EMULEX
An Avago Technologies Company

Boot Version 10.6 for the Fibre Channel Protocol

User Manual

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1. Introduction

This manual describes installing, updating, enabling, and configuring Emulex® Fibre Channel (FC) boot code. This manual also describes the Emulex boot from SAN implementation and its operation with distinct hardware and operating system requirements. Boot from SAN is booting servers directly from disk operating system images located on a storage area network (SAN) by way of Emulex LightPulse® adapters using Emulex FC boot code.

When booting from SAN, the storage device is typically identified by its World Wide Port Name (WWPN) and a logical unit number (LUN). By extending the server system boot basic input/output system (BIOS), boot from SAN functionality is provided by the bootBIOS contained on an Emulex adapter in the server. When properly configured, the adapter then permanently directs the server to boot from a logical unit (disk) on the SAN as if it were a local disk.

Notes

- Emulex drivers support multi-path boot configurations. Refer to your storage vendor's documentation for details on how to configure multi-path booting.
- Screenshots in this manual are for illustrative purposes only. Your system information can vary.

Emulex Boot Code Files

Emulex is unique in providing Universal Boot and Pair Boot images of boot code. Universal Boot images contain x86 BootBIOS, OpenBoot, and EFIBoot boot code. Pair Boot boot code images contain x86 BootBIOS and EFIBoot boot code. These images provide multi-platform support for boot from SAN.

Universal Boot and Pair Boot transparently determine your system platform type and automatically execute the proper boot code image in the adapter. These boot code images reside in the adapter's flash memory, allowing for easier adapter portability and configuration between servers.

Emulex provides the following types of boot code:

- x86 BootBIOS works with the existing system BIOS on x64 and x86 systems.
- OpenBoot works with the existing system firmware on SPARC systems. OpenBoot is also called FCode.
- UEFIBoot provides system boot capability through the use of the Unified Extensible Firmware Interface (UEFI) shell. It also functions on UEFI 2.*x*-based x64 platforms through the Human Interface Infrastructure (HII) interface.

Abbreviations

ACL	Access Control List
AL_PA	Arbitrated Loop Physical Address

API	application programming interface
ARP	Address Resolution Protocol
BBS	BIOS Boot Specification
BFS	byte file system
BIOS	basic input/output system
CLI	command line interface
DHCP	Dynamic Host Control Protocol
DID	device ID
DMA	direct memory access
DNS	Domain Name System
EDD	Enhanced Disk Device
FC	Fibre Channel
FC-AL	Fibre Channel Arbitrated Loop
FCF	FC over Ethernet Forwarder
FL_Port	fabric loop port
FoD	Feature on Demand
FTP	File Transfer Protocol
FUI	FoD Unique Identifier
Gbps	gigabits per second
GPT	GUID partition table
GUI	Graphical User Interface
GUID	Globally Unique Identifier
HBA	host bus adapter
HII	Human Interface Infrastructure
HTTP	Hypertext Transfer Protocol
IEEE	Institute of Electrical and Electronics Engineers
INTx	PCIe legacy interrupts, where “x” is variable
I/O	input/output
IOCTL	input/output control
IP	internet protocol
JBOD	just a bunch of disks
KB	1024 bytes (Kilobyte or Kibibyte)
LACP	Link Aggregation Control Protocol
LDAP	Lightweight Directory Access Protocol
LUN	logical unit number
MAC	Media Access Control
MBR	master boot record

MPIO	multipath I/O
MSI	message signaled interrupt
MSI-X	message signaled interrupts - extended
MTU	maximum transmission unit
NBP	network boot program
NIS/NIS+	Network Information Service/Network Information Service Plus
NIV	Network Interface Virtualization
NLB	network loopback
NPIV	N_Port ID virtualization
NVRAM	non-volatile random-access memory
OBP	OpenBoot PROM
OCSD	Option Card Sensor Data
OEM	original equipment manufacturer
OS	operating system
PC	personal computer
PCI	Peripheral Component Interconnect
PCIe	Peripheral Component Interconnect Express
PDU	protocol data unit
PLOGI	port login
POST	power-on self-test
PXE	Preboot Execution Environment
RAID	redundant array of independent disks
RHEL	Red Hat Enterprise Linux
RIS	Remote Installation Services
ROM	read-only memory
RPM	RPM package manager
RSS	receive-side scaling
SAN	storage area network
SCSI	Small Computer System Interface
SLES	SUSE Linux Enterprise Server
SLI	Service Level Interface
SMS	System Management Services
SNP	Simple Network Protocol
X	Denotes a variable
TB	terabyte
TCP	Transmission Control Protocol
TFTP	Trivial File Transfer Protocol

UCNA	universal converged network adapter
UDP	User Datagram Protocol
UFP	Unified Fabric Protocol
UEFI	Unified Extensible Firmware Interface
USB	Universal Serial Bus
WWN	World Wide Name
WWNN	World Wide Node Name
WWPN	World Wide Port Name
ZB	zettabyte

2. Booting from SAN

This section provides instructions for installing and using all of the types of boot code provided by Emulex.

When booting from SAN, the storage device is typically identified by its WWPN and a LUN. By extending the server system BIOS, boot from SAN capability is provided by the boot BIOS contained on an Emulex adapter in the server. If properly configured, the adapter then permanently directs the server to boot from a logical unit (disk) on the SAN as if it were a local disk.

Note: Not all procedures are required. Emulex HBAs usually ship from the factory with the latest version of boot code installed and enabled, so you do not need to install or enable boot code in those cases. However, if boot code is not installed, you must install it, and if it is not enabled, you must enable it. Check the Emulex website at http://www.emulex.com for the latest version of boot code.

This section describes setting up a system to boot from SAN. The specific procedure to follow is determined by the system architecture and the operating system.

Table 2-1 Boot from SAN Procedures

Architecture	Operating System	Procedure
x86 and x64	Windows Server	“Installing Windows Server on an FC Boot Disk” on page 16.
	Linux	“Configuring Boot from SAN on Linux or VMware (x86 and x64)” on page 17.
	VMware	
	Solaris (SFS driver)	“Configuring Boot from SAN on Solaris (SPARC)” on page 18.
SPARC and PowerPC	Linux	“Configuring Boot from SAN on Linux or VMware (UEFI)” on page 17.
	Solaris (SFS driver)	“Configuring Boot from SAN on Solaris (x86 and x64)” on page 17.

Windows Server

This section describes configuring boot from SAN for Windows systems and installing Windows Server on an FC boot disk.

Configuring Boot from SAN on Windows Server (x64)

To configure boot from SAN:

1. If necessary, update the boot code on the adapter (see "Updating and Enabling Boot Code" on page 24).
2. If necessary, enable the boot code on the adapter (see "Updating and Enabling Boot Code" on page 24).
3. Enable the adapter to boot from SAN (see "Enabling an Adapter to Boot from SAN" on page 27).
4. By default, the boot adapter uses auto topology with loop first. You can set the boot adapter to use a different topology (see "Changing Topology" on page 34).
5. Configure boot devices (see "Configuring Boot Devices" on page 27).
6. If desired, configure the boot options on the adapter (see "Configuring Adapter Parameters" on page 31).
7. Install the operating system on an FC boot disk (see "Installing Windows Server on an FC Boot Disk" on page 16).

Installing a New Windows UEFI-aware Operating System on a UEFI-based x64 Server

This installation procedure assumes LUNs are created in the SAN storage device and zoned appropriately to the host adapter's WWN.

1. From the server system UEFI setup, ensure that CD/DVD is the first device in the boot order list.
2. Enable the adapter BIOS setting to allow SAN boot in the Emulex UEFI configuration utility.
3. Configure the boot target and LUN in the Emulex UEFI configuration utility to point to the desired target (see "Configuring Boot Parameters" on page 63).
4. Boot the host server with the Windows Server operating system DVD inserted. Follow the on-screen prompts to install the appropriate version of Windows Server.

   The Windows installation exposes all available and visible LUNs as disks and partitions numbered 0 to N, where N is the highest number available. These numbers typically are the LUN numbers assigned by the array.
5. Select the disk on which you want to install the operating system.
6. Follow the system prompts in the Windows installation.

   Note: The operating system image is installed with the GPT disk partition. See "The GUID Partition Table" on page 15 for a brief description of GPT disk partitions.

After the installation is complete, a Boot Option variable called Windows Boot Manager is populated with a Media Device path pointing to the Windows boot loader utility. The Windows Boot Manager can be found in the Start Options menu of the host server UEFI.

The Windows Boot Manager option is inserted as the first boot option in the boot order list of the Host Server UEFI. The CD/DVD boot is the second device in the boot order list.

Upon reboot, the system boots from the LUN set up on the SAN.

Directing a UEFI-based Server to a Windows Server Operating System Image (Installed as UEFI-Aware) Already Installed on the SAN

This installation procedure assumes a LUN exists in the SAN storage device, is zoned appropriately to the host adapter's WWN, and a UEFI-aware operating system resides on the target LUN.

To direct a UEFI-based server to a Windows Server operating system image:

1. Enable boot from SAN in the Emulex UEFI configuration utility.
2. Configure the boot target and LUN in the Emulex UEFI configuration utility to point to the desired target (see "Configuring Boot Parameters" on page 63).
3. Select **Boot Manager** from the System UEFI configuration manager.
4. Select **Add Boot Option**.
5. Identify the desired target in the list, and continue down the explorer path until you locate the bootmgfw.efi file. This file is the boot loader utility for your Windows Server UEFI-aware operating system installation.
6. Input a boot device description (such as Win2K8_UEFI_SAN) and optional data (if desired) for this device and select **Commit Changes.**
7. From the Boot Manager, select **Change Boot Order.**
8. Move the previous input description name (Win2K8_UEFI_SAN) to the desired position in the boot order.
9. Select **Commit Changes.** The Start Options list now reflects the boot order changes.

Upon reboot, the server is able to boot from this target LUN on the SAN.

The GUID Partition Table

The GPT provides a more flexible mechanism for partitioning disks than the older MBR partitioning scheme that has been common to PCs. MBR supports four primary partitions per hard drive and a maximum partition size of 2 TB. If the disk is larger than two TB (the maximum partition size in a legacy MBR), the size of this partition is marked as 2 TB and the rest of the disk is ignored.

The GPT disk itself can support a volume up to 2^{64} blocks in length (for 512-byte blocks, this is 9.44 ZB). The GPT disk can also theoretically support unlimited partitions.

Note: By default, Microsoft Windows Server operating systems install with a GPT-formatted disk on a UEFI-aware server.

For more information on the GUID partition table, see the Microsoft website and search for the terms *Windows* and *GPT FAQ*.

Installing Windows Server on an FC Boot Disk

This procedure installs Windows Server onto an unformatted FC disk drive and configures the system to boot from the SAN disk drive.

Note: The computer's system BIOS may require that another controller take precedence over the Emulex adapter during boot. If this occurs, you must disconnect or disable the other adapter. This allows you to configure and build the operating system on the drive connected to the Emulex adapter.

To install Windows Server on a boot disk:

1. Install the Emulex driver for Windows as described in the *Emulex Drivers Version for Windows User Manual*.
2. In Windows Explorer, navigate to the folder you specified during driver installation.
3. In the \AutoPilot Installer\Drivers*drivername* folder, open the folder that corresponds to your computer type, such as x64. "*drivername*" is the type of driver you downloaded.
4. Copy all the files in this folder onto a formatted floppy disk or a USB device.
5. Boot the target system with the Windows Server setup media. The Install Windows splash screen is displayed.
6. Verify and if necessary change the Language, Time and Date, and Keyboard values. Click **Next**. Another splash screen is displayed.
7. Click **Install Now.** The Where do you want to install Windows? screen is displayed.
8. Click **Load Driver.** Browse to the floppy disk or USB device specified in step 4 where the driver is located to load the Storport Miniport driver for the appropriate operating system. Once selected, the correct driver location and driver are displayed under the Select driver to be installed screen.
9. Select **Next.** After the driver is loaded, the Where do you want to install Windows? screen is displayed.
10. Select the same drive you configured as the boot device (see "Configuring Boot Devices" on page 27).

Linux,Citrix, and VMware

This section describes configuring boot from SAN on Linux, Citrix, and VMware operating systems.

Configuring Boot from SAN on Linux or VMware (x86 and x64)

To configure boot from SAN:

1. If necessary, install or update the boot code on the adapter (see "Updating and Enabling Boot Code" on page 24).
2. If necessary, enable the boot code on the adapter (see "Updating and Enabling Boot Code" on page 24).
3. Enable the adapter to boot from SAN (see "Enabling an Adapter to Boot from SAN" on page 27).
4. By default, the boot adapter uses auto topology with loop first. If you want to set the boot adapter to use a different topology, change it (see "Changing Topology" on page 34).
5. Configure boot devices (see "Configuring Boot Devices" on page 27).
6. If desired, configure the boot options on the adapter (see "Configuring Adapter Parameters" on page 31).
7. Use the driver on the operating system distribution disk to boot the system. If necessary, you can then update the driver to the desired version.

Configuring Boot from SAN on Linux or VMware (UEFI)

To configure boot from SAN:

1. If necessary, update the latest boot code on the adapter (see "Updating and Enabling Boot Code" on page 24).
2. If necessary, enable the boot code on the adapter (see "Updating and Enabling Boot Code" on page 24)
3. Configure boot devices. See "Enabling an Adapter to Boot from SAN" on page 27 for more information.
4. If desired, configure the boot options on the adapter. See "Configuring Adapter Parameters" on page 31 for more information.
5. Use the driver on the operating system distribution disk to boot the system. If necessary, you can update the driver to the latest version.

Solaris

This section explains how to configure boot from SAN on the Solaris operating system.

Configuring Boot from SAN on Solaris (x86 and x64)

To configure boot from SAN:

1. If necessary, update the boot code on the adapter (see "Updating and Enabling Boot Code" on page 24).
2. If necessary, enable the boot code on the adapter (see "Updating and Enabling Boot Code" on page 24).

3. Enable the adapter to boot from SAN (see "Enabling an Adapter to Boot from SAN" on page 27).
4. By default, the boot adapter uses auto topology with loop first. You can set the boot adapter to use a different topology (see "Changing Topology" on page 34).
5. Configure boot devices (see "Configuring Boot Devices" on page 27).
6. If desired, configure the boot options on the adapter (see "Configuring Adapter Parameters" on page 31).
7. Boot the Solaris installation CD and follow the prompts.

   Note: If you need help determining the LUNs to select for boot from SAN, "Determining LUNs to Select for Boot from SAN" on page 18.

Determining LUNs to Select for Boot from SAN

To determine which LUNs to select:

1. Open a terminal window and leave it open.
2. In the terminal window, select the LUN you are going to use as the SAN boot disk (not the local drive) using the luxadm probe command. This shows all the available LUNs. Record this LUN information, which is used throughout this procedure. LUN 0 is used in the example:

```
luxadm probe

Found Fibre Channel device(s):
   Node WWN:50060e8003823800 Device Type:Disk device
   Logical Path:/dev/rdsk/c5t226000C0FF9833AFd6s2
   Node WWN:50060e8003823800 Device Type:Disk device
   Logical Path:/dev/rdsk/c5t226000C0FF9833AFd6s2
   Node WWN:50060e8003823800 Device Type:Disk device
```

3. Copy the `/dev/rdsk/nnn` part of the path statement for a drive.
4. In the terminal window, use the luxadm display command to show the WWPN or the LUN for which you selected the path in the prior step:

```
luxadm display </dev/rdsk/nnn>
```

5. Record this LUN or WWPN information for use in the procedure.

Configuring Boot from SAN on Solaris (SPARC)

To configure boot from SAN:

1. If necessary, update the boot code on the adapter (see "Updating and Enabling Boot Code" on page 24).
2. If necessary, enable the boot code on the adapter (see "Updating and Enabling Boot Code" on page 24).
3. Type the following at the OBP prompt:

```
show-devs
```

   The ID information for each found adapter is displayed, such as:

```
/pci@5d,700000/lpfc@1
```

4. Enable boot from SAN on each Emulex adapter in the system by typing the following set of commands, replacing *adapter_id* with the ID information (as shown above), for each Emulex adapter. There is a space between the first quotation mark and the first character of the adapter ID.

```
" adapter_id" select-dev [for example, "/pci@5d,700000/lpfc@1"
select-dev]
set-sfs-boot
unselect-dev
```

5. After all Emulex adapters have been enabled to boot from SAN, reboot the system with the following command:

```
reset-all
```

6. After the system reboots, boot the Solaris installation CD and follow the prompts.
7. After the installation completes successfully, you will be prompted to reboot or exit the system. Press **<!>** and then press the **<Enter>** key to go to the Unix prompt.
8. After the Unix prompt appears, append the following line to the system file at /a/etc/system:

```
set pcie:pcie_max_mps=0
```

9. Save and reboot server.

Installing Solaris from a Network Image

The system must have a DVD drive and must be part of the site's network and naming service. If you use a naming service, the system must already be in a service, such as NIS, NIS+, DNS, or LDAP. If you do not use a naming service, you must distribute information about this system by following your site's policies.

Note: This procedure assumes that the system is running the Volume Manager. If you are not using the Volume Manager to manage media, see the *Sun Microsystems System Administration Guide: Devices and File Systems.*

To install from a network image:

1. Log on as a superuser or equivalent.
2. Insert the Solaris DVD in the system's drive.
3. Create a directory to contain the DVD image.

```
# mkdir -p install_dir_path
```

Install_dir_path specifies the directory where the DVD image is to be copied.

4. Change to the Tools directory on the mounted disc.

```
# cd /cdrom/cdrom0/Solaris_10/Tools
```

Note: For Solaris 10 only:

a. Remove the SUNWemlxu and SUNWemlxs from the /install_dir_path/Solaris/Tools/Boot directory.
b. Unzip the lpfc driver to a temporary directory:

```
pkgadd -R/install_dir_path/Solaris/Tools/Boot -d/tmp
```

c. Modify the elxfc.conf file to use persistent binding. For more information, refer to the *Emulex Drivers for Solaris User Manual*, which is available on the Emulex website.

5. Copy the DVD image in the drive to the install server's hard disk.

```
# ./setup_install_server install_dir_path
```

install_dir_path specifies the directory where the DVD image is to be copied.

The setup_install_server command indicates whether you have enough disk space available for the Solaris Software disc images. To determine available disk space, use the df -kl command.

6. Decide whether you need to make the install server available for mounting:

If the install server is on the same subnet as the system to be installed or you are using DHCP, you do not need to create a boot server. Proceed to step 7.

If the install server is not on the same subnet as the system to be installed and you are not using DHCP, complete the following steps:

a. Verify that the path to the install server's image is shared appropriately.

```
# share | grep install_dir_path
```

install_dir_path specifies the path to the installation image where the DVD image was copied:

- If the path to the install server's directory is displayed and anon=0 is displayed in the options, proceed to step 7.
- If the path to the install server's directory is not displayed or anon=0 is not in the options, continue and make the install server available to the boot server. Using the share command, add this entry to the /etc/dfs/dfstab (all on one line).

```
share -F nfs -o ro,anon=0 -d "install server directory"
install_dir_path
```

b. Verify that the nfsd daemon is running, or start the nfsd daemon.

