generator.

■ Lisp Chip PDL Memory Test — Tests push down list (PDL) RAM using test patterns from the pattern generator.

■ Return to Prev. Menu — Displays the Standalone Diagnostics Main Menu.

■ Execute All — Executes all the tests listed on this menu.

■ Debug Menu — Displays the Debug Menu.

■ Parameter Menu — Displays the Operational Parameters Menu.

BOARD STATIC RAM Tests

4.8.3 The tests on the BOARD STATIC RAM Test Menu (Figure 4-10) check the virtual memory map (VMM) RAM, cache RAM, and external instruction memory using the common I/O memory test routines. The common I/O memory routines consist of a data path test, an address test, a bit cell test, and a data retention test.

Figure 4-10 BOARD STATIC RAM Test Menu

```
   EXP2 Diagnostic                                      Revision ddd/yy
**
**                     BOARD STATIC RAM Test Menu
**
**   A = Right Virtual Memory Map RAM
**   B = Left Virtual Memory Map RAM
**   C = Least Significant VMM Status RAM
**   D = Most Significant VMM Status RAM
**   E = Left Cache Data RAM
**   F = Right Cache Data RAM
**   G = Left Cache Data Tag RAM
**   H = Right Cache Data Tag RAM
**   I = Transport RAM
**   J = Least Recently Used RAM
**   K = Address Space Map RAM
**   L = Instruction RAM Low
**   M = Instruction RAM High
**
**
**   R = Return to Prev. Menu, X = Execute All, Y = Debug Menu, A = Parameter Menu
**
**                         Select the desired option:
```
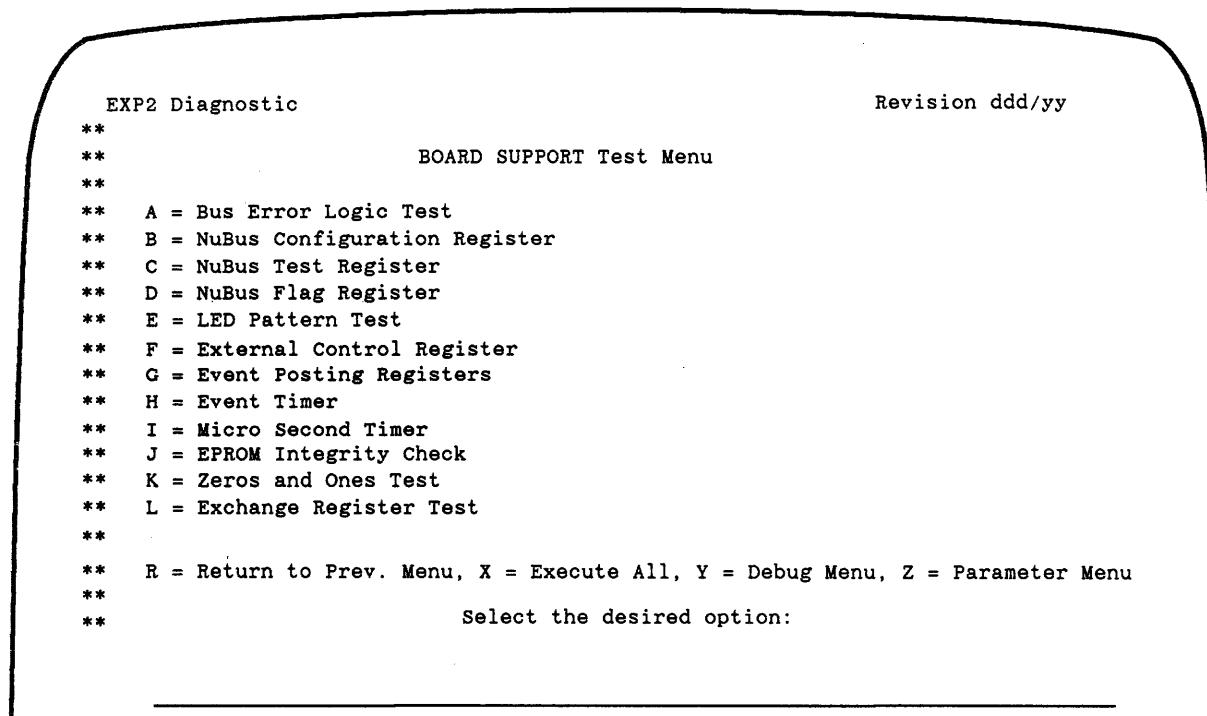
The following descriptions briefly explain each test listed on the BOARD STATIC RAM Test Menu:

■ Right Virtual Memory Map RAM test — Tests the right bank of the virtual memory map (VMM) using the common I/O memory test routines.

■ Left Virtual Memory Map RAM test — Tests the left bank of the VMM using the common I/O memory test routines.

■ Least Significant VMM Status RAM test — Tests the least significant bank of the VMM status bits using the common I/O memory test routines.

■ Most Significant VMM Status RAM test — Tests the most significant bank of the VMM status bits using the common I/O memory routines.

■ Left Cache Data RAM test — Tests the left RAM bank of the cache data RAM using the common I/O memory routines.

■ Right Cache Data RAM test — Tests the right RAM bank of the cache data RAM using the common I/O memory routines.

■ Left Cache Data Tag RAM test — Tests the left RAM bank of the cache data tag RAM using the common I/O memory routines.

■ Right Cache Data Tag RAM test — Tests the right RAM bank of the cache data tag RAM using the common I/O memory routines.

■ Transport RAM test — Tests all of the transport RAM using the common I/O memory test routines.

■ Least Recently Used RAM test — Tests all of the cache least recently used (LRU) RAM using the common I/O memory test routines.

■ Address Space Map RAM test — Tests the address space map RAM using routines similar in function to the common I/O memory test routines.

■ Instruction RAM Low test — Tests all of the external instruction memory residing below the execution shell. The test is loaded into memory and tests all memory below it by performing a bit cell test, a data path test, an address test, and a checksum test.