- If the install server is running the current Solaris release, or a compatible version, type the following command.

```
# svcs -l svc:/network/nfs/server:default
```

If the nfsd daemon is online, continue to step c. If the nfsd daemon is not online, start it.

```
# svcadm enable svc:/network/nfs/server
```

c. Share the install server.

```
# shareall
```

7. Change directories to root (/).

```
# cd /
```

8. Eject the Solaris DVD.
9. (Optional) Patch the files that are located in the miniroot on the net install image that was created by setup_install_server. Patching a file may be necessary if a boot

image has problems. For more information, see the Solaris operating system documentation.

Installing Solaris by Migrating an Image from a Local SCSI Disk

To install Solaris by migrating an image from a local SCSI disk:

1. Type the following at the OBP prompt:

   ```
   show-devs
   ```

   The ID information for each found adapter is displayed, such as:

   ```
   /pci@5d,700000/lpfc@1 select-dev
   ```

2. Select the Emulex adapter on which you want to enable boot from SAN by entering the path to the adapter, for example:

   ```
   " /pci@5d,700000/lpfc@1" select-dev
   ```

3. To view the current boot device ID, type

   ```
   show-devs
   " /pci@5d,700000/lpfc@1" select-dev /* to select lpfc@1 (for
   example) */
   .boot-id
   ```

   Make a note of the WWPN, DID, or AL_PA returned from the probe and write down the corresponding boot entry.

4. To enable boot from SAN, set the boot device ID to the SAN device from which you want to boot, for example:

   ```
   " /pci@5d,700000/lpfc@1" select-dev
   wwpn|did|alpa lun target_id set-boot-id
   unselect-dev
   ```

   where:

   - *wwpn* | *did* | *alpa* is the device WWPN, DID, or AL_PA of the storage device.
   - *lun* is the LUN number in hexadecimal. To enter it in decimal, enter d# [*lun*].
   - *target_id* is the target ID in hexadecimal. To enter it in decimal, enter d# [*target_id*].

   Note: Emulex recommends using the WWPN in most cases. The DID and AL_PA may change between boots, causing the SAN boot to fail, unless the DID and AL_PA are specifically configured to not change between boots.

   Example 1: alpa=e1, lun=100 (decimal) and target id=10 (decimal):

   ```
   alpa e1 d# 100 d# 10 set-boot-id
   ```

   Example 2: wwpn=50000034987AFE, lun=af (hexadecimal) and target id=10 (decimal):

   ```
   wwpn 50000034987AFE af d# 10 set-boot-id
   ```

   Example 3: did=6312200, lun=25 (hexadecimal) and target id=f (hexadecimal):

   ```
   did 6312200 25 f set-boot-id
   ```

5. Boot to the original local disk to set up the newly defined FC disk. Type

```
boot local_disk
```

where *local_disk* is the complete path or the alias of the original boot disk.

6. Run the format utility:

```
format
```

7. Select the target disk to become the new boot disk (for example, c1t1d0).
8. Select the partition option and partition the disk as desired.
9. Select the label option and write a volume label to the target disk.

   For help with the format utility, see the man page *man format*.

10. Install the boot on partition 0 of the target disk. (Type this command on one line.)

```
installboot /usr/platform/ `uname -i`/lib/fs/ufs/bootblk
/dev/rdsk/clt1d0s0
```

11. Create a filesystem for each partition that contains a mounted filesystem:

```
newfs -v /dev/rdsk/clt1d0s0 (becomes root)
newfs -v /dev/rdsk/clt1d0s6 (becomes usr)
newfs -v /dev/rdsk/clt1d0s7 (becomes export/home)
```

12. Create temporary mount points for the new partitions:

```
mkdir root2
mkdir usr2
mkdir export2
```

13. Mount, copy, then unmount the usr2 file system:

```
mount /dev/dsk/clt1d0s6 /usr2
c0t0d0s6 ufsdump 0f - /dev/rdsk/c0t0d0s6 | (cd /usr2; ufsrestore rf -)
umount /usr2
```

14. Copy the export/home file system:

```
mount /dev/dsk/clt1d0s7 /export2
ufsdump 0f - /dev/rdsk/c0t0d0s7 | (cd /export2; ufsrestore rf -)
umount /export2
```

15. Perform copy:

```
mount /dev/dsk/clt1d0s0 /root2
ufsdump 0f - /dev/rdsk/c0t0d0s0 | (cd /root2; ufsrestore rf -)
```

16. Edit /root2/etc/vfstab, changing the controller number, target number, and LUN number to point to the new FC boot disk. For example, if the FC boot disk is c1t1d0, replace all local disk entries of c0t0d0 with c1t1d0.

    Currently the file shows:

```
/dev/dsk/c0t0d0s1 (swap)

/dev/dsk/c0t0d0s0 and /dev/rdsk/c0t0d0s0 (root)
/dev/dsk/c0t0d0s6 and /dev/rdsk/c0t0d0s6 (usr)
/dev/dsk/c0t0d0s7 and /dev/rdsk/c0t0d0s7 (export)
```

    Edit the file to show:

```
/dev/dsk/c1t1d1s1 (swap)
```

```
/dev/dsk/clt1d0s0 and /dev/rdsk/c1t1d0s1 (root)
/dev/dsk/clt1d0s6 and /dev/rdsk/c1t1d0s6 (usr)
/dev/dsk/clt1d0s7 and /dev/rdsk/c1t1d0s7 (export)
```

17. Reboot the system:

```
sync
sync
halt
reset-all
```

18. Boot to disk:

```
boot disk
```

The system should boot to the FC disk.

19. View the current dump device setting:

```
dumpadm
```

20. Change the dump device to the swap area of the FC drive:

```
dumpadm -d /dev/dsk/c1t1d0s1
```

where /dev/dsk/c1t1d0s1 is a sample path to the swap area of the FC drive.

3. Updating and Enabling Boot Code

Use the Emulex utilities to update boot code to a newer version and enable boot code. The utility that you use depends on the operating system and, in some cases, the driver type or system architecture. Table 3-1 indicates the utilities you can use to install and update boot code.

Table 3-1 Utilities that Update and Enable Boot Code

Operating System	OneCommand Manager GUI	OneCommand Manager CLI	UEFI Utility	CIM Provider (VMware only; see the *CIM Provider Package Installation Guide*)	FCA emlxadm	Offline Utilities
Windows	✓	✓	✓			✓
Linux	✓	✓	✓			✓
Solaris	✓	✓			✓	
VMware	✓	✓	✓	✓		

After you decide which utility to use, see the appropriate procedure:

- OneCommand Manager GUI: See the *OneCommand Manager User Manual.*
- OneCommand Manager CLI: See the *OneCommand Manager Command Line Interface User Manual.*
- UEFI utility: See"Configuring Boot via UEFI HII (Human Interface Infrastructure) in a UEFI 2.1 System" on page 50.
- FCA emlxadm utility: See the *FCA Utilities User Manual.*
- Offline utility: See the *Offline and Online Adapter Management Utilities User Manual.*

4. Emulex BIOS Utility

Before using the Emulex BIOS utility, ensure that the boot code is loaded and enabled on the adapter as described in "Updating and Enabling Boot Code" on page 24.

Notes

- This section reflects the most recent release of the BIOS utility. Some selections may not be available if you are using an older version of the utility.
- Changes made to parameters common to UEFI and x86 drivers are changed in both driver configuration utilities.

Navigating the FCoE BIOS Utility

Use the following methods to navigate the BIOS utility.

- Press the up and down arrows on your keyboard to move through and select menu options or configuration fields. If multiple adapters are listed, use the up/down arrows to scroll to the additional adapters.
- Press **<PageUp>** to scroll to the previous page.
- Press **<PageDn>** to scroll to the next page.
- Press **<Enter>** to select a menu option, to select a changed value, to select a row in a screen, or to change a configuration default.
- Press **<Esc>** to go back to the previous menu.

Starting the Emulex BIOS Utility

To start the Emulex BIOS Utility:

1. Turn on the computer and press and hold down **<Alt>** or **<Ctrl>** and press **<E>** immediately (within five seconds) when the Emulex bootup message to enter the BIOS utility is displayed. An adapter listing screen is displayed (Figure 4-1 on page 26).

   ### Notes

   - Links must be connected and established before entering the BIOS utility; otherwise, you will receive an error message.
   - If the bootup message does not appear, you must enable x86 BootBIOS. See "Enabling an Adapter to Boot from SAN" on page 27 for more information.

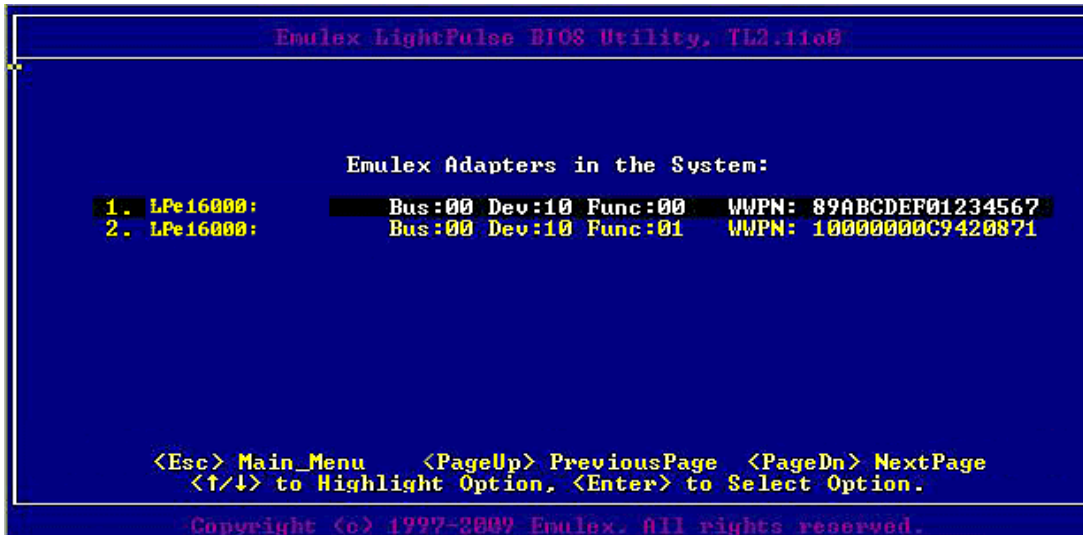

Figure 4-1 Adapter Listing Screen

2. Select the adapter to configure and press **<Enter>**. The main configuration menu is displayed (Figure 4-2 on page 26).

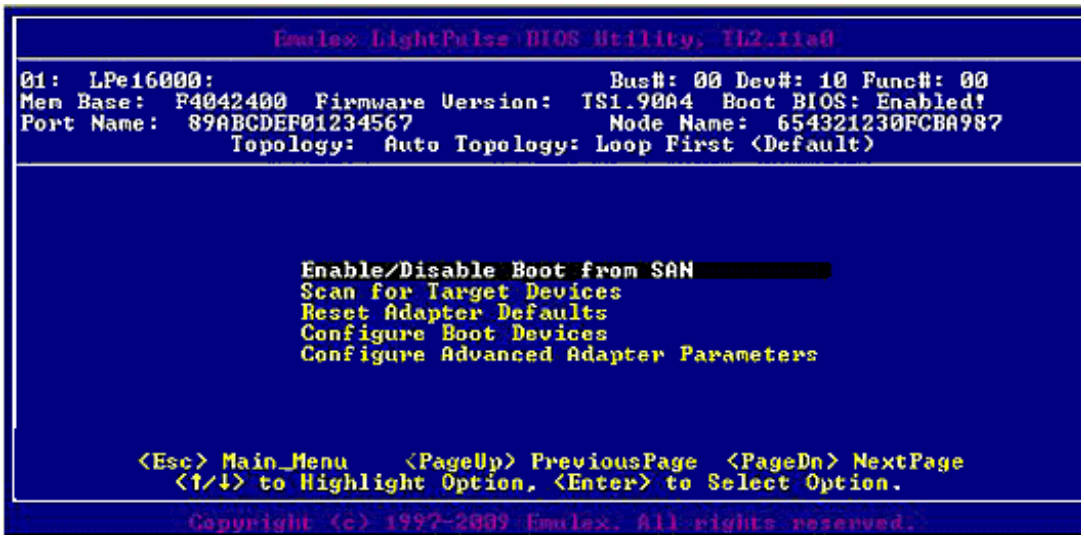

Figure 4-2 Main Configuration Menu

Under normal circumstances, you would first configure boot devices using the BIOS Utility (see "Configuring Boot Devices" on page 27). However, in the following two situations, you must perform the indicated procedure first:

- The adapter is not enabled to boot from SAN: You must enable the adapter's BIOS to boot from SAN (See "Enabling an Adapter to Boot from SAN" on page 27).
- You want to use a topology other than the default (auto topology with loop first): You must change the topology setting before configuring boot devices (See "Changing Topology" on page 34).

Enabling an Adapter to Boot from SAN

To enable an adapter to boot from SAN:

1. From the main configuration menu (Figure 4-2 on page 26), select **Enable/Disable Boot from SAN** and press **<Enter>**.

   Note: Adapters are disabled by default.

   Boot from SAN must be enabled on one adapter in order to use remote boot functionality. After you enable an adapter, the status of the Boot BIOS changes as shown in Figure 4-3 on page 27.

   Note: x86 BootBIOS supports a maximum of 16 or 32 ports depending on the adapter.

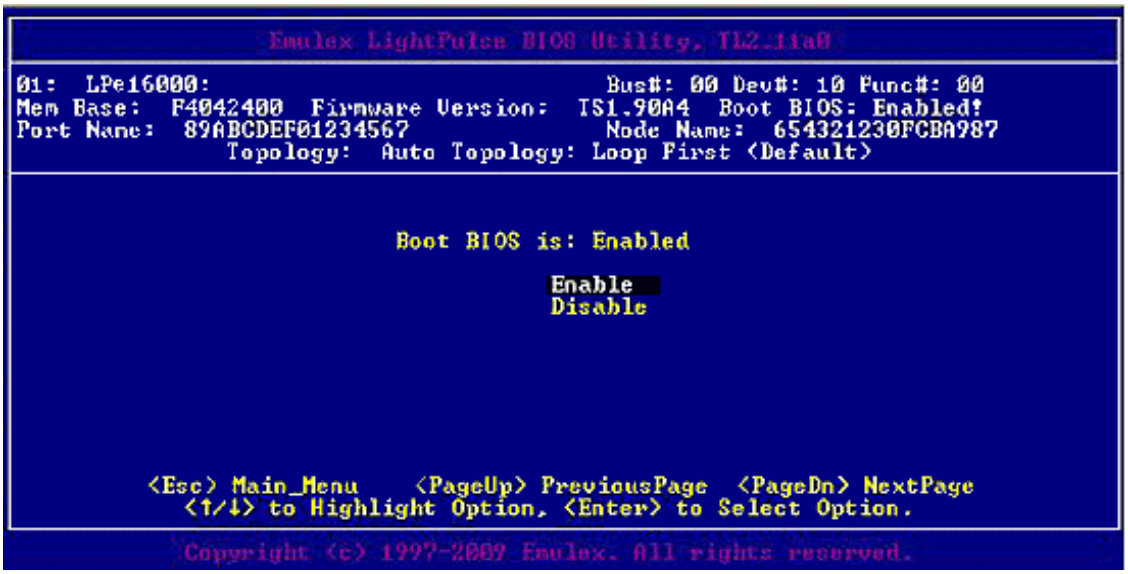

Figure 4-3 BIOS Status Screen

Configuring Boot Devices

This option supports FC_AL: (public and private loop) and fabric point-to-point. When operating in loop (FC_AL) topology, the system automatically determines whether you are configured for a public or private loop. The BIOS looks for a fabric loop (FL_Port) first. If a fabric loop is not detected, the BIOS looks for a private loop. For the "Configure Boot Devices" option, the eight boot entries are zero by default (<D> key).

Note: If you must change the topology, do it before you configure boot devices. The default topology is auto topology with loop first. For FC-AL, each adapter has a default AL_PA of 01 (Hexadecimal).

To configure boot devices:

1. On the main configuration menu (Figure 4-2 on page 26), select **Configure Boot Devices.**

   A list of eight boot devices is shown (Figure 4-4 on page 28). The primary boot device is the first entry shown, and it is the first bootable device.

   If the first boot entry fails due to a hardware error, the system can boot from the second bootable entry. If the second boot entry fails, the system boots from the third bootable entry and so on, if it is configured in the system BIOS on a BBS system.

Note: The Emulex BIOS utility only presents the boot devices to the system BIOS. The system BIOS must enumerate and attempt to boot from the drive as the primary hard drive from which to boot. See "Using Multi-Path Boot from SAN" on page 44.

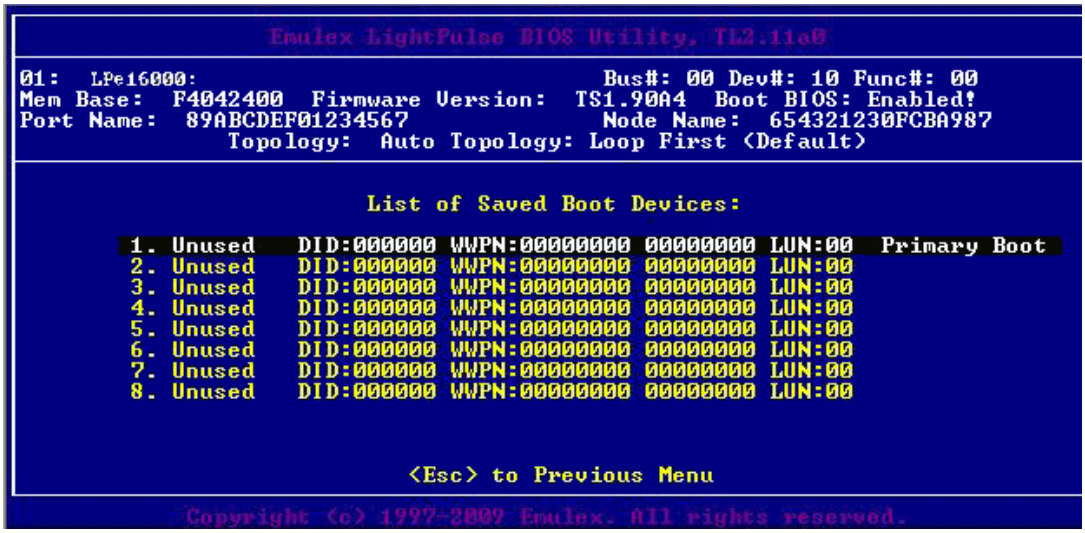

Figure 4-4 List of Saved Boot Devices Screen

2. Select a boot entry and press **<Enter>**. A screen similar to Figure 4-5 on page 29 is displayed.

Figure 4-5 Device Selection List Example (Array) Screen

Note: To minimize the amount of time needed to locate the boot device, Emulex recommends that you select the drive with the lowest AL_PA as the boot device when connected to devices on a FC arbitrated loop.

3. Select **<00>** and press **<Enter>** to clear the selected boot entry, or select the WWPN or DID of a device to configure.
4. If you select a device, you are prompted for the starting LUN. Enter the starting LUN (Figure 4-6 on page 29). The starting LUN can be any number from 0 to 255.