■ Instruction RAM High test — Tests all of the external instruction memory residing above the execution shell. The test is loaded into memory and tests all memory above it by performing a bit cell test, a data path test, an address test, and a checksum test.

■ Return to Previous Menu — Displays the Standalone Diagnostics Main Menu.

■ Execute All — Executes all the tests listed on this menu.

■ Debug Menu — Displays the Debug Menu.

■ Parameter Menu — Displays the Operational Parameters Menu.

BOARD
SUPPORT Tests

4.8.4 The tests on the BOARD SUPPORT Test Menu (Figure 4-11) check the interface of the Lisp microprocessor to other functions on the processor board.

Figure 4-11 BOARD SUPPORT Test Menu

```
   EXP2 Diagnostic                                       Revision ddd/yy
**
**                        BOARD SUPPORT Test Menu
**
**    A = Bus Error Logic Test
**    B = NuBus Configuration Register
**    C = NuBus Test Register
**    D = NuBus Flag Register
**    E = LED Pattern Test
**    F = External Control Register
**    G = Event Posting Registers
**    H = Event Timer
**    I = Micro Second Timer
**    J = EPROM Integrity Check
**    K = Zeros and Ones Test
**    L = Exchange Register Test
**
**    R = Return to Prev. Menu, X = Execute All, Y = Debug Menu, Z = Parameter Menu
**
**                        Select the desired option:
```

The following descriptions briefly explain each test listed on the BOARD SUPPORT Test Menu:
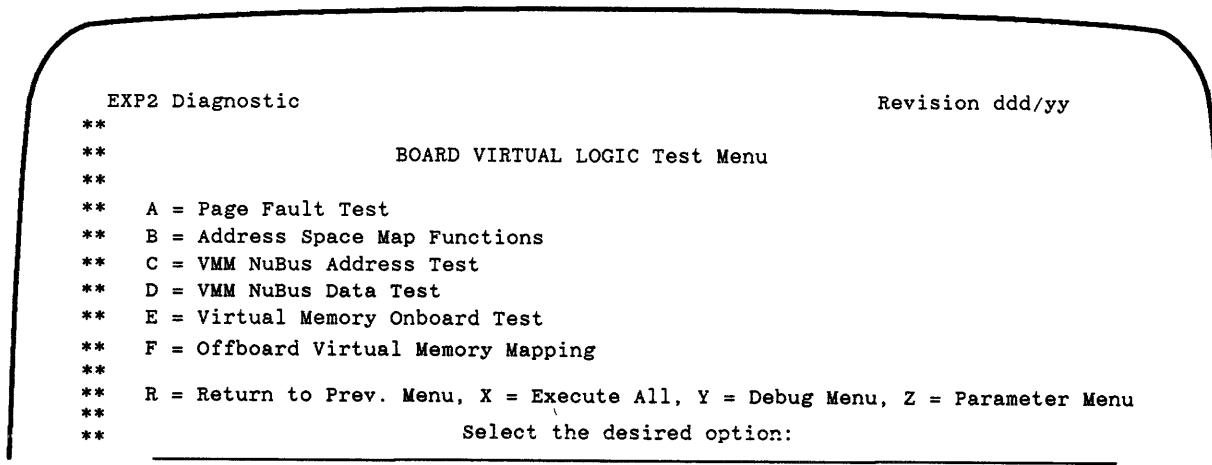
■ Bus Error Logic Test — Forces bus errors and then checks for both conditional and abort sensing of the error by the Lisp microprocessor.

■ NuBus Configuration Register — Checks that a zero and one can be written to each bit of the NuBus configuration register (except the reset bit).

■ NuBus Test Register — Tests the 8-bit NuBus test register using the common I/O memory test routines.

■ NuBus Flag Register — Tests that all possible combinations can be written to bits one and two of the NuBus flag register.

■ LED Pattern Test — Tests the eight read/write bits of the LED register by walking a one (1) and then walking a zero (0).

■ External Control Register — Tests the writable bits of the external control register (XCR) using the common I/O memory test routines.

■ Event Posting Registers — Tests the event posting and status logic by setting events one at a time from lowest to highest priority, then clearing each event from highest to lowest priority. The event registers are verified via NuBus cycles. This test is also executed in ROM based self-test, but the event registers are only addressed via local I/O cycles.

■ Event Timer — Tests the functionality of the event timer logic by writing and verifying test patterns to the event timer register, verifying the event timer disable logic, and verifying that the event timer can generate a level 9 event.

■ Micro Second Timer — Tests the functionality of the microsecond timer logic by writing and verifying test patterns to the microsecond timer register, verifying the timer disable logic, verifying that the timer counts up, checking the overflow bit after the timer overflows, and verifying that the overflow bit clears after reading the microsecond register.

■ EPROM Integrity Check — Tests all the bytes in the EPROM using a CRC-type algorithm from the EPROM starting address to the 4-byte stored CRC.

■ Zeros and Ones Test — Reads the zeros generator and the ones generator to verify that a zero (0) and #xffffffff can be read from the 32-bit data bus.

■ Exchange Register Test — Tests data transfers from the Lisp microprocessor to the internal data bus exchange register by using test patterns generated from the pattern generator.

■ Return to Previous Menu — Displays the Standalone Diagnostics Main Menu.

■ Execute All — Executes all the tests listed on this menu.

■ Debug Menu — Displays the Debug Menu.

■ Parameter Menu — Displays the Operational Parameters Menu.

BOARD VIRTUAL LOGIC Tests

4.8.5 The tests on the BOARD VIRTUAL LOGIC Test Menu (Figure 4-12) check the Virtual Memory Mapping (VMM) logic and the transfer of addresses and data to the NuBus.

Figure 4-12 BOARD VIRTUAL LOGIC Test Menu

```
   EXP2 Diagnostic                                    Revision ddd/yy
**
**                      BOARD VIRTUAL LOGIC Test Menu
**
**    A = Page Fault Test
**    B = Address Space Map Functions
**    C = VMM NuBus Address Test
**    D = VMM NuBus Data Test
**    E = Virtual Memory Onboard Test
**    F = Offboard Virtual Memory Mapping
**
**    R = Return to Prev. Menu, X = Execute All, Y = Debug Menu, Z = Parameter Menu
**
**                         Select the desired option:
```

The following descriptions briefly explain each test listed on the BOARD VIRTUAL LOGIC Test Menu:

■ Page Fault Test — Checks that a page fault and a page fault abort can occur correctly.