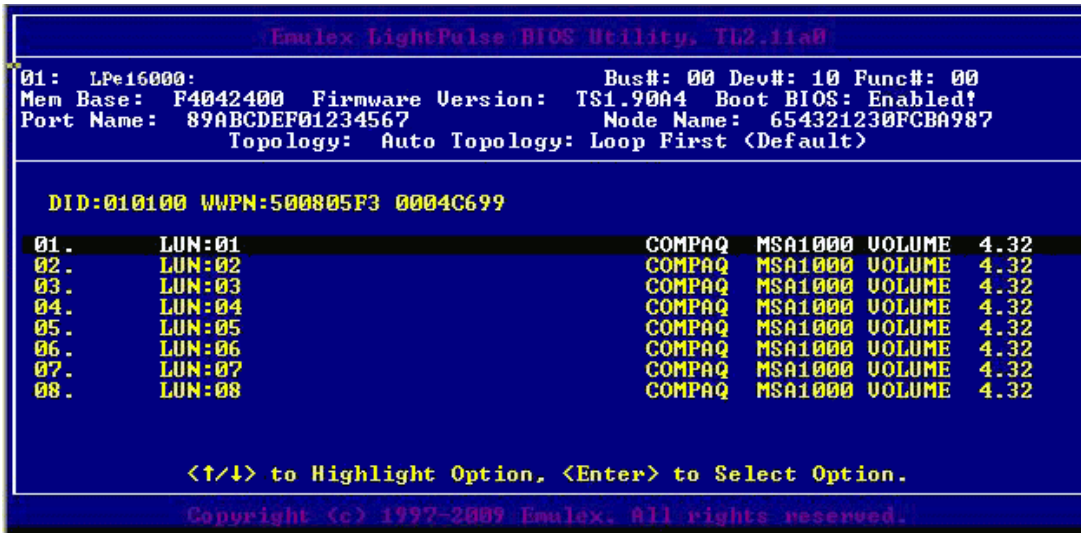

Figure 4-6 LUN listing Screen

You can define 256 LUNs per adapter, but the screen displays only 16 consecutive LUNs at a time. In front of each entry, B#D or B#W specifies the boot entry number

and whether the device boots by DID or WWPN. For example, B1D means that boot entry 1 boots from the DID. B2W means that boot entry 2 boots from WWPN.

5. Type the two digits corresponding to the entry you are selecting. The boot devices menu (Figure 4-7 on page 30) is displayed.

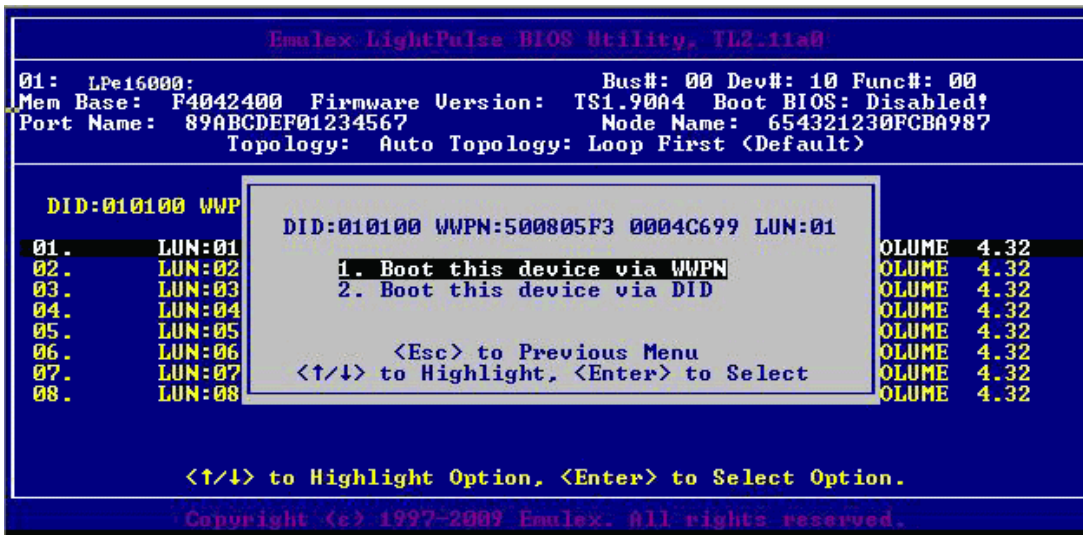

Figure 4-7 Boot Devices Menu

6. Use the up and down arrows to select the boot method you want. If you select to boot the device by WWPN, the WWPN of the earlier selected entry is saved in the flash memory. However, during the initial BIOS scan, the utility issues a Name Server Inquiry GID_PN (Get Port Identifier), converting the WWPN to a DID. Then, based on this DID, it continues with the remainder of the scanning.

   If you select to boot this device by DID, the earlier selected entry is saved in the flash memory (Figure 4-8 on page 30).

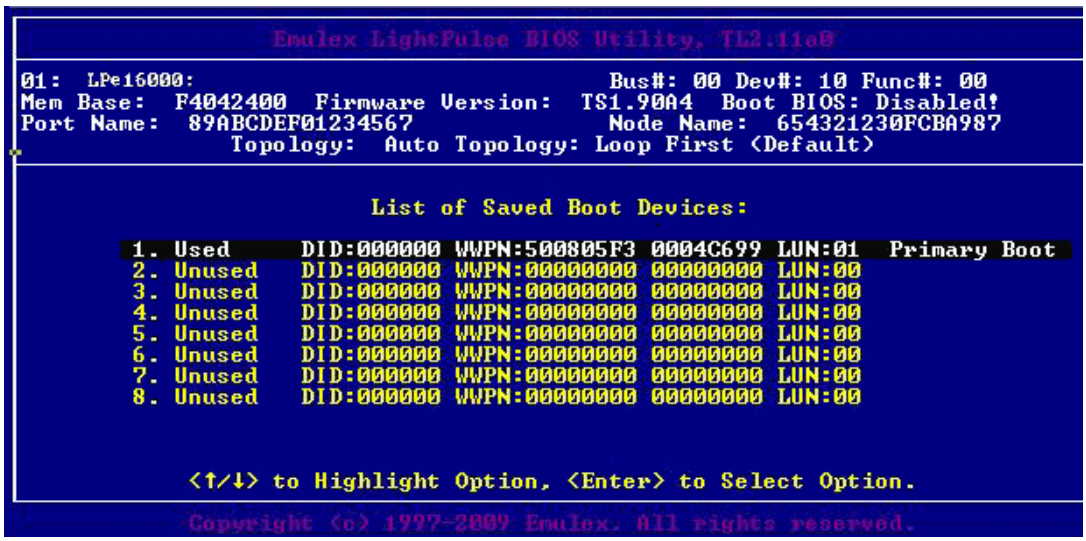

Figure 4-8 Primary Boot Device Set Up Screen

7. Press **<Enter>** to select the change.

8. Press **<Esc>** until you exit the BIOS utility.
9. Reboot the system for the new boot path to take effect.

Configuring Adapter Parameters

The BIOS utility has numerous options that can be modified to provide for different behavior. Use the BIOS utility to perform the following tasks:

- Change the default AL_PA of the adapter.
- Change the PLOGI retry timer.
- Select a topology.
- Enable or disable spinup delay.
- Set autoscan.
- Enable or disable EDD 3.0.
- Enable or disable the start unit command.
- Enable or disable the environment variable.
- Enable or disable the auto boot sector.
- Select a link speed.

Note: The default topology is auto topology with loop first. Change this topology setting, if necessary, before configuring boot devices.

To access the adapter configuration menu:

1. From the main configuration menu (Figure 4-2 on page 26), select **Configure Advanced Adapter Parameters** and press **<Enter>**. The adapter configuration menu is displayed (Figure 4-9 on page 31).

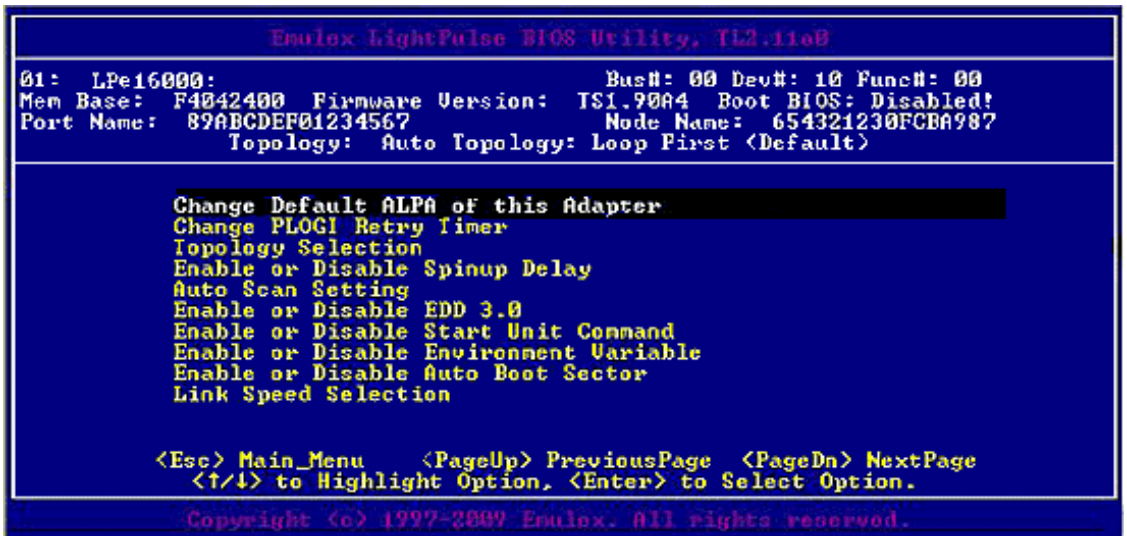

Figure 4-9 Adapter Configuration Menu

Default settings are acceptable for most installations.

To reset all values to their defaults, from the main configuration menu (Figure 4-2 on page 26) select **Reset Adapter Defaults** and press **<Enter>**.

Changing the Default AL_PA (Arbitrated Loop Physical Address)

The default value of the AL_PA for the adapter BIOS is 00 (hexadecimal). All adapters or boot drives can be configured to other AL_PAs rather than their default values.

Note: This option applies only to arbitrated loop (FC-AL).

To change the default AL_PA:

1. From the main configuration menu (Figure 4-2 on page 26), select **Configure Advanced Adapter Parameters**. The adapter configuration menu is displayed (Figure 4-9 on page 31).
2. Select **Change Default ALPA of this Adapter** and press **<Enter>**. Information similar to Figure 4-10 on page 32 is displayed.

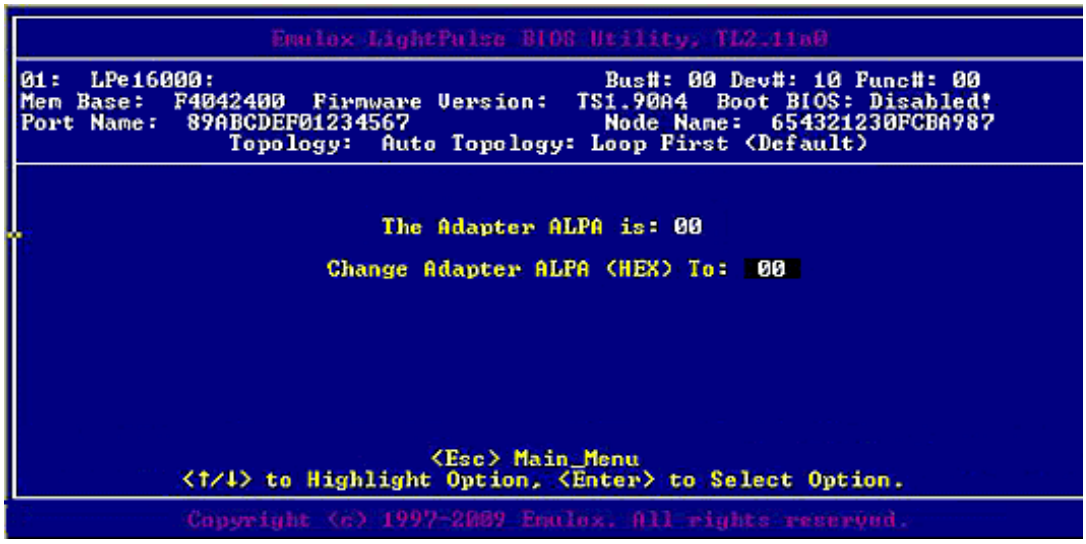

Figure 4-10 Change Default ALPA Screen

3. To change the default AL_PA, use the up and down arrow keys to scroll through the valid ALPAs. Table 4-1 below lists the valid AL_PA values.
4. Press **<Enter>** to accept the new value.
5. Press **<Esc>** until you exit the BIOS utility.
6. Reboot the system.

Note: If the adapter's AL_PA is changed, it does not appear on the NVRAM AL_PA until the system has been reset.

Table 4-1 Valid AL_PA Values

0x00	0x01	0x02	0x04	0x08	0x0F	0x10	0x17
0x18	0x1B	0x1D	0x1E	0x1F	0x23	0x25	0x26

Table 4-1 Valid AL_PA Values (Continued)

0x27	0x29	0x2A	0x2B	0x2C	0x2D	0x2E	0x31
0x32	0x33	0x34	0x35	0x36	0x39	0x3A	0x3C
0x43	0x45	0x46	0x47	0x49	0x4A	0x4B	0x4C
0x4D	0x4E	0x51	0x52	0x53	0x54	0x55	0x56
0x59	0x5A	0x5C	0x63	0x65	0x66	0x67	0x69
0x6A	0x6B	0x6C	0x6D	0x6E	0x71	0x72	0x73
0x74	0x75	0x76	0x79	0x7A	0x7C	0x80	0x81
0x82	0x84	0x88	0x8F	0x90	0x97	0x98	0x9B
0x9D	0x9E	0x9F	0xA3	0xA5	0xA6	0xA7	0xA9
0xAA	0xAB	0xAC	0xAD	0xAE	0xB1	0xB2	0xB3
0xB4	0xB5	0xB6	0xB9	0xBA	0xBC	0xC3	0xC5
0xC6	0xC7	0xC9	0xCA	0xCB	0xCC	0xCD	0xCE
0xD1	0xD2	0xD3	0xD4	0xD5	0xD6	0xD9	0xDA
0xDC	0xE0	0xE1	0xE2	0xE4	0xE8	0xEF	

Changing the PLOGI Retry Timer

This option is especially useful for Tachyon-based RAID arrays. In rare situations, a Tachyon-based RAID array resets itself and the port goes offline temporarily. When the port returns to operation, the port login scans the loop to discover this device. The port login retry interval is the time it takes for one port login to scan the whole loop (if 126 AL_PAs are on the loop). You can choose:

- No PLOGI Retry: 0 msec – default
- 50 msec takes 5 to 6 seconds per device
- 100 msec takes 12 seconds per device
- 200 msec takes 22 seconds per device

To set the interval for the port login retry timer:

1. On the main configuration menu (Figure 4-2 on page 26), select **Configure Advanced Adapter Parameters** and press **<Enter>**. The adapter configuration menu is displayed (Figure 4-9 on page 31).

2. Select **Change PLOGI Retry Timer** and press **<Enter>.** Information similar to Figure 4-11 on page 34 is displayed.

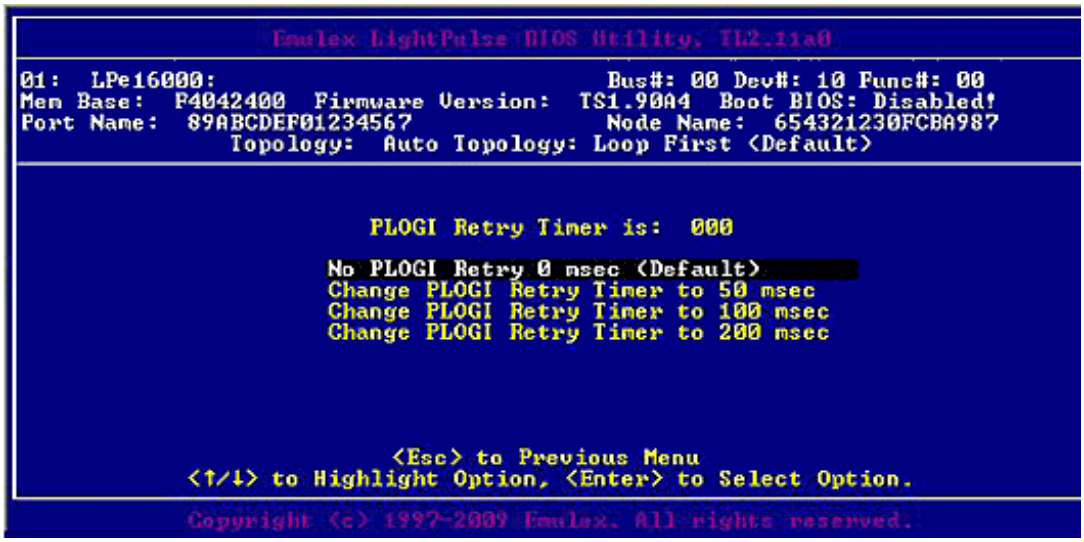

Figure 4-11 Change the PLOGI Retry Timer Screen

3. Select the retry timer interval.
4. Press **<Enter>** to accept the new interval.
5. Press **<Esc>** until you exit the BIOS utility.
6. Reboot the system.

Changing Topology

Emulex drivers support arbitrated loop and point-to-point topologies. If you must change the topology, do it before you configure boot devices. The default topology is auto topology with loop first. For FC-AL, each adapter has a default AL_PA of 01 (Hexadecimal).You can configure:

- Auto topology with loop first – default
- Auto topology with point-to-point first
- FC-AL
- Fabric point-to-point

To select the adapter topology:

1. On the main configuration menu (Figure 4-2 on page 26), select **Configure Advanced Adapter Parameters** and press **<Enter>**. The adapter configuration menu is displayed (Figure 4-9 on page 31).

2. Select **Topology Selection** and press **<Enter>**. Information similar to Figure 4-12 on page 35 is displayed.

Figure 4-12 Topology Menu

3. Select the topology for the adapter.
4. Press **<Enter>** to accept the new topology.
5. Press **<Esc>** until you exit the BIOS utility.
6. Reboot the system.

Enabling or Disabling the Spinup Delay

This option allows you to enable or disable the disk spinup delay. The factory default setting is disabled.

If at least one boot device has been defined, and the spinup delay is enabled, the BIOS searches for the first available boot device.

- If a boot device is present, the BIOS boots from it immediately.
- If a boot device is not ready, the BIOS waits for the spinup delay and, for up to three additional minutes, continues the boot scanning algorithm to find another multi-boot device.

If boot devices have not been defined and auto scan is enabled, then the BIOS waits for five minutes before scanning for devices.

- In a private loop, the BIOS attempts to boot from the lowest target AL_PA it finds.
- In an attached fabric, the BIOS attempts to boot from the first target found in the NameServer data.

To enable or disable the spinup delay:

1. On the main configuration menu (Figure 4-2 on page 26), select **Configure Advanced Adapter Parameters** and press **<Enter>**. The adapter configuration menu is displayed (Figure 4-9 on page 31).
2. Select **Enable or Disable Spinup Delay** and press **<Enter>**. The Enable or Disable Spinup Delay screen (Figure 4-13 on page 36) is displayed.

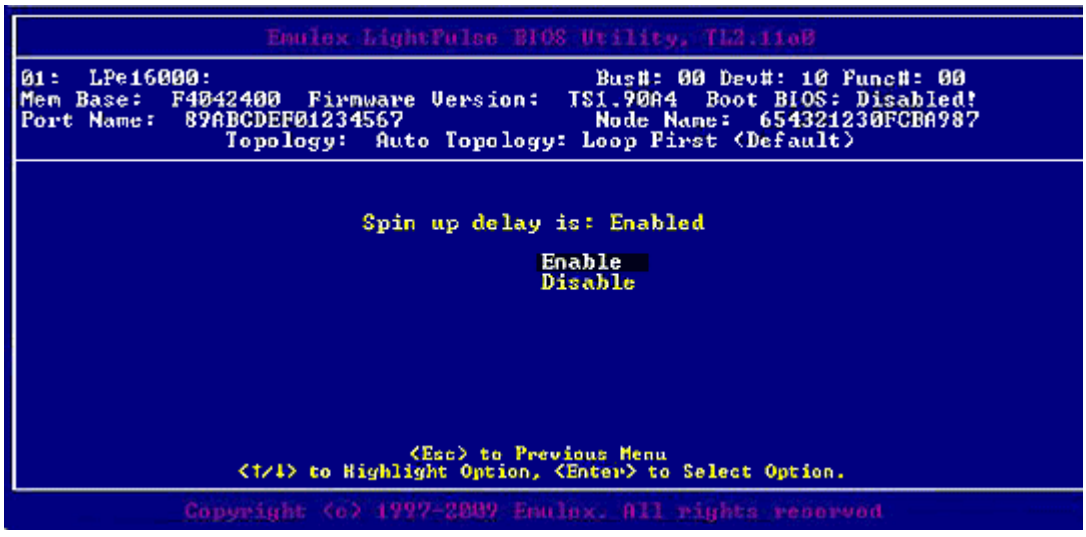

Figure 4-13 Enable or Disable Spinup Delay Screen

3. Select whether to enable or disable spinup delay.
4. Press **<Enter>** to accept the new value.
5. Press **<Esc>** until you exit the BIOS utility.
6. Reboot the system.

Setting Auto Scan

This option allows you to set auto scan and enable the first device in the boot entry list to issue a Name Server Inquiry. Auto scan is available only if none of the eight boot entries are configured to boot from DID or WWPN. The factory default is disabled. If there is more than one adapter with the same PCI Bus number in the system, and each has a boot drive attached, the first PCI-scanned adapter is the boot adapter.

Use the Boot Devices menu (Figure 4-7 on page 30) to configure up to eight boot entries for fabric point-to-point, public loop, or private loop configurations. The first adapter is usually in the lowest PCI slot in the system. This device is the only boot device and it is the only device exported to the multi-boot menu.

Auto scan options:

- Autoscan disabled – default.
- Any first device – The first adapter issues a Name Server Inquiry and the first D_ID from the inquiry becomes the boot device. The adapter attempts to log in to a public loop first. If it fails, it logs in to a private loop. The first successfully scanned device becomes the boot device. Only this device is exported to the multi-boot menu.
- First LUN 0 device
- First NOT LUN 0 device (a device other than LUN 0)

To set auto scan:

1. From the main configuration menu (Figure 4-2 on page 26), select **Configure Advanced Adapter Parameters** and press **<Enter>**. The adapter configuration menu is displayed (Figure 4-9 on page 31).
2. Select **Auto Scan Setting** and press **<Enter>**. Figure 4-14 on page 37 is displayed.

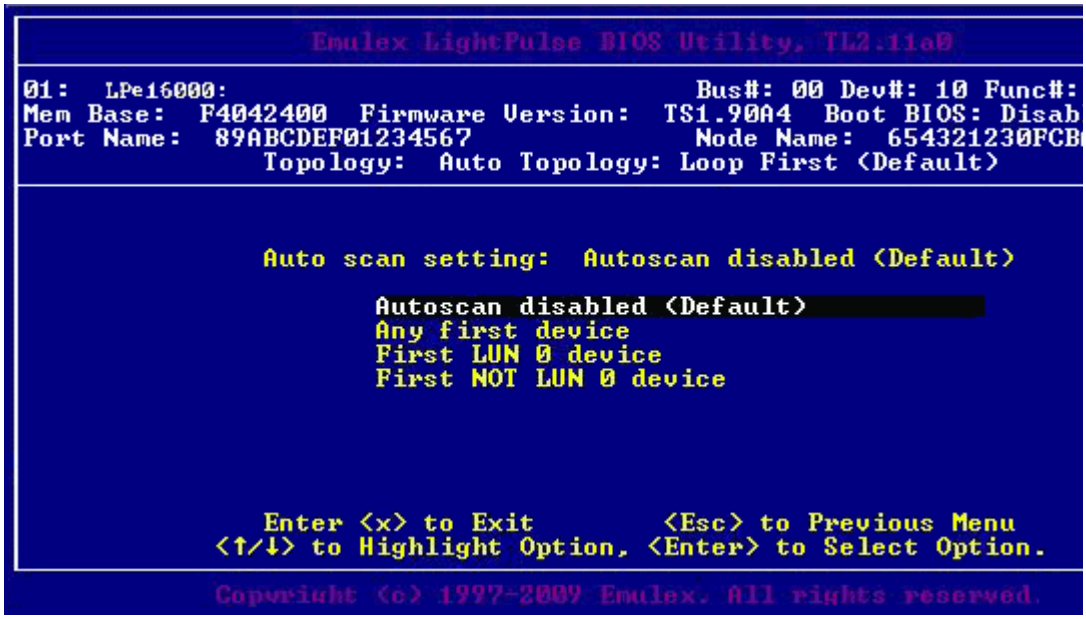

Figure 4-14 Set Auto Scan Menu

3. Select the desired auto scan option.

4. Press **<Enter>** to accept the new option.
5. Press **<Esc>** until you exit the BIOS utility.
6. Reboot the system.

Enabling or Disabling EDD 3.0

EDD 3.0 provides additional data to the operating system boot loader during the INT-13h function 48h (get device parameters) call. This information includes the path to the boot device and disk size. The default setting for EDD 3.0 is enabled.

Note: If EDD 3.0 is disabled, then EDD 2.1 is enabled.

To enable or disable EDD 3.0:

1. From the main configuration menu (Figure 4-2 on page 26), select **Configure Advanced Adapter Parameters** and press **<Enter>**. The adapter configuration menu is displayed (Figure 4-9 on page 31).
2. Select **Enable or Disable EDD 3.0**. The Enable or Disable EDD 3.0 screen (Figure 4-15 on page 38) is displayed.

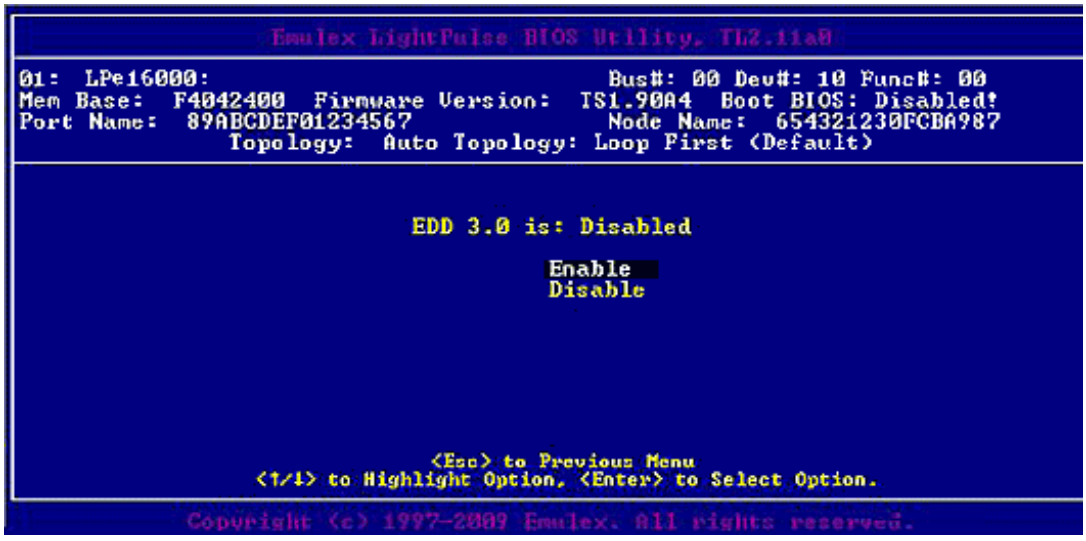

Figure 4-15 Enable or Disable EDD 3.0 Screen

3. Select the desired EDD 3.0 setting.
4. Press **<Enter>** to accept the new setting.
5. Press **<Esc>** until you exit the BIOS utility.
6. Reboot the system.

Enabling or Disabling the Start Unit Command

This option allows a start unit command to be sent to a particular disk. This may be needed if the disk you want to boot from is not yet spun up or started. You must know the specific LUN to issue the SCSI start unit command. The default setting is disabled.

To enable or disable the start unit command:

1. From the main configuration menu (Figure 4-2 on page 26), select **Configure Advanced Adapter Parameters** and press **<Enter>**. The adapter configuration menu is displayed (Figure 4-9 on page 31).
2. Select **Enable or Disable Start Unit Command** and press **<Enter>**. The Enable or Disable Start Unit Command screen (Figure 4-16 on page 39) is displayed.

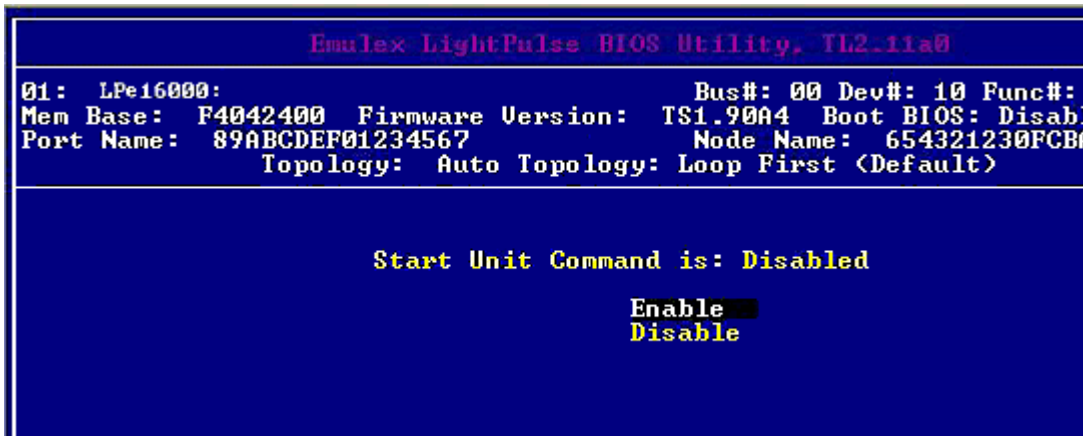

Figure 4-16 Enable or Disable Start Unit Command Screen

3. Select the desired Start Unit Command setting.
4. Press **<Enter>** to accept the new setting.
5. Press **<Esc>** until you exit the BIOS utility.
6. Reboot the system.

Enabling or Disabling the Environment Variable

This option sets the boot controller order if the system supports the environment variable. The default setting is disabled.

To enable or disable the environment variable:

1. From the main configuration menu (Figure 4-2 on page 26), select **Configure Advanced Adapter Parameters** and press **<Enter>**. The adapter configuration menu is displayed (Figure 4-9 on page 31).

2. Select **Enable or Disable** and press **<Enter>**. The Enable or Disable Environment Variable screen (Figure 4-17 on page 40) is displayed.

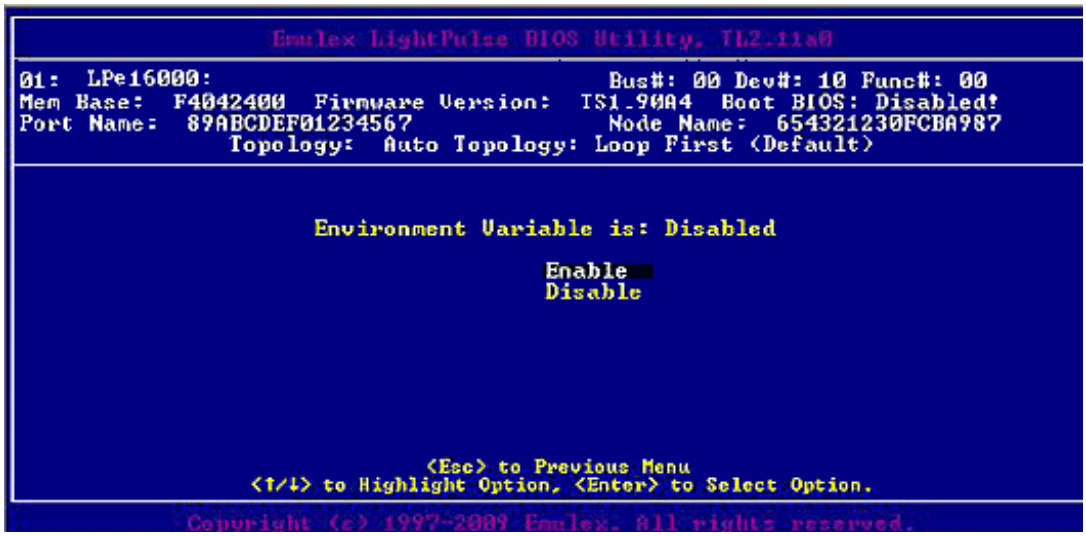

Figure 4-17 Enable or Disable Environment Variable Screen

3. Select the desired setting.
4. Press **<Enter>** to accept the new setting.
5. Press **<Esc>** until you exit the BIOS utility.
6. Reboot the system.

Enabling or Disabling Auto Boot Sector

This option automatically defines the boot sector of the target disk for the migration boot process, which applies only to HP MSA1000 arrays. If there is no partition on the target, the default boot sector format is 63 sectors. The default setting is disabled.

To enable or disable auto sector format select:

1. From the main configuration menu (Figure 4-2 on page 26), select **Configure Advanced Adapter Parameters** and press **<Enter>**. The adapter configuration menu is displayed (Figure 4-9 on page 31).

2. Select **Enable or Disable Auto Boot Sector** and press **<Enter>**. The Enable or Disable Auto Boot Sector Format Select screen (Figure 4-18 on page 41) is displayed.

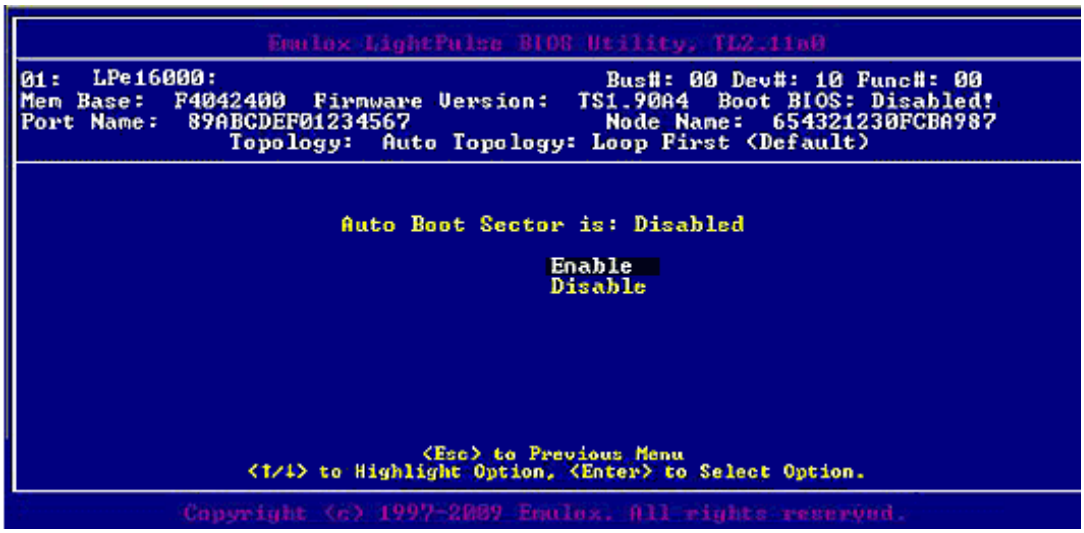

Figure 4-18 Enable or Disable Auto Boot Sector Format Select Screen

3. Select the desired setting.
4. Press **<Enter>** to accept the new setting.
5. Press **<Esc>** until you exit the BIOS utility.
6. Reboot the system.

Changing Link Speed

The default link speed is Auto Select, which automatically selects the link speed based on the adapter model.

Note: The Link Speed setting will be overwritten by the FC driver and will not take effect during a regular boot into the local operating system. Therefore, the link speed BIOS setting will work for the actual boot, but will be overwritten once the operating system loads.

Possible link speeds (depending upon your adapter model):

- Auto Select – default
- 1 Gbps
- 2 Gbps
- 4 Gbps
- 8 Gbps
- 16 Gbps

Note: Emulex 8 Gbps adapters do not support 1 Gbps link speed. Emulex 16 G/bs adapters do not support 1 Gbps or 2 Gbps link speed. Additionally, some older devices do not support auto link speed detection, therefore the link speed must be forced to match the speed of those devices.

To change the adapter's link speed:

1. From the main configuration menu (Figure 4-2 on page 26), select **Configure Advanced Adapter Parameters** and press **<Enter>**. The adapter configuration menu is displayed (Figure 4-9 on page 31).
2. Select **Link Speed Selection** and press **<Enter>**. The Link Speed Selection menu (Figure 4-19 on page 42) is displayed.

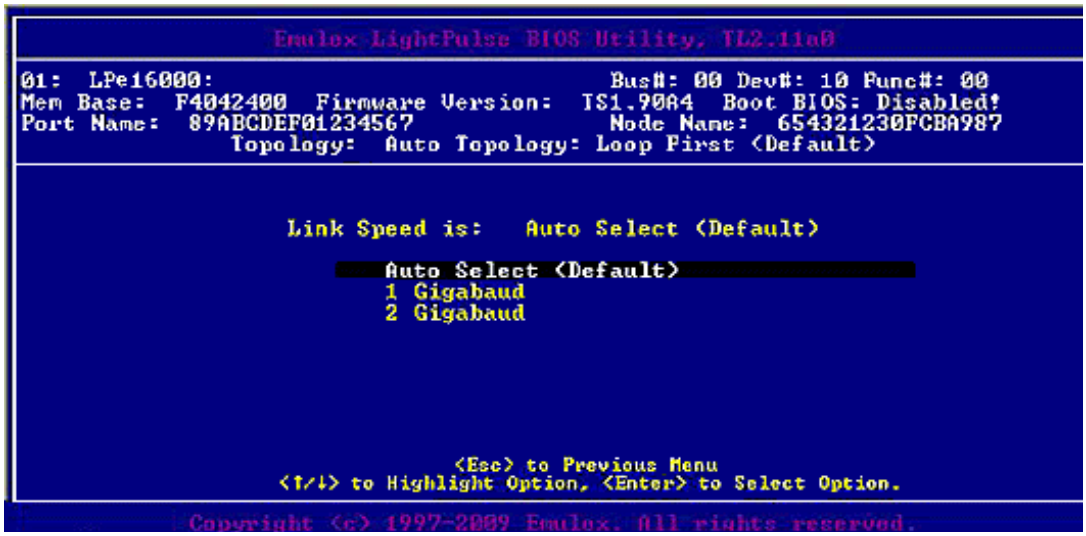

Figure 4-19 Link Speed Selection Menu

3. Use the up and down arrows to select the desired FC link speed you would like to use.
4. Press **<Enter>** to accept the new link speed.
5. Press **<Esc>** until you exit the BIOS utility.
6. Reboot the system.