■ Address Space Map Functions — Tests the address space map garbage collector volatility fault (GCVF) and old space functions using left and right virtual memory map (VMM) banks. The test verifies the results using the Map Status Register and through Lisp microprocessor dispatching.

■ VMM NuBus Address Test — Tests that mapped idle cycles can correctly transfer pattern generator values as addresses to the NuBus. The addresses are latched for verification in the NuBus read-FIFO.

■ VMM NuBus Data Test — Tests the capability of the VMM to output data by performing mapped reads and writes to and from the NuBus.

■ Virtual Memory Onboard Test — Checks the VMM logic by testing all combinations of the following:

  ■ VMM status RAM — Right and left, valid and invalid, lower and upper half of RAM

  ■ VMM status RAM access — Valid and invalid

  ■ VMM status RAM write access — Valid and invalid
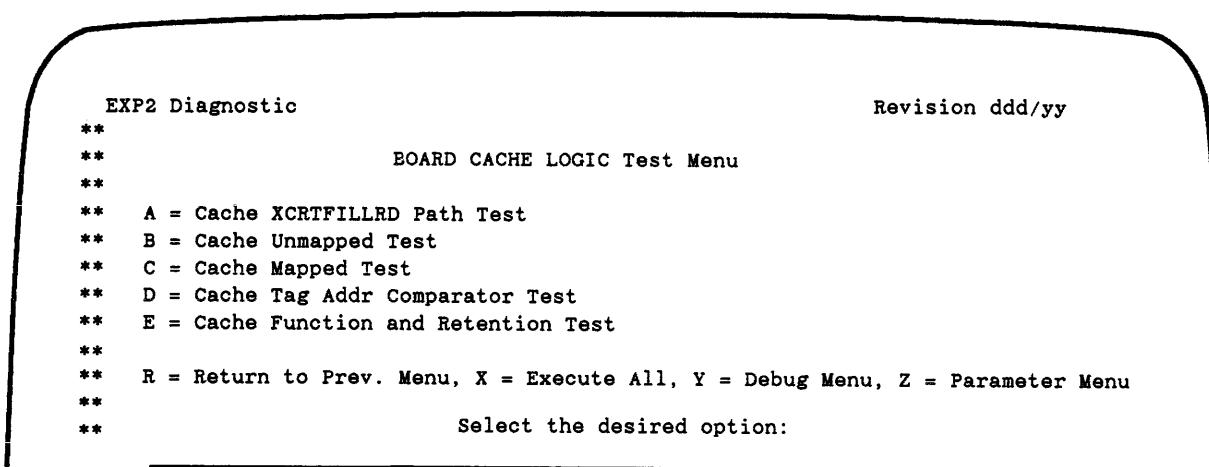
The VMM logic is verified by producing a predictable bus error or page fault. Most map status registers are checked in each cycle.

■ Offboard Virtual Memory Mapping — Tests all 128K of the VMM pages by performing offboard mapped writes, then mapped and unmapped reads to the NuBus.

■ Return to Previous Menu — Displays the Standalone Diagnostics Main Menu.

■ Execute All — Executes all the tests listed on this menu.

■ Debug Menu — Displays the Debug Menu.

■ Parameter Menu — Displays the Operational Parameters Menu.

BOARD CACHE LOGIC Tests

4.8.6 The tests on the BOARD CACHE LOGIC Test Menu (Figure 4-13) check the cache logic and functionality with the virtual memory map (VMM) and NuBus memory.

Figure 4-13 BOARD CACHE LOGIC Test Menu

```
   EXP2 Diagnostic                                    Revision ddd/yy
**
**                      BOARD CACHE LOGIC Test Menu
**
**   A = Cache XCRTFILLRD Path Test
**   B = Cache Unmapped Test
**   C = Cache Mapped Test
**   D = Cache Tag Addr Comparator Test
**   E = Cache Function and Retention Test
**
**   R = Return to Prev. Menu, X = Execute All, Y = Debug Menu, Z = Parameter Menu
**
**                      Select the desired option:
```

The following descriptions briefly explain each test listed on the BOARD CACHE LOGIC Test Menu:
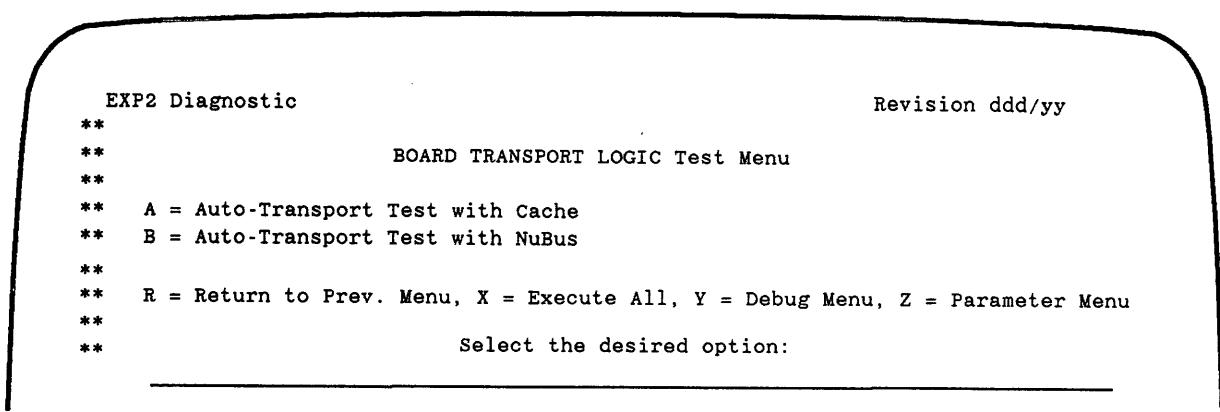
■ Cache XCRTFILLRD Path Test — Checks the cache tag address path from the CVMA bus to the data bus using the XCRTFILL bit (XCR<22>) of the external control register (XCR).