Resetting to Default Values

The BIOS utility enables you to reset BIOS boot parameters to their factory default settings. These defaults are listed in Table 4-2.

Table 4-2 Adapter Defaults

Parameter	Default	Valid Values
Boot from SAN	Disabled	Enabled Disabled
ALPA Value	0x00 Fibre	See ALPA reference table ("Changing the Default AL_PA (Arbitrated Loop Physical Address)" on page 32.
EDD 3.0	EDD 3.0	Disabled (EDD 2.1) Enabled (EDD 3.0)

Table 4-2 Adapter Defaults (Continued)

Parameter	Default	Valid Values
PLOGI Retry Timer	Disabled	Disabled 50 msec 100 msec 200 msec
Spinup Delay	Disabled	Enabled Disabled
Auto Scan	Disabled	Enabled Disabled
Start Unit	Disabled	Enabled Disabled
Environmental Variable	Disabled	Enabled Disabled
Auto Boot Sector	Disabled	Enabled Disabled
Topology	Auto (start FC-AL)	Auto (start FC-AL) Point-to-Point Auto (start Point-to-Point) FC-AL
Link Speed	Auto (highest successfully negotiated speed)	

To reset parameters to their factory default settings:

1. On the main configuration menu (Figure 4-2 on page 26) select **Reset Adapter Defaults** and press **<Enter>**. A screen similar to Figure 4-20 on page 43 is displayed asking if you want to reset to the default settings.

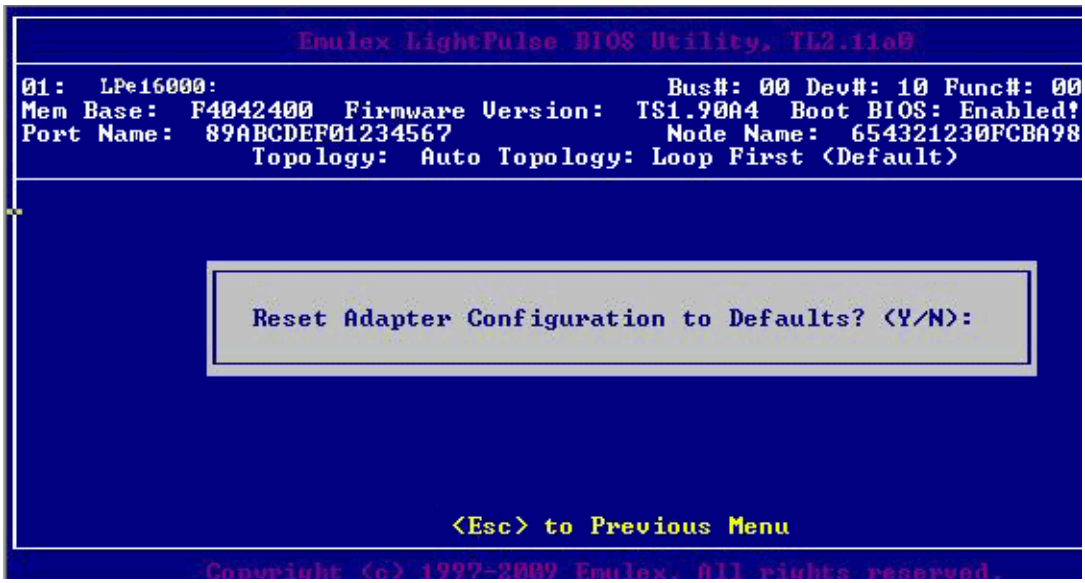

Figure 4-20 BIOS Utility Screen

2. Press **<Y>**.

   All settings revert to their factory default values.

   Note: After exiting the Emulex BIOS configuration utility, the system will reboot whether or not any changes were made.

Using Multi-Path Boot from SAN

Multi-boot BIOS is in compliance with the BIOS Boot Specification (BBS). The system must have a Multi-boot system BIOS to use this feature. Multi-boot BIOS allows you to select any boot disk in the system BIOS setup menu. The boot disk can be an FC drive, a SCSI drive, an IDE drive, a USB device, or floppy drive. The Emulex BIOS supplies the first eight drives to the system BIOS menu. The Multi-boot BIOS can override the FC drive that is selected in the BIOS utility.

For example, the system has eight FC disks only. The boot disk has ALPA 02. However, you can select ALPA 23 in the system BIOS setup menu. The boot device is the FC disk with ALPA 23 instead of ALPA 02, as is set in the BIOS utility.

If your system supports Multi-boot BBS, the local boot disk (drive C) is the first entry in Multi-boot on the system BIOS setup menu. The list of entries is determined by the list of configured boot entries in the BIOS utility. For example:

```
Adapter 1: boot_entry0, boot_entry1
Adapter 2: boot_entry2, boot_entry3
```

The order of boot entries exported to Multi-boot (BBS) is:

```
boot_entry0, boot_entry1, boot_entry2, and boot_entry3.
```

However, Multi-boot allows changing the boot order in the server BIOS, which allows any disk to become the C drive.

5. OpenBoot

OpenBoot commands are supported on SPARC systems.

Attribute Commands

The following commands show the boot device ID, boot list, OpenBoot versions, and so on.

.boot-id

Syntax	`..boot-id`
Description	Shows the current boot device ID.
Parameters	None

devalias

Syntax	`.devalias`
Description	Shows the boot list.
Parameters	None

.fcode

Syntax	`..fcode`
Description	Shows the current version of OpenBoot.
Parameters	None

host-did

Syntax	`.host-did`
Description	Shows the actual current ALPA of the adapter.
Parameters	None

.nvram

Syntax `..nvram`

Description Shows the current flags for OpenBoot.

```
show-devs
"/pci@1f,0/pci@1/lpfc@1" select-dev
   /* select lpfc@1 (for example) */
.nvram
```

Parameters None

probe-scsi-all

Syntax `.probe-scsi-all`

Description Shows the current SCSI and FC devices.

Parameters None

show-devs

Syntax `.show-devs`

Description Shows a list of the devices found.

Parameters None

.topology

Syntax `..topology`

Description Shows the current topology.

Parameters None

Functional Commands

The following commands remove boot IDs, resets default values, sets link speed, and so on.

.remove-boot-id

Syntax `.remove-boot-id`

Description Removes the boot ID from the boot list.

```
   "/pci@1f,0/pci@1/lpfc@1" select-dev
   remove-boot-id /* to clear boot id settings */
   unselect-dev
or
   "/pci@1f,0/pci@1/lpfc@1" select-dev
   set-default-mode /* to clear boot id settings */
   unselect-dev
```

Parameters None

set-default-mode

Syntax `set-default-mode`

Description Resets to the default value mode.

Parameters None

set-link-speed

Note: The Link Speed setting will be overwritten by the FC driver and will not take effect during a regular boot into the local operating system. Therefore, the link speed BIOS setting will work for the actual boot, but will be overwritten once the operating system loads.

Syntax `set-link-speed`

Description Shows the current link-speed setting. Changes and sets the link speed. The default is 0=Auto Select Link Speed.

Parameters
0=Auto Select Link Speed (Default)
1=1 Gbps Link Speed – Only
2=2 Gbps Link Speed – Only
4=4 Gbps Link Speed – Only
8=8 Gbps Link Speed – Only
16=16 Gbps Link Speed – Only

set-max-lun

Syntax `set-max-lun`

Description Shows the current maximum LUN support. Changes and sets the support setting, the default max lun is 256.

Parameters
0=Set Max Lun to 255 (Default)
1=Set Max Lun to 1023
2=Set Max Lun to 2047
3=Set Max Lun to 4095

set-post-linkup

Syntax `set-post-linkup`

Description Controls if a linkup is to occur during a POST. The default is off.

Parameters
0=Set Linkup Switch OFF (Default)
1=Set Linkup Switch ON

OpenBoot Signature

Target ID can be bound to either DID (destination ID) or WWPN (worldwide port name) and saved in an adapter NVRAM. It can also be saved in an environmental variable boot-device.

Table 5-1 OpenBoot Signature Table

Signature	OpenBoot signature
Valid_flag	internal flag for OpenBoot
Host_did	shows host DID number
Enable_flag	internal flag for OpenBoot
Topology_flag	topology flag for OpenBoot
Link_Speed_Flag	set link speed

Table 5-1 OpenBoot Signature Table

Signature	OpenBoot signature
Diag_Switch	set fcode diag switch
Boot_id	shows target ID number
Lnk_timer	internal use for OpenBoot
Plogi_timer	internal use for OpenBoot
LUN	shows boot LUN in use
DID	shows boot ID in use
WWPN	shows boot WWPN in use

6. Configuring Boot via UEFI HII (Human Interface Infrastructure) in a UEFI 2.1 System

You can configure boot functions using the Emulex Configuration Utility. If you have several adapters in your system, the UEFI system firmware or boot code uses the highest version driver that is on one of your adapters.

Note: Adapters with older versions of EFIBoot are managed by the more recent version, but only as long as the adapter with the most recent version is in the system. The adapters must be updated to actually update and not just use the most recent version available. EFIBoot is not supported on legacy CNAs such as the LP21000 and LP21002.

Updating an Adapter's Firmware or Boot Code

The Emulex UEFI Boot driver supports firmware updates by implementing the UEFI Firmware Management Protocol.

Starting the Emulex Configuration Utility

Depending on the OEM UEFI configuration, the Emulex Configuration Utility may appear under different setup menus in the OEM system firmware or BIOS.

To start the Emulex Configuration utility using HII:

1. Exit the UEFI shell (Figure 6-1 on page 50).

Figure 6-1 Exiting the UEFI Shell

A front page is displayed.

Note: Depending on the vendor UEFI configuration, the menu item on the front page that allows you to configure devices can be called Storage, Device Manager, Device Settings, or something else; see the documentation that accompanied the server.

2. Select the menu item that allows you to configure devices. On the screen that appears (Figure 6-2 on page 51), a list of all the adapters in the system is displayed. Your list may vary depending on the installed adapters.

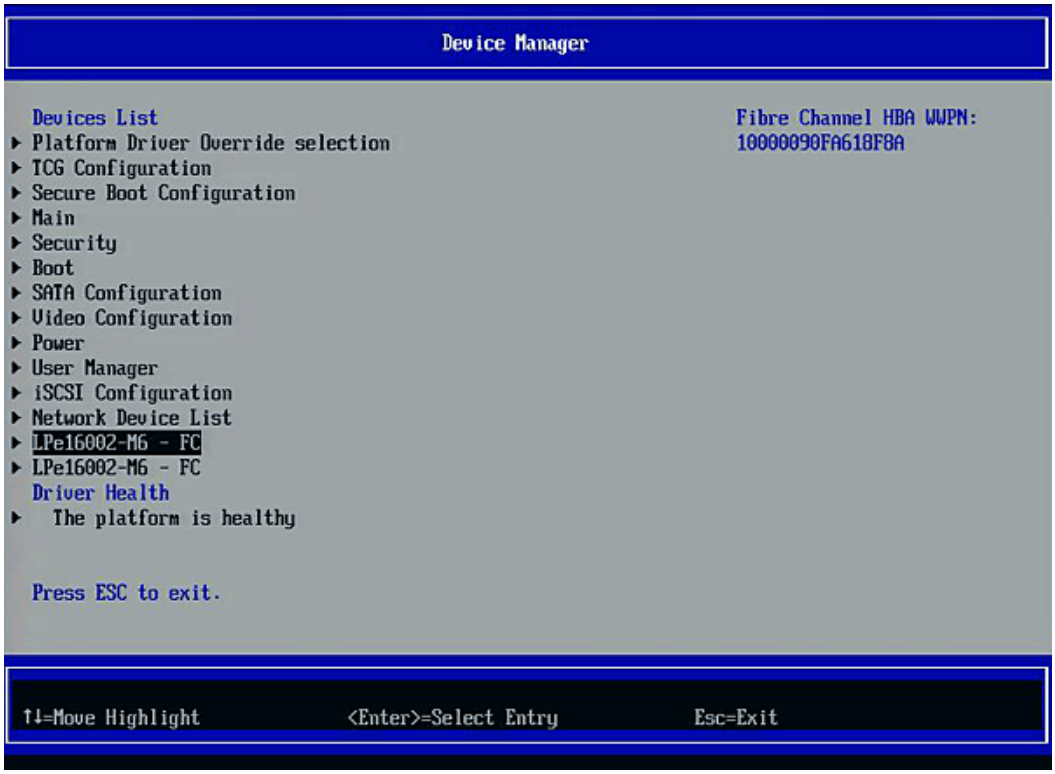

Figure 6-2 Device Configuration Screen Example

3. Select the adapter you want to configure and press **<Enter>**. The Emulex Adapter Configuration main menu screen (Figure 6-3 on page 52) is displayed.

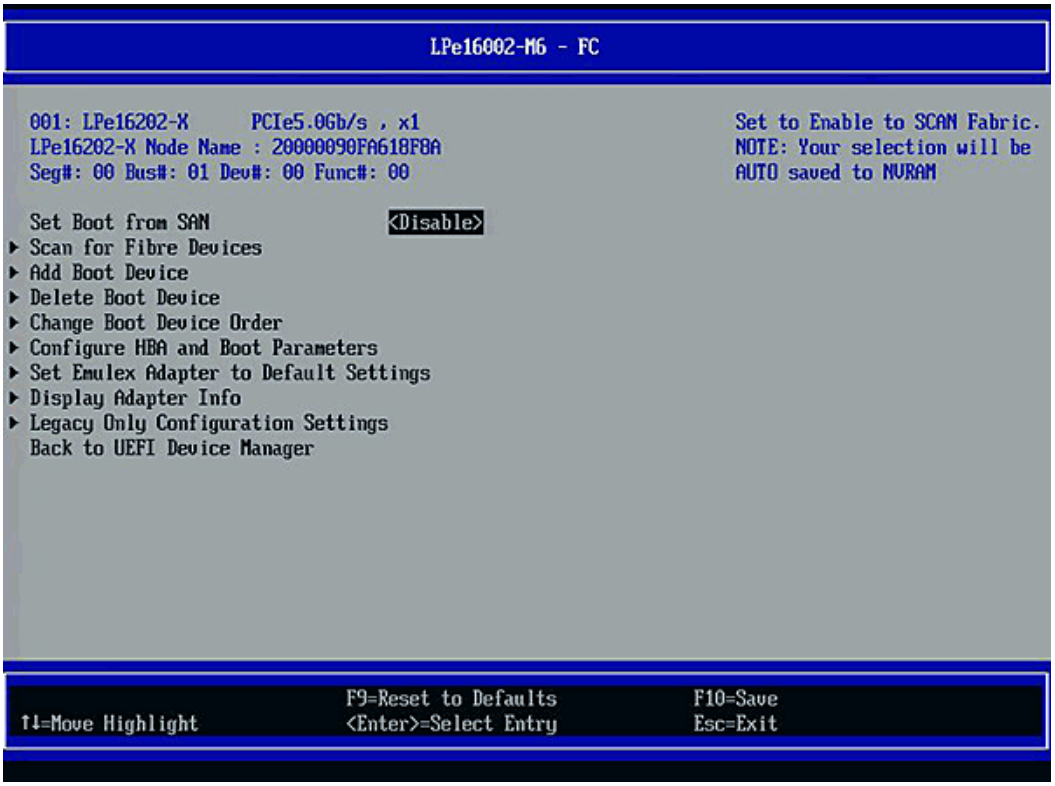

Figure 6-3 Emulex Adapter Configuration Main Menu Screen

Emulex Configuration Utility Conventions in UEFI/HII

The Emulex Configuration Utility has menus and configuration screens. Use the following methods to navigate them:

- Press the up and down arrows on your keyboard to move through and select menu options or configuration fields. When multiple adapters are listed, use the up and down arrows to scroll to the additional adapters.
- Press the **<+>**, **<->**, or **<Enter>** keys to change numeric values.
- Press **<Enter>** to select a menu option, to select a row in a configuration screen, or to change a configuration default.
- Use the navigation entries on the page to move about the utility.
- Select **Commit** to save changes. Select **Discard** to not save changes.

Configuring Boot in UEFI/HII

The Emulex Configuration Utility utility has numerous options that can be modified to provide for different behavior. Use the Emulex Configuration Utility utility to do the following tasks:

- Set boot from SAN
- Scan for fibre devices
- Add and delete boot devices
- Change boot device order
- Configure boot settings that apply only to Emulex Legacy boot
- Configure HBA and boot parameters
- Set adapters to their default settings
- Display adapter information

Note: Changes made to parameters common to UEFI and x86 drivers are changed in both driver configuration utilities.

Setting Boot from SAN

To set boot from SAN:

1. From the Adapter Selection screen (Figure 6-2 on page 51), select the adapter whose boot from SAN setting you want to change and press **<Enter>**.
2. From the Main menu (Figure 6-3 on page 52), select **Set Boot from SAN**. The current boot setting is displayed. Press **<Enter>**. A Disable/Enable menu appears (Figure 6-4 on page 53).

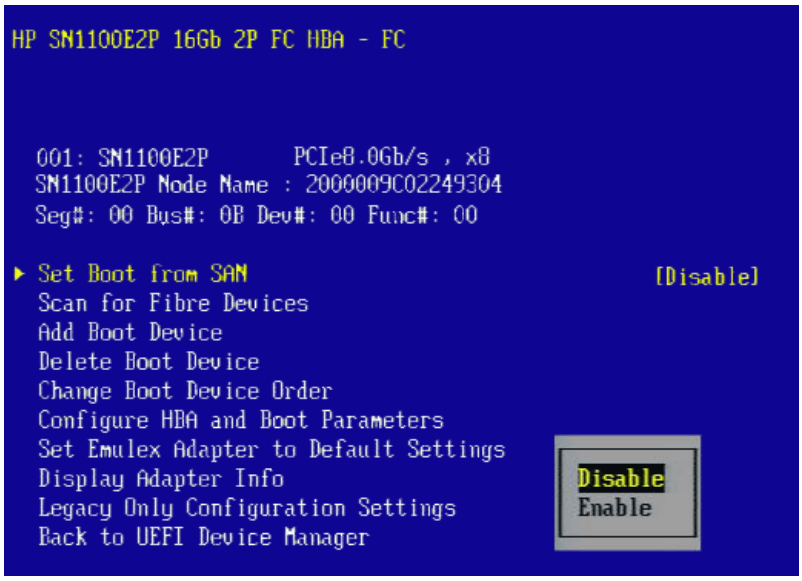

Figure 6-4 Main Menu, Boot from SAN Options Menu

3. Make your selection and press **<Enter>**. The utility displays the new boot from SAN setting (Figure 6-5 on page 54).