■ Cache Unmapped Test — Tests minimal cache functionality using unmapped cycles with the NuBus master enable turned off. Verifies cache miss read and write, cache hit read, and cache hit write. Cache hit reads are verified by comparing the expected cache data with the expected cache data pattern (should be equal), using the actual cache data read.

■ Cache Mapped Test — Checks mapped cycles by first testing eight possible combinations in the following three modes:

  ▪ Cycle type — Read versus write

  ▪ Cache tag RAM — Hit versus miss

- Virtual Memory Map bit VMM<22> — Cache-enable versus cache-inhibit

The test then checks the cache write-through update of cache data with buffered writes, even if the cache write-through receives a bus error.

■ Cache Tag Addr Comparator Test — Tests the cache tag address comparators by setting one side at a time to *addr* and the other side with *addr-*. The test then does mapped read cycles and changes the address bits into the comparator, one address bit at a time, causing a mismatch. The test expects a cache miss to occur.

■ Cache Function and Retention Test — Tests the cache functionality and retention by shadowing cache with NuBus main memory. Verifies cache fill and write-through logic in the entire 128K-byte cache range.

■ Return to Previous Menu — Displays the Standalone Diagnostics Main Menu.

■ Execute All — Executes all the tests listed on this menu.

■ Debug Menu — Displays the Debug Menu.

■ Parameter Menu — Displays the Operational Parameters Menu.

BOARD TRANSPORT LOGIC Tests

4.8.7 The tests on the BOARD TRANSPORT LOGIC Test Menu (Figure 4-14) check the transport RAM addressing with cache and NuBus memory.

Figure 4-14 BOARD TRANSPORT LOGIC Test Menu

```
  EXP2 Diagnostic                                    Revision ddd/yy
**
**
**                    BOARD TRANSPORT LOGIC Test Menu
**
**    A = Auto-Transport Test with Cache
**    B = Auto-Transport Test with NuBus
**
**    R = Return to Prev. Menu, X = Execute All, Y = Debug Menu, Z = Parameter Menu
**
**                    Select the desired option:
```

The following descriptions briefly explain each test listed on the BOARD TRANSPORT LOGIC Test Menu:

■ Auto-Transport Test with Cache — Tests the transport RAM addressing with cache memory by using transport type, data type, and transport state counter. Also tests the invisible pointer-following logic of the Lisp microprocessor.

■ Auto-Transport Test with Nubus — Tests the transport RAM addressing with NuBus memory by using transport type, data type, and transport state counter. Also tests the invisible pointer-following logic of the Lisp microprocessor.

■ Return to Prev. Menu — Displays the Standalone Diagnostics Main Menu.

■ Execute All — Executes all the tests listed on this menu.

■ Debug Menu — Displays the Debug Menu.

■ Parameter Menu — Displays the Operational Parameters Menu.

BOARD NUBUS LOGIC Tests

4.8.8 The tests on the BOARD NUBUS LOGIC Test Menu (Figure 4-15) check the interface to the NuBus, check NuBus functionality, and verify that the bits in the NuBus status register (NSR) are set properly during NuBus operations.

Figure 4-15 BOARD NUBUS LOGIC Test Menu

```
  EXP2 Diagnostic                                        Revision ddd/yy
**
**                       BOARD NUBUS LOGIC Test Menu
**
**    A = NuBus Access Enable Test
**    B = NuBus Access IDLE Status Test
**    C = NuBus Access TESTNUACK Test
**    D = NuBus Access IDLE Addr Test
**    E = NuBus Access DATA Test
**    F = NuBus Access FIFO DATA Test
**    G = NuBus Access Byte Mode Test
**    H = NuBus Access Buffer Write Test
**    I = NuBus Access NuBus Lock Test
**    J = NuBus Unmapped Cycles
**    K = NuBus Virtual Memory Cycles
**    L = NuBus Block Memory Cycles
**    M = NuBus Buffered Block Writes
**    N = NuBus Cache Memory Cycles
**
**    R = Return to Prev. Menu, X = Execute All, Y = Debug Menu, Z = Parameter Menu
**
**                       Select the desired option:
```

The following descriptions briefly explain each test listed on the BOARD NUBUS LOGIC Test Menu:

■ NuBus Access Enable Test — Checks that the NuBus master enable bit in the configuration register can be turned off, and produces predictable NuBus status register values when unmapped cycles are attempted.
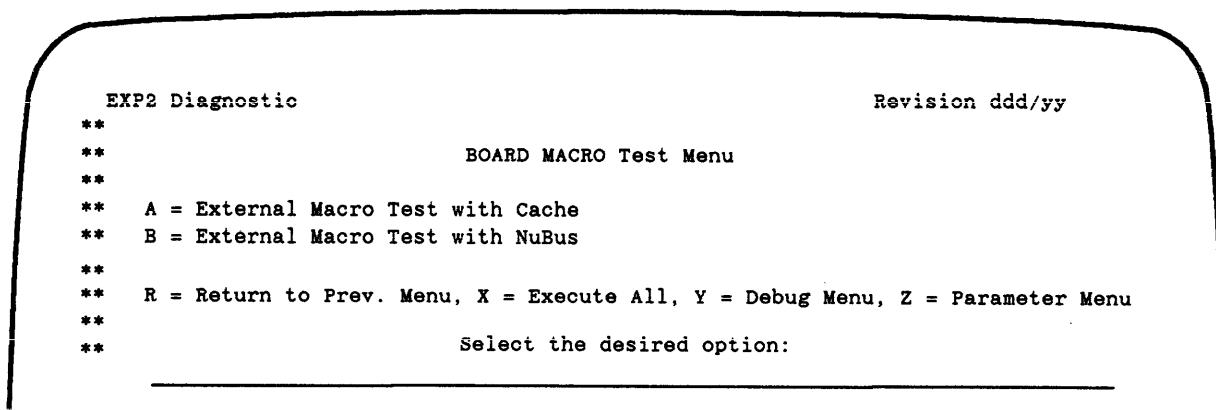
■ NuBus Access IDLE Status Test — Checks that idle cycles generate correct NuBus status register values. The external control register bits XCR<10:9> (XCRTM1 and XCRTM0) show up inverted in the NuBus status register bits NSR<17:16> (ITM1– and ITM0–).