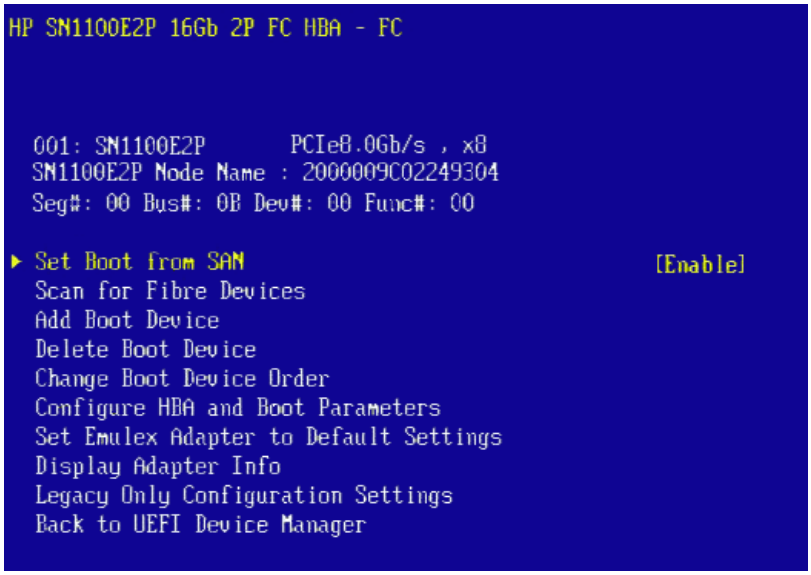

Figure 6-5 New Boot From SAN Setting

Scanning for Fibre Devices

To scan for fibre devices:

1. From the Device Configuration screen (Figure 6-2 on page 51), select the adapter that you want to scan for Fibre devices and press **<Enter>**.
2. From the Main menu (Figure 6-3 on page 52), select **Scan for Fibre Devices** and press **<Enter>**. A list of the discovered targets is displayed (Figure 6-6 on page 54). This is only a list of discovered target devices to determine SAN connectivity. To add or configure boot devices, see the following sections.

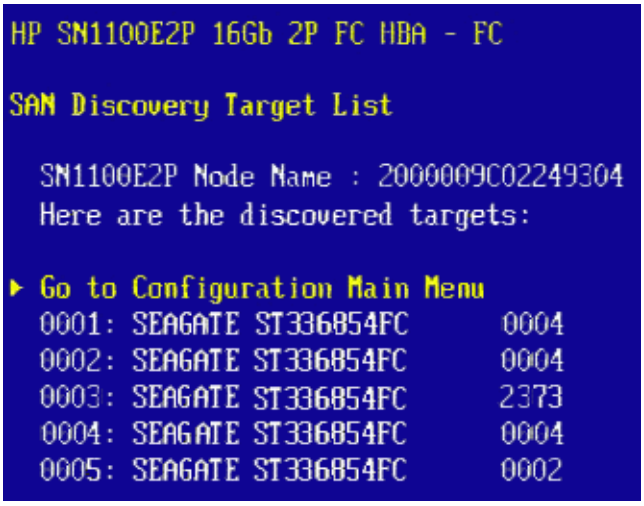

Figure 6-6 Discovered Targets Screen

Adding Boot Devices

To add a boot device:

1. From the Device Configuration screen (Figure 6-2 on page 51), select the adapter to which you want to add a boot device and press **<Enter>**.
2. From the Main menu (Figure 6-3 on page 52), select **Add Boot Device** and press **<Enter>**. A screen appears displaying the discovered targets (Figure 6-7 on page 55).

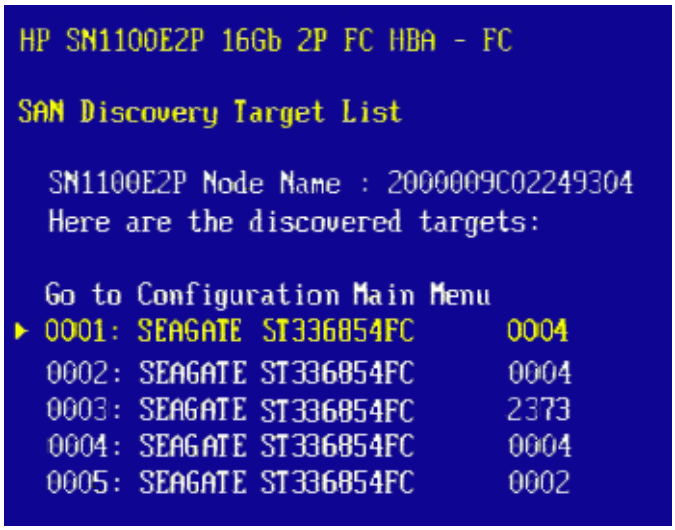

Figure 6-7 Discovered Targets Screen

3. Select the target you want and press **<Enter>**. A list of bootable LUNS is displayed (Figure 6-8 on page 55).

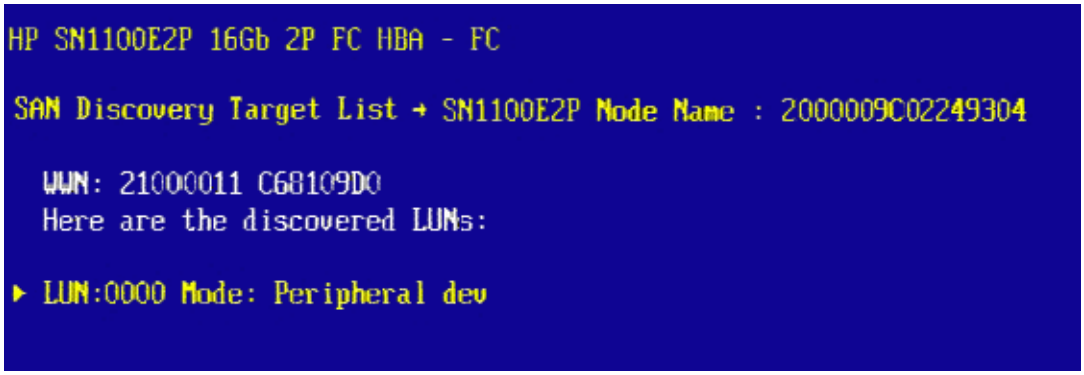

Figure 6-8 Boot Device Screen

4. Select the boot device you want to add and press **<Enter>**. A menu appears enabling you to commit or discard your changes (Figure 6-9 on page 56).

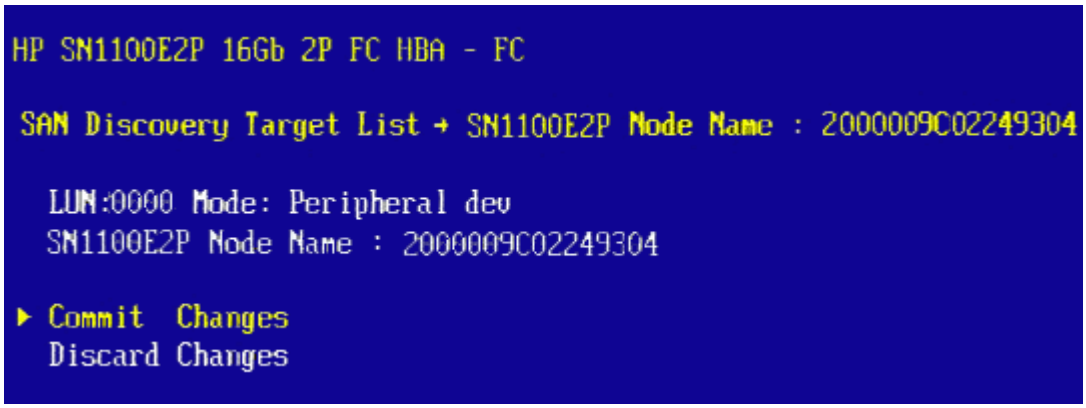

Figure 6-9 Commit/Discard Changes Menu

5. Select **Commit Changes** and press **<Enter>**.

Deleting Boot Devices

To delete boot devices:

1. From the Device Configuration screen (Figure 6-2 on page 51), select the adapter from which you want to delete a boot devices and press **<Enter>**.
2. From the Main menu (Figure 6-3 on page 52), select **Delete Boot Device** and press **<Enter>**. A list of boot devices is displayed (Figure 6-10 on page 56).

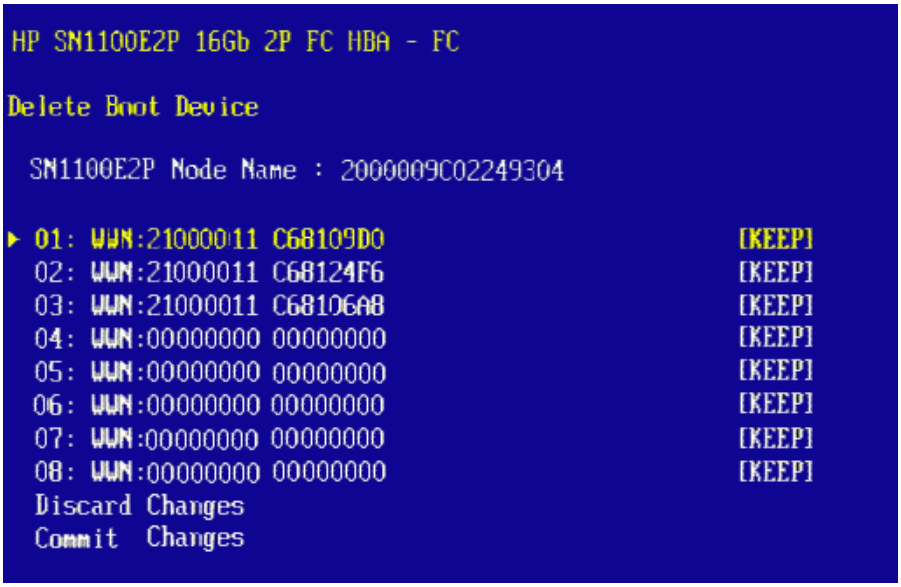

Figure 6-10 Boot Device Screen

3. Select the boot device you want to delete and press the space bar. The device is highlighted and KEEP changes to DELETE. (Figure 6-11 on page 57).

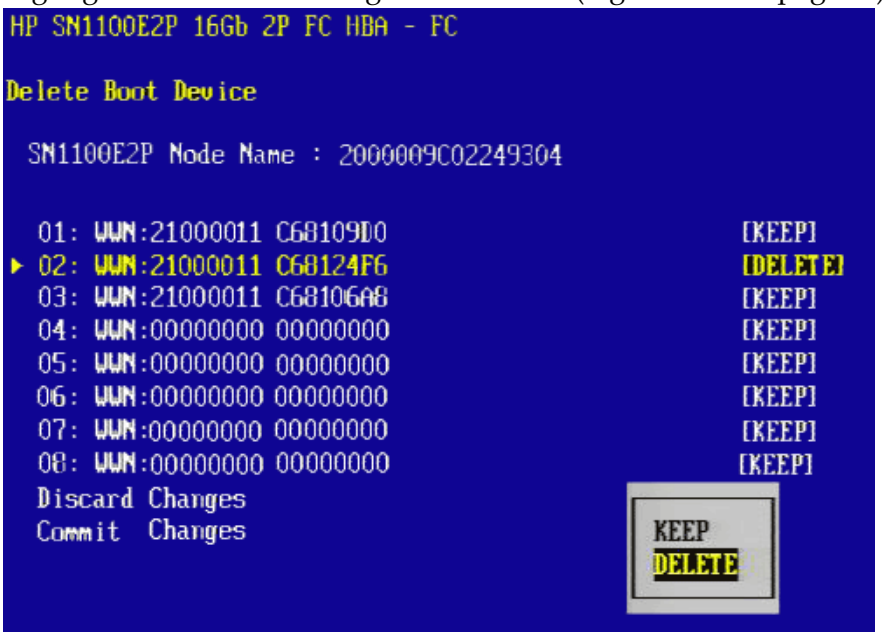

Figure 6-11 Selected Boot Device is highlighted

Note: This screen is different for LPe16000 adapters, but the functionality is the same.

4. Select **Commit Changes** and press **<Enter>**.

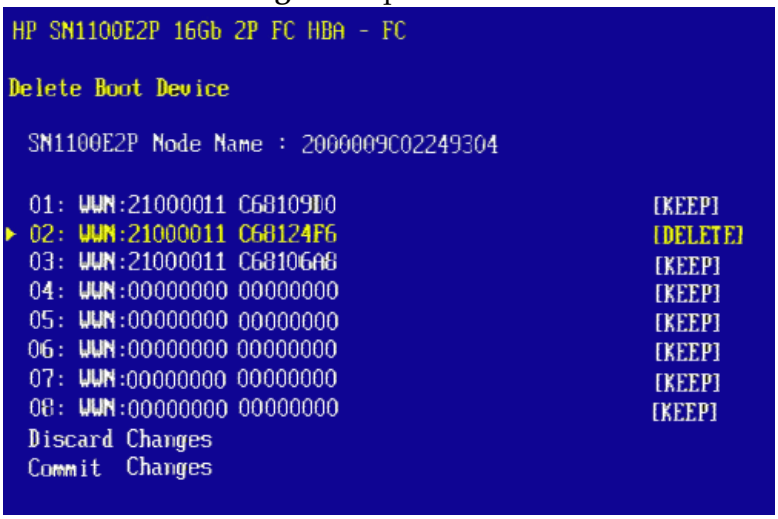

Figure 6-12 Confirm Boot Device Delete

Changing Boot Device Order

Note: Changing the boot device order only changes the order that the targets are discovered by the boot driver. The system BIOS controls the order that available boot devices in a system are prioritized.

To change boot device order:

1. From the Device Configuration screen (Figure 6-2 on page 51), select the adapter whose boot device order you want to change and press **<Enter>**.
2. From the Main menu (Figure 6-3 on page 52), select **Change Boot Device Order** and press **<Enter>**. A screen displaying the discovered targets appears (Figure 6-13 on page 58).

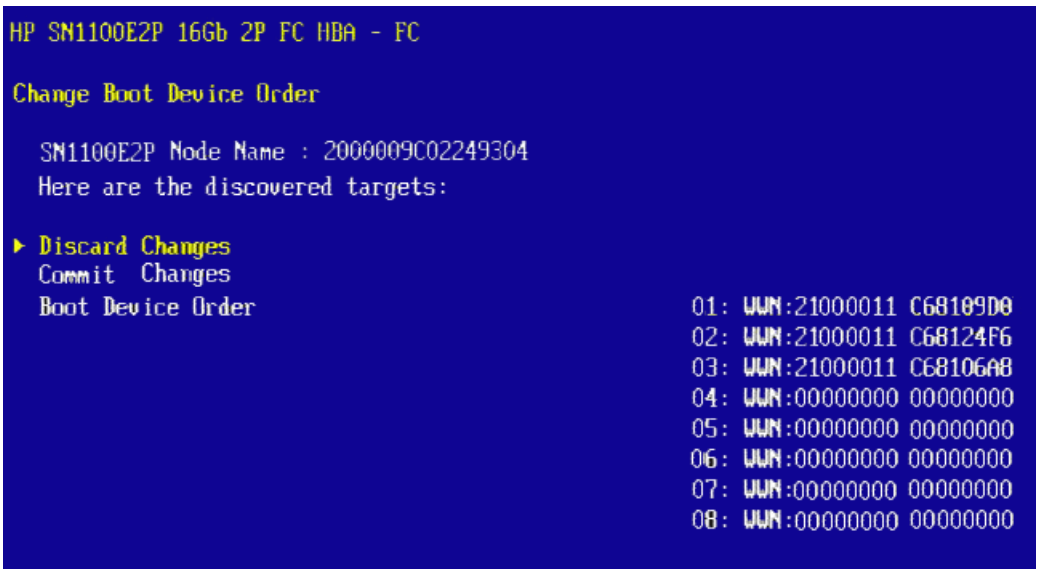

Figure 6-13 Discovered Targets Screen

3. Select **Boot Device Order** and press **<Enter>**. A screen appears displaying the boot device order (Figure 6-14 on page 58).

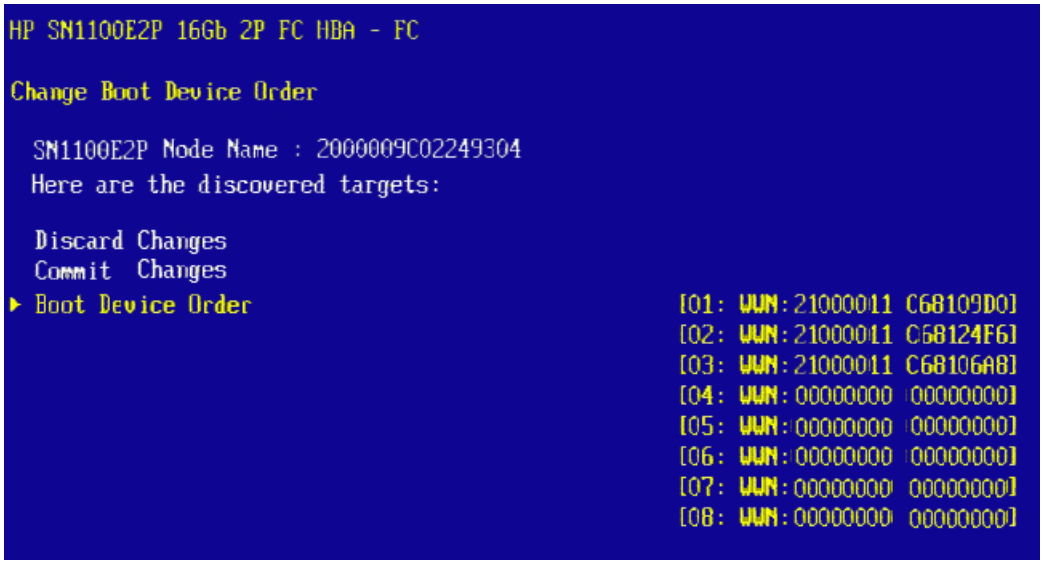

Figure 6-14 Boot Device Order Screen

4. Press **<Enter>**. The Boot Device Order menu screen appears (Figure 6-15 on page 59).

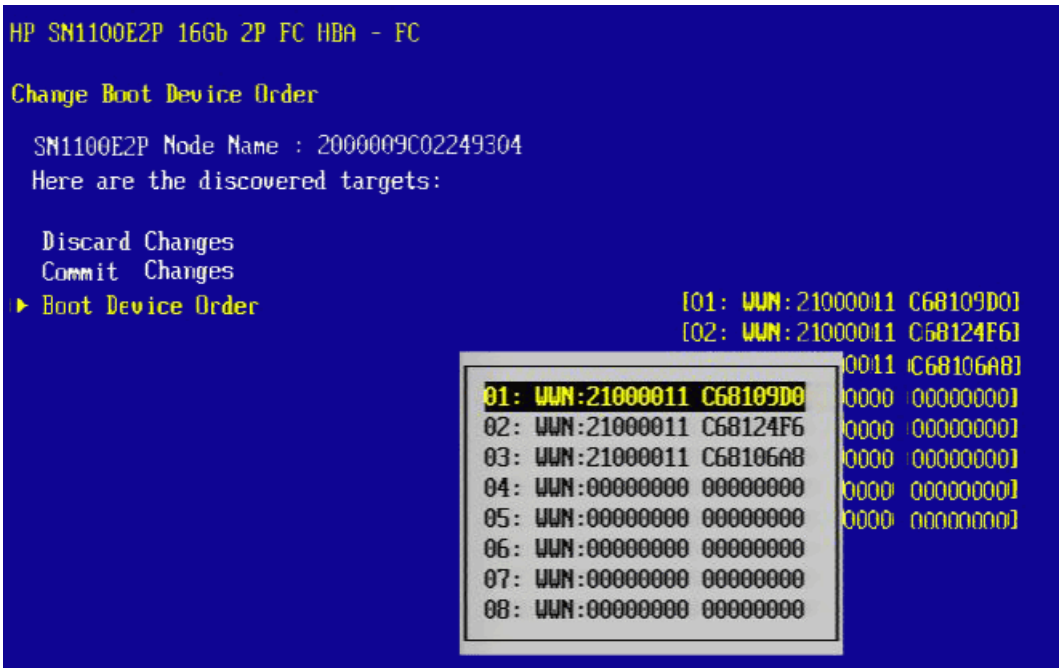

Figure 6-15 Boot Device Order Menu

5. From the menu, select the device whose boot order you want to change. Use the <+> or <-> keys to change the order of the selected device and press **<Enter>**. A screen appears showing the new boot device order.
6. Press **<Enter>** to confirm the changes.

Configuring Adapter Parameters

The Emulex Configuration Utility enables you to configure the following adapter parameters:

- Topology
- Port login (PLOGI) retry timer
- Link speed

Changing the Topology

Emulex drivers support arbitrated loop and point-to-point topologies. You can configure:

- Auto Loop first – default
- Auto point to point first
- Point to point
- FCAL

To change the topology:

1. From the Device Configuration screen (Figure 6-2 on page 51), select the adapter whose topology you want to change and press **<Enter>**.
2. From the Main menu (Figure 6-3 on page 52), select **Configure HBA and Boot Parameters** and press **<Enter>**.
3. From the Configure HBA and Boot Parameters menu (Figure 6-16 on page 60), navigate to **Topology Selection** and press **<Enter>**. The Topology menu screen appears (Figure 6-16 on page 60).

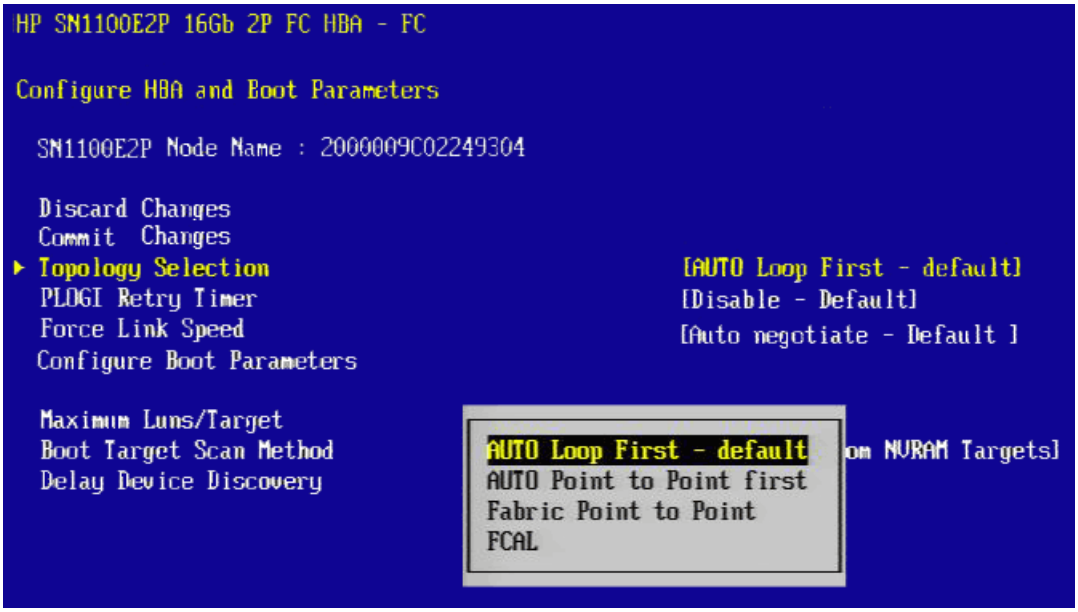

Figure 6-16 Topology Menu

4. Select a topology and press **<Enter>**. The screen is refreshed with the new value.

   The presence of a fabric is detected automatically.
5. Press **<Esc>** to return to the Emulex Configuration Utility menu.
6. Select **Commit Changes** and press **<Enter>**.

Changing the PLOGI Retry Timer

This option allows you to set the interval for the PLOGI retry timer. This option is especially useful for Tachyon-based RAID arrays. Under very rare occasions, a Tachyon-based RAID array resets itself and the port goes offline temporarily in the loop. When the port comes to life, the PLOGI retry interval scans the loop to discover this device.

You can choose:

- Disable – Default
- 50 Msec
- 100 Msec
- 200 Msec

To change timer values:

1. From the Device Configuration screen (Figure 6-2 on page 51), select the adapter whose PLOGI retry timer information you want to change and press **<Enter>**.
2. From the Main menu (Figure 6-3 on page 52), select **Configure HBA and Boot Parameters** and press **<Enter>**.
3. From the Configure HBA and Boot Parameters menu (Figure 6-16 on page 60), navigate to **PLOGI Retry Timer** and press **<Enter>**. The PLOGI Retry Timer menu appears.

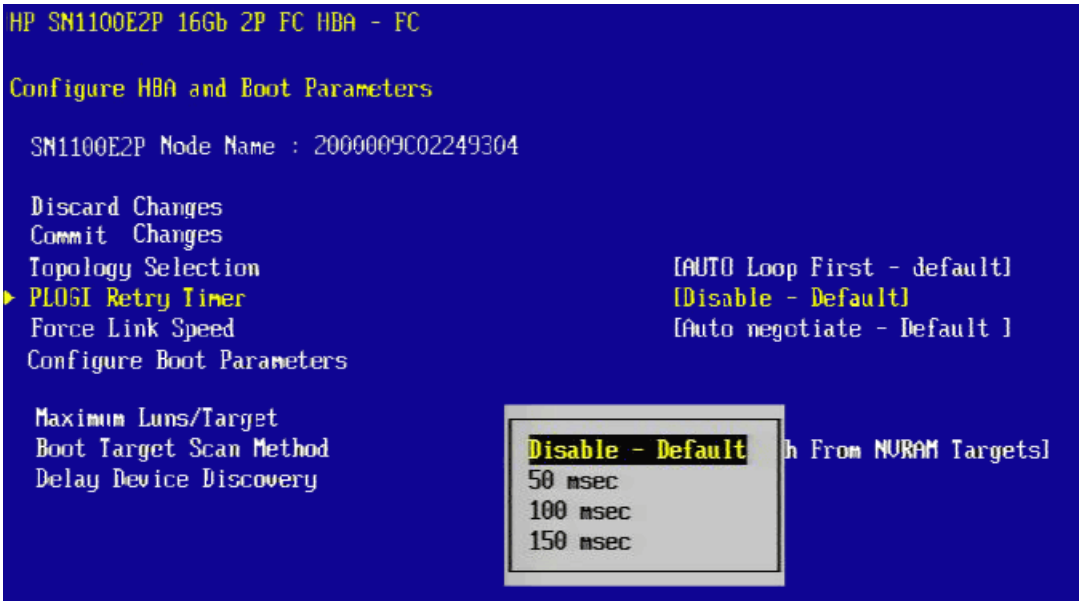

Figure 6-17 PLOGI Retry Timer Menu Screen

4. Select a retry timer option and press **<Enter>**. The screen is refreshed with the new value.
5. Press **<Esc>** to return to the Emulex Configuration Utility menu.
6. Select **Commit Changes** and press **<Enter>**.

Changing the Link Speed

Use this feature to change, or force, the link speed between ports instead of auto-negotiating. The supported link speeds depend upon the adapter. The menu only displays options that are valid for the selected adapter.

Note: The Link Speed setting will be overwritten by the FC driver and will not take effect during a regular boot into the local operating system. Therefore, the link speed BIOS setting will work for the actual boot, but will be overwritten once the operating system loads.

Possible link speed choices:

- Auto negotiate – Default
- 1 Gbps
- 2 Gbps
- 4 Gbps
- 8 Gbps
- 16 Gbps
- 8 Gbps or 4 Gbps
- 16 Gbps or 8 Gbps or 4 Gbps
- 16 Gbps or 8 Gbps

To change the link speed:

1. From the Device Configuration screen (Figure 6-2 on page 51), select the adapter whose link speed you want to change and press **<Enter>**.
2. From the Main menu (Figure 6-3 on page 52), select **Configure HBA and Boot Parameters** and press **<Enter>**.

3. From the Configure HBA and Boot Parameters menu (Figure 6-16 on page 60), navigate to **Force Link Speed** and press **<Enter>**. The Force Link Speed menu appears (Figure 6-18 on page 63).

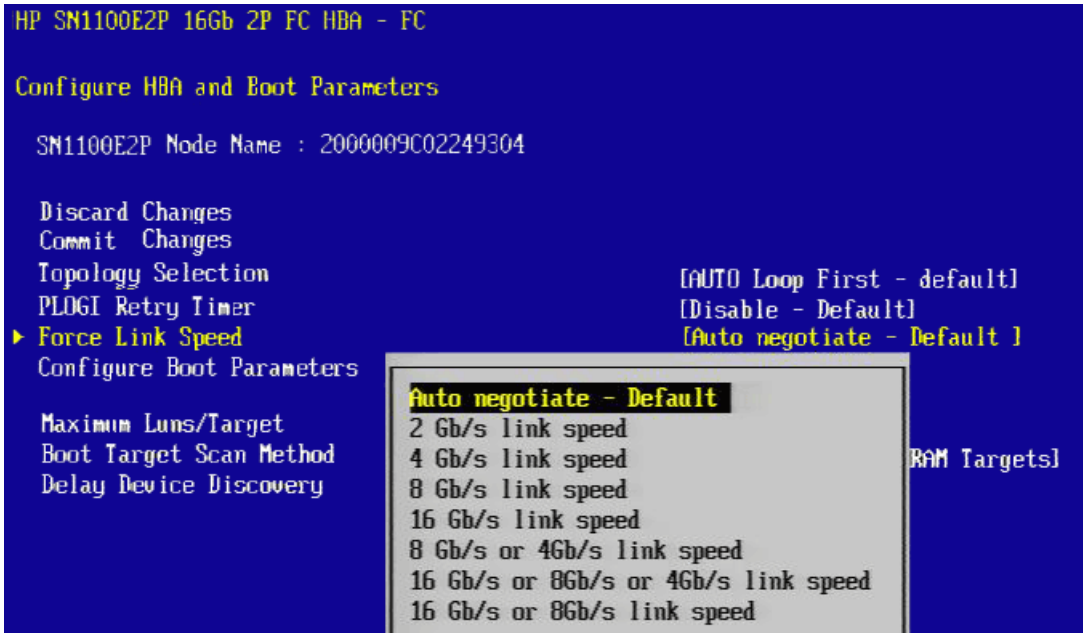

Figure 6-18 Force Link Speed Menu Screen

4. Select a link speed and press **<Enter>**.

   Note: Emulex 8 Gbps adapters do not support 1 Gbps link speed. Emulex 16 Gbps adapters do not support 1Gbps or 2 Gbps link speed.

   The screen is refreshed with the new value.

5. Press **<Esc>** to return to the Emulex Configuration Utility menu.
6. Select **Commit Changes** and press **<Enter>**.

Configuring Boot Parameters

You can change the:

- Maximum LUNS/targets
- Boot target scan method
- Device discovery delay

Changing the Maximum LUNs per Target

The maximum number of LUNs represents the maximum number of LUNs that are polled during device discovery. The minimum value is 1, the maximum value is 4096. The default is 256.

To change the maximum number of LUNs:

1. From the Device Configuration screen (Figure 6-2 on page 51), select the adapter whose maximum LUNs per target information you want to change and press **<Enter>**.
2. From the Main menu (Figure 6-3 on page 52), select **Configure HBA and Boot Parameters** and press **<Enter>**.
3. From the Configure HBA and Boot Parameters menu (Figure 6-16 on page 60), navigate to **Maximum Luns/Target** and press **<Enter>**. The screen becomes editable (Figure 6-19 on page 64).

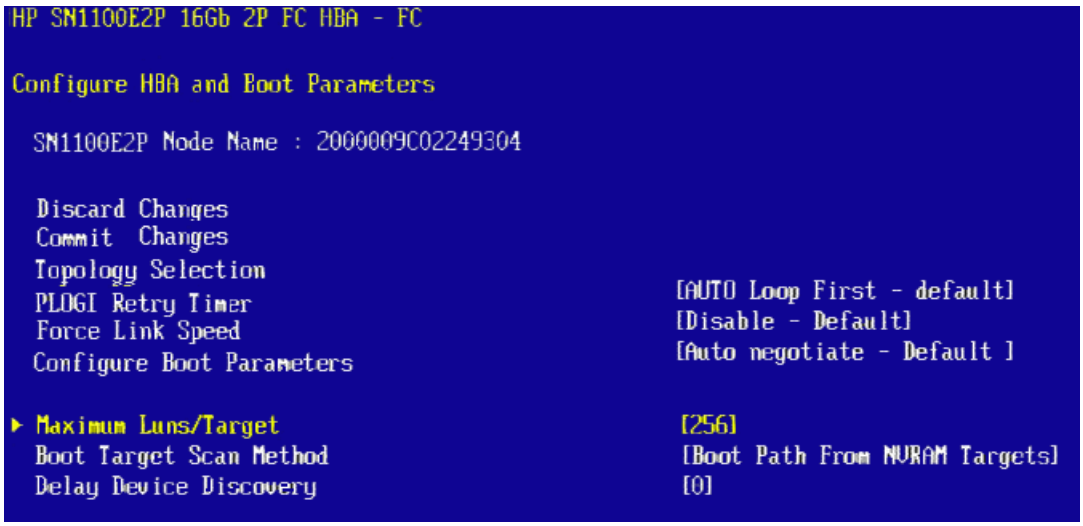

Figure 6-19 Maximum LUNs/Target Screen

4. Type the maximum LUN value (between 1 and 4096) and press **Enter**.

   The screen is refreshed with the new value.

   Note: 256 is the default, and typical, maximum number of LUNs in a target device. A higher number of maximum LUNs causes the discovery to take more time.

5. Press **<Esc>** to return to the Emulex Configuration Utility menu.
6. Select **Commit Changes** and press **<Enter>**.

Changing Boot Target Scan Method

This option is available only if none of the eight boot entries are configured to boot from DID or WWPN. The Configure Boot Devices menu is used to configure up to eight boot entries for fabric point-to-point, public loop, or private loop configurations.

The boot scan options are:

- Boot Path from NVRAM Targets – Boot scan discovers only LUNs that are saved to the adapter's NVRAM. Select up to eight attached devices to use as

potential boot devices. Limiting discovery to a set of eight selected targets can greatly reduce the time it takes for the EFIBoot driver to complete discovery.

- Boot Path from Discovered Targets – Boot scan discovers all devices that are attached to the FC port. Discovery can take a long time on large SANs if this option is used.
- Do not create a boot path.
- Boot Scan from EFIFCScanLevel – Allows third-party software to toggle between Boot Path from NVRAM and Boot Path from Discovered Targets by manipulating an UEFI system NVRAM variable. After the scan is set to EFIFCScanLevel, the scan method can be changed without entering the UEFI Boot configuration utility.

  If EFIFCScanLevel is selected, the scan is determined by the value of the EFIFCScanLevel variable maintained by the UEFI system firmware or boot code. The value of this variable can be changed either by using the menu in the EFIBoot Configuration utility, or by using third-party software.

To change the boot target scan method:

1. From the Device Configuration screen (Figure 6-2 on page 51), select the adapter whose boot target scan method you want to change and press **<Enter>**.
2. From the Main menu (Figure 6-3 on page 52), select **Configure HBA and Boot Parameters** and press **<Enter>**.
3. From the Configure HBA and Boot Parameters menu (Figure 6-16 on page 60), navigate to **Boot Target Scan Method** and press **<Enter>**. The Boot Target Scan Method menu appears (Figure 6-20 on page 65).

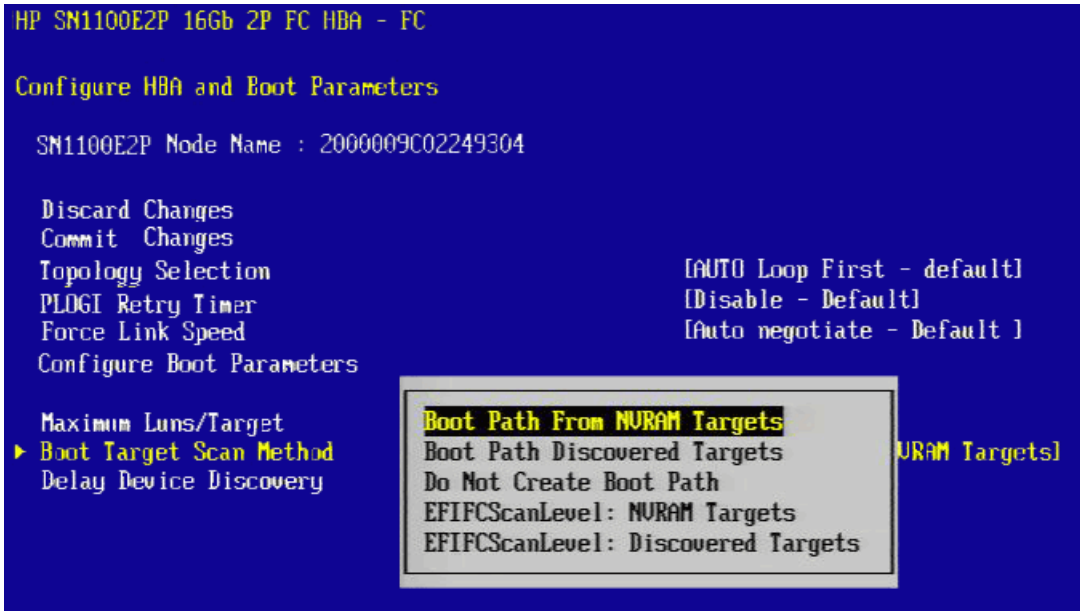

Figure 6-20 Boot Target Scan Method Menu Screen

4. Select a boot scan setting and press **<Enter>**.The screen is refreshed with the new value.

If you have a large SAN and set the boot path to "Boot Path Discovered Targets," discovery takes a long time.

5. Press **<Esc>** to return to the Emulex Configuration Utility menu.
6. Select **Commit Changes** and press **<Enter>**.

Changing Device Discovery Delay

This parameter sets a delay to occur after an loop initialization and before a scan is initiated to discover the target. The default is off or 0 seconds.

Change the default if you have an HP MSA1000 or HP MSA1500 RAID array and if both of the following conditions exist:

- The MSA array is direct connected or part of an arbitrated loop (for example, daisy chained with a JBOD).
- The boot LUN is not reliably discovered. In this case, a delay may be necessary to allow the array to complete a reset.