■ NuBus Access TESTNUACK Test — Checks the ability of the external control register bit XCR<8> (XCRTESTNUACK) to generate slave acknowledgement transfer modes (TMs).

■ NuBus Access IDLE Addr Test — Checks the address lines to the NuBus (captured in the read-FIFO) using unmapped NuBus idle write cycles.

■ NuBus Access DATA Test — Checks NuBus write data paths using unmapped NuBus writes to the NuBus data latch, and unmapped NuBus reads of the exchange register.

■ NuBus Access FIFO DATA Test — Checks write and read FIFOs by doing NuBus writes, transferring data for verification from the memory data (MD) through the write-FIFO to the read-FIFO. The write-FIFO is filled using I/O writes to test all data and flag bits, with unmapped writes transferring the values to the read-FIFO.

■ NuBus Access Byte Mode Test — Checks all unmapped modes to verify that the slave IA<1:0> NSR bits are generated properly. Appropriate NuBus error status is verified for all combinations.

■ NuBus Access Buffer Write Test — Checks buffered writes for the following functionality:

  ■ NuBus status register bits NSR<20> (MCINPROG–) and NSR<19> (WRTQUEUED–) are checked.

  ■ A buffered write that would normally end in a NuBus error will appear to *not* cause a NuBus error if checked immediately.

  ■ A second NuBus write is *not* started if a previous buffered write encounters a NuBus error.

  ■ The NuBus status register (NSR) contains the information for a buffered write that has a NuBus error and not for a later write.

  ■ NSR latches the results of a write error, from a buffered write, until a read.

■ NuBus Access NuBus Lock Test — Tests the external control register buslock bit XCR<3> by checking for a third word in the read-FIFO, as the result of an automatically issued attention-null cycle.

■ NuBus Unmapped Cycles — Checks the NuBus byte, halfword, and word cycle types.

■ NuBus Virtual Memory Cycles — Tests right and left virtual memory and map status RAM logical to virtual memory address translation logic.

■ NuBus Block Memory Cycles — Verifies 2-, 4-, 8-, and 16-word block moves.

- NuBus Buffered Block Writes — Checks buffered block writes by per-forming 256 8-word buffered block writes to NuBus memory. The test then verifies the data written with unmapped reads.

- NuBus Cache Memory Cycles — Verifies cache hits, cache fill logic on cache misses, and cache write through logic.

- Return to Previous Menu — Displays the Standalone Diagnostics Main Menu.

- Execute All — Executes all the tests listed on this menu.

- Debug Menu — Displays the Debug Menu.

- Parameter Menu — Displays the Operational Parameters Menu.

BOARD MACRO Tests **4.8.9** The tests on the BOARD MACRO Test Menu (Figure 4-16) check the macro instruction interface between the Lisp microprocessor and external memory using cache and NuBus memory.

Figure 4-16 BOARD MACRO Test Menu

```
   EXP2 Diagnostic                                    Revision ddd/yy
**
**                       BOARD MACRO Test Menu
**
**   A = External Macro Test with Cache
**   B = External Macro Test with NuBus
**
**   R = Return to Prev. Menu, X = Execute All, Y = Debug Menu, Z = Parameter Menu
**
**                       Select the desired option:
```

The following descriptions briefly explain each test listed on the MACRO INSTRUCTIONS Test Menu:

- External Macro Test with Cache — Tests the Lisp microprocessor and the board macro instruction interface using cache memory as the data source for the following functions:

  - Macro instruction address path to external memory
  - Macro operand address path to external memory
  - Macro instruction data path from external memory
  - Macro instruction chaining
  - Aborts on macro instruction boundaries

■ External Macro Test with NuBus — Tests Lisp microprocessor and the board macro instruction interface using NuBus memory as the data source for the following functions (only runs in interface diagnostic mode):

- ■ Macro instruction address path to external memory

- ■ Macro operand address path to external memory

- ■ Macro instruction data path from external memory

- ■ Macro instruction chaining

- ■ Aborts on macro instruction boundaries

■ Return to Previous Menu — Displays the Standalone Diagnostics Main Menu.

■ Execute All — Executes all the tests listed on this menu.

■ Debug Menu — Displays the Debug Menu.

■ Parameter Menu — Displays the Operational Parameters Menu.

Execute External Memory Tests

4.8.10 The Execute External Memory Tests entry allows you to verify that all NuBus memory in the system is good or, if failures occur, to pinpoint the failing component.

The tests prompt you for information one line at a time and display the default value for the prompt along with a field for entering a new value. Press the RETURN key to accept the default value, or enter a new value and then press the RETURN key. Figure 4-17 shows the prompts and sample output of the Execute External Memory Tests entry when the default values are specified and the tests complete execution.

Figure 4-17 Execute External Memory Tests

```
EXP2 Diagnostic                                              Revision ddd/yy
**
**                        EXTERNAL MEMORY TEST
**
**    (00000004) Slot number of board under test          : 00000004
**          (Y) Address memory via Base Register?   Y/N : Y
**    (00000000) Beginning Base Register address offset    : 00000000
**    (00200000) Size in bytes of memory under test        : 00200000
**    (FFFFFFFF) Beginning test pattern                     : FFFFFFFF
**    (00000002) Number of test patterns per location       : 00000002
**    (01111111) Test mode enables (x,DATA,ADR,CELL,BYTE,HFWD,BLOCK RETN) : 01111111
**    (00001111) BLOCK MODE ENABLES (x,x,x,x,16wd,8wd,4wd,2wd) : 00001111
**    (00000011) Retension test mode (x,x,x,x,x,x,UNMAPPED, BLOSKED) : 00000011
**
**
**                        Any changes needed? Y/N : N
**
**    DATA PATH TEST                    Executing...
**    ADDRESS TEST                      Executing...
**    BIT CELL TEST                     Executing...
**    BYTE MODE TRANSFER TEST           Executing...
**    HALF WORD TRANSFER TEST           Executing...
**    BLOCK TRANSFER TEST               Executing...
**    UNMAPPED RETENTION TEST           Executing...
**    BLOCK RETENTION TEST              Executing...
```

Color System Diagnostic Tests

4.9   This section provides brief descriptions of the color system diagnostic tests. You can access these tests through the GDOS menus. Figure 4-18 shows the color system main menu.