Caution: Do not change the delay device discovery time if your MSA array is connected to a fabric switch. Setting it to any other time guarantees that the maximum delay time is seen on every loop initialization.

If both of the conditions exist, typically set this parameter to 20 seconds. However, the delay only needs to be long enough for the array to be reliably discovered after a reset. Your value may be different.

To change the delay device discovery value:

1. From the Device Configuration screen (Figure 6-2 on page 51), select the adapter whose device discovery delay settings you want to change and press **<Enter>**.
2. From the Main menu (Figure 6-3 on page 52), select **Configure HBA and Boot Parameters** and press **<Enter>**.
3. From the Configure HBA and Boot Parameters menu (Figure 6-16 on page 60), select **Delay Device Discovery** and press **<Enter>**. The screen becomes editable (Figure 6-21 on page 66).

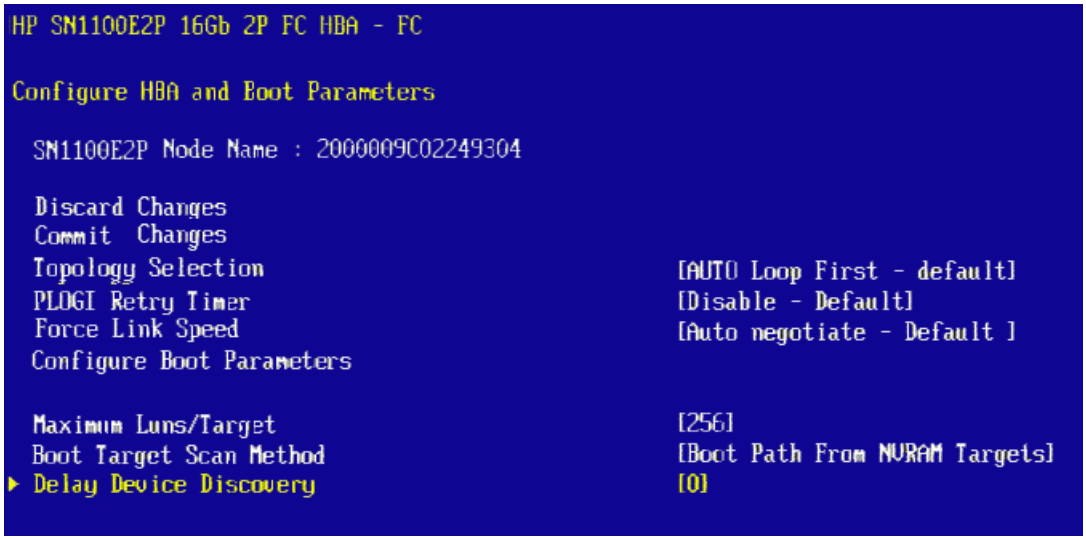

Figure 6-21 Delay Device Discovery Screen

4. Use the +/- keys to change the delay device discovery value in increments of 10 seconds and press **<Enter>**. The screen is refreshed with the new value.
5. Press **<Esc>** to return to the Emulex Configuration Utility menu.
6. Select **Commit Changes** and press **<Enter>**.

Resetting Emulex Adapters to Default Values

The Emulex Configuration Utility enables you to clear the NVRAM target list and set all boot device WWNNs back to 0.

These defaults are listed in Table 6-1.

Table 6-1 Adapter Defaults

Parameter	Default	Valid Values
Enable/Disable BIOS	Disabled	Enabled Disabled
PLOGI Retry Timer	Disabled	Disabled 50 msec 100 msec 200 msec
Boot Target Scan	Boot path from NVRAM targets	Boot path from NVRAM targets Boot path discovered targets Do not create boot path
Max LUNs Setting	256	0–4096

Table 6-1 Adapter Defaults (Continued)

Parameter	Default	Valid Values
Topology	Auto (start FC-AL)	Auto (start FC-AL) Point-to-Point Auto (start Point-to-Point) FC-AL
Delay Device Discovery	0000	0000–0255
Link Speed	0 (Auto-select)	<0> = Auto Select (the adapter's speed is selected automatically based on its model). <1> = 1 Gbps <2> = 2 Gbps <4> = 4 Gbps <8> = 8 Gbps <16> = 16 Gbps

To set Emulex adapters to their default settings:

1. From the Device Configuration screen (Figure 6-2 on page 51), select the adapter whose default settings you want to change and press **<Enter>**.
2. From the Main menu (Figure 6-3 on page 52), select **Set Emulex Adapters to Default Settings** and press **<Enter>.**
3. A menu screen appears enabling you to set defaults or cancel default settings (Figure 6-22 on page 68). Select **Set Adapter Defaults** and press **<Enter>**.

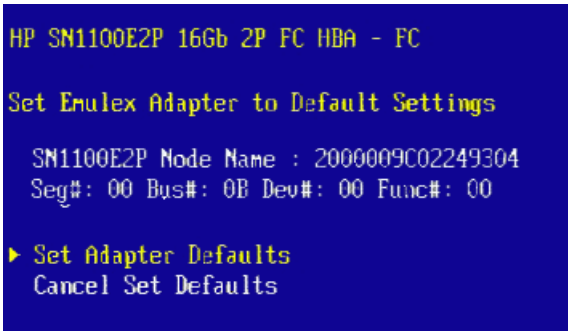

Figure 6-22 Adapter Selection Screen

Displaying Adapter Information

The Adapter Information screen displays the following information about the selected adapter:

- HBA status
- Boot from SAN status
- Link Speed
- Topology
- Firmware version

- Universal Boot version
- UEFI Boot version

To display adapter information:

1. From the Device Configuration screen (Figure 6-2 on page 51), select the adapter whose information you want to view and press **<Enter>**.
2. From the Main menu (Figure 6-3 on page 52), select **Display Adapter Info** and press **<Enter>**. A screen appears displaying information about the selected adapter (Figure 6-23 on page 69).

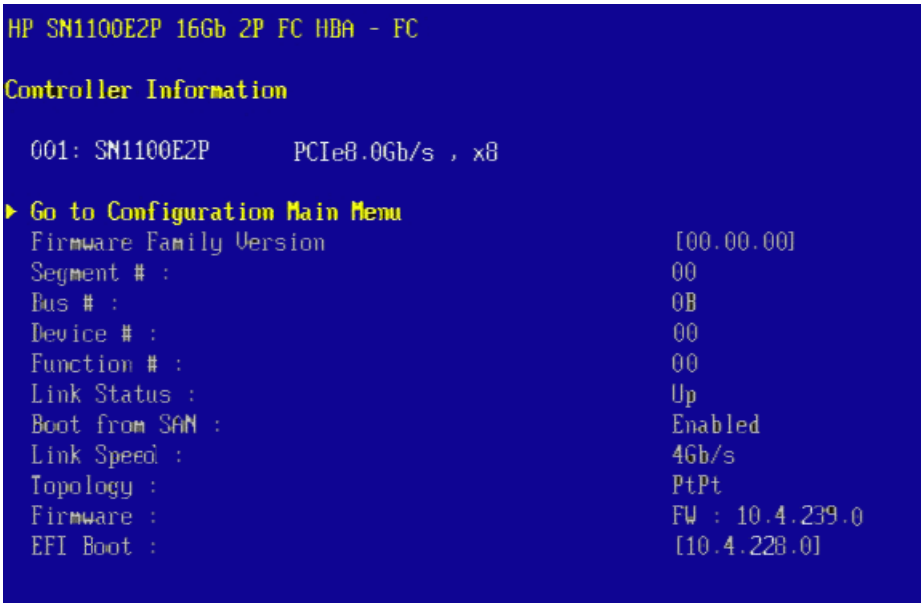

Figure 6-23 Adapter Information Screen

Legacy Only Configuration Settings

To change legacy only configuration settings:

1. From the Device Configuration screen (Figure 6-2 on page 51), select the adapter whose Legacy settings you want to change and press **<Enter>**.
2. From the Main menu (Figure 6-3 on page 52), select **Legacy Only Configuration Settings** and press **<Enter>**.

3. A screen appears displaying settings that apply only to the Emulex Legacy boot driver (Figure 6-24 on page 69).

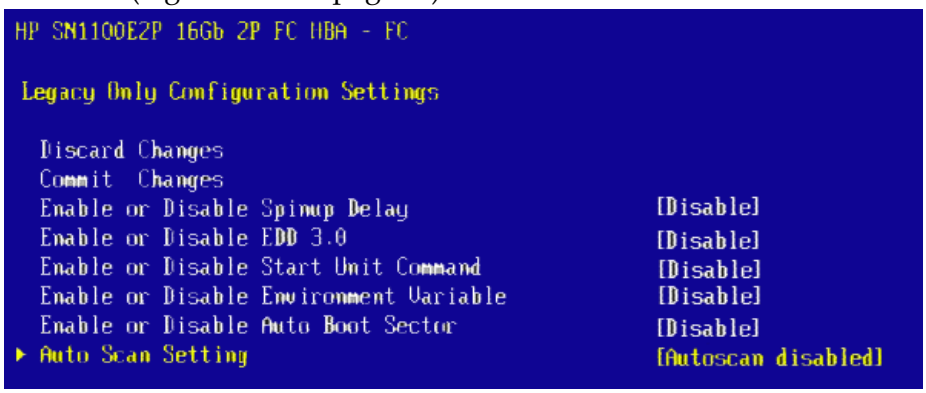

Figure 6-24 Legacy Only Configuration Settings Screen

4. Make desired changes to any of these settings and select **<ESC>** or **Commit Changes**.

Refer to the "Emulex BIOS Utility" on page 25 for a description of the Legacy Only settings displayed in Figure 6-24 on page 69.

Enabling or Disabling OCSD Settings (HP systems only)

During a POST, this setting causes the EFIBoot driver to register (ENABLED), or not register (DISABLED) the device (that is, to add any entries) in the OCSD or OCBB buffers, as defined in the Option Card Sensor Data Reporting specification.

Note: This menu is for HP systems only and will not appear on other systems.

To enable or disable OCSD:

1. Open the HP System Configuration menu (Figure 6-25 on page 70).

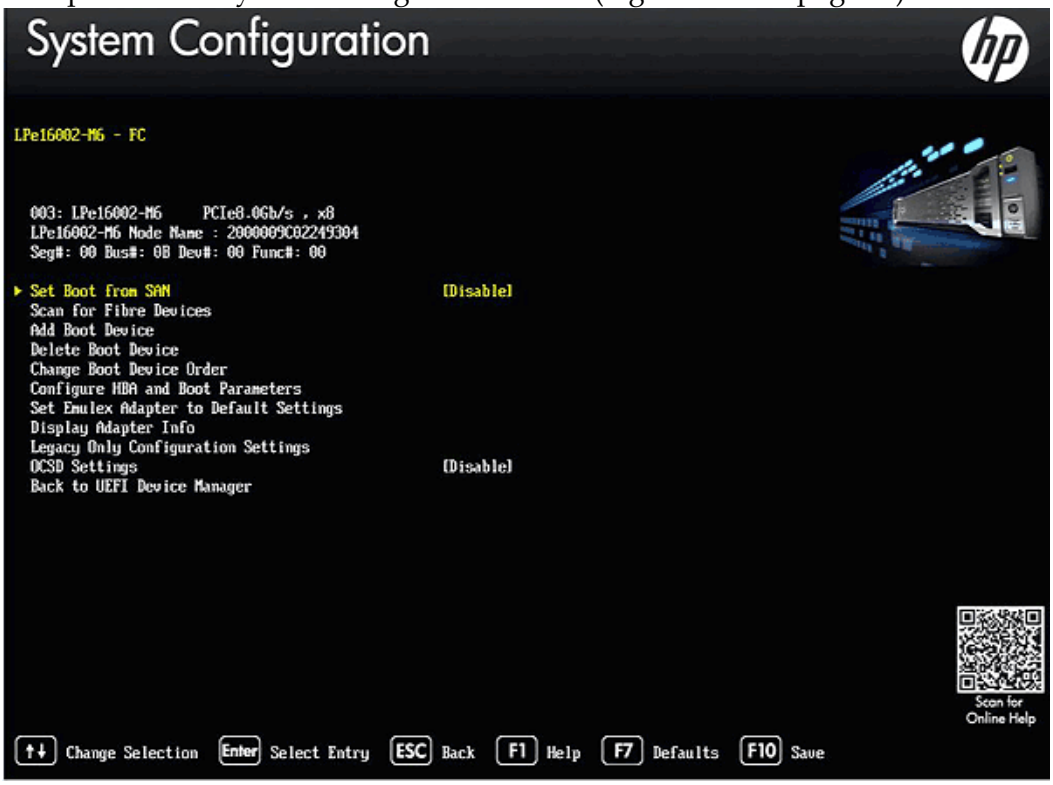

Figure 6-25 HP System Configuration Menu Screen

2. Navigate to OCSD Settings and press **<Enter>**. The Disable/Enable menu appears. (Figure 6-26 on page 71).

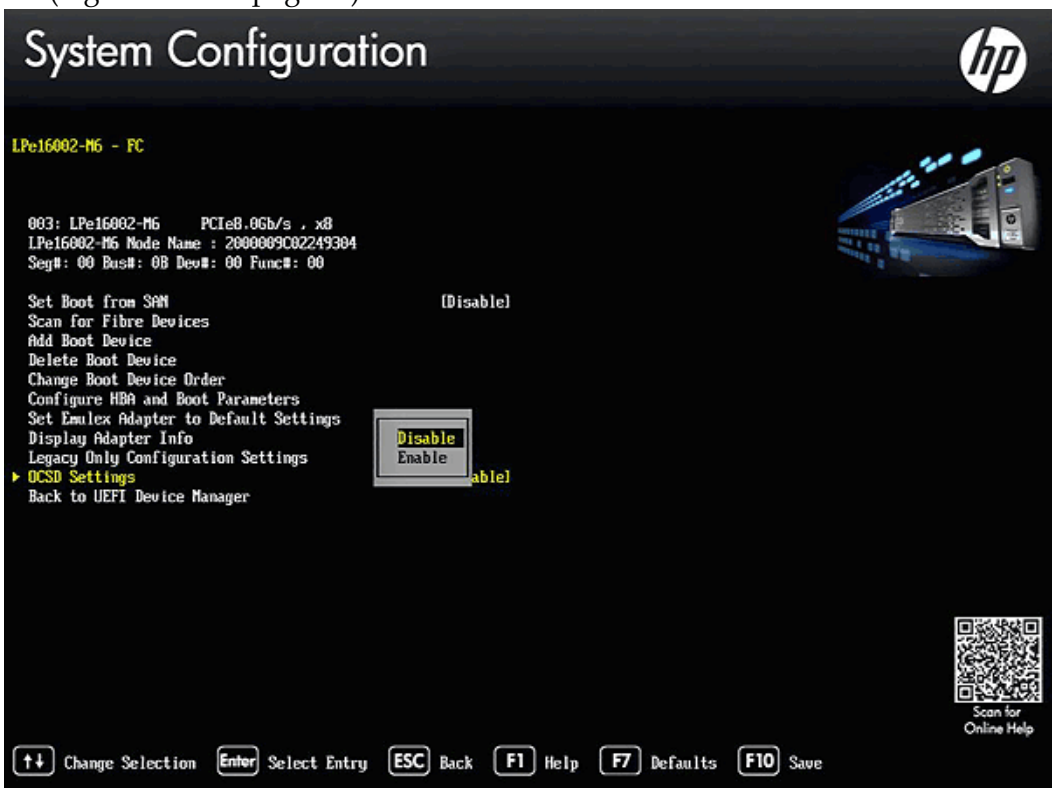

Figure 6-26 OCSD Settings Menu Screen

3. Make your selection and press **<F10>** to save it.

Returning to the UEFI Device Manager

To return to the UEFI Device Manager:

1. Select **Back to UEFI Device Manager** to return to the Device Configuration screen (Figure 6-2 on page 51).

7. Troubleshooting

There are circumstances in which your system may operate in an unexpected manner. This section explains several of these circumstances and offers one or more workarounds for each situation.

x86 BootBIOS

The following table lists X86 BootBios issues and their resolutions.

Table 7-1 x86 BootBIOS Troubleshooting

Issue	Situation	Resolution
The Bootup Message Does Not Appear As the System Boots	You want to access the BIOS utility, but the bootup message does not appear.	Make sure that x86 BootBIOS has been loaded and enabled.
Retry This Adapter Message	The message “Retry This Adapter” appears during BIOS scanning.	Check the hardware configuration or reconfigure the adapter BIOS using the BIOS utility.
Cannot Mount Root File System Message (Solaris SFS Driver)	The message “Cannot Mount Root File System” appears during bootup.	Make sure the correct storage device is identified in the scsi_vhci.conf file.
Cannot Find UNIX Kernel Message (Solaris SFS Driver)	The message “Cannot Find UNIX Kernel” appears during bootup.	Set up the correct LUN to boot in the BIOS utility. The correct LUN can be seen at the end of the Device Address line when you issue a `luxadm display <device>` command. See the luxadm documentation from Oracle for more information.
No Such Partition Message (Solaris SFS Driver)	The message “No Such Partition” appears during bootup.	Make sure the correct boot device is selected at the GRUB menu. See the GRUB documentation from Oracle and the /boot/grub/menu.lst for more information.

OpenBoot

The following table lists OpenBoot issues and their resolutions.

Table 7-2 OpenBoot Troubleshooting

Issue	Situation	Resolution
The System Cannot mount or fsck /etc/vfstab a FC Boot Disk (Solaris LPFC Driver)	During the boot process, the system cannot mount or fsck /etc/vfstab a FC boot disk.	Make sure that persistent binding is implemented correctly.

Table 7-2 OpenBoot Troubleshooting

Issue	Situation	Resolution
A Loaded File Is Not Executable (Solaris LPFC Driver)	After entering boot disk, a message states that the file that was loaded is not executable.	The boot block may not be installed correctly to the FC drive. See “Configure Boot from SAN on Solaris LPFC (SPARC)” on page 16.
The System Hangs or Reboots After Displaying Driver Information (Solaris LPFC Driver)	The system hangs for a long time after displaying driver information, or it reboots after displaying driver information.	Possible incorrect topology set in the /kernel/drv/lpfc.conf file on the target disk.
FC Disk Is Not Found (Solaris LPFC Driver)	You have performed the setup tasks and the FC disk is not found when you reboot the system.	If the FC disk is not found when the system is rebooted, it may be necessary to do the following: 1) Type “cfgadm -a” to list the target. 2) Type “cfgadm -vc configure c1::c5t2200002037AE0091” to configure the FC target. 3) Type “cfgadm -c unconfigure c1” to remove the FC target. It may also be necessary to add an entry for the boot drive to the sd.conf file.
The Displayed List of Emulex Adapters Ends with “fibre-channel” (Solaris LPFC Driver)	After all Emulex adapters have been enabled to boot from SAN, the system has been rebooted, and you show all system devices, the path to an Emulex adapter ends with “fibre-channel”, for example: /pci@1f,2000/fibre-channel instead of “lpfc@#”, for example: /pci@1f,4000/lpfc@2	The OpenBoot code is not loaded in the adapter’s firmware. You must install OpenBoot before you can set up boot from SAN on the adapter. See “Install, Update, and Enable Boot Code” on page 22.