Figure 4-18 Color System Main Menu

```
                  Color System Interface Board (CSI) Diagnostic
                          Version : CSITST 250/87

                               Main Menu

   1 Test All Available CSIs With All Noninteractive Tests   . . .     Execute
   2 Select Color System Interface Board(s) to Test . . . . . .       Execute
   3 Enter Menu to Display and Set Test Execution Parameters . . .    Execute
   4 Execute Noninteractive (Non-I), Interactive (I), or All Tests .  Non-I
   5 Loop on All Noninteractive Tests (0 - continue until ABORT)  .   I           Dec
   6 Enter Menu to Execute Selected Tests . . . . . . . . . .         Execute
   7 Enter Menu to Loop on Selected Tests . . . . . . . . . .         Execute
   8 Return to GDOS. . . . . . . . . . . . . . . . . . .              Execute


   ?=HELP, CTRL-F=Key Functions
```
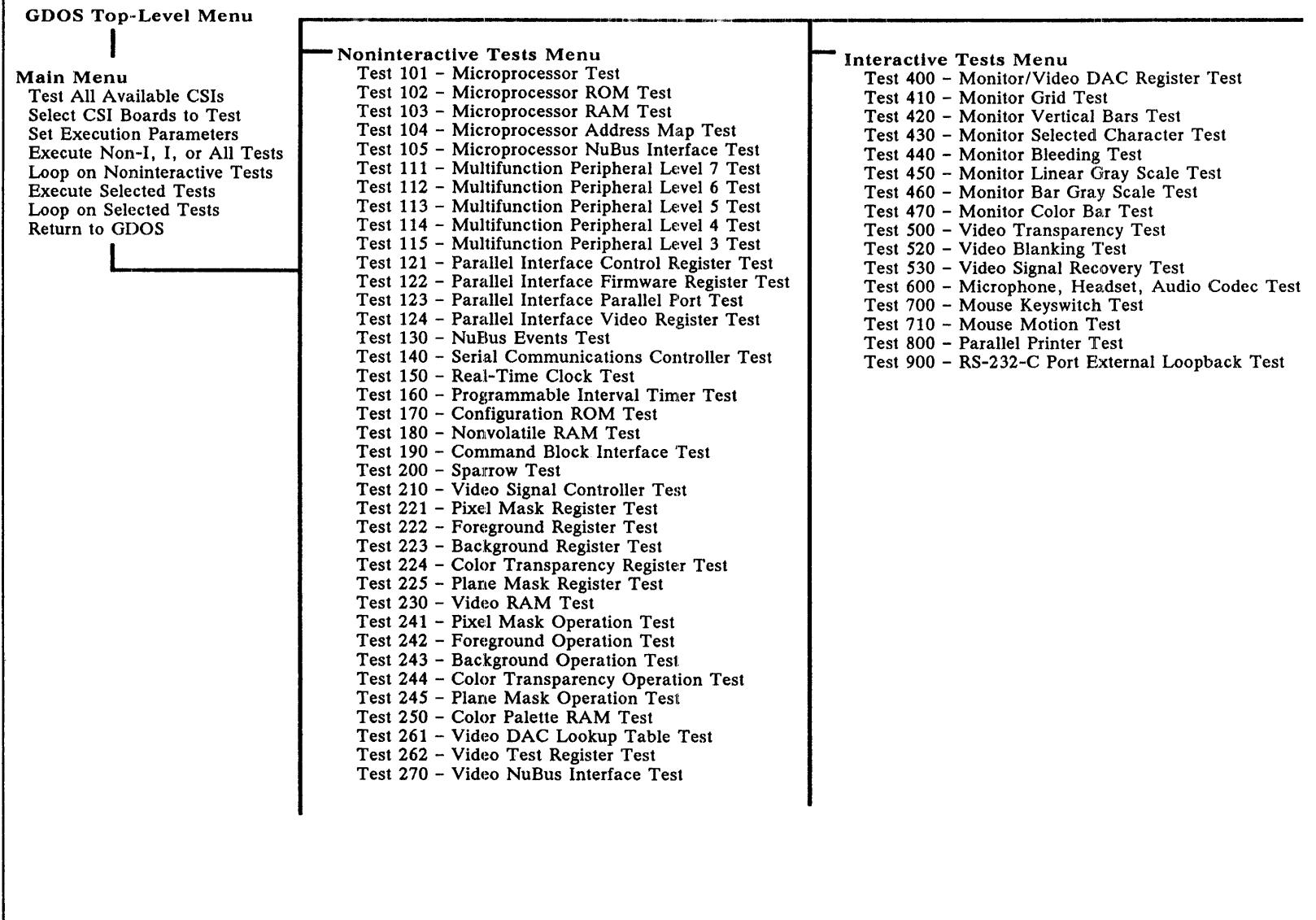
The following descriptions briefly explain each item listed in the COLOR SYSTEM main menu. Refer to the online diagnostics for detailed information on running the noninteractive and interactive tests (see Figure 4-19).

■ Item 1 executes all noninteractive tests in GDOS.

■ Item 2 allows you to select specific CSIBs to test.

■ Item 3 displays a menu that allows you to modify the test execution parameters.

■ Item 4 allows you to run noninteractive or interactive tests separately, or to run all the tests. Noninteractive tests require no operator input during execution. Interactive tests do require operator input during execution. If you chose to run all tests, the noninteractive tests run first; then, the interactive tests run.

■ Item 5 runs all noninteractive tests with the currently selected CSIBs and execution parameters the specified number of times you have entered. To cause an infinite loop, enter 0, and press RETURN. To stop the looping, press ABORT.

■ Item 6 displays a menu that lists all of the noninteractive and interactive tests. You can select the tests you want to run from this list. The tests are run on the currently selected CSIBs and execution parameters.

■ Item 7 displays a menu that lists all of the noninteractive tests. You can select the tests you want to loop on from this list, and also specify the number of loops you want to run. The tests are run on the currently selected CSIBs and execution parameters.

■ Item 8 returns the diagnostic operation to the GDOS Extended-Interactive Diagnostic Mode menu (Figure 3-3).

Figure 4-19   Color System GDOS Tests (CSITST)

GDOS Top-Level Menu

Main Menu
Test All Available CSIs
Select CSI Boards to Test
Set Execution Parameters
Execute Non-I, I, or All Tests
Loop on Noninteractive Tests
Execute Selected Tests
Loop on Selected Tests
Return to GDOS

Noninteractive Tests Menu
Test 101 – Microprocessor Test
Test 102 – Microprocessor ROM Test
Test 103 – Microprocessor RAM Test
Test 104 – Microprocessor Address Map Test
Test 105 – Microprocessor NuBus Interface Test
Test 111 – Multifunction Peripheral Level 7 Test
Test 112 – Multifunction Peripheral Level 6 Test
Test 113 – Multifunction Peripheral Level 5 Test
Test 114 – Multifunction Peripheral Level 4 Test
Test 115 – Multifunction Peripheral Level 3 Test
Test 121 – Parallel Interface Control Register Test
Test 122 – Parallel Interface Firmware Register Test
Test 123 – Parallel Interface Parallel Port Test
Test 124 – Parallel Interface Video Register Test
Test 130 – NuBus Events Test
Test 140 – Serial Communications Controller Test
Test 150 – Real-Time Clock Test
Test 160 – Programmable Interval Timer Test
Test 170 – Configuration ROM Test
Test 180 – Nonvolatile RAM Test
Test 190 – Command Block Interface Test
Test 200 – Sparrow Test
Test 210 – Video Signal Controller Test
Test 221 – Pixel Mask Register Test
Test 222 – Foreground Register Test
Test 223 – Background Register Test
Test 224 – Color Transparency Register Test
Test 225 – Plane Mask Register Test
Test 230 – Video RAM Test
Test 241 – Pixel Mask Operation Test
Test 242 – Foreground Operation Test
Test 243 – Background Operation Test
Test 244 – Color Transparency Operation Test
Test 245 – Plane Mask Operation Test
Test 250 – Color Palette RAM Test
Test 261 – Video DAC Lookup Table Test
Test 262 – Video Test Register Test
Test 270 – Video NuBus Interface Test

Interactive Tests Menu
Test 400 – Monitor/Video DAC Register Test
Test 410 – Monitor Grid Test
Test 420 – Monitor Vertical Bars Test
Test 430 – Monitor Selected Character Test
Test 440 – Monitor Bleeding Test
Test 450 – Monitor Linear Gray Scale Test
Test 460 – Monitor Bar Gray Scale Test
Test 470 – Monitor Color Bar Test
Test 500 – Video Transparency Test
Test 520 – Video Blanking Test
Test 530 – Video Signal Recovery Test
Test 600 – Microphone, Headset, Audio Codec Test
Test 700 – Mouse Keyswitch Test
Test 710 – Mouse Motion Test
Test 800 – Parallel Printer Test
Test 900 – RS-232-C Port External Loopback Test

General Testing Information

4.10 The Explorer II system architecture does not use the local bus that is used in existing Explorer systems. The Explorer II system, as shipped from the factory, uses the terminator clock to run the NuBus rather than the SIB on-board clock (as in existing Explorer systems). These two factors change the way the system behaves when you perform self-test board troubleshooting.

- **SIB versions** — Explorer II systems shipped from the factory will have SIB part number 2236654-0002 installed. This SIB version is modified to have the on-board clock disconnected, and pins have been changed to accept OVERTEMP and POWER FAILURE IMMINENT signals from the NuBus-only backplane used in Explorer II systems. This version of the SIB will not operate with a local bus backplane.

- **Single board testing** — Either the NUPI board or the Explorer II processor board can execute self-tests as the only board in the chassis (other than the power supply). Suspected NUPI board failures can be isolated by pulling all other boards out of the chassis and executing self-tests. The Explorer II processor will also execute self-tests as the only board in the chassis.

- **Two-card SIB or CSIB test** — Possible SIB or CSIB failures can be isolated by executing self-tests with only the Explorer II processor in slot 6 and the SIB or CSIB in an appropriate slot. All other boards can be removed and taken out of the loop.

- **Two-card memory or Ethernet board testing** — Either the memory board or the Ethernet board can run self-tests with the processor board as the only other board in the system. Additional tests should use extended tests and GDOS.

- **System upgrade testing** — When an Explorer I processor is upgraded to an Explorer II processor in the field, the SIB provides the NuBus clock. In this situation, board-testing (by removing certain boards) should be the same as that done with the Explorer I processor.

- **Explorer II processor standalone diagnostics test** — The Explorer II processor can be thoroughly tested by the Standalone Diagnostics (EXP2). The operation of these diagnostics, with explanations of the errors that can be generated, is given in paragraph 4.8, Explorer II Processor Standalone Diagnostics Test Descriptions. Table 4-3 provides the error codes associated with the error explanationed in paragraph 4.8.

- **ROM Debug Utilities** — These utilities allow diagnostic testing without loading GDOS or the standalone diagnostics, but have limited error and message reporting capabilities. You can display or write NuBus data, select single or all slots for testing (default is all slots), and execute self-tests 07-3C (listed in Table 4-3 and described in paragraph 4.8).

The ROM Debug Utilities are only accessible when the initial boot menu is displayed, as follows:

```
D=Default load, M=Menu load, R=Retest, E=Extended tests:
```

When the initial boot menu is displayed, press SHIFT 1. The ROM Debug Utilities menu is displayed:

```
N=NuBus Read/Write, S=Single slot, X=eXecute self-test, A=Aux. type,
Q=Quit, F=Flags (toggles: L=Loop, H=Halt, I=Ignore):
```

Pressing the Space Bar or any character not associated with the options listed on the menu, displays the following help screen:

```
N=display/modify NuBus
S=select single or multiple Slots for R/E (Restart/Extended) tests
X=eXecute self-test (O=all)
A=display Auxiliary processor type
F=display test mode Flags
L=toggle Loop on tests flag
H=toggle Halt on error flag
I=toggle Ignore self-test flag
```

To return to the ROM Debug Utilities menu when the help screen is displayed, or to stop execution of the diagnostics, press the ABORT key.
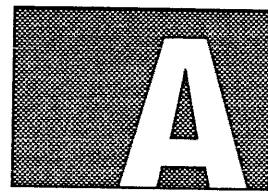
NOTE: Pressing ABORT does not interrupt the test in progress. Test execution stops after the current test completes, unless the key pressed is out of synchronization with the test. If the test does not stop, press ABORT again. Another way to stop the test is to reboot.

If the Loop on tests flag is on and you execute a self-test (eXecute self-test), the ABORT key does not stop the test. You must reboot the system to terminate the test.

To return to the initial boot menu, press the Q key. After the initial boot menu is displayed, you can rerun the diagnostic tests by pressing R to select Retest or E to select Extended Tests. The diagnostics execute using the parameters you specified for the ROM Debug Utilities options.

■ **Intermittent errors** — If the display freezes during system self-test (while the slots and test results are being listed), an unknown intermittent error may have occurred. Press META-CTRL-META-CTRL-ABORT to reset the system. If the problem is a temporary one, the system may boot properly. The following documents may be useful when a system will not boot or will not load GDOS:

  ■ *Introduction to the Explorer System* — Provides detailed instructions on starting the system, general information about recovering from errors, and other useful information.

  ■ *Explorer System Software Design Notes* — Provides detailed information about the function of the Explorer system. This manual is for advanced users only.

FAMILY TREE DRAWINGS

This appendix contains the following family tree drawings:

■ Explorer systems family tree, part number 2249427-0001

■ Explorer II systems family tree, part number 2544051-0001

Figure A-1 Explorer Systems Family Tree, Part Number 2249427 (Sheet 1 of 3)

| 8 | 7 | 6 | 5 | 4 | 3 | DWG NO 2249427 SH 2 | 1 |

D

FROM SH 1 AND 3

FROM SH 1 AND 3

(1)

(2)

OPTIONS   MANUALS   MISC

EXPLORER CHASSIS ASSY
2249448-0001 THRU -0066

ETHERNET OPTION KIT
2249433

MANUAL, EXPLORER SYSTEM
FIELD MAINTENANCE
2243141

NUBUS EXTENDER CARD
2236420

MANUAL, EXPLORER NUBUS ETHERNET
CONTROLLER GENERAL DESCRIPTION
2243161

SPY PORT ADAPTER CARD
2236495

CABLE ASSY, FIBER OPTIC
2233200

SPARES LISTING, EXPLORER
2242653

MASS STORAGE KIT, SECONDARY
2236148

S/W BUILD PROC, EXPLORER
MASS STOR UNITS
2249458

FIELD INSTALLABLE DISK KIT
2249432

CABLE ASSY, 3M MASS STORAGE
2236142

EXPLORER MEMORY OPTION
2249429

S/W INSTALLATION OPTION
2249434

EXPLORER CARTRIDGE TAPE
2249438

ETHERNET NETWORK KIT,
2249457

EXPLORER 855 PRINTER
KIT 2249436

855 DOWNLOAD FONT
OPTION KIT 2249439

EXPLORER SERIAL CABLE KIT
2249456

MASS STORAGE UNIT II, SECONDARY
2236178

EXPLORER POWER SUPPLY KIT
2544064

EXPLORER LX PROCESSOR KIT
2544062

EXPLORER MT3201 KIT
2544066

EXPLORER SMD DISK KIT
2544063

EXPLORER II PROCESSOR UPGRADE KIT
2544082

EXPLORER SMD DISK CONTROLLER KIT
2544080

Right column (from chassis assy):

SYSTEM CABINET ASSY 2537342-0002	EXPLORER LCL PROCESSOR 2243881
EXPLORER MEMORY 2243910	NUBUS PERIPHERAL I/F 2238040
SYSTEM INTERFACE 2236645	NUBUS ETHERNET CONTROLLER 2236400
FIBER OPTIC ADAPTER CARD 2236595	TEST PROC 2249444
POWER CORD (220V) 2249468-0002	NUPI CABLE ADAPTER 2238045
POWER CORD (240) 2249468-0003	ETHERNET ADAPTER CARD 2236490
POWER CORD (120V) 2249468-0001	CABLE ASSY, ETHERNET 2239129
LX PROCESSOR ASSY 2535860	LABEL, NAMEPLATE, EXPLORER LX 2235700-0001
S/W PROTECT ADAPTER 2535880	LABEL, LOGO, SYSTEM BOX 2235690-0001
SCSI I/O ASSY 2537795-0001	MASS STORAGE CONTROLLER ASSY 2537780-0001
SYSTEM BOX LOGO 2235701-0001	SMD I/O ASSY 2537790-0001
EXPLORER NAMEPLATE LABEL 2235689-0001	CONNECTOR STRIP 2537333-0001
S1500 COMM CARRIER BOARD 2535555-0001	8 CHANNEL COMM 2535570-0001
I/O CABLE ASSEMBLY 2537332-0002	
8 CHANNEL ADAPTER 2535575-0001	

TEXAS INSTRUMENTS   DATA SYSTEMS GROUP

SIZE	FSCM NO	DRAWING NO	REV
D	06668	2249427	K
SCALE NONE		SHEET 2	

| 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 